Mine Action:
Lessons and Challenges

Geneva International Centre for
Humanitarian Demining
Centre International de
Déminage Humanitaire - Genève

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The **Geneva International Centre for Humanitarian Demining** (GICHD) supports the efforts of the international community in reducing the impact of mines and unexploded ordnance (UXO). The Centre provides operational assistance, is active in research and supports the implementation of the Anti-Personnel Mine Ban Convention.

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Foreword

Over the past 15 years, mine action has evolved into an established component of the relief and developments sectors, supported by more than 250 million US dollars each year. Over this period, projects and programmes for demining, mine risk education, victim assistance, advocacy, and stockpile destruction have all been discussed, refined and improved by operators, programmers, diplomats and activists.

A landmark treaty banning the production, stockpiling, transfer and use of anti-personnel mines has entered into force, and already binds more than three-quarters of the world's nations. Since 2003, the world also has an international legal instrument — a new protocol to the Convention on Certain Conventional Weapons — allocating responsibility for action to counter the threat posed by other explosive remnants of war.

International mine action standards have been adopted and are being translated into national realities. Most mine action programmes have a national authority and mine action centre that uses advanced geographic information system (GIS) based information management systems. Priorities are being better managed, employing socio-economic criteria to determine them. In turn, comprehensive landmine impact surveys are being carried out in affected States to assist in the identification of priorities. Standards for mine risk education have been developed, and guidelines for victim assistance have been finalised. Management training courses are being offered regularly for national mine action staff and a mine action exchange programme between mine-affected countries is progressing well.

As part of its ongoing concern to reinforce the effectiveness and efficiency of mine action, the Geneva International Centre for Humanitarian Demining commissioned contributions from development and mine action experts on the many lessons that have been learned over the past 15 years — and the challenges that remain to be met. These have been brought together in this work: *Mine Action: Lessons and Challenges*. We hope that it will contribute to debate on the future of mine action and its role within relief and development more generally.

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Ambassador Stephan Nellen
Director
Geneva International Centre for
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Introduction

On 18 September 1997, the Oslo Diplomatic Conference formally adopted new international law — the Convention on the Prohibition of Anti-Personnel Mines — which outlawed the production, stockpiling, transfer and use of anti-personnel mines. In December 1997, at the subsequent treaty signing ceremony in Ottawa, States pledged a total of US$500 million over five years to the global response to the landmine problem. Since 1989, the world has spent more than US$2.5 billion in seeking to rid the world of the scourge of mines and abandoned or unexploded ordnance.

Humanitarian responses to the landmine problem have existed as a distinct discipline since 1989, but a comprehensive technical review of lessons learned and future challenges has not yet been conducted. With the First Review Conference of the Convention on the Prohibition of Anti-Personnel Mines in November-December 2004, the international community seized the opportunity to take stock of progress made in reducing the threat posed by anti-personnel mines and other explosive remnants of war and to help map the path for the remainder of the decade.

Certainly, the international mine action community has learned a great deal over the past 16 years. This work, *Mine Action: Lessons and Challenges*, represents the views of selected experts as to what some of the key lessons have been, and what challenges remain for the future.

Following an Executive Summary of its main conclusions and findings, this work is laid out in two parts. Part I looks at the core activities — the "pillars" — of mine action: advocacy, victim assistance, mine risk education, demining (survey, marking and clearance of mines and unexploded ordnance) and stockpile destruction. Part II looks at key management issues, specifically, programme coordination and management, information management and capacity development. This work concludes with a thought-provoking assessment of what mine action has actually achieved.

Executive summary

Over the past 15 years, mine action has evolved into an established component of the relief and developments sectors. It benefits from an accepted international definition that comprises five main pillars: demining (encompassing survey, marking and clearance), advocacy, mine risk education, victim assistance and stockpile destruction. These activities are underpinned by international law, especially the Anti-Personnel Mine Ban Convention and a recent protocol governing explosive remnants of war (ERW, covering abandoned explosive ordnance — AXO, and unexploded ordnance — UXO). In addition, internationally agreed standards, as well as a model legal and institutional framework, exist to guide the effective coordination, management and implementation of national mine action programmes. Today, the world understands how these weapons affect the lives of civilians and the civilian population in a far more accurate and sophisticated way.

Thus, from the shaky foundations of unadapted military breaching procedures in the late 1980s, demining has evolved rapidly into a distinct and refined discipline. The disjointed approaches of individual organisations converged as, beneath an intense media spotlight, conferences and other liaison brought productive exchanges of information. As the Ottawa Process that led to the adoption of the Anti-Personnel Mine Ban Convention captured the public imagination, governments throughout the world became involved, with many donating funds or contributing resources to this growing industry.

The creation of the United Nations Mine Action Service (UNMAS) and the Geneva International Centre for Humanitarian Demining (GICHD) brought proper oversight, along with a more detached and objective approach to management. Regulation has been applied primarily to working standards (in the form of the International Mine Action Standards — IMAS) and information technology (provided by the Information Management System for Mine Action — IMSMA). This has helped standardise diverse programmes and allowed a host of other benefits, ranging from better working conditions for deminers to the ability to assess programme efficiency. The pool of accumulated knowledge is also being better managed to allow new programmes to benefit from the lessons of previous operations and to further enhance the equipment and procedures in use.

The evolution of the five pillars of mine action

Demining and demining technologies

At a relatively early stage in the evolution of mine action, scientists and engineers became interested and began to contribute, unproductively at first, but with increasing benefit as relationships with the demining community improved. Necessity has been the mother of invention throughout the evolution of mine action and many recent developments have been prompted by requirements from the field, and then accomplished using sound scientific research. Yet, despite the substantial and well-focused development work, there have been few changes to the fundamental nature of mine clearance, which remains dangerous, labour intensive and slow. Most people now accept that there will be no "silver bullet" or one unique answer to solve the many practical problems of demining.

In contrast, the exploitation of existing technologies has been more successful, and new and improved mine clearance machinery is being produced and fielded on a wider scale than ever before. Techniques for the training and use of mine detection dogs have also been improved, thanks to some original research carried out under the GICHD mine detection dog programme.

One difficulty is that there is no single "mine problem", a fact not understood by most researchers. Each minefield or mined area may present a series of unique problems to the clearance staff. And clearance tools that work well in one area may be useless in another, even in the same country or region. User requirements may vary subtly in each place, so single solutions may not work as well in another location. This leads to the question whether research and development of new technologies is cost effective.

From the researcher's point of view, it is difficult to get from the deminers a consolidated set of quantified performance requirements for new equipment. Each mine action organisation has its own opinions on performance specifications, but these would be better coordinated to cover the whole demining community rather than one specific programme. Most armies and industries have well-tried routines for establishing customer needs for equipment performance. The mine action community needs the same.

Also, although incremental improvements are being made in the cost-effectiveness of mine action, there has been little success in developing a stand-off detector to remotely locate the presence of mined areas. This alone could improve the efficiency of technical surveys by a very large amount. It can be argued that success in this area of research would find a ready market and it is highly probable that military demining organisations would wish to acquire the same capability. Military purchases would change the pattern of the market completely and would probably give the return on the investment that is currently sought.

In terms of survey — a major component of demining operations — the landmine impact surveys (LIS) moved survey away from "chasing minefields" to providing a better assessment of the impact of landmines on communities.

The LIS gives an overview of the national landmine situation, and allows a ranking of communities based on the severity of mine impact (and hence guidance on the allocation of priorities and resources). However, ongoing data collection is required to avoid a static view, the impact scoring system needs adaptation to local situations, and the LIS does not provide data on contamination of infrastructure.

There is a need for a greater focus on incorporating survey results into the activities of potential end users — in order to maximise benefits from survey projects. In the wake of national surveys, for instance, the transfer of survey information to the IMSMA database is often considered the end-goal of the project, but it is the activities that follow that define the success of the project. Greater effort should be placed on the integration of survey information into the activities of stakeholder groups through organised presentations, workshops, training and dissemination of tailored data. Where appropriate, survey results can also be used for strategic planning where the strengths and weaknesses of the data are fully understood.

There are weaknesses in approaches of both hazard-focused and impact surveys. Both can benefit from a more deliberate attempt at integrating their findings. Better quality assurance procedures in emergency surveys could be introduced and impact surveys could be adapted to capture impact associated with blocked infrastructure. If it is indeed necessary to undertake additional surveys it may be possible to avoid full duplication by retrofitting existing information into the new format, allowing only new data fields to be addressed. If surveys have followed a common gazetteer or use IMSMA as a mutual database, then the possibilities of this are greater.

In addition to emergency surveys with socio-economic components, there may, at the other extreme, be more comprehensive surveys that correlate aspects of landmine and UXO contamination with information bodies from other sectors — using data that have a focus on agriculture, land use or poverty mapping. Agricultural surveys for instance, could supply values of land productivity that would better support cost-benefit models for demining sites that have a defined land use potential. Database and geographic information system (GIS) efforts for mine action could be shared with other sectors during post-conflict rehabilitation with diverse information-gathering bodies expanding the potential for data analysis in mine action.

Advocacy

Advocacy has been a major factor in achieving a comprehensive international legal prohibition of anti-personnel mines in the space of only a few years and has promoted the commitment of significant resources to mine action. A side benefit has been the promotion of the development and implementation of international humanitarian law more generally.

The Landmine Monitor, issued by the International Campaign to Ban Landmines, is an example of a mechanism that has been effective in monitoring the progress made on landmines. It has become an essential element in advocacy on the landmine issue. While many of its reports provide a glimpse into the UXO problem, their primary focus is on the policies and activities related to landmines. More detailed information on other forms of UXO would be useful.

In learning the lessons of the past decade, it is clear that part of the success of the campaign against anti-personnel mines was the unprecedented degree of coordination among the variety of actors involved in advocacy activities. Although the main actors came from a range of disciplines, operated under different mandates and played different roles in the advocacy work, they nevertheless closely coordinated and supported each other's activities.

However, the same level of cooperation and coordination has not been as evident in the efforts to improve the international law on ERW, anti-vehicle mines and cluster munitions in the context of the Convention on Certain Conventional Weapons (CCW). While some bodies and organisations have worked closely in these areas, other organisations involved in the anti-personnel mine issue have been less active. As compared with meetings on landmines, fewer organisations have participated in the meetings of the States Parties to the CCW or its Group of Governmental Experts. In addition, the proposals on ERW and anti-vehicle mines have not been as extensively raised in capitals by advocacy organisations.

One explanation is that many of the relevant organisations remain focused on the anti-personnel mine problem and the implementation of the Anti-Personnel Mine Ban Convention. With the Convention's Standing Committees, the Meeting of States Parties and implementation work at the national level, most organisations are fully occupied throughout the year. It is often difficult for them to follow developments in the parallel processes in the CCW with their existing resources. As a result, there has been less public and political pressure on governments for a positive result on ERW, anti-vehicle mines and cluster munitions.

As work continues on these issues, cooperation and coordination will need to be enhanced if the Protocol on Explosive Remnants of War is to be widely ratified, and effective measures are to be adopted on anti-vehicle mines and cluster munitions. The mobilisation of public pressure, political will and dialogue with the armed forces will be essential parts of the advocacy work. Greater cooperation and coordination in these areas will maximise the effectiveness of the messages and activities. The organisation of an NGO campaign on cluster munitions and ERW will improve the capacity for cooperation and coordination on these issues. Formed in November 2003, the Cluster Munitions Coalition needs to become an important actor and a focal point in the advocacy efforts on these issues.

Mine risk education

The mine risk education (MRE) sector has slowly begun to professionalise — a process marked by the development of guidelines, the introduction of training protocols and the development of IMAS standards incorporating MRE. Having said that, given the size of the MRE industry, there has been a relative dearth of quality information for training and programme management. The recent development of IMAS Best Practice Guidebooks by

UNICEF in partnership with the GICHD should help to fill at least some of the gaps.

Indeed, by far the most potentially important development of recent years has been the development of the International Mine Action Standards for MRE. These standards are intended to replace the existing UN guidelines and include standards on data gathering, accreditation, programme planning, implementation, management, training, monitoring and evaluation. The MRE standards were formally adopted in June 2004.

The standards are welcome in that for the first time a generally supported definition of MRE — what it is and what it is not — is codified in the document. This alone is no small feat and, by clearly highlighting the public education component and the community liaison function in unambiguous terms, it is extremely useful. How quickly the standards effectively will impact on practice in MRE organisations, though, will depend to a large extent on how aware the operators are of the standards and their implications.

Yet, given the amount of funding made available to MRE programmes (probably between US$10 million and US$15 million each year), it is extremely surprising that donors have not been more insistent on being shown substantive proof of efficacy. To date, operational efficiency and effectiveness have largely been evidenced by questionable indicators such as the counting of outputs — a particular favourite being the quantity of posters printed and the number of individuals "briefed" or "reached".

For, as has become better understood in recent years, factors such as mine clearance and population movements may be responsible for a reduction in mine and UXO casualties with no input from MRE programming. Similarly, MRE may result in increases in casualties, or at least an increase in *reported* casualties, as systems are put in place for recording these. In the same way as mine clearance is seeking to look beyond simple quantitative measurements of progress (such as numbers of mines and quantities of square metres of land cleared) to assess the social and economic impact of its work on communities, so MRE evaluations must seek to judge success on the basis of more representative proxy indicators.

So, in seeking to coordinate and integrate with other mine action and development intervention, MRE must also do much better than it has done so far to demonstrate its effectiveness (and efficiency) as a means of reducing casualties.

It can be argued that one reason for the lack of respect at times shown for the profession is that the sector has poorly marketed itself, including its relevance and proof that it works. MRE, and for that matter the clearance side of mine action as well, has been guilty of assuming funding will remain available, and that it was more important to deliver rather than waste time in retrospective measurement activity. This view was convenient in that it allowed for focusing on the delivery rather than on the search for evidence of behaviour change among the target group. It also reflected a naivety that funding would continue. As the funding environment has become more formalised, so MRE organisations have realised this is no longer the case and increasingly, organisations are undertaking more meaningful evaluations of their work.

In addition, mine action, including MRE, must improve its accountability to the communities it serves. Completed general surveys, detailed maps of contaminated, suspected and known cleared areas, clearance reports, etc., are rarely shared with communities. Where such material exists, MRE organisations should be tasked with ensuring its regular effective dissemination. In communities where mine clearance is being undertaken the focus should be on MRE through community liaison, managed and tasked as part of the clearance operation.

Victim assistance

In terms of responding to the needs of one of the fundamental reasons for its existence, mine action and the broader health sector have made relatively little headway in improving the provision of assistance to mine and UXO victims, despite it being a "pillar" of mine action. Broadly the same actors — medical centres under national ministries of health, the International Committee of the Red Cross, Handicap International, and the Vietnam Veterans of America Foundation, to name some of the key service providers, are engaged in various aspects of assistance, notably in physical rehabilitation.

The vast majority of the affected countries have to deal with specific needs of landmine victims while struggling with fundamental challenges of economy, employment, health, education, and basic human rights at the same time, some amid internal or international conflicts or post-conflict reconstruction. Three main issues identified by States Parties to the Anti-Personnel Mine Ban Convention in 1999 still pose a challenge to victim assistance today: how to collect and share needed information on victims; how to gain sufficient attention from donors; and how to coordinate victim assistance activities more effectively. The world still has much to do in repairing the many wounds of war.

Stockpile destruction

The fifth pillar of mine action — stockpile destruction — is also its most recent, having been added to the definition of mine action only five years ago. However, the world has made inroads into global stockpiles, estimated at more than 250 million anti-personnel mines prior to the entry into force of the Anti-Personnel Mine Ban Convention. Sometimes progress has been slow, but generally the obligation has been implemented in good faith. In the past decade, more than 60 million stockpiled anti-personnel mines have been destroyed, according to the Landmine Monitor.

But most stockpiled anti-personnel mines remain outside the purview of the Convention. China and the Russian Federation hold the bulk of these and neither appears ready to accede to the Convention at an early stage. Despite apparently destroying many millions of stockpiled anti-personnel mines that did not comply with Amended Protocol II, the Russian Federation has continued to use landmines in its military operations in Chechnya. Getting these and other major military powers, such as India, Pakistan and the US, to destroy their stockpiles will demand greater political will than has so far proved to exist.

The coordination and management of mine action programmes

Overall, the international community has learnt — and agreed upon — many of the requirements for successful coordination and management of national mine action programmes. Central to that learning experience has been the work of the national authorities of affected States, the United Nations and key donors to mine action.

Wherever there is significant contamination or impact from mines, UXO or abandoned explosive ordnance (AXO), a national mine action authority and a mine action centre can play an effective role in ensuring the proper coordination and management of a mine action programme. These institutions should be mandated and regulated by domestic legislation to bring clarity, coherence and transparency to the sector.

Information management

Central to effective mine action management is the management of information. The first five years of mine action information management systems — the period pre-IMSMA — saw the development of databases in large programmes that had a requirement but, more importantly, the capacity to devote significant resources to this task. These databases were not well rounded — they focused on the particular sort of data and reporting that were of specific interest to the individuals working in the programme at the time and did not benefit from a wider body of experience.

The next five years saw the development of IMSMA through three major versions and, with the exception of the northern Iraq programme, very little database development elsewhere. As IMSMA progressed from v1 to v3 it grew in size, complexity and capability. Important new functionality included robust decentralised data entry, integrated coordinate transformations and the addition of mine risk education. IMSMA is now the *de facto* standard database for mine action. For the most part mine action programmes have warmly embraced this standardisation effort.

The current course of the IMSMA version 4 project marks a sharp turn from that of the previous five years. The GICHD's creation of regional IMSMA representatives addresses one of the main points highlighted by Price Waterhouse Coopers in their review of mine action information management. Namely, that far more attention has been given to developing the IMSMA software than to assisting users in the field in making appropriate use of it. Rather than relying on technical advisers — a resource many programmes cannot afford — GICHD has stepped forward to directly provide this service to the users of its software.

However, the balance of power between headquarters staff and information management professionals seems to be firmly weighted towards headquarters staff, given the experience during the design of recent surveys. Important lessons learned during the landmine impact survey process seem to have been forgotten. By focusing on data rather than data use, surveys such as the Emergency Survey in Iraq have degraded their effectiveness by failing to focus on analysis. Fielding data collection forms that do not have a focused intent yields poor quality data.

Geographic information systems are now widely used in mine action. For most programmes this means that they have the capability to print maps showing the mine threat. While automated mapping is a very modest use of the geographic tools made available by IMSMA, it is a huge advance from what was available before and places mine action among a very select group of GIS users in many of the countries where it is used.

Capacity development

The UN and its many partners can play a major role in developing an indigenous capacity to run national institutions to plan, direct and coordinate mine action operations efficiently, while at the same time maintaining safety standards as high as possible. However, the effort to foster indigenous mine action capacities in developing countries and economies in transition is very much a glass half-empty/half-full story. International assistance generally has succeeded in developing the capacities of individuals for the front-line tasks relating to mine clearance, survey, quality assurance, medical support of clearance operations, MRE and victim assistance. In most cases where the contamination is likely to require a sustained effort, indigenous capacity for continuing these training programmes has also been developed. These achievements provide benefits in particular to the successful trainees (at least those obtaining employment).

Where the incentives are right, some of the more entrepreneurial of these individuals will go on to establish local organisations (even though, in competitive environments, the unlucky and incapable will cease operations). In short, the transfer of technical skills to individuals is fairly easily accomplished and the problems that have occurred have in the main stemmed from coordination failures among the donors and with the government. In the case of Angola, for example, this led to an inordinate delay in mounting the training programmes; in Bosnia's case, donor competition led to grossly excessive investment in basic capacity development activities such as training and equipping people for manual demining. A further concern is that sometimes a notable lack of political will to address the issue exists within the government of an affected country.

The development of individual capacities, together with the provision of equipment, funding and the like, is also a boon to existing organisations that have established capacities and can absorb new responsibilities when assisted appropriately. However, capacity development of the type needed to establish new organisations or to improve the management cadres and systems of poorly performing organisations has been much more hit-and-miss. In the first decade, the failures at this level of capacity development outweighed the successes, in part because short-term emergency thinking dominated, no successful models existed in the new field of mine action, and most of the early programmes began in the difficult situations of complex emergencies and failed states.

More fundamentally, donors and the UN organisations could not muster the extra individual and collective capacities for capacity development required in such trying circumstances. After the excellent *Development of Indigenous Capacities* study, the UN addressed many of its shortcomings, most fundamentally by establishing the coordination structures required to learn from experience and then to apply these lessons.

But enhanced donor coordination will also be necessary in one of the frontier issues for capacity development in mine action; the transition of mine action programmes from donor dependence to sustained financing by the local government. This is likely to involve downsizing of most programmes, both to match the government's fiscal capacity and in recognition that the most pressing contamination priorities will have been addressed in many cases, leaving a "residual" contamination problem. Ideally, the transition should not be abrupt, but the experience from other humanitarian and development sectors that have gone out of fashion or "off the boil" suggests that a dignified disengagement of donors is more likely to be the exception than the rule.

The need for better coordination within the donor arena is also one of many frontier issues concerning capacity development of networks, which is needed to ensure that a group of otherwise capable organisations works effectively in concert. There is a general awareness of the institutions and processes required to make the organisations within a country's mine action arena function as a reasonably coherent network (donor support groups, steering committees, technical working groups for clearance, MRE, and the like, plus a national strategic plan), although of course these elements are not fully in place in all programmes and most programmes exhibit some common weaknesses, such as failure to truly integrate MRE with the survey, marking and clearance functions.

So, has mine action really made a difference?

After all the work that has been carried out and all the money that have been expended, it is still necessary to ask whether mine action has really made a significant, long-term difference to the lives of the people it is trying to help. For few things in mine action cause more frustration and misunderstanding among donors, recipient governments and programme managers than the question: what results has the programme achieved? Study after study has decried the fact that, while there is abundant data detailing the number of landmines destroyed, the area of land cleared and the number of people receiving mine risk education ("doing the job right"), there is little data allowing an assessment of whether these achievements have enhanced the well-being of people in mine-afflicted communities.

Simply put, mine action practitioners often cannot demonstrate that they are doing — or even aiming at — "the right job". This deficiency will pose ever greater problems as donors seek an accounting of the benefits generated with their funds and as host governments try to gauge what mine action (relative to other claims on the public purse) promises for their citizens and for the country's overall development.

There are numerous attempts under way to rectify this shortcoming, but for the most part these represent only partial measures — pieces of a larger puzzle. In fairness, the mine action puzzle is unusually complex. The community faces the challenges that always arise when trying to focus more tightly on results — what might be termed "garden variety" management problems. But it also faces "exotic" challenges because many mine-afflicted countries represent such difficult and rapidly changing environments.

What is certain is that mine action programmes in heavily contaminated countries will almost certainly not be able to declare victory in the short- to medium-term. Therefore, they need to equip themselves adequately for the long haul. This implies something more fundamental than new tools for their tool kits: it implies learning how to learn. This ability is required if programmes are to assess their performance in terms of results that make a difference to people in mine-afflicted communities, which is necessary to maintain the support of donors and, increasingly, of host governments. Even more critically, the ability to assess performance in terms of meaningful results is necessary to improve such performance over time. In sum, the learning process, reflected throughout this publication, must not only continue, it must intensify.

Part I

The Pillars of Mine Action

1

The demining toolkit

Colin King

Summary

From the shaky foundations of military breaching procedures, demining has evolved rapidly into a separate, refined discipline. Maturity occurred during the 1990s with the integration of mine risk education, minefield survey, marking and clearance, victim assistance, advocacy and stockpile destruction into the broader discipline of mine action. This rounded approach now takes its place as a major component of humanitarian aid to mine-affected regions, particularly in the immediate post-conflict period. Yet, despite substantial research and development work, there have been few changes to the fundamental nature of mine clearance, which remains dangerous, labour-intensive and slow. Most people now accept that there will be no "silver bullet" to solve the many practical problems of demining.

Introduction

From its inception in the late 1980s, mine action has developed into a global activity with an entire industry built up around it. The growth and rate of change within mine action is almost unparalleled among international aid efforts, and the expansion has occurred simultaneously on several fronts. Not only have programmes emerged in dozens of different countries, but the extent and complexity of those programmes have increased beyond the wildest expectations of the early days.

A network of activities has developed in support of this expansion, ranging from the provision of specialist equipment and information technology to systems for regulation and global management. The explosion of activity has attracted a great deal of media attention, raising the profile of mine action and stimulating broad interest and support. In turn, the heightened awareness has helped to attract the substantial levels of funding needed to sustain operations on this scale.

As a result of its accelerated development, mine action organisations[1] have achieved tangible results in countries throughout the world; they have also evolved a template for providing rapid and effective mine action in new programmes or post-conflict situations. Part of the approach involves the selection of proven equipment and techniques for demining tasks, together with the knowledge and experience to use them effectively.

Demining is the clearance of land to internationally agreed standards. This means that the objective is to clear given areas of land of all explosive devices — mines, unexploded ordnance (UXO) and any other explosive remnants of war (ERW).[2] The term "demining toolkit" is often used to describe the range of options available to the mine action programme manager. The elements of the toolkit, which have been adapted (from military applications), invented, developed and refined over the last 15 years or so, now offer workable solutions to most demining challenges.

However, despite the many accomplishments of mine action, progress has not always been smooth and success has been achieved at considerable cost. The evolution of mine action has been punctuated by hard-learned lessons, personal tragedies and, occasionally, outright failure. This chapter explains the impetus behind global mine action and outlines the evolution of the demining toolkit over the last 15 years.

Mines and mine warfare

The characteristics of mines

The need for mine action owes a great deal to the characteristics of the mines themselves. Ever since the development of explosive munitions there has been danger from UXO, but landmines are unique in their ability to inflict casualties long after their deployment.

Most munitions are targeted towards the intended "victim" — this entails a degree of selectivity and is intended to produce a destructive effect at, or shortly after, the time of impact. In contrast, the typical mine waits for its victim to arrive, completely removing the element of selectivity. This method of operation also requires the mine to remain functional for an indefinite period, often extending its lifespan way beyond the conflict in which it is used. More recently, "smart" mines with pre-determined life spans and greater selectivity have been produced, but these are the preserve of wealthy nations and few have been used operationally.

Mines are inherently simple munitions and require few components. The casing may be of virtually any material and the mechanism is often little more than a spring-loaded striker retained by a pin. This means that mines are inexpensive and easy to produce, resulting in universal availability and (prior to the entry into force of the Anti-Personnel Mine Ban Convention) widespread use. With little to go wrong and virtually guaranteed operation, mines are highly efficient defensive weapons.

Mine warfare

The availability, efficiency and versatility of the mine have led to its adoption by military forces throughout the world. Originally, mines were used mainly for the defence of borders and installations, but then spread to more offensive use in ambushes and isolated attacks. The potential of mines for insurgent or terrorist use soon became clear, and the ease with which mines could be made or acquired meant that they were readily available to any hostile faction.

Mines are made in a number of different configurations, with hundreds of individual designs and fuze combinations. Although many are designed to be buried, others are placed on short stakes or positioned well above the ground, creating a three-dimensional threat. The use of tripwires, linked mines and improvisation adds further complications. All in all, the variety of mine types, fuzes and means of positioning leads to countless permutations, making it impossible to evolve a single foolproof clearance process.

While well-trained military engineers generally used mines in a systematic and disciplined manner, many forces did not. In many countries, mines were laid in vast numbers by untrained soldiers, militias or insurgent groups with little or no thought for the long-term implications and, more importantly, without recording their locations. In most cases, the urgency of the conflict overwhelmed any other consideration and, even within otherwise responsible governments, few people considered the devastating consequences of extensive and indiscriminate mine-laying.

Minefields

For most people, the term "minefield" conjures up an image of a discrete area of flat agricultural land crossed by neat rows of mines. The reality is very different, for a variety of reasons. To begin with, mines have been used in every type of environment, from the deserts of North Africa to the jungles of South-East Asia. Even where mines have been laid on agricultural land, their denial of access over the land means that it can no longer be used for grazing animals or growing crops. It therefore quickly becomes overgrown, particularly in fertile regions, with thick vegetation and trees creating major obstacles after a few years.

Other natural obstacles (such as steep slopes, rocks and water courses) contribute to the complexity of the minefield and greatly complicate the clearance process. Battlefields often contain earthworks (such as trenches and mounds), wire (barbed wire, communications line and missile guidance wires) and a great deal of metallic military scrap, including live UXO and other ERW. In some cases, mines are also present in and around settlements, bringing the added complication of man-made structures and underground services. In sum, there is no such thing as a standard minefield and, therefore, no single approach to a clearance task.

The British Army was reintroduced to the realities of mine warfare during the Falklands campaign of 1982, where minefields proved to be formidable and demoralising obstacles. Despite their relative simplicity,[3] the minefields defied clearance once the conflict had ended. As casualties mounted during the initial attempts at clearance, the British government recognised the inherent difficulties of the task and halted demining operations. The minefields still remain in place, with little prospect of clearance in the foreseeable future.

Minefield breaching

The ability to clear mines is a fundamental component of mine warfare, but is tailored to the requirements of military formations during combat. The objective is normally to overcome the obstacle in the most efficient manner possible: for a minefield, this means crossing it rather than removing it. It also means taking the shortest practical route and clearing as little area as possible.

The sole aim of minefield breaching is to create a (relatively) safe lane for the movement of troops. The work will always have a strict time limitation and might be carried out under enemy fire; these limitations demand some compromise in the standard of clearance, which cannot be guaranteed completely under combat conditions. Modern surveillance equipment has virtually eliminated the utility of the early manual breaching techniques (performed by soldiers equipped with metal detectors and probes). Current methods (including explosive line charges, ploughs and rollers) use equipment that can be deployed from behind armour and yield rapid results.

Many of the considerations for breaching are different from those in demining and, in some cases, the two are in direct conflict. While calculation of "acceptable losses" of troops is part of planning a military operation, there can be no acceptable losses, and therefore no missed mines, in a humanitarian context: there can be no "acceptable" loss of life or limb, and any future accident would destroy the confidence of local people, in using the land (as we know, people often *do* use the land despite the danger). It soon became obvious that existing military minefield breaching techniques and equipment would be of little value for demining.

The beginnings of demining

Afghanistan, 1989

The first major humanitarian demining programme was part of Operation Salam, an ambitious United Nations (UN) aid project aimed at restoring normality to war-torn Afghanistan following many years of Russian occupation.

Extensive mine clearance operations had taken place after the 1939-45 war, especially in Europe, but most were conducted by troops and many units suffered heavy casualties. Most mines had been recently laid and were readily detectable because of their substantial metal content. In many cases the minefields were well-recorded and could be identified or cleared by those who laid them.

In contrast, the situation in Afghanistan was awkward and confused. The casualty rate among the local population was appallingly high,[4] with the very few medical facilities hopelessly unable to cope with increasing numbers of mine victims. Countless refugees were unable to return to their homes and many of the surviving communities had been denied the use of their land.

A wide variety of mines had been used by both sides, including a number of "minimum-metal" types designed to defeat metal detectors. Few records of the minefields existed, and some mines had been scattered from the air or positioned randomly without any form of marking. No formal organisation existed for the clearance of mines and the workforce had to be drawn from Afghans with little or no relevant experience. The scale of the problem was daunting, yet similar situations would be soon encountered in regions throughout the world.

At this time, the only people with any relevant expertise were army personnel trained in mine warfare. A number of Western countries, including Australia, Canada, France, Italy, New Zealand, the UK and the US, sent training teams to teach the would-be Afghan deminers. The most immediate problem was that many of these trainers had never cleared live mines themselves. Most were military engineers, but only a few were trained in explosive ordnance disposal (EOD); the US contingent, for example, were Special Forces personnel who had only just received superficial training in mine clearance.

Further problems immediately became apparent.[5] Not only did the trainers lack credibility among their Afghan trainees, but they also lacked the depth of knowledge to address new or unforeseen issues. Training was firmly based on military breaching procedures, yet there was no attempt to standardise practices between national contingents. Some of the techniques taught (such as probing in rocky ground) were completely impractical, while others (such as throwing a grapnel hook to clear tripwires) were downright dangerous. Even as training was going on (and training was held in camps in neighbouring Pakistan, not in the minefields of Afghanistan), some instructors began to recognise serious shortcomings; however, it was not until the "trained" Afghan teams were deployed to begin demining that the inadequacies of the system became truly apparent.

Despite its many weaknesses, Operation Salam did establish some important and enduring principles of mine action. To begin with, the work would be carried out entirely for the benefit of the local population, not for military expediency. The programme attracted international support and some of the best "technical advisers" available at the time, while the deminers were drawn from the host nation and would remain there to build an indigenous capacity. It was also the first humanitarian programme to make extensive use of mine detection dogs and demonstrate their potential for demining applications. From these shaky beginnings, the Mine Action Programme for Afghanistan (MAPA) developed into one of the most successful long-term mine action programmes in the world.

Kuwait, 1991: international contract clearance

The clearance of Kuwait following the first Gulf war was the second major demining programme of recent times. But while the scale of the problem was comparable to Afghanistan, the approach was entirely different. In Kuwait, the ready availability of funding meant that massive resources could be committed to hire commercial operators to complete the job quickly. While the majority of Afghanistan is expected to be demined within another ten years[6] (making nearly 25 years in total), Kuwait was cleared in less than four years. The work was performed by expatriates, recruited from virtually any ordnance-related field, although very few had any operational experience of mine clearing.

While the basic aim was achieved, the cost of clearing Kuwait was high in terms of both funding and casualties. According to reports, the Kuwaitis employed 4,000 contractors at a cost of US$800 million,[7] a level of funding unlikely to be available to most national programmes. During the clearance, 84 deminers were killed and a further 200 injured,[8] a casualty level that was widely regarded as unacceptably high. Unfortunately, some of the military contingents accepted their casualties as the inevitable price of a high-risk operation and continued their approach to clearance throughout the operation. However, among the civilian contractors a series of investigations and conferences prompted a major re-evaluation of working practices; the resultant changes were to permanently alter the conduct of demining.

Although some would take years to evolve, a number of common-sense and innovative measures were implemented as the clearance progressed. An interesting example was the adoption of a "sapping" technique used by soldiers of the French Foreign Legion in preference to traditional military probing. They found that it was faster and more thorough to scrape away sand as they progressed down their clearance lane, allowing the loose surface to fall back to its natural angle of repose. As the edge fell away, mines were exposed and could be dealt with easily.

Both the British and American contingents experimented with new explosives, machines and personal equipment; although there were few major breakthroughs, a great deal was learned about the limitations of new techniques. One example was a mine flail brought in to clear beach areas of anti-personnel mines. The machine was well designed and engineered, and should have been a major asset in this particular task, but operational use soon proved otherwise. Not only was the machine routinely halted by wire, which it tended to reel onto the rotating spindle, but it scattered live mines into previously cleared areas, resulting in an operator losing a leg.

Fundamental flaws in the early programmes

For all their differences, the demining programmes in Afghanistan and Kuwait demonstrated many of the same shortcomings. Perhaps the most significant weakness was that both programmes focused on the clearance of mines while largely overlooking other mine-related issues. Both were primarily "demining" programmes and had little or no linkage with other components of what is now called "mine action".

Mine risk education

While some mine risk education (then called "mine awareness") was conducted in both regions, the activity was never an integral part of the demining programme. There was no concerted education campaign and efforts by individual departments and non-governmental organisations (NGOs) were largely sporadic, disjointed affairs. Even in these early days, it should have been apparent that mine risk education could have had a far more immediate impact on casualty rates than demining, yet this option was largely overlooked.

Victim assistance

The situation regarding victim assistance was similar to that with mine risk education; some work was being done, but there was little linkage with the demining programme. Agencies such as the International Committee of the Red Cross (ICRC) treated the casualties who survived long enough to reach them, but many mine victims had no access to effective first aid in the immediate aftermath of an incident. There were also few provisions for long-term aid, such as prosthetic limbs or facilities for continuing care in the community.

Survey

No process existed to conduct a comprehensive survey of the countries in order to establish which areas had suffered the highest humanitarian impact. In Kuwait, since all work began more or less simultaneously, nations participating in the clearance effort were simply allocated sectors of the country. In Afghanistan, the first demining teams were expected either to return to their home communities or work wherever their help was sought. Since there was no comprehensive overview of the mine problem, it was impossible to prioritise tasks or allocate resources efficiently.

Stockpiles

In the meantime, while the demining continued, substantial stockpiles of mines remained available to the many hostile factions in Afghanistan. These would continue to be used in the many territorial disputes and power struggles between warlords, even as mines were being lifted in other parts of the country. This situation has occurred in many other unstable areas, and in some cases cleared ground has been re-mined when hostilities resumed.

Practical issues

Besides the strategic "mine action" issues highlighted above, a host of technical problems emerged during the early demining programmes. These were issues that directly affected the deminers and indicated that operational reality would involve a steep learning curve. One example was the minimum-metal mines that were now widely encountered; these became the misleading stereotype image that the scientific community, media, public and even deminers themselves would associate with mines. Among the many categories of mine, the small buried blast mine attracted all the attention, despite the fact that, for example, a fragmentation stake mine is far more lethal and takes far longer to clear.[9]

Many minimum-metal mines were barely, if at all, detectable by the location equipment of the time, and they became such an obsession that, for many years, the development of mine detectors addressed little else. Other detection issues, such as locating tripwires or minimising false-alarm rates, were virtually ignored in the relentless pursuit of ever-more sensitive metal detectors. Unfortunately, increasing *sensitivity* without any corresponding increase in *selectivity* raised the false alarm rate still further.[10] With most detectors now capable of locating 0.1 grams of metal, it can be extremely difficult and time-consuming for operators to identify the object that is causing their detectors to alarm.

Good training or reference material could have mitigated the lack of operational expertise among the expatriate "technical advisers" and deminers, but this too was unavailable. At the time, Western military intelligence was largely focused on the Warsaw Pact countries, while many of the mines were from Europe (East and West) or other parts of the world. Of the information that was available, much was classified and most concentrated on weapon characteristics and capabilities rather than disarming procedures.

The lack of technical knowledge was the direct cause of numerous accidents as operators (many of whom had never touched a live mine, let alone cleared a minefield) attempted to lift, disarm and dismantle mines that they knew little about. Few, for example, understood the difference between percussion detonators and the far less stable "stab-sensitive" detonators used in many mine fuzes.[11] One organisation issued its deminers with needle-nosed tweezers, with instructions to extract "stab-sensitive" detonators from the bounding mines they recovered, a practice that caused at least one fatality.

The issue of weapons intelligence was not confined to mines. In Afghanistan and Kuwait, as with many other mine-affected regions, many other types of UXO were present in and around the minefields. Unexploded submunitions were a particular threat and were often likened to mines because of their sensitivity and the numbers in which they were encountered. The UXO problem led to the formation of EOD teams, often created by providing existing deminers with more advanced training.

The rising number of accidents revealed many weaknesses in basic working practices, but also highlighted the urgent need for effective personal protective equipment (PPE). Early deminers were issued little, if any, PPE; helmets and flak jackets were provided in some programmes but provided inadequate protection for the special needs of the deminer. Eye protection also became a major issue after an expatriate deminer was blinded during an accident in Kuwait.

At the time, most of the available protective equipment was military issue body armour, which had been designed for a completely different role. It soon became apparent that specialist equipment would be needed to protect deminers, while allowing them sufficient comfort and freedom of movement for sustained work.

A further lesson from the ever-increasing casualty list was the need to insure all deminers. While the expatriate workers were generally provided with adequate cover, host-nation workers were not. Litigation following mine-related accidents also acted as a stark reminder to employers that they had a duty of care towards their workers, no matter how inherently dangerous the task. By law, failure to provide adequate equipment, protection or even information might be regarded as negligence. This realisation may have been instrumental in prompting programme managers to anticipate problems rather than simply reacting to them.

Reflection and adaptation

The experiences and casualties from the early programmes had given the growing demining community much cause for reflection. It was obvious that addressing a mine-affected region required something more than a prolonged clearance project and that the elements of an aid package should be integrated into a more coherent effort. Clearly, the removal of mines would remain a fundamental component of the new rounded approach to “mine action”, but the adaptation of military breaching procedures and equipment had proven inadequate for the job.

Cambodia

Even as the clearance programme in Kuwait proceeded, new approaches were beginning elsewhere. The programme in Cambodia (started in 1991) brought together a diverse range of managers and technical advisers into a new environment that demanded innovation. Although the new Cambodian Mine Action Centre was firmly based on a military structure, procedures had to be adapted or formulated to address problems such as probing in hard ground and moving through heavy vegetation.

In the dry season, much of the ground in Cambodia becomes so hard that conventional probing techniques are impossible. However, deminers found that if they soaked the earth with water, it became soft enough to probe. Unfortunately, there were two major disadvantages to this process: the first was that large amounts of water were needed and the second was that it took some time for the water to soak in sufficiently. Although the technique was used with some success, no measures were introduced to mitigate the logistic and time penalties.

Undergrowth was cut, by hand, in a painstaking process that had to allow for the possible presence of tripwires among the vegetation. In some areas, technical advisers estimated that 80-90 per cent of their deminers’ time was used simply to clear vegetation and gain access to the ground. Although many organisations still endure this major penalty, it prompted consideration of mechanical assistance to accelerate the process. A British demining organisation, the HALO Trust, bought local tractors with brush cutters and armoured them to protect the operator. In 1994, they began the first mechanically-assisted manual demining operations and saw a substantial increase in productivity.[12]

Mozambique

The UN programme in Mozambique (where planning started in 1992) saw the introduction of numerous refinements to address common problems.

Mozambique was among the first programmes to identify the inadequacy of existing metal detectors in magnetic soils, which were encountered in around one third of the clearance tasks. This situation threatened a key component of the deminers' toolkit and soon stimulated research into "all-terrain" detectors capable of operating effectively in magnetic soils.

Since the inability to use metal detectors often resulted in continuous prodding, a second effect from the Mozambican experience was to prompt a faster and more refined probing technique. New probes were produced from disused bayonets and were slightly longer than previous versions. This allowed prodding in the kneeling position, which had proven the most stable and comfortable position for sustained work. A simple wooden guide eliminated guesswork and increased consistency by marking the correct prodding intervals and unwinding lane-marking tape as it was moved forwards. Having seen the advantages of using water to soften hard ground for probing in Cambodia, programme managers in Mozambique formally incorporated water supply into their logistic system to ensure that their deminers always had an adequate supply.

During the early days of the programmes in Cambodia and Mozambique, the only protective equipment in use was industrial glasses. These were worn at all times and, in addition to being very cheap, did not impair the performance of the operator. Although the visors being adopted elsewhere offered much better facial protection, they quickly became scratched and their cost prevented regular replacement. This, together with their added inconvenience, meant that visors were often raised or absent altogether when accidents occurred. Acknowledging these practical considerations, the first demining standards permitted the use of goggles.

Angola

Some of those involved in Mozambique went on to work in Angola, where they continued to build upon their experience. PPE was becoming an obvious priority and, while protective goggles had been tolerated at first, the additional protection offered by full-face visors was undeniable. The deminers in Angola opted for a long visor, which offered protection over a range of movement and positions: it also tied in better with body protection to give continuous coverage over the front of the neck. Meanwhile, the importance of good equipment "husbandry" was driven home and more care was taken to keep visors in good condition.

Operators were no longer expected to work in the prone position and, since most explosions were likely to occur around ground level, it was important to offer protection from below. Protective clothing, such as flak jackets developed for the military, simply did not cater for this, so programme managers began to design their own. An unexpected bonus of this move was that goods from the commercial companies they approached were substantially cheaper than those from companies used to supplying the defence industry.

Manual demining procedures were further refined in Angola, including more thorough and precise methods of searching and marking. New detectors were also adopted: these had no external cables to snag or break, were extremely simple to use and had external speakers, which eliminated the need to wear headphones. As the French Legionnaires had done in Kuwait, the managers in Angola questioned the efficiency of probing and established that excavation or "sapping" was often faster.

Although none of these measures was particularly momentous in isolation, the constant refinement of existing techniques, together with the gradual development of new equipment, was continually enhancing the demining process. As managers migrated between national programmes, new ideas spread throughout the mine action community, further stimulating the refinement process.

The media spotlight

Throughout the early 1990s, a combination of influences accelerated the pace of change within demining. New programmes were beginning all over the world, drawing in technical advisers from elsewhere and forcing them to adapt their experience to different situations. The increased activity also generated media interest, particularly after October 1992, when the International Campaign to Ban Landmines (ICBL) was formed by a steering committee of six NGOs.[13]

The unprecedented success of the ICBL advocacy and the subsequent Ottawa Process launched by the Canadian government captured the imagination of people throughout the world. While some argue that this diverted potential funding from the operational programmes, there is little doubt that it also drew attention to their existence. With many nations under intense pressure to join the Ottawa Process, some of the more astute administrations realised that demining exemplified the popular struggle against the now stigmatised mine and began to increase their support.

The slow progress and problems associated with demining also became a source of fascination among academics and equipment developers. A large number of mine action conferences were organised throughout the 1990s but, at least initially, few deminers attended and many events lacked purpose or direction. Few of the early conferences yielded any significant progress but gradually, as more programme managers and technical advisers began to attend, there was some useful exchange of information and topics identified for further action.

Some of the conference discussions indicated a need for further research or development in particular areas. The subjects were diverse, ranging from a need to understand more about the mechanism by which a dog locates a mine to the collection of data on mine accidents in order to develop more effective PPE. In some cases, separate working groups were organised to focus on specific issues, such as the employment of machines or future trends in detection. In others, leading stakeholders were asked to confer on more academic projects, such as drafting safety standards or "statements of user requirement".[14]

Among the short simplistic media articles on demining, it was common to blame the so-called "non-metallic" mine for the slow and costly progress of clearance. This, together with endless technical discussions at the conferences, led many to the conclusion that the key to the problem would be equipment-based. At this stage, many believed that the answer lay in one of two options: either a new generation of detector or a clearance machine that processed ground with no requirement for detection at all. So began a number of parallel research and development programmes in the relentless pursuit of a "solution" to the mine problem.

Seeking new solutions

A prime example of this mindset was the establishment of a humanitarian demining equipment programme within the US Army's Night Vision and Sensors Directorate (NVESD) at Fort Belvoir in 1995. Initially, the programme was heavily criticised by the operational community for its isolation from reality and relentless, misguided pursuit of inappropriate equipment. It had also raised the expectations of many observers, only to disappoint them by failing to deliver any significant progress. However, despite its initial shortcomings, this project had realistic funding levels and talented, enthusiastic engineers who were willing to learn. Gradually, they would reach out to the demining programmes and involve them in migrating new equipment to the field. At last, the scientific, engineering and operational communities were beginning to combine their resources productively (although the concrete achievements remained difficult to quantify).

Heavy machinery

Humanitarian demining was (and still is) primarily a manual task and it was difficult for most people to understand why the process could not be mechanised. There were countless examples of machines that had assisted or replaced people in routine, laborious or dangerous work ranging from harvesting crops to mining coal. Besides this, the military had all but abandoned manual minefield breaching in favour of mechanical expedients or explosive devices. Logically, the use of a demining machine would not only make the work safer, faster and cheaper, but would also render the entire detection process redundant.

Variations on military equipment — ploughs, rollers and flails — were researched extensively and even used for clearing mines by some organisations. The problem was basically one of perceptions: for those who had never worked in mine-affected countries, the stereotype image of a minefield was based on agricultural fields or open plains. The reality in most places was very different, with heavy vegetation, watercourses, steep slopes and a variety of other obstacles. In many developing countries, the infrastructure could not even cope with the transportation of large heavy vehicles from site to site. There was also a wide variety of mines, some more resistant to detonation by standard mechanical demining equipment than others.

Much of the research and development (R&D) effort during the early 1990s was ill-conceived and misdirected. Equipment of all types was developed, often in isolation, based on flawed perceptions of the problem. In many cases, the deminers were not consulted until the prototype stage, when they were invited to trial the equipment within their programme. A succession of inventions ranging from the bizarre to the suicidal quickly eroded deminers' confidence in the ability of the scientific community to help. Not surprisingly, many engineers became disheartened and some despaired of the deminers' seeming unwillingness to accept change.

It was only when engineers and operators began working together closely that there was genuine progress in equipment development. As engineers accompanied their machines to overseas programmes, they began to see the reality of the environment and understand the limitations of their designs. Meanwhile, the operational demining community became better at articulating its problems and defining its needs. Over recent years, an atmosphere of mutual trust and cooperation has gradually replaced the contempt and suspicion.

One outcome has been the widespread acceptance that, used in isolation, machines are unlikely ever to achieve sufficiently high levels of confidence to be used for mine clearance (although recent research has questioned even this assertion).[15] But it was soon apparent that they could make a major contribution by cutting vegetation, preparing ground and eliminating the tripwire threat ahead of manual or dog clearance. Towards the end of the 1990s designers once again went to work on heavy machines, but this time with a better sense of direction. Having seen the environment where the machine would work and understanding the limited facilities for repair in the field was a tremendous advantage. By the end of the 1990s, a variety of purpose-built machines had been fielded, many of which were embraced by the operators, who had been consulted during their design. In addition, there had been some useful, local adaptation of heavy machinery, notably construction equipment, for use in demining.

Detection

The progress of detection equipment has followed two distinct paths. The established manufacturers of metal detectors have continually refined their products, gradually incorporating new technology while improving ergonomics and robustness. Successive generations of metal detectors have been developed with assistance and feedback from the operators, and most have been adopted by demining programmes as soon as they are fielded.

During the same period, a number of organisations with no previous involvement in demining began to design other high-technology detection options. Here, the story is similar to that of the heavy machinery engineers, with many of the systems developed in isolation from the demining community. Once again, high expectations were dashed and field operators became disillusioned with the scientific community, while many scientists were frustrated by their inability to translate good science into usable equipment.

Some equipment was successfully developed for military use but proved too costly, too unreliable or too inflexible for demining. Examples include aerial detection systems[16] that can identify patterns of mines in lightly-vegetated areas but cannot locate individual mines that are deeply buried or obscured by undergrowth. Many of these long-range "stand-off" systems also lack the spatial resolution to identify small mines. Early multi-sensor systems were incapable of instant signal processing and were so bulky and power-hungry that they had to be vehicle-based, severely limiting their versatility.

Mine detection dogs

Mine detection dogs (MDDs) were trialled in the early days of the Afghanistan programme and, having shown their potential, were gradually adopted in many other regions. Dogs have proven valuable not only for the detection of mines but also for "area reduction", the term used for narrowing down a suspect area to the section actually containing mines, or eliminating it (confirming the absence of mines) altogether. The speed with which dogs can cover ground makes them particularly suitable for both area reduction and rapid confirmatory checks: this offers enormous savings in time and resources by eliminating the need to undertake completely redundant work.

Since there were no existing guidelines on the use of MDDs, a variety of techniques evolved in parallel. These procedures required substantial modifications to existing clearance methods (such as working in "boxes" rather than parallel "lanes") and there are still major differences in the techniques employed by organisations using MDDs. The subject remains highly controversial among deminers and the fundamental capabilities of MDDs are still disputed, as are the safest and most effective ways to employ them.

Demilitarisation

Just as inappropriate military equipment had been rejected, many organisations began to question the suitability of their procedures, many of which had also been based on the military principles of minefield breaching. One example, common to many organisations, was the withdrawal of the deminer on identifying a suspect signal, handing over to another team member to continue the investigation. A handover at this critical stage was clearly dangerous and illogical, but had somehow been perpetuated from its origins in the military chain-of-command, where the team leader would confirm any finds.

There was no longer a blind adherence to outdated practices but, instead, an atmosphere in which each and every aspect of procedure was open to question. In fact, particularly where accidents had occurred, it became necessary to actively review and justify every component of a standing operating procedure (SOP). Before awarding contracts or accepting NGOs, mine action centres (MACs) now began to study the SOPs of prospective demining organisations to ensure that they were both current and practical.

A further aspect of demilitarisation was the gradual rejection of combat body armour in favour of purpose-built PPE. The Kuwait experience had driven home the requirement for PPE, not only from a common-sense point of view, but also from a legal perspective. Yet, other than eye protection, the only items widely available to the early programmes were military flak jackets and helmets. Sleeveless waist-length jackets provided hopelessly inadequate protection, particularly in the kneeling or squatting position adopted by most deminers. Helmets did at least provide a mounting point for a visor (which offered far superior protection to goggles), but were excessively hot and heavy for sustained use in tropical climates.

The use of dogs for detection in demining was another departure from routine "Western" military procedures. The ability of dogs to detect mines had been recognised for many years but, although detection dogs had been incorporated into former Warsaw Pact mine clearance teams, they were not widely used by US forces or those of most Western European countries.

A deminer in PPE looking for cluster bomblets in Kosovo close to Pristina, 2000. ©ICRC/ Giovanni

Practical innovation

Much of the new equipment of the early 1990s had been developed in isolation. Not only did this result in misguided efforts, it often wasted resources by duplicating effort. Some of the ideas were feasible but all too often they worked best where they were needed least. Most of the detection and clearance equipment was designed for flat open ground with loose, uncontaminated soil. In these conditions most options, including straightforward manual clearance, would be quick and effective. It was in the rocky, steep, heavily-vegetated or contaminated areas where help was needed.

The many technical conferences not only provided direction but also increased awareness of other projects: some even managed to inject a reality check by giving deminers the opportunity to show their working environment and explain their problems. Although some designers were more willing to share their ideas than others, the general effect was a trend towards more focused equipment development programmes. Above all, many of the newer ideas were driven by the requirements of the operational demining community instead of being based on flawed assumptions.

The scientific community also contributed through their systematic analysis of demining. This was one area where lack of prior knowledge proved to be a positive advantage by eliminating preconceptions and preserving objectivity. One of the most revealing studies has been on the types and causes of injuries sustained during demining. Injury statistics were drawn from accident investigations[17] among a number of demining organisations, most of which cooperated fully in the study.

Actual blast testing began on simulated limbs and dummies and culminated in a "Lower Extremity Assessment Programme", conducted by the US Department of Defense (DoD) in 2000. This controversial project used full-body human cadavers and high-speed radiographic imaging to fully evaluate the mechanism of injury and determine the degree of protection provided by commercially-produced protective footwear.

Such information has allowed the development of better tools and PPE based on hard science, rather than instinct or expedience. The resultant equipment revisions have also prompted or allowed innovative and unconventional departures from traditional designs. In one example, the Massachusetts Institute of Technology (MIT) demonstrated that a probe with an oval cross-section requires less force than a round one — an observation that was initially met with derision but has proved significant.

There has been widespread adoption of aprons for PPE to replace fitted suits. Not only do these provide greater freedom of movement, they also offer better protection. Systems are also becoming better integrated to complement one another: for example, overlapping the visor and body armour to ensure complete neck protection.

A great deal of new demining equipment has been fielded recently for detection, demolition and mechanical vegetation clearance and most has been carefully designed around the needs of the user. Those needs include not only the ability to locate and clear mines but also less obvious requirements such as ease of training and simple maintenance. This revolution in common sense and practicality has done much to restore the relationship between the equipment developers and the demining community. It has also ensured that the dialogue and atmosphere of cooperation will continue to refine the demining process in years to come.

Not all of the news is good, however. The one area where new development consistently fails to meet the needs of the user is cost. By itself, demining rarely offers a large enough market to justify major commercial development costs or mass production. Although some inventions are spin-offs from other projects and others are funded under national development programmes, many reflect the substantial outlay for development and production costs in the price. This often makes them disproportionately expensive for programmes struggling to survive on minimal funding and the sad fact is that most mine action organisations cannot afford the equipment that they would like.

Mine action comes of age

During the late 1990s, mine action began to gel into a cohesive international industry. Not only had many lessons been learned but they had also been broadly disseminated via networks, conferences and the movement of technical advisers between programmes. For many years, the various elements of mine action had progressed in isolation but the quantum leap in communication brought a flurry of productive activity, which resulted in a series of important milestones.

Particularly significant was the unification of mine action to incorporate five fundamental pillars or core components in pursuit of its aim to reduce the social, economic and environmental impact of mines and UXO. These are:

- mine and UXO awareness and risk reduction education;
- minefield survey, mapping, marking, and clearance;
- victim assistance, including rehabilitation and reintegration;

- advocacy to stigmatise the use of landmines and support a total ban on anti-personnel landmines; and
- stockpile destruction, to ensure that stockpiles of landmines are destroyed.

Another, less obvious form of engagement has occurred between the demining community and the military. After the early split between combat breaching and demining, one accepting casualties as a reality of life, the other striving for clearance of all mines and UXO from a given area, it appeared that the two would continue to diverge, the only link being the large numbers of military personnel who went on to work in mine action. Yet, ironically, the two now work side by side in many areas.

Not only are the military increasingly involved in humanitarian operations but the deminers have based much of their heavy mechanical assistance equipment on the breaching equipment designed for the battlefield. The US routinely sends army personnel to train foreign national deminers[18] and works closely with NGOs and other civilian mine action specialists. In Kosovo and Iraq, the military established the initial systems to collate and provide information, while military EOD teams from several countries coordinate closely with humanitarian agencies to undertake clearance operations.

Regulation

With the integration of mine action came both the opportunity and the need for regulation. In October 1997, the United Nations Mine Action Service (UNMAS) was formed to coordinate all aspects of mine action within the UN system. This was followed by the establishment of the Geneva International Centre for Humanitarian Demining (GICHD) in 1998, tasked with supporting the mine action efforts of the international community and the United Nations via mine action research, operational support for demining in the field and advocacy of the Anti-Personnel Mine Ban Convention.[19] These two organisations brought a more detached and objective approach to management onto an industry that had been heavily biased toward field operations. They have been instrumental in unifying and regulating programmes and organisations that had neither the time nor the resources to do so for themselves.

Perhaps the greatest practical milestone was the production of the International Mine Action Standards (IMAS), the first edition of which was officially adopted on 1 October 2001.[20] These lay down standards for virtually every aspect of mine action — minimum norms to which every UN-supported programme should aspire. The broad consultation with operational mine action organisations has resulted in a highly practical approach. IMAS has even won favour with programmes outside the UN system, many of which now adhere to the same standards.

The IMAS do not attempt to dictate every procedure in detail but rather to specify aims and (where appropriate) how these should be achieved. A good example is the use of mine detection dogs — a subject which continues to cause disagreement and defy detailed regulation. IMAS lay down guidelines for the employment of dogs but make no attempt to impose rigid or detailed procedures for their use.

In many ways, the agreement and international acceptance of common-sense rules signalled the coming of age of an industry that had remained immature for far too long. It has also helped to demystify an activity that once thrived on its image as a “black art”. No longer perceived as a stand-alone function, mine action often has to compete with other aid programmes for donor funding and must demonstrate value for money. In addition to laying down basic safety requirements, standardisation was necessary to establish meaningful performance indicators on which programmes could be assessed or compared.

Further refinements

It is difficult to say whether regulation hastened the integration of mine action or vice versa but the maturing process has stimulated — and in some cases demanded — further refinements. A prominent example is information management, which had to be improved and standardised to keep pace with the new generation of mine action programmes. The Information Management System for Mine Action (IMSMA) became the UN-approved standard in January 1999. The system was developed by the Swiss Federal Institute of Technology (ETHZ) for the GICHD, at the request of UNMAS, to help programmes coordinate, prioritise and execute their mine action activities.

Additional benefits from the introduction of IMAS and IMSMA have included the standardisation of terminology and improved transparency within national programmes. In turn, the enhanced oversight of decision-making and the ability to assess progress has led to greater accountability. Not only is this important for the credibility of the programme but it is crucial to donors, who require evidence that their money is being well spent.

At the operational level, the systematic approach to mine action has led to genuine capacity-building within the host nation. This means that, in addition to the individual skills provided, an infrastructure is created to sustain the activity or organisation. An important aspect of capacity-building is the preparation of indigenous people to assume the various management functions when expatriate staff and technical advisers leave. This tended to be a weakness of earlier programmes but has now become a fundamental component of most new mine action programmes.

Problem areas

Although there has been phenomenal progress since the early days of mine action, the process is far from perfect. Demining is still inherently dangerous and most tasks are labour intensive and painfully slow. Most programmes have funding problems of some kind and some are so chronically under-funded that they continually struggle for survival. One of the disadvantages of integration with other international aid initiatives is that mine action is continually competing for funds.

The shortage of money means that many organisations are ill-equipped, or at least unable to acquire the equipment best suited to their task. This undermines the widely-held concept that organisations are free to select from a demining toolkit. Although an enormous range of equipment is available globally, very few organisations have the luxury of picking the items they require at will. The problem is most acute among the poorer, military-run programmes, many of which still have to make do with obsolete and unsuitable military-issue equipment.

Several national demining programmes are conducted by the country's own armed forces with little or no NGO involvement. Often, they do not have the benefit of accumulated experience and, being outside the UN system, they are not subject to IMAS regulation. While some have chosen to adopt the IMAS, many fail to meet the standards set: not only is the level of clearance unacceptable by UN standards but injury rates among deminers are also often alarmingly high. A number of military clearance programmes have been influenced by US training programmes, but many are still reminiscent of the early days, including the focus on demining to the exclusion of the other components of mine action.

Another problem area is the exit strategy, which is rarely satisfactory. Very few programmes have either fully achieved their aim or successfully handed control to the host nation and, in many of the earlier programmes, there was no realistic plan for the "end game" at all. The first exception was the Kuwait clearance, which was unique in having virtually limitless funding to achieve its ambitious aims. More recently, the clearance of Kosovo was the first major UN mine action programme to "achieve completion" and hand control to the local authorities.[21]

It has also been accepted that the absolute clearance of all mines is rarely possible. No matter how thorough the demining, there will always be the possibility that some may have been missed for one reason or another. In recognition of this fact, the terms "mine safe" or "impact free" have been adopted in preference to "mine free". In Kosovo, for example, completion signified that every marked minefield had been cleared, but recognised that some areas were known to contain so-called nuisance minefields.[22] Even within the "cleared" areas, it was considered likely that some mines and submunitions had been missed.

Conclusions

From the shaky foundations of outdated military breaching procedures, demining has evolved rapidly into a separate, refined discipline. The disjointed approaches of individual organisations converged as, beneath an intense media spotlight, conferences and other liaison brought productive exchanges of information. As the Ottawa Process captured the public imagination, governments throughout the world became involved, with many donating funds or contributing resources to this growing industry.

Scientists and engineers also became interested and began to contribute, unproductively at first, but with increasing benefit as relationships with the demining community improved. Necessity has been the mother of invention throughout the evolution of mine action and many recent developments have been prompted by requirements from the field, then accomplished using sound scientific research.

Yet, despite the substantial and well-focused development work, there have been few changes to the fundamental nature of mine clearance, which remains dangerous, labour intensive and slow. Most people now accept that there will be no “silver bullet” to solve the many practical problems of demining.

Maturity occurred during the 1990s with the integration of mine risk reduction education, minefield survey, marking and clearance, victim assistance, advocacy and stockpile destruction into the broader discipline of mine action. This rounded approach now takes its place as a major component of humanitarian aid to mine-affected regions, particularly in the immediate post-conflict period.

The creation of UNMAS and GICHD brought proper oversight, along with a more detached and objective approach to management. Regulation has been applied primarily to working standards (in the form of IMAS) and information management (provided by IMSMA). This has brought diverse programmes into line and allowed a host of other benefits, ranging from better working conditions for deminers to the ability to assess programme efficiency. The pool of accumulated knowledge is also being better managed to allow new programmes to benefit from the lessons of previous operations and to further enhance the equipment and procedures in use.

There is an enormous range of equipment available to the demining community but the term toolkit is, perhaps, a misnomer. It implies that each programme can assess the problem it faces and select the appropriate resources, much as a mechanic would pick the tools needed for a particular repair. The reality is that few programmes have the luxury of access to the most appropriate tools. Having made their initial choices of detector, PPE, hand tools and so forth, most are constrained to use them for each and every situation they face, until a periodic enhancement or fleet replacement can be made.

Funding is the major limitation but not the only one. A change of equipment or technique often involves a major training burden (during which work ceases) and may well demand additional logistic support. Individual organisations cannot justify the purchase, operation and maintenance of expensive assets, such as heavy machinery, unless they will see extensive use coupled with demonstrable increases in productivity. In future, it may be feasible for mine action centres to control centrally-held equipment for loan to the organisations under their control, as and when it is needed. Such coordination at national level would ensure the most efficient use of resources and allow the transfer of equipment to new programmes when no longer needed.

There continue to be problems and frustrations, including the continuing shortage of funds and the limitations that this imposes on field operations. A number of programmes outside UN control fail to achieve accepted safety or clearance standards and many do not adequately address the other pillars of mine action, such as victim assistance. However, the overall picture is one of success: the evolution of mine action has been tremendously fast and has brought tangible benefits to people living in mine-affected regions throughout the world. It should not be forgotten that the cost has been high, in both casualties and financial terms, but mine action continues to make substantial progress towards reducing the threat of mines and UXO.

Endnotes

1. Most of the organisations directly involved in mine action are UN agencies, national and international NGOs and commercial contractors. Military forces frequently provide individual specialists or technical advisers.
2. ERW are defined under international law as abandoned explosive ordnance (AXO) and unexploded ordnance (UXO).
3. Only nine types of mine were used throughout the Falklands, all of conventional mechanical design. Most of the minefields were laid in consistent patterns and many were marked and recorded.
4. Early surveys indicated casualty rates of 14-24 mine victims per day.
5. First-hand accounts of the author, who was a training team leader during Operation Salam.
6. MAPA plans, UN Mine Action Service website (*www.mineaction.org*), September 2003.
7. ICBL (1999: 891), citing the UN.
8. Roberts and Williams (1995: 261).
9. Stake mines are initiated by tripwires, which must be traced (often through vegetation) to both ends before they can be neutralised. Most stake mines have a lethal radius in excess of 10 metres.
10. Estimated at around 1,000 false alarms per one live mine in parts of Cambodia.
11. Percussion detonators require a substantial blow from a blunt striker on a specific point. This distorts a protective metal layer and crushes a friction-sensitive compound onto an anvil. In a stab-sensitive detonator, the friction-sensitive compound is exposed, and is therefore vulnerable to initiation by contact with any foreign object.
12. Increased productivity is estimated to be up to 300 per cent, with a single brush-cutting machine allowing approximately 60 deminers to proceed with the detection and removal of mines.
13. Handicap International, Human Rights Watch, Medico International, Mines Advisory Group, Physicians for Human Rights, and the Vietnam Veterans of America Foundation.
14. An element of the military procurement process in which the user defines the capabilities (rather than the characteristics) desired from a new item of equipment.
15. See GICHD (2004b).
16. Including the COBRA system developed for the US Marine Corps, and LAMD, developed for the US Army as part of the ASTAMIDS programme.
17. "Database of demining victims" sponsored by the US DoD, 2000.
18. The US Department of State publication, *To Walk the Earth in Safety*, (US DoS, 2002) notes DoD assistance to 30 countries between 1994 and 2001.
19. The Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction, commonly referred to as the Anti-Personnel Mine Ban Convention, opened for signature in Ottawa in December 1997.
20. See *www.mineactionstandards.org*.
21. *Report of the Secretary-General on the UN Interim Administration Mission in Kosovo*, 15 January 2002.
22. Particularly border areas and tracks in the Dulje Pass, where clearance work is scheduled to continue for several years. *Remaining tasks in MNB order, amendment six*, MACC Pristina, 12 March 2002.

2 Landmine detection and destruction technologies

Paddy Blagden

Summary
The processes of the detection and destruction of mines and munitions for humanitarian purposes has come a long way since 1989, but arguably not far enough. Reliance still has to be placed on "classical" methods of mine detection: few new technologies have been introduced into demining, despite the expenditure on research. In contrast, exploitation of existing technologies has been more successful, and new and improved mine clearance machinery is being produced and fielded on a wider scale than ever before. Techniques for the training and use of mine detection dogs have also been improved.

Introduction

Chapter 1 described the evolution of the demining toolkit. The slow progress of demining can be largely attributed to the level of technology of the tools that mine action managers have at their disposal. Accordingly, this chapter attempts to look at historical efforts, both military and humanitarian, to create technologies to detect and destroy landmines.

Detection is considered to be the process by which mines are detected, which may mean the exact location of single mines or the less precise location of groups of mines. Destruction refers to the destruction of previously detected and located mines in the ground or in special destruction areas, and also the destruction of mines which have not been detected but are destroyed by actuation leading to detonation or by physical disruption. The word "mines" is taken to include other explosive munitions found on the battlefield which have to be detected and removed. Anti-tank mines are referred to as anti-vehicle mines.

After this introduction, this chapter addresses the following issues:

- close-in detection (the detection and location of individual mines);
- stand-off detection (the detection of mined areas);

- the destruction of individual mines after location;
- the destruction of mines by machine, using physical detonation or disruption; and
- the destruction of unexploded ordnance (UXO).

The chapter concludes with suggestions on where mine action might need new technologies and how the introduction of new technologies could be speeded up.

The challenge for detection and destruction technologies

As we saw in Chapter 1, landmines, both anti-personnel and anti-vehicle, were not extensively used until the 1939-45 war. This was one of the first major wars in which armoured vehicles were used extensively and many large-scale minefields were laid, especially in Eastern Europe and North Africa. By the end of the war, hand-held mine detectors were widely used, and early versions of tank-mounted mine destroyers such as flails and armoured hoses had also been deployed.

The mines of the 1940s were predominantly metal-cased, although some anti-personnel and anti-vehicle mines were made of wood, especially those improvised from munitions or local explosive. In the mid-1940s, the development of plastics allowed the first generation of plastic mines to be developed,[1] and plastic mines proliferated rapidly in the immediate post-war period. By the start of mine action in 1989, almost all anti-personnel mines and many anti-vehicle mines were plastic-cased — which were detected by the metallic or magnetic mine detector and by the prodder.

Following the 1939-45 war, a large amount of mine clearance took place in Europe and the Far East, mostly carried out by military units, which in some countries (such as Germany and Poland) continue to clear mined areas from that war. The detection and destruction equipment remained similar to that used during the war itself, and this situation remained almost unchanged until the start of humanitarian mine clearance in 1989. This caused many problems because the military detectors were heavy and unreliable, being designed for intermittent use in minefield breaching rather than continuous use in mine clearance. The same applied in mine destruction equipment such as flails or explosive hoses. Though adequate for minefield breaching, their ability to detonate or remove mines and their reliability under continuous operation were insufficient for humanitarian use. Some early mechanical equipment was based on tank platforms, making it expensive to buy and maintain, and cumbersome to use.

The size and complexity of the world mine and munition problem, and its effects in post-conflict environments, began to come to light after the end of the Cold War. The true situation began to emerge when nations in Africa, Latin America and South-East Asia which had adopted or been pushed into warring ideologies began to seek assistance in removing their mine and munition problems. From a single national clearance programme in Afghanistan in 1989, there are now over 30 countries which have identified mine or munition problems needing clearance to humanitarian standards.

As humanitarian mine clearance has developed and the true nature of the world's mine problem has become apparent, a pressing need has developed to make best use of scarce resources by increasing the efficiency and cost-effectiveness of clearance. Since, in practice following limited conflicts, many declared mined areas or minefields actually contain few mines, greater effort is being exerted to find where mines are NOT within the suspected area, to reduce expensive and time-consuming mine clearance to genuinely contaminated areas. This has led to the need for two different types of detector — the "close-in" detector, often hand-held, locating the exact position of the mine, and the "remote" or "stand-off" detector, to remotely determine where mines are, but with no great positional accuracy. The two types of detector may be different in concept.

Close-in detection

Close-in detectors exist in many forms. In general, detection is done either by pushing some form of energy at the mine and measuring the response (prodders, eddy current, radar, infrared, nuclear, etc.) or by detecting any disturbance caused to the natural conditions by the mine (disturbance of magnetic fields, disturbance of soil, detection of explosive vapour from the mine and its filling). Below are some of the more common forms used or in development.

The mine prodder

The prodder, still in use as the final physical check of the presence of the mine, has gone through much development, but in most areas remains in its basic form. Prodders were conceived as simple, cheap and effective tools. They have been made from many materials, from expensive plastics down to small-gauge reinforcing bar retrieved from broken concrete buildings. Experimental prodders (with acoustic sensors to detect the materials being encountered by the noise of impact)[2] and vibrating prodders (to allow hard soil to be pierced more easily) have rarely been introduced into service because, in the hands of a skilled operator, the ordinary prodder can give information of size and shape of the target and sometimes even the toughness of its casing.

A deminer in Afghanistan.
©ICRC/Zalmaï

The disadvantage of the prodder is that it brings the hands and sometimes the face of the operator close to the mine. In some theatres, the stoniness of the soil demanded that the prodders were stiff, to pierce through stony soil, and short military bayonets were used, which led to injuries to hands and eyes. Prodders can also become hazardous to use against any mines such as the Chinese T72B with a tilt or anti-disturbance fuze.

Another disadvantage of the prodder is that to engage the side of the mine, it has to be inserted at a shallow angle, usually about 30° to the ground. Since many prodders are around 30 centimetres in length, this means that they cannot penetrate more deeply into the ground than about 10-14 centimetres. In many cases, anti-personnel mines are found buried at about this depth or more, while anti-vehicle mines are often deeper. To insert the prodder at a steeper angle may risk impacting the top cover or actuating surface of the mine which, in the case of the anti-personnel mine, might cause it to detonate.

Mines can also rotate in the ground due to soil movement, so that the top face of the mine can end up being hit by the prodder, even though inserted at the correct angle. In the same way, mines in the "windrow" of soil produced by a mine plough can be at any orientation, which makes detection by prodding potentially hazardous. Despite these shortcomings, the mine prodder is likely to remain a useful tool for the deminer for many years to come.

The magnetic or metallic mine detector

The metal-cased mines of the 1945 period were comparatively easily detected by the metal-detecting mine detectors of the day, although they were often heavy, cumbersome, insensitive, uncomfortable to use and unreliable. With the increasing use of plastics in mine construction, the metal component of the mine decreased sharply. Soon the metal components were confined to the firing pin and spring, and parts of the arming mechanism. To match the decreasing metal content, the detectors had to be increased in sensitivity and, with the high usage found in humanitarian mine clearance, detectors also improved in lightness, reliability and ease of use.

Unfortunately, as sensitivity increased, so did the susceptibility of metal detectors to false alarms from small fragments of metal in the ground, sometimes splinters from exploding shells or rocket warheads, or food and beverage cans. Sensitivity also increased to metallic compounds found in certain soils, such as laterite, a common road-making material in South-East Asia and Africa.

Hand-held metal detector. ©EIA

Despite these limitations, metal mine detectors remain the most commonly used form of detectors, and considerable improvements in their design continue to be made.

There are various types of metal detector, but the most common is based on electromagnetic induction. The sensor head sends a primary magnetic pulse or continuous wave which creates eddy currents in the buried metallic object, creating a secondary magnetic field. This in turn is detected by coils in the search head.

Other types are usually used to detect buried munitions. These are most commonly based on magnetometers, which measure alterations to the earth's magnetic field, or gradiometers, which measure the magnetic field gradient, again altered by the presence of a metallic object.

Major advances have been made in the sensitivity of these detectors and their capability of detecting metal items in laterite soils without major loss of sensitivity. Several types of detector are on the market which can "tune out" or "compensate" for background magnetic returns. Developments have also indicated the possibility of giving an estimation of the depth of the mine or munition target, and even a definition of the shape of the metal piece within the object. Should this become a feature of future metallic mine detectors, it could radically decrease the false alarm rate in soil contaminated by metal scrap.[3] Thus the metal detector has by no means reached the end of its development potential.

Other technologies

Even in 1992, the reducing amount of metal in anti-personnel and anti-vehicle mines was causing concern, and it was rumoured that totally non-metallic mines were in development or even in production, which would render metal detectors useless against such mines.

In Stockholm in May 1994, the Swedish Defence Research Agency (then FOA), together with the UN, organised what was probably the first major meeting between mine clearers and research scientists. The aim was to assess what technologies existed, how they could be used, and roughly when "fieldable" new technology detectors would appear. This produced some interesting results. A table of different technologies was drawn up, showing which was more likely to produce fielded equipment within five years. The most promising detection technologies at the time appeared to be ground penetrating radars and infrared detectors.

Ground penetrating radars

The ground penetrating radar (GPR) consists of a transmitter which pushes into the ground a pulse of energy or a continuous wave at a certain given range of frequencies. This is matched to a receiver, which takes in the reflected radar signals. The radar energy passes through the ground and is reflected back, at different speeds, depending on the material through which the radar energy is passing. If the radar detects that there is a sub-ground object which is of a different material (or more strictly material of a different permittivity or dielectric constant), the object can be detected. This means that plastic or totally non-metallic objects can be detected by GPR.

In theory, GPR can present indications of the location and the depth of the target object, and sometimes even the shape. This, however, depends to an extent on the frequencies used: to get good definition of small objects, a high transmitted frequency must be used. It also depends on whether the output of the radar is in the form of an audio signal or an image on a screen. To get good penetration of soils, a lower transmitted frequency has to be used. Current GPRs work between about 0.4 MHz and 6.0 MHz.

Unfortunately, despite being the most likely technology to be fielded by 1999, GPR detectors are only just becoming fieldable. The problems surrounding their development have been more difficult than was originally thought and totally non-metal mines have not yet been used in conflicts, so the need to establish them as a primary detector has not been great. GPR performance can be limited by soil humidity and type, and under certain circumstances can give false alarms. At present their likely cost is still several times higher than the equivalent metal detector. Fieldable radars are being used in conjunction with metal detectors, and can significantly improve the false-alarm rate of the detection system. Despite the significant improvements already achieved, such combined detectors have not yet found a significant market in humanitarian mine clearance.

At least some of the problems of current GPRs can be resolved by better detection computer algorithms and faster processing, especially with visual output detectors, and antenna development is still in progress. Ultimately, GPR might develop the capability to provide three-dimensional images, and even provide some indications of the material of which the detected target is made.

The development of GPRs has been concentrated on detecting anti-personnel mines. There is still a need for the rapid and reliable detection of anti-vehicle mines in roads, and anti-vehicle mines present a larger target than anti-personnel mines and thus can be detected using lower frequencies. Anti-vehicle mines such as the Chinese T72 mine (not to be confused with the T72A and T72B anti-personnel mines) have very small amounts of metal in the firing mechanisms, and many Italian mines, such as the Valsella VS 2.2 and 3.6, are also difficult to detect using metal detectors. If funds can be found to continue development, GPR may yet become a major element in the toolkit of the humanitarian deminer.

Infrared detectors

Initial tests of infrared (IR) detectors were encouraging, and IR detectors were also considered to be fieldable by 1999. In addition, IR was seen as a possible technology to locate the edges of mined areas, a capability that is vital to "technical survey", which can greatly increase the efficiency and cost-effectiveness of clearance.

In fact, the resolution of current IR cameras is insufficient to identify the very small areas of changed temperatures, and it is currently unlikely that sufficient resolution will be obtained to identify small targets such as the US M14 anti-personnel mine[4] under four centimetres of soil, topped with vegetation and under tree canopy, scenarios which are fully representative of actual field conditions. The target is so small that even when there are major changes in ground temperature, the "thermal inertia" of the mine will not be sufficient to give sufficient cooling or heating to the soil above it to provide a patch of soil that will be detectable. It was also hoped that IR could identify the edges of minefields by locating at least some of the mines, but performance of this resolution has not yet been achieved. Many well established minefields are by now heavily vegetated, which makes detection even more difficult.

Anti-vehicle mines can be detected under certain circumstances, especially when they are newly-laid and the disturbed ground above them gives a different IR response. There may also be a role for IR in the detection of submunitions such as the US BLU 97[5] (used in the first and second Gulf wars, Afghanistan and Kosovo), or even the M75 and M85 artillery-launched submunitions (used in the second Gulf war), because they have a high metal content and are usually found on or near the surface of the ground. But small submunitions, such as the M75 and M85, might require a high-resolution camera to identify them at anything but close range.

Consideration has also been given to artificially heating the ground, to show up "cool spots" caused by the presence of mines. In practice, the heating system might well require large amounts of energy, especially to achieve a temperature difference from mines buried below ten centimetres deep. Such power requirements could prove difficult to provide in a man-portable detector system and difficult to apply in areas with heavy vegetation.

In general, there have been few major improvements announced in IR sensor sensitivity and resolution, and the widespread use of IR for the detection of individual anti-personnel mines is unlikely, although its use against anti-vehicle mines and submunitions remains a possibility.

Nuclear detection

Neutron-based techniques

Most explosives contain specific identifiable elements, including nitrogen. When activated with thermal neutrons, various elements in the target produce small but characteristic levels of radiation, usually gamma-ray activity. This can then be detected by gamma-ray detectors such as scintillometers, which in principle can give a relatively precise location of the concentration[6] of the element concerned, usually nitrogen in the case of explosives. Explosive detection is widely used in airport security but can also be adapted for the detection of landmines.

In principle, all nuclear detection methods require a neutron generator, often a Caesium or Californium source to irradiate the target area, and a method of slowing the neutrons down and collimating them in the direction of the target. The various elements in the explosive respond to neutron bombardment in different ways, but often they emit some form of identifiable reaction. These returning signals are then detected by a detector, the results of which are analysed, giving an indication of the chemical composition of the material detected.

There are various types of neutron-based detection systems, and eight have been patented[7] but none has as yet been sufficiently developed to be fielded for humanitarian mine detection.

Although the technology is thought to be relatively straightforward, turning the technology into a hand-held working tool has proved more difficult. Nuclear technology-based detectors are better suited to static large-scale installations, such as those used to examine baggage at airports. The practical requirement to produce a neutron generator with long service life, and which is safe and simple to use by local mine clearance staff, has not yet been achieved. The requirements to keep the neutron generator at some distance from the user may also pose a problem. In summary, although research is continuing, no recent new developments have been fielded in this technology area.

Nuclear quadrupole resonance (NQR)

Some of the nuclei found in explosives, such as molecular groups containing nitrogen, oxygen and chlorine, respond in a particular way when bombarded by radio frequency radiation, and their responses depend on the chemical structures within which they are bonded. This means that the response of some explosive compounds can be detected by a technique called nuclear quadrupole resonance (NQR).[8]

This technology has had some success and is being explored to meet a military requirement, but a humanitarian version of any forthcoming equipment is probably not yet planned.

In some experiments, NQR has given clear responses for the detection of explosives such as RDX and HMX, but not for the more common explosive, trinitrotoluene (TNT). Although some mines, such as the Italian anti-personnel mine VS50, are made of RDX and others use an RDX/TNT compound, most of the simpler and cheaper mines are filled with cast TNT. This means that unless NQR responses to TNT can be enhanced during development, NQR detectors may not be suitable for humanitarian mine clearance for some time.

NQR is also being considered as a component of an integrated mine detector, using more than one sensor. This concept is discussed below.

Other radiation detectors

There are a number of other ways in which explosive materials can be "interrogated" by inputs of energy. Among these are the following:

X-ray backscatter

As with neutrons, materials bombarded with x-rays may cause photons to be scattered at differing angles from them and these photons can be detected. Although experiments have been carried out on the use of x-rays in baggage search devices, the power consumption and size of the equipment make them difficult to develop into a fieldable mine detector.

Acoustic detectors

Acoustic detection is used in the mining industry and the development of acoustic detectors was suggested in a meeting at the University of Colorado in Denver in 1994. Various experiments have been tried and methods have been evolved where geophones can be in contact with the ground outside the immediate area of the minefield being cleared, which would be acceptable from a safety standpoint. Although research continues, no prototypes have yet been presented for field trials, and it is suspected that acoustic detectors are still some years away from being fielded.

Animal antibodies

Animals, if injected with some chemicals, can develop sensitive antibodies which can detect and indicate the presence of such chemicals. This process, called Enzyme-Linked Immunosorbent Assay (ELISA) can apparently be made highly sensitive, but no development has yet shown how such detection can be used in the field.

Laser detection

Laser energy can be used to cause the breakdown of TNT vapour into chemicals that fluoresce or glow at specific frequencies. Again, this process may be developed into a form of detector for bulk explosive, but at this stage it is hard to see how it can be developed into a fieldable detection system

Ultraviolet detection

Efforts were made to detect mines in roads by spraying with ultraviolet sensitive material and looking for anomalies or disturbances in the road surface after a period of time. The system proved cumbersome to use and the experiments were discontinued.

Vapour detectors

Another way of detecting mines is by detecting their smell. This smell, undetectable to humans but detectable by some animals and by sophisticated chemical detection equipment, can lead to detecting the mines sufficiently accurately to locate their individual positions. The vapour produced by a mine can vary and its components are at present not fully understood.

The amount of vapour given out by a chemical depends on its vapour pressure or volatility. Some explosive compounds have impurities produced during the manufacturing process, such as dinitrotoluene (DNT) which occurs as an impurity in TNT, which has a lower vapour pressure and is in theory more detectable. Explosive vapours can also be changed by molecular action as the vapour passes through soil: the new compounds (including amino-and di-amino compounds of DNT and TNT) may also have a lower vapour pressure and be more detectable.

There are currently two main methods under development for detecting explosive vapours — chemical sensors, and animals or insects.

Chemical analysis detectors

There are a number of chemical analysis techniques in existence, but the method showing the greatest practicability and resolution is that of gas chromatography. In this method, a sample of the target substance in the form of gas or liquid is moved by a carrier gas along a column containing on its inner surfaces a chemical liquid in a solid supporting structure. The various components of the sample interact with the chemical liquid, a process which takes varying amounts of time. When the components of the sample emerge from the column, they are detected and the time they have taken to move down the column varies according to the chemical nature of the components, thus discriminating between them and identifying them. The components are then detected in a way that measures their relative quantity, so the final readout can separate the component parts of the sample which can be identified for chemical composition and quantity.

The actual detection is either done by measuring the extent to which the components capture electrons (Electron Capture Detection or ECD), which happens if the components are nitro-explosives or compounds such as carbonyls, or by measuring their thermal energy when they decompose (Thermal Energy Activity or TEA detector). Unfortunately the electron capture detectors are poor at specifically identifying explosive components, but TEA detection is nitrogen specific.

Most gas chromatographs are more suited for laboratory use rather than field use, as they are large, delicate, and require supplies of electricity and gases. They could be built into a mobile laboratory which could be taken into the field, where vapour samples could be brought for analysis. This would require use of remote explosive scent tracing, a technique which will be described later.

An NPA mine detection dog. ©M. Kelly

Animals and insects

Animals have a keen sense of smell and their powers of scent detection exceed those of humans by many orders of magnitude. A human may be able to detect one part of contaminant in 10,000 (1 in 10^{-4}), and some gas chromatographs may be able to detect down to one part in 1,000,000,000,000 (1 in 10^{-12}) but dogs and rats are believed to be able to detect to 1 in 10^{-15} or less.

The animal most commonly used for mine detection is the dog, mainly because of its ability to work in conjunction with humans. Dogs can be trained to detect odours from specific vapours. Dogs have been used for tracking and hunting for many years, but also for the detection of landmines since the 1939-45 war. Dogs can also detect drugs, explosives, weapons, specific foodstuffs, metals such as mercury, wood rot, and human beings buried in snow or rubble.

An APOPO's mine detection rat. ©GICHD

In the past, the experience of using mine detection dogs (MDDs) proved highly variable. Even the performance of individual dogs varied considerably and detection dogs were not universally used except by a few commercial companies for many years. Many mine action programme managers would not trust dogs sufficiently to allow them to be used. In September 1999, a meeting was held in Ljubljana, at which the GICHD was asked to take the lead in carrying out a study into the breeding, training and use of MDDs, and the study was started soon afterwards.

The study soon showed how little was known about dogs, what vapour they were detecting and at what concentrations, and how vapour was emitted from mines in the first place. It also studied what weather conditions permitted or inhibited vapour detection, and at what levels weather features such as humidity and wind speed began to erode the performance of detection dogs.

The study assembled many of the MDDs breeders and trainers, and the mine action groups who were using the trained dogs, to try to work out some best-practice procedures for training, licensing, accreditation, testing, daily checking and use. This study is still ongoing but much information is already available. The use of MDDs is increasing and their cost-effectiveness is becoming more widely acknowledged.

As part of the study, the GICHD looked at work being done under the Belgian APOPO project into the use of rats for explosive detection. Early experience with African pouched rats showed that they could be sociable, easily trained and that their ability to detect specific odours was possibly as good as, or better than, that of the dog. The APOPO project is still ongoing in Tanzania and the results are encouraging. Rats can breed quickly and successive generations become increasingly tolerant to humans and easier to train. Basic training can be carried out in small multi-choice cages and results can be collected directly by computer — so that identifying the better rats becomes a quick and effective process.

If scents can be brought to rats, the detection can be simply carried out, with one or more animals sampling each vapour target. Rats have not yet been extensively used in a free-running mode and techniques for free-running are under development. Although rats are considered as food in some countries and condemned for religious reasons as unclean animals in others, it has to be remembered that the same can be said of dogs, which are widely used even in those countries where they are declared unclean. Rats cost between one tenth and one thirtieth of the cost of dogs to buy, train and keep. They are often indigenous to the country of use, so are less prone to local disease or climatic effects than dogs, which are usually imported. Rats could provide a highly cost-effective part of the mine clearance toolkit.

Experiments have also been carried out with insects such as flies or bees. While the insects may be bred to have excellent detection capability and sensitivity, how they can be used repeatedly in the field has not yet been made clear.

Remote explosive scent tracing (REST)

There are two ways in which explosive vapour can be detected; first by taking the detector to the source of the scent, and second by taking the scent to the detector.

In the late 1980s, a South African commercial company developed a method of "sniffing" roads by sucking vapour from the road surface through filters, mounted in cups that were hung just above the road surface. The sampling filters were replaced in the cups at measured and recorded intervals, and the removed filters were put into surgically clean containers and taken back to base. Up to four sampling filters were used for each stretch of road, which might be between a half-kilometre and two kilometres. The sampling filters were then mounted on holders and MDDs were trained to

A REST scent trapping team in Angola. ©GICHD walk along the row of holders to identify which filters had the scent of explosive vapour. A positive identification implied that within the stretch of road on which the filter was installed in the cups, there was probably a mine. Free-running dogs then returned to that stretch, to identify if there was a mine and locate it.

This system was first deployed successfully in South Africa and later for UN contracts in Mozambique and Angola in 1994 and 1995 (and more recently in Afghanistan in 2003 and Sudan in 2004). The GICHD dog study has undertaken research into this technique to refine and validate it. The research has concentrated on finding the best filter material, optimum air speeds through the filter, effect of dust and many other criteria. The result is potentially a very powerful technique which can be used to bring explosive scent to any form of detection system, whether a gas chromatograph in a laboratory, a dog in the field or a rat at a base camp.

The REST technique was originally designed for the clearance of relatively narrow linear targets such as roads or railways, but tests are now in progress to see if it can be adapted for searching or checking wider areas, as part of area reduction (eliminating areas of suspect land which are not in fact mined). If this is the case, the REST technique will become a powerful method of increasing the cost-effectiveness of mine clearance.

System integration

At the 1994 meeting in Stockholm, it was agreed that it was unlikely that any one sensor would ever be able to provide the degree of definition required, but that two or more should be linked together to provide complementary output.

For simplicity, detection can perhaps be divided into four categories of capability:

- *Category 1:* A target of some kind has been detected, which may be a false alarm.
- *Category 2:* A target has been detected, which appears to have a man-made shape, which is probably not a false alarm.
- *Category 3:* A target has been identified, which is of man-made shape and contains explosive, which is probably a mine.
- *Category 4:* A mine has been identified at 5.5cm depth, the type of which can be identified by the on-board computer.

It was generally agreed at the Stockholm meeting that no one sensor of the types considered above would ever progress beyond the first two categories of detection without being integrated with another form of sensor. Much research effort has gone into systems integration, but the problems of linking two completely different types of sensor input have not yet been sufficiently resolved to allow an example to be fielded.

The nearest to an integrated system to have been produced in a fieldable state so far is a hand-held detector with two sensors, magnetic and GPR, but even here the two systems are independent and the outputs are not mixed.

Stand-off detection

All the detector technologies mentioned above have been designed for close-in detection, for either hand-held use or to be mounted on a vehicle platform. The efficiency of mine detection could be greatly increased if some detector system could indicate where mines were, or were not, from a remote or stand-off position. This presents an even greater technical challenge but could provide greater rewards. Some systems have shown potential in this area.

Visible light imagery

Obviously normal airborne or space-borne photography cannot detect mines or submunitions below the surface, unless they have recently been laid and the disturbed earth shows up clearly, or if the mines or submunitions are on the surface. On the other hand, if the minelaying has been recent, or fences have been erected, it may be possible to detect the laying activity for some time after the event, although this may require some skilled interpretation to derive full benefit from the imagery.

Although not fully relevant to detection as such, air and space photography can play a major role in providing detailed imagery of the ground conditions, and possibly even the position of military defences around which mines may have been laid.[9] If old satellite imagery can be obtained from the archives of Cold War satellite users, comparisons with up-to-date imagery might show how cultivation, ground and road use may have changed or villages have been destroyed or moved. Although this is no proof that the use of mines prompted the changes, such anomalies can show areas which might merit further investigation. The absence of any changes in land use patterns might indicate that the areas can take lower priority in the survey process.

Air and space imagery is therefore a useful tool in minefield survey, although under certain conditions the possession of air or satellite photos can be militarily and politically sensitive. It is also important for the making and updating of maps, which are key to mine action or any kind of mine activity. One of the key elements of a mine action programme is a standard and up-to-date map, which can be the basis of all mine action, aid and redevelopment activity. Such imagery can be produced for mapping at any scale and can be part of the graphical output obtainable from current information management software.

Infrared detectors

These have already been mentioned in the close-in detection section above, but are better suited to stand-off use. As stated, the resolution of current IR cameras is insufficient for detecting small anti-personnel mines, although even minute differences in temperature are now becoming detectable. Surface-laid anti-vehicle mines and certain submunitions should be identifiable, but this depends on the vegetation and tree cover.

IR detectors may well prove to be difficult to use in the field, as they often require aerial platforms, which are not only expensive to operate and maintain but militarily and politically unpopular. Aerial surveillance may require specific authorisation from national governments, especially in areas of national sensitivity such as international borders (frequently areas contaminated by mines), which may further limit its use. Although optical wavelength images have been produced with high resolution, space-borne IR cameras available for humanitarian use are unlikely to achieve the necessary resolution to identify anti-personnel-mine-sized targets in the near future.

Air or satellite radar imagery

Air and space visual light imagery is much limited by cloud cover in many areas of the globe but radar is not so badly affected. At present, the resolution of space radars available for humanitarian purposes is not sufficient to identify anomalies on the ground which can be detected by visual imagery — although radar images could perhaps be used to verify previously obtained photographic imagery, or identify changes to it. Future developments may need to be monitored, perhaps if military-grade radar images become available for humanitarian use.

Remote explosive sensing

It has been suggested that vapour sensors, placed downwind of suspected mined areas, may detect explosive vapour over a period of time. This could give a general indication that the area was in fact contaminated without the need to enter the suspect area. This method has not yet been tried under field conditions but might be adaptable, possibly using REST techniques.

In the same way, explosive molecules escaping from mines or munitions can leach into ground water, and it has been proposed that water extracted from small tube wells near the suspect site might contain traces of explosive. Unless there was some knowledge of how the ground water moved, the indication might prove too general to be of value, but some research might still be merited.

Detector platforms

Much research resources have been expended on platforms for carrying mine or explosive detectors to allow mine clearance without putting mine clearers into active mined locations. Some mine destruction equipment can already be used remotely, either using a simple controller at the end of a cable or some form of radio control.

Remote sensing using robot-mounted sensors (usually conceived without user advice) has not yet been fielded — because of the difficulties of knowing exactly where the robot platform is and when a target has been identified, and because of the poor vision capabilities of robot-mounted television cameras. Mine clearance uses visual cues such as disturbance to earth or vegetation, tripwires, bits of plastic or metal packing material, boxes, protective caps removed before mines are laid, or even the canisters from which submunitions are released. Experiments have shown that the human eye is more capable and versatile when collecting data than was first imagined and no television imagery can currently match the wide angle stereo imagery built into the human head.

Another problem with unmanned platforms is the difficulty of retrieving such platforms in the event of breakdown or mine damage. Retrieving broken machinery from active minefields is a hazardous and unpleasant process. It is not hard to create safe protective cabs for human operators — and human-operated machines are much easier to control, retrieve and repair than robots.

In the opinion of many deminers, the first priority for development funding must remain the two types of detector, close-in and stand-off. This opinion has been reflected in the GICHD study into operational needs, which showed improvements in detectors has the potential to provide the greatest operational advantage.[10]

Many development projects for mine action equipment insist on designing new platforms for detection equipment, ignoring the fact that sensors would perhaps be better mounted on proven mine-protected vehicles, several types of which are commercially available. Illustrations of such equipment can be found in the GICHD *Mechanical Equipment Demining Catalogue*.[11]

Practical limitations to detector technologies

Many detector technologies are technologically complex and this can present difficulties to field operators. In some countries, trained operators are often highly astute and skilled at interpreting the audio or visual signals from the detectors on which their personal safety may depend, although they may not be literate.

Some new technologies require relatively large amounts of power, which are difficult to provide using current battery technology without making the detection device heavy and unwieldy, or giving it a short operating life between battery changes. Commercial standard batteries are considered by many operators to be better than rechargeable ones, partly because of uncertainty with the life of rechargeable cells, and partly because the continuous supply of electrical power in the field cannot be guaranteed. All hand-held detection equipment must also be ergonomically designed, so that operators can work for many hours without undue stress, even at extremes of temperature.

Maintenance and repair of complex equipment is also a major problem in the field, especially when the mine clearance work site may be many, even thousands of kilometres from the nearest source of spare parts. Modular construction can make maintenance and repair a more simple matter and the modules can be sent for repair to the manufacturer. Simplicity has to be built into design as early as possible or the resulting equipment will be found to be unsuitable for field use and represent a major waste of development resources.

Individual destruction equipment

Once mines have been detected and located, they can be destroyed. Destruction is either done in place, to prevent any dangers of moving the mines, or mines can be defuzed on the spot and removed to central destruction areas for disposal. The procedure to be used depends on many factors, such as the stability of the mines, the number of mines to be destroyed, the proximity of buildings or infrastructure and the skills level of the workforce.

Some mines, such as the Soviet PMN1 anti-personnel mine and Czech PTMi BAIII anti-vehicle mine, can become dangerously sensitive and hazardous to handle, as can some submunitions such as the BLU97. Old munitions with nitro-glycerine in their propellant should be moved as little as possible before destruction. Some mines and munitions are relatively stable and can be carefully defuzed and moved with comparative safety to a central destruction area.

Destruction of mines in Albania, 2001.
©ICRC/Sidler

Whether destroyed in place or in bulk, mines are often destroyed by open burning or by detonation where the environmental circumstances allow. Open burning can be achieved by using a pyrotechnic charge to burn through the case of the mine and ignite the main explosive change. Detonation is achieved by exploding a charge in close proximity to the mine, or piercing the case of it with a shaped charge and achieving a sympathetic detonation.

Pyrotechnic charges

These function by directing a jet of high temperature flame at the mine, burning through the case and igniting the main charge. Typical flame temperatures are over 1,800°C, while the ignition temperatures of TNT and RDX are both about 300°C.[12] A minimum burning temperature of 850°C is advised.[13] Pyrotechnic charges work best for mines with plastic or wood cases, but can penetrate metal cases as well. A number of such pyrotechnic devices are available commercially from countries such as the UK and US.[14]

Pyrotechnic charges can only be used if the mine is on the surface or is sufficiently exposed to enable the flame to play directly on the mine casing. Such charges can also be used for starting open burning of mines collected at a destruction point, including for the destruction of anti-personnel mine stockpiles in accordance with Article 4 of the Anti-Personnel Mine Ban Convention.[15]

Pyrotechnic charges are useful when the noise of detonation may cause alarm or the detonation blast may harm surrounding buildings or services. In some cases, the heat generated by the ignition of the main charge may cause the detonator to explode and the mine to actuate, detonating any un-burnt portion of the main charge. The destruction of individual mines by burning is a slow procedure and may delay the clearance process as all mine action staff have to leave the minefield until all burning is completed.

Use of fire for mine clearance

In some countries, local people have tried to clear mines by igniting dry vegetation or undergrowth. Although fire has value in removing such vegetation, buried mines are rarely affected by surface fires but could be made more sensitive by heating, as happened to mines laid near oil fires in Kuwait in 1991. Fire will destroy the wooden stakes on which some tripwire-actuated blast mines are mounted and may melt, but not necessarily ignite, their main charge, rendering them more difficult to dispose of. Such methods of attempted clearance are not usually recommended.

Explosive charges

The most common way of destroying mines is by placing a charge of explosive in close proximity and detonating it, causing a sympathetic detonation in the detonator, booster or main charge of the mine. For mines in place, destruction is done by exposing the edge or surface of the mine, placing a charge of plastic explosive such as C4, PE4 or block TNT in direct contact with the mine and detonating it. A charge of about 250gm of conventional explosives will normally detonate any anti-personnel mine. If moulded into or around the fuse pocket of an anti-vehicle mine, full detonation will also usually occur.

For the destruction of stockpiles of anti-personnel mines, bulk explosive is often used because, if the mines are sensitive enough, they can be detonated when packaged in boxes, which eases the handling of the mines at the demolition site. One nation completed the destruction of its anti-personnel mine stocks using a mixture of ammonium nitrate and fuel oil (ANFO). Some care is needed in setting up large-scale demolitions for destruction of mines, because shock wave effects can vary and some parts of the demolition may not be destroyed but ejected some distance from the demolition site.

Explosive charges can also take the form of shaped charges, fired through the side of the mine. This can have the advantage that the mine itself need not be touched once it has been located. And, if the mine has been located accurately enough, the shaped charge can be fired into the mine through the earth above it. Provided that the explosive jet has sufficient energy as it passes through the main charge of the explosive, a high order detonation will occur. For munitions, the shaped charge can be “tuned” to cause a low order detonation (“deflagration”), which reduces the explosive effect.

Shaped charges can be quicker, safer and easier to transport than bulk explosive charges. Mines with sensitive explosive, or with anti-handling fuses, need not be touched, as the shaped charge is fired from the stand-off position. It is also quicker and safer to destroy a mine underground, without exposing it, but it does require a detector of sufficient accuracy to locate the mine to fine limits (within 1cm or less for anti-personnel mines). Shaped charges are produced commercially in a number of countries including Austria, Germany and Switzerland.[16] The only hindrances to their more widespread use are their cost compared with standard charges and lack of experience with their use.

Where the transportation of explosive is difficult due to legal restrictions, explosives can be produced in binary form, where they consist of two stable and transportable compounds which, when mixed, form a normal liquid explosive. Explosive can also be produced in the form of foams, which can be placed over exposed mines without contact with their surface. The foam can then be detonated using standard electrical or safety fused detonators. Both foam and binary liquid explosives have considerably lower power than conventional explosives and have a higher cost, which makes them more suitable for specialised use only.[17]

Environmental issues

Much comment has been made on the environmental issues surrounding the destruction of mines and munitions, especially during stockpile destruction in accordance with Article 4 of the Anti-Personnel Mine Ban Convention. Where mines are destroyed by open burning or open detonation the gaseous products of detonation or burning are released to the atmosphere.

In reality, the detonation products of most TNT- or RDX-filled mines are similar in nature to the combustion products of fuels for cars and aircraft, but the polluting cloud of a large-scale demolition is instantaneous and conspicuous, which makes it more dangerous in the eyes of some environmentalists. This has led to recommendations for the use of elaborate forms of destruction or demilitarisation, often using very high temperature burning and the scrubbing of the gases formed in the combustion process. These methods are relatively expensive and destruction or demilitarisation costs can vary between US$0.50 per mine to more than US$12 per mine in countries where environmental laws are at their strictest, a sum which most countries cannot afford.

Other commercial destruction or demilitarisation techniques favour dismantling of the mine, removal of the bulk explosive for commercial use and the recycling of some of the plastics used in the mine bodies. Despite the income generated by the recycling process, the costs per mine are usually well in excess of open detonation techniques. Since long-term burial in moist soils can lead to explosive products leaching into the ground water, the delaying of clearance and destruction due to the imposition of stringent environmental regulations may not in the end be the best environmental solution.

There is one case where controlled destruction must take place, which is the destruction of munitions filled with liquid explosive or propellant. One form of anti-personnel landmine, the Soviet PFM1, contains a liquid filling that is toxic and corrosive, and whose products of combustion or detonation are also toxic. These mines are the subject of a special study into the most cost-effective methods for their destruction.

In general, most countries have opted for the simplest and cheapest methods of landmine stockpile destruction using open burning or detonation and so far no reports of environmental consequences have been reported.

The bulk destruction of UXO poses a different series of problems, due to the dense metal casing of some of the munitions involved. Extraction of the explosive then becomes a more favoured option, unless the country concerned has few environmental laws and many sparsely inhabited areas where pollution by metallic fragments would not pose a major problem. This was the case in Kuwait in 1991, where open detonation was frequently used for the destruction of tank and artillery ammunition, mortars and rockets. Care and specialist knowledge were needed to ensure that the detonation drove the metal fragments downwards, to limit the spread of metallic fragments.

Mechanical destruction/disruption

Mines can be destroyed in place by causing them to actuate or by physically disrupting them. Destruction by actuation is achieved by pressurising them beyond the actuation pressure, which should cause the mines to explode. This is usually done by an explosion or by rollers.

Explosive disruption

Many variants of mine clearance explosive devices have been produced for military purposes. Many of them are based on thrusting explosive pipes, or firing rockets towing hoses full of explosive across the mined area. The explosive pipes or hoses, when detonated, are intended to cause either sympathetic detonation or disruption of any mines below or nearby.

This procedure has not been adopted for humanitarian purposes because it is many times more expensive than manual mine clearance[18] and because the clearance capability of even heavy explosive hoses depends on the vegetation in the mined area. Bushes can prevent the hose from reaching the ground and the detonation of every mine under the linear hose cannot be guaranteed. Rocket-pulled hoses rarely land in a straight line and even a successful detonation of an explosive charge may not be sufficient to make a safe lane. This is of less importance in military minefield breaching because the track made by the explosive hose is usually immediately augmented by a mine plough to make a track for the armoured vehicles following it.

A variant of the explosive hose is the polythene tube filled with an explosive mixture of gas and air. The polythene tube rolls out across the mined area as it fills and is then detonated. For military use, charges of fuel/air explosive (FAE) can be used, but both these and the explosive tube above rely totally on the shock and pressure effect of the gas/air detonation.

Mines do not always detonate under explosive hoses and the fuses of some mines, such as the TS50 anti-personnel mine and PTMi BAIII anti-vehicle mine, are specifically designed against them, especially the very rapid explosive pressure pulse produced by the explosive hose. This can limit the use of hoses still further under certain conditions. Explosive hoses have received limited use in mine action, although they have been tried in South Africa with some apparent success.

Mine rollers

A more reliable way of detonating mines is to pressure them with a roller, pushed in front of a vehicle. This again is mainly used by military forces, often in conjunction with a plough, but rollers have been used to destroy anti-personnel mines and are available commercially. Military mine rollers have often been mounted on armoured vehicles and cover the rack width only, whereas humanitarian rollers need to cover the entire front of the pushing vehicle and are usually propelled by a modified agricultural vehicle or construction equipment such as a bulldozer.

Rollers are moderately effective but their performance can be degraded by uneven ground or ground that is so soft that the mines are pushed deeper into the soil without exploding. In addition, some mines do not respond when pressurised only once as they require two or more efforts to actuate the detonator system. Even so, rollers have a use in rapidly checking cleared land or in area reduction where a suspect area can be tracked by the roller until the edge of the mined area is found. Only military rollers can withstand repeated blasts of anti-vehicle mines.

A successful variant of the mine roller is the protected vehicle fitted with steel roller wheels. Vehicles of this type have been produced and successfully used in South Africa and have been trialled in Croatia. So far, little use has been made of them by mine clearance NGOs, possibly because of the cost of the protected vehicles, but their performance merits further use in other and non-African theatres.

Pearson mine roller. ©Pearson

Anti-personnel mines were also successfully detonated in large numbers in Kuwait in 1992 using a digging rake on an armoured excavator. The anti-personnel mines were dug up and one claw of the rake was used to press on them until they detonated. If they failed to do so, the next mine found would be placed on top and the two detonated together. This method was suited to sandy soils with patterned minefields but would be difficult to use for isolated mines in soft or heavily vegetated soils.

Experiments were also conducted where anti-vehicle mines were pressured using a steel rod mounted on an armoured excavator. This system worked but it was impossible to find steels strong enough for the pressure rod to withstand the repeated heat, blast and shock of the anti-vehicle mine detonation without cracking or spalling away. A similar but smaller-scale experiment for detonating larger anti-personnel mines such as PMN was tried in Cambodia using a wooden rod mounted on two bicycle or agricultural wheels. The success of this low-cost experiment is not known.

Flails

Diana 40T flail unit in action. ©Hontstav S.R.O.

One of the earliest devices to be used against anti-vehicle mines was the flail, first developed in 1942. This tank-mounted device had a rotating shaft mounted at the front, with weights on chains slung from it. When the shaft rotates, the weights beat the ground with the aim of detonating any mines in the path of the flail. The flail concept was rapidly revisited following the Falklands/Malvinas war of 1982 and versions were produced for military trial. These were taken into humanitarian use in 1991 but early models proved underpowered and unreliable, and prone to throw anti-personnel mines out of the beaten zone of the flail. The machines were also easily damaged by repeated detonations of anti-vehicle mines.

Since then, a number of humanitarian versions of the flail have been produced, of varying sizes.[19] The larger flails mounted on heavy tracked chassis are still too cumbersome for field use and difficult to transport on country roads and bridges. They are also extremely difficult to extract from active minefields if they are damaged or break down. Some of the smaller mini-flails are proving successful for vegetation clearance in heavy undergrowth and limited mine clearance against anti-personnel mines only. A number are now produced with remote or radio control and some are mounted as attachments onto the arms of hydraulic excavators, which makes them able to clear corners that cannot be reached by vehicle-mounted flails. Some of the bigger wheeled versions of the flail are proving to be robust, reliable and very effective.

RM-KA 02 remote-controlled flail. ©Duro Dakovic Specialjalna Vozila

Despite the increasing and long-term use of flails, comparatively little is known of the precise interaction between the flail weight (also called the pick or bob) and the ground. Research has shown that different shapes of weight transfer different degrees of energy in different directions when they hit the ground, which can affect their capability for applying the necessary pressure to the target mines. Different sizes and shapes of weight are now being used but further research is needed to optimise the flail weights to the soil conditions and the types of mine being cleared.

Earth tillers

Rhino system in operation. ©Rheinmetall Landsysteme GmbH

The principle of the earth tiller is to beat or till the ground with steel teeth to such an extent that any mines are either detonated or physically broken to the stage that they are no longer able to detonate. Earth tillers require high power to turn the tilling shaft, which, like the flail shaft, is mounted at the front of the vehicle. An early model had two engines, both of about 900bhp, and the tilling head was mounted on a tank. This design was unfortunately too heavy to be practicable in the field, even in Europe with its full network of high capacity roads and bridges.

Several types of tilling machine have been produced and are available commercially[20] but are still large, heavy and ungainly and show few advantages against the better types of flails. Tillers are usually heavier, more expensive and need greater maintenance and repair than their flail counterparts.

Tilling machines can leave broken fragments of explosive in the soil after the tilling process. This makes it difficult to employ dogs in the quality control process that has to follow the primary clearance.

Some smaller tilling machines have the tilling head mounted on the hydraulic arm of a tracked or wheeled excavator. These, like the arm-mounted flails, are very effective at removing vegetation and preparing the ground for manual or dog clearance and are being increasingly used for humanitarian mine action.

An environmental disadvantage with both flails and tillers is that the cohesion of the soil is disrupted and the roots of any vegetation are destroyed. In areas with thin layers of topsoil, any form of earth-processing equipment must be used with care or the pulverised soil may be blown or washed away, leaving the area completely barren.

Sifters

The aim of mechanical sifters is to cut a layer of soil from the ground and pass the soil through a sifter process to sift out mines from possibly contaminated soil. This is not easy to achieve because of the amount of other material in or on the cut soil such as stones, roots or lumps of vegetation which also has to pass through the sifter. Sifters are best working in dry and sandy soils as clay or wet loam can quickly clog the sifting system. Early sifters tended to build up soil in front of the cutter blade which, due to the sideways movement of soil along the blade, could leave mines at the edges of the sifter path.

Sifters need a relatively powerful base machine and require that the sifted soil is examined for mines among the rocks, stones and roots that have not passed through the sieve mesh. Sifters will probably be capable of withstanding the blast of a small anti-personnel mine, but repeated blasts, or the explosion of an anti-vehicle mine, might cause extensive damage. The sifting process is thorough but slow. Specialised sifters mounted on wheeled plant are in operational use in southern Africa and are available commercially.[21]

A method of mine detection and destruction allied to the sifting process is the procedure used by one NGO using standard wheeled bucket loaders. The top layer of soil is excavated from the suspected minefield, then removed and spread out over a hard bare earth surface. The deposited soil is raked over by hand by mine clearance staff in full protective gear, which exposes the mines among the roots, rocks and vegetation. When the mines have been raked to one side and removed the soil is returned its original location and the next bucket-load of topsoil is collected and examined. This method has the benefit of using equipment commonly found in commercial use in many countries, unlike the specialist machinery mentioned above.

Rotar sifting dry soil. ©HEC Hendric Ehlers Consult

Ploughs

Although used by military formations to clear routes through mined areas, ploughs do not destroy mines but merely remove them from one place to another — at the same time turning them over so that the top actuating cap may be facing in any direction, thus increasing the hazard of prodding for them. Ploughs are only of use in humanitarian mine clearance for gaining access to mined areas or in conjunction with some types of sifter. Sifters work best with broken ground and can sift the windrow produced by a plough easier than undisturbed earth.

Detection of UXO

This chapter has linked the clearance of mines and UXO together under the term “mine clearance” because in most cases they present a similar problem and both forms of munition are often cleared by mine clearance staff. The clearance of certain types of UXO can pose special problems, which require specialist clearance skills.

UXO are usually either munitions fired from artillery, rocket or mortar weapons, or are aerially delivered, like submunitions or bombs. These can pose specific hazards for clearance staffs. Unexploded artillery, rocket or mortar rounds can either end up on the surface or buried. Fortunately, most have a high metal content, especially artillery and mortar rounds, which makes them detectable by magnetic mine detectors. Some aerial delivered bombs can end up deeply buried and specialist detection techniques are used for their detection.

Once detected, many unexploded munitions are relatively inert but some have sensitive fuzing systems which render them dangerous to normal clearance methods. Bombs with delayed-action fuses have to be treated with caution. Deep-buried shells and bombs have to be dug out before they can be destroyed and if they are close to buildings, services or infrastructure, they must be defuzed before removal, a highly specialised task.

Some missiles, especially the larger surface-to-air or surface-to-surface missiles, are powered by liquid propellant which is toxic and corrosive, and leakage or spillages of these substances can be hazardous to those near to the missile or who approach without adequate protection. Clearance should not be attempted without specialised advice. Some guidance is given in IMAS or their Technical Notes on the handling of liquid-fuelled munitions. Although not classed as explosive, depleted uranium-cored bullets or anti-tank projectiles can be toxic, especially if they have passed through armour plate. The absorption of uranium oxides by contact or inhalation of uranium oxide dust is hazardous because of its toxicity.

Many mine clearance groups have ordnance specialists who should be consulted if unidentified munitions are discovered during the clearance process.

Conclusions

The processes of the detection and destruction of mines and munitions for humanitarian purposes have come a long way since 1989, but arguably not far enough. Reliance still has to be placed on "classical" methods of mine detection. Research and development (R&D) of new technologies has been disappointingly slow: there is little doubt that few new technologies have been introduced into demining, despite the expenditure on research.

In contrast, the exploitation of existing technologies has been more successful, and new and improved mine clearance machinery is being produced and fielded on a wider scale than ever before. Techniques for the training and use of mine detection dogs have also been improved, thanks to some original research carried out under the GICHD mine detection dog programme.

It is arguable that R&D has been taking place on two parallel tracks. On one track, new technologies have been the subject of many millions of dollars or euros on research but little has come from the expenditure. On the other track, incremental user-led evolution of mechanical equipments, and the use of detection dogs, is leading to increasing efficiency and effectiveness. The reasons for the imbalance are worth examining.

Generation of new technologies

Of the new technologies mentioned above, only one GPR handheld detector is ready for full-scale field trials for humanitarian use. Many scientists and engineers have attacked the "mine problem" with vigour, but without continuous discussion with the users. As a result, they have decided for themselves what the problem is and have tried to adapt their technologies to it. The pursuit of an elegant technological answer has in some cases become an end in itself, divorced from the pressing user need to increase safety and productivity in the effort to save lives and livelihood.

Many scientists are exploring exactly similar areas and the amount of repetition in research has been considerable and wasteful. Repeated warnings from the user community have had little effect. In a recent case one short visit to one minefield cemented the perceived user need into the minds of the researchers and further user input seemed to be considered unnecessary. As a result, the mine clearance users are beginning to doubt the capability of the scientific community to do anything but promote their own research, with a consequent waste of scarce resources better employed elsewhere. This is a heavy indictment but one that is hard to refute.

One difficulty is that there is no single "mine problem", a fact not understood by most researchers. Each minefield or mined area may present a series of unique problems to the clearance staff. And clearance tools that work well in one area may be useless in another, even in the same country or region. User requirements may vary subtly in each place, so single solutions may not work as well in another location.

As a result, it is difficult to decide whether to try to drag the scientific community into the mine clearers "real world" or dismiss the whole idea as a waste of time and money. This leads to the question of whether R&D of new technologies is cost-effective.

Cost-effectiveness of research and development

It is not often appreciated that research into any new technologies is rarely cost-effective until one of the ideas thrown up in the research programme gets to the full development stage and a potential market can be identified. In mine action, the matter is complicated still further by the fact that there is no identified humanitarian mine clearance market — and mine clearance teams are notoriously conservative and slow to trust new technologies. This means that predicting the business return on research and development investment is almost impossible.

The basic research into a detection system may cost at least US$3 million to take from concept to prototype. Full development can take five to ten times that amount and gearing up for large-scale production a further ten times more. It would take a large production run to give a reasonable return on so heavy an investment, a return that is unlikely to occur in the present mine action world. This has always been recognised and it has been consistently urged that governments would have to support R&D into mine action technologies, or no research will take place. Unfortunately, much research funding is wasted by the failure of research organisations to work together, which is not an encouragement to governments or donors to provide such funding.

From the researcher's point of view, it is difficult to get from the deminers a consolidated set of quantified performance requirements for new equipment. Each mine action organisation has its own opinions on performance specifications, but these would be better coordinated to cover the whole demining community rather than one specific programme. Most armies and industries have well-tried routines for establishing customer needs for equipment performance. The mine action community needs the same.

NGOs frequently assert that R&D money would be more profitably spent on mine clearance, but this fails to recognize that R&D funds come from different funding envelopes that are not transferable. This attitude is hardly helpful or encouraging for the researchers concerned. Though ridiculing the value of research, it is quite possible that the same NGOs would criticise the research organisations for their lack of new technologies if the NGOs were faced with entirely metal-free mines.

Also, although incremental improvements are being made in the cost-effectiveness of mine action, there has been little success in developing a stand-off detector to remotely locate the presence of mined areas. This alone could improve the efficiency of technical surveys by a very large amount. It can be argued that success in this area of research would find a ready market and it is highly probable that military demining organisations would wish to acquire the same capability. Military purchases would change the pattern of the market completely and would probably give the return on the investment that is currently sought.

Optimisation of existing technologies

As mentioned, many new mechanical equipments are in use and the numbers are slowly increasing as their safety and cost-effectiveness become better known. In the same way, the use of mine detection dogs (MDDs) is increasing. In both cases the demand for improvement is user-driven and the user is closely involved with the development process.

Interestingly, in the use of some GPR mine detectors and MDDs, researchers and developers have worked alongside the users and have entered minefields to see for themselves what problems the users are facing. The result has been highly focused and productive research on animal vapour detection with dogs and rats and the generation of equipments that are ready for large-scale acceptance trials. We therefore know that full-scale collaboration with the user during the R&D process produces the right results.

Meeting the users' needs

Mine clearance is developing but needs to develop still further. Cost-effectiveness, safety and quality have all much improved since 1989 but are not yet good enough. At the same time, the generosity of the donors may be waning and their expectations for cost-effectiveness are rightly increasing.

The GICHD User Needs Study[22] identified that the greatest improvements to efficiency in the opinion of programme managers would come from close-in detectors with a lower false-alarm rate and effective stand-off detectors for area reduction. The situation has not changed since the study was published in 2002. So far, the mines and munitions found in conflict areas have not changed much — but new totally non-metal mines and munitions with sensitive fuzes are available on the market and, despite the Anti-Personnel Mine Ban Convention, may yet appear in the ground. In addition, the current international circumstances suggest that the permanent end to all warfare seems as far away as ever.

In this case, it would be short-sighted for the user community to ignore the potential for technical advance or naively demand that R&D money be somehow transferred to mine action programmes. Research budgets seem to have a life of their own and the user community might be better employed seeking to gain from them rather than ignoring them. At the same time, some of the users' needs are increasingly being met by extending the development of existing equipment. Such development must be encouraged as a way of increasing the cost-effectiveness of the mine clearance process.

One of the difficulties of establishing the cost-effectiveness of a single piece of mine-clearance equipment is that few clearance organisations carry out stringent cost calculations on the elements of their clearance process, such as the machines, dogs, survey teams, etc. More work needs to be done to prepare simple software that will allow mine clearance groups to perform such calculations. At the same time, data on the operating costs of demining tools need to be better collected. At present it is difficult for a programme manager to estimate what cost savings could be achieved under particular project conditions — or use such estimates to ask donors for funding for better equipment.

In the early days of demining, derivatives of military equipments were the only options available and these often proved unworkable due to the practical differences between the military act of minefield breaching and the humanitarian act of minefield clearance. Recent military interventions in Afghanistan, Bosnia and Herzegovina, Iraq, and Kosovo have required soldiers to carry out mine clearance operations closely related to humanitarian operations and many armies have re-equipped with detectors originally developed for humanitarian use. These are encouraging signs. Research into military hand-held and vehicle-borne detection systems is under way in many countries. This means that the chances of using the results of such research for humanitarian purposes may be increasing and the divergence between military and humanitarian requirements may reduce.

New technologies

It must be accepted that the mine action community, with the right equipment, can make further advances in cost-effectiveness, which will be keenly sought by donors. As part of the search for greater efficiency, the community needs to promote new technologies and R&D must continue. The mine action community cannot alter or control the R&D community but perhaps should seek to advise and assist them by clarifying the users' needs and insisting that the users' views are kept in mind throughout the development process. This can in part be done by seeking greater participation in equipment development fora, such as EUDEM (European Union in Humanitarian Demining), HUDEM (Belgian joint research programme for humanitarian demining), and others.

Clarification of user needs must take the form of consolidated statements of operational requirement. The preparation of operational requirements will be difficult and will require negotiation with, and cooperation between, the UN, NGOs, commercial companies and the managers of mine action programmes. But it will be worth the effort. It is possible that the GICHD could assist in a project to study how such operational requirements could be formulated, possibly as an extension to the User Needs Study.

Every opportunity must be made to get R&D staff to visit the field, to talk with field staff, see actual mine clearance terrain and conditions, and observe working practices. Such visits may be time-consuming for field staff but, without a greater understanding of the user needs and working environments, usable and effective equipment will never reach the field.

The search for new technologies for mine and munition detection should continue. It would be over-optimistic to assume that there will be no more wars or that, during these wars, landmines will not be used. They have been a weapon of choice for irregular forces or small armies for many years and their effectiveness, especially for controlling or harassing the civilian population, has been proven. New and non-metal mines exist but fortunately have not yet been widely deployed. It might be foolish to assume that they never will be, thus it is better to search for a solution for their clearance before, rather than after, they have arrived.

Existing technologies

The development of existing technologies has been successful, but the new improvements for increasing cost-effectiveness must become more widely used. One way of ensuring this is to have better methods for informing mine action programme managers and donors of the benefits of the new developments and this can come through better measurement of these benefits. With clearer statements of benefit, and increasing field experience in varied terrains, there will be increasing acceptance of mine dog detection and mechanical techniques.

It is suggested that more information on good results with proven equipment is made available — possibly via the UN, GICHD or James Madison University[23] — to ensure that more donors and programme managers are informed on the latest equipment developments.

Improvements in efficiency will be better understood if they can be quantified and more performance-calculation software needs to be developed and circulated to programme managers. More information needs to be gathered on the efficiency and capabilities of new types of equipment, but this information will have to derive from the field, not from the manufacturers. Calculations will need to be linked to specific types of equipment working in specific scenarios. Software for such calculations has already been developed within the GICHD and should possibly be made available to programme managers and their technical staffs.

Donors should support the managers of the programmes they are funding in striving to increase productivity. They should also be dissuaded from purchasing equipment for these mine action programmes on the basis of supporting national industry without first obtaining the agreement from the programme manager that the equipment will meet the needs of the programme in a cost-effective way.

As with new technologies, users with practical experience must provide feedback to the developers of improved equipments and procedures. This will encourage further iterative improvement and refinement, and result in wider applicability. There is not a major market in the mine action world, but good equipment will still find buyers.

Endnotes

1. For a background to landmines, see Croll (1998).
2. Proceedings of SUSDEM 1997, *Improving the Process of Manual Probing*, Zagreb.
3. For further information on magnetic and other detectors, see Acheroy (undated).
4. For details of the M14 mine, see King (2003: 340–341).
5. For details of submunitions, see King (2003).
6. For information on nuclear detection techniques, see Yihon (1999).
7. *Ibid*.: 135.
8. *Ibid*.: 118–123.
9. For fuller information, see Lacroix et al. (2001).
10. GICHD (2002a).
11. See GICHD (2004c).
12. See Yihon (1999: 2 and 4).
13. See IMAS 11.20 "Open Burning and Open Detonation Operations".
14. See King (2003).
15. See *Landmine Monitor Report* at *www.icbl.org/lm.*
16. See King (2003).
17. For information on binary explosives and foams, see *King (*2003).
18. Estimated at between 150 and 1,500 times as expensive by the author in a costing exercise.
19. See GICHD (2004c).
20. *Ibid*.
21. *Ibid*.
22. GICHD (2002a).
23. Possibly through the JMU Mine Action Information Center's *Journal of Mine Action*.

3

Landmine surveys

Guy Rhodes

Summary

Discrete survey projects in support of clearance operations began to appear from 1990. Since then, countries considered to be severely affected by landmines have seen a host of assessments and surveys during the history of their mine action programmes. In general, however, most surveys have focused on either the hazards or the impact; there are weaknesses in approaches of both. Indeed, survey is, perhaps, the most challenging and most critically debated aspect of mine action.

During the development of landmine surveys, projects have benefited from advances in technologies, particularly in the fields of GPS and digital photography. A new generation of technologies is now reaching the market with considerable implications for future survey work.

Introduction

In order to plan and prioritise mine action activities it is necessary to quantify the scope and nature of the threat posed by landmines and unexploded ordnance (UXO). The term *survey*[1] is used to describe a set of activities that endeavours to achieve this (for brevity, hereinafter, the term *mine* encompasses also UXO). In addition to large-scale assessment projects it also includes projects with a more technical focus — those which better define areas of contamination — and site surveys conducted after a demining task has been completed. In some literature, evaluations that review whether cleared land is being used as envisaged have also been included in the survey process.

A project to characterise the unknown on a scale that is required for many landmine surveys is a daunting task. The extent and nature of contamination presents considerable challenges for the design of surveys attempting to capture and record wide-ranging aspects of the contamination within a relatively short time. Survey is, perhaps, the most challenging and most critically debated aspect of mine action.

This chapter reviews the development of survey activities, exploring the limitations of various methodologies and discussing adaptations in approaches that have occurred to address shortfalls in stakeholder expectations. The development of survey terminology is first reviewed with an outline of current definitions. This is followed by an examination of aspects that contribute to the survey environment — which is unique in every country and can challenge certain survey approaches. The expectations of key stakeholders are then reviewed to set the scene for a wider discussion of the survey projects undertaken to date and the potential for further improvements.

Primary survey data (i.e. initial non-technical assessments) focus on gathering information about the location and scale of hazardous areas and the social and economic impact of mine contamination. It is used to help shape mine action strategies, allowing rational decisions to be made on the allocation of resources and the targeting of mine action tasks according to clear priorities. Such survey data are collected by a variety of activities, described variously as: level 1 survey, general survey, landmine impact survey and emergency survey. These surveys, which are arguably the most vital in the planning of a well-targeted and cost-efficient mine action programme, are accorded particular attention in the chapter.

Survey definitions and terminology

The development of survey terminology

Discrete survey projects in support of clearance operations began to appear at the beginning of the 1990s. It began with so-called level 1 (general) surveys, a term used to describe the process whereby mobile teams recorded mine-related information on questionnaires. This was distinct from level 2 (technical) surveys that relied on a technical approach using demining equipment to confirm the existence of mines and to better define the extent and boundaries of the contamination.

Later an additional term, level 3, came into use — representing survey activities associated with recording the boundaries of completed clearance tasks — to document demining efforts better and to improve the process of formal handover of clearance sites to beneficiaries.

Although now obsolete, the survey terminology based on levels one to three was used throughout the 1990s, and was referred to in the first International Standards for Humanitarian Mine Clearance Operations, released by the Mine Clearance Policy Unit of the UN Department for Humanitarian Affairs in March 1997.

United Nations survey definitions in 1997

Level 1 (general) survey

The objective of a level 1 (general) survey was to collect information on the general locations of suspected or mined areas. Information was collected on areas affected by mines and on areas not affected. Areas were supposed to be categorised and the reliability and credibility of data recorded. A level 1 survey was a prerequisite for the planning of a level 2 (technical) survey.

Level 2 (technical) survey

The objective of a level 2 (technical) survey was to determine and delineate the perimeter of mined locations initially identified by a level 1 survey. The marked perimeter formed the area for future mine clearance operations.

Level 3 (completion) survey

The level 3 (completion) survey was conducted in conjunction with the mine clearance teams and accurately recorded the area cleared.

Terminology problems

The 1997 level 1 survey definition did not accurately represent the full data content of most survey questionnaires used during the 1990s. The definition did, however, reflect the general sentiments of many in the demining community at the time — that the unit of focus in survey activities should be the minefield, described in terms of type of ordnance, density of ordnance and area of contamination.

A small number of surveys during the 1990s were not well described by the 1997 level 1 survey definition. These were surveys that were more impact oriented — looking at socio-economic aspects of the contamination rather than focusing on the type, density and area of contamination. Examples of this were the Mines Advisory Group (MAG) 1991 survey *The Report of the Afghanistan Mine Survey*, the Handicap International (HI) Laos 1997 survey *Living with UXO* and the MCPA/UNOCHA 1999 Afghan survey *Socio- Economic Impact Study of Landmines & Mine Action*.

Where certain aspects of a particular project were to be emphasised, expansions of the level 1 term occurred. For instance, where a focus was to be placed on impact, the term level 1 impact surveys appeared and when an emphasis was on the duration of the project, such as in a rapid assessment in the immediate aftermath of a conflict, then the term level 1 emergency surveys appeared.

The terminology of landmine impact surveys (LIS), as defined by the Survey Working Group and first implemented in 2000 in Yemen, provided the most consistent understanding of a particular methodology. This survey initiative made a concerted effort to develop a standard implementation approach that used the community as the main target of the assessment rather than the minefield, and recorded the impact on communities through victims and blockage of access to resources.

Formerly known as level 1 impact surveys, the Survey Action Center (SAC) readdressed the survey terminology in the light of the revised IMAS (2001) and has since removed all level 1 references. Since the completion of the first SAC LIS in Yemen, there has been a remarkable expansion of this type of survey approach and hence a wider usage and understanding of the landmine impact survey terminology.

The terminology for level 2 (technical) surveys created confusion throughout the 1990s. A key theme of the level 2 surveys was to define the boundaries of a suspected mined area through "area reduction" using technical teams to delineate the perimeter of minefields and to mark them as an intermediate measure pending future clearance. The theory of this approach, however, did not translate well into a practical activity in many mine clearance settings and was not seen by some as a discrete activity. The definition has since been amended in IMAS 08.20, describing a broader activity with greater application.

The level 3 (clearance) surveys as defined in the Department of Humanitarian Affairs 1997 standards were largely considered an activity conducted by clearance teams themselves — after a task had been completed. The terminology of level 3[2] surveys therefore was not used as much as level 1 and level 2. Although the site completion map depicting land cleared remains a vital activity at the end of a demining task, the level 3 terminology has been lost and the clearance map is simply a component of the post-clearance documentation (PCD) as outlined in IMAS 08.30.

Although not addressed in any published standards to date, reference is sometimes made to a level 4 survey or post-clearance evaluation (PCE). This activity is understood as an assessment that is undertaken sometime after the cleared area has been handed over to local authorities (or other beneficiaries) in order to determine whether the cleared land is being used as envisaged. Such a survey would represent a logical final stage.

Current survey terminologies and IMAS definitions

In October 2001 the first edition of the IMAS removed all reference to level 1, 2 and 3 surveys and although they still remain in common use today the numerical reference for a survey level is now obsolete. IMAS now uses terminology that makes reference to a General Mine Action Assessment (GMAA) that is a continuous process incorporating data from a combination of activities including emergency surveys, LIS and technical surveys.

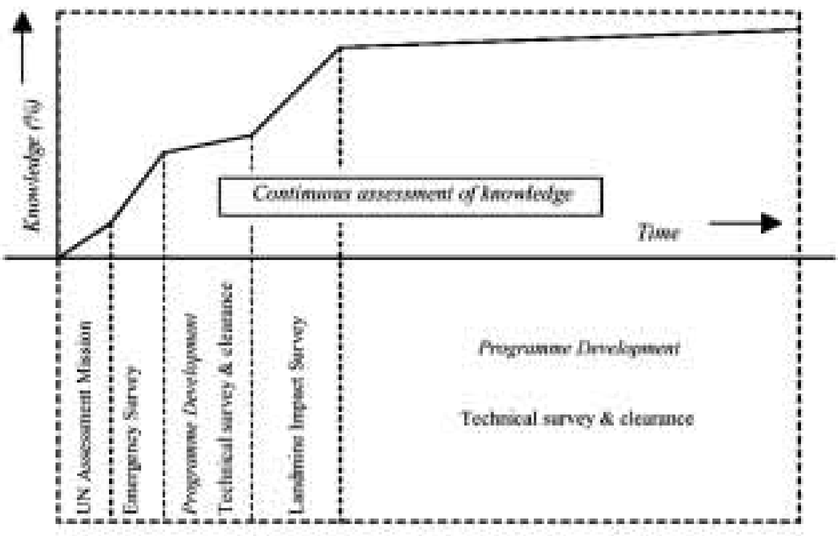
General Mine Action Assessment (IMAS 04.10 & 08.10)

According to the IMAS Glossary, a General Mine Action Assessment is "*the process by which a comprehensive inventory can be obtained of all reported and/or suspected locations of mine or UXO contamination, the quantities and types of explosive hazards, and information on local soil characteristics, vegetation and climate, and an assessment of the scale and impact of the landmine problem on the individual, community and country*".

The important difference from many previous terms describing information-gathering activities is that the GMAA relates to a continuous process of collecting, evaluating and analysing data to assist and update strategic planning, and provide support to mine action authorities (*Figure 1*). In addition to field surveys it consists of many different types of information-gathering activities including sourcing of available satellite imagery, aerial photographs, military dossiers and hospital records.

There can be some confusion in the concept of the GMAA as some activities that remain functional areas of the overall mine action assessment, such as technical survey or impact surveys, are also described in separate standards or technical notes.

Figure 1. Schematic representation of a GMAA as a continuous activity — illustrating a functional flow with various surveys approaches (adapted from IMAS 08.10)



Emergency survey

The 2003 version of IMAS contains no definition for emergency surveys but they are generally understood to be a rapid process of gathering data on suspected hazardous areas, to assess safe routes, and provide an inventory of reported or suspected areas of contamination. This type of activity normally takes place in the period immediately following the end of a conflict. The approach and content has considerable overlap with earlier level 1 (general) surveys.

There is also potentially an overlap with impact surveys as some recent emergency surveys have incorporated a greater impact component. In this chapter, however, all survey approaches that focus on the suspected hazardous area (SHA), rather than the community as the main focal point are termed SHA-focused surveys.

Impact survey (IMAS 04.10 & Technical Notes for Mine Action (TNMA) 08.10 series)

> *"An assessment of the socio-economic impact caused by the actual or perceived presence of mines and UXO, in order to assist the planning and prioritisation of mine action programmes and projects."*

Technical survey (IMAS 04.10 & 08.20)

> *"The detailed topographical and technical investigation of known or suspected mined areas identified during the planning phase. Such areas may have been identified during the general mine action assessment or have been otherwise reported."*

Figure 2. Illustration of the progressive developments from initial site identification gleaned through early stages of the general mine action assessment, through technical survey and clearance, to post-clearance documentation and evaluation

Progressive steps from GMAA through Technical Survey and clearance to PCD and PCE

General Mine Action Assessment - GMAA (a continuous activity) ***LEVEL 1: general survey***

Including: review of military records, hospital records, emergency and impact survey data

Technical survey (a continuous activity) ***LEVEL 2: technical survey***

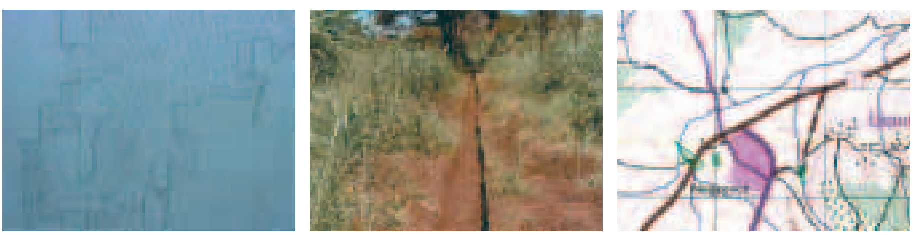
(Technical investigation of a known mined area (may also include exploratory clearance)

Clearance activities

Removal of mines and UXO utilising manual deminers, dogs, machines (or a combination)

Post-clearance documentation - PCD ***LEVEL 3: completion survey***

Including maps of cleared area, post-clearance inspection details, SOPs and handover documentation



(Post-clearance evaluation - PCE) ***(LEVEL 4)***

Asessment that cleared land is being utilised as envisaged — not currently addressed in IMAS

Notes:
a. The sequential stages from initial GMAA to post-clearance documentation may not always be followed as presented here. A technical survey, for instance, can take several forms and in some situations, especially where clearance follows immediately from an emergency or impact survey, it may not be clearly differentiated as a separate activity. Furthermore, post-clearance documentation (IMAS 08.30) can in practice be limited, depending on the size of the clearance site, type of task, the clearance contract, implementing organisation or operational setting.
b. Post-clearance evaluation illustrated here represents a logical final stage in the process, however, it is not currently recognised or addressed in IMAS documentation.
c. Outdated survey terminology using the levels 1-4 are indicated in the right of the table, although care should be taken as representation of these levels in line with new terminology suggests that they are equivalent — which is not strictly the case.

Photos from left to right:
GMAA:
- Villagers indicating area of mine threat during a general survey at Cassua, Ndalatando, Angola. ©G. Rhodes
- Liaison officers from the Royal Thai Army assist information gathering on the Myanmar border. ©G. Rhodes
- Map showing some general suspected areas of contamination, Kosovo. ©VVAF

Technical survey
- Mine warning sign on the Thai Cambodian border. ©G. Rhodes
- Detailed avaluation of a minefield undertaken from an exploration lane, Ndalatando, Angola. ©G. Rhodes
- Map showing better defined perimetres of the reported sites of contamination, Kosovo. ©VVAF

Post-clearance documentation
- Site clearance map (incomplete) from ongoing task at Toco, Huila Province, Angola. ©G. Rhodes
- Trench around the borders of a cleared site to indicate extent of safe area after clearance has been completed, Malanje, Angola. ©G. Rhodes
- Map showing the boundaries (in green) of the areas cleared, Kosovo. ©VVAF

Post-clearance evaluation
- Cleared land being ploughed by oxen, Figueira, Huila Province, Angola. ©G. Rhodes
- Former mined paddy fields on the Thai Cambodian border now under cultivation. ©G. Rhodes
- The completion of a bridge on the Lubango-Menongue road, Angola. ©G. Rhodes

Post-clearance documentation (IMAS 08.30)

Post-clearance documentation refers to a "comprehensive" set of documents relating to clearance operations. During the process of handing over a cleared site, this documentation is provided to a recipient authority, organisation or individual. A critical item in the documentation is a map of the completed clearance site. A copy of any technical survey undertaken prior to the clearance is also included with further documentation such as the standing operating procedures (SOPs) of clearance methods used and any quality assurance activities, such as post-clearance sampling.

A general illustration of the complete survey process is contained in Figure 2.

Evolution of general landmine assessments

Historical background

Survey operations

Demining has its roots in the late 1980s within several pioneering programmes in Afghanistan. During the first two years or so, however, survey activities were limited to reconnaissance in support of clearance operations. But from 1990 onwards discrete survey projects began to materialise that aimed at making broader geographic assessments of the nature of mine contamination. Perhaps the most prominent NGO conducting surveys in the 1990s was the British organisation, the HALO Trust, which undertook surveys in many countries.[3]

Although the terminology of the survey titles differed slightly, the content was similar in the level 1 (general) surveys conducted in Afghanistan 1991-92, Cambodia 1992, Mozambique 1993-94, Nagorno-Karabakh 1995-96, Chechnya 1997, Abkhazia 1999-2000. Since the late 1990s, however, there has been a tendency to emphasise this type of survey intervention as "more rapid assessments", using terminology such as level 1 danger area survey (Kosovo 2000) or level 1 mine and danger area survey (Sri Lanka 2002), although the underlying methodology is the same.

The emergency survey is a more recent term that is likely to now supersede previous terminology; this has been used in both the Eritrean (2000) and Ethiopian (2001) survey projects. Other such surveys conducted by NGOs and mine action organisations all have a similar theme — recording the location of areas and features such as roads suspected or known to be contaminated by landmines. Field teams sometimes also operate in a reconnaissance capacity describing road conditions, access routes and assessing security considerations.

Although the focus of the HALO Trust and others was very much on conventional minefield surveys during the 1990s, there were also surveys that were incorporating a greater focus on socio-economic considerations. In 1991, for instance, the early work of MAG, although limited in its geographic extent, culminated in *The Report of the Afghanistan Mine Survey*, which placed an emphasis on socio-economic aspects of landmine contamination. Also in Afghanistan, the 1999 report of MCPA/UNOCHA *Socio-Economic Impact Study of Landmines & Mine Action* used existing information, supported by further field assessments, to evaluate, on a greater scale, the negative affects of mine contamination in the country.

In 1997, the Handicap International survey of Laos, whose final report was titled *Living with UXO*, was from the outset a national project focused on the community as the unit of assessment. This was partly necessary because of the nature of the UXO contamination in Laos that blanketed much of the country and the limited application of more conventional general survey mapping techniques. The Laos survey nevertheless marked a milestone in surveys becoming more community-oriented — with socio-economic factors being increasingly taken into consideration.

Much of this shift in focus of survey approaches can be attributed to the progressive integration of mine action into a broader field of development. The limelight that was enjoyed by mine action as result of the Anti-Personnel Mine Ban Convention signed by 122 nations in Ottawa in 1997 and the rise in public awareness provided by prominent celebrities further diluted mine action's traditional staffing by military and ex-military deminers. This inevitably brought in new ideas and a shift of emphasis away from the minefield as the focus of many survey activities.

The idea of a global landmine survey was conceived in 1998 and later that year the Survey Working Group (SWG), composed of key actors in mine action and the Survey Action Center (SAC) as a focal point for coordination, embarked on an ambitious programme to survey mine-affected countries using a standard methodology focusing on community assessments. The first LIS was completed in Yemen in 2000. Since then similar projects have been conducted in more than a dozen countries.

In total, more than 30 major mine action surveys have been completed over the past 15 years and a dozen or so more are either underway or planned. There are countless more survey projects that have been conducted over the years on a smaller scale in support of clearance initiatives and larger development or emergency relief work.

The development of organised databases to support mine action[4]

The earliest mine action database was established in 1990 to store survey data from the Afghanistan "Landmine Survey". It was based on FoxPro, a database system, and initially had no geographic information system (GIS) functionality to view information spatially on a digital map. (*See Chapter 9 for a detailed discussion of information management technology*.) Three years later, the Cambodian Mine Action Centre (CMAC) also established a FoxPro database initially to store mine information from the United Nations peace-keepers within the UN Transitional Authority in Cambodia (UNTAC). Since then, other databases began to appear using various database software and with an increasing GIS functionality.

In 1999, however, the UN approved an information management system called IMSMA (the Information Management System for Mine Action) and most mine action programmes are now using IMSMA to manage their demining information.

IMSMA was developed to meet two specific requirements identified by the United Nations Mine Action Service (UNMAS). The primary requirement was to provide a ready-made application to meet the data-recording needs of a newly established mine action centre. The field module (FM) was designed to be used at a national level in any country affected by landmines. It combines a relational database with GIS functionality and has successfully met this first requirement. The second requirement was to collate data from the national mine action centres and to provide aggregate information to the UN and donors. A global module (GM) was designed to facilitate the collection and aggregation of global information.

IMSMA has been designed as an information management tool to improve decision-making and coordination in mine action by collecting data in a standard format and incorporating statistical and geographical tools to improve data evaluation. IMSMA as an information management tool has considerable possibilities. However, in many situations the coordination of mine action activities based on IMSMA functionalities is weak. In most mine action programmes today decision-making on priorities and the monitoring of field activities take place outside information management systems. Some programmes have developed add-on or parallel modules for operational management, to compensate for their absence in IMSMA.

The potential for IMSMA to be used in combination with other database/ GIS applications to improve information exchange and coordination in post-conflict environments has already been demonstrated. Humanitarian mine action information can therefore be enhanced when combined with or compared to other socio-economic, health and environmental data in an analysis process.

Technology advances in support of field operations

Survey operations have benefited considerably from improvements in technology and the introduction of new tools to assist field activities. Early in the 1990s coordination of field operations by high-frequency (HF) radios was enhanced by additional modems to allow reports and position data to be transmitted to base receivers if required. In the mid-1990s satellite phones started to appear and, although expensive to operate, were used as substitutes for HF communications in some instances. By 2000, mobile phones also proved valuable in countries or regions that had supporting networks, particularly around urban areas affected by landmines and UXO.

Since 1989 laptops and improved software to support survey requirements have slowly been introduced and are now standard equipment at a supervisor level. Along with the development of databases and the increased use of computers, digital cameras have become a tremendous tool for providing information on vegetation cover, topography and land use that can be linked to a SHA and stored alongside IMSMA. Digital cameras also allow ordnance identification to be undertaken remotely where skills are not present in field teams.

The Global Positioning System (GPS) for fixing sites of contamination or community centres, or for plotting roads and tracks not represented on available topographic maps, are now invaluable and are standard issue in most surveys. The dimensions of GPS units have also shrunk from those that were the size of house bricks in the early 1990s to more efficient and durable pocket-sized models. The accuracy of the regular GPS units also took a leap forward in May 2000 when the US discontinued its policy of degrading GPS signals, and accuracies of these devices improved to about 10-20 metres — compared with 100 metres prior to 2000.

Sub-10-metre accuracy can now be achieved by GPS with Wide Area Augmentation Systems (WAAS) and about one metre for Differential GPS (DGPS). Most significantly, however, the prices of the useful technical devices to support surveys have dropped consistently and are now readily affordable.

Perhaps the equipment that still remains out of reach for most survey budgets are suitably protected vehicles. Survey teams are vulnerable in Emergency Survey situations particularly where there is a significant anti-tank mine threat or where field teams are exposed to risks from undisciplined factions and militia that may oppose peace-keeping activities. Some attempts have been made to improve protection from anti-tank mine detonations through adaptations to standard vehicles such as Land Cruisers and Land Rovers, but these only provide limited superficial protection at best.

Emergency and general surveys

Apart from a few isolated projects of community-focused surveys, the vast majority of surveys during the 1990s were focused on collecting data on suspected areas of contamination and undertaking reconnaissance. Projects such as the survey of Mozambique in 1993-94 typically used a one-page questionnaire for each suspected area reported, recording information on location, density, type and number of mines suspected and type of land affected, number of victims and distance to nearest town (with population). If appropriate, a sketch map was attached. In parallel to the questionnaire a topographic map was updated with information of access roads — both those closed due to suspected mines and those considered open.

Although approaches were adapted to some degree and variations of questionnaires occurred between countries and organisations, the survey approach known as level 1 (general) survey was implemented by many organisations including leading NGOs such as the HALO Trust, Norwegian People's Aid (NPA) and MAG.[5] One objective of the survey was to produce a map of the contamination including affected infrastructure — in addition to an inventory of suspected hazardous areas with some insight into the reliability of data and priority clearance for each site.

Surveys went beyond a mine focus, however, by including data vital to support operations and to assist other organisations plan their assistance programmes in war-torn countries. Surveys also included the recording of road and bridge conditions, GPS fixes of road vehicle wrecks and ambush sites, plotting roads on maps that otherwise did not exist and descriptions of security and safe access roads to accompany mine data.

In some cases survey teams specifically identified spot tasks[6] that were added to lists that could be easily followed up by mobile explosive ordnance disposal (EOD) teams. Furthermore, a list of high priority tasks was suggested by survey teams on completion of provinces. In the majority of cases the implementing organisations of SHA-focused surveys were demining NGOs that also had clearance capacities in-country. This enabled the realisation and integration of clearance activities in the wake of surveys.

Many surveys, however, suffered from a lack of field testing of survey instruments, poor quality assurance in both fieldwork and database entry (if indeed databases were used) and, most importantly, a severe lack of information management in order to analyse data, present findings and integrate results with all relevant stakeholders.

Although improvements have occurred, there remains potential for addressing some of the weaknesses in these types of projects today. The surveys are, however, cheap and relatively short in duration and have served as a critical tool for clearance organisations, particularly those which actually received the data.

For comparison with later surveys, the HALO Trust level 1 general survey of 1993-94 in Mozambique had a total duration of six months (four months fieldwork) and a budget of US$395,000.[7] The LIS conducted by Canadian International Demining Corps (CIDC) in 1999-2001,[8] however, took approximately two years (17 months' fieldwork) with a budget of US$2,272,000.[9]

In countries in the immediate aftermath of conflicts the only survey methodology that is normally relevant is the SHA-focused survey. In Angola in the late 1990s surveys were undertaken on behalf of agencies such as the

World Food Programme (WFP) and the Office of the UN High Commissioner for Refugees (UNHCR) where priorities were not based on some community impact theme — but were simply targeted at supporting refugees or internally displaced persons (IDPs) where route access for repatriation of displaced populations was a priority and where sites had to be selected for temporary IDPs camps or distribution points for food.

Surveys in the wake of ceasefire agreements, such as the Kosovo Emergency Survey, can suffer from lack of informants at community level as many people remain displaced from their homes.[10] Even where present, however, informants may be reluctant to reveal data, particularly regarding the location of mines, which may be considered a military issue. As stability and faith in a lasting peace increases, informants talk more confidently about the mine threat, although some mined areas may still remain off limits for discussion, such as active military installations and sensitive border regions. Certain national surveys may not therefore have full national coverage of sensitive areas or parts of the country poorly served by infrastructure or where security concerns existed at the time of the survey operations.

Coordination with national authorities, mine action centres, peace-keeping forces, local military, the United Nations and other NGO organisations is vital for survey work in order to raise awareness among stakeholders and to gain assistance from such bodies to implement the project. Experiences have been mixed, but to operate in an isolated fashion restricts access to potentially valuable information and may exclude vital assistance such as air support which is rarely budgeted but essential in many survey settings.

In addition to community meetings, survey teams actively source information from the military, police, hospitals, utility companies, road maintenance offices, missionaries, UN, NGOs and local authorities. Depending on the survey, it may be that more systematic and detailed approaches are undertaken when security situations improve and access within a country increases. This is reflected in the term general mine action assessment — and the nature of an emergency or former level 1 survey usually requires follow-up teams to do technical reconnaissance to plan for large clearance tasks. At some stage there may also be a socio-economic survey, such as the LIS.

Socio-economic aspects of both communities and the individual mined areas affecting them are not excluded from non-technical, SHA-focused surveys, although information is not always collected in a clear and easily accessible fashion. Almost from the outset of surveys, however, victim numbers, blockage types and ordnance details have been recorded — these are the only three elements that actually contribute to the community impact score used today in the LIS. Furthermore, these data have been mostly available for each minefield and thus potentially yields a far greater resolution and relevance for prioritising SHA for clearance than only a community impact score.

Impact data were not always collected in such a systematic fashion — or analysed in relative impact terms (with the exception of victim numbers) and operational considerations for clearance were involved to a greater extent in the decision making process. As donor scrutiny on criteria for demining task selection grew during the 1990s the focus on impact as a means to select priority sites grew. Yet the potential for generating an impact score for each minefield, or indeed a community, for a level 1 survey was never realised (even though this would be quite straightforward with a few minor adaptations to the questionnaire).

One source of confusion is that much of these impact activities remain under a survey title of general survey or even level 1 (general) surveys. NPA, for instance, took steps from the mid-1990s to improve their standard approach[11]— to include greater socio-economic considerations, even including some approximate cost-benefit analysis of potential clearance activities. This has culminated in a concept of task impact assessment (TIA),[12] which has a clear objective of evaluating potential impact and benefit from the demining activity as part of the task selection criteria. This focuses on a SHA rather than a community and thus, of course, has greater resolution and addresses some of the spurious results that can sometimes be generated from the LIS community ranking process.

Landmine impact survey (LIS)

After the signing of the Anti-Personnel Mine Ban Convention in December 1997 it became clear that that the scope and impact of the worldwide landmine problem needed to be better defined. In the spring of 1998, at two meetings sponsored by the Vietnam Veterans of America Foundation (VVAF) and hosted by Handicap International/Belgium, a group of interested parties, composed of survey operators, UN and donors, started to develop a collaborative plan for the Global Landmine Survey (GLS).[13]

A smaller Survey Working Group (SWG) agreed to lead the project and appointed VVAF to create a Survey Action Center (SAC) and to serve as its fiduciary and management body. The SAC was tasked with coordinating LIS worldwide, gaining donor support and providing technical assistance. At the end of 2001 SAC became a legal entity outside VVAF.

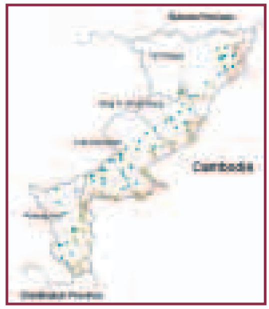
> *"The objective of a landmine impact survey is to facilitate the prioritisation of human, material, and financial resources supporting humanitarian mine action at the national, regional, and global level, through the collection and analysis of socio-economic data."*[14]

LIS projects use a common database — IMSMA — and collect data through a standard approach defined in the LIS protocols. Survey operations are observed by a UN Quality Assurance Monitor who follows the survey process and provides a report on the basis of which the UN decides whether or not to "certify" the survey process.[15]

The LIS approach pays less attention to the actual location and the mapping of mine contamination than the emergency or the former level 1 general surveys but more on the evaluation of landmine impact on communities. This is achieved through participatory community interviews that capture knowledge of landmine contamination as perceived by the community.

One of the principal objectives of the LIS is to provide a ranking of communities based on the severity of mine impact and hence the suggested allocation of mine action resources. Indicators of community impact are combined into an index — the Impact Score — that is sensitive to three elements of the mine problem:

1. the nature of the contamination (whether landmines or UXO or both);
2. the type of land that the contamination is affecting (e.g. agricultural, housing, forest, etc.);
3. the number of recent victims (accidents occurring within the last 24 months).



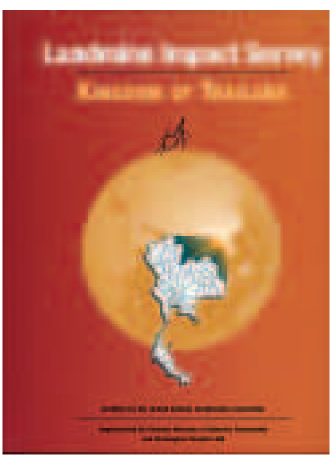
Mine impact score, Cambodia

The results of a LIS provide data to improve planning for operations, including guidelines for the targeting of mine action resources to communities. LIS reports are produced and accompanied by a CD-ROM with an electronic copy of the report, other documentation and, in some cases, a copy of the full content of the IMSMA database.

SAC has formed links with Cranfield Mine Action in the UK to assist mine action centres in developing strategic plans, using software such as *Freeway* that accesses the survey database and allows data manipulation and assistance in exploring various strategic planning options.

The introduction of the LIS approach has been the most significant event in the development of surveys in mine action. Several projects previously focused on community impact as the primary theme but there had been no standardised approach to the methodology. The LIS provides a "brand name" that is recognised as a product that emphasises careful planning, training, pre-testing of survey tools, pilot testing of survey capacities and quality assurance of the survey process through the presence of a UN monitor.

The LIS approach, however, is not without its critics and a shift in focus to the socio-economic impact of landmines on communities has taken place at the expense of geographic data (mapping) that is present in SHA-focused surveys. The lack of a national map in LIS that shows the distribution of reported physical contamination — and illustrates mined roads and other contaminated features that may go beyond the confines of a single community — is puzzling to some stakeholders.



The limitations of the impact score itself have also come under close scrutiny, principally due to the strong influence that "recent victims" have on this composite index and the fact that the numeric extent or degree of the impacts are not considered (although no better alternative has been proposed that can be incorporated in such a rapid assessment). For example, of the 69 communities listed from the most contaminated province in Thailand — Sa Kaeo — all the high impacted communities could have been captured by asking just one question in each community interview: "How many victims have there been in the last 24 months?"

The important issue is that end users understand the inherent limitations in the LIS system and also that the impact relates only to communities. The standard methodology cannot realistically capture socio-economic impact of contaminated infrastructure, which in some countries may represent the most pressing concern. Yet, irrespective of the debates, the LIS has made a considerable impact on the mine action community.

Modified impact approach — Kosovo

The Kosovo modified level 1 impact survey was not a survey in the sense of gathering knowledge from local inhabitants. Rather, it was characterised by pulling together information from various sources and integrating it into a decision-making process. Impact evaluations and decisions were not based on landmine impact scores and the final report did not follow the LIS framework.

The conflict in Kosovo occurred over a relatively short time when much of the population was displaced and as a result the major source of information shifted from local informants to external sources. It was a precedent-setting incidence where US (NATO) authorities turned over their bombing records, and extensive mine information was available from KFOR which had received records from the Yugoslav Army.[16] It was also a situation where the main donors of mine action (US and many of the NATO countries) were party to the conflict.

The project is particularly significant in the development of surveys and databases not only because it was a watershed for using geospatial tools to compile existing data with external data sources but it was the first time that there was clear linkage between ceasefire negotiation conditions and the follow-on relief and reconstruction efforts.

The arrangement whereby information management interests could prepare prior to deployment and then gain access to records in a close collaboration with US-led coalition forces repeated itself in Afghanistan and then again in Iraq.

Technical surveys

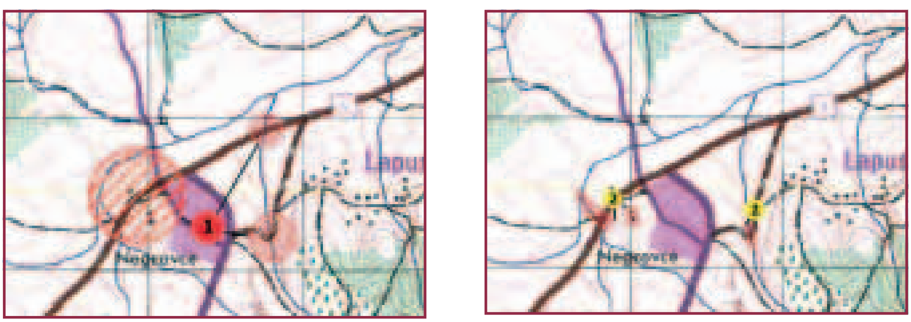
As the field of demining has developed it has became progressively apparent in almost all clearance programmes that the majority of operational time is spent on the clearance of land that is not in fact contaminated. This is a reflection of lack of confidence in operational planning due to the irregular fashion in which mines are typically found, of the poor quality of information that is available on the location of the contamination and of the stringent safety procedures employed.

The concept of technical surveys, according to the 1997 definition, addressed the problem of poor information by reducing large danger areas reported by level 1 surveys into more representative plots of contamination. One of the methods outlined in various SOPs was the use of manual deminers as a breaching tool into suspected minefields — a process that would confirm the presence of mines and exclude large areas of previously suspected land from the need to be cleared. Indeed, the concept of marking defined boundaries of the contaminated areas and then having the opportunity to set aside well-defined packages of land for later clearance (thereby containing the problem) was a very attractive idea and one that was advocated widely.

Unfortunately, in most scenarios such an approach relied heavily on the notion that mines actually existed in dense, well-defined areas. It is now well documented that, for most areas where mines have been removed, this remains a myth. In Bosnia and Herzegovina, for instance, of the 18,000 "minefield" records received from warring fractions, 60 per cent of indicated sites contained fewer than ten mines.[17] In other countries the random nature of low density minefields has been even more prolific and it was difficult for some clearance operators to imagine that breaching lanes could be an effective method of confidently defining boundaries of highly irregular contamination.

In order to gain the confidence required to erect warning markings or to define the limits of contamination for later clearance, most scenarios required such extensive exploration that it was questioned whether such resources were justifiably deployed and used at a site unless that site was a priority for clearance anyway. This was even further debated when large resources such as mechanical flails, mine-protected vehicles, dogs and manual deminers were deployed for long periods when other higher priorities had to delayed. It became apparent that, in many situations, organisations were more likely to undertake area reduction activities at a site that had been prioritised for clearance and thus the technical surveys were just an integrated component of an actual clearance task.

Figure 3. Illustration of a process where general information on suspected contaminated areas (shown on left as circles) is better defined by a more focused investigation using technical staff (shown on right as polygons)



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Irrespective of the content of published survey standards, the technical survey as an activity has always been subject to debate. Objectives and implementation approaches have largely been a function of the nature of the mine contamination in a particular setting and the preferences and working procedures of a particular organisation. The concept of the former level 2 (technical) survey sounded reasonable, particularly for operators in areas such as Afghanistan or northern Iraq who could understand the concept of regular minefields and where relatively successful technical survey and marking teams had operated for many years.[18] But clearance operators in other regions, particularly in Africa, had rare examples where they could visualise an effective application of the level 2 survey approach: thus stand-alone technical surveys according to the level 2 protocols have not been common.

The technical survey as defined in IMAS is not equivalent to the old level 2 surveys, as has been claimed in some recent literature. There is a considerable difference between an activity that requires technical capacity to clearly define boundaries of contamination and one that just requires technical skills to be present to better prepare and design a clearance plan. Technical surveys, as now described in the literature, may indeed include some breaching lanes into the suspected area but reference to defining boundaries through technical area reduction as an objective has been removed. The general trend has been to introduce LIS as an important tool in the GMAA. The LIS tool lacks technical components and has reinforced the need to follow up priority areas with persons with technical knowledge — but not necessarily technical equipment resources.

Some have questioned the logic of introducing a new survey step between initial assessments such as impact surveys and actual demining task.[19] In reality, however, the IMAS simply reinforce the activity of reconnaissance missions that most organisations operated to investigate potential sites for clearance anyway.

A complete list of outputs expected from the IMAS technical survey is set out in IMAS 08.20. In summary, however, the activity provides a detailed technical and topographical investigation of known or suspected hazardous areas with a primary aim of collecting sufficient information to more accurately define the clearance requirement, including: the depth of clearance, the local soil conditions and the vegetation and topographic characteristics. Such information ahead of clearance operations allows better task planning in terms of resources needed, timeframes for the clearance and a better evaluation of estimated clearance costs against anticipated benefits. A technical input into priority setting is also vital since high priority sites, as defined by other impact parameters, may simply be dismissed when operational factors are considered.

The survey of features such as roads, electricity pylons and pipelines is not directly addressed in impact or technical surveys in IMAS but there is little doubt that they can affect socio-economic development more than most isolated area tasks. This is particularly so in a country such as Angola where the crippling of the country's infrastructure is a major hindrance to the process of normalisation.

In order to survey roads appropriately and to plan clearance projects based on a knowledge of the road condition, vegetation cover, state of bridges and to access informants who may exist along the course of a disused road, either low-level air reconnaissance must be conducted or, preferably, a ground assessment in a mine-protected vehicle. Physical reconnaissance by vehicle and a recording of the road in conjunction with a sampling programme followed by remote explosive sensing analysis[20] is an extremely valuable method of providing technical input to plan expensive road clearance tasks.

Evolution of post-clearance "survey" activities

Post-clearance documentation

The concept of providing clearance maps and reports to local authorities or other recipients of the land released from demining operations has evolved considerably over the course of the development of demining. Typically, site clearance in the early days was only documented in terms of square metres cleared and numbers and type of ordnance removed and destroyed — and even these records are not available for many programmes.

The concept of constructing a detailed map of the clearance site (formally known as level 3 surveys) and having a formal handover of cleared land to beneficiaries was not considered a priority unless the opportunity was to be used to gain publicity or to signal closure of the project for the deminers and local population. Normally demining organisations were keen to redeploy clearance capacities to new sites quickly and to keep pace with work demands.

Post-clearance documentation has developed as part of the general increase in professionalism within mine action and the introduction of more accountability into activities that surround demining. However, a particular focus on post-clearance procedures was prompted by recurring events in several programmes:

1. **Accidents occurring in or around the "clearance" site after the departure of teams.** Without clear records it was difficult to prove whether the accident had taken place in the area cleared or close to its perimeter, especially when vegetation had grown back or land was cultivated.
2. **Confusion among recipients about what land had been cleared and what had not**.
3. **Later expansion of previous sites or new activities in close proximity to old tasks.**
4. **Criticism that land cleared remained idle and was not used for its intended purpose.** Frustrations were mounting from land that was not being used as intended. Some organisations introduced pre-clearance paperwork where beneficiaries outlined what the land was going to be used for and when it would be used. This post-clearance documentation activity was then a required step to hand over land formally and to signal that the task was complete.
5. **Rise in commercial contracts and donor requirements.** The increase in the number of commercial companies involved in humanitarian demining introduced standard practices from the commercial sector. The requirement for documentation was also a greater donor concern with commercial contractors than had previously been the practice with NGOs.
6. **Mine action authorities' requirements to keep a record of all clearance activities**. Post-clearance documentation is now a comprehensive activity requiring the inclusion of:
   - task identification numbers;
   - clearance specifications — area and depth;

- copy of the technical survey conducted prior to the clearance (if available);
- licenses and paperwork of the clearance organisation showing accreditation;
- survey of equipment used and procedures followed during the clearance task;
- quality assurance activities undertaken and specifications;
- post-clearance inspection reports;
- map of site cleared with turning points and a table of mines and UXO located and destroyed;
- accident reports during clearance, if applicable;
- a formal declaration from the demining organisation that the area has been cleared to the specifications stated; and
- formal recognition of, and signature for, receipt of area to acknowledge and understand the final status of the land.

Today, post-clearance documentation is understood as a vital component of the overall demining process and has developed into a comprehensive activity described in IMAS 08.30, where land may not be formally recognised as cleared until this documentation is complete. Post-clearance documentation as a process is widely understood for large clearance tasks, but in most programmes it is not fully implemented (i.e. according to the full list of documentation) nor is it considered applicable to smaller site clearance and isolated EOD tasks.

The process of official handover of land helps clarify the ownership of the residual risk and the legal responsibilities and accountability of the donor, the national mine action authority and the demining organisation. The local community is encouraged to participate and community liaison officers are tasked to ensure that the local population is fully aware of clearance activities and implications for the community. Recipients of land typically walk through cleared areas and are shown where ordnance has been removed to raise confidence in the task and ensure that clearance boundaries and marking systems are understood. A further activity termed post-project review (PPR) is recommended in the IMAS to identify lessons learned during the completed task. How often this is formally implemented is questionable.

Though the concept of post-clearance documentation developed with the level 3 map concept, most practitioners did not consider this a survey activity in the sense that survey teams arrived and mapped the clearance site. Maps were, in most cases, a neat copy of the supervisor's site progress map on the last day of operations. Much of the literature does not mention level 3 surveys, and now with the change of terminology and the emphasis of the official documents into the process, it is likely that post-clearance documentation may not be further considered part of the "survey" portfolio of mine action activities but rather associated with "demining" activities.

Post-clearance evaluation

A particularly disastrous NGO clearance project in Africa involved an entire village of some 50 families who had fled during the conflict and had been forced to relocate to another site some kilometres away. In the aftermath of the hostilities an expensive clearance project was undertaken to clear mines and UXO from the original village at the request of the local authorities. When it came to the time for the displaced villagers to move back — a day the demining organisation wanted to promote with great fanfare — the villagers changed their minds and said that they now preferred to stay at their new location as it far better suited their needs!

Although steps are taken to safeguard demining investments, it remains very difficult to guarantee that land once cleared will be used as intended. Many of the mistakes of the past involve land that has cost considerable sums of money to clear and which is simply not in use — or where land is being used for a purpose other than that originally stated. Such incidents make a mockery of a selection process for demining prioritisation if the principal reasons that identified a site for clearance do not materialise.

The worst examples are where there has been some deception about land ownership and the beneficiaries of a clearance task are exposed as the community leader who originally tabled the priority or senior military officers. Indeed, most long-term programmes have at least a short list of clearance mistakes that they do not readily publicise.

There has been an increasing trend towards greater donor scrutiny and the more efficient allocation of expensive mine clearance resources. This has happened in parallel with clearance operators realising that not all their activities were successful and that there was a need to assess past clearance projects. These tasks needed to be evaluated not in terms of square metres or ordnance cleared but in terms of what activities the clearance operation had actually facilitated. Were these in line with initial expectations and was the whole project a successful investment?

Originally the evaluation activity was informally called a level 4 survey (as it represented a logical final stage in the survey process that existed at the time); it is now referred to as post-clearance evaluation even though it still has no formal definition or reference to it in the IMAS.

Post-clearance evaluation can either be undertaken internally by the clearance organisation or externally by a mine action authority or contractor for the donor. It is not widely employed as a routine activity, but, where implemented, post-clearance evaluation generally focuses on the larger and more costly demining tasks completed. Post-clearance evaluation should not be confused with post-project review referred to in the IMAS, which is focused more on identifying lessons learned during the undertaking of clearance operations than on an analysis of the impact of the clearance some time after a task has been completed.

In most instances, the post-clearance evaluation does not expose the extreme examples of clearance disasters outlined above because land is actually used for the purpose intended. However post-clearance evaluation gives an opportunity to analyse the decision-making practices of the organisation because factors such as full operational costs — previously unknown — can now be evaluated against the follow-on activities that can be themselves observed and appraised. Such surveys not only ensure that priority setting employed by an organisation is appropriate but can identify problems that are faced by communities in transforming the land available into a sustainable outcome.

Unfortunately it is not always straightforward to do a cost-benefit analysis of a clearance task against follow-on activities as it is difficult to assign a monetary value to human life, or to the value of the accident risk reduction of the area cleared. Furthermore, projections are required well into the future, as benefits of the released land are felt over many years. There are lessons to be learned from embracing the broader development approaches to monitoring and evaluation[21] but to date there has been only limited work in mine action to fully use these approaches for initial priority setting and evaluation.

In recent years a number of mechanisms have been put in place to try to safeguard demining investments and reduce the incidence of project failures. One key step has been the introduction in some programmes of pre-clearance contracts between the demining organisation and the identified beneficiaries. In these documents, which are countersigned by the competent authorities, the recipients of the land outline in some detail the plans for the cleared areas, with timelines. There is also provision for clarification of ownership of the land.

Another approach that has been implemented with some success for large clearance sites is to release land in a "step by step" process. In this case, packages of land are provided to beneficiaries who have to show that development plans outlined in the pre-clearance contract are implemented. Failure to do so suspends operation of the full project.

Accuracy and reliability of non-technical survey data

> *"What intrigues me about surveys is that each and every one is virtually discounted by someone as soon as it is done — and this includes surveys conducted internally within a mine clearance programme by technicians for technicians. Surveys are sitting ducks for criticism — it is almost inevitable that the next person who picks up a survey report will either be privy to better information or will conduct a more detailed investigation and expose all the inaccuracies of the initial work … perhaps what's important here is the fact that someone has actually been tasked to go back to this place. If the site revisited is actually a priority … shouldn't this be the indicator of success?"*[22]

In some instances landmines or UXO are visible and can be observed directly by survey staff. Normally, however, survey teams depend on informants as the means of collecting data. Both LIS and emergency surveys therefore rely on the assumption that informants will be available at the time of the survey and that the informants actually know what they are talking about.

Furthermore, it is assumed that survey methodologies are well designed and capable of capturing the required information; that field staff are able to record the data on questionnaires precisely and that data are transferred to databases, entered correctly, then analysed and presented in an appropriate fashion. If one considers that the objects of investigation — landmines — are usually by their very nature "hidden" and that projects on a national scale only allow rapid community assessments, it is clear that there are limitations to conducting a non-technical survey and considerable room for error. The accuracy and reliability of data that some stakeholders seem to expect is simply unachievable.

The reality is that primary assessments have inherent weaknesses and the details of the geographic location of SHAs or levels of community impact recorded should not, in most cases, be taken as absolute but rather as guidelines for follow-up activities. Although shortfalls exist, the GMAA collates data and goes some way towards defining the mine problem in a country, providing confidence for strategic planning and assisting the effective framework in which to target mine action resources. This is key to a successful mine action programme.

Hazard-focused surveys

The quality of data from rapid hazard-focused assessments varies. At one extreme there will be situations where a single item of UXO or piles of UXO exist, or where mines have been carried into a community and a survey officer is able to stand over the objects and take a GPS fix, record details of informants, mark the item(s) with a warning sign and take a photograph. Similarly there will be situations during a rapid assessment where there are mines reported in an area that is well defined. For instance, an isolated paddy field surrounded by well cultivated land where the survey officer is able to walk around the site and map the perimeter of the contamination. He or she may even be able to make some rough cost-benefit estimate of a clearance task, based on the area that is blocked and comparing it with the productivity of surrounding agricultural land.

Furthermore, consider a situation where a bridge at a river crossing may be mined to protect it from sabotage. In this setting the survey officer may have an excellent viewing point from the safety of the bridge over the suspected area where he or she may be able to record information from their vantage point — such as visible mines or tripwires, evidence of trench systems or remains of animals — that may suggest the presence of contamination and increase the reliability of their report. There will also be some control of at least two boundaries of the contaminated areas defined by the road and the river. There may be some agricultural land that encroaches on the bridgeheads but which stops abruptly where the ground is observed to be overgrown. In this situation simple mapping exercises can define the limits of the contaminated area quite well.

This is not rocket science, as some critics have claimed. There are many situations during a national survey where excellent control of the limits of landmine contamination can be achieved without a detector and without exposing survey officers to unnecessary risk. Where feasible, this is the goal of a SHA-focused survey that attempts to provide an inventory of SHAs with the best definitions that can be achieved within existing constraints.

There are more examples: mines around the bases of electricity pylons, mines around a well or on the summit of a well-defined hill. In such cases the geographic data on the location of the contamination is fairly reliable as these features tend to be on maps and can be highlighted with a suitable buffer zone to increase the confidence of the hazardous area being recorded. In a case where a road, railway or pipeline is mined, it may not be feasible to determine the exact position of mines along the course of the feature, but it may be possible to highlight sections that are not in use and between which the suspected mines are confined. In all these examples, simple mapping skills, some basic understanding of mine-laying strategies and a little common sense can go a long way in recording a fairly accurate picture of the contamination.

At the other extreme, information on the location of contaminated areas or the sites of accidents can be unhelpfully vague. Such instances are where informants swing their arms in a general direction of some expansive pasture land saying that an accident happened some time ago "over there" (arm swinging), but there is really no reliability at all on the location of the incident, when it occurred, or whether any appreciable threat still remains. Should this be recorded?

A further example is where hunters use mines for killing animals in forested areas by placing tripwires across paths frequented by game. Once in a while a hunter doesn't come home and his knowledge of the mine traps is gone forever. In such instances there can be an extremely low density of mines over large expanses of forest where there is some risk of a mine accident involving a member of the community. Survey teams may mark on a map the boundaries of the forest and just record the area as low risk. This probably seems appropriate, but if it is included in the database and not understood in context, this one site could hugely inflate the total area of SHAs recorded and considerably influence area clearance calculations for strategic planning purposes.

The tendency has been for survey officers to record any potential threat, however minimal. This is their job. The onus must, in part, be on end users to understand that the database contains a fair amount of "noise" and that over time this should be removed as new information arrives during the ongoing process of the GMAA. Some SHA-focused surveys have tried to address poor reliability and accuracy concerns by the use of two simple fields in the questionnaires: reliability and accuracy, which have tick boxes rated high, medium or low. This may not be very scientific but at least it flags a concern that decisions should not be based on this particular data alone.

The provision of archive data and combat records that provide details of minefields and of airstrikes can be extremely helpful in assisting initial survey assessments sites. This is particularly applicable in recent conflicts where combat activities have been relatively straightforward and the accuracy of records is of high quality.

On the other hand, for older and more complex conflicts that have occurred over several years or decades ago, records can be confusing and in several instances have been more of a hindrance than a help. For instance, the limited minefield records provided by government forces in Mozambique at the end of the civil war were particularly confusing. Maps did not have appropriate scales or an indication of orientation (meaning a "North" reference), nor could clearance operators be sure that this was not an earlier minefield that had since been replenished.

GMAAs are also not designed well to cope with mapping expansive UXO contamination, such as found in Viet Nam or Laos. Most survey approaches are designed to deal with discrete mine sites or target zones — basically packages of contamination around features that can be more or less mapped and defined. Where blanket bombing occurs there is no real definable edge to the contamination and ordnance may be several metres deep. In this survey environment traditional approaches have considerable limitations.

One easy way for surveys to be discredited is where spurious coordinates recorded for SHA are entered in a database and, when plotted, relocate minefields onto other continents or move them into oceans. This is not good for instilling confidence in the datasets but has been a recurring problem for surveys since their inception. Prior to 2001 accuracy of GPS meant that readings could easily move mined sites from one side of a road to another due to the inherent inaccuracies of the system at the time (~100m). Perhaps less excusable were instances where GPS units had not been calibrated correctly or where there was a failure to ensure that they were consistent with the maps in use.

The most significant contribution to poor geographic control, however, has been the lack of quality assurance in various stages of data transfer. Where coordinates were misread or inaccurately recorded by survey officers, errors remained undetected. Similarly much of the blame may be given to data entry staff who may lose concentration and occasionally type long series of numbers into a database incorrectly.

Unfortunately, databases are not like cashpoint machines that inform you when the number is incorrect. Rigorous quality assurance mechanisms must be employed routinely in survey work and there has definitely been a lack of it in the history of mine action surveys.

Assuming that coordinates of a contaminated area are recorded accurately, the advantage of the SHA as a focus for survey methodology over LIS is that a minefield generally does not move. Therefore, correctly recorded sites in SHA-focused surveys stay relevant over time, and, in theory, if there is a return to conflict the additional contamination data only top up the existing database. This is not always the case with impact surveys that represent more of a snapshot. Over time more accidents can occur, livelihoods may change and communities may adapt — altering the impact that landmines have on a community.

In sum, geographically focused surveys, such as emergency and general surveys, produce a range of data quality and reliability. Some are excellent, some are hopeless, but this should be expected due to the limitations of the methodology, the timeframes, the challenging survey environments and the nature of the contamination. Although there remain considerable areas for improvement — especially in regard to quality assurance and possibilities for allocating an impact score for a minefield — the real challenge lies in the ability of end users to understand the vulnerability of data in some reports and the precision of data in others.

Accuracy of landmine impact surveys

The LIS questionnaire captures a broad spectrum of community-based information and minefield data to support the calculation of the landmine impact score and to assist later data analysis. Community facts, such as population numbers and available services, are typically obtained from the head of the community or other appropriate official. Information on mines and their impact are acquired from a community interview after which there is a further chance to clarify some of the SHA information during an inspection of the reported areas of contamination.

The LIS has several quality assurance steps in place to safeguard data as it moves from the field to a data entry point which is normally at a mine action centre. Similar to SHA-focused surveys, however, most of the key data is provided through informants and the quality of data hinges to a great extent on the knowledge of these informants.

In time, one of the defining components of the impact score, recent victims, will change, as will the opportunities and constraints facing the mine-affected community. There is therefore a limited shelf life for some of the key data from a LIS, although this may be longer than some would suspect (assuming there is no regression to conflict). This is a result of the LIS attempting to identify communities that are impacted severely by landmines and to use these communities as a priority for targeting mine action resources.

It may be fair to assume that the accident location of new victims that occur after a survey has been completed will more or less coincide with the high impacted communities already identified, since these are probably located in the vicinity of heavily contaminated areas. Although there may be some jostling for position at the bottom of the high impact category, the most affected communities are likely to remain close to the top of the table for a considerable time after the completion of an LIS. Whether it is correct, however, to assign such a considerable influence to "recent victims" in the scoring mechanism is debatable.

Spurious impact scores are usually a result of multiple accidents occurring at one time or where many blockages are credited to a community by several minor sites of suspected contamination. It is therefore recommended that, after the completion of an LIS, the paperwork for all the highly impacted communities in a database be reviewed to wean out obvious spurious communities.

Excluding the "recent victim" component of the impact score, the magnitude of the score is indifferent to the size of the suspected minefield, the number of minefields or indeed the number of persons affected. In other words the impact score does not measure very well the numeric extent or the degree of the impacts. Consider the following example:

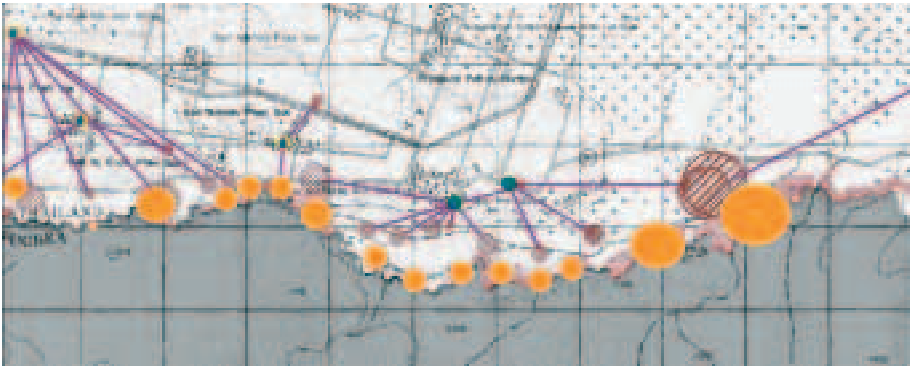
> *"a farmer finds one mine in a corner of his orchard yet is still perfectly able to harvest 95 per cent of his fruit trees; his discovery will make the same contribution to the overall score as would happen if mines put out of operation the entire non-irrigated crop land in his community."*[23]

This is a weakness that should be understood. The impact score does little to analyse the possible benefits of demining, as it provides little illumination on the economic benefits that would occur from clearance activities. And the focus of the LIS is on communities — it does little if anything to evaluate contamination of mines on infrastructure. In some countries this may be of no consequence but in others where infrastructure is crippled by mines, this may be where demining activities should be targeted. Effective clearance would establish access to markets and supporting the free movement of people — as well as connecting and expanding services and utilities. In such cases, the standard LIS methodology would not appreciably capture the most important mine action priority in the country.

This is perhaps the greatest limitation of the LIS approach in specific countries where the infrastructure really is the key to the socio-economic development — being interwoven with the interests and aspirations of communities.

The LIS is also not capable of mapping the contamination along linear features with much accuracy, especially where the scale of a mined feature is beyond the size of a community. Even within the community the geographic control is weak. At present, the IMSMA representation of suspected minefields from standard LIS provides only circles whose areas are equivalent to the area of blockage reported by the community. This is true even if the suspected area of contamination contains elongated features such as a road, a railway, a riverbank, pipelines, electricity pylons or borders.[24]

Figure 4. Example of the geographic limitations of LIS data seen along the Thai-Cambodia border illustrating the possibilities of repositioning the circles as data are collected in the field.



Note: SHA problems as represented by IMSMA could be partially addressed in the field by the use of a targeting function of the GPS. This would provide a better geographic representation of the actual contamination on the ground where hatched circles are shifted to a new position shown by the orange circles. This however does little to help the geographic problems of representation of linear features that cannot be adequately represented as a circle (e.g. a road). Hatched irregular polygons along the border represent a fairly accurate picture of the distribution of contaminated areas of land. The hatched circles represent the corresponding area that is stored in IMSMA and which would be displayed on GIS. In most cases the circles do not overlap with the actual location of contamination on the ground. Furthermore, some circles overlap even when they represent different SHAs.

These circles are projected forward of the viewing point and rarely cover the minefield – if indeed they overlap at all. The potential for overlap will be a function of the distance that the SHA is away from the viewing point, the shape of the SHA, its area and the location of the community centre in relation to both the SHA and the viewing point. Currently, if the location data from LIS in IMSMA is plotted there is a danger that circles representing different mined areas are superimposed even when the reported details from informants clearly define distinct areas. In other words it is incorrect to represent location data of SHA from LIS on topographic maps as it suggests that the areas are geo-referenced, which they are not.

The LIS approach does not claim to capture geographic data with much accuracy so this is not a failing of the objectives of the survey approach. But stakeholders should understand that there will not be a map provided at the end of a LIS project that geographically represents the spatial relationship between communities and mine contamination. Some argue that LIS staff are not technically qualified to map contamination and that representation of contamination as polygons may be misinterpreted by some stakeholders.[25] But incorporating an appropriate mapping component into the LIS that would allow the mapping of linear features[26]and capture elements of contamination along affected infrastructure would require a significant change to LIS protocols and an extension of the training period.[27]

Perhaps a good compromise may be for LIS field staff to learn to use the "targeting" function of a GPS, which would enable the circle to be projected from the viewing point into a location that better represents the contamination.

There have been some attempts to address the lack of geographic control and the extent of contamination features in some countries by various adaptations. In Thailand, for instance, a core component of the survey approach was to map the mined areas where possible and to represent them as polygons within IMSMA. This was particularly necessary due to the linear mined features along sections of borders of Thailand which could not be realistically represented by circles.

Furthermore, LIS methodologies run into similar problems as SHA-focused surveys with regard to the nature of widespread low-density UXO contamination, as in Viet Nam or Laos, since the LIS is designed to evaluate the impact of discrete areas of contamination that create a "blockage" or otherwise impact a community. In addition, deeply buried contamination may have no immediate impact on a purely agriculture-based community today but there are clear socio-economic implications as a country develops and buildings are erected and roads and other infrastructure are improved (as in Viet Nam today). The dangers that populations are exposed to and the considerable costs of clearance must be factored into construction activities.

A final consideration with regard to LIS methodology is that the process only recognises those instances where humans interact with mines. It can not capture data on mined areas that are remote from human activity and so must be updated as populations move into areas contaminated by mines. Examples of such population relocation include resettlement of the displaced, population movement due to construction of roads or railways, and movement brought about by pressure on land resources. Stakeholders must therefore remember that an LIS does not provide an inventory of mined areas in a given country, rather it shows where mines affect people at a given time.

The illustration of some examples here that challenge the LIS approach has exposed some of the concerns raised in regard to the methodology. However, there are limited alternatives to impact calculations and most practitioners feel relatively comfortable with community designations of high, medium and low impact as a framework for further developing mine action priorities. But limitations of the approach must be appreciated by end users for decision making purposes. There are significant dangers in blindly following LIS community impact categories as a sole basis for targeting mine action activities.

Conclusions

Survey data integration

There is a need for a greater focus on incorporating survey results into the activities of potential end users — in order to maximise benefits from survey projects. In the wake of national surveys, for instance, the transfer of survey information to the IMSMA database is often considered the end-goal of the project, but it is the activities that follow that define the success of the project. Greater effort should be placed on the integration of survey information into the activities of stakeholder groups through organised presentations, workshops, training and dissemination of tailored data. Where appropriate, survey results can also be used for strategic planning where the strengths and weaknesses of the data are fully understood.

Survey methodology — potential developments

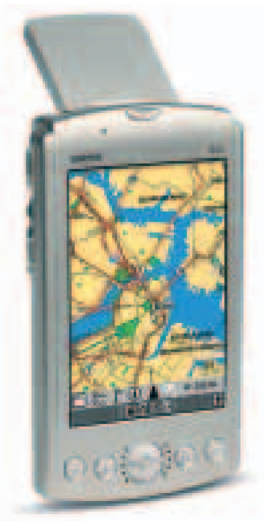
The General Mine Action Assessment, according to the IMAS, is a continuous process that includes a range of approaches throughout the life of a programme. Countries considered to be severely affected by landmines, such as Afghanistan, Angola and Cambodia, have seen a host of assessments and surveys during the history of their mine action programmes. Potential adaptations of survey methodology and approach could save costs, reduce project timeframes, improve survey products and focus on the real mitigation activities of mine action: clearance, marking, MRE and survivor assistance.

There are weaknesses in approaches of both hazard-focused and impact surveys. Both can benefit from a more deliberate attempt at integrating their findings. Better quality assurance procedures in emergency surveys could be introduced and impact surveys could be adapted to capture impact associated with blocked infrastructure. If it is indeed necessary to undertake additional surveys it may be possible to avoid full duplication by retrofitting existing information into the new format, allowing only new data fields to be addressed. If surveys have followed a common gazetteer or use IMSMA as a mutual database then the possibilities of this are greater.

In addition to emergency surveys with socio-economic components, there may, at the other extreme, be more comprehensive surveys that correlate aspects of landmine and UXO contamination with information bodies from other sectors — using data that has a focus on agriculture, land use or poverty mapping. Agricultural surveys, for instance, could supply values of land productivity that would better support cost-benefit models for demining sites that have a defined land use potential. Database and GIS efforts for mine action could be shared with other sectors during post-conflict rehabilitation with diverse information-gathering bodies expanding the potential for data analysis in mine action. VVAF, for instance, hopes that the landmine/UXO survey in Viet Nam will be a model for combining survey data with external data on alleviating poverty.

Survey-related technologies

During the development of landmine surveys since the late 1980s, projects have benefited from advances in technologies, particularly in the fields of GPS and digital photography. Technology will continue to improve quality and facilitate survey activities. A new generation of technologies is now reaching the market with considerable implications for future survey work.



A PDA with incorporated GPS.

Handheld computers are now widely available for as little as US$800 with integrated GPS and a personal digital assistant (PDA) version of ArcView (ArcPAD) that can display GIS lines, points, polygons, scanned maps and satellite images. It may be in future that such technologies become common in survey activities. The new generation of PDAs would reduce the need for paper maps, enable questionnaires to be completed electronically thus potentially downloading direct to an IMSMA interface. This would avoid data transfer steps such as coding sheets and data entry that potentially introduce errors into survey results. This type of equipment with its integrated GPS would allow survey staff to locate themselves readily on maps, reduce the skill requirements for mapping and help see the end of spurious minefield positions that are in the middle of oceans.

The ultimate aerial survey device that would confidently locate the positions of mines in varying terrains and conditions and thus see the end to conventional mine survey is however some way off. Considerable research has been done for airborne mine detection devices using an array of sensors, including infrared and ground penetrating radar, but the spectrum of ordnance types, patterns of deployment and the differing field conditions that exist in post-war situations are particularly challenging. Unfortunately the rather strange situation where we have commonly to wait for populations to return to their communities and to interact with landmines before we are able to build up knowledge of the locations of ordnance and impact to target our mine action response will continue for the foreseeable future.

Simple high-resolution aerial photography may actually be the best tool yet to assist technical surveys, especially where access is restricted to SHA or where thick vegetation or topography obscures the site. A bird's-eye view of a SHA assists area calculations, assesses vegetation cover and allows the identification of features such as trench systems, buildings and further access routes to support the process of planning for future clearance (and for monitoring process of demining tasks under way).

While we wait for the ultimate airborne mine detecting sensor that would reduce survey activities to only limited community assessments, the current survey approaches must be further developed to improve their application for priority setting and defining the shape of mine action initiatives.

Endnotes

1. The generic term *survey* is not defined in the International Mine Action Standards.
2. For instance, level 3 surveys are not mentioned in Rae McGrath's *Landmines and Unexploded Ordnance: A Resource Book* (2000), although nearly a third of the book relates to survey activities.
3. See *www.halotrust.org*.
4. See Chapter 9 for more details on information management.
5. For instance, some survey projects incorporated marking of contaminated areas as an integrated survey task.
6. Spot task is a term used for a discrete site of contamination such as a pile of UXO or a mine that has been left in an exposed place such next to a path or road.
7. The HALO Trust/UNOHAC (1994: 46).
8. The state of Mozambique's infrastructure and security situation were very different between 1994 and 2000.
9. See *www.sac-na.org*.
10. Surveys, in particular emergency surveys have used military liaison and demobilised soldiers to assist information gathering.
11. NPA (1996).
12. See NPA website: *www.npaid.hr/en/TaskImpact.html.*
13. *www.sac-na.org.*
14. Survey Action Center and Mine Clearance Planning Agency (2001: 5).
15. This is a certification not of quality but only that an agreed standard process has been followed.
16. Messick et al. (2000: 6).
17. Van der Merwe (2002: 3).
18. MAG in northern Iraq from 1992 and MCPA/UNOCHA and others in Afghanistan from 1992.
19. Van der Merwe (2002: 3).
20. Bach and McLean (2003).
21. For more current thinking on the monitoring and evaluation of mine action programmes see for instance GICHD/UNDP (2002: 81-96).
22. Taken from an e-mail from a mine action manager requesting anonymity.
23. GICHD/UNDP (2001: 30).
24. Rhodes (2000: 1).
25. Morete (2003a).
26. Common mined features in mine-affected countries are often elongated or linear: roads, pipelines, electricity pylons, railways, riverbanks, borders, etc., and since they extend beyond the boundary of a village they are difficult to capture using the LIS methodology.
27. Adaptations to IMSMA and requirements are outlined in Engeset (2003).

4 Advocacy and international law

Lou Maresca

Summary

Advocacy has been a major factor in achieving a comprehensive international legal prohibition of anti-personnel mines in the space of only a few years and has promoted the commitment of significant resources to mine action. A side benefit has been the promotion of the development and implementation of international humanitarian law more generally.

Part of the success of the campaign against anti-personnel mines was the unprecedented degree of coordination among the variety of actors involved in advocacy activities. However, the same level of cooperation and coordination has not been as evident in the efforts to improve the international law on anti-vehicle mines and cluster munitions in the context of the CCW. These will need to be enhanced if the Protocol on Explosive Remnants of War is to be widely ratified and effective measures are to be adopted on other conventional weapons.

Introduction

Over the last decade there have been significant developments in the international law governing landmines and other explosive ordnance that contaminate the land of countries affected by armed conflict. New international treaties have been adopted that prohibit or restrict the use of anti-personnel mines, anti-vehicle mines, booby-traps, command-detonated munitions and time-fused munitions. A new legal instrument has also been concluded to deal with problems caused by "explosive remnants of war" (ERW), which covers both UXO and AXO — abandoned explosive ordnance (AXO). The work in these areas has sought to minimise the impact of landmines and ERW on civilians, peacekeepers and humanitarian organisations and lessen the socio-economic burden of armed conflict on war-affected societies.

The last decade is also notable for the way in which some of these treaties were forged. Advocacy by international organisations, non-governmental organisations (NGOs), and other actors has played a central role in raising awareness among governments and the general public of the problems caused by mines and UXO and in mobilising support for an international response. In the case of anti-personnel landmines, these organisations, along with a number of supportive governments, drove the process that led to the conclusion of the Anti-Personnel Mine Ban Convention and they continue to play an important role in the Convention's universalisation and implementation.[1]

This chapter will first provide an overview of the developments in international law on landmines and UXO and highlight important aspects of the advocacy that helped make them a reality. It then charts the development and content of the major international treaties in this area and highlights the role that advocacy played in their conclusion, drawing attention to some of the key aspects and concerns of recent advocacy activities. The paper ends with conclusions on lessons that may assist future advocacy efforts on the international law governing mines and UXO.

Advocacy and mine action

There are numerous definitions of advocacy and every discipline has sculpted the concept to suit its needs.[2] In the International Mine Action Standards (IMAS), advocacy, in the context of mine action, is defined as *"public support, recommendation or positive publicity with the aim of removing, or at least reducing, the threat from, and the impact of mines and UXO"*.[3] Although not explicitly stated in the IMAS definition, one of the important goals of advocacy in this area is to influence the positions and policies of States in relation to the international law governing mines and UXO.[4]

Efforts to address the consequences of mines and UXO are not new and there have been a number of initiatives that have sought to improve the international rules in this area. While early advocacy involved only a few organisations, recent efforts have mobilised a wide range of actors from a variety of disciplines. Activities have focused on lobbying governments to adopt new rules on mines and UXO, promoting adherence to, and implementation of, existing treaties and encouraging action to improve the situation of mine and UXO victims and affected communities. There have also been extensive activities to raise awareness among the general public in order to influence national policies in these areas.

Advocacy and the development of international law governing landmines and UXO

Two branches of international law are relevant to mines and UXO. The first is ***international humanitarian law*** or, as it is sometimes referred to, the law of armed conflict. This body of law seeks to minimise the suffering arising from armed conflict, particularly for combatants, civilians and those no longer participating in the hostilities (i.e. the sick and wounded, prisoners of war). As part of this effort, international humanitarian law restricts the types of weapons that may be used in armed conflict, how they may be used and how military operations should be conducted. It also identifies measures to reduce the post-conflict consequences of the fighting. Major treaties in this area include the Geneva Conventions of 1949 and the 1977 Additional Protocols to the Geneva Conventions.

The second branch is ***disarmament law***. This law generally consists of international arms control agreements that seek to limit, reduce or abolish certain types of weapons. Unlike international humanitarian law — the primary purpose of which is to limit the suffering caused by armed conflict — disarmament law seeks to eliminate or reduce the proliferation of certain weapons in order to achieve or maintain regional or international security. Treaties in this area include the Convention on the Prohibition of Biological Weapons, the Chemical Weapons Convention and the Nuclear Non-proliferation Treaty. Disarmament law has traditionally concerned weapons with strategic implications or so-called weapons of mass destruction.

As will be explained later, elements from both these areas of law are today part of the rules and regulations governing landmines and UXO. However, it is in the domain of international humanitarian law that most efforts to address the mine and UXO problem have been concentrated and that regulations to limit the effects of these weapons have been first developed.

From its early stages, international humanitarian law was concerned with limiting the suffering caused by weapons used in armed conflict. One of the first agreements in this area banned the use of a newly developed lightweight "exploding bullet". The *1868 St Petersburg Declaration Renouncing, in Time of War, the Use of Explosive Projectiles under 400 Grammes Weight* was the first international humanitarian law agreement devoted to a specific weapon. It had been adopted because these lightweight projectiles had the capacity to explode upon impact with soldiers even though they were intended for use against ammunition carts. In light of the inevitable death such projectiles would cause, governments considered their use contrary to the laws of humanity.[5]

Additional agreements on weapons were adopted in the years that followed. In 1899, at the First Hague Peace Conference, governments adopted a prohibition on expanding or "dum-dum" bullets.[6] In 1925, they banned the use of "asphyxiating, poisonous or other gases" and "bacteriological methods of warfare" in response to public outrage at the use of poison gas during the 1914-1918 war.[7] Following the conclusion of these instruments, however, no new humanitarian law treaties on weapons were developed until the conclusion of the Convention on Certain Conventional Weapons (CCW) in 1980.

These early instruments established several principles that today regulate all weapons used in armed conflict and underlie the discussions on mines and UXO. These principles establish that:

- parties to a conflict are restricted in the weapons they may lawfully use;
- parties to a conflict must always distinguish between civilians and combatants and shall direct military operations only against combatants and military objectives (the "principle of distinction");
- weapons that cannot distinguish between civilian and military objectives shall not be used; and

- it is prohibited to use weapons of a nature to cause superfluous injury or unnecessary suffering.[8]

The principle of distinction and the prohibition on the use of weapons that cannot make such a distinction were often cited in the efforts to ban anti-personnel mines. Because mines are designed to be laid, left and victim-activated, several organisations, notably Human Rights Watch,[9] argued that their use violated these fundamental humanitarian law rules. A number of militaries argued, however, that, if used properly, mines could be employed consistent with international humanitarian law. The adoption of the Anti-Personnel Mine Ban Convention in 1997 has provided a more direct path to the prohibition of these weapons but the argument remains an important issue.

The first attempt to deal with the specific problems caused by landmines followed the 1939-1945 war. Advancements in weapons technology and changes in the conduct of warfare exposed significant gaps in international humanitarian law. In order to strengthen the protection afforded by the law to civilians and combatants, States concluded the four Geneva Conventions of 1949, which laid down new rules on the treatment of the sick and wounded on the battlefield, the sick and wounded at sea, prisoners of war and civilians.

The 1949 Geneva Conventions did not, however, prohibit the use of specific weapons or extensively restrict the conduct of military operations.[10] Nevertheless, the International Committee of the Red Cross (ICRC) believed that new rules in these areas were necessary and in 1954 consulted a number of experts to discuss the development of a new international instrument governing weaponry. The result was the Draft Rules for the Protection of the Civilian Population from the Dangers of Indiscriminate Warfare (1955). These rules sought to prohibit weapons whose consequences were "*unpredictable and uncontrollable*". Of particular concern were "*delay action weapons*", which according to a commentary published by the ICRC were unable to distinguish between civilians and combatants and included "*bombs and mines dropped from the air and [which] have a delayed action in the sense that they explode after a given lapse of time or when they are touched*".[11]

The 1955 Draft Rules stipulated that:

> *"The use of so-called delay action projectiles is only authorised when their effects are limited to the objective itself."*
>
> *"Weapons capable of causing serious damage shall, so far as possible, be equipped with a safety device which renders them harmless when they can no longer be directed with precision against a military objective."*

The 1955 Draft Rules also identified landmines as a special concern requiring further study. In preparing a revised version of the Draft Rules for the 19th International Red Cross Conference held in Delhi in 1957, a new rule on landmines was added.

> *"If the Parties to the conflict make use of mines, they are bound, without prejudice to the stipulations of the VIIIth Hague Convention of 1907, to chart minefields. The chart shall be handed over, at the close of hostilities, to the adverse Party, and also to the authorities responsible for the safety of the civilian population."*[12]

Due to concerns about the potential impact of the Draft Rules on atomic weapons, governments took no action. As a consequence, these early proposals to lessen the threat of mines and UXO lay dormant and were not revisited until a re-examination of international humanitarian law in the 1970s and the development of the CCW.[13]

The Convention on Certain Conventional Weapons

The CCW is the result of efforts to strengthen international humanitarian law during the 1970s.[14] Wars of national liberation and conflicts in Southeast Asia highlighted changes in the nature and conduct of warfare and a corresponding need to ensure that the law be brought up to date with these developments. The Diplomatic Conference on the Reaffirmation and Development of International Humanitarian Law Applicable in Armed Conflicts was held from 1974 to 1977 under the auspices of the Swiss government and produced two new international humanitarian law treaties, the two 1977 Additional Protocols to the Geneva Conventions.[15]

While the 1977 Protocols increased the protections afforded to combatants and civilians in armed conflict, they do not include prohibitions or restrictions on specific types of weapons. Although two expert meetings were held to explore possible restrictions in this area, States at the Diplomatic Conference could not agree on including such rules as part of their work. Rather than delay progress, the Conference called for the issue to be taken up within the framework of the United Nations.

Negotiations began under the auspices of the UN General Assembly in 1979 and concluded in 1980. The result was the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May be Deemed to be Excessively Injurious or to Have Indiscriminate Effects, commonly referred to as the Convention on Certain Conventional Weapons or simply the CCW, which was adopted in 1980, coming into force in 1983.

As its name indicates, the CCW covers "conventional" weapons. Such weapons are not defined in the Convention itself, but are generally understood to be weapons other than biological, chemical or nuclear weapons. Consequently, the Convention would cover the arms possessed by most armies and regularly used in modern armed conflict. The CCW is generally considered to be the primary regime to regulate conventional weapons under international humanitarian law. As of 3 November 2005, the CCW had been ratified by 100 States, including the five permanent members of the UN Security Council and most other military powers.

The CCW has a unique structure. The main Convention is a framework or umbrella instrument that contains the general rules on the CCW's operation (e.g. entry into force, scheduling of review conferences, etc). The rules regulating specific weapons are found in the three protocols annexed to the framework convention. As adopted in 1980, the CCW included a prohibition on the use of weapons designed to injure by fragments not detectable by X-ray (Protocol I), restrictions on the use of landmines, booby-traps and other similar devices (Protocol II), and restrictions on the use of incendiary weapons (Protocol III).

An important characteristic of the CCW is that additional protocols can be added to deal with future humanitarian concerns. In 1995, a new protocol was added prohibiting the use of blinding laser weapons (Protocol IV). In 1996, the rules in Protocol II on mines, booby-traps and other devices were amended in response to the problems caused by anti-personnel mines (amended Protocol II). More recently, in November 2003, a new protocol (Protocol V) was added on explosive remnants of war.

The CCW's rules on mines, booby-traps and similar devices

The rules on mines, booby-traps and other devices in the original version of Protocol II are the first international regulations specifically directed at landmines in an effort to minimise their impact on civilians.[16] The Protocol prohibits the targeting of mines, booby-traps and other devices against civilians and the indiscriminate use of these weapons. There are also restrictions on the use of these weapons in populated areas, except for remotely-delivered mines, which are treated separately.[17] The Protocol requires that States take all feasible precautions to protect civilians from the effects of mines, booby-traps and other devices.

The Protocol includes provisions on the recording of minefields, mines and booby-traps and urges the parties to cooperate among themselves and, where appropriate, with other States and organisations in the removal or neutralisation of minefields, mines and booby-traps placed in position during conflicts.

It soon became evident that the rules of Protocol II were inadequate to stem the humanitarian problems caused by the use of mines in the 1980s and 1990s. Protocol II might have been effective if meticulously applied but that was not the case during most of the conflicts that occurred. Wars in Afghanistan, Angola, Cambodia, Mozambique and Nicaragua are just a few examples where mines, especially anti-personnel mines, were targeted against civilians, employed indiscriminately and widely used without any precautions to limit civilian casualties. Medical staff from international and non-governmental organisations began to raise the alarm about the growing numbers of civilian casualties.

The amendment of Protocol II

In 1993, in response to pressure from organisations working in mine-affected countries, France formally requested the convocation of the First CCW Review Conference to address the problems caused by anti-personnel mines. Sessions in Vienna and Geneva considered a range of proposals that included a ban on anti-personnel mines, greater restrictions on their use, requirements for self-destruct and self-neutralisation mechanisms and improvements on the requirements to map and remove these devices. Negotiations were difficult, as a number of military powers were not ready to give up or accept far-reaching regulation of weapons that they possessed by the millions.

Finally, on 3 May 1996, more than two years after negotiations first began, States Parties adopted "Protocol II as amended", also commonly referred to as amended Protocol II. Like other decisions taken by the States Parties to the CCW, the Protocol was adopted by consensus, but, to the disappointment of many in the international community, it did not include a comprehensive prohibition on anti-personnel mines.

Amended Protocol II strengthens many of the rules found in the original Protocol II and includes a number of new ones. Like the original Protocol, amended Protocol II prohibits directing mines, booby-traps and other devices against civilians and forbids the indiscriminate use of these weapons. It also requires parties to a conflict to take all feasible precautions to protect civilians from the effects of these weapons and to take measures to protect peace-keeping, humanitarian and fact-finding missions of the United Nations and other specified organisations.

The amended Protocol also established a number of new obligations. These include a prohibition on the use of mines, booby-traps and other devices that detonate when passed over by a metal detector and a ban on the use of self-deactivating mines with an anti-handling device that will continue to function after the mine has become inert. A total of 999 out of 1,000 anti-personnel mines must self-destruct or self-neutralise within 120 days after being remotely delivered or laid outside marked and fenced areas. The Protocol also forbids the transfer of all anti-personnel mines to non-State actors. Importantly, and unlike the other protocols to the CCW at the time, its application was extended to non-international armed conflicts.

For the first time in international humanitarian law, the Protocol established that the parties to the conflict are responsible for the mines, booby-traps and other devices they use and stipulates that these weapons must be cleared from a party's territory without delay after the cessation of active hostilities.[18] For territory it no longer controls, a party must provide technical and material assistance to the party in control of the territory in order to facilitate the removal of the devices it laid. For all other situations, the parties must endeavour to reach agreement among themselves and, where appropriate, with other States and international organisations on the provision of technical and material assistance to remove mines, booby-traps and other devices.

The amended Protocol also established several mechanisms to monitor implementation and compliance with its provisions. Meetings of States Parties are held annually to review the operation and status of the Protocol. States Parties are also required to file annual reports on the implementation measures taken at the national level. They are also required to take all appropriate steps, including the adoption of legislation and other measures, to prevent and suppress violations of the amended Protocol.

These developments, however, were widely considered inadequate to address the anti-personnel mine problem. By the end of the negotiations, some 40 States had publicly proclaimed their support for a complete prohibition on the production, stockpiling, transfer and use of anti-personnel mines. They, along with the International Campaign to Ban Landmines (ICBL), the ICRC and the United Nations, believed that amended Protocol II was unlikely to significantly reduce the level of civilian landmine casualties. In addition to the lack of a complete prohibition on anti-personnel mines, criticisms of the Protocol included an ambiguous definition of an anti-personnel mine, the Protocol's reliance on technical solutions (i.e. self-destruct and self-neutralisation mechanisms) and the fact that States were permitted to delay these requirements for up to nine years.

At the end of the CCW Review Conference the Government of Canada issued an invitation to pro-ban States to meet in Ottawa to discuss ways to move the international community towards a prohibition of anti-personnel mines. This initiative, which was held in October 1996, was the first step in the development of the Anti-Personnel Mine Ban Convention.

In spite of its weaknesses, amended Protocol II entered into force on 3 December 1998. As at 14 October 2005, 85 States were party to the instrument. While many of these States have also ratified the Anti-Personnel Mine Ban Convention, adherence to amended Protocol II is also considered important as it contains rules for munitions not covered by the Convention but which are also an international concern, mainly anti-vehicle mines, booby-traps and other devices.

A new protocol on explosive remnants of war

The Second Review Conference of the CCW was held on 10-21 December 2001. Three proposals made at the Conference were specifically directed at mines and UXO.

The first was a proposal of the United States and Denmark, later supported by 14 other countries, to strengthen the rules on anti-vehicle mines (referred to as mines other than anti-personnel mines). This proposal would require that all anti-vehicle mines be detectable and that remotely delivered mines possess self-destruct or self-neutralisation features. These requirements were intended to supplement the rules of amended Protocol II governing these weapons, which were also considered to be one of the Protocol's weak points.[19]

The second proposal was a call to address the problems caused by "explosive remnants of war" (ERW). This term is generally understood to encompass UXO and explosive ordnance abandoned by armed forces on the battlefield. The proposal was for the adoption of a new CCW protocol requiring the clearance of ERW, measures to facilitate the work of organisations conducting humanitarian clearance and/or risk education, requirements to provide warnings to civilians and preventive measures to reduce the chance that explosive ordnance would become ERW in the first place. Work on this issue was first proposed by the ICRC in 2000 and was quickly supported by many States Parties.

The final proposal related to mine and UXO was a request by Switzerland for the CCW to consider specific rules on cluster submunitions (that is, munitions that are "clustered" within a bomb or artillery casing that opens at a predetermined height or after a set period of time). This proposal would require the fuzing of future submunitions to have 98 per cent reliability through improvements to the primary fuze or through self-destruct features.[20] The ICRC also proposed improvements to international law on the use of these weapons. It asked the CCW to consider a prohibition on the use of submunitions in populated areas.

The Review Conference decided these proposals warranted further consideration and established a Group of Governmental Experts to consider them. After holding three sessions in 2002, the Group recommended that negotiations on a new ERW protocol should begin the following year. Conversely, the Group recommended that further discussion was required on anti-vehicle mines and specific measures on submunitions, as not all experts agreed that new rules were needed in these areas.[21]

After five weeks of negotiations in 2003, CCW States Parties adopted the "Protocol on Explosive Remnants of War". This is the first multilateral treaty to deal with the problem of UXO, other than mines, and ordnance that has been abandoned on the battlefield.[22] It requires each party to an armed conflict to:

- clear the ERW in territory they control after a conflict;
- provide technical, material and financial assistance in areas they do not control to facilitate the removal of the unexploded or abandoned ordnance resulting from their operations. This assistance can be provided directly to the party in control of the territory or through a third party such as the UN, NGOs or other organisations;
- record information on the explosive ordnance employed by their armed forces and to share that information with organisations engaged in the clearance of ERW and programmes to warn civilians of the dangers of these devices; and
- take all feasible precautions to protect civilians from the effects of ERW. This may include the fencing and monitoring of territory affected by ERW, and the provision of warnings and risk education.

In addition to the obligations placed upon the parties to a conflict, all States Parties in a position to do so must provide assistance for the marking and clearance of ERW, risk education, and assistance for the care, rehabilitation and socio-economic reintegration of ERW victims.

The Protocol is an important development of international humanitarian law. However, it has several limitations. The most significant weakness is that it will primarily apply to future conflicts and not to existing ERW problems.[23] In addition, some of the obligations listed above are qualified with phrases such as "*where feasible*". Nonetheless, the Protocol's core obligations and its technical annex provide a framework for dealing with the problems of ERW after the end of an armed conflict.

Anti-vehicle mines and specific measures on submunitions were not part of the ERW negotiations. Discussions on these issues were continuing in 2005.

The Anti-Personnel Mine Ban Convention

The development of the Convention

There was widespread dissatisfaction with the content of amended Protocol II adopted by the First CCW Review Conference in 1996. Jody Williams, the coordinator of the ICBL, called the instrument "*a humanitarian failure*" and the ICBL declared that the amended protocol would not make a significant difference in stemming the global landmine crisis. The ICRC declared the results "*woefully inadequate*" and "*unlikely to significantly reduce the level of civilian* *landmine casualties*". The then Secretary-General of the United Nations, Boutros Boutros-Ghali, also expressed his deep disappointment at the failure of the conference to adopt a ban on landmines. More than 40 States supported a ban on the weapons during the CCW Review Conference. As it became clear that the conference would not adopt a ban, attention soon turned to alternative ways to end the use of anti-personnel mines.

At the close of the Review Conference, Canada announced that it would host a meeting of pro-ban States to discuss ways to further an anti-personnel mine prohibition. The "International Strategy Conference: Towards a Global Ban on Anti-Personnel Mines" was held on 3-5 October 1996 in Ottawa. Its final declaration committed some 50 governments to work to ensure the earliest possible conclusion of an international agreement outlawing anti-personnel mines. At the close of the meeting the Foreign Minister of Canada, Lloyd Axworthy, shocked a number of States by issuing a dramatic invitation to States to return to Ottawa before the end of 1997 to sign a treaty banning anti-personnel mines. The so-called "Ottawa Process" was launched.

Following these developments, events began to unfold rapidly. Austria circulated a draft text for a mine-ban convention for comments, which one of its diplomats had begun working on towards the end of the CCW Review Conference. In February 1997, Austria convened an expert meeting, with more than 100 governments represented, to exchange views on the draft and to further develop its contents.[24] Following this, Germany hosted a meeting to discuss the verification mechanisms that might be part of the convention.[25] Based on the results of these discussions, Austria issued a final draft text that would be the basis for negotiations later that year in Oslo, Norway.

In preparation for the start of formal negotiations, on 24-27 June 1997 in Brussels, Belgium hosted the official follow-up meeting to the 1996 Ottawa Strategy Conference, the "International Conference for a Global Ban on Anti-Personnel Mines". The purpose of this meeting was to galvanise international support for the conclusion of a ban treaty and to forward the Austrian draft text for negotiation and adoption at the forthcoming Diplomatic Conference. The "Brussels Declaration" affirmed that the essential elements of an agreement to ban anti-personnel mines should include:

- a comprehensive ban on the use, stockpiling, production, and transfer of anti-personnel mines;
- the destruction of stockpiled and removed anti-personnel mines; and
- international cooperation and assistance in the field of mine clearance in affected countries.

A total of 97 States signed the Declaration. Political will among governments to support a comprehensive ban treaty was clearly growing.

Formal negotiations opened in Oslo, Norway on 1 September 1997. The Diplomatic Conference on an International Total Ban on Anti-Personnel Mines was attended by 117 governments, as well as the ICBL, the ICRC, the UN and others.[26] The 89 States that had endorsed the Brussels Declaration were recognised as full participants and were accorded the right to vote on proposals. Other States, NGOs, international organisations and the ICRC attended as observers and, while permitted to speak at the meeting and comment on developments, they did not have the right to submit or vote on proposals or amendments to the chairman's text.[27]

During the following three weeks of negotiations the Diplomatic Conference concluded the Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction.

The Anti-Personnel Mine Ban Convention was opened for signature on 3 December 1997 in Ottawa, Canada. Minister Axworthy's challenge to conclude an instrument in one year had been met. Some 121 States signed the Convention at the signing ceremony and, in accordance with its provisions, the Convention entered into force six months after 40 States had submitted instruments of ratification or accession to the UN Secretary-General, the Convention's depositary. In September 1998, Burkina Faso became the fortieth State to ratify the Convention, and consequently on 1 March 1999, international law had a new legal instrument in the effort to reduce the effects of mines and UXO. As at 14 October 2005, the Convention had become widely ratified with 147 States, the latest being Vanuatu, having agreed to be bound by its provisions.

The Convention's provisions

The Anti-Personnel Mine Ban Convention sets out to end the use of anti-personnel mines and to reduce the threat of anti-personnel mines already in the ground.[28] At its core is Article 1 (General Obligations), which stipulates that States Parties undertake "*never under any circumstances*" to use, produce, develop, stockpile or transfer anti-personnel mines. In addition, it is prohibited to assist, encourage or induce anyone to commit such acts. These prohibitions apply in all circumstances. This includes situations of armed conflict, internal disturbances and tensions, and times of peace. Anti-personnel mines cannot be used in offence, self-defence, to protect borders or for any other reason.

A State must also destroy the anti-personnel mines stockpiles it owns, possesses or that are otherwise under its jurisdiction or control (Article 3). Destruction must be completed as soon as possible but no later than four years after a State becomes a party to the Convention. States are allowed to transfer an unlimited number of anti-personnel mines for the purpose of destruction. They are also permitted to keep a limited number of anti-personnel mines for training in mine detection, mine clearance or mine destruction techniques. The number of mines retained for these purposes is to be "*the minimum number absolutely necessary*". During the negotiations this was understood to mean hundreds or, at most, thousands, but not tens of thousands of anti-personnel mines. Many States, believing that the weapons are not required for training, have retained no anti-personnel mines.

Each State is required to clear all emplaced anti-personnel mines in mined areas under its jurisdiction or control (Article 5). Clearance must take place as soon as possible but no later than ten years after the State becomes a party to the Convention. As a prelude to clearance, States must make every effort to identify all mined areas in its territory and perimeter mark, monitor and ensure the effective exclusion of civilians by fencing or other means. Given the difficulty some heavily mine-affected States may have in reaching the clearance deadline, the Convention allows a Meeting of the States Parties or a Review Conference to grant an extension of up to ten years, following a detailed explanation of its needs by the affected State. Extensions can be renewed subsequently.

The Convention also establishes obligations in the area of victim assistance. Each State Party, in a position to do so, must provide assistance for the care and rehabilitation, and socio-economic reintegration of mine victims (Article 6). This is an obligation upon all States Parties to the Convention, not only those with mine victims or mines on their territory. Similarly, all States Parties, in a position to do so, are also required to provide assistance for the destruction of anti-personnel mine stockpiles, the clearance of anti-personnel mines and mine risk education activities. Thus, mine-affected States are not alone in their efforts to remove the threat posed by anti-personnel mines or to relieve the suffering of victims.

The Convention provides several mechanisms to monitor the implementation of its provisions. It requires each State Party to adopt domestic measures, including legislation if necessary, to implement the Convention (Article 9) and to file annual reports on the status of its implementation (Article 7). It also mandates that Meetings of States Parties be held annually for the first five years of the Convention's entry into force to consider any matter related to the application and implementation of the Convention (Article 11). Similarly, Review Conferences, the first of which was convened in November-December 2004, were able to consider matters related to the operation and status of the Convention (Article 12). Finally, there are mechanisms to facilitate and clarify compliance with the Convention if there are concerns that a party may have or may be violating its provisions (Article 8).

One of the more important means to monitor implementation is the regular meetings of the Standing Committees established by the First Meeting of States Parties in 1999. The Committees meet once a year since the First Review Conference (previously they met twice a year) and were created as a process through which to examine and discuss issues related to the Convention between the annual meeting of States Parties. It creates a systematic programme of work on the themes of mine clearance, victim assistance and risk education, stockpile destruction and the status and operation of the Convention. The Committees have proven themselves to be a dynamic process through which States, international organisations, NGOs and others can advance the humanitarian objectives of the Convention.

Equally important are the efforts of the ICBL to monitor the progress made in the campaign against anti-personnel mines through its annual Landmine Monitor Report (*see below*).

Advocacy and the development of international law on mines and UXO

One of the significant images from the First Review Conference of the CCW was the sight of advocates outside the UN in Geneva encouraging government delegates to adopt a ban on anti-personnel mines. Mine victims, mine clearance personnel, humanitarian workers and NGO activists were seen passing out leaflets, putting up posters and otherwise lobbying for a positive result. Images of these activities appeared in newspapers and on news broadcasts around the world. It was clear evidence of how mobilised civil society had become on this issue. It was also an indication of how advocacy in the development of the international law on mines and UXO had changed since the early efforts to address the problems caused by these weapons.

Advocacy in the early efforts

Few NGOs or similar civil-society-based associations were involved in the development of the early international humanitarian law treaties on weapons. It is estimated that nearly 500 NGOs with an international presence existed in the first part of the twentieth century.[29] These organisations covered a wide range of issues such as anti-slavery, organised labour and women's suffrage, to name just a few.[30] Although there was a significant NGO presence on the margins of the Hague Peace Conference in 1899, their activities were generally directed at reducing military expenditures and promoting the peaceful settlement of disputes rather than "humanising" the conduct of war through the development of restrictions on specific weapons.[31] Thus, the development of the Hague Convention IV on the conduct of warfare on land and the declarations associated with it was largely a governmental affair.

The ICRC's 1955 Draft Rules were the result of consultations between the ICRC and government experts. Several academics with expertise in law and medicine also participated in the discussions. In preparing the revised version, the ICRC consulted National Red Cross Societies, as it had done in preparing the drafts of the Geneva Conventions. The absence of broader expert involvement can perhaps be explained by the ICRC's tradition of working closely with governments and its sister elements of the Red Cross and Red Crescent Movement in the development of international humanitarian law.

Non-governmental and other organisations were slightly more involved in the development of the CCW. The ICRC convened two expert meetings to explore the prospects for greater regulation of conventional weapons that may have indiscriminate effects or be unnecessarily injurious.[32] The work and proposals of these meetings formed the basis for the CCW negotiations in 1979 and 1980. The participants included military, legal, medical and weapons experts from more than 40 governments. Experts appointed by select national liberation movements and representatives of the UN Secretary-General were also permitted to attend. Along with representatives of the National Red Cross and Red Crescent Societies, NGOs participated as observers. NGOs taking part included the Stockholm International Peace Research Institute, the Special NGO Committee on Disarmament, Friends of the World Committee and the International Confederation of Former Prisoners of War. These organisations brought an important non-governmental expertise and perspective to the discussions.[33]

Non-governmental organisations were also present at the United Nations Conference that negotiated the CCW when it convened in 1979. Although the main actors in the negotiations were governments, NGOs were permitted to participate in the conference as observers and where appropriate in meetings of its subsidiary organs. Upon invitation of the presiding officer, NGOs were also allowed to make statements in areas of their competence. The ICRC and agencies of the UN also attended the negotiating sessions as observers.

Overall, the advocacy of non-governmental and international organisations in the development of the early rules on mines and UXO was limited. Although they participated in an expert capacity in the preparation of the CCW in the mid-1970s and its negotiation in 1979-1980, it was not until the 1990s that these organisations would become a major factor in the development of the law on mines and UXO and their public advocacy activities would have a significant impact.

The growth of advocacy: the efforts of NGOs and international organisations in the development of a prohibition on anti-personnel mines

As humanitarian organisations became aware of the problems caused by anti-personnel mines, advocacy activities began to increase. The principal developments, however, were external to the formal meetings and negotiations. In spite of their growing involvement, NGOs were prohibited from attending the working sessions of the CCW expert meetings and the First Review Conference. Their participation was limited to the meetings' public sessions where they attended as observers. Yet, in these sessions and in the events held on the margins, the organisations advocating for a complete prohibition on anti-personnel mines made their views known. During the first session of the CCW Review Conference in 1995, the International Campaign to Ban Landmines presented a petition with 1.7 million signatures of people from around the world calling for a ban on anti-personnel mines to the president of the conference, Ambassador Johann Molander of Sweden. At the final public session of the CCW Review Conference in 1996, some 150 NGO representatives from 20 countries were present in Geneva as governments concluded amended Protocol II.

The increase in NGO advocacy activities was the result of an unprecedented strategy and coordination to mobilise civil society in support of a complete prohibition on anti-personnel mines. Well before the First CCW Review Conference opened, a strong and very public international effort was under way. With the failure of the Conference to adopt a complete ban on anti-personnel mines and the launch of the Ottawa Process, the advocacy efforts swung into high gear. By the time the negotiations on the Anti-Personnel Mine Ban Convention opened in Oslo on 1 September 1997, public and political pressures for a successful result were significant. The death of Princess Diana, who had spoken in favour of a ban on anti-personnel mines, brought an unprecedented amount of media attention to the negotiations. Unlike earlier negotiations in the fields of disarmament or international humanitarian law, there was clearly a sense that the world was watching.

The ICBL, the ICRC and the United Nations were the principal actors in the advocacy efforts. Their main activities during this time are briefly highlighted below.

The International Campaign to Ban Landmines

The ICBL is a coalition of NGOs which has advocated aggressively for an international ban on the use, production, stockpiling, sale, transfer and export of anti-personnel mines. Formed in 1993, with some 40 organisations initially, it had grown to include more than 1,000 member organisations by the conclusion of the Convention on the Prohibition of Anti-Personnel Mines in 1997. National campaigns were found on all populated continents and many were active at the national, regional and international levels. By the time the Convention entered into force on 1 March 1999, the ICBL truly had a global reach.

In the lead-up to the First CCW Review Conference, the ICBL was very active in mobilising public and political opinion in support of a ban on anti-personnel mines.[34] Early publications produced by NGOs — such as *Landmines in Cambodia: The Cowards War* and *After the Guns Fall Silent: The Enduring Legacy of Landmines* — were instrumental in highlighting the scope and nature of the anti-personnel mine problem and became an important reference for future work.[35] Public meetings and events were held in a number of countries to raise awareness of the problem among the general public and parliamentarians. The ICBL also employed direct appeals, writing open letters to Heads of State and calling for a ban on anti-personnel mines with full page advertisements in *The New York Times.* The Second International NGO Conference held in Geneva in 1995 brought together more than 110 representatives from 75 NGOs.

Once the Review Conference began delegates could not help but feel the ICBL's presence. In addition to the large number of activists attending the public sessions of the Conference in Vienna (1995) and Geneva (1996) a variety of activities broadcast their messages to conference delegates and the general public. Activities included a simulated minefield in the hall of the UN that delegates saw each day, a "Wall of Remembrance" with pictures of mine victims as well as leaflets, posters, photo exhibitions, stickers and other documentation. At the closing plenary of the Conference, the ICBL requested one minute's silence to remember mine victims past, present and future. A candlelight vigil was also held.[36] Such activities had never been seen before in the development of international humanitarian law.

The failure of the CCW Review Conference to adopt a complete ban on anti-personnel mines and the launch of the Ottawa Process gave new opportunities for the ICBL and other organisations to press for a comprehensive ban treaty. NGO activities continued in the lead-up to the Oslo negotiations and the period following the conclusion of the Convention. While governments took the lead role in organising expert meetings to develop the structure and contents of the Convention, the ICBL was active at the international level in mobilising NGOs and building political will in support of a prohibition.

Of particular importance was the 4th International NGO Conference held in Maputo, Mozambique, on 25-28 February 1997, attended by some 450 participants from more than 60 countries and the NGO Forum held alongside the Oslo negotiations. These meetings were instrumental in informing national campaigns of recent developments and providing them with the tools to lobby government officials. The meetings were also valuable vehicles through which to expand the campaign. The Oslo meeting was attended by some 130 NGOs and developed an NGO plan of action for the Convention's entry into force.

In addition to the work being done at the international level, regional and national meetings were also effective mechanisms for advocacy during this time. Regional meetings brought together government officials from neighbouring countries and provided a venue to discuss the regional dimensions of the anti-personnel mine problem and the regional implications of an anti-personnel mine ban. As militaries often viewed a ban on anti-personnel mines as having implications for national security, discussions with neighbouring governments were essential. In the lead-up to the adoption of the Anti-Personnel Mine Ban Convention and the subsequent efforts to promote it, regional meetings were held in nearly every part of the world.

National meetings were also instrumental. They allowed for broader participation than was possible at regional or international conferences and facilitated a frank exchange of views among government officials, military officials, parliamentarians, academics and NGO activists and other actors. In the lead-up to the conclusion and entry into force of the Convention, national meetings were held in Australia, Azerbaijan, Greece, Japan, Jordan, Nepal, Senegal, Sudan, Ukraine, the Federal Republic of Yugoslavia, and Yemen.

In parallel with these events the ICBL and the national campaigns continued to use dramatic displays to bring attention to its cause and remember the victims of anti-personnel mines. Some of the memorable events include the "shoe pyramid" used to symbolise the limbs lost to anti-personnel mines, a clock registering another victim every 20 minutes, simulated minefields for people to walk through and a bell-ringing campaign in more than 30 countries at the Convention's entry into force.

The ICBL's activities continued after the entry into force of the Convention. Through meetings, conferences and public events, it has played an important role in the efforts to universalise the Convention. As mentioned above, it has also taken a lead role in monitoring its implementation. The ICBL and its national member campaigns have made important contributions to the intersessional work on mine clearance, victim assistance and risk education, stockpile destruction and the status and operation of the Convention. In addition, the Landmine Monitor has become a main source of information on adherence to and implementation of the Convention and the success of efforts to address the anti-personnel mine problem.

Unlike the CCW process, NGOs were permitted to contribute to the substantive development of the text of the Convention. ICBL representatives participated in the range of experts' meetings to prepare the Convention and in all the sessions of the negotiations. One ICBL participant in these meetings noted that this was the first time that NGOs had been given official status in international negotiations of an arms control or humanitarian law treaty.[37]

The ICRC

As mentioned above, the ICRC was closely associated with the early efforts to minimise the dangers of landmines to civilian populations. Since its founding in 1863, the ICRC has worked to develop the humanitarian rules applicable in armed conflict and is widely recognised as the "guardian" of international humanitarian law. States have often given the ICRC a mandate to prepare the drafts of humanitarian law treaties as the basis for international negotiations.

Similar to its earlier role in the development of the CCW, the ICRC was active in the preparations for the First CCW Review Conference. It was invited to participate in the government experts' meetings preparing the Conference and to submit a report on mines and other issues on the basis of its field experience and expertise in international humanitarian law.[38] During the Review Conference the ICRC participated as an observer and commented formally and informally on the issues and proposals which emerged. It also submitted its own proposals for States Parties and experts to consider.[39]

The ICRC was also very active outside of the CCW context during this time. It organised a series of expert seminars on anti-personnel mines between 1993 and 1995. One of the most important was the ICRC Symposium on Anti-Personnel Mines held in Montreux, Switzerland, in April 1993. The meeting brought together for the first time experts in military strategy, the development and production of mines, international law, surgery, rehabilitation and mine clearance. Participants included NGOs advocating a complete ban on anti-personnel mines. The report of this meeting was sent to all governments and became an important source of reference for the ICRC, NGOs and others in their future activities.[40] The meeting also marked the start of a loose cooperation between the ICRC, the ICBL and other organisations and experts working on the anti-personnel mine issue.

Subsequent ICRC meetings and documents also made important contributions to the efforts to ban anti-personnel mines. In 1995, in cooperation with the Organisation of African Unity (OAU), the ICRC organised meetings in Africa to encourage African States to participate in the CCW Review Conference and to work towards a ban on anti-personnel mines.[41] Particularly useful was its 1996 study examining the military effectiveness of anti-personnel mines in 26 armed conflicts. Its findings, supported by 55 military officers, concluded that the military utility of anti-personnel mines was limited and was far outweighed by the weapon's humanitarian consequences. It went on to say that "*their prohibition and elimination should be pursued as a matter of utmost urgency by* *governments and the entire international community.*"[42] As the military utility of anti-personnel mines was an important issue in discussions with military officers, these were valuable findings for the advocacy efforts.

Four days before the first meeting of governmental experts to prepare the CCW Review Conference, the ICRC publicly called for a total ban on anti-personnel mines. This was followed by ICRC's decision to launch — for the first time in its history — a media campaign to mobilise public opinion and political will for the stigmatisation of anti-personnel mines and for increased commitments to victim assistance and mine clearance.[43] The ICRC believed that a strong public reaction would increase the political will of governments to support a ban treaty and alleviate the suffering of mine victims. It had never before used such "public" methods in its efforts to develop international humanitarian law.[44]

The ICRC continued its advocacy and was active at many levels following the disappointing results of the CCW Review Conference. It was keenly involved in the work to develop the text of Anti-Personnel Mine Ban Convention, commenting on the various draft texts and proposals in the experts' meetings in the Oslo negotiations. It also prepared and disseminated a broad range of campaign materials and specialist and layman's publications on the humanitarian costs of landmines and the legal, medical, rehabilitative aspects of the landmine problem.

The ICRC also used regional and national meetings to garner support for a comprehensive ban treaty and the Ottawa Process. Following the First CCW Review Conference it organised or assisted regional meetings in the Philippines (for military officers) and Zimbabwe (for members of the Southern African Development Committee). It also organised a national seminar on landmines in Managua, Nicaragua.

In parallel with its media campaign, the ICRC also facilitated media coverage of the situation in mine-affected countries. Journalists, of both the electronic and print media, were received at ICRC delegations and transported to mine-affected areas to speak with local residents about their situation. They also visited ICRC medical treatment centres and rehabilitation clinics and were put in touch with other humanitarian organisations working in the area. Many articles, stories and documentaries resulted from such visits, further increasing the public exposure to the issue and the scale of the problem.[45]

This unprecedented ICRC advocacy reflected how determined it was to pursue the total elimination of anti-personnel mines.

The United Nations

Along with the ICBL and the ICRC, the United Nations also made important contributions to the development of a ban on anti-personnel mines. It expressed support for a ban prior to the start of the experts' meetings preparing the First CCW Review Conference. Even though the UN Secretary-General is the depositary of the CCW, he noted in 1994 that "*the best and most effective way*" to solve the global landmine problem was a complete ban on all landmines.[46] The UN also issued yearly reports (1994-1996) on national moratoriums adopted by States on the export of anti-personnel mines and urged those States which had not already done so to take such measures in the lead-up to the First CCW Review Conference. A report on the progress towards an international agreement to ban anti-personnel mines (1997) and reports on assistance in mine action (from 1995) were also issued. These documents, prepared in response to UN General Assembly resolutions, helped document developments on the anti-personnel mine issue and highlight its importance among UN departments and specialised agencies.

The study by Ms Graça Machel for the UN on the impact of armed conflict on children (1996) was a particularly important document.[47] It specifically highlighted the dangers landmines posed to young people and called upon governments to support a worldwide ban. It played an important role in sensitising and galvanising the various agencies and departments of the UN towards a ban on anti-personnel mines.

The agencies of the UN also played an important role in promoting a ban. the United Nations Children's Fund (UNICEF), the United Nations Development Programme (UNDP), the Office of the United Nations High Commissioner for Refugees (UNHCR) and the United Nations Mine Action Service (UNMAS) were all active in various capacities. In many instances their country representatives lobbied the relevant ministries to support the Anti-Personnel Mine Ban Convention or worked at the local level to empower communities to carry out their own advocacy. A variety of reports, publications and other materials were also produced. Representatives from UN departments and agencies attended many of the conferences and seminars on landmines, and participated in the First CCW Review Conference as well as the Ottawa and Oslo meetings. Their activities have continued in the efforts to universalise and implement the Convention.

Other international and regional organisations

Other international and regional bodies also played a role. Support for a ban on anti-personnel mines was expressed by the Vatican Council for Justice and Peace (1994), the Islamic Conference (1995) and the African, Caribbean, Pacific Union Joint Assembly (1995). The Council of Ministers of the Organisation of African Unity (OAU) adopted a resolution calling upon member States to support a common African position in favour of a ban (1995). On the other side of the Atlantic Ocean, the Organization of American States (OAS) adopted a resolution establishing the Americas as a hemisphere-wide zone free of all landmines (1996). Shortly thereafter, Caribbean States also declared the creation of a mine-free zone (1996). These developments helped further the political discussions and were a further indication of the depth of the support to ban these weapons.

Key features of the advocacy on mines and UXO

A multi-dimensional role and partnership with States

One of the most striking features of the development of a ban on anti-personnel mines was the multi-dimensional character of the advocacy campaign.

Advocacy was undertaken by a variety of actors from an assortment of backgrounds and disciplines. Never before had a campaign been so well coordinated and so motivated to achieve a development of international humanitarian law.

Equally striking was the wide range of activities used. Case studies, expert meetings, national, regional and international conferences, public demonstrations and mass media were used to raise awareness and promote a ban. This was a style of advocacy much different from the early development of international law on mines and UXO.

The following features played an important role in the campaign's success.

Expertise

Each major organisation involved had first-hand experience of dealing with the problems caused by mines and UXO. The ICRC, the UN and several core members of the ICBL had operations in war-torn countries. They witnessed, on a daily basis, the direct effects of these weapons on individual civilians and communities. These organisations were either clearing mines and UXO, conducting risk education and treating and rehabilitating victims even before such activities were enveloped under the label of "mine action." In sounding the alarm about the mine and UXO problem, these organisations thus brought a credible field perspective and a distinct authority to the discussions on how to address the problem. Their experiences changed the perception that anti-personnel mines were a humanitarian problem and not an arms control issue.

Global reach

The ICBL, the ICRC and the UN had direct links to government capitals and to civil society in many countries. Through its national campaigns and member NGOs, the ICBL was able to raise awareness of anti-personnel mines at the local level, to mobilise public opinion and to lobby government officials. As the international community began negotiations on anti-personnel mines, the campaigns could meet directly with government representatives, parliamentarians and military officials to explain the ICBL's proposals and positions. This gave the organisation an active and nearly global reach.

The ICRC also had local operations supporting its advocacy efforts. Through its delegations and the National Societies of the Red Cross and Red Crescent Movement, the ICRC could distribute documents and have its print and media advertisements used at the national level. Many documents and advertisements were translated into local languages. As ICRC delegations and national societies often work closely with governments on international humanitarian law issues, most already had a well-established dialogue with government officials.

The UN also played an active role. UNICEF and UNHCR were particularly active in advocating for a ban on anti-personnel mines at the regional and national levels through their participation at seminars and conferences and in bilateral contacts at the field level.

There was a significant coordination between these organisations in their advocacy work. While the ICRC and the UN were not members of the ICBL, their activities were mutually reinforcing. Representatives of each were often found together on the panels of meetings and conferences and they often disseminated each other's documentation. While they each conducted separate dialogues with government officials there was a consistent flow of messages that helped further the discussion and consideration of the anti-personnel mine ban by governments.

Partnership with States

Achieving a ban on anti-personnel mines required a working collaboration with States in order to further the issue on the international agenda. Working closely with pro-ban organisations, States such as Austria, Belgium, Canada, Norway, South Africa and Switzerland helped drive the process at the diplomatic level to develop the structure and contents of the Anti-Personnel Mine Ban Convention. Similarly, the carefully planned focus on a regional approach (especially in Africa and Central America), supported by a cross-regional "core group" of States, quickly and effectively built momentum towards a ban. Thus the anti-personnel mine issue moved forward more quickly than is generally the case in traditional disarmament or international humanitarian law negotiations. It also showed that important humanitarian issues can be addressed without the involvement of the most powerful governments. States other than the world's largest military or diplomatic powers can establish important and widely ratified humanitarian norms, particularly in the face of an urgent humanitarian need and with strong public support (*see further below*).

Military-to-military dialogue

One of the important, yet often overlooked, elements of the campaign against anti-personnel mines was the effective role of military-to-military dialogue. Parallel to the public campaign in many countries was a corresponding effort in military circles to end anti-personnel mine use. Senior military officers, both active and retired, from combat and clearance forces, took a lead role in these activities. Countries supporting a ban, such as Canada and South Africa, made their officers available for advocacy activities.

Documents were developed specifically for military audiences. These include *Anti-Personnel Mines: Friend or Foe, a study on the military utility of anti-personnel mines,* written by retired Brigadier Patrick Blagden (the former UN Expert on Mines) and published by the ICRC, and *Alternatives to Anti-Personnel Landmines,* written by General Robert Gard Jr. and published by the Vietnam Veterans of America Foundation. These and other similar materials were widely distributed at national, regional and international conferences on anti-personnel mines and, more specifically, at the meetings organised for military officials.

The issues addressed in these publications included the military utility of anti-personnel mines, the consequences of anti-personnel mines on one's own forces and civilian populations, and tactical and technical alternatives to anti-personnel mines. Military-to-military dialogue was, and still is, one of the most effective means of furthering consideration of the Anti-Personnel Mine Ban

Convention among military forces, because it challenged the military case for the retention of anti-personnel mines above and beyond the humanitarian impact on the civilian population.

A process to promote implementation

Equally important to the norms established by the Anti-Personnel Mine Ban Convention are the formal and informal processes created to promote its implementation. The Standing Committees provide an open and informal forum where States Parties, NGOs and international organisations and even non-party States can share expertise, experiences and resources on the Convention's key provisions and mine action more generally. This has helped States Parties to fulfil their obligations and to prepare them to meet the deadlines for anti-personnel mine clearance and stockpile destruction. It has also helped keep States Parties and the international community focused on addressing the anti-personnel mine problem in the years since the Convention entered into force.

An annual meeting is also held by States Parties to amended Protocol II of the CCW. This one-day event examines the overall status of the Protocol but does not significantly examine issues related to mine action. As most of the States Parties to amended Protocol II are also parties to the Anti-Personnel Mine Ban Convention, many see no value in discussing similar issues in both fora. While their participation is permitted, few NGOs and other mine action organisations attend the annual meetings of amended Protocol II.

The Landmine Monitor Report, published annually by the ICBL, is one of the important surveys of the progress being made on the landmine problem. This annual report provides an independent overview of the situation in mine- and UXO-affected countries, the ongoing mine action activities within each country and the national positions on the Anti-Personnel Mine Ban Convention and amended Protocol II to the CCW. For States Parties to the Anti-Personnel Mine Convention, the report highlights the status of the instrument's implementation at the national level and its positions on related issues, such as anti-handling devices and anti-vehicle mines with sensitive fuzes. The Landmine Monitor plays an essential role in measuring the impact of the Anti-Personnel Mine Convention and the efforts to address the problems caused by mines and UXO more generally.

A new approach to creating rules on mines and UXO?

Several commentators have suggested that the development of the Anti-Personnel Mine Ban Convention signals a new approach in international relations and, in particular, in the efforts to address threats to human security.[48] Following the success of the Ottawa Process, NGO coalitions were formed to advocate on the International Criminal Court, child soldiers, and small arms and light weapons, with varying degrees of success.[49]

Compared to the advocacy on anti-personnel mines, there has been significantly less effort directed at addressing the impact caused by ERW. From the humanitarian point of view, ERW is an equally devastating problem — leftover ordnance causing large numbers of civilian casualties and long-term socio-economic consequences. In some respects, addressing the ERW problem would seem easier than prohibiting anti-personnel mines. Unlike anti-personnel mines, militaries have widely recognised that ERW have no intended military utility. In addition, governments have been dramatically sensitised to the problems caused by ERW as a result of the Anti-Personnel Mine Ban Convention. Finally, there has not been a concerted effort to ban any weapon in the work on ERW. Thus, ERW would seem to be a good candidate for a strong response by the international community.

The new Protocol V recently adopted by the States Parties to the CCW is, however, only a modest result. Many States sought stronger obligations to minimise the post-conflict consequences of ERW. Others, however, would not accept absolute commitments. The result is a protocol which establishes an important framework for reducing the threat of ERW but which only requires parties to a conflict to act "*where feasible*" and "*where practicable*". In addition, the Protocol's principal rules will only apply to future conflicts and are not meant to apply to existing ERW problems. States Parties with ERW on their territory from past conflicts are, however, given a right to seek assistance from other States and international organisations in order to help them deal with the existing problem.

As mentioned above, CCW States Parties also decided to continue to discuss the problems of anti-vehicle mines and specific regulations on cluster munitions. While a number of States have proposed new rules on these weapons to minimise the humanitarian consequences, there has been little progress since these issues were placed on the CCW agenda in 2000. Several States oppose new rules on cluster munitions and have consistently blocked negotiations.

A number of factors may explain the modest results on ERW and the slow approach to new rules on anti-vehicle mines and submunitions. Firstly, the negotiations and discussions were conducted in the context of the CCW, which takes its decisions by consensus. As a result, the texts and decisions must be acceptable to all States Parties and are destined to be the result of compromise. No State, even those involved in the Ottawa Process, sought to take these issues out of the CCW.

Secondly, there was much less public pressure for strong results. Fewer NGOs and international organisations were involved in the development and negotiation of the ERW Protocol and the efforts to create stronger rules on anti-vehicle mines and submunitions. Mines Action Canada, Human Rights Watch, Landmine Action, ICRC, the UN Mine Action Service and several other organisations have been active on these issues but, despite their efforts, there has not been the same sense of urgency found during the campaign against anti-personnel mines. As was highlighted by one delegate from a State that does not want new regulations on anti-vehicle mines: "*We don't feel any real pressure to address the issue*".

The reach of international humanitarian law: more than just the numbers

One of the points often raised in the work to develop new rules on mines and UXO is the need to secure the adherence of major military and diplomatic powers. It is widely believed in diplomatic circles that new treaties adopted in this area must have the support of powerful countries if they are to have any chance of becoming widely ratified and achieve their objectives. This was regularly cited in the early pursuit of a ban on anti-personnel mines. It has also been referred to in the work on ERW and is likely to be a consideration in the future efforts to develop new rules on mines and UXO.

The Anti-Personnel Mine Ban Convention is one example of an international treaty that became a widely accepted international norm without the support of a number of significant military powers. Despite this lack of support (perhaps even as a result of it!), the Convention was quickly and widely ratified. Within 19 months of its adoption in December 1997, the Convention had received the 40 ratifications necessary for it to become binding international law. Six years later, 147 States — more than three quarters of the world's nations — have joined the Convention.

As a result of the large number of ratifications, the prohibition on anti-personnel mine use has become the international norm. This has had a corresponding impact on the behaviour of States not a party to the instrument. While States not bound by the Convention can legally use anti-personnel mines, fewer and fewer choose to do so. As cited by the Landmine Monitor, "*the overall trend has been positive, even with respect to non-States Parties, as the international norm against the anti-personnel mine has spread*".[50] When anti-personnel mines have been used, the ICBL and others have voiced concern and disapproval. Thus, even though only legally applicable to States Parties, the Anti-Personnel Mine Ban Convention has become the standard of behaviour expected of responsible governments.

The Anti-Personnel Mine Ban Convention is not the only instance where a treaty of international humanitarian law has been widely ratified without the support of powerful nations. The 1925 Geneva Protocol prohibiting the use of poison gas and bacteriological weapons was widely adhered to in spite of the fact that several important countries, most notably the United States and Japan, did not consent to be bound by the instrument. The US eventually ratified the Protocol in 1975 — some 70 years after its adoption. Nevertheless, the prohibition on the use of poison gas became a widely accepted norm throughout the international community.

These examples show that instruments can become a widely accepted norm in spite of the fact that some major military and diplomatic powers have not adhered to them. While there is clearly a benefit in having as broad support as possible on weapons issues, particularly in order to bind users and producers, humanitarian rules can nonetheless develop. Universal application of the law can be a slow process. It may take some countries decades to formally adhere to new treaties, but, in the development of humanitarian norms, States seeking solutions to a humanitarian problem can set the standard for the international community.

The use of statistics in advocacy

Statistics played a prominent role in the public campaign against anti-personnel mines. The ICBL, the ICRC and the UN used a variety of figures on the nature and the scope of the mine problem. These figures were often quoted by governments and repeated in media reports. The numbers provided an easily understood indication of the scale of the problem and captured the attention of governments and the general public. Some of the statistics regularly quoted included estimates that there were 35 million uncleared mines in Afghanistan, 9–15 million in Angola, 6 million in Bosnia and Herzegovina and 6 million in Cambodia. The worldwide problem was said to total up to 110 million mines in the ground.

These figures became a source of controversy. There were strong objections to these estimates by several mine clearance organisations. It was noted, for example, that in order to lay 35 million mines in Afghanistan, Soviet forces would have had to have emplaced 10,000 mines per day, every day of the Soviet Union's nine-year military involvement in the country.[51] The HALO Trust claimed that the scope of the anti-personnel mine problem in many countries was far less than cited in the advocacy campaign documents.[52]

These claims had merit and many estimates were subsequently lowered. In Afghanistan, the estimate was reduced to 10 million mines (which probably still overstated the scale of problem). The national mine action centre in Bosnia and Herzegovina lowered its estimate to 750,000 mines that needed to be cleared.[53] Moreover, although useful for advocacy, these figures are almost valueless in terms of mine action. Thus, today the information coming from countries heavily affected by mines and UXO focuses not on the number of mines that remain uncleared but rather on the number of known minefields and UXO locations, the number of villages and square meters affected by the weapons, and the number of victims.[54]

One concern about the use of such figures was that it would undermine funding for mine action programmes. Specifically it was asserted that the high figures would cause donors to shy away from providing funds for clearance activities if they perceived that such projects might need to last for decades or even hundreds of years.[55] Fortunately, such claims have not materialised. Funding for mine action has been and remains substantial. For calendar year 2003, Landmine Monitor identified US$339 million in mine action funding from more than 24 donors. It appears likely that funding for 2004 increased significantly, although the convening of the First Review Conference of the Anti-Personnel Mine Ban Convention and the change in the exchange rate between the dollar and the euro is probably largely responsible for that increase.

In total, it is believed that more than US$2.5 billion has been contributed for mine action since 1989. Advocacy has probably taken up no more than US$50 million of this amount — a relatively meagre 2 per cent of the funds allocated. Importantly it also notes that there has been an increase in the number of mine/UXO affected countries reporting organised mine clearance operations.[56]

The Implementation Support Unit (ISU) of the GICHD also retains information on the trends in funding. Tables prepared by the ISU show that there has been no significant change in the total level of contributions to mine action since 1998 and that the annual contributions of some significant donors have actually increased in recent years. Similarly, the ICRC's Special Appeal for Mine Action has been consistently funded. The appeal, launched in 1999, sought to raise 100 million Swiss Francs (approx. US$80 million) over five years for its mine risk education, victim assistance and advocacy programmes.[57]

The capacity to record data on mines and UXO has improved in recent years. With the professionalisation of mine action and the development of survey standards and information management tools, such as the IMSMA, organisations have better means to determine and record the extent of the mine and UXO problem. Aware of the earlier concerns on the use of statistics, many organisations are now much more cautious in their use of figures.

Conclusions

Advocacy has been a major factor in achieving a comprehensive international legal prohibition of anti-personnel mines in the space of only a few years and has promoted the commitment of significant resources to mine action. A side benefit has been the promotion of the development and implementation of international humanitarian law more generally.

The current definition of advocacy in the IMAS focuses on initiatives aimed at mobilising *public* support to reduce the threat or consequences of mines and UXO. However, as this chapter has highlighted, advocacy in the development of the international law on mines and UXO has involved more than the marshalling of public opinion. It has also encompassed the direct lobbying of government officials and activities in coordination with NGOs, international organisations, the ICRC and others. Much of the work in developing the law on mines and UXO has occurred at the expert level. While public opinion and public pressure are essential elements in influencing government positions, it is only part of the more general advocacy effort.

Future editions of the IMAS should consider improving the definition of advocacy. A possible definition could be as follows:

> Advocacy: *In the context of mine action, the term refers to actions or activities intended to lobby for, encourage or promote the adoption and implementation of rules and policies with the aim of removing or reducing the threat from and the impact of mines and UXO.*

This would bring the IMAS concept of advocacy closer to the way that it is practised by NGOs, international organisations and other actors in this area.

Consideration should also be given to broadening the reference to advocacy and international law in the IMAS definition of mine action. Thus, the IMAS declares that mine action includes five complementary groups of activities, including "*advocacy against the use of anti-personnel mines*".[58] This seems unnecessarily narrow. A better formulation might be as follows:

> *Mine action includes "advocacy in favour of the prohibition and elimination of anti-personnel mines and the promotion of the adoption and implementation of norms, rules, policies and actions that reduce the threat from and impact of other UXO".*

More generally, there is a need to develop a means to regularly monitor the UXO situation globally and in specific contexts. Information on the problem in many parts of the world is not regularly reported or disseminated.

Thus, it is often difficult to keep abreast of developments on the nature of the UXO problem, its human and socio-economic consequences and the consequences of new conflicts or other factors on the ground. As work progresses on a variety of UXO-related issues, information in these areas would be an important contribution to ongoing advocacy work.

Such a mechanism would also be valuable for ensuring the implementation of the new Protocol on Explosive Remnants of War. This new agreement is more than a treaty to govern the conduct of States. It is an international framework for mine action. In addition to the more general information on UXO, a monitoring mechanism could chart adherence to the Protocol and how States are altering their national and military policies. Once a conflict has taken place, such a monitoring mechanism would be essential to report on how the Protocol's obligations are being executed.

The ICBL's Landmine Monitor is an example of a mechanism that has been effective in monitoring the progress made on landmines. It has become an essential element in advocacy on the landmine issue. While many of its reports provide a glimpse into the UXO problem, their primary focus is on the policies and activities related to landmines. More detailed information on other forms of UXO would be useful.

Consideration should be given to developing a mechanism to regularly monitor the broader UXO problem and the work being done to address it. Annual publications are one approach. Broadening or supporting the work of the Landmine Monitor might so be considered. Other ideas may include regular consultations of States and mine action professionals, through a process parallel to the Standing Committees of the Anti-Personnel Mine Ban Convention. Clearly any concepts developed need to build upon existing efforts and not duplicate them.

In learning the lessons of the past decade, it is clear that part of the success of the campaign against anti-personnel mines was the unprecedented degree of coordination among the variety of actors involved in advocacy activities. Although the main actors came from a range of disciplines, operated under different mandates and played different roles in the advocacy work, they nevertheless closely coordinated and supported each other's activities.

However, the same level of cooperation and coordination has not been as evident in the efforts to improve the international law on ERW, anti-vehicle mines and cluster munitions in the context of the CCW. While several NGOs, the ICRC, UNMAS and UNICEF have worked closely in these areas, other organisations involved in the anti-personnel mine issue have been less active.[59] As compared with meetings on landmines, fewer organisations have participated in the meetings of the CCW States Parties or its Group of Governmental Experts. In addition, the proposals on ERW and anti-vehicle mines have not been as extensively raised in capitals by advocacy organisations.

One explanation is that many of the relevant organisations remain focused on the anti-personnel mine problem and the implementation of the anti-personnel Mine Ban Convention. With the Convention's Standing Committees, the Meeting of States Parties and implementation work at the national level, most organisations are fully occupied throughout the year. It is often difficult for them to follow developments in the parallel processes in the CCW with their existing resources. As a result, there has been less public and political pressure on governments for a positive result on ERW, anti-vehicle mines and cluster munitions.

As work continues on these issues, cooperation and coordination will need to be enhanced if the Protocol on Explosive Remnants of War is to be widely ratified and effective measures are to be adopted on anti-vehicle mines and cluster munitions. The mobilisation of public pressure, political will and dialogue with the armed forces will be essential parts of the advocacy work. Greater cooperation and coordination in these areas will maximise the effectiveness of the messages and activities. The organisation of an NGO campaign on cluster munitions and ERW will improve the capacity for cooperation and coordination on these issues. Formed in November 2003, the Cluster Munitions Coalition should become an important actor and a focal point in the advocacy efforts on these issues.

Endnotes

1. The full title is the *Convention on the Prohibition on the Use, Stockpiling, Production, and Transfer of Anti-Personnel Mines and On Their Destruction*, hereinafter, the *Anti-Personnel Mine Ban Convention*.
2. See, for example, Terre des Hommes, *What is Advocacy (www.tdhafghanistan.org/Capitalisation%20Paper%20-%20Advocacy.pdf)*, 17 October 2002, which defines advocacy (in the case of street children) as: "*Liaising with and lobbying subscribers and policy makers, including the use of public events and media coverage, regarding the violation of rights encountered by street children and appropriate measures to counter them*". See also The Advocacy Institute, *www.advocacy.org/definition.htm*.
3. International Mine Action Standards (IMAS), *IMAS 04.10: Glossary of mine action terms, definitions and abbreviations*, Second Edition, 1 January 2003, Definition 3.7.
4. In addition, UNMAS, through the Department of Peacekeeping Operations, has (with varying degrees of success) been able to influence the formulation of the text of a number of cessation of hostilities and peace agreements (e.g. Eritrea-Ethiopia, Kosovo and Sudan) and related Security Council Resolutions, to ensure that some wording is included to recognize: (1) the residual mine/UXO threat, (2) its potential impact on emergency and humanitarian relief efforts, (3) the responsibility of the Parties to assist in and facilitate the mitigation of this threat (4) their responsibility to hand over the minefield records and related information, including (5) responsibility to facilitate the efforts of UNMAS and its partners in the post-conflict efforts to deal with the landmine problems.
5. Preamble to the *Declaration Renouncing, in Time of War, the Use of Explosive Projectiles under 400 Grammes Weight*, concluded in St. Petersburg, entered into force 11 December 1868.
6. Declaration (IV, 3) concerning expanding bullets, The Hague, 29 July 1999. Entered into force 4 September 1900.
7. *Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare*, signed at Geneva 17 June 1925. The Protocol entered into force on 8 February 1928.
8. These principles find expression in the *1977 Additional Protocols to the Geneva Conventions* (see Articles 35, 48 and 51) and were repeated by the International Court of Justice in its advisory opinion on the legality of nuclear weapons.
9. See, for instance, Human Rights Watch and Physicians for Human Rights (1993).
10. The conduct of military operations remained regulated by Hague Convention (IV) *Respecting the Laws and Customs of War on Land*, adopted in 1899. It entered into force 26 January 1910.
11. See Maresca and Maslen (2000: 16–17).
12. ICRC (1995).
13. The full legal title of this instrument is the *Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May be Deemed to be Excessively Injurious or to Have Indiscriminate Effects*.
14. The full title is *Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons which may be Deemed to be Excessively Injurious or to Have Indiscriminate Effects*, hereinafter, *CCW*.
15. The full title of the Protocols are : *Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I)*, 8 June 1977; *Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of Non-International Armed Conflicts (Protocol*

II), 8 June 1977.
16. Article 2(3) of amended Protocol II defines "*other devices*" as "*manually emplaced munitions and devices designed to kill, injure or damage and which are actuated by remote control or automatically after a lapse of time*".
17. Article 5 of Protocol II prohibits the use of remotely delivered mines unless their location can be accurately recorded and each mine contains a self-neutralising mechanism so that the mine will destroy itself when it no longer serves a military purpose.
18. Amended Protocol II, Article 3(1) and Article 10.
19. The detectability requirements of Protocol II only apply to anti-personnel mines (Article 5). Remotely delivered anti-vehicle mines, referred to as "*mines other than anti-personnel mines*" must, <u>to the extent feasible</u>, have a self-destruct or self-neutralisation mechanism with a back-up self deactivation feature (Article 6(3)). There are no such requirements on manually emplaced anti-vehicle mines.
20. CCW/CONF.II/PC.3/WP.4.
21. CCW/MSP/2002/2.
22. The Protocol does not cover landmines as they are already dealt with by the Anti-Personnel Mine Ban Convention and amended Protocol II of the CCW.
23. However, Article 7 of the Protocol allows States Parties with existing ERW problems to seek assistance from other States and relevant organisations to address the problems caused by UXO and AXO already in its territory.
24. Expert Meeting on the Text of a Convention to ban Anti-Personnel Mines, held on 12–14 February 1997 in Vienna. One-hundred and eleven governments attended as did many NGOs, international organisations and the ICRC.
25. International Expert Meeting on Possible Verification Measures to Ban Anti-Personnel Landmines was held in Bonn, Germany, 24 and 25 April 1997. A total of 121 States attended the meeting.
26. Other organisations included the Organization for American States, the Organisation for African Unity and the International Federation of Red Cross and Red Crescent Societies.
27. See the *Draft Rules of Procedure for the Conference*, Rules 1 and 47.
28. For a more detailed overview of the requirements of the Convention and some of the concerns about the clarity of its definitions and provisions see GICHD (2004d).
29. Chatfield (1997: 21).
30. *Ibid*.: 21.
31. *Ibid*.: 24.
32. Conference of Government Experts on the Use of Certain Conventional Weapons, held in Lucerne, Switzerland, 24 September–18 October 1974, and Lugano, Switzerland, 28 January–26 February 1976.
33. For one of the few non-governmental expert perspectives on these meetings see Prokosch (1995).
34. The *Chronology of the Ban Movement* can be found on the ICBL's website: *www.icbl.org*.
35. Human Rights Watch and Physicians for Human Rights (1991), Roberts and Williams (1995).
36. Williams and Goose (1998: 33).
37. Goose (1998: 278).
38. ICRC (1994).
39. Maresca and Maslen (2000: 266–326).
40. ICRC (1993).
41. Regional meetings were held in Addis Ababa, Harare and Yaounde in 1995.

42. ICRC (1996a).
43. Maresca and Maslen (2000: 404–406).
44. Print and television advertisements were the principal media used. A total of 12 print and four television advertisements were produced and placed throughout the international media on a pro bono basis. It has been estimated that the media space donated was in excess of 4,000,000 Swiss Francs (roughly US$2.6 million with a potential audience of more than 700 million people) (Lavoyer and Maresca, 1999: 501-525).
45. *Ibid*.
46. UN Doc. A/49/357 of 6 September 1994.
47. UN Doc. A/51/306 of 26 August 1996.
48. L. Axworthy, "Towards a New Multilateralism" in Cameron et al. (1998: 448-460).
49. Hubert (2000).
50. ICBL (2003: 5).
51. Maslen (2001: 20–21).
52. In Afghanistan, for example, HALO Trust asserted that there were fewer than one million anti-personnel mines and that there were less than 500,000 mines in Angola. See Bottigliero (2000: 50, 55).
53. ICRC (1997:5, 15). More recent information puts the number of uncleared mines at 670,000 and 650,000 items of UXO (see ICBL, 2003: 117–118).
54. See the Landmine Monitor reports for Afghanistan (ICBL, 2003: 51–52), for Angola (*ibid*.: 79) and for Cambodia (*ibid*.: 137).
55. Bottigliero (2000: 4).
56. ICBL (2003:21).
57. ICRC (2003).
58. IMAS 04.10, Second Edition, 1 January 2003, Standard 3.124.
59. ICBL, Human Rights Watch, Landmine Action and Mines Action Canada have consistently prepared statements for the CCW meetings and circulated to NGOs to sign and endorse.

5

Mine risk education

Andy Wheatley

Summary

The MRE sector has slowly begun to professionalise — a process marked by the development of guidelines, the introduction of training protocols and the current development of IMAS standards incorporating MRE. Yet, given the amount of funding made available to MRE programmes (probably between US$10 million and US$15 million each year), it is extremely surprising that donors have not been more insistent on being shown substantive proof of efficacy. To date, operational efficiency and effectiveness have largely been evidenced by questionable indicators such as the counting of outputs. So, in seeking to coordinate and integrate with other mine action and development intervention, MRE must do more to demonstrate its effectiveness (and efficiency) as a means of reducing casualties. In addition, in communities where mine clearance is being undertaken the focus should be on MRE through community liaison, managed and tasked as part of the clearance operation.

Introduction

This chapter looks at the development of mine risk education (MRE), which was previously called mine awareness. It begins by discussing the needs of affected communities for MRE, which should be the basis of all good programming. A review of some of the key actors in MRE precedes an assessment of the different methodologies that have been used to date. This leads on to a broader review of the evolution in the sector, in particular relating to the development of community liaison. The chapter ends with some thoughts for the future professionalisation of the discipline.

MRE is one of the five pillars of mine action. As such, it has received substantial donor support since the inception of mine action at the end of the 1980s. Yet its effectiveness has been questioned, it has at times been poorly understood by other mine action practitioners and only rarely has it been well integrated within demining programmes. It is defined as: *"educational* *activities which seek to reduce the risk of physical injury from mines /UXO by raising awareness and promoting behavioural change, including public information dissemination, education and training, and community mine action liaison."*[1]

MRE is deemed an activity in support of mine (and UXO) risk reduction. Risk reduction is defined by the IMAS as:

> *"Those actions which lessen the probability and/or severity of physical injury to people, property or the environment … Mine risk reduction can be achieved by physical measures such as clearance, fencing or marking, or through behavioural changes brought about by MRE."*[2]

Another common characteristic is that during the 1990s MRE has typically been a "catch-all" term for activities consisting of many different "deliverables". What these activities have in common is the promotion and dissemination of safety messages to perceived "at risk" communities. This process has undergone much refinement during the 1990s as implementing organisations have developed a clearer understanding of the messages to be communicated and improved the methodologies used to do so. Learning, however, has not been uniform.

In general, activities can be divided into three different approaches:

- ***Public awareness***: this covers the use of the mass media, posters, public information campaigns, information dissemination in refugee camps and so on, and is very much a one-way delivery of information, often in emergency situations.
- ***Education***: this is (or should be) a two-way process, whether formal or informal, allowing for the sharing of collective knowledge and building on existing community strengths.
- ***Community liaison:*** this third approach will be discussed later in the chapter.

Helping communities at risk

Communities requiring MRE assistance can be broadly divided into the following three groups:

- those who are ***unaware*** of existence of mines/UXO and their dangers — this group often includes children, or those who have not previously been exposed to conflict;
- those who are aware of what mines are and have some idea as to their danger but do not know how to minimise their exposure to risk — the ***uninformed***; and
- those who are aware of mines and what they can do, have had exposure to information on how to minimise risks, but still practise high risk behaviour — the ***intentional*** risk-takers.

A number of factors affect behaviour other than awareness and knowledge, including economic necessity, social pressures and the personal attitude of those involved. Those in the third group may include resource-poor communities or individuals searching for water or fuel, adolescent boys tending cattle, children tampering with mines through play or as a show of bravado, or people attempting to defuze and remove explosive or metal casing for use/sale.

Experience to date suggests that a well-planned intervention can assist the rapid reduction of risk faced by these first two groups.[3] The provision of detailed and practical information specific to the threat faced in a given area has helped reduce casualty rates — sometimes dramatically (although demonstrating impact is a contentious issue, as discussed below). Relevant information would include identification of mines and UXO, the promotion of safe behaviour (for example information on areas to avoid, and recognition of formal and informal mine marking), advice on what to do if a mine or suspicious item is encountered.

Increasingly, however, MRE practitioners have recognised the shortcomings of such approaches in the case of the third risk-taking group. It has been understood that promoting long-term behavioural change demands more than just the provision of information. There must be a clear understanding as to why risky activities are undertaken before embarking on efforts to reduce the exposure of the target population. As such, these programmes have more in common with HIV/AIDS prevention, anti-smoking and drink-driving campaigns. Such programmes are difficult and require sustained support. Accordingly, they are not necessarily feasible in all circumstances.

Further, some programmes, for example in Bosnia and Herzegovina or Croatia, have sought to target a much wider population than simply those directly affected by landmines or UXO. These programmes seek to inform not only all those who may come into contact with mines, but also key opinion formers who can be used to influence others, such as journalists, celebrities, tourists and the public at large.[4] In general, however, and notwithstanding the basic principles of communication, programmes have tended to target directly only those deemed most at risk.

The rationale for MRE

MRE developed from recognition that UXO and mine clearance, while being the ultimate solution to a community's mine problem, was also slow, expensive and at times simply not possible or appropriate. Clearance was often not feasible in areas of restricted access, ongoing conflict, where there was hostility or suspicion by governing authorities to mine action initiatives, or where a lack of funding resulted in at-risk communities not receiving the priority they deserved.

In this context, it was quickly understood that a number of interventions could be undertaken to reduce a community's exposure to the threat in the short to medium term. These centred on disseminating information to affected communities using different educational and participatory approaches in an attempt to increase knowledge of the dangers of mines and UXO, their typical locations, and showing how exposure to risk can be minimised.

As mine action has matured, changes have been instituted to reflect improved practice regarding prioritisation, coordination, communication and ownership of activities. A trend of the last few years, certainly among the more established organisations, has been an evolution of MRE activities from a narrow educational function towards one of community liaison — seeking to develop information-gathering capacity, to share information with key mine action stakeholders, and to assist in developing a community's sense of ownership of mine action.[5]

In essence, MRE seeks to achieve a reduction in risk-taking behaviour and, hopefully, also in the number of mine and UXO victims. However, it also recognises that risk can be reduced through the use of a "toolbox" approach using a variety of methodologies beyond pure information and education. These include:

- mine marking;
- information sharing on the location and nature of threat in affected areas;
- the identification of key at-risk groups in communities;
- a better understanding of how and why communities are exposed to mines and UXO (e.g. through KAPB [Knowledge, Attitudes, Practices and Belief][6] studies); and
- the development of reporting systems (and crucially demining response mechanisms) and specifically targeted activities in response to the needs of individual communities.

Such a community liaison approach appears to be the way forward for MRE (and is being applied in a growing number of projects and programmes). It is a reflection that education in the traditional sense has often overlooked many of these approaches and has not linked well with clearance organisations — particularly with regard to prioritisation and the sharing of data gathered from communities. However, as of writing too many programmes continue to undertake inappropriate "traditional" programmes of questionable value and impact. Further, concern remains that the IMAS standards for MRE do not adequately capture the complexities of this process.[7]

The "key players"

The early 1990s saw the parallel emergence of MRE programming in a number of countries — the majority of which still remain large programmes today. Most activity and learning as to how MRE should be undertaken emerged from the experience of a few key countries (most prominently, Afghanistan, Angola, Cambodia, northern Iraq and Mozambique) — often with very different mine threats. In only one of these countries (Afghanistan) was the mine action process effectively managed and coordinated by the UN.[8] While there may have been UN presence in mine action elsewhere it was the non-governmental organisations (NGOs) who were in the main responsible for the establishment, design and development of programmes.

Non-governmental organisations

Indeed, as with much of mine action, MRE was pioneered in the 1990s by a small number of NGOs, most of whom developed programmes in parallel to mine and UXO clearance. Among the NGOs involved, Norwegian People's Aid (NPA), Handicap International (HI, both Belgium and France) and Mines Advisory Group (MAG) were the most prominent innovators in this sector.[9]

Other NGOs undertook prominent roles in specific countries — for example, Save the Children US was a prominent partner of the Afghanistan MRE programme from 1996, Save the Children UK gained significant MRE experience in Sri Lanka and Save the Children Sweden (Rädda Barnen) has developed a number of programmes in the Middle East. However, the involvement of other organisations was more the exception than the rule and they rarely developed sectoral expertise in-house.

Of the three main NGOs, MAG pursued the most integrated model, eventually seeking to incorporate MRE and clearance within the same team. Key countries which provided important learning opportunities and thus were crucial to the development of what became MAG's community liaison approach were Angola (1993), Cambodia (1992), northern Iraq (1992) and the Lao People's Democratic Republic (Laos) (1994). These countries, the first in which MAG undertook clearance and MRE activities, provided the opportunity to develop solutions to overcome programming limitations.

Over time, MAG learned that many of the constraints to efficient programming (limited information on the scale and scope of particular threats, poor prioritisation, lack of clarity as to the objective to be achieved in demining a particular area, duplication of visits to particular communities, and inefficient use of often scarce transport resources) were eliminated or reduced by providing their MRE teams with a wider brief — to encompass data gathering and ongoing communication with key community representatives. In Angola, this learning process was supported by the move by clearance personnel from large clearance teams to the creation of small multi-skilled mobile teams, which incorporated a community liaison element.[10]

NPA's MRE programming began in Mozambique in 1993 and in Angola in 1994. In the two countries NPA undertook different educational and information sharing initiatives, although activities increasingly evolved more towards developing the capacity to measure the impact of particular clearance projects on affected communities, and as such focused more on community development and liaison initiatives rather than on MRE in the more traditional sense. More recently, NPA has embarked on an integrated clearance programme in Croatia designed explicitly to include mechanisms for promoting community involvement, communication and ownership issues.

HI France has tended to run separate clearance and MRE programmes — either MRE programmes stand alone in a country where demining is not being undertaken, or parallel programmes are implemented within the same country programme (for example, in Mozambique).

HI began including community liaison teams (CLTs) in its demining programmes from 1996, viewing the work of these teams as a sub-activity of MRE in the larger sense — making the link between demining activities, the community and any externally implemented MRE. CLTs gather information useful for the demining units, inform the community about demining activities and conduct limited mine risk education in communities in close proximity to the demining activity. HI has been responsible for developing training and programme management tools, applied as appropriate both to CLT operations and to its more traditional MRE educational activities.

HI Belgium has likewise undertaken awareness initiatives since 1992 in Afghanistan, Cambodia, Laos and the Democratic Republic of Congo, with their programmes increasingly being considered as an integral part of the mine action process.

For most of the 1990s, and in common with many aid organisations, communication and sharing of best practice between practitioners have not always occurred efficiently or systematically. In part this simply reflects the circumstances of small, overstretched NGOs where time and resources have been at a premium, where communication from conflict-affected countries is difficult, and where budget and time are lacking for the publication and dissemination of "lessons learned" publications. The result is that emphasis tended to focus on today's problems rather than on sharing policies.

While understandable, the predictable outcome has been that many agencies were engaged in "rediscovering the wheel" in parallel and, without a doubt, best practice in MRE was slow to spread as a result. Indeed, for some organisations it was difficult to share best practice between their own programmes in different countries, let alone with external bodies. The inevitable competition between NGOs also may have hindered the sharing of best practice[11] as NGOs — often in competition for funding — sought to protect what they viewed as their competitive advantage.

In recent years, however, this appears to have been changing and a concerted effort has been made to share experience more effectively. For example, HI France has produced and widely shared implementation and good practice guides[12] and HI Belgium has published external evaluations and recommendations for good practice emerging from its Afghanistan and Cambodia programmes. Rädda Barnen has also produced and disseminated a best practice guide for undertaking MRE activities with children[13] and in 2001 organised the first workshop to share and develop best practice in the use of media in MRE.[14]

The International Committee of the Red Cross

The International Committee of the Red Cross (ICRC) first became involved in MRE in the mid-1990s, within the context of its broader efforts to alleviate the suffering caused by war. Field staff, particularly doctors, who were finding themselves treating increasing numbers of mine victims, had been encouraging the organisation's headquarters to consider possible preventive measures for several years. While most of the ICRC's efforts to stem the "epidemic of mine injuries" were directed towards campaigning for a ban on anti-personnel mines, some within the organisation had also recognised the need to undertake MRE in affected countries.

The first full-scale ICRC mine and UXO programme was launched in spring 1996 in Bosnia and Herzegovina and Croatia. Since then, the ICRC has conducted programmes directly, or through national Red Cross/Crescent Societies, in some 20 countries or regions.[15] Initially programmes tended to concentrate on information collection and dissemination, sometimes including statistics on the number of landmine victims. Over time, ICRC has come to regard this aspect of its work as key to planning and implementing more community-based activities that address the specific reasons for risk-taking. Thus, posters and other one-way "small" media have been replaced by more community engagement in the process.

ICRC has also sought to integrate better its MRE campaigns with other mine

The civilian population in Azerbaijan is made awareof the dangers of anti-personnel landmines ©ICRC/B. Heger

action activities.[16] Thus, in Kosovo in February 2000 the ICRC signed an agreement with the Swiss Demining Federation (*Fédération suisse de déminage* — FDS) in which the FDS would respond to the survey, marking and defining requests of communities identified through ICRC MRE activities. The ICRC has stated that it intends to adopt this approach in future programmes.[17]

As of June 2003, however, the ICRC's arrangement with FSD had not been mirrored elsewhere, putting the strategy in doubt. For example, the ICRC programme in Basra, Iraq, in early 2003 would have appeared to have benefited from such clearance support but no plans are currently in place for contracting FSD or any other demining organisation.

In 2005, the ICRC adopted a new, more comprehensive policy on "preventive mine action operations", which includes not only traditional MRE and linkages with demining, but also other relief activities intended to reduce the need for risk-taking among the civilian population.

The military

During the last decade, international military contingents (and sometimes police units) have engaged in MRE presentations in several countries and territories, including Afghanistan, Albania, Bosnia and Herzegovina, Cambodia, Croatia, Kosovo and Iraq. In addition, members of national military units have undertaken MRE in Lebanon, Nicaragua and Thailand among others.

An additional international actor has been the US. The US Army Engineer School established the Countermine Training Support Center (CTSC) at Fort Leonard Wood, Missouri, in April 1996. One course caters to standard army units and offers a five-day programme of instruction in MRE techniques. The other, which lasts two weeks, is geared to prepare American Special Forces detachments to run a "train-the-trainer" programme in the specific country to which they will be deployed. Both courses are said "*to give US commanders the ability to coordinate more effectively with foreign civilian and military officials and to stress the congruence of US military countermine activities with the mores and customs of civilians*".[18]

Provision of MRE training usually occurs in parallel to national or UN coordinated efforts, outside the coordinated plan. MRE materials and programmes are often designed in the US or a third country and are of questionable relevance. Chris Horwood[19] highlights an example of US Special Forces Psychological Operations staff arriving in Cambodia to undertake MRE training with pre-designed computer-based materials for introduction to Cambodia without field testing or consultation of any kind.

Most agencies recognise that the involvement of the military or police in MRE is undertaken for the best of intentions. Perhaps the argument can be made that in certain countries the military, whether national forces or international peace-keeping contingents, are respected authority figures[20] — particularly to adolescent boys. As such, their word may command more respect and therefore obedience than that of a civilian.

MRE organisations have expressed concern that flawed methodology can, and often does, undermine the message being delivered. For example, situations in which military MRE instructors touch or hold mines during presentations are numerous,[21] and there is also concern that soldiers in full uniform — often armed — do not represent the best role model for impressionable children. Presentations are often one-off deliveries of information with little capacity to establish an ongoing link with that community — or use the contact to develop further intelligence as to the location and impact of mines or UXO on that population. It is partly for these reasons that in 2000 the Kosovo Mine Action Coordination Centre (MACC) attempted to end the Kosovo Protection Force (KFOR) "soldier to child" MRE programme in schools around the province. For it is questionable what added value is provided by military personnel undertaking MRE when there is already sufficient capacity in country.

The United Nations

In 1998 the United Nations adopted a new policy on mine action. The document, entitled *Mine Action and Effective Coordination: the UN Policy*, stated that "*UNICEF, working in collaboration with the UN Mine Action Service, is the UN focal point for MRE. In this capacity it will provide appropriate guidance for all MRE programmes, liaising closely with concerned partners such as OCHA, WFP, UNHCR, WHO and UNDP*".[22] The document also outlined UNICEF responsibilities with regard to advocacy and victim assistance programmes.

In 2000, these responsibilities were formally incorporated into UNICEF's *Core Corporate Commitments in Emergencies*,[23] and during 2001 work began on the UNICEF Mine Action Strategy, which was finally released in March 2003.[24] The goal set for MRE is that "*MRE needs are identified and met in an appropriate, effective and timely manner*", while objectives highlight the need for integration of mine action, the capacity to provide an emergency response and the need to provide technical guidance and the promotion of best practice.[25]

UNICEF had been actively involved in mine action prior to this[26] although quality and capacity has varied substantially between programmes, reflecting the sometimes poor knowledge and interpretation of the organisation's mandate (as well as that of the other key players in mine action).[27] While some interventions have been successful, others have proved problematic. Until recently mine action was not recognised as mainstream programming and was therefore often poorly understood and resourced by country offices — a fact tacitly admitted in the 2002-2005 Mine Action Strategy document.[28]

Furthermore, MRE has tended to be placed within the child protection component of programming. This has often resulted in an over-concentration on programming aimed at children and insufficient attention given to other key at-risk groups.[29] UNICEF's capacity to support or monitor implementation by partners has thereby been impeded.

In common with many MRE programmes much focus has been placed on undertaking direct delivery of MRE at the expense of advocacy, capacity building and support to national governmental or NGO bodies.[30] Often, programmes have focused on the production and distribution of materials rather than quality delivery of MRE programming and have therefore had limited impact. While this is not unique to UNICEF, in common with many agencies and donors it has taken a long time to learn this lesson and move on.

Another reflection from past UNICEF programming is that there has often been insufficient engagement with other key players — UN bodies such as the UN Mine Action Service (UNMAS), the UN Development Programme (UNDP), mine action centres (where these exist), and recognised international players such as ICRC and key NGOs. The experience in Kosovo where the UNICEF country office chose not to fund the post of chief of MRE within the UN's Mine Action Coordination Centre provides a clear example of the problems resulting from a failure to engage at an early stage. The upshot was that UNICEF had far less influence on the evolution of the discipline and MRE was far less integrated with mine action than is desirable.[31]

However, where UNICEF has focused on facilitation and coordination there have been a number of successes. The programmes in Afghanistan, Angola and Cambodia and the emerging programme in Iraq prove examples of good practice and act as something of a template for future programming. Here UNICEF has focused on facilitation rather than implementation since it acted to add value to programming through sharing good practice, monitoring the activities of implementing partners, assisting the creation of long-term programming and building capacity within local structures.

In 2002, UNICEF and the ICBL established a Mine Risk Education Working Group (MREWG), co-convened by both organisations, and made up of NGOs and agencies engaged in MRE. It aims to bring together MRE practitioners to better coordinate activities, share lessons learned, identify field support needs and develop strategies to meet these. The MREWG was involved with the development of the MRE components of the IMAS (*see below*).

Elsewhere within the UN structure, various agencies have touched on the issues of landmines and MRE. For example, the study by Ms Graça Machel for the UN on the impact of armed conflict on children includes a substantial section on the impact of landmines. The study report noted critically that presentations within MRE programmes *"are not as effective as they need to be, making relatively little use of techniques which are interactive … Often mine awareness teams simply enter a community, present information and leave — an approach that does not address the behavioural changes an affected community must make to prevent injury."*[32] This would appear a reasonable criticism and something of a reoccurring theme regarding MRE, as discussed further below.

Two other UN agencies have mandates that impact directly on MRE issues — namely the United Nations Development Programme and the United Nations Mine Action Service — and the United Nations Office for Project Services

(UNOPS) was responsible for MRE in its integrated mine action programme in northern Iraq. UNDP has responsibility for addressing socio-economic consequences of landmine and UXO contamination, as well as for developing and supporting national and local capacity to tackle the impact of mines and UXO in the long term. UNMAS was formed in October 1997 to serve as the UN focal point for mine action. At the global level, it is responsible for coordinating all aspects of mine action within the UN system. At the field level, it is responsible for providing mine action assistance in the context of humanitarian emergencies and peace-keeping operations. As such, the role of UNMAS includes MRE — although recognising that the lead is taken by UNICEF.

It has been argued that given the limitations imposed on UNICEF's MRE function as a result of issues raised above — in particular its country offices' confusion as to the mandate, along with concerns as to UNICEF's capacity to integrate its activities — there is a strong case to be made for promoting either UNDP or UNMAS as the natural home for MRE. In 2005, the waters were somewhat muddied by the adoption of a new UN policy on mine action that foresaw the allocation of responsibility for mine action, including MRE, on a country-by-country basis within the UN Country Team. It remains to be seen whether this will lead to UNICEF's role in MRE becoming practically diluted.

Methodology

This section will focus on MRE methodology and content as it relates to information dissemination and the promotion of behavioural change. It will first review principles and lessons learned during different programming phases and then reflect on global learning and best practice in this regard. This will be followed by an overview of key developments.

MRE during emergency, transition and development

A consensus[33] has emerged as to what can be expected as a reasonable output in terms of MRE, reflecting learning from a variety of programmes during the last decade and more of mine action.[34]

In an emergency characterised by conflict, instability and large-scale population movements, there is general agreement that MRE can typically only hope to communicate basic mine safety messages using mass media techniques[35] — to inform rather than to educate in the wider sense.[36] Information is disseminated in a broad-brush manner, providing basic safety messages and raising "awareness" about the threat (or suspected threat) of mines or UXO. Such programmes, while disseminating information widely, particularly aim to reach most at-risk groups such as refugees or the internally displaced returning to areas of past conflict.

In a post-conflict transitional environment in which peace-keeping or peace-building have provided a greater degree of stability and access, it is now generally recognised that MRE initiatives should evolve further. Stability gives greater access, and thus an ability to better determine the location, scale and nature of the mine/UXO threat. The focus of programming can and should change from a public information approach to one far more focused on community level initiatives, seeking to establish who is most at risk — and why.[37]

In terms of methodology, it is generally agreed among education professionals that participatory methods of learning are more effective than traditional rote learning methods.[38] Too often, MRE programmes have tended to be based on presentations and lectures, in a process that is often disempowering and usually of little educational value,[39] failing thereby to recognise how adults learn, nor taking into account the knowledge and coping skills within the communities forced to live daily with the mine threat. Often the members of these communities possess greater knowledge of mines and their dangers than the self-proclaimed experts instructing them. Community-based participatory MRE events should ideally be undertaken with small groups — possibly disaggregated by age or gender.[40]

MRE professionals have recognised that in many places, mine safety is best achieved through promoting long-term behavioural change. Lessons still need to be drawn from other public health and development education campaigns, such as HIV/AIDS awareness, breastfeeding promotion and anti-smoking initiatives. However, while this view is constantly repeated and reiterated in MRE circles, it is difficult to point to examples of effective campaigns, or indeed many examples of where this approach has been effectively pursued.[41]

Changes are, though, being seen in MRE programming in the development context, where the population has had to live for long periods of time with mines and UXO.[42] Some programmes often no longer demonstrate "traditional" MRE, but rather combine this with a process of information transfer involving a dialogue with the community about not only the landmine threat but also wider developmental problems, and seeking possible solutions to these.[43]

In situations of long-term mine and UXO impact, knowledge of mines and their dangers tends to be high, often learned through bitter experience. Promoting greater mine safety is often therefore a process of ongoing negotiation with communities and in particular with sub-groups within that community who are exposed to particular risk-taking activities. Villagers who have lived with a threat for a long time develop coping mechanisms and try to avoid affected areas as much as they can; in these circumstances, standard MRE messages such as "Don't touch!" are not useful to the community. Accidents occur largely because of intentional risk-taking brought about by survival pressures. The presence of mines further marginalises already impoverished post-conflict communities to the extent that crops have to be sown and gathered and firewood and water collected, even in cases where the only available land is affected by mines or UXO. In effect, activities essential for daily survival overrule the desire to avoid possible death or injury.

In this context messages must evolve from discussions and focus on practical detailed and precise alternatives as a way of promoting the reduction in risk-taking behaviour. A key tool in this regard is community village risk mapping[44] which can also be fed into the mine marking and prioritisation process. In addition, as noted in the Landmine Monitor Report in 2001:

> *"as a result of its community focus, mine awareness/community liaison is also well placed to identify mine survivors who have unmet needs. Although community liaison teams should not necessarily be expected to have technical expertise in mine survivor assistance, sometimes amputees are not aware of the existence of prosthetics clinics, or believe that being fitted with a replacement or even first artificial limb will be prohibitively expensive. In such a case, the simple transfer of information — and possibly the provision of transport — can suffice to make a world of difference to an individual and his/her family."*[45]

Similarly, a broader community liaison approach can include rapid-response "spot" explosive ordnance disposal (EOD) activities. In Cambodia, the focus of MRE is now on risk reduction in the widest sense, with the traditional information-based approach jettisoned in favour of one focusing more on undertaking concrete steps to make a particular area safe through improved marking and removal of known and dangerous ordnance. This approach is aided by the fact that a team may spend many days in a village undertaking UXO removal, proximity clearance, presentations, discussions and mapping.

Messages promoted

Clearly the detail of safety messages promoted over the last decade or more has varied depending on country, context and the nature of the threat — not to mention the quality of the programme itself. No two countries or programmes will (or indeed should) promote the same mix of messages or promote them in the same way, although there is some scope to do so in refugee repatriations, for example, where it may be appropriate for messages promoted in the host country to mirror those of the country of return.[46]

Message promotion has evolved during the 1990s, as MRE staff have learned at least a little from education professionals and public education campaigns. Currently there is general agreement as to the set of messages to be promoted and, increasingly, resource material from which to draw. HI's framework, for example, provides a useful means of breaking down the subject. Commonly, these messages are broken down into the following "message groups":

- how to recognise mines and UXO;
- what effects mines and UXO have, physically, psychologically, socially and economically;
- areas liable to be mined;
- clues indicating possible mines or mined areas;
- signs and markings indicating mine- or UXO-contaminated areas;
- what to do before travelling in unknown (and therefore possibly dangerous) areas;
- what to do when a mine or suspected mine/UXO is encountered; and
- what to do in case of an accident.

While this does not claim to be exclusive or exhaustive it does provide a basic framework for MRE activities, although any actual promotion should be preceded by as thorough and detailed a needs assessment as possible. Many individual agencies have developed their own frameworks and methodologies. While for the more established agencies this will have been developed in-house, increasingly many (particularly the newer) agencies are following the lead developed by UNICEF,[47] the GICHD[48] and (particularly with regard to programming with children) the work of Save the Children Sweden. However, as will be seen below, the key issue to date has not been so much the message itself but the *promotion* of that message that has proved problematic.

A number of messages have, however, generated considerable controversy, perhaps highlighting the need for flexibility in implementation. Minefield extraction has been a particular cause for debate with considerable argument as to the best message to promote — for example, whether someone who finds him- or herself in a minefield should retrace footsteps out of the minefield or stay still and shout for help. Most argue against promoting the retracing of footsteps given the limited conditions in which it is likely that footsteps will be visible, although in some programmes it is recognised that this may be the best of a bad list of options.

Prodding also promotes much debate — most agencies being actively opposed to this message. Nonetheless, it continues to be promoted in certain agencies despite concerns as to the impractical and potentially dangerous nature of this advice — most controversially in the *Landmine and UXO Safety Booklet* produced by UNMAS and CARE.[49] Likewise, advice to mark suspected items has caused debate about balancing the need to not move about unnecessarily (and therefore be exposed to more potential danger) versus the need to mark suspected areas to inform others.

Ultimately, much of this debate has been of limited value. Circumstances vary substantially and it is necessary to remember that MRE is a process of "negotiation" with the affected community. As such, messages must be realistic and credible if they are to be acted on. In circumstances where it is crucial to tailor messages to the needs of one particular community the message promoted will vary depending on circumstance and the current strategies and requirements of that community.

Methodologies and approaches used to date

Despite evidence of some good practice developed during the course of the 1990s, as recently as 2000 concern remained about the pedagogical basis for much of the methodology used to implement MRE projects around the world. The Landmine Monitor Report in 2000 echoed the criticism made by the Machel Report four years earlier, stating that:

> "*Although often advertised as 'community-based', 'participatory', 'interactive', or employing 'child-to-child' techniques, it appears that the typical mine awareness programme relies on one-way presentations and/or mass media to get its message across*."[50]

Such an approach takes little notice of the skills and knowledge already existing in the community, frequently fails to target those most at risk, and is unlikely to have anything other than a negligible long-term impact on casualty rates. This is often linked to poor or non-existent needs assessments and a consequent failure to collect the information required for the elaboration of a comprehensive and targeted communication strategy.[51] One study found that:

> *"without research into the overall situation, the lifestyles and situation of people in mine and UXO affected areas … it is not possible to design an effective mine awareness programme. Lack of this baseline information also makes it impossible to measure the effectiveness of the intervention. The needs assessment and baseline information are the most commonly neglected activities in all … programmes."*[52]

Indeed, needs assessments for emergency and transitional programmes have often been overlooked as MRE organisations are required not simply to respond but to be *seen* to be responding. Undertaking a needs assessment — trying to ascertain exactly what the problem is, where, who is mainly being hurt and why — has often been squeezed out by the demands of donors, governments or peer organisations urging MRE agencies to not just stand there but to "do something", inappropriate as that "something" might be. Once programmes develop they generate their own momentum — and once started can rarely be turned around easily.

This reticence to undertake even "quick and dirty" assessments possibly also reflects insecurities on behalf of MRE field staff, many of whom are comfortable undertaking and delivering programmes but less so with the design and the development stage. Lack of clarity as to what a needs assessment is, and, crucially, how one should be undertaken, along with fear of criticism for the methodology chosen or the analysis developed, may also feed this desire to "do" rather than "analyse". The result is that programmes have poor foundations, often built on assumptions about the threat and the causes of casualties that may not fit with reality — resulting in seriously flawed messages or programming.[53]

Leaflets explaining the dangers of mines were distributed to children in Kosovo.
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This process is often further compounded by the lack of regular community-focused monitoring and systematic evaluations, again often due to similar pressures. Moreover, what monitoring does take place is typically more focused on process than on outcome. Few programmes to date have demonstrated a capacity to monitor whether behavioural change has occurred as a result of MRE programming. Clearly such monitoring is difficult — not least in developing meaningful indicators — and also diverts often scarce resources and management time. However, the almost complete absence of output-oriented evaluations (as opposed to counting internal deliverables) until the last two or three years is of serious concern and reflects poorly on the profession (*see below for further discussion of monitoring and evaluation*).

Much of the MRE resources available during the 1990s and early 2000s have tended to be devoted to the production and dissemination of various communications media, such as television/video, radio, posters, T-shirts, and the like. According to the the Landmine Monitor Report in 2000, as much as US$100,000 was spent on airing MRE messages on Rwandan radio, an astonishing amount in such a small country, particularly given the geographically limited nature of the threat.[54] A similar concern came across in the Landmine Monitor Report in 2001, which commented caustically that:

> "*Carefully assessing available and traditional forms of communication in the target groups will likely prevent a headlong rush to print posters that may communicate little apart from the pride of the donors. Likewise, T-shirts may be effective incentive items for awareness instructors — and the community can always use free clothing — but their pedagogical value is at least debatable*".[55]

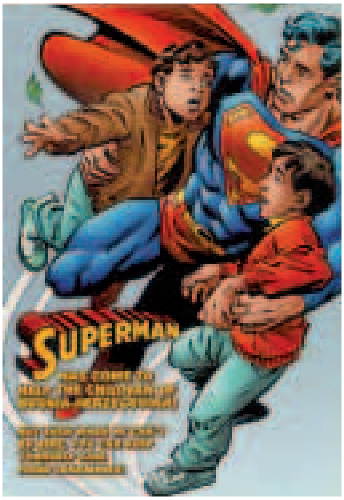
The same report went on to comment:

> "*But whatever the media chosen to deliver the message, certain, underlying principles … should apply. For instance, there appears to be widespread agreement that programmes should resist the temptation to adapt materials from other contexts and in any event not use materials and media that have not been field tested prior to their active deployment*."[56]

Which brings us to the issue of Superman and MRE — an example to many of an inappropriate tool introduced as a result of importing material with little reference to local cultural norms and with little or no field testing. This comic is not the only failure in this regard,[57] however it is one of the most well known (and expensive) and as such provides a useful lesson in programming.

The Superman comic was a joint venture between DC Comics and UNICEF to be disseminated as a tool for MRE. Concerns were widely expressed as to both its technical accuracy and cultural appropriateness. The comic book was used in Guatemala but overall the reaction has been so universally negative that the original version (produced for Bosnia and Herzegovina) was withdrawn from distribution and a Spanish version was not distributed in Colombia nor a Portuguese version planned for Mozambique. Following a detailed evaluation it was, however, used in Kosovo[58] — the evaluation concluding that it was suitable for children in the 10-14 age group but not for 7-9-year-olds, who might infer incorrect and dangerous messages. A controlled reading in a classroom environment in the presence of a teacher was recommended — hardly a cost-effective or realistic approach.

The issue of the Superman comic is not that it was a failure — mistakes are inevitable and as such acceptable (within limits) provided lessons are learned and similar mistakes not repeated. While it is hoped that lessons would have been learned from the Superman experience, remarkably it would appear that the importation of inappropriate methodologies continues. The use of US cultural icons in promoting MRE continues, with USAID funding a series of television public service announcements for Cambodia featuring Bugs Bunny.[59] This raises multiple concerns: about the appropriateness of the media of delivery (TV not being widely accessible in the areas where mines have the greatest impact),[60] about not being a community-based activity and about its use going against the principles highlighted above. As such, it is unlikely this particular initiative will prove effective, while the prognosis



is not good for overruling similar interventions in the future.

Improving communication strategies is clearly an issue that needs greater attention. As observed by one of the few resources available on this topic:[61]

"more than $200 million is spent every year on mine action ... Yet it is difficult to identify any other international humanitarian or development activity which has devoted so little resources or attention to its communication activities, particularly to the critical task ... of changing people's behaviour".

Certainly there are few communication specialists within the field, the result being that the medium of delivery has been inappropriate or blinkered: there has been a heavy dependence on the use of posters and pamphlets, usually heavily text-dependent and therefore requiring a literate audience. Posters are often relatively expensive, have a very short lifespan and often are not easily understood in many cultures. Likewise there have been many cases of radio programmes developed for areas where radio reception is poor and radio ownership low, or broadcast in the wrong dialect. It would appear that for most MRE campaigns insufficient attention has been paid to issues of timing, location, delivery and medium — let alone clarity as to the message needs of the target audience.

One reason put forward in the past for this poor communication performance is the high number of mine action programme personnel, particularly managers, who are recruited from the military — an institution which values discipline, surprise and secrecy over the informality, creativity and interpersonal skills required of a successful communicator. The result is often that MRE communication programmes are not awarded the resources or priority they should receive. Certainly at field level, communication, particularly in relation to MRE messages, is still the poor relation of mine clearance. Few mine action organisation or coordinating bodies have full-time communication staff at field level or coherent communication components in their work plans. This is particularly true of those countries where resources for mine action are scarce but where the need is probably the greatest.

It would appear that MRE programmes generally need to develop greater communication skills and thereby to elaborate much more focused communication objectives. These should be based on a clear understanding of what is needed, where and why, and programmes should also be more skilled in designing messages and appropriate channels for their delivery.

Consistent with a frequent preoccupation to protect children from landmines and UXO, "child-to-child" training entered the MRE lexicon in 1999, with a number of organisations claiming to be incorporating "child-to-child" methodology into their awareness programmes, most notably in Kosovo. In a number of instances, though, it seems that the component was actually little more than peer education — a far cry from the participatory methodology delineated by the Child to Child Trust in London which developed the concept.[62] Yet, in a context where teaching is typically authoritarian and learning is by rote, child-to-child techniques can be liberating and empowering both for the children and for their teachers. There is some anecdotal evidence to suggest that this approach also results in information being shared in the home and as such can and has educated parents via their children.

While this section has served to critique a number of poorly-designed programmes it should also be highlighted that well planned and participatory programmes have been undertaken over the years. These include HI programming in Cambodia, MAG's work in Laos and work being undertaken by NPA in Croatia. The ICRC implements well-thought-out, community-level MRE programmes in Bosnia and Herzegovina, Croatia and Kosovo,[63] among others, each with an integral data-gathering element that assists in the national mine action coordination process. In Kosovo, the communities themselves decide on their local MRE volunteer whose task is to pass on valuable information to the community and also update the regional MRE teams with relevant information on incidents or discoveries of mines or cluster bomblets.

The use of volunteers is often problematic however. While ICRC/Croatian Red Cross have successfully used this approach, it does have shortcomings, usually related to volunteers seeking paid employment elsewhere and therefore not having the time or inclination to continue with a mine action role or seeking payment for their MRE activities. Some MRE programmes have recognised this issue and pay a small stipend to volunteers.[64]

The changing environment, the UN and the growth of the mine action centre

The changing profile of the sector

A clear trend within the MRE sector has been the increase in the number of agencies involved, particularly since the adoption and signature of the Anti-Personnel Mine Ban Convention in 1997.

Understanding has increased among those in the mainstream relief and development sector of the impact mines and UXO play in post-conflict rehabilitation and peace-building. For example, the first mine clearance that took place in Mozambique was at the behest of three British relief agencies,[65] which sought assistance to protect their staff and projects from the threat posed by landmines. Since then, at least one of those agencies has developed a MRE programming capacity of its own.[66] It is clear that NGOs working in an ever more hazardous environment are becoming increasingly aware of mines and UXO and the dangers they represent to their own staff and those sections of the community with whom they work. A number of those organisations — for instance CARE, Save the Children and World Vision — have developed at least a limited in-house capacity to undertake MRE activities.[67]

In addition, the mine action sector has done an effective job in breaking down barriers to understanding the concept of MRE, its role and relevance. In part the MRE sector was cloaked in the black art of mystery and awe that surrounded the clearance side of mine action. Just as clearance is increasingly being seen as simply another form of engineering, so MRE is being seen as community education with a particular focus. In part this process was assisted by the "Diana effect" and the high profile the sector received in the period surrounding the signing of the Convention. More organisations became engaged with the sector, which has brought a greater understanding and willingness to undertake programming.

The increased number of NGOs (and, to a lesser extent, commercial organisations) claiming to have MRE skills and capacity would appear to also be linked to the increased funding made available post-1997. This period saw a proliferation of often small organisations being created, or existing relief or development agencies "adding" an MRE dimension to their work. While many of these organisations are professional this proliferation of organisations has also resulted in a great number of projects of questionable quality. This proliferation has been facilitated by donor ignorance, a limited supply of experienced MRE professionals (resulting in a "gap in the market") and the limited capacity of a new industry to accredit and monitor quality control of mine action agencies. Donor preference for funding their own national agencies has also assisted the formation of new MRE organisations. It would appear that mine clearance also faced similar issues. Funding now appears to be levelling out or possibly even decreasing, although it is not yet clear if the number of MRE NGOs has also reduced, but this seems unlikely at this stage.

An industry database listing all commercial, NGO and other MRE operators does not yet exist. It is not clear how many organisations undertake MRE. However, a brief review of organisations (including local and international NGOs and Red Cross/Crescent societies) that have undertaken MRE programming in recent years would place this figure at between 140-180.[68] This does not include military units which may undertake MRE activities, nor national bodies such as ministries of education in mine-affected countries. However, counting the number of MRE players is of limited value as it does not distinguish between agencies with one small regionalised project and agencies such as the ICRC that are running multiple large-scale programmes. The Landmine Monitor Report in 2002, for example, highlighted seven key agencies,[69] while the previous year's report highlighted eight new players[70] — most of whom were active in Kosovo.

Kosovo as a watershed

Until 1999, as with mine action generally, MRE had been driven by NGOs. The UN role was slowly becoming more influential with the respective agencies slowly finding their way and testing their mandates. The emergency in Kosovo came at a stage when most UN mine action mandates had just become well established and "bedded in". The result was that Kosovo proved to be something of a watershed for MRE, a closing of the gap between NGOs and the UN.

While mine action centres had been in place prior to this, Kosovo was the first example of such a centre actively monitoring the quality of MRE programming, and the first case in which MRE organisations required accreditation[71] if they wished to operate within the UNMACC MRE structure. In part this was a reflection of the sheer number of agencies, many of them new to the field, wishing to involve themselves in MRE programming,[72] which in turn led to concerns as to the quality of programming.

Kosovo also provided the first example where MRE activities have been guided by a mine action coordination body during an emergency start-up phase.[73] Previously, in most large country programmes, while a central authority may have existed its capacity was generally weak.[74] Programming and priorities were determined by operational agencies and little or no quality control capacity was established. Coordination was usually the result of informal meetings of operational bodies, while operations were usually in different geographical areas to minimise confusion. Programme content, methodology, tasking and evaluation likewise were determined by the implementing agency with little involvement of the coordinating body which had no mandate and little capacity to oversee quality control issues.

In Kosovo, the model of coordination was loosely based on that applied to mine clearance. First and foremost, agencies had to be accredited with the MACC to undertake MRE in the province.[75] Second, the MACC developed a reporting system for MRE, which meant visibility of agency activity by location and activity[76] and therefore, by extension, a degree of accountability for their actions. Further, the MACC established a series of guidelines for quality assurance of training in various methodologies and with different target audiences. Agencies not operating within acceptable standards were requested to retrain their staff or to reassess the information they were promoting. Accreditation would be withdrawn until satisfactory changes were made. Finally a series of regular (monthly) centralised MRE meetings and (weekly) regional mine action meetings were organised.

While far from perfect — many developments being introduced in a piecemeal, problem-solving fashion, for example — in the context of MRE activity to date, much of what was undertaken was revolutionary in comparison to how MRE activities were organised and managed elsewhere.

However, while this model did greatly improve coordination within and between MRE organisations there remained a gulf in communication externally — both internal to the sector (i.e. with mine action clearance and victim assistance organisations) and externally (i.e. with non-mine-action relief and rehabilitation agencies). In an attempt to overcome this lack of integration, at least within mine action, the Mine Action Support Team (MAST) concept was developed. This provided the operational link between the two aspects of mine action and is discussed in the following section.

Also, with regard to coordination, the UN was pushing against an open door. In 1998, the three NGOs HI, NPA and MAG had sent a letter to UNMAS outlining a series of common principles indicating what they believed humanitarian mine action should be and how this should be managed. These principles included an agreement to be coordinated within a UN mine action umbrella where such a body existed and functioned effectively.

The issue of accreditation is of interest here. Kosovo was the first time (internationally) MRE agencies required accreditation to work alongside the MACC system. The Kosovo experience seems to have heavily influenced the IMAS MRE standards in this regard — the first draft being developed shortly after the closure of the Kosovo MACC. Requiring accreditation had many advantages — it provided a degree of quality assurance, it ensured standardisation of messages and it promoted some element of accountability.

But Kosovo was very different from most other mine clearance programmes and it is unclear whether the process as envisaged by IMAS can be meaningfully adhered to in future programmes. There is the assumption that the MACC (or equivalent) MRE personnel are in a position to effectively assess what is and is not appropriate, and to effectively monitor delivery. In many countries this will often not be possible due to insecurity, lack of resources or obstructive host governments.

Most programmes require the involvement of a local NGO or government bodies to lead the delivery of MRE. Usually in the initial start-up phase such agencies have little or no capacity to deliver MRE and as such do not have training curricula or proven experience to be assessed. Additionally the mine action centre (or equivalent body) has little sanction — certainly in the short to medium term — to prevent an unaccredited body undertaking MRE. In Kosovo, the MACC had some influence with donors as to how funding should be undertaken, but even this took many months to bed in place while donors demonstrated their capacity to coordinate between themselves.

In most emergency scenarios donor coordination is rare. Once funding has been received there is almost no way in which a mine action centre can prevent an unaccredited programme of MRE from being implemented regardless of its quality — thus undermining the credibility of the whole process. This lack of sanction may prove a debilitating stumbling block to effective accreditation in MRE programmes elsewhere.

MRE in Kosovo — both implementation and management — was far from perfect but it was a significant advance in terms of coordination and the mainstreaming of an alternative MRE model. The hothouse environment (and, crucially, the availability of funding) appears to have acted as something of a catalyst for many players, leading to changes in content and methodology of operations. The decision by the ICRC to contract their own clearance capacity is an example of a radical rethink in terms of programme direction.

Additionally, the MACC was limited by a shortage of resources and this impacted on the MRE and public information component.[77] The structure described also took time to establish, a fact noted by the 2002 external evaluation of the mine action programme[78] which concluded that:

> "*the mine awareness lessons learned over the past ten years still primarily rest with various pioneering NGOs... [T]he MACC was not in a position to lead from day one as there was no mine awareness experience represented within the MACC. NGOs such as the Mines Advisory Group, Handicap International and the ICRC introduced their own community-based approaches, grounded in years of experience. These approaches were then*

adopted by the MACC and embodied in the mine action support team (MAST) concept."

Integration

As highlighted by the Kosovo example, a trend to emerge strongly in recent years has been the promotion of the desire for integration[79] — a feature noted by the Landmine Monitor Report in 2002,[80] although sometimes this has been more wishful thinking than reality. Mine action is fragmented. It is rare to find organisations that span two, let alone all five of the pillars of mine action.[81] Despite or because of this, integration has been promoted as the way forward for effective and efficient mine action.

Key documents highlighting the desire for integration include the UNICEF *Mine Action Strategy 2002-2005*,[82] the UN document *Mine action and effective coordination: the UN policy*,[83] the Bad Honnef framework[84] and the ICRC document *Towards Safer Villages*.[85] Yet, with few exceptions and for much of the period under review, MRE has been poorly integrated with operational clearance bodies. Much lip service has been paid to the important role played by MRE, although a cynic might view this as a fear of being politically incorrect or swimming against the prevailing political and funding current, rather than a true belief in the added value provided by an effective MRE programme. What is also true is that MRE practitioners have not successfully promoted the advantages of integrated programming to those involved in the management of mine action programmes (themselves usually from a clearance background) nor to those undertaking mine /UXO clearance activities.

Integration does not necessarily mean combining all activities within one agency, but rather integrating activities to ensure a seamless service delivery. On the issues of risk reduction, community liaison, communication and mine clearance outreach, however, there are strong managerial arguments in favour of this being done in-house by clearance agencies, ensuring an MRE component to their work.[86]

It is important to highlight that despite the calls for integration emanating from key documents, not all agencies agree with the current push for improved integration, while others do not feel that MRE should receive such a high priority. For example, to the contrary it has been stated that integrated development

> "*is a concept that has been played with in the development world for about 30 to 40 years. It is rather long of tooth. Many of the NGOs have taken on this integrated approach as a sort of mantra. There are better and more proven approaches. Trying to integrate all aspects under one organization just can't happen, and, if it does, it is under extraordinarily high cost. We [RONCO] found, as an institution and myself as an individual, that comments about integrated mine action are suspect*."[87]

Meanwhile the HALO Trust, a prominent British clearance NGO, has pointedly not engaged itself in MRE for much of its existence,[88] while others have gone as far as accusing MRE programmes of being inappropriate, wasteful, paternalistic and often culturally insensitive.[89] Rae McGrath for instance has written that

> *"[MRE] programmes on the scale and in the format presently employed [1999] by many organisations are a damaging misuse of funds that would be put to better use surveying, marking and clearing minefields."*[90]

He adds that:

> *"The problem has not merely arisen because donors are willing to fund these programmes, but because they provide an opportunity for many organisations and individuals, with none of the engineering skills necessary to respond directly to landmines, to be involved in one of the major issues of our time."*[91]

While it would seem that opinion as strong as this is unusual, UNICEF in particular has been singled out for criticism, including questions about whether it is the most effective or logical home for mine action within the UN family.[92] However, it should be noted that, despite his stinging criticism of MRE, Rae McGrath also states that many of these problems stem from MRE programmes working in parallel with clearance, rather than in an integrated manner. It is this issue of integration, referred to as community liaison, and enclosed within MRE terminology, that will be investigated further in the next section.

Community liaison

Integration, ownership and communication

In general, MRE is practised by two types of organisation:

- specialised mine clearance organisations[93] or those development NGOs that have a mine clearance capacity; and
- awareness organisations not linked to clearance activity but which undertake programming as a result of experience and specialisation in fields such as education, protection or similar sectoral interventions.

This distinction has been crucial to the way in which MRE has developed, impacting as it does on organisational values, culture and development potential. A further feature of the MRE sector is that the number of organisations practising MRE is increasing and, within the MRE field, there are a great many more "stand alone" MRE organisations than there are MRE agencies linked to clearance. This section will highlight and further unpick the developments that have lead to the rebranding and retooling of the sector.

A common experience of mine clearance teams has been frustration or miscommunication in dealings with the population near to areas being demined. Examples of these frustrations include:

- the theft or disappearance of minefield marking material — resulting in delay and possibly danger to clearance teams;
- local herders or farmers crossing land being cleared, resulting in delay and possibly danger to deminers;
- a community's seeming "refusal" to use land once cleared;

- a community complaining that the "wrong" area has been prioritised for clearance from their point of view:
- staff of clearance agencies being made to feel unwelcome, or treated with suspicion; and
- a great deal of time and resources spent clearing suspect areas which later are found not to contain mines or UXO.

Meanwhile communities have often claimed that they are:

- not informed what is going on, who the deminers are working for, who is in charge and why they are there;
- not consulted about when is a convenient time of year for clearance to start so as not to clash with seasonal use of land;
- often not informed of when clearance is completed, or where clearance has been suspended due to seasonal factors; and
- not clear how land for clearance has been prioritised.

Communication has clearly been a problem during mine action and what has become known as community liaison has developed in part to overcome this. Improved communication has allowed mine clearance teams to work far more efficiently due to better cooperation and intelligence from local communities, while providing those communities with a far greater sense of ownership and understanding as to what is being done, for whom, for how long and why. The impact of this approach has been noted:

> "*… agencies that systematically build an understanding of the communities within which they work, and who build strong relationships with those communities, are capable of triggering change…*
> *In other words, the extent to which an intervention will have an impact is not only a reflection of the inherent impact of landmine removal (i.e. accident reduction), but* <u>*is also dependent on the manner in which the intervention is conducted*</u>*.*"[94]

This reflects another aspect of community liaison: the role it can play in contributing to priority-setting. In most mine action programmes the lack of community-originated socio-economic data hampers all stages of operations from planning through to operations. In many, if not most countries, priority setting, and often clearance, has been initiated prior to the completion of a detailed countrywide (or affected area) landmine impact survey. Community liaison activities can and have provided an alternative means for prioritising activity.[95]

Pioneered by MAG as part of the Mine Action Team (MAT) concept[96] and first formally undertaken in Luena, Angola, in April 1996, community liaison has since been developed further by a number of organisations.[97] The concept recognises that those best equipped with skills to regularly maintain contact with communities and to develop a relationship of trust and mutual respect were often staff involved in MRE programming, who are typically (or should be) trained educators.

In essence the community liaison function is a three-stage process as set out in the text box below.

In essence, therefore, community liaison staff provide assistance to two distinct "customer groups": clearance personnel and those living on or near land being cleared. The needs of community and clearance customers have proved to be very different depending on location and the nature of the mine/UXO threat.[98] Determining the needs of each customer, working to ensure these needs are met and regularly revisiting these requirements are the basic building blocks of a community liaison function.

Box 1. Community liaison: a three-stage process

1. Pre-clearance activities

- information gathering to prioritise activities, gathered from e.g. regional authorities, hospitals, the government, the military, NGOs;
- detailed work with representatives of all sectors of the community gathering information on the specific nature of the threat; and
- developing a clear understanding of existing socio-economic conditions in communities prior to organisational involvement (with a view to measuring change) and access to land, health care, education, grazing, water, firewood, etc.

All the above information is fed back to clearance teams to assist with prioritisation/tasking etc.

2. During clearance

(including preparation and detailed planning phase immediately prior to clearance commencing)

- agreeing with the community details of the work: where this will start, what it will involve, how long it is likely to take and how the community can assist;
- providing updates and feedback on the progress of the clearance programme with adjusted timeframes;
- actively involving the community in maintaining minefield marking signs, and control of children and animals in and around minefield areas; and
- close liaison with relevant stakeholders on progress with the various organisations and bodies involved.

If required, provide MRE, targeted at the most appropriate/vulnerable sectors of the community.

3. Post-clearance activities

- handing over land to communities indicating where it has been cleared, and areas that still possibly present dangers;
- evaluation of work undertaken, with a view to providing feedback for future programmes to improve impact;
- linking the community to organisations providing post-clearance support, including assistance with the rehabilitation of resources/infrastructure in whatever form appropriate; and
- returning to communities periodically to assess land use, and update basic socio-economic data to assist understanding of the impact of clearance.

Two examples of the community liaison approach are highlighted in Boxes 2 and 3. The first example is that of Kosovo where the MAST concept was introduced primarily (but not exclusively) in support of clearance organisations in an attempt to improve the management of the mine action process.[99] Here the MACC borrowed the community liaison concept and shaped it to the realities of the local mine/UXO threat. The final shape also reflected the function gaps of existing mine action players where problems of prioritisation and post-clearance handover resulted in each clearance body being provided with a MAST from a MRE organisation to provide the "before", "during" and "after" service.

Box 2. The Kosovo Mine Action Support Team (MAST) concept

The Kosovo model emerged over time when it became clear that mine clearance and mine awareness were operating in isolation of one another with extremely limited communication between the two. In one instance, a mine clearance organisation had completed a technical survey on an area, no mines were found and the area was certified clear. Some months later, however, the community was still under the impression that there was a mine threat in the area and the deminers were coming back. The area had been visited several times by independent mine awareness agencies also unaware the area was safe.

Accordingly, in 2000, guidelines were set out for the establishment of a (MAST for each mine or battle area clearance organisation. MRE agencies were tasked to provide support to every clearance organisation where an integral mine awareness capacity did not already exist. To formalise the arrangements and to ensure all participants were aware of the degree of importance the MACC placed on this concept, completed mine awareness arrangements were included as part of the quality assurance and certification process of completed clearance tasks.

The MASTs were tasked to support clearance before, during and after operations through communication and facilitation between community and clearance organisation. These included who would be working, where, why, for how long and on what particular threat. It also included negotiating special needs, such as access to vehicle tracks during working hours for quick casualty evacuation, negotiating animal access routes to cross certain areas, and respecting farmers' property while working in the area. Deliberate efforts were made to discuss with the community exactly what mine threat they faced and what was going to be done about it.

The UNMAS/Praxis Group (2001) evaluation of the mine action programme highlighted the success of the concept from an operational point of view. However no evaluation was made to determine the view of clearance and mine awareness agencies, or affected communities as to the success of this approach. Anecdotal evidence, however, suggests general satisfaction from clearance agencies regarding an improved operating environment.

The example from Cambodia (*Box 3*) highlights the introduction of the community liaison approach chiefly in support of communities as the primary customer group. Recognition that the current system was failing mine-affected communities led to a fundamental review of how MRE was undertaken. This has sought to reduce the number of civilians falling victim to landmines each year.

Each example highlights how community liaison combined with the principles of MRE can and has resulted in a far more efficient programme, and a far more effective service to those mine action seeks to assist.

Box 3. Cambodian Mine Action Centre/Handicap International Belgium-trained mine risk reduction teams

Following the end of the conflict in Cambodia, the total number of landmine and UXO casualties decreased significantly. Despite this, there had been no dramatic reduction in the numbers of civilian casualties since 1982 — this figure remaining at a level higher than that recorded in 1981 and at comparable levels for the years 1986 to 1991. This situation appeared to indicate that the greatest contributing factor in the overall reduction of casualties recorded since 1998 had been the significant decrease in military casualties since the end of fighting. Unfortunately, the impact of mines on the civilian population has not decreased to the same effect.

Through investigating this anomaly Handicap International Belgium came to the conclusion that the general organisation of mine action was not conducive to the reduction of risk to communities. Principally, this was due to the large size of Cambodian Mine Action Centre (CMAC) mine action teams and their lack of mobility, and, perhaps more importantly, the lack of meaningful community involvement in the approach being taken. In addition, available data on mine and UXO victims was generally poorly used and was not adequately integrated in the planning of mine action interventions. Consequently, the capacity of clearance teams to react following an accident and to render safe affected areas was often inadequate. Moreover, even when information was used, the capacity to react was slow due to a need to modify existing mine clearance resources. In the opinion of HI, there was a need to ensure direct links between communities and mine action practitioners and to directly target initiatives towards at-risk communities.

In 2002, HI, in collaboration with CMAC, organised the training and the deployment of multi-skilled mine risk reduction teams in order to more effectively prevent accidents and reduce the risk faced by communities. These teams would undertake the following activities:

1. **Community liaison**, to identify the exact nature of the problem facing particular communities and their needs in terms of mine action.
2. **Proximity landmine clearance**, to open up paths and access routes for communities who are forced to enter dangerous areas to ensure their livelihood, or otherwise conduct clearance on medium-scale tasks posing an immediate threat.
3. The **destruction of UXO**, to destroy unexploded bombs, especially spot UXO, in areas where children are identified as being at high risk of playing with such devices.
4. **Minefield survey and long-term marking** of minefields, to warn people of hazardous areas and support larger scale clearance.
5. The **provision of mine and UXO awareness messages** for affected communities, where the problem is identified as a lack of knowledge — particularly in the case of children — to prevent casualties and teach safe behaviour.

While it is still early days, initial indications are that the teams are having a successful impact. This represents a considerable advance on the process previously used and may have a significant impact on the implementation of future integrated programming in the region.

The activities undertaken by the community liaison process are clearly crucial to the effective implementation of all clearance programmes. Often, however, this function has not been undertaken — a crucial obstacle to effective mine clearance. As has been highlighted above, mine clearance undertaken with a poor prioritisation process, limited intelligence as to the scale and nature of the threat and a limited understanding of perceived need will be at best wasteful, and at worst dangerous for those involved in clearance activity.

Community liaison

Increasingly it is being recognised that the community liaison approach is the way forward for MRE operatives. For example, the Landmine Monitor Report in 2000 stated that:

> "*As the mine action community begins to recognise the role of socio-economic data and analysis in planning mine action programmes, it is clear that mine awareness should be looking to exploit its comparative advantages. In its capacity as a community-level initiative, mine awareness should, in theory at least, generate a large amount of precious quantitative and qualitative data that can help to prioritise mine clearance and marking, identify unfulfilled needs for mine victim assistance and provide information in support of the prohibition of anti-personnel mines and its implementation*."[100]

Likewise, the new IMAS standards on MRE highlight the importance of this aspect of the work. There is an interesting issue here, however. The past ten years or more of mine action have shown that the majority of national mine action coordinating bodies, whether independent mine action centres or national government entities, have tended to view MRE as a peripheral and poorly understood function that requires specialist educationalist input and as a result,

> "*mine awareness is placed to the side so the other mine action initiatives can proceed unhindered. This is often done because the mine action coordinating body does not feel qualified or prepared to engage in such a specialised endeavour: unfortunately, to leave the pursuit to others has only reinforced its exclusion*."[101]

Box 1 above outlined the functions of community liaison. While it is true that the skills profile required for community liaison activities tends to mirror that of "classical" MRE, it does *not necessarily* require staff previously recruited for MRE to undertake the community liaison function. Indeed, a skilled community educator or public health official with no training in MRE is likely to be able to undertake all but one of the 12 activities listed. The point is that because MRE existed before community liaison the assumption often made is that staff from (what used to be termed) MRE should now undertake the community liaison activities. This does not necessarily need to be the case; indeed this may actually damage the wider understanding of community liaison among clearance practitioners and mine action managers.

The concern is that as long as it is MRE staff who undertake community liaison, the many activities that this role fulfils will continue to be misunderstood and downgraded by the many clearance-focused personnel who fail to engage with MRE.[102] If staff were recruited for the liaison function, but tasked and managed by the same operations cell that tasks clearance operations, it is likely that benefits to clearance would be far more visible and quickly recognised.[103]

An argument could therefore be made for the separation of community liaison teams and stand-alone MRE teams, with MRE teams only undertaking public awareness campaigns, educational approaches (for example overseeing national or sub-national level educational activities, media campaigns and curriculum development), or community-based activities with communities ***only in areas where mine clearance is not being undertaken***. Such situations may include working with refugee groups in preparation for return, or with communities in mine-contaminated areas that do not have an ongoing clearance programme.

However, in communities where mine clearance is being undertaken the focus should be on MRE through community liaison, preferably integrated into the clearance agency, managed and tasked as part of the clearance operation. While this function could be undertaken by a separate team from another agency (as was done in Kosovo), the process would be far smoother if such teams consisted of personnel from the clearance agency concerned.

It is recognised in management journals that in-house operations usually aid communication (both formal and informal), ensure a more efficient use of resources and tend to remove issues of conflicting organisational priorities — while also increasing accountability and transparency. Relying on contracted-in assistance (the approach used by many clearance agencies in Kosovo) usually proves less efficient since shortfalls reported by community liaison teams can be seen as an “attack” on the clearance organisation, responsibility for problems is denied and more time is required to correct operational procedures.

If such an in-house set-up is not possible then there is a need for MRE practitioners to be far more proactive in explaining the community liaison process and the benefits that can be derived by clearance personnel. Likewise, clearance managers need to “sell” the process more effectively to their staff. Community liaison staff need to remember that the mine clearance organisation is a customer and must be treated as such. In many programmes, MRE staff bristle at the thought of being managed by, and accountable to, clearance organisations. However, ultimately, where clearance is being undertaken, community liaison teams are there to “grease the wheels” and ensure activities are undertaken as smoothly as possible. Where friction exists (with either the community or the clearance personnel) the role of community liaison personnel is to resolve this. If community liaison personnel are perceived as adding little to the clearance process it is their responsibility to disprove this through quality work .

Conclusions

The MRE sector has slowly begun to professionalise — a process marked by the development of guidelines, the introduction of training protocols and the current development of IMAS standards incorporating MRE. Having said that, given the size of the MRE industry, there has been a relative dearth of quality information for training and programme management. The recent development of IMAS Best Practice Guidebooks by UNICEF in partnership with the GICHD should help to fill at least some of the gaps.

Indeed, by far the most potentially important development of recent years has been the development of the International Mine Action Standards for MRE. These standards are intended to replace the existing UN guidelines and include standards on data gathering, accreditation, programme planning, implementation, management, training, monitoring and evaluation. The MRE standards were formally adopted in June 2004.

The standards are welcomed in that for the first time a generally supported definition of MRE — what it is and what it is not — is codified in the document. This alone is no small feat — and while no doubt there will be those who feel it can be improved, by clearly highlighting the public education component and the community liaison function in unambiguous terms it is extremely useful. How quickly the standards will impact on practice in MRE organisations, though, will depend to a large extent on how aware the operators are of the standards and their implications.

Yet, given the amount of funding made available to MRE programmes, it is extremely surprising that donors have not been more insistent on being shown substantive proof of efficacy. To date, operational efficiency and effectiveness have largely been evidenced by questionable indicators such as the counting of outputs — a particular favourite being the quantity of posters printed and the number of individuals "briefed" or "reached".

For, as has been noted in recent years,[104] factors such as mine clearance and population movements may be responsible for a reduction in mine and UXO casualties with no input from MRE programming. Similarly, MRE may result in increases in casualties, or at least an increase in reported casualties, as systems are put in place for recording these. In the same way as mine clearance is seeking to look beyond simple quantitative measurements of progress (such as numbers of mines and quantities of square metres of land cleared) to assess the social and economic impact of its work on communities, so MRE evaluations must seek to judge success on the basis of more representative proxy indicators.

So, in seeking to coordinate and integrate with other mine action and development interventions, MRE must also work harder to demonstrate its effectiveness (and efficiency) as a means of reducing casualties. It can be argued that one reason for the lack of respect at times shown for the profession is that the sector has poorly marketed itself, including its relevance and proof that it works. MRE, and for that matter the clearance side of mine action as well, has been guilty of assuming funding will remain available, and that it was more important to deliver rather than waste time in retrospective measurement activity. This view was convenient in that it allowed for focusing on the delivery rather than on the search for evidence of behaviour change among the target group. It also reflected a naivety that funding would continue. As the funding environment has become more formalised, so MRE organisations have realised this is no longer the case and increasingly, organisations are undertaking more meaningful evaluations of their work.

In addition, mine action, including MRE, must improve its accountability to the communities it serves. Completed general surveys, detailed maps of contaminated, suspected and known cleared areas, clearance reports, etc., are rarely shared with communities. Where such material exists, MRE organisations should be tasked with ensuring its regular effective dissemination. In communities where mine clearance is being undertaken the focus should be on MRE through the community liaison approach (preferably integrated into the clearance agency), managed and tasked as part of the clearance operation.

MRE in Cambodia ©ICBL

Endnotes

1. *IMAS 07.11 — Guide for the Management of MRE*.
2. *Ibid*.
3. Such groups often comprise returning refugees, nomadic groups and internally displaced civilian populations and have been effectively targeted in Afghanistan, Kosovo and the North Caucasus.
4. GICHD (2002c).
5. This approach was developed by key non-governmental organisations, especially the Mines Advisory Group, and developed further into the mine action support team (MAST) concept used in Kosovo.
6. Knowledge, attitudes, practice and behaviour (with regard to mines and UXO).
7. *IMAS 12.10—Planning for mine risk education programmes and projects.*
8. While coordinating bodies such as the CMAC and UXO LAO existed from the early to mid 1990s, CMAC (rightly or wrongly) has never actively managed all mine action players in the country. In Laos, UXO LAO was not effectively established until late 1997 (and did not actively manage clearance and awareness until approximately 1998/99), nearly three years after the first clearance organisation began its activities.
9. According to the Landmine Monitor Report for 2000 (ICBL, 2000).
10. The Mine Action Team (MAT) was a small mobile unit of 12-14 multi-skilled personnel combining demining, mine awareness, EOD and medical skills.
11. This was usually more prevalent at headquarters rather than field level. For example, senior MAG management appear to have been somewhat territorial about "their" community liaison concept — on the one hand, sensing that it was the most appropriate approach, on the other, fearing the implications of this approach being pursued more widely within the mine action world.
12. Handicap International (2001).
13. Rädda Barnen (2000).
14. International Workshop on the Design of Materials, Resources and Other Media in Mine Awareness programmes organised by Rädda Barnen in Aden, Yemen, 19-22 February 2001.
15. Afghanistan, Albania, Bosnia and Herzegovina, Croatia, Ethiopia, Iraq, Lebanon, the former Yugoslav Republic of Macedonia, Nicaragua, the Occupied Territories, Peru, southern Serbia, Tajikistan, the northern Caucasus and the regions of Kosovo and Nagorno-Karabakh.
16. ICRC (2002: 8).
17. *Ibid*., p. 9. This approach contrasts with the more typical situation where organisations focused primarily on clearance have developed a secondary awareness/MRE capacity.
18. As reported in an interview with the Director, Countermine Training Support Center, in *maic.jmu.edu/journal/2.2/profiles/counter.htm*.
19. Horwood (2000: 31).
20. For example, in Croatia the military are viewed with great respect by the (Croat) civilian population while in Kosovo NATO forces were widely trusted and respected by most of the population.
21. For example, on BBC World News on 21 May 2003 during a report on British troops in Basra, Iraq. Best practice dictates that dummy mines are never handled, but, if used at all, are stored in glass or wooden display cases.
22. United Nations (2001b).
23. E/ICEF/2000/12.

24. UNICEF (2003a).
25. *Ibid*.: 9.
26. Some examples of early engagement in MRE include El Salvador (from 1993), Angola (1994 onwards), Cambodia (from 1994) and Somalia (1993 onwards). UNICEF also conducted MRE with refugees in camps in different areas linking, on occasions, with UNESCO, UNHCR and NGOs.
27. As evidenced by UNICEF (2001).
28. As evidenced, for example, by the need for the section entitled "mainstreaming mine action in UNICEF" (UNICEF, 2003a:11).
29. In Croatia, for instance, considerable funding has been directed to conducting mine awareness in schools even though no children were killed by mines in 1999 and only three out of the total of fifty-one victims (i.e. killed and injured) were children. A similar focus existed in Laos and Viet Nam, despite available data demonstrating that other target groups were far more in need of preventive education.
30. For example the Bosnia programme was criticised in the document *Overview of the status of mine awareness implementation* (Sarajevo, June 2001) for failing to engage with the MACs, building long-term capacity or providing an effective facilitation and leadership role.
31. The Praxis Group (2002: 11).
32. UNICEF (1996). The document was also known as the Machel Study after its author, Graça Machel, the expert to the UN Secretary-General on children and armed conflict.
33. Aided in great part by the International Workshop on the Design of Materials, Resources and Other Media in Mine Awareness Programs, Aden, Yemen, 21 February 2001 organised by Rädda Barnen.
34. See for example "An analytical review of the state of mine awareness" in ICBL (2001).
35. Thus, for example, the ICRC reports that in Kisangani, in the east of the Democratic Republic of Congo, when civilians returned home after the fighting between Rwanda and Uganda abated, an emergency information campaign was launched through the local radio to inform the population of the dangers posed by UXO and mines laid by the parties to the conflict. See Desvignes (2000: 8).
36. See for instance *Summary Report of the International Workshop on the Design of Materials, Resources and Other Media in Mine Awareness Programs*, Rädda Barnen, Beirut, May 2001, point 6.
37. See Desvignes (2000: 7).
38. Consensus emerging from the International Workshop on the Design of Materials, Resources and Other Media in Mine Awareness Programs, Aden, Yemen, 21 February 2001.
39. Particularly if, as in one case viewed by the author, presentations are made to a group of over 300 using a badly distorted PA system and in a language not understood by most of those present.
40. A good example of a mine awareness activity that could rightly claim to be "participatory" is the ICRC-sponsored theatre group that has traveled around Kosovo. A former ICRC mine awareness instructor, a professional actor, adapted a version of Little Red Riding Hood, in which the heroine is threatened by mines as well as by the wolf. The target audience of children and their parents has to shout out instructions to Little Red Riding Hood to prevent her being injured. Using professional actors, the play has entertained as well as educated, thus facilitating longer retention of the key messages.
41. See for example ICBL (2001) and Summary Report of the International Workshop

on the Design of Materials, Resources and Other Media in Mine Awareness Programs, Rädda Barnen, Beirut, May 2001, point 5.
42. For example, Cambodia, Laos and Viet Nam as well as certain communities in Angola and Lebanon.
43. For example, the MAG community liaison process in Angola, Cambodia and Laos sought to link communities with non-mine action NGOs who could provide input. This process, while of benefit to the community, also enhanced the credibility of the teams, and hence the messages they promoted.
44. A process whereby community members identify dangerous areas by drawing maps of the village or locality, highlight main resources and routes to these in the area and include the known location of mines and UXO and how these impact on resource use. It is crucial that information is triangulated by using different informant groups since, for example, children have a different focus of activity and world view than adults, while women and men may have differing knowledge and priorities.
45. ICBL (2001).
46. This, for example, would be the preferred option in Zambia where messages promoted should be developed in close cooperation with Angola-based MRE organisations.
47. For example see UNICEF (2000a). UNICEF has also committed itself to producing further guides — see below for more details.
48. Particularly with regard to methodologies and communication strategies. See for example GICHD (2002b).
49. UNMAS (2000).
50. ICBL (2000).
51. For example, see GICHD (2002a), finding 3 of The International Workshop on the Design of Materials, Resources and Other Media in Mine Awareness Programs, held in Aden, Yemen, in February 2001, which concluded among other things that: "*A careful needs assessment should be the basis on which all tools, media and other resources are elaborated. A needs assessment is necessary to determine the nature, extent and perception of a mine/unexploded ordnance problem, the at-risk populations and risk-taking behavior, the existing resources available to address the problem, and the appropriate mine awareness messages and their effective delivery. A mine awareness communication strategy must be underpinned by the findings of the needs assessment and any subsequent information obtained through formative research and ongoing monitoring*". *Summary Report of the International Workshop on the Design of Materials, Resources and Other Media in Mine Awareness Programs*, Rädda Barnen, Beirut, May 2001, point 1.
52. GICHD (2002a: 7).
53. For example, particularly in longer running programmes, messages communicated by MRE organisations often assume those at risk do not know basic safety messages whereas often the reality is that these messages are known but ignored due to a variety of reasons.
54. See "Executive Summary Mine Awareness Methodology" in ICBL (2000).
55. See "An Analytical Review of the State of Mine Awareness" in ICBL (2001).
56. *Ibid*.
57. For example, Save the Children US had to withdraw picture-based materials using a horse/donkey in Afghanistan, an animal not well respected in that culture. No doubt there are many examples of similar problems stemming from poor field testing.
58. 320,000 Superman comic books were distributed according to Buse (2000a).
59. The messages, which feature Bugs Bunny, Daffy and an animated Cambodian landmine survivor named Rith, along with local footage, deliver "*mine risk education*

and (encourage) landmine survivors' social reintegration", according to AFP Washington, 14 May 2003.
60. In remote areas of rural provinces such as Pailin, Banteay Meanchey, Siem Reap and Battambang.
61. GICHD (2002a: 3).
62. Child-to-child programmes that were developed as a more participatory alternative to public health education give children the opportunity to explore subjects without the framework of the traditionally authoritarian and disempowering methods of teaching practiced in many countries around the world. In child-to-child initiatives, the teacher is involved more as a facilitator to guide the learning process than the central fulcrum around whom all wisdom revolves. Training teachers and instructors in these methods is a time-consuming (and therefore expensive) procedure. For details of the Child-to-Child Trust work on landmines see for instance "Land Mine Awareness", an activity sheet available from its offices in London (Child-to-Child Trust, Institute of Education, 20 Bedford Way, London WC1H 0AL, United Kingdom, tel: +44 207 612 6648; fax: +44 207 612 6645; e-mail: c.scotchmer@ioe.ac.uk).
63. According to ICBL (2001).
64. See for example Knudsen (2000: 19).
65. Action Aid, Oxfam and Save the Children UK.
66. Save the Children UK has been operating a mine awareness programme in Jaffna, Sri Lanka, since 1997.
67. While CARE has also been closely involved in the development of training and messages for UN and NGO staff as part of the Landmine Safety project.
68. A cursory review of the Landmine Monitor Report for 2001 indicates at least 143 organisations, NGOs, UN and government bodies involved in mine awareness activities. This is undoubtedly an underestimate of the agencies involved. Some of these will be focused exclusively on mine awareness programmes, while others will offer mine awareness projects as part of a wider programme of activities.
69. UNICEF, the ICRC, Handicap International (France and Belgium), the International Save the Children Alliance (Save the Children Sweden, UK and US), and MAG. In Central America, the Organization of American States (OAS) has been active in a number of affected countries. The report seems to have inadvertently not included NPA, listed as a key agency in the 2001 report.
70. VVAF, AAR Japan, Caritas, Danchurch Aid, HMD response, Intersos, Islamic Relief Worldwide and the Mines Awareness Trust.
71. Accreditation is defined by the draft IMAS standards as being the process "*by which an MRE organisation is formally recognised as competent and able to plan and manage MRE activities safely, effectively and efficiently*".
72. As many as 16 agencies according to ICBL (2000) and (2001).
73. It could be argued that Afghanistan was the first emergency mine action centre. However, the MACA is unique in many ways. Given that this was not established in the country of operation but rather in Pakistan, and that the Afghanistan "emergency" had been ongoing for many years prior to the establishment of MACA in 1990 this will be disregarded.
74. For example BHMAC in Bosnia, CMAC in Cambodia, INOREE in Angola and IND in Mozambique were all very weak bodies with little capacity to actively manage mine awareness activities, while for much of the 1990s no coordination body existed in northern Iraq.
75. Accreditation required presenting to the MACC Public Information Branch (Mine Awareness Section): evidence of a curriculum of training; a suitable training methodology; qualified officers capable of implementing such a programme; an

indication of a monitoring and evaluation plan for the project; and evidence of field-testing of any new material to be used.
76. The database, which, initially at least, was embraced only reluctantly by the mine action community, has since been incorporated into the IMSMA (Information Management System for Mine Action) Mine Awareness Module.
77. For example, there was insufficient funding available to the MACC to recruit a Mine Awareness Officer, meaning all mine awareness functions were undertaken by an overworked Public Information Officer.
78. The Praxis Group (2002).
79. Defined by the Collins English Dictionary as being "*the act of combining or adding parts to make a unified whole*".
80. "*In 2001 and the first half of 2002, two trends became more visible: more standardization of MRE, and increased integration of MRE with other humanitarian mine action programs and activities*." ICBL (2002).
81. As defined by the 1998 document *Mine Action And Effective Coordination: The UN Policy*: mine risk education, advocacy, survey mapping and clearance, and victim assistance. Stockpile destruction was added in 2000.
82. UNICEF (2003a: paras 35 and 37).
83. *Ibid*.: para. 7.
84. GIBL (1999).
85. UNICEF (2003a: 9).
86. See further below.
87. "RONCO Executives Talk About Demining Integration and the IMAS Contract: An Interview with Lawrence Crandall, Stephen Edelmann and A. David Lundberg", *Journal Of Mine Action* (2000), Issue 4.2: 71.
88. Only recently, and seemingly grudgingly, has the HALO Trust begun mine awareness activities (in Kosovo, the Caucasus and Cambodia) — presumably at the behest of donors or mine action centre managers. Their website makes no mention of mine awareness/MRE or the role it plays in assisting clearance. ICBL (2001: 46) describes the organisation prior to 2001 as being "*previously unenthusiastic about mine awareness*".
89. McGrath (2000: 197).
90. *Ibid*.: 193.
91. *Ibid*.
92. *Ibid*.: 197.
93. Although not all specialist mine clearance NGOs undertake mine awareness, for example RONCO does not.
94. Millard and Harpviken (2000).
95. For example, MAG activities in Laos in support of UXO LAO.
96. A Mine Action Team is a small mobile unit of 12-14 multi skilled personnel combining demining, mine awareness, EOD and medical skills.
97. See, for example, Filippino (2000).
98. In one country a major problem for one clearance organisation was that access tracks to clearance sites were often blocked by logging trucks, an issue particularly important in relation to medical evacuation. Mediation from MRE support teams resolved this. Similarly in another country delays to clearance due to the removal of mine markings was overcome once MRE teams explained the importance of these and implications of their removal. The local community responded by nominating a person to ensure markings were left undisturbed and to act as a focal point for discussions with clearance personnel.
99. This is not to say that the needs of local communities were not recognised, but it

would seem that this was not the primary motivating factor for the introduction of the new approach.

100. See: *www.hrw.org/reports/2000/landmines/LMWeb-04.htm#P1346_144841*.

101. Filippino (2000).

102. For example, it would be interesting to know whether this section is actually read by most clearance personnel who pick up this study. Of the 12 thematic papers presented the author believes that the four on victim assistance, advocacy, results and MRE will be the least read by those engaged in clearance activity.

103. Anecdotal evidence suggests this was the case with the MAG programme in Laos. What were termed data gathering teams in effect undertook prioritisation and community interface, tasked by the operations officer, and were well appreciated by the clearance personnel. It was only later that the mine awareness and UXO spot clearance role was added to these teams.

104. See, for example, GICHD (2002d: 82).

6

Assistance to landmine victims

Rachael Mann and Stuart Maslen

Summary

The world has made relatively little headway in improving the provision of assistance to mine and UXO victims, despite it being a "pillar" of mine action. The vast majority of the affected countries have to deal with specific needs of landmine victims while struggling with fundamental challenges of economy, employment, health, education, and basic human rights. The three main issues preventing improved victim assistance in 1999 still pose a challenge today: how to collect and share needed information on victims; how to gain sufficient attention from donors; and how to coordinate victim assistance activities more effectively.

Introduction

Landmines and unexploded ordnance (UXO) have been killing, maiming and injuring soldiers and civilians for many decades. Accordingly, the provision of at least some assistance to the victims of these weapons predates modern mine action[1] and will surely outlast it, because, today, the total elimination of the explosive threat they pose remains a pipe-dream.

Yet, within and outside the mine action community, victim assistance has too often been mired in controversy as conceptual debates have raged about who (if anyone) should be given priority for assistance; and by whom, and how, it should be provided. Thus, despite the promulgation in the past two decades of new international legal obligations to support victim assistance, programmatic interventions at field level have rarely fulfilled the promise or matched the energetic rhetoric of assistance advocates.

This chapter, then, tries to analyse some of the key issues in the provision of assistance to mine and UXO victims. It begins with a summary of the injuries inflicted by mines and UXO and then discusses the estimates of the number of victims worldwide. This first section also includes a discussion of terminology and definition — who are the victims and is that term even appropriate? The second section looks at the needs of victims — what do they require in order to reintegrate effectively into society? The third section considers how far their needs are reflected in accepted norms and standards and to what extent they have been met by existing programmes and service providers. A fourth and final section suggests what more can be done in the future to better address the needs of mine and UXO victims.

Who are the victims?

During armed conflict, most of those killed or injured by landmines are military personnel but, after hostilities cease, civilians form the majority of victims.[2] Civilians at risk are the poorest and most vulnerable members of society, such as subsistence farmers, refugees, children herding animals, nomads and those living on the economic fringes of society.[3] Poverty forces these people to enter known minefields to find food and water, to cut wood and graze animals; these people rely on their physical fitness for survival, and can least afford the care necessary to treat landmine injuries or to lose their livelihoods. In 1991, 27 per cent of patients in the International Committee of the Red Cross (ICRC) surgical database were landmine victims: although the analysis dates back more than a decade, strangely this data set has remained the baseline used ever since.

The injuries inflicted by mines and UXO[4]

Medical experts generally agree that landmines and UXO, in particular buried blast anti-personnel mines, inflict among the worst of all war wounds without necessarily killing their victims. The reason is that these weapons tend to affect the extremities of the body most severely. Originally considered just another conventional weapon,[5] it is now understood that mines inflict a much more severe injury owing to their specific design: "*the result is specific medical needs*".[6] According to Coupland and Korver,[7] "*victims of anti-personnel mines present a recognisable pattern of injury — each pattern carries its own implication for the surgeon, the blood transfusion service and the patients' long-term disability/prognosis*".

The ICRC, which deploys some of the world's leading war surgeons, has discerned three general patterns of mine and UXO injury. Pattern I injury — the most severe — is caused by stepping on a buried anti-personnel mine. In many cases, the amount of explosive contained in the mine is — deliberately — sufficient to maim but not to kill its hapless victim. The blast causes traumatic amputation of the foot or leg with severe injury to the other leg, genitalia and arms. Based on research by the ICRC, it is estimated that roughly one in three mine and UXO victims suffers these Pattern I injuries.[8]

Pattern II injuries are the result of triggering a fragmentation mine, including a bounding or directional fragmentation mine, usually by snapping a tripwire or by being caught in the radius of destruction that results. If the victim is not killed immediately the wounds are similar to those caused by any other fragmentation device, such as a hand grenade or mortar shell; such wounds can affect any part of the body.[9] Depending on how far away the victim was at the time of the explosion, the penetration o fragmentation can be superficial or deep. The ICRC has found that half of all its mine and UXO patients have suffered Pattern II injuries.

Pattern III injuries are caused by accidental detonation of a mine or item of UXO while handling or tampering with it; they are typically seen among deminers, those laying mines or children who play with explosive devices. In the mid-1990s, the ICRC estimated their number at 5 per cent, based on an analysis of its database of patients in some of the hospitals the organisation supports (in the remaining cases, the injuries could not be classified). However, based on injury statistics around the world, in which tampering with UXO makes up a significant minority, and sometimes the majority, of victims, this percentage is probably considerably higher.

The number of victims worldwide

No one knows exactly how many people are killed and injured each year by mines and UXO,[10] nor how many mine and UXO victims there are in the world today (a widely quoted estimate for the total number of living victims is 300,000).[11] In 2003 and through September 2004, the Landmine Monitor Report, the annual report issued by the International Campaign to Ban Landmines, reported new landmine and UXO victims in 66 countries.[12] Landmine Monitor also registered mine vctims in seven areas that it monitors because of a significant landmine problem (Abkhazia, Chechnya, Kosovo, Nagorno-Karabakh, Palestine, Somaliland and Western Sahara).[13] According to the Landmine Monitor: "*While acknowledging that it is not possible to know with absolute certainty, it is now likely that there are between 15,000 and 20,000 new landmine casualties each year*".[14] This figure includes UXO victims and probably those killed or injured by abandoned ordnance — AXO.

Given the global expenditure on mine action — well over one billion dollars since the adoption of the Anti-Personnel Mine Ban Convention in 1997 — this seems a rather meagre decrease from the figures widely quoted in the early— to mid-1990s (typically, 24,000 – 26,000).[15] Although new conflicts — in Cambodia, Chechnya, Kosovo and latterly in Afghanistan and Iraq, have added to the totals, this does suggest that the targeting and effectiveness of clearance and risk education has not been impressive.

Moreover, the original figures were estimates based on rather tenuous extrapolation from data at a hospital in Afghanistan. This was at the height of the refugee return to Afghanistan and Cambodia, which led to extremely high levels of accidents. In Afghanistan, it was claimed that in one district 1.95 per cent of the population were killed and a further 3.5 per cent injured by landmines in a two-year period: one in every 18 persons.[16] In Cambodia, the number of amputees was estimated at 1 in 236 people, an astonishing figure.[17] Indeed, the ICRC's medical staff in the mid-1990s, "*overwhelmed by the ever-increasing number of civilian mine victims they had to treat*", declared that the world was facing an epidemic of landmine injuries. Subsequently, it is believed that the number of new mine victims declined significantly. On the other hand, earlier estimates may have understated the total number of victims, in particular by not fully reporting the victims of UXO.

Although today the quality of victim data is far from ideal, it has certainly improved since the early 1990s, when data reporting — absent the ICRC's hospital database — was notable by its paucity. The Information Management System for Mine Action (IMSMA) can possibly take some of the credit for this, although most should be ascribed to greater interest in the data from concerned organisations and donors. Often, efforts are made to disaggregate victim data by type of munition, age and sex of victim, and sometimes even the activity that led to the accident and the assistance subsequently provided.

In early 2003, the Landmine Monitor identified more than 8,065 new landmine/UXO casualties.[18] This included at least 1,833 children (23 per cent) and 258 women (3 per cent). Less than 14 per cent of reported casualties were identified as military personnel. The Landmine Monitor cautions that the statistics do not take into account the many casualties that are believed to go unreported, as civilians are killed or injured in remote areas away from any form of assistance or means of communication.

Among the most affected countries in 2002 were Afghanistan, with 1,286 victims recorded; Cambodia, with 834 victims recorded (a small increase on the previous year); Colombia, with 530 victims reported, a significant increase (145 per cent) on 2001; Iraq, with 457 victims recorded in the northern governorates; and Angola, with 287 victims recorded. Reliable figures for the whole of Iraq in 2003 are not yet available, but are likely to show a significant increase, based on the conflict in April 2003, which included some new mine-laying, and the resultant abandoned and unexploded ordnance.

The reported casualty rate declined in 2002 from 2001 in the majority of mine-affected countries. Where an increase was reported in 2002 this generally appears to be due to population movements within affected areas (Cambodia), or to a new or expanded conflict (India and the Palestinian Occupied Territories). In other mine-affected countries, the increase appears to be largely the result of improved data collection: Chad, Guinea-Bissau, Iran, Iraq, Jordan, the Republic of Korea, Myanmar, Pakistan and Thailand. In Chechnya and Colombia, all three factors contributed to significantly higher numbers of reported casualties.

The sources used to identify new casualties include databases, government records, hospital records, media reports, surveys, assessments and interviews. According to the Landmine Monitor, the main collectors of victim data are the national mine action centres, the ICRC, the United Nations Children's Fund (UNICEF) and a number of NGOs. The US-based NGOs, Human Rights Watch and Physicians for Human Rights[19] claim that NGOs only started to collect systematic data on mine blast injuries and deaths in 1991. And most of the information gathered at that time was medical or from hospital databases (such as ICRC) and therefore only represents some victims/injuries and not those who did not reach a medical facility.[20]

Definitions and terminology

In ordinary usage, a victim is *"a person … suffering death, injury, ruin, etc., as a result of an event, circumstance, or oppressive or adverse impersonal agency"*.[21] This is a potentially broad definition insofar as the nefarious consequences of mines and UXO can hurt many members of society and in many and varied ways. But instinctively, we feel that the victims of mines and UXO specifically encompass those who are killed or injured by an explosion of such weapons, while accepting that others will be adversely affected by its aftermath.[22] Certainly, as we have already seen, the data collected by the Landmine Monitor focus on these individuals.

This is clearly the case in extant international law. The preamble to the Anti-Personnel Mine Ban Convention recognises the desire of States Parties "*to do their utmost in providing assistance for the care and rehabilitation, including the social and economic reintegration of mine victims*". The Convention requires that each State Party "*in a position to do so shall provide assistance for the care and rehabilitation, and social and economic reintegration, of mine victims...*". Although the term is not defined in the Convention, the *travaux préparatoires* and the scope of the obligation to provide assistance suggest that it applies solely to the individuals hurt by landmines[23] and not more broadly.[24]

The International Mine Action Standards (IMAS) are rather unclear in their definition of the term. The latest version of the *IMAS Glossary* (Second Edition, 1 March 2003) states that a *victim* is *"an individual who has suffered harm as a result of a mine or UXO accident"*.[25] It appears to imply that a *survivor* is a synonym but it also notes, however, that: *"In the context of victim assistance, the term victim may include dependants of a mine casualty, hence having a broader meaning than survivor"*.[26] It is not clear therefore what term is applied to individuals who are killed in a mine or UXO blast.

The ICBL appears to have had a somewhat ambivalent attitude to the ambit of the term. On the one hand, in previous years, its annual report, the *Landmine Monitor*, has referred to victims and casualties interchangeably as those who have been killed or injured by landmines or UXO. Yet, on the other hand, the ICBL Working Group has asserted that landmine victims are *"those who, either individually or collectively, have suffered physical, emotional and psychological injury, economic loss or substantial impairment of their fundamental rights through acts or omissions related to mine utilisation"*.[27]

These are not just semantics, for the scope of the term has significant ramifications for both the needs of "the victims" and the consequent programmatic interventions that are required to address those needs. Describing everyone affected by mines as a victim may be useful for advocacy but it risks diluting the impact of the call for assistance — and the legal obligations that apply.

However, not everyone appreciates the term *victim*. Indeed, the sense of "victimisation", in which the suffering a person has to endure as a result of a mine or UXO blast is prolonged by social stigma and discrimination, has led some organisations — notably the eponymous Landmine Survivors Network — to prefer the term *survivor* for those who are not killed by the blast or its immediate after-effects.[28]

Meeting the assistance needs of mine and UXO victims

Several organisations have attempted to compile a comprehensive set of requirements for the survivors of mine and UXO accidents.[29] According to the IMAS, victim assistance *"refers to all aid, relief, comfort and support provided to victims (including survivors) with the purpose of reducing the immediate and long-term medical and psychological implications of their trauma"*.[30]

The Landmine Monitor[31] has categorised the key components in victim assistance as being the following:

- pre-hospital care (first aid and injury management);
- hospital care (medical care, surgery, pain management);
- rehabilitation (physiotherapy, prosthetic and assistive devices and psychological support);
- socio-economic reintegration (associational skills and vocational training, income generation and sports);
- disability policy and practice (education, public awareness, disability laws); and
- health and social welfare surveillance and research capacities (data collection, processing, analysis and reporting).

Yet, despite some progress, the same challenges to meeting the assistance needs of the victims, as depicted by the ICRC in 1997, still largely remain unaddressed — poor security, lack of access, the paucity of good data, poor coordination, political and administrative constraints, inter-agency rivalry and lack of funding — hindering the provision of assistance. At times, the disconnect between the rhetoric and the reality is enormous: there has been little systematic effort to turn conceptual frameworks into practical improvements in the well-being of mine and UXO survivors. The victim assistance cycle looks good on paper, but it has made scant difference to the majority of those who must live with their injuries each and every day of their lives.

For instance, based on the estimated figure of 300,000 victims worldwide, Jerry White[32] calculated that total assistance for an individual victim would cost US$9,820 annually over a total rehabilitation time of ten years. Holistic victim assistance to such a large and increasing number of victims would work out at US$3 billion. These figures are, however, highly speculative, and even if available would not address some of the underlying problems.

Nonetheless, on the — admittedly heroic — assumption that globally one in three mine and UXO victims is an amputee, as the ICRC found from its analysis of patients in its hospitals, the world may have roughly 100,000 amputees whose disability results from these weapons. These amputees, typically resulting from detonating a blast anti-personnel mine, will require a lifetime of assistance, notably physical rehabilitation (physiotherapy and prosthetic limbs). A number of victims may have lifelong disabilities, such as blindness or irreversible brain damage or mental trauma. For others who have survived a mine or UXO explosion, recovery may be slow, but it may also be complete. Their chances of receiving such assistance are slim to say the least.

First aid

A victim caught in the explosion of a mine or UXO[33] and who survives the initial trauma will need urgent medical attention.[34] The ICRC, which has led the world in the care of mine and UXO victims, has developed straightforward, practical guidelines for the care in the field of the victims of weapons of war.[35] Its basic principle is that first aid is the only appropriate care at the point of wounding and that if any other care is given to the wounded person it will be conditional upon the presence of a health professional with appropriate skills and infrastructure.[36] First aid involves: putting an unconscious wounded person in the recovery position; arresting any haemorrhage; talking to the wounded person; and protecting the wounded person from the environment.

Blood loss — very severe in the case of blast mines — must be stemmed with the application of a firm dressing by direct or indirect pressure. A tourniquet is usually the most practical method, although a compress can also be used. The tourniquet must be released regularly (roughly every 20 minutes) otherwise infection will set in causing a higher amputation than otherwise necessary.

Any fractured limbs should be immobilised, using a rigid or inflated splint (or whatever is available). It is usually necessary (but not always possible given the lack of resources in most mine-affected areas) to insert a drip and give plasma/fluid to compensate for blood loss. Of course, pain should be relieved in the most effective way possible.[37]

The next priority is to get the mine/UXO survivor to a suitably equipped medical facility in the shortest time (and most comfortable way) possible. According to the ICRC,[38] only 25 per cent of mine victims arrive at one of its hospitals within six hours of injury; and 15 per cent travel for more than three days to reach the hospital.

Early evacuation from the battlefield and prompt surgical care is crucial to saving lives and reducing disabilities. According to the Landmine Monitor,[39] emergency care is particularly difficult to provide in heavily-mined areas and evacuation to health centres is often problematic. Military personnel stand a better chance of this than civilians due to the more frequent availability of helicopters, teams with first aid equipment, radios and staff trained to deal with war wounds.[40]

For all victims, there is a need for the basics of care, including a tetanus vaccination, antibiotic prophylaxis and, in the case of chest wounds, a chest drain. On average, blast mine victims need blood transfusions twice as often as people injured by bullets or fragments and the number of units of blood required to operate on patients with mine injuries is between two and six times greater than that needed by other war casualties. Lack of blood is often a problem in severely mine-impacted countries.

Surgical care

As the ICRC has often remarked,[41] surgery for mine injuries can be time-consuming and complex because the equivalent severity and degree of contamination are rarely seen in civilian practice. Few surgeons have experience and skill in dealing with such wounds.

In ICRC hospitals, 82.5 per cent of all amputations were for victims of landmines. The average stay in hospital for mine injuries is 32.2 days in comparison to 18.1 days for a bullet wound. A blast mine injury requires an average of four operations and 3.2 units of blood, whereas a bullet wound requires an average of 1.9 operations and 0.5 units of blood.[42]

Traumatic amputation of the right leg following mine injury. ©ICRC

The cost per patient per day in an ICRC hospital is US$120; therefore, the average medical cost of a landmine patient before they have left hospital is US$3,000-US$4,000 in total. According to one study of Cambodia,[43] 61 per cent of Khmer victims went into debt to pay for their medical attention, although more recent treatment aims to be free. Already in hospital, the process of physical rehabilitation must begin with post-operative physiotherapy.

Physical rehabilitation

Although the perception has sometimes been otherwise, not all mine and UXO victims are amputees. According to the ICRC, roughly one in three of the mine and UXO patients it treats require surgical amputation of one or more limbs. Prostheses and other assistive devices (wheelchairs and crutches, for example) form an important part of these victims' physical rehabilitation and considerable efforts have been put into this area over the past decade. The cost of prostheses and orthotics, however, still represents a hurdle to affected populations in post-conflict societies, despite the attempts of humanitarian organisations to provide a free service to all.

Government rehabilitation services, on the other hand, usually have long waiting lists and require payment, both of which landmine victims can ill afford. An adult's prosthesis needs replacing every three to five years, and a child's every six months or more. For instance, a ten-year-old child will need 25 prostheses in his or her lifetime at an average cost of US$125 per limb, totalling US$3,125 — a luxury for most in developing countries.[44]

ICRC and Ministry of Health Orthopaedic Centre in Tbilisi. ©ICRC/F. Friedel

For reasons of cost and sustainability, prostheses should be able to be maintained and repaired

Rehabilitation centre in Cambodia. ©P. Williams

locally. The ICRC has developed specific and appropriate technologies for local and regional manufacture of prosthetic components using polypropylene (thermoformable plastic) technology, which is light, individually fitted and cheap to repair, transport and recycle. An amputee's first artificial limb is transitional; therefore there is a need for long-term services. Ill-fitting or poorly designed components can cause skin breakdown, infections and the need for further surgery.[45]

But since not all mine and UXO survivors are amputees, the rehabilitation of other injuries must also be addressed. Often in conflict-ridden countries, though, physiotherapy is not widely available or is not of high quality. Assistance for sensory-impaired victims — blind and deaf — also needs to be provided. These services are slow to develop in post-conflict societies, but should form an integral part of health and social services.

Another aspect of physical rehabilitation, which is gradually receiving more attention, is pain management. Phantom limb pain (PLP) is especially debilitating and affects at least 25 per cent of amputees; this can seriously inhibit physical rehabilitation if not treated.[46]

Normal life also includes playing football. ©ICRC/T. Pizer

Psycho-social rehabilitation

Victims of landmines and UXO accidents have not only suffered physical damage but also psychological trauma. The very nature of their injuries means they have to recuperate and readjust to life, possibly without the use of one or more of their limbs or senses. Without sufficient or appropriate support, victims may end up begging to support their families, experience divorce, ostracism or be excluded from schooling. It is important for the affected individual to resume previous activities.

Psychological or psycho-social assistance to victims of severe trauma is largely neglected, especially in post-conflict countries. There are very few, if any state-run rehabilitation facilities in developing countries (at best, some artificial limb-fitting centres). Psycho-social support is rarely a component of government services and the resources for other organisations to provide these services are lacking. Medico International[47] provides some recommendations in regard to victim assistance and economic reintegration

Mine victim begging in the streets in Cambodia. ©ICRC

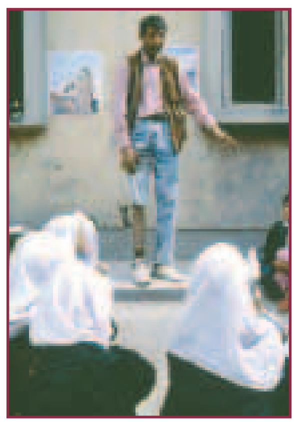
through psycho-social care: listen; assess potentials for change; use best resources available; network and share information; provide specific care; use sport and culture; strengthen local organisations; and promote monitoring of the impact.

One solution widely promoted in remote rural areas is community-based rehabilitation (CBR). Social service providers from non-formal and formal health and social service sectors can provide culturally appropriate support. Survivors can be trained to provide peer support by empathy and attentiveness. Emphasis is placed on the value of interaction with peers, with a focus on emotional healing and, where possible, involvement in recreation activities and the arts.[48]

Social reintegration

Psycho-social rehabilitation and recovery of self-esteem (and confidence) are usually dependent on social reintegration.[49] Unfortunately, these services are not usually available in mine-affected countries, so NGOs implement most of these activities, with the government limited to providing pensions.[50]

Victims find it difficult to get employment, or to continue subsistence farming, or to carry heavy loads and therefore contribute to household income.[51] Most amputees leave the hospital or the prosthetic centre with little or no hope for the future. In Cambodia, for instance, amputees must be protected against discrimination or exploitation; they have no legal protection. Buddhism preaches inner and outer "wholeness" and excludes amputees from becoming monks. Many amputees drift into towns to beg, turn to petty crime or drift into alcoholism.



Being an MRE community facilitator may assist in social reintegration. ©UNICEF/J. Hartley

According to the results of the Standing Committee for Victim Assistance and Socio-Economic Reintegration (SC-VASER)[52] questionnaire, landmine survivors ranked employment and economic reintegration as top priorities (medical care came in sixth position).[53] In Cambodia, 80 per cent of victims have a prosthesis or access to physical rehabilitation and only 20 per cent of victims are in a satisfactory economic situation.

To some extent, employment rates and lack of income may be similar to those of the general population — but persons with disability are put at a further disadvantage. In Kosovo, roughly 80 per cent of those interviewed of employable age are unemployed; this matches the 80 per cent unemployment rate for the province surveyed in Kosovo. However, mine/UXO victims interviewed declare they cannot work because of their disabilities and medical problems and 60 per cent maintain their financial situation has deteriorated since they were injured.[54]

In most mine-affected countries (generally post-conflict), unemployment rates are high due to general economic problems, so instigating equal rights and employment of victims is even more challenging. But, as the ICRC has written,[55] amputees consider that employment in victim assistance services helps to regain their dignity as well as having a positive impact on other amputees and combating social stigma. For example, some of the technicians in ICRC limb-fitting centres are themselves amputees — a positive role model for others and an obvious benefit to themselves and their families.

Programmes for social reintegration of victims aim to improve the economic status of the disabled population through education, economic development of community infrastructure and creation of employment opportunities.[56] The World Rehabilitation Fund (WRF) has compiled a set of guidelines for socio-economic integration of landmine survivors to help them become productive community members and contribute to their families.[57] This is crucial as, in the absence of outside support, in many cases *"a PWD [person with disability] loses his/her status as a 'member of the family' and becomes gradually a 'dependant', like an old person or child"*.[58]

Victim legislation and policy

Legislation and policy aspects of victim assistance in affected countries require considerable development. Only 32 of 71 countries reporting mine incidents in 1999-2000 had explicit policies and/or legislation on disability. For instance, only half of the countries of Africa and Asia-Pacific region have disability laws. Even where policies and legislation exist, they are slow and difficult to implement.[59]

Policy changes ought to enable survivors to become more fully integrated into society's economic and social realm — for example, through legislation and public awareness, access to services and assistance, and a national council on disability issues; for instance, in Cambodia, there is a national Disability Action Council.

The role of data gathering and analysis

Objective information and data collection on victim assistance is crucial to quantify the impact of mines/UXO on public health and reintegration systems, on human and socio-economic development, and on the daily life of people and communities. The first major obstacle in dealing with the problems of mines is that data in general are lacking and without statistics and facts, priorities cannot be established, policy articulated and programmes planned.[60] In 1997, the ICRC introduced the concept of the Mines Information System (MIS) to facilitate the collection of standardised, systematic mine accident information for centralisation and analysis. Determining how most effectively to use national and foreign funding and setting proper operational priorities according to humanitarian criteria depend on systematic collection of standardised data and a coherent analysis.[61]

The Information Management System for Mine Action (IMSMA) is now the most widely used information management system in mine-affected countries and has led to more countries collecting victim data and generating reports based on the data.[62] IMSMA provides useful information for identifying *immediate* victim assistance needs but is not sufficient for planning long-term rehabilitation and reintegration. Some consequences of landmines are more complex to measure (than casualties) — for example, the effects on health, nutritional levels, access to water and a community's economy.[63]

The current principle collectors of mine casualty data on an international scale are: the national mine action centres, the ICRC, UNICEF and NGOs.[64] For example, the Landmine Survivors Rehabilitation Database tracks resources and programmes in mine-affected countries that could serve to improve the lives of victims.[65] But most individual countries/States have some capacity to assimilate data at a national level. The Cambodian Mine/UXO Victim Information System (CMVIS) details new casualties, monthly trends compared to the last three to four years; location of accidents by province, district and commune; casualty types and cause of casualty; casualty trends, by terrain type, by population group.[66]

Effective dissemination of information is also essential. The Landmine Monitor encourages State Parties to the Anti-Personnel Mine Ban Convention to submit in its annual reporting the voluntary Form J; this specifically enables reporting on the situation of mine victims and the status of assistance provision.

The Mine Action Information Centre Landmine Casualty Database Workshop[67] outlined four purposes for collecting data on mine accident victims:

1) operational mine action (survey, marking, clearance, quality assurance, operations planning and management);
2) mine risk reduction and education;
3) victim assistance; and
4) advocacy/donor information needs/resource mobilisation.

The provision of assistance to mine and UXO victims

The context for assistance to mine victims

Intense media coverage of the mine issue has led to a "disproportionate" concentration of interest on assistance to mine victims at the expense of victims of other injuries, even though, globally, mine/UXO victims only represent 0.3 per cent of all wounded.[68] Thus, the World Health Organisation (WHO) and the ICRC have asserted that humanitarian assistance must not give preference to one category of injury.[69]

The Kampala Declaration supports the Bern Manifesto (1998) in the non-discrimination between mine victims and victims of other traumas or violent situations in their medical or psychological management and their socio-economic reintegration. The Swiss Development Corporation believes that *"assistance to victims of landmines is defined as an integrated part of assistance to all* *victims of violence and trauma and persons with disabilities"* and should be integrated into post-conflict reconstruction and development strategies, public health, community development, conflict and violence prevention, human rights, good governance and poverty reduction.

The need to integrate mine/UXO victim assistance into all sectors of life does not necessarily mean cutting all links with mine action. To be sure, victim assistance can benefit from drawing funds and donor attention to mine action programmes for all war victims and persons with disabilities. But the question remains as to whether mine action operators possess the professional capacity to institute or implement successful victim assistance programmes.

Provisions for victims were extensively debated during the Oslo diplomatic conference that adopted the Anti-Personnel Mine Ban Convention (1-18 September 1997). Certain donor States were reluctant to embrace a "holistic" approach to victim assistance, being concerned about the ramifications on funding. Ultimately, however, their concerns were overcome or overridden.

Thus, the preamble to the Convention recognises the desire of States Parties "*to do their utmost in providing assistance for the care and rehabilitation, including the social and economic reintegration of mine victims*". Of greater legal force, Article 6 of the Convention requires that each State Party "*in a position to do so shall provide assistance for the care and rehabilitation, and social and economic reintegration, of mine victims...*".

Similar obligations exist for victims of UXO and AXO (abandoned explosive ordnance), by virtue of Protocol V on Explosive Remnants of War annexed to the Convention on Certain Conventional Weapons (the Protocol has not yet entered into force).

Key actors and actions

According to Article 6(3) of the Anti-Personnel Mine Ban Convention:

> "*Each State Party in a position to do so shall provide assistance for the care and rehabilitation, and social and economic reintegration of mine victims… Such assistance may be provided, inter alia, through the United Nations system, international, regional or national organizations or institutions, the International Committee of the Red Cross, national Red Cross and red Crescent societies and their International Federation, non—governmental organizations, or on a bilateral basis*."

The United Nations General Assembly (2001) states in Paragraph 8, "Principle of national ownership and integration", that "*the primary responsibility for taking action against landmines lies with the concerned state*". The role of the government in many countries is to establish standards and to provide technical guidance. Governments should make provisions, whether through tax exemptions or other forms of support, to allow for private distribution of services. And Ministries of Health are responsible for the long-term health care and rehabilitation of all persons with disabilities. In fact, in most post-conflict countries, with such heavy demands on meeting other needs for primary and tertiary health care, the needs of disabled people are generally given very low priority because national bodies do not have the technical capacity or budget.

The leading organisation in the treatment of war-wounded is the ICRC. It provides or supports first aid, medical and surgical assistance for mine victims and other war-wounded. Since 1979, the organisation has established or supported 80 limb-fitting and rehabilitation centres in 36 countries. It has provided more than 300,000 prosthetic and orthotic devices for amputees, more than half of whom were mine victims.[70] Other significant organisations engaged in the rehabilitation of mine and UXO victims are international NGOs, such as Handicap International and the Vietnam Veterans of America Foundation.

According to the 2003 Landmine Monitor Report, most countries seem to have facilities to address some of the needs of landmine survivors. However, the Landmine Monitor identified 48 mine-affected countries with new mine casualties in 2002 where one or more aspects of survivor assistance were said to be inadequate:

> "*Even when services exist, they are often long distances from mine-affected areas, making them inaccessible to many survivors, are too expensive for survivors to afford, or are bureaucratically off-limits to one group or another*."

From the research collected in 2002-2003, several general observations can be made:

- most services are still located in urban centres, but the majority of mine survivors are in rural areas where the concentration of mine pollution is greatest;
- the majority of resources continues to be directed towards medical and physical rehabilitation;
- the availability of assistance in psycho-social support and economic reintegration continues to be limited;
- international organisations, NGOs and UN agencies continue to play a key role in the delivery of services to mine survivors;
- local NGOs often lack the financial resources to continue programmes after international organisations have withdrawn;
- ongoing conflict and the consequent security concerns in some mine-affected countries severely limit the ability of the government and international agencies to provide assistance to landmine survivors;
- the economic situation of many mine-affected countries remains an obstacle to the provision of adequate assistance to landmine survivors;
- the development of programmes that address the long-term needs of landmine survivors and other persons with disability, is hampered by the practice of some donors to only fund programmes for a limited period of time. A commitment to long-term funding is needed to ensure sustainability and to build local capacities to continue the programmes;
- in a positive development, more mine-affected States are now taking, or have taken, steps to develop a plan of action to address the needs of mine survivors, or more generally to improve rehabilitation services for all persons with disabilities.[71]

Key issues in the provision of assistance

In most instances, it is suggested that the mine action centre or the United Nations should not be involved in direct implementation, but instead take on a coordination role as some aspects of victim assistance are clearly outside their professional capacity.[72] MACs are not designed to take the lead role in victim assistance, nor do they have a mandate, expertise or required resources to do so. Under overall coordination of the national commission or responsible ministry, any mine action organisation can make significant contributions to care, rehabilitation and integration of landmine survivors and victims notably in the field of data collection and dissemination, advocacy, planning and coordination, community relations and support to service delivery.[73]

The GICHD *Study on the role of Mine Action in Victim Assistance* produced six concrete recommendations. **First**, victim assistance was clearly a part of mine action but situated within broader emergency and development initiatives, and there is a necessity to define the parameters of victim assistance so as to address the whole range of victims' needs (to which mine action operations can certainly contribute). **Second**, the MAC can act as a field coordination centre for related sectors of victim assistance, such as: mine risk education, employment for victims, resource mobilisation, sharing mine victim data, use of victim data in prioritisation, coordination with relevant actors in health and disability sectors. **Third**, with the exceptions of Kosovo and northern Iraq when victim assistance fell under the auspices of emergency/ interim measures, mine action has played a small operational role in direct service provision, as the skills and knowledge required are typically very different. **Fourth**, in efforts to advocate the provision of the best possible aid, mine action can assist in the support of long-term, sustainable funding for victim assistance projects. **Fifth**, mine action operators can reinforce preventative methods of victim assistance by placing more emphasis on mine risk education and minefield marking. And **sixth**, mine action professionals should have more access to victim assistance materials in order to be aware of the specific needs of victims they encounter in the field.

In conclusion, the GICHD study recommends that *"mine action should not completely turn its back on victim assistance"* but assume a coordination role and in *"exceptional circumstances"* it *"should be prepared to take an active role in the provision of services"*.[74] Participants at a meeting of the Standing Committee on Victim Assistance noted that activities of victim assistance are more related to the field of health care than to *"operational mine action"*.

Mine action has historically been a very *"technical"'* field of expertise, yet it is conscientiously moving toward a more inter-disciplinary approach to relieve all aspects of the impact of landmines and UXO on communities.[75] Objective 3.9 of the UN Strategy 2001-2005 states that *"All UN-supported victim assistance activities … be integrated into broader community and public health strategies by 2004"*. This means the incorporation of social, medical, legal, legislative, informational and psychological aspects into a national plan.[76] Bailey (2003) believes *"assistance to landmine victims should be viewed as part of a country's overall public health and social services system"*.

The origin of funding for victim assistance reflects where support lies and potentially can be drawn from for mine/UXO victims. Victim assistance's proportionate funding to other pillars of mine action is considerably less. In 1999, identifiable support for victim assistance amounted to US$28.5 million or 11.9 per cent of total mine action funding. This figure rose in 2000 to US$29.7 million, although dropped as a proportion to 11.5 per cent of mine action funds. In 2001, the figure dropped to US$28.7 million and rose slightly to 11.6 per cent of total funding to mine action.[77] There is a considerable amount of opacity surrounding the financing of victim assistance programmes, a task the UN Mine Action Investment Database is trying to clarify.[78]

Exact figures are difficult to extrapolate, which indicates that either States do not report on victim assistance funding separately and consider it an integrated part of humanitarian mine action or landmine victims are reached through bilateral development cooperation. In relation to bilateral development cooperation, unless funding is specifically targeted at facilities and programmes that assist people with disabilities, including landmine victims, it is more likely that resources will be directed to other areas of public health or development concern, leaving the disabled population at a further disadvantage.

Guidelines on assistance to mine victims

Since its inception, the Anti-Personnel Mine Ban Convention has triggered a number of international bodies and organisations to compile guidelines on the formulation of assistance to mine and UXO survivors. Detailed below are some of the major influences:

The WHO/ICRC 1997 Strategic Framework's primary aim is to facilitate inter-sectoral integration among assistance programmes, donors, governments including public health and social services and non-governmental services at national, subnational and community levels. Achieving a more balanced distribution of resources, strengthening capacity of affected countries for planning and execution of programmes, and encouraging sustainable, long-term interventions are the main goals of this strategy.

Bad Honnef,[79] a set of guidelines drafted by a number of mine action NGOs for mine action programmes, lays out guidelines, based on the following three principles for field workers, donors and campaigners: 1) participation — appropriate involvement of those affected at all levels and from the beginning; 2) coherence — mine action programmes embedded between emergency relief measures and long-term development programmes; and 3) solidarity — not promoting new dependencies. These principles should address the needs and aspirations of those affected, be community driven, integrated with other development activities and define social indicators in consultation with the community.

The macro framework for victim assistance by the Swiss Government, ICRC, UNICEF and the World Health Oranization (the 1998 Bern Manifesto), sought to promote an integrated approach using the health sector. The manifesto was endorsed by ten African countries in Kampala in 1997 based on four core components:

1) prevention (prohibition, clearance, awareness);
2) surveillance (data collection on impact and analysis);
3) injury management and care; and
4) rehabilitation (physical and psychological) to full reintegration.

This framework was subsequently elaborated into the “Maputo Strategy”, which brings together seven principles for intervention:

1) non-discrimination of victims;
2) integrated and comprehensive approach;
3) principle of co-participation;
4) national ownership and institutional support;
5) principle of transparency and efficiency;
6) sustainable development approach; and
7) victim empowerment and rights.

At the 51st World Health Assembly in May 1998, the *“concerted public health action on anti-personnel mines”* was launched, requesting UN/governmental/ international organisations and NGOs to:

1) strengthen the capacity of affected States for planning and execution of programmes;
2) better assess the effect of injuries on health;
3) focus on mine awareness and prevention;
4) merge emergency, treatment, rehabilitation (psychosocial) with the health service;
5) support policy and programme integrated database.

In 2003 UNMAS’s sectoral policy laid out its *Guiding Principles for Victim Assistance* as: comprehensive and integrated approach; participation, capacity building and sustainability; non-discrimination, neutrality, impartiality and humanity; integration; and training.

Conclusions

The world has made relatively little headway in improving the provision of assistance to mine and UXO victims, despite it being a “pillar” of mine action. Broadly the same actors — medical centres under national ministries of health, the ICRC, Handicap International, the Vietnam Veterans of America Foundation, to name some of the key service providers, are engaged in various aspects of assistance, notably in physical rehabilitation.

The vast majority of the affected countries have to deal with specific needs of landmine victims while struggling with fundamental challenges of economy, employment, health, education, and basic human rights at the same time, some amid internal or international conflicts or post-conflict reconstruction.[80] Three main issues identified by the Standing Committee on Victim Assistance in 1999 still pose a challenge to victim assistance today:[81] how to collect and share needed information on victims; how to gain sufficient attention from donors, and how to coordinate victim assistance activities more effectively. Standardised collection of data and information on mine victims would help to prioritise efforts and resources to alleviate the problem. The world still has much to do in repairing the many wounds of war.

Endnotes

1. The origins of "modern" mine action are traced back to Afghanistan in the late 1980s. Advocacy for a ban on anti-personnel mines aside, however, none of the core components of mine action — clearance, stockpiling, awareness/risk education and assistance — were inherently new activities in and of themselves.
2. Krug et al. (1998); up to 70 per cent of post-conflict casualties are recorded as being civilians.
3. See for instance Roberts and Williams (1995).
4. This section is based on ICRC (1995) and Coupland (1997).
5. That is, other than a biological, chemical or nuclear weapon.
6. Coupland (1997: 10).
7. Coupland and Korver (1991).
8. ICRC (1995: 3-4); Coupland (1997: 5).
9. Coupland (1997: 5).
10. Unknown numbers of victims go unreported as civilians are killed in remote areas far away from assistance or communication. Thus, available data suggest that the impact of landmines may be grossly underestimated, as only the fittest survivors reach treatment (De Smet et al., 2000).
11. US Department of State (2001).
12. Afghanistan, Albania, Algeria, Angola, Azerbaijan, Belarus, Bosnia and Herzegovina, Burundi, Cambodia, Chad, Chile, China, Colombia, the Republic of Congo, Croatia, the Czech Republic, the Democratic People's Republic of Korea, the Democratic Republic of Congo, Ecuador, Egypt, El Salvador, Eritrea, Estonia, Ethiopia, Former Yugoslav Republic of Macedonia, Georgia, Greece, Guinea-Bissau, India, Indonesia, Iran, Iraq, Jordan, Kenya, the Republic of Korea, Kuwait, Kyrgyzstan, the Lao Democratic People's Republic, Latvia, Lebanon, Lithuania, Malawi, Mauritania, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Peru, the Philippines, Poland, the Russian Federation, Rwanda, Senegal, Serbia and Montenegro, Slovakia, Somalia, Sri Lanka, Sudan, Syria, Tajikistan, Thailand, Tunisia, Turkey, Uganda, Ukraine, Uzbekistan, Vietnam, Yemen, Zambia, and Zimbabwe. ICBL (2003: 38)
13. The Republic of Congo, the Czech Republic, El Salvador, Estonia, Latvia, Lithuania, Nigeria, Poland, and Slovakia. *Ibid*.
14. ICBL (2004: 49).
15. Figures quoted by the ICRC and the ICBL in the mid-1990s; see also ICBL (2001).
16. Medical Educational Trust, *Background Paper*, London, March 1993.
17. ICRC (1995: 6).
18. This section is based on ICBL (2004: 50).
19. 1993.
20. Krug (1998) points out that follow-up information on discharged mine/UXO victims is also deficient.
21. *The Shorter English Dictionary*, Fifth Edition on CD-ROM, Oxford University Press, Oxford, UK.
22. Mines and UXO affect three layers of society: the individuals caught in the blast; the families who suffer emotional, social and financial loss; and entire communities, who lose access to land, water, food and other essential resources. There is also a national impact on economic production and the provision of public services.
23. Although the Convention is focused on anti-personnel mines, the obligation to assist victims applies to those injured by any type of landmines.
24. See, for instance, Maslen (2004a: 183–184).

25. IMAS 04.10, Second Edition, 2003, Definition 3.225.
26. *Ibid*.
27. ICBL (1999/2000). Similarly, Handicap International, a founding member of the ICBL, summarises victims as all persons killed or injured by landmines and their family members and those who have suffered through actions or negligence linked to the use of landmines, economic and/or social damage or any serious restriction to their fundamental rights that prevent them from pursuing their normal activities (HI, 2000b).
28. There are also objections to the use of the term casualty to refer to those killed or injured by mines or UXO. Its use began in the middle of the nineteenth century to allude to a person killed or injured in war, implying the sense of chance or accident, in particular in the case of civilian deaths or injuries.
29. A widely cited source is the ICBL's Guidelines for the care and rehabilitation of survivors, which outlines some of the key needs as: emergency medical care; continuing medical care; physical rehabilitation, prostheses and assistive devices; psychological and social support; employment and economic integration; capacity-building and sustainability; legislation/policy-making/public awareness; access to services; and data collection (ICBL, 2000b). The ICBL also identifies constraints of victim assistance as: lack of access to hospitals; lack of protection; security; political, military and administrative; poverty; lack of educated people and social structure; lack of funds; donor pressure; inter-agency rivalry; and lack of coordination.
30. IMAS 04.10, Second Edition, 2003, 3.226.
31. ICBL (2000a).
32. White (1999).
33. Due to often long and difficult evacuation (most victims arrive at a hospital six or more hours after the accident), those most seriously injured do not survive. The fatality rate has been estimated at anywhere between 35 and 51 per cent of mine and UXO accidents.
34. However, often the less seriously injured do not come to hospital, making do with local treatment (Coupland and Korver, 1991).
35. ICRC (2001).
36. *Ibid*: 14.
37. ICBL (2000b) recommends that first aid must also be followed up by qualified medical professionals and in the field with mine awareness education materials, public sector and community action plan, and investment in communication and transportation systems to improve access to medical care.
38. Coupland (1997).
39. ICBL (2001).
40. Stover et. al. (1997).
41. See for example Coupland (1997).
42. *Ibid*.
43. Andersson et al., 1995.
44. Human Rights Watch/Physicians for Human Rights (1993).
45. ICBL (2000b).
46. De Smet et al. (2000) highlights the importance of pain control for an optimal quality of life, which if untreated can prevent the use of prosthesis and lead to depression and isolation.
47. Kasach (2002).
48. Standing Committee on Victim Assistance and Socio-Economic Reintegration and ICBL (2002a).
49. De Smet et al., 2000.

50. ICBL (2000a).
51. Coupland (1997).
52. Hereafter referred to as the Standing Committee.
53. Cited in Ikeda (2000).
54. VVAF (2000).
55. Coupland (1997).
56. A study into the provision of socio-economic reintegration of mine/UXO victims into society highlights: ensure economic necessities; provide comprehensive and coordinated care; create opportunities to be productive members of society; and assist in re-establishing social relations with family, community and society (Standing Committee, 2002a).
57.WRF (2001).
58. Handicap International (1996). Translation by the authors: "*la personne handicapée perd sa qualité de 'membre de la famille' à part entière, pour devenir de plus en plus une 'charge de famille', au même titre que les personnes âgées et les enfants*".
59. ICBL (2000a).
60. Giannou (1997).
61. See Coupland (1997).
62. Fiederlein (2002).
63. ICBL (2000a).
64. For instance, Physicians for Human Rights (2000) developed hospital-based surveillance and community survey tool with WHO, PHR, ICRC, Injury Centre Uganda, London School Hygiene and Tropical Medicine. Designed to measure morbidity and mortality associated with landmine injuries and collect information on demographics, device type, pre-hospital care, transportation time and treatment, epidemiological-based surveys are essential for properly quantifying the public health consequences — results facilitate the allocation of resources and aid in evaluating the impact of interventions. PHR & ICBL members developed tools for: pre-hospital care and hospital capabilities, prosthetic capabilities, rehabilitation and social reintegration of victims.
65. *www.lsndatabase.org.*
66. Handicap International (2003b).
67. Mine Action Information Centre (2002), available at *maic.jmu.edu/conference/casualty/recommendations.htm.*
68. Swiss Agency for Development and Cooperation (undated).
69. WHO/ICRC (1997). However, United Nations Office for Project Services' (UNOPS) experience in the field found that "*positive discrimination*" of landmine and UXO survivors in northern Iraq yielded a strengthened network of services capable of addressing the needs of all people with mobility disorders. Ikeda (2002) concludes that since landmines are designed to cause severe injuries to their victims, they are considered a "*major cause of disability*". And ICBL (1999/2000) believes that "*individual mine victims constitute a sub-group of all persons with disabilities*".
70. ICRC (undated).
71. ICBL (2003).
72. GICHD (2002g).
73. UNMAS (2003b).
74. GICHD (2002g).
75. UNOPS (2002).
76. Barlow (1999).
77. Bailey (2003).
78. Handicap International (2002a).

79. Bad Honnef (1997).
80. Handicap International (2002b).
81. Cited in Fiederlein (2002).

7 Destruction of anti-personnel mine stockpiles

Stuart Maslen

Summary
The world has made significant inroads into global stockpiles, estimated at more than 250 million anti-personnel mines prior to the entry into force of the Anti-Personnel Mine Ban Convention. But most stockpiled anti-personnel mines remain outside the purview of the Convention. China and the Russian Federation hold the bulk of these and neither appears ready to accede to the Convention at an early stage. There are seemingly few technical obstacles to stockpile destruction, although there are environmental and cost considerations depending on the type and size of the stockpile in question.

Introduction

There are a number of reasons why a State might wish to destroy stockpiles of explosive ordnance it holds: it may be as part of a disarmament process, to implement a legal obligation, upon expiry of the weapon's shelf life or for reasons of safety. This chapter focuses on the destruction of stockpiles of anti-personnel mines. It begins by looking at the challenge of stockpile destruction and then describes some of the key actors that have been involved. It then reviews the international legal obligations and standards that govern the destruction of stockpiles, before assessing progress to date in implementing the obligations set out in the Anti-Personnel Mine Ban Convention.

Since the entry into force of the Anti-Personnel Mine Ban Convention in 1999, which requires States to destroy all their stockpiles of anti-personnel mines within four years of becoming a party, stockpile destruction has become an accepted component of mine action. Indeed, since 2000, stockpile destruction has been considered one of mine action's five "pillars"[1] and accordingly the International Mine Action Standards (IMAS), developed under UN auspices, also address the process of stockpile destruction in some detail.[2]

As the IMAS point out, although stockpiled anti-personnel mines rarely pose an immediate threat to human life they do enable the deployment of new minefields.[3] The removal of this capability is therefore an important factor for the continuing success of the Convention and the reduction of the threat from landmines worldwide.[4]

The challenge of stockpile destruction

No one knows exactly how many anti-personnel mines remain stockpiled worldwide. According to the Landmine Monitor, the monitoring arm of the International Campaign to Ban Landmines (ICBL), approximately 200 million anti-personnel mines were stockpiled by 67 countries in 2004.[5] This contrasts with its estimate of 230 million in 2002, which is partly explained by the claim made in 2003 by the Russian Federation that it had destroyed nearly 17 million anti-personnel mines since 1996.[6]

According to the IMAS, there were traditionally five options for the logistic disposal of ammunition and explosives. However, in the case of anti-personnel mines, four of these options are banned by international treaty. The Anti-Personnel Mine Ban Convention does not permit the sale, gift or increased use in training of anti-personnel mines, and the Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (the Oslo Convention) has outlawed deep sea dumping.[7] Therefore, the international community is now left with destruction "*as the only available option for the disposal of anti-personnel mines*".[8]

Stockpiles tend to be large in quantity, but relatively small in terms of weight and net explosive content: yet the destruction of these stockpiles can be a complex logistic operation.[9] In the context of the Anti-Personnel Mine Ban Convention, it was generally understood that a number of States would need assistance — technical, financial and material — in order to complete their stockpile destruction within a specific deadline. Thus, Article 6(5) of the Convention provides that: *"Each State Party in a position to do so shall provide assistance for the destruction of stockpiled anti-personnel mines".*

According to the Landmine Monitor, States Parties that once produced anti-personnel mines include: Albania, Argentina, Australia, Austria, Belgium, Bosnia and Herzegovina, Brazil, Bulgaria, Canada, Chile, Colombia, the Czech Republic, Denmark, France, Germany, Hungary, Italy, Japan, the Netherlands, Norway, Peru, Portugal, Romania, South Africa, Spain, Sweden, Switzerland, Uganda, the United Kingdom (UK) and Zimbabwe. Others have been cited as past producers, but deny it: Croatia, Nicaragua, Philippines, Thailand, and Venezuela.[10]

But the overwhelming majority of global stockpiles — around 190 million — are held by States outside the Anti-Personnel Mine Ban Convention. The largest stockpiles probably belong to China (estimated 110 million) and the Russian Federation (estimated 50 million).[11] Other States with large stockpiles include the United States (US) (10.4 million), Pakistan (estimated 6 million) India (estimated 4-5 million), and the Republic of Korea (2 million). Other States not party to the Convention believed to have large stockpiles are the

Democratic People's Republic of Korea, Egypt, Finland, Iran, Iraq, Israel, Myanmar, Syria, Turkey and Viet Nam.[12]

States Parties to the Convention probably stockpile around 10 million anti-personnel mines. Nearly half of this amount (an estimated 4.5 million) is held by Belarus and a further 1.3 million by Serbia and Montenegro. Both of these States acceded to the Convention in September 2003 and became States Parties on 1 March 2004. Greece, which also became a State Party on 1 March 2004, has declared stockpiles in excess of 1 million mines. In addition, a number of States Parties likely to have substantial stocks have not yet officially reported their numbers, including Afghanistan, Angola, the Democratic Republic of Congo and Eritrea.[13]

The Landmine Monitor has estimated that the remaining signatories to the Convention stockpile approximately 8.5-9 million anti-personnel mines. Ukraine reported that it possesses a stockpile of 6.35 million. Poland has declared a stockpile in excess of 1 million mines. In May 2002, Indonesia revealed it has a stockpile of 16,000 anti-personnel mines. Ethiopia also likely holds stockpiles and Brunei has acknowledged possessing anti-personnel mines. In the view of the Landmine Monitor, the remaining signatories — the Cook Islands, Haiti, and the Marshall Islands — are unlikely to stockpile anti-personnel mines.[14]

Finally, in addition to governments, the Landmine Monitor has affirmed that many armed opposition groups also have stockpiles of anti-personnel mines, including in Burma, Chechnya, Colombia, the Democratic Republic of Congo, Kashmir, the Philippines, Somalia, Sri Lanka, Sudan and Uganda.[15] It is unlikely, however, that any of these have very significant stockpiles.

Key actors in stockpile destruction

Stockpile destruction is significantly different to the other four pillars of mine action in that it has seen only minimal involvement of non-governmental organisations (NGOs), aside from the monitoring role played by the Landmine Monitor.[16] The primary role in carrying out destruction of anti-personnel mines has been accorded to State Party militaries, normally of the country holding the stockpiles, with a secondary role being played by commercial companies, sometimes in another country.

The United Nations believes it has a general responsibility to encourage and support the effective management of stockpile destruction programmes. Thus, for example, according to the Chief of Mine Action Team at the UN Development Programme (UNDP), stockpile destruction should form part of each integrated mine action programme that UNDP supports.[17] In addition, the UN's Electronic Mine Information Exchange (E-MINE),[18] has a dedicated stockpile destruction section providing technical papers, policy guidelines, lessons learned and other relevant information. The Geneva International Centre for Humanitarian Demining (GICHD) also provides technical assistance to States requiring help with stockpile destruction.[19]

International legal obligations and standards

The definition of a stockpile

A number of international legal instruments have either direct or indirect implications for stockpiles of anti-personnel mines. However, what constitutes a stockpile is not precisely defined in any of these instruments (although the scope of the term in the context of the Anti-Personnel Mine Ban Convention is discussed below). The IMAS provide that in the context of mine action, the term "stockpile" refers to a large accumulated stock of explosive ordnance.[20] Stockpile destruction is defined, somewhat narrowly, as *"the physical destructive procedure towards a continual reduction of the national stockpile*."[21]

Convention on Certain Conventional Weapons

The Convention on Certain Conventional Weapons (CCW),[22] adopted in 1980, is a humanitarian law treaty and as such focuses on prohibiting or restricting the use of conventional weapons. Thus, Protocol II annexed to the CCW, which addresses mines, booby-traps and what it terms "other devices" (mainly directional Claymore-type munitions), does not seek to regulate the production, transfer or stockpiling of these weapons. Of more relevance is the amended Protocol II, which was adopted by States Parties to the CCW in May 1996.

Although Amended Protocol II does not require stockpile destruction, potentially it has implications for national stockpiles. Thus, if a State Party is unable or unwilling to modify an anti-personnel mine to make it compliant with the demands of the Protocol, since the Protocol prohibits the use or transfer of an unlawful weapon, it is likely, in practice, to destroy it. This is particularly relevant for anti-personnel mines that do not meet the requirements for detectability,[23] or remotely-delivered anti-personnel mines that do not meet the threshold for self-destruction and self-deactivation reliability.[24] The Amended Protocol appears to have stimulated at least a significant portion of the stockpile destruction carried out by the Russian Federation and the US.

Anti-Personnel Mine Ban Convention

But the greater destruction of stockpiles has been as a result of the entry into force of the Anti-Personnel Mine Ban Convention. The formal title of the Convention — the *Convention on the Prohibition of the Use, Stockpiling, Production*

Article 4 – Destruction of stockpiled anti-personnel mines

Except as provided for in Article 3, each State Party undertakes to destroy or ensure the destruction of all stockpiled anti-personnel mines it owns or possesses, or that are under its jurisdiction or control, as soon as possible but not later than four years after the entry into force of this Convention for that State Party.

and Transfer of Anti-Personnel Mines and on their Destruction — clearly illustrates its relevance to the destruction of anti-personnel mine stockpiles. A number of provisions in the Convention detail the relevant legal requirements.[25]

A general undertaking to destroy anti-personnel mines

Article 1 of the Convention sets out the general obligations of States Parties, which includes paragraph 2 whereby *"Each State Party undertakes to destroy or ensure the destruction of all anti-personnel mines in accordance with the provisions of this Convention"*. This provision applies to already emplaced as well as to stockpiled anti-personnel mines. The phrase, to "*ensure the destruction of*", makes it explicit that a State Party might wish to arrange for another State or a private company to destroy stockpiled mines elsewhere. Under Article 3 of the Convention, transfer of anti-personnel mines for the purpose of destruction is specifically authorised. For example, in 2002, two German companies destroyed mines from the Netherlands and also Taiwan (a non-party State).[26]

The specific obligation to destroy stockpiles

The key article dealing with stockpile destruction is Article 4. Article 4 sets out the disarmament obligation to destroy all stockpiled anti-personnel mines that a State Party owns or possesses, or that are under its jurisdiction or control. Each State Party has an obligation to destroy or ensure the destruction of its stockpiles as soon as possible but not later than four years after the date on which it became a party to the Convention.

What constitutes destruction?

Yet, neither "destroy" nor "destruction" is defined in the Convention. It is clear that a variety of different methods of destruction are lawful, as Article 7(1)(f) requires reporting on the *"status of programs for the destruction of anti-personnel mines in accordance with Articles 4 and 5, including details of the methods which will be used in destruction"*. Physical destruction techniques available range from the relatively simple open burning and open detonation (OBOD) techniques to highly sophisticated industrial processes. The decision to opt for any particular technique is likely to be based on cost, safety and environmental considerations.[27]

Typically, States have used the OBOD method but State practice has included dismantling as well as physical destruction of the mine or its components. Thus, for example, in Albania's stockpile destruction programme, supported by the North Atlantic Treaty Organisation (NATO): the project costs were offset by recycling of ferrous metals (1,100 tons, from which one company made manhole covers and another made steel reinforcing rods) and of TNT explosives (192 tonnes, converted into about 2,000 tonnes of ammonite explosive for construction use).[28]

A particular problem arises with respect to the destruction of PFM scatterable mines (i.e. those mines, known informally as "butterfly mines" because of their shape, that are remotely delivered), produced by the former Soviet Union and held in large stockpiles in a number of States Parties and signatories, notably Belarus (a Party) and the Ukraine (a signatory), as well as in the Russian Federation (a non-signatory). These mines contain liquid explosive (*see further below*) and result in a number of "demilitarisation hazards".[29] Likely approaches to safe destruction are contained chamber detonation with an integrated pollution control system, or cementation (i.e. encasing in concrete) and destruction. A company in the Russian Federation has pioneered a cementation method[30] — the government claims that this has been a key factor in the destruction of 13.8 million PFM-1S mines (which fail to meet the self-destruction threshold criteria set down in Amended Protocol II).

Directional fragmentation "mines" (i.e. Claymore-type devices fitted with tripwires) are covered by Article 2 of the Convention and are therefore not only prohibited but also legally subject to the requirements for destruction under Article 4. States Parties have tended to implement this requirement by reconfiguring the devices, by removing and sometimes destroying the fuzing but leaving the devices themselves intact. The UK has reconfigured its Claymore-type mines, which is said to have involved more than simply removing the tripwire.

In the case of mines ostensibly categorised as anti-tank or anti-vehicle mines but which fall under the definition of anti-personnel mine in Article 2 of the Convention because of the fuzing system they contain, they should, in accordance with Article 1(2) and Article 4, be destroyed. In such cases, however, a number of States Parties have simply removed or altered the fuzing mechanism rather than destroyed the mine itself.

Jurisdiction or control – a broad concept

The interpretation of the term "jurisdiction or control" in Article 4 has proved contentious and State practice is mixed, depending on the individual circumstances of the State Party. For example, Norway had both jurisdiction *and* control over stockpiles of US anti-personnel mines held on its territory on behalf of NATO. It informed the US that the mines would have to be removed by 1 March 2003 — Norway's deadline for stockpile destruction — having become a State Party on 1 March 1999.[31] In accordance with the provisions of Article 4, Norway should rather have destroyed the mines. Moreover, their removal was not expressly permitted by the Convention, as they were not being transferred for the purposes of destruction. Thus far, however, no State Party has raised any objection.

At the other end of the spectrum, Germany, Japan[32] and the UK have stated that they have neither jurisdiction nor control over anti-personnel mines stockpiled by the US on their territory. In May 2001, the UK stated:

> *"We wish to affirm that US stocks do not fall under our national jurisdiction or control and we do not therefore have any obligations under Article 4 … in respect of them. We have fully complied with our obligations in respects of stocks that were under our jurisdiction or control."*[33]

But, the obligation to destroy stockpiles laid down by the Convention is potentially even broader as, depending on the circumstances, it can also be interpreted to encompass quantities of anti-personnel mines that fall under the jurisdiction or control of armed forces operating abroad in military operations, including offensive actions and peace-keeping. Thus, an army of a State Party that wins control of anti-personnel mine stockpiles belonging to a non-party State is likely to be required to destroy those stockpiles as soon as possible, even though the non-party State is not itself bound by the Convention. It has been reported by the Landmine Monitor, for instance, that French troops participating in the international peace-keeping force destroyed 70,000 anti-personnel mines stored near Kabul airport in February 2002.[34] It is highly likely that UK forces have come across stockpiled anti-personnel mines in Iraq.

Lawful retention

Yet, in any case, not every single anti-personnel mine has to be destroyed. Article 3 of the Convention allows each State Party to retain "*a number of anti-personnel mines for the development of and training in mine detection, mine clearance, or mine destruction techniques*", as long as the number does "*not exceed the minimum number absolutely necessary*". Thus, no maximum number is stipulated by Article 3; nonetheless, it is difficult legally to sustain any State Party's decision to keep the whole of its original stockpile, ostensibly for training and research in accordance with Article 3. In accordance with customary international law, a treaty is to be interpreted and applied in good faith. Furthermore, the provision has been widely interpreted by States Parties to mean that *"hundreds or thousands, but not tens of thousands*" may be retained.

The deadline for completion

Each State Party undertakes to destroy stockpiles "*as soon as possible but not later than four years after the entry into force of this Convention for that State Party*" (i.e., four years and six months after formally adhering to the Convention). In applying that provision in good faith, as required by international treaty law, a State should develop destruction plans and initiate destruction early within the allotted time period and should not wait for the deadline to loom large. Although each party's destruction programme is dependent on national resources and capacity, Australia, for instance, destroyed its entire known stockpile of 128,161 anti-personnel mines in five days in September and October 1999,[35] only three months after it became party to the Convention.

A number of States Parties have discovered additional stocks of anti-personnel mines,[36] sometimes after ostensibly completing the destruction of stockpiles.[37] In a number of cases, mines are "stockpiled" by civilians.[38] How does this affect the deadline laid down in Article 4? As long as a State Party has not sought to conceal stockpiles, it is to be assumed that they should destroy any new anti-personnel mines located in stocks or caches "as soon as possible." They should also include full details in their next Article 7 report, due annually to be submitted to the Secretary-General of the UN. Given initial good faith on the part of the State Party, the identification of very significant new stocks of anti-personnel mines should normally be considered unlikely.

In Bosnia and Herzegovina, for instance, the Stabilisation Force (SFOR) has been collecting landmines and other explosive munitions for the purpose of destruction in what it terms “Operation Harvest”. Since Operation Harvest began in 1998, close to 9 million rounds of ammunition, nearly 110,000 hand grenades, 27,000 small arms, 28,000 mines and more than 24,000kg of explosives have been collected. Destruction of all explosive devices is carried out by SFOR.[39]

The International Mine Action Standards

As previously noted, stockpile destruction may relate to any explosive ordnance contained in stockpiles, however, the IMAS focus on the destruction of anti-personnel mine stockpiles. There are currently four standards pertaining to stockpile destruction — one in Series 7 (07.41) dealing with the monitoring of stockpile destruction, and three in Series 11, a series dedicated to stockpile destruction:

- 11.10 – Guide for the destruction of stockpiled anti-personnel mines;
- 11.20 – Principles and procedures for open burning and open detonation (OBOD) operations; and
- 11.30 – National planning guidelines for stockpile destruction.

Destruction techniques

According to the IMAS, the costs of demilitarisation of anti-personnel landmines range from US$2 to US$4 each, depending on the type of mine.[40] Generally, open detonation is likely to be the cheapest means to destroy stockpiles of up to one million anti-personnel landmines, but it requires significant knowledge of explosives engineering as the shock wave caused by detonation may not destroy the mines but throw them out and arm them.

Industrial-scale demilitarisation has many advantages — mechanical disassembly, incineration in environmentally-controlled systems and the ability to operate 24 hours a day, 365 days a year. Its major disadvantage is the high capital set-up costs of design, project management, construction and commissioning. Operating costs are generally lower than OBOD (once amortisation of the development capital is discounted), although high labour costs in developed countries account for a large percentage of the OBOD costs.

Notwithstanding this, OBOD can be a cheaper option, depending mainly on the economy of scale possible. In the US, for example, average OBOD costs are US$850 per tonne, whereas industrial demilitarisation is US$1,180 per tonne; but these costs are for all ammunition types, not just anti-personnel mines. The IMAS also notes that salvage of metallic scrap, or explosive waste, can result in an income stream. Some explosive fillings of anti-personnel mines may be useful to the commercial explosive industry, while scrap steel is always in demand.[41]

In many cases the development of such purpose-built demilitarisation facilities to enable State Parties to fulfil their obligation for stockpile destruction will be well beyond available resources and therefore may not be a practical option. Factors such as cost, location and safety may mean that OBOD is the only pragmatic and feasible option.

Environmental considerations in stockpile destruction[42]

Concerns have been expressed as to the environmental consequences of destroying certain mines by open detonation, both by the State holding the stockpiles and also potential donors, which may have their national or broader environmental legislation to consider.[43] For instance, the PFM-1 scatterable anti-personnel mine contains hydrogen chloride, the open detonation of which may lead to unacceptable environmental pollution. One solution may be contained detonation in a pollution control chamber as the mine cannot be disassembled.

Traditionally the military are usually responsible for the destruction of anti-personnel mines using OBOD techniques, while civilian companies use industrial demilitarisation. The availability, or not, of qualified manpower may have a significant influence on the destruction technique to be used. Certain destruction techniques result in the production of "special" or "hazardous" waste, which itself requires destruction or disposal in an environmentally benign manner. This is usually done by a specialist environmental disposal company.

In Europe, many nations have banned OBOD of all munitions — unless there is no alternative and that it can be justified on safety grounds. This has necessitated the construction of expensive demilitarisation facilities, hence the requirement for the disposal of ammunition types other than anti-personnel mines and the necessity for economies of scale if pursuing this option. The argument about the environmental effects of OBOD is still ongoing and sound scientific evidence has been developed to support a case that OBOD of certain anti-personnel mine types may not be a threat to the environment. This means that OBOD still remains a viable destruction option for anti-personnel mines and may well be the most suitable option for regions with little or no industrialised demilitarisation capacities.

Within the UN, all work related to the transport of dangerous goods is coordinated by the Economic and Social Council Committee of Experts on the Transport of Dangerous Goods, which produces the *Recommendations on the Transport of Dangerous Goods*, also called the "Orange Book". These Recommendations and Regulations are addressed not only to all Governments for the development of their national requirements for the domestic transport of dangerous goods but also to other interested international organisations.

The International Standardization Organization (ISO) 4200 series also lays down internationally accepted standards for determining and measuring air pollution from industrial processes. These standards will apply to any pollution control systems used during industrial demilitarisation operations,[44] but only in terms of the measurement of emissions as the standards do not provide any guidance on what the overall emission limits should be: this remains the responsibility of the national authority.

The only supra-national legislation that covers emissions into the atmosphere from the incineration of hazardous waste is the European Union Council Directive 91/689/EEC of 12 December 1991 on hazardous waste.[45] This provides a comprehensive standard and is in use by all European Union countries and those countries with associate status. It does not prohibit open detonation.

Determining the appropriate technology for stockpile destruction

According to the IMAS, there are so many inter-relational factors involved in anti-personnel mine stockpile destruction that it is not possible to provide "template solutions".[46] The selection of the most suitable technique or technology by a national authority will depend primarily on the resources available, the physical condition and quantity of the stockpile, the national capacity and the applicable environmental and explosives legislation.[47] For instance, the stability in storage and degradation or deterioration rates of the explosive content will influence the degree of urgency for disposal, the type of transport that can safely be used and the destruction methodology.

In stockpile destruction, anti-personnel mines are no different to other types of munitions. They all contain fusing systems and high explosives so the inherent dangers present during transport, storage, processing and destruction are the same. For this reason, the IMAS recommends that the stockpile destruction of anti-personnel mines should not be looked at in isolation.

Economies of scale are likely to be an influential factor in that the more anti-personnel mines requiring destruction, the larger the economies of scale, and therefore the wider range of available technology. The IMAS therefore suggests that national authorities may wish to consider anti-personnel mine destruction on a regional basis and/or to include other ammunition in the destruction plans, in order to achieve large economies of scale. For example, the destruction of anti-personnel mines could be done in conjunction with the disposal of large-calibre artillery shells. These can be used as "donor" charges for the anti-personnel mines, to ensure that all the ordnance is destroyed, thereby reducing the costs of serviceable explosives during open detonation disposal operations.

Maintenance of stockpiles[48]

While stockpiles are awaiting destruction, they must still be stored appropriately. Yet there are no internationally recognised standards for the safe storage of ammunition and explosives in either military or civilian ammunition storage areas. Regional organisations, such as NATO, do have agreed standards[49] but the safe storage of ammunition and explosives is a national responsibility.

There are, however, basic principles for the safe storage and maintenance of ammunition stockpiles.[50] If these principles are followed, in general the risk of an undesired explosion occurring is greatly reduced. An exception is the risks from sabotage or war although, according to the GICHD, even in this case, adherence to basic principles will reduce the resultant damage.

The implementation of the Anti-Personnel Mine Ban Convention

Progress to date

In the 10 years from 1992 to 2002, according to the Landmine Monitor,[51] a total of 69 countries destroyed some 52 million anti-personnel mines. Of these, 63 States Parties to the Anti-Personnel Mine Ban Convention destroyed 30 million anti-personnel mines. Between May 2002 and June 2003, 18 States Parties completed the destruction of their stockpiles, eliminating a combined total of almost 10.8 million anti-personnel mines over the course of their destruction programmes. About 3 million mines were destroyed in 2002-2003 by States Parties, and more than 1 million by non-party States (Belarus, the Russian Federation, Somaliland and the Ukraine).

By 2003, a total of 99 States Parties had either completed destruction of anti-personnel mines stockpiles or declared never having a stockpile. More than 50 States Parties had completed destruction of their stockpiles.[52] Forty-eight States Parties had officially declared not stockpiling anti-personnel mines.[53] A dozen States Parties were in the process of destroying their stockpiles: Afghanistan, Argentina, Chile, the Democratic Republic of Congo, Guinea-Bissau, Romania, Tajikistan, Tanzania, Tunisia, Uruguay and Venezuela.

Four States Parties (Algeria, Bangladesh, the Republic of Congo and Kenya) had not begun the destruction process but each has developed a plan to destroy their stockpiles in advance of the treaty-mandated deadline. Four States Parties will announce their plans when they submit their initial transparency measures reports: Central African Republic, Cyprus, Timor-Leste and São Tomé e Príncipe.

Fifteen States Parties had not officially declared the presence or absence of anti-personnel mine stockpiles because of their failure to submit transparency measures reports on time.[54] Of those 15, those believed to stockpile anti-personnel mines are Angola, Eritrea, Liberia, Nigeria, Sierra Leone, Suriname and, possibly, Guinea. In addition, the deadline for stockpile destruction has passed for three of the 15 countries: Equatorial Guinea, Guinea and Namibia. Equatorial Guinea has stated that it does not stockpile anti-personnel mines. Namibia claimed to only retain mines for training and research purposes. Guinea's stockpile status was not known.

The first deadline for destruction

An important milestone in the implementation of the Anti-Personnel Mine Ban Convention was reached on 1 March 2003: the four-year deadline for destruction of stockpiled anti-personnel mines for all countries that were party to the Convention when it first entered into force on 1 March 1999. According to the Landmine Monitor, it would appear that all States Parties with a 1 March 2003 deadline met their obligation, with the minor exception of Djibouti, which was two days late. The major issue related to Turkmenistan, which reported completion of destruction but also declared retention of 69,200 anti-personnel mines. The ICBL expressed its view that retention of such a number of mines in fact meant that Turkmenistan had not fully destroyed its stocks and that it was not keeping "*the minimum number absolutely necessary*" as required by the Convention, and was therefore in violation of a core treaty obligation.[55]

Turkmenistan had previously stated in its first Article 7 report in October 2001 that there remained 761,782 anti-personnel mines from an initial stockpile of 1.17 million. It also declared, however, that: "*It will take approximately eight years to destroy all of the stocks of anti-personnel mines. Therefore, Turkmenistan is requesting an extension of the time allowed for the destruction of the whole arsenal of anti-personnel mines to the year 2010.*"[56] No extension to the deadline is possible under the Convention and no reservations may be made to its provisions.

Subsequently, the Co-Chairs of the Standing Committee on Stockpile Destruction were in contact with Turkmenistan, which indicated that it planned to meet the deadline set down by Article 4 of the Convention and that it had only about 250,000 mines left to destroy.[57] It subsequently reported successful completion of stockpile destruction, but stated its intention to retain nearly 70,000 anti-personnel mines for training and research in accordance with Article 3 of the Convention.

Mines retained for training and research

Of the 134 States Parties, 62 retain a total of more than 280,000 anti-personnel mines for training and research purposes. Of these 62 states, five intend to keep more than 10,000 mines. These five countries account for nearly half of all the mines retained by States Parties. Turkmenistan alone accounts for 25 per cent, with 69,200 mines retained. Others with very high levels are Brazil (16,545), Sweden (16,015), Algeria (15,030), and Bangladesh (15,000).

A total of 55 States Parties have chosen not to retain any anti-personnel mines. Of those not retaining, 13 States once stockpiled mines but have destroyed them or are in the process of destroying them. Seventeen States Parties have not yet declared whether they intend to retain any anti-personnel mines.

Conclusions

The world has made inroads into global stockpiles, estimated at more than 250 million anti-personnel mines prior to the entry into force of the anti-personnel Mine Ban Convention. Sometimes progress has been slow, sometimes there have even been concerns about slow timing, but generally the obligation has been implemented in good faith.

But most stockpiled anti-personnel mines remain outside the purview of the Convention. China and the Russian Federation hold the bulk of these and neither appears ready to accede to the Convention at an early stage. Despite apparently destroying many millions of stockpiled anti-personnel mines that did not comply with Amended Protocol II, the Russian Federation has continued to use landmines in its ongoing military operations in Chechnya. Getting these and other major military powers, such as India, Pakistan and the US, to destroy their stockpiles will demand political will that has so far proved absent.

On the other hand, the accession of Belarus to the Convention and, despite its delay in ratifying, signature by the Ukraine, are both significant steps forward. The path towards the elimination of anti-personnel mines appears irreversible.

Moreover, there are seemingly few technical obstacles to stockpile destruction, although there are environmental and cost considerations depending on the type and size of the stockpile in question. The trials of industrial disposal techniques for PFM scatterable anti-personnel mines, sponsored by the European Commission, NATO and Canada, along with the development of the cementation process by the Russian Federation, represent useful progress towards ridding the world of the infamous "butterfly" mine, an earlier scourge of Afghan children in particular.

Of all the aspects of mine action, stockpile destruction has seen the least involvement of NGOs, with the bulk of the task being performed by the military, and a secondary role played by commercial companies, especially in Western Europe.

Endnotes

1. On 17 August 2000, the UN Inter-agency Co-ordination Group for Mine Action agreed that stockpile destruction be formerly incorporated as the fifth core component of mine action.
2. As set out below, there are currently four standards in the IMAS pertaining to stockpile destruction — one in Series 7 (07.41) dealing with the monitoring of stockpile destruction and three in Series 11: 11.10 – Guide for the destruction of stockpiled anti-personnel mines; 11.20 – Principles and procedures for open burning and open detonation (OBOD) operations; and 11.30 – National planning guidelines for stockpile destruction.
3. IMAS 11.10 — Guidelines for the Destruction of Stockpiled Anti-Personnel Mines — notes that "*only in those circumstances where there is significant chemical instability of the explosive filling or a major fault in the fusing mechanism will stockpiled anti-personnel mines pose an immediate threat to human life. Notwithstanding, they of course remain a hazard and must be stored and transported in accordance with international safety standards in order to reduce the risk of an undesired explosive event*".
4. IMAS 11.10 – Guidelines for the Destruction of Stockpiled Anti-Personnel Mines, available at: *www.mineactionstandards.org*.
5. ICBL (2004). This section is based largely on the Landmine Monitor Report for 2003.
6. ICBL (2003:9).
7. *Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft*, adopted in Oslo on 15 February 1972.
8. IMAS 11.10, Second Edition, 1 January 2003, p. 5.
9. IMAS 11.10, Edition 2, 1 January 2003, p. vi.
10. ICBL (2003: 8).
11. In 2003, Russia publicly claimed for the first time that it destroyed more than 16.8 million stockpiled anti-personnel mines between 1996 and 2002. Taking this new information into account, Landmine Monitor reduced its estimate of Russia's stockpile to 50 million anti-personnel mines.
12. ICBL (2003: 10).
13. *Ibid*.: 9–10.
14. *Ibid*.: 9–10.
15. *Ibid*.: 10
16. An exception to this is in the Democratic Republic of Congo, where Handicap International Belgium reported destroying 1,660 anti-personnel mines from rebel stockpiles in 2002 and 2003.
17. *Statement by UNDP on the Status of UN Support to Stockpile Destruction to the intersessional Standing Committee on Stockpile Destruction of the Anti-Personnel Mine Ban Convention*, Geneva, 6 February 2003.
18. *www.mineaction.org.*
19. See *www.gichd.ch.*
20. IMAS 04.10, Edition 2, 1 January 2003, Standard 3.201.
21. *Ibid*., Standard 3.202.
22. The formal title is the *United Nations Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May be Deemed to be Excessively Injurious or to Have Indiscriminate Effects*.
23. In the case of anti-personnel mines produced after 1 January 1997, States Parties must incorporate in the construction a material or device that enables the mine to be detected by commonly-available technical mine detection equipment and provides a

response signal equivalent to a signal from 8 grammes or more of iron in a single coherent mass. Anti-personnel mines produced earlier must either incorporate such material or device or have it attached prior to emplacement "*in a manner not easily removable*". Technical Annex, Article 2, CCW Amended Protocol II.
24. According to Technical Annex, Article 3(a), CCW Amended Protocol II: "*All remotely-delivered anti-personnel mines shall be designed and constructed so that no more than 10% of activated mines will fail to self-destruct within 30 days after emplacement, and each mine shall have a back-up self-deactivation feature designed and constructed so that, in combination with the self-destruction mechanism, no more than one in one thousand activated mines will function as a mine 120 days after emplacement.*"
25. For further detail on the relevant provisions, see Maslen (2004a).
26. ICBL (2003: 266).
27. GICHD (2004d).
28. ICBL (2002: 52).
29. These include explosive degradation and toxic products of combustion and detonation. In addition, removal of the mine from the dispenser starts the arming process, and additional pressure of 3.4mm displacement on the mine body will then arm and fire the fuse. There is no in-built neutralization mechanism.
30. See ICBL (2003: 670).
31. Letter from Norwegian Minister of Foreign Affairs, Knut Vollbaeck, to US Secretary of State, Madeleine Albright, 20 May 1998. See also Capece, C. M., "The Ottawa Treaty and its Impact on US Military Policy and Planning", *Brookings Journal of International Law*, Vol. XXV, No. 1 (1999), pp. 191–193.
32. See for instance ICBL (2002: 313).
33. United Kingdom Permanent Representation to the Conference on Disarmament, "APL Mine Stockpiles and Their Destruction: A Progress Report: Landmine Monitor Fact Sheet", 11 May 2001, cited in ICBL (2002: 22).
34. *Ibid*.: 10.
35. *Ibid*.: 83.
36. For example, Argentina, See ICBL (2002: 78).
37. For example, Bosnia and Herzegovina, Cambodia, Croatia and Nicaragua. See ICBL (2002: 115–116, 137, 138–139, 211).
38. Thus, for example, Landmine Monitor reports that in Nicaragua a resident of the town of San Fernando kept a stock of anti-personnel mines to trade for materials or for money, as he had heard that the army was paying for them. *Ibid*.: 375.
39. NATO/SFOR Press Briefing, 12 December 2002, at *www.nato.int/sfor/trans/2002/t021212a.htm*.
40. IMAS 11.10, Edition 2, 1 January 2003, p. 4.
41. *Ibid*., 6.13 Scrap salvage, p. 7.
42. *Ibid*., p. 3.
43. The NATO Maintenance and Supply Agency (NAMSA), for instance, will not award contracts for stockpile destruction by open detonation.
44. See *www.iso.ch*.
45. Further information on the background and contents of the directive may be found on the EU website: *europa.eu.int/scadplus/leg/en/lvb/l21199.htm.*
46. IMAS 11.10, Edition 2, 1 January 2003, p. vi.
47. *Ibid*.: 6.
48. This section is adapted from GICHD (2002c).
49. See *ibid*.:Appendix 1.
50. See *ibid*.: 51; ICBL (2003: 11).
51. See *ibid*.

52. Albania, Australia, Austria, Belgium, Bosnia and Herzegovina, Brazil, Bulgaria, Cambodia, Canada, Chad, Croatia, Czech Republic, Denmark, Djibouti, Ecuador, El Salvador, France, Gabon, Germany, Guatemala, Honduras, Hungary, Italy, Japan, Jordan, Luxembourg, the Former Yugoslav Republic of Macedonia, Malaysia, Mali, Mauritania, Moldova, Mozambique, Netherlands, New Zealand, Nicaragua, Norway, Peru, Philippines, Portugal, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkmenistan, Uganda, the UK, Yemen and Zimbabwe.
53. Andorra, Antigua and Barbuda, Bahamas, Barbados, Belize, Benin, Bolivia, Botswana, Burkina Faso, Cameroon, Comoros, Costa Rica, Dominica, Dominican Republic, Fiji, The Gambia, Ghana, Grenada, Holy See, Iceland, Ireland, Jamaica, Kiribati, Lesotho, Liechtenstein, Lithuania, Madagascar, Malawi, Maldives, Malta, Mauritius, Mexico, Monaco, Niger, Niue, Panama, Paraguay, Qatar, Rwanda, St. Kitts & Nevis, Samoa, San Marino, Senegal, Seychelles, Swaziland, Togo, Trinidad & Tobago and Zambia.
54. Angola, Cape Verde, Cote d'Ivoire, Equatorial Guinea, Eritrea, Guinea, Liberia, Namibia, Nauru, Nigeria, Saint Lucia, Saint Vincent and the Grenadines, Sierra Leone, Solomon Islands, and Suriname.
55. ICBL (2003: 11).
56. Article 7 report, dated 1 October 2001, but submitted on 14 November 2001 for the period to 1 October 2001, Forms B—D.
57. Standing Committee on Stockpile Destruction, "Update on Implementation of Article 4", 30 May 2002, available at *www.gichd.ch*. See ICBL (2002: 499–500).

Part II

The Management of Mine Action

8

The coordination and management of mine action programmes

Ian Mansfield

Summary

Over the last 15 years, the international community has identified many of the requirements for successful coordination and management of mine action programmes. Wherever there is significant contamination or impact from mines or explosive remnants of war, a national mine action authority and a mine action centre can play an effective role in ensuring the proper coordination and management of a mine action programme. These institutions should be mandated and regulated by domestic legislation to bring clarity, coherence and transparency to the sector.

The United Nations and its many partners can play a major role in developing an indigenous capacity to run these institutions and thereby to plan, direct and coordinate mine action operations efficiently in response to the needs of affected communities, while at the same time maintaining safety standards as high as possible, both for those engaged in demining as well as those who will ultimately benefit from clearance.

Introduction

The need for proficient coordination and management of mine action programmes has been evident from the very beginnings of this humanitarian and development discipline — generally agreed to be activities within Operation Salam in Afghanistan in the late 1980s, following the Soviet withdrawal from the country. Initial efforts to set up a national clearance capacity by training and equipping Afghan returnees from neighbouring Pakistan floundered as the volunteers, formed into small clearance teams, were inadequately equipped and were left wholly unsupervised and unsupported following their repatriation to Afghanistan. It is not known, even approximately, how many perished or were injured during valiant efforts to spontaneously clear the many mined areas that affected their country.

Following this early setback, the United Nations, which was leading the national reconstruction effort, rethought its approach and decided to promote the creation of indigenous demining[1] organisations — non-governmental bodies that would ostensibly work on a contract basis to the UN for survey, clearance and risk education (then generally referred to as mine awareness). Thus were born the world's first demining NGOs, and several of these organisations continue to play a leading role today in freeing not only Afghanistan but also other similarly blighted countries of their explosive contamination. At around the same time, two former British military figures decided to set up their own organisations to clear mines and UXO — leading to the creation of the HALO Trust and Mines Advisory Group.

The UN, through its Office for the Coordination of Humanitarian Assistance to Afghanistan (UNOCHA) assumed, de facto, responsibility for the coordination and management[2] of the nascent mine action programme in Afghanistan, from its operational base in Islamabad across the border in Pakistan. As a major study of the mine action programme in Afghanistan, conducted in the mid-1990s, would later find: "*In a political and economic environment characterized by sporadic warfare and numerous uncertainties, UNOCHA took the initiative of developing a mine action plan and the means for its implementation. The basic two-tier structure which emerged makes a clear distinction between coordination and implementation*".[3] The UN would subsequently support coordination in many other countries around the world, and even, in exceptional circumstances, fulfil this coordination role on its own, as this chapter will describe.

National programme coordination and management

The origin and role of the national mine action authority and the mine action centre

In Afghanistan, UNOCHA served as a "*central planning, regulatory, coordination and resource mobilization mechanism*", contracting Afghan mine action NGOs to undertake specific tasks such as mine awareness, surveying, mapping and clearance. The DHA study, referred to above, concluded that:

> *"The Afghan institutional model is unique in that it has enabled the development of a comprehensive mine action programme notwithstanding the absence of a central authority and an ongoing war… The allocation of distinct but inter-related activities such as survey, clearance and monitoring, to different NGOs constitutes an in-built control or self-checking system which simplifies overall management and reduces the costs of running the programme. This institutional arrangement has facilitated the development of a significant and impressive degree of indigenization and operational capability which allows for diversity, flexibility and cost-effectiveness. The programme in Afghanistan also operates with a very small number of expatriate advisers."*[4]

Yet, although Afghanistan appeared to be a successful programme with relatively good coordination and management, its lessons were not applied in the next major humanitarian challenge for the international community:

Cambodia. The Cambodian mine action programme was launched in April 1992 following a negotiated settlement of its long-term armed conflict. The UN's peace-keeping mission, UNTAC (the UN Transitional Authority in Cambodia), had specific responsibilities for mine clearance and mine awareness but was largely "*focused on the achievement of short-term objectives geared to the realization of immediate peace-consolidation tasks*".[5]

During this period, the Supreme National Council (SNC) which had been set up by the Paris Peace Agreement, represented the "*ultimate authority concerning policy on landmines*".[6] The SNC approved the creation of the Cambodian Mine Action Centre (CMAC)[7] in April 1992 and adopted its statutes a few months later. However, "*while CMAC was formally established as the Cambodian institution mandated to address the country's mine problem, it existed primarily as a concept throughout the UNTAC period*".[8] Furthermore, in a marked change from what had been the case in Afghanistan, CMAC operated as both a coordination and an implementation body for mine action,[9] to the obvious dislike of some of the other demining operators in the country. The two-tier structure that had been employed in Afghanistan (though one that had been driven, at least in part, by the exigencies of the situation), had been discarded — or overlooked — in favour of a new approach.[10]

It was hoped that upon UNTAC's departure, CMAC would assume responsibility for coordination of mine action activities in Cambodia, including the work being carried out by the Mines Clearance and Training Unit (MCTU), which reported to the UNTAC Force Commander. Accordingly, just before the departure of UNTAC at the end of 1993, "*there was a flurry of activity to re-arrange institutional mechanisms and to capacitate CMAC to absorb and sustain MCTU's activities. This resulted in a redefined and strengthened CMAC as it became the institution responsible for planning and coordinating mine action activities in Cambodia while simultaneously having the bulk of the capacity available in-country for operational activities*".[11] However, CMAC proved to be far too weak to conduct its own affairs and international NGOs had to step in to provide direct technical and financial support to prevent the institution from collapsing. Major structural and managerial inadequacies, which the Cambodian government, even with the support of the UN, never fully managed to rectify, would come back to haunt the institution. The complaint among operators was that CMAC was trying to be "*both a player and the umpire*".

The story broke in the local and international press in 1999. Accusations about corruption, nepotism and poor financial management were made against a number of Cambodian organisations, including CMAC, and received considerable publicity. CMAC's donors suspended funding and called for a proper audit of the entire funds received and demanded new accountability for the use of funds. A 50-point list of requirements before funding would be continued was handed over to the institution. In fact, the audit, though critical of management practices, indicated that the disbursement of funds could be accounted for to within a small proportion of the total funds. This small percentage was mainly related to funds allocated to CMAC by the Royal Government of Cambodia.[12] Nevertheless, the adverse publicity that had been generated badly damaged the image of CMAC and lowered staff morale. According to the International Campaign to Ban Landmines (ICBL):

> *"Concern over whether the agency would close and whether they would have a pay packet and a job the next month was spoken of by many staff. Relationships between UNDP and CMAC were strained and some instances of public recriminations appeared in the media. The consequent and probably understandable stop-start approach to funding hindered planning".*[13]

By this time, however, many other mine action programmes had been established. In Angola, Bosnia and Herzegovina, Croatia, and Mozambique, to name a few, large-scale demining programmes funded with millions, sometimes tens of millions of dollars, were operating, often with the assistance and support of a UN peace-keeping operation, as had been the case in Cambodia; on other occasions, the UN Development Programme (UNDP) took a leading role to develop the capacity of the national authorities to take responsibility for coordinating and managing its mine action programme.

Experiences were mixed, as a landmark study of several countries attested. In Mozambique, the UN's initial plan "*foresaw a Mozambican Mine Action Centre which would mirror the Cambodian model: an inter-ministerial group or similar configuration would constitute the governing authority while a mine action centre would intervene directly and orchestrate the activities of all other involved agencies*".[14] However, the plan, and the initiation of the proposed mine action programme, encountered significant difficulties, in particular opposition from major donors, as well as a lack of commitment from the former warring parties. In response, the UN adjusted the institutional arrangements, having set up the Accelerated Demining Programme (ADP), a demining body under UN project management that brought together demobilised soldiers from both the former government and the armed opposition group, RENAMO, working in harmony side by side to clear mines laid during decades of bitter combat.

But at the time of the departure of the UN peace-keeping operation — ONUMOZ — at the end of 1994 the UN and the donor community had still not reached agreement on future institutional arrangements and how the capacity of the Mozambican government would be developed to address the landmine problem. By then, however, "*a pragmatic arrangement of sorts had emerged whereby Norwegian People's Aid operated in the north of Mozambique, HALO Trust in the centre, and … ADP in the south*".[15]

Indeed, as of 2004, the institutional management and coordination situation had still to be clarified. Mine action was under the overall supervision of the Ministry of Foreign Affairs, which set up the National Demining Institute (IND) in 1999, replacing the National Mine Clearance Commission that had lost the confidence of operators and donors. A 10-year review of mine action in Mozambique, conducted by the GICHD at the request of the UNDP office in Maputo, identified serious deficiencies in the country's latest five-year action plan (2002–2006), a limited ability to plan and prioritise mine action effectively, and a need to integrate mine action with national development. However, the review also described Mozambique's mine problem as a constraint on economic development rather than a humanitarian emergency, arguably the result of effective and well-targeted mine clearance operations.[16]

The GICHD's review proposed that the government create a new institutional framework making stronger links between mine action and national development plans. This would include an interministerial Mozambican Mine Action Authority to provide the policy for and regulate mine action, and manage linkages within the government, mine action community and donors. It would be chaired by a minister whose responsibilities focus on the country's socio-economic development, with the Minister of Foreign Affairs and Co-operation serving as Deputy Chair, responsible for Mozambique's continued participation in the Ottawa Process. The proposed authority would report to the Council of Ministers, which would have final authority on policy measures intended to have government-wide effect and for final review of draft legislation for mine action before it was submitted to parliament.[17]

In Angola, following the 1992 cease-fire a recognised government was already in place during the planning phase for the mine action programme. A preliminary plan developed in September 1994 by the UN's Humanitarian Assistance Coordination Unit in collaboration with DHA declared that "*a major mine clearance programme was required if the UN was 'to advance in a meaningful manner its humanitarian and peace-keeping objectives in Angola.' The plan was built around the notion that the Angolan government was ultimately responsible and must be assisted in acquiring the necessary expertise to deal with the long-term problems of landmines*".[18] However, the programme ran into trouble from the outset. A review of the programme in 1996 concluded that the UN had "*illustrated its inability to learn from other programme experiences and was unable to avoid difficulties it had encountered in other settings*".[19]

Subsequently, in May 1995, the Council of Ministers issued a Decree establishing the National Institute for the Removal of Explosive Devices (INAROEE)[20] as a "*specialized government institution responsible for coordinating and conducting mine-removal operations*" under the authority of the Minister of Welfare and Social Reintegration.[21] Again, as had been the case in Cambodia, operators complained that INAROEE was both a player and the umpire: this resulted in a lack of respect for the institution. In July 2001, the government set up the Inter-Sectoral Commission on Demining and Humanitarian Assistance (CNIDAH)[22] to take over the role of regulator and coordinator of mine action in Angola, reporting to the Council of Ministers. INAROEE was subsequently reformed and reorganized as the National Demining Institute (INAD) responsible only for carrying out demining operations.[23]

Based on a candid assessment in the mid-1990s of the UN's support for the development of indigenous capacities in four countries, it was recommended to the then-focal point for mine action within the United Nations, DHA, that in a mine-affected country the organisation should support a two-tier structure for mine action coordination and management. This demanded, first, that the UN, "*facilitate the creation of a national mine action authority with an appropriate mandate and composition. The purpose of a national authority is to ensure that mine action activities have an appropriate governance body… [It] would normally ensure that a portion of the national budget is made available annually for the country's mine action activities. The authority should ensure that mine action policy is non-partisan and is in accord with humanitarian considerations including the allocation of resources to address the mine-related problems of those who are most vulnerable*".[24]

The second tier of the management structure would be the mine action centre or MAC:

> *"The core function of such a Centre is to ensure that programme activities give effect to established policy. This necessarily involves the development of an overall plan and ensuring that a coherent and comprehensive approach is pursued in a safe and cost-effective manner. In line with its central coordination responsibilities, the MAC will generally be responsible for planning, for a central data bank on minefield information, for resource mobilization, for monitoring, and overall programme development including the investigation of accidents and follow up activities.»*[25]

The report to DHA highlighted a problem with the MAC holding dual roles of coordination and implementation, although it noted that: "*The general preference of Programme Managers, past and present, in charge of initiating and developing Mine Action Centres was to have an operational capability under their direct command. For the most part, MAC managers felt that they would be handicapped by 'having to rely on a third party'*".[26] Ultimately, however, it rejected these arguments and concluded with a strong recommendation:

> *"in favour of distinct coordination and implementation arrangements. Operational activities should be undertaken by independently managed mine action agencies (such as national and international NGOs) under contract to the MAC. The MAC should not become directly involved in implementation activities but retain overall control through sound contractual arrangements. This approach puts less strain on human resources at the centre in terms of management and control capabilities. It is more transparent for donors and more responsive to shifting priorities and demand as the mine problem is brought under control and the level of activities decrease over the years. There are situations, however, where the vertical integration approach will be the option preferred by the national authorities. If the mine action authority and the MAC determine to directly execute operations in the field then the central management structure must be considerably enlarged to provide management and logistical support to units in the field."*[27]

The UN accepted these recommendations, and reflected them in the first version of the International Mine Action Standards (IMAS), issued in 2000. The second edition of the IMAS, published on 1 January 2003, lays down the following core guidance to States:

> *"The primary responsibility for mine action lies with the Government of the mine-affected state. This responsibility is normally vested in a NMAA [National Mine Action Authority,] which is charged with the regulation, management and coordination of a national mine action programme. The NMAA is responsible for establishing the national and local conditions which enable the effective management of mine action. It is ultimately responsible for all phases and all facets of a mine action programme within its national boundaries, including the development of national mine action standards, SOPs and instructions."*[28]

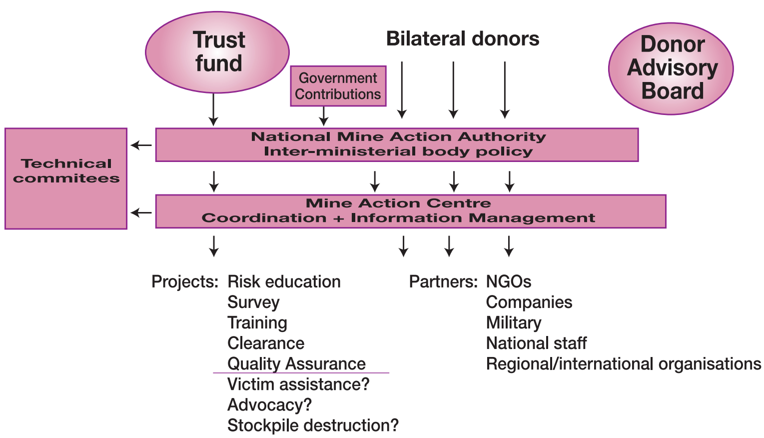
The IMAS also foresee the creation of a mine action centre, declaring that a MAC

> *"can be established by either the NMAA, or in specific circumstances by*

the United Nations. The structure of each MAC will reflect the national mine action plan, but in general they will be responsible for:
a) the co-ordination or planning of all mine action activities in their area of responsibility;
b) the provision of technical advice to the NMAA;
c) the maintenance of mine action records and databases;
d) (if delegated by the NMAA), the accreditation of mine action organizations; and
e) the investigation of mine action related accidents and incidents."

The standard two-tier coordination and management structure (*see Figure 1 – the third tier illustrated in the national structure refers to implementation through demining and mine risk education operators*) has been adopted by the governments of many mine-affected States, though it is by no means universal. In particular, States that have been assisted by bilateral or regional military-to-military cooperation for the creation of a manual mine clearance capacity within the armed forces have tended to set up a national demining office (or similar title) within or under the direct control of the Ministry of Defence. These countries have tended to eschew the need for a national authority, preferring to concentrate on direct implementation of clearance activities.

Figure 1. National mine action structure



However, the IMAS model remains the norm, and a number of countries that have taken other approaches have moved to adopt, or have been encouraged to adopt, critical features of that model. In Cambodia, for instance, the funding crisis in 2000 that followed a collapse in donor confidence in CMAC, led to the government setting up the Cambodian Mine Action Authority (CMAA) and making CMAC simply an operator for demining and mine risk education.

Likewise, in the neighbouring Lao People's Democratic Republic (Lao PDR), UXO LAO had fulfilled a similar role to CMAC. Following its own cash-flow problems in 2002, and under the encouragement of the UNDP, the Lao PDR government issued a decree establishing the National Regulatory Authority, which would assume responsibility for management and coordination of "UXO action" in the country.[29] This initiative, which was warmly welcomed by donors,[30] was still to come to practical fruition as of October 2005, although the signs were encouraging. In Ethiopia, also, which had set up the Ethiopian Mine Action Office (EMAO), following the initiation of support from the United States, EMAO is calling for its role to be transformed by national legislation into a formal coordination body.[31]

Indeed, with a view to promoting effectiveness and transparency, the UN encourages all States to adopt national mine action legislation that mandates and regulates the work of these key institutions;[32] to date, too few States have done so.[33] A GICHD study conducted in 2002-2004 for UNDP identified some of the main issues that should be included in such legislation.[34]

The role of the UN in supporting coordination and management

In general, since the publication of the report to DHA on developing indigenous mine action capacities, it is clear that the UN has been successful in strengthening its efforts to support national coordination and management of mine action. The UN's approach to national capacity development for mine action coordination and management is focused on three major components:

- the provision of technical advisers within the national mine action authority and/or mine action centre;
- in-depth training for national staff working within these two institutions, notably through the Senior and Middle Manager's courses offered by Cranfield University's Resilience Centre and the Mine Action Information Center at James Madison University (both through UNDP and with the support of key donors to mine action); and
- ongoing support for resource mobilisation, by facilitating relations with mine action donors.

In rare cases, the UN (as foreseen by the IMAS) has undertaken responsibility for national programme coordination and management directly. In Kosovo, for example, the UN can claim a major success in effectively coordinating the work of dozens of disparate operators over some two and a half years, and clearing the province of the vast majority of its explosive contamination. Similarly, in Lebanon, the UN facilitated the disbursement of a US$50 million contribution from the United Arab Emirates that significantly reduced the mine and UXO threat in the south of the country.

Where the UN has sometimes been rather less successful is in securing the transition to full national ownership of a mine action programme. In the major mine action programmes set up at the end of the 1980s and early 1990s, such as Afghanistan, Angola, Cambodia, and Mozambique, UN technical advice for coordination and management still remains an important element of the programme more than a decade later. Providing technical advisers to programmes clearly has consequent and significant cost implications.

But premature handover also has risks. Thus, for example, it is generally agreed that despite the many successes of the mine action programme in Kosovo, the UN left too early — even another six months could have made a difference in the view of the former UN Programme Manager. In Azerbaijan, however, no technical assistance is deemed necessary by the Azeri government, and the programme is functioning autonomously.

Tools for coordination and programme management

However, the UN can also claim credit for spurring the development of key tools for mine action programme management and coordination, notably the IMAS and support for the development of the Information Management System for Mine Action (IMSMA).

The International Mine Action Standards

The IMAS in force today are the result of many years of work by the UN, the GICHD and mine action operators and actors around the world.[35] International standards for humanitarian mine clearance programmes were first proposed in July 1996, by working groups at an international technical conference in Denmark. Criteria were prescribed for all aspects of mine clearance, standards were recommended and a new universal definition of “clearance” was agreed. In late 1996, the principles proposed in Denmark were developed by a UN-led working group and the International Standards for Humanitarian Mine Clearance Operations were developed. A first edition was issued by the UN Mine Action Service (UNMAS) in March 1997.[36]

The scope of the original standards subsequently expanded to include the other components of mine action and to reflect changes to operational procedures, practices and norms. The standards were re-developed and renamed as the International Mine Action Standards (IMAS); the first edition was published in 2000 and a second edition (the current basis for the standards, as amended) was issued in 2003.[37] Individual IMAS are reviewed at least every three years to reflect developing mine action norms and practices and to incorporate changes to international regulations and requirements.[38]

Although the concept of the IMAS has been widely welcomed at international level, the content of every standard has not (as one might expect) found universal support. In particular, the IMAS are criticised by some for being a straightjacket, slowing down efforts to reduce the humanitarian impact of mines, especially through its requirement that clearance be conducted to a 100 per cent success rate down to a stipulated depth.

In defence of the IMAS, however, it is always made clear that the international standards should be adapted to the national context and turned into applicable national standards. Over the past few years, a great deal of progress has been made in many major mine action programmes in achieving this. Thus, for example, innovative approaches to clearance, for instance using rakes in sandy soil as occurs in Somalia or Sri Lanka, can thereby be endorsed and safety standards maintained, without preventing their employment in relevant circumstances. Moreover, mine clearance standards should be applied only to mine clearance; thus, where the threat demands a battle area clearance response, other, more appropriate standards should be applied.[39]

The Information Management System for Mine Action (IMSMA)

IMSMA is a software-based data management tool for use at Mine Action

Centre (MAC) level. It combines a relational database with a geographic information system (GIS). It is able to provide mine action managers and practitioners with up-to-date information management capabilities to facilitate decision-making in the framework of mine action. The system is currently in use in more than 80 per cent of mine action programmes around the world.[40] Based on the input of field users, the system has been continuously revised and upgraded since its initial release in the summer of 1999 (it was fielded for the first time in Kosovo).

In 2005, the IMSMA Re-Engineering Project got underway. The aim of the project was to develop a comprehensive update to IMSMA based on ideas submitted by system users over the first five years of its life. This latest version of IMSMA (V. 4.0) has been designed as a decentralised system and will replace existing systems within the next two years. The new release contains a fully integrated GIS based on the ESRI Arc Engine software package, allowing users to perform interactive map-based navigation throughout the entire content of the database.

Language-related challenges are made easier by IMSMA V. 4.0 through the inclusion of Arabic, English, French, Portuguese, Russian, and Spanish versions of the system's user screens, forms, error messages and other text. The system's data entry, review and reporting tools will also be updated to provide for the creation of locally developed data collection forms in local languages. Combined with a simplified custom data field creation capability these changes will make it easier to customise the system to meet local needs.

The updated IMSMA is built around an easy-to-use core module, which is designed to provide operations with a simple set of data collection and reporting tools suitable for most situations. Sites with more sophisticated operational requirements will be able to choose from a set of "plug-ins" designed specifically for particular activities. Plug-ins are already in development for mine risk education, victim assistance and quality assurance activities, with others in the planning stages.[41]

These changes respond effectively to many of the criticisms of the IMSMA system, but one significant obstacle — not related to the performance of the system itself — remains. Distribution of the database and the information it contains is dependent on the goodwill of the State that is given the system. Sadly, not all governments have been as effective in disseminating the information that IMSMA generates as they have at gathering it. Some data must, of course, remain confidential, for reasons of national security or human rights; most the data should be shared widely with all the mine action actors that can benefit from and use it.

Challenges in coordination and programme management

In conclusion, then, over the last 15 years, the international community has learnt — and agreed upon — many of the requirements for successful coordination and management of mine action programmes. Central to that learning experience has been the work of the national authorities of affected States, the United Nations and key donors to mine action.

Wherever there is significant contamination or impact from mines, UXO or abandoned explosive ordnance (AXO), a national mine action authority and a mine action centre can play an effective role in ensuring the proper coordination and management of a mine action programme. These institutions should be mandated and regulated by domestic legislation to bring clarity, coherence and transparency to the sector.

The UN and its many partners can play a major role in developing an indigenous capacity to run these institutions and thereby to plan, direct and coordinate mine action operations efficiently, while at the same time maintaining safety standards as high as possible, both for those engaged in demining as well as those who will ultimately benefit from clearance.

Yet, despite major, generalised improvements in coordination and management of mine action programmes around the world, significant challenges remain. For example, the first deadlines for States Parties to the Anti-Personnel Mine Ban Convention to clear all anti-personnel mines from mined areas under their jurisdiction or control will elapse on 1 March 2009. It already seems likely that a number of major mine action programmes will not make this looming deadline in time. This presents a challenge to both the affected countries themselves and to donors who have committed to support host country mine action to meet their obligations.

Linked to this issue is the demand for effective strategic planning, that sets realistic objectives maximising benefits in relation to costs. There are many different approaches to strategic planning and no one approach is endorsed by the IMAS. Clear, though, is the overriding obligation for any strategic plan to respond to the assessed needs of the affected populations and not to be a supply-driven exercise in resource distribution. One way to determine those needs has been the landmine impact survey, already conducted in more than a dozen countries, and potentially an important management tool.

Thus, with a clear and internally consistent strategic plan in place that determines criteria for adjudging priorities, setting operational priorities becomes far easier. These can then be implemented through annual work-plans, which have helped to determine and allocate the necessary resources efficiently.

Of course, in a country beset by difficulties resulting from many years of bitter armed conflict, the need to confront corruption is persistent. Of course, this is by no means the *domaine réservé* of mine action — all sectors of everyday life and the economy are prone to its excesses — but given the very significant allocation of resources to mine action (currently running at more than US$250 million per year), the demining community has an ongoing obligation to maintain the highest standards of financial probity.

In order to sustain that level of funding, mainstreaming mine action into development has become a rallying cry for the UN and major donors. Most mine action funding has been from short-term and sporadic emergency budgets, barely conducive to efficient long-term planning. A number of countries have sought to integrate mine action within broader rehabilitation and development efforts (significant steps have been taken by Afghanistan, for example, to the extent that some 40 per cent of all clearance work is in direct support of national reconstruction). But overall the picture could be brighter. If mine action is to deserve future funding, it must do even more to demonstrate that its contribution to rebuilding a country after war is not only worthy but essential.

Endnotes

1. The word *demining* was suggested to distinguish clearance for purely humanitarian purposes from breaching of minefields in support of operational, military objectives. Today, of course, demining is defined under the International Mine Action Standards as encompassing also survey, marking, mapping, the handover of cleared land, and even community mine action liaison. See I*MAS 04.10: Glossary of mine action terms, definitions and abbreviations*, Second Edition, 1 January 2003, Definition 3.51.
2. Oftentimes, coordination and management are deemed synonyms, but they are not exactly the same. Coordination is the "harmonious functioning" of different but interrelated elements — itself a major but essential challenge given the typically wide and disparate nature of mine action actors within any given programme — whereas management focuses on the daily decisions that must be taken on how the programme should be run. Thus, coordination challenges centre on issues such as standardisation of approach and allocation of responsibilities within mine action. Management, on the other hand, is closely linked to the planning of mine action and the requisite resource mobilisation, as well as quality management (i.e. quality assurance and quality control) of ongoing operations.
3. Eaton et al. (1997).
4. *Ibid*., para. 66.
5. *Ibid*., para. 67.
6. *Ibid*., para. 68.
7. Canadian peacekeepers are credited with putting forward the term "mine action", the first known use of the term. They wanted a phrase that would give the impression of energy and momentum.
8. Eaton et al (1997), para. 68.
9 Law to Prohibit the Use of Anti-Personnel Mines, Article 5. See the report on Cambodia in ICBL (2000a), available at *www.icbl.org/lm.*
10. Some even believed that the Cambodian model was an "institutional blueprint for elsewhere". See for instance Eaton et al. (1999), para. 71.
11. *Ibid*., para. 69.
12. Country report on Cambodia, in ICBL (2000a).
13. *Ibid*.
14. Eaton et al. (1997), para. 74.
15. *Ibid*., para. 76.
16. GICHD (2005a).
17. GICHD (2005: 118-120) and ICBL (2005).
18. Eaton et al. (1999), para. 78.
19. *Ibid*., para. 83.
20. *Instituto Nacional de Remocão de Obstáculos e Enghenos Explosivos*.
21. Eaton et al (1999), para. 78.
22. *Commissão Nacional Intersectorial de Desminagem e Assistência Humanitária às vítimas de minas*.
23. See United Nations, *Country profile: Angola*, available on EMINE at *www.mineaction.org.*
24. Eaton et al. (1999), Recommendation 11.
25. *Ibid*., Recommendation 12.
26. *Ibid*., para. 100.
27. *Ibid*., Recommendation 13.
28. *IMAS 01.10: Guide for the application of International Mine Action Standards (IMAS)*, Second Edition, 1 January 2003 (Incorporating amendment number(s) 1 & 2), Section 5.1.

29. The explosive threat in Lao PDR emanates very largely from unexploded ordnance (UXO) rather than landmines, thus the government prefers the term "UXO action" to describe intervention in this sector.
30. Thus, the UN appeared to have effectively internalised one of the key lessons from Mozambique, whereby donor support for the approach that it advocates is critical to the ultimate success of the initiative.
31. Ethiopia is also notable for the predominance of national resources that it has allocated to mine action, through a World Bank loan secured in the late 1990s for the rehabilitation of the regions of Afar and Tigray as a result of the border conflict with its neighbour, Eritrea.
32. See for instance GICHD (2004f).
33. According to the Landmine Monitor, only four countries are known to have adopted national legislation in support of mine action: Bosnia and Herzegovina, Colombia, Croatia, and Zambia. It notes, however, that several others are known to be in the process of doing so, including Afghanistan, Albania, Iraq, Nicaragua, and Uganda. See "Mine Action Overview", in ICBL, Landmine Monitor Report 2005: Toward a Mine-Free World, Mines Action Canada, Ottawa, October 2005.
34. GICHD (2004f).
35. The IMAS project is managed by the GICHD on behalf of the United Nations. It consists of the review process for extant IMAS, the development of new IMAS and an "outreach" support capacity to assist in the design of national mine action standards. It is a continual process. See *www.gichd.ch.*
36. See for instance the foreword to *IMAS 01.10: Guide for the application of International Mine Action Standards (IMAS)*, Second Edition, 1 January 2003 (Incorporating amendment number(s) 1 & 2).
37. The work of preparing, reviewing and revising IMAS is conducted by technical committees, with the support of international and governmental organisations and NGOs. The latest version of each standard, together with information on the work of the technical committees, can be found at *www.mineactionstandards.org*.
38. *Ibid*.
39. According to the IMAS, battle area clearance (or BAC) is defined as "*the systematic and controlled clearance of hazardous areas where the threat is known not to contain mines*". Definition 3.18, IMAS 04.10, Second Edition, 1 January 2003 (Incorporating amendment number(s) 1 & 2 issued on 1 December 2004 and 23 July 2005, respectively). Battle area clearance is typically far quicker than mine clearance.
40. In 2005, it was installed and being used to some extent in 41 countries and territories: Afghanistan, Albania, Angola, Armenia, Azerbaijan, Bosnia and Herzegovina, Burundi, Cambodia, Chad, Chile, Colombia, Costa Rica, Cyprus, the Democratic Republic of Congo, Ecuador, Eritrea, Estonia, Ethiopia, Guatemala, Guinea-Bissau, Iraq, Jordan, Kosovo, Lebanon, the Former Yugoslav Republic of Macedonia, Mauritania, Mozambique, Nicaragua, Peru, the Russian Federation (Chechnya/Ingushetia/northern Ossetia), Rwanda, Serbia and Montenegro, Sierra Leone, Somalia (Somaliland), Sri Lanka, Sudan, Tajikistan, Thailand, Western Sahara, Yemen, and Zambia.
41. See *www.gichd.ch* for up-to-date information on the IMSMA.

9 Mine action information management

Mark Yarmoshuk

Summary

The first five years of mine action information management systems — the period before the Information Management System for Mine Action (IMSMA) — saw the development of databases in large programmes that had a requirement but, more importantly, the capacity to devote significant resources to this task. These databases were not well rounded — they focused on the particular sort of data and reporting that were of specific interest to the individuals working in the programme at the time and did not benefit from a wider body of experience.

The next five years saw the development of IMSMA through three major versions and, with the exception of the northern Iraq programme, very little database development elsewhere. IMSMA is now the de facto standard database for mine action. However, the balance of power between headquarters staff and information management professionals seems to be firmly weighted towards headquarters staff, given the experience during the design of recent surveys. Important lessons learned during the landmine impact survey process seem to have been forgotten. By focusing on data rather than data use, surveys such as the emergency survey in Iraq have degraded their effectiveness by failing to focus on analysis.

Geographic information systems are now widely used in mine action. For most programmes this means that they have the capability to print maps showing the mine threat. While automated mapping is a very modest use of the geographic tools made available by IMSMA, it is a huge advance from what was available before and places mine action among a very select group of GIS users in many of the countries where it is used.

Introduction

This chapter reviews the development of mine action information management systems over the past decade. It discusses the major themes that have influenced the development of these systems, notably:

- **Technological advancements in computer hardware and software:** a particular focus is made on database and geographical information systems (GIS) development.
- **The databases themselves and the survey procedures which populate them:** this aspect is broadly influenced by the varying attention paid to field *v.* headquarters perspectives on requirements. It also covers the end use of the data and attempts to deploy systems to the field to improve the use of data in mine action planning and evaluation.
- **Spatial data:** historically this has meant maps but now encompasses various digital products derived from photographic images, airborne sensors or space-borne platforms.
- **Point positioning techniques:** this is related to mapping and therefore overlaps somewhat with the discussion on spatial data but focuses on the collection of location data during survey activities;
- **Advisers, training and system documentation:** this has been a major, if perhaps somewhat hidden, cost of improving information management capability in mine action centres.
- **Multi-sector cooperation:** the most significant example of this has been in humanitarian information centres.
- **Regional initiatives:** such initiatives have been seen in southern Africa and south-eastern Europe.

Section 1 reviews what is expected from mine action information systems and the guidance provided by various international standards. Section 2 contains a history of information management and database technology relevant to the development of mine action information management and reviews the ways in which the technology has been applied in mine action centres. Section 3 provides some background on GIS and digital mapping prior to reviewing their use in mine action. Section 4 is about data use and exchange — the ways in which data stored in databases are made available for reporting and analysis. Section 5 looks at the non-technical aspects of information management, namely the technical assistance and exchange of best practices that build the required skills to use the relevant technologies. Finally, Section 6 offers general conclusions.

The promise of information management

Information management has evolved into a critical element of effective mine action. Judged by numbers of staff and technical advisers it is usually among the largest departments of a typical mine action centre — and sometimes it forms the core of the mine action centre. Judged by budgets it is again among the top spenders outside of actual field clearance. Information management spans a broad swathe, ranging from the database administrator who doesn't often get out of the office, to the surveyor who doesn't often get out of the field.

At heart, a mine action database is a record of what is known and what has been done. It records all available information regarding threat from explosive remnants of war (ERW) and the different activities — e.g. survey, clearance, mine risk education (MRE) — carried out to mitigate those threats. Mine action information can do more than this but without these basic elements in place further work is not possible. The database can inform general planning by providing figures on the nature of the problem (types of ERW, square metres affected) and, with the addition of community impact data, can be used to prioritise mine action activities. At the operations level it can inform managers about the progress of the work plan and measure productivity.

Early mine action databases focused on the location of hazards. Survey information was stored and updated to reflect clearance activities. The requirement was quite simple and a single flat table with 20-30 fields of information could meet the requirement. This was sometimes extended to store progress information which could be used to report on productivity over a period of interest. The advent of the landmine impact survey (LIS) coincided with the development of the Information Management System for Mine Action (IMSMA) and allowed far more complicated information management tools to be deployed in mine action centres.

Users expect information management systems to support them in their jobs, both in planning and reporting. A surveyor would like help in calculating the area of the surveyed minefield and producing a high quality map. A clearance planner would like detailed information on relevant factors, such as soil, terrain and vegetation. A field manager for a clearance team looks for detailed productivity information. A regional manager looks for more general productivity information, status of assets on their current tasks and the progress against the clearance plan. A quality assurance manager looks for records of past inspections and compliance. At headquarters, the programme manager wants to know if the programme's objectives are being met and operations planners want to know about tasks that warrant priority attention. International bodies and donors want guidance on deciding where available funds are best spent.

The remainder of this section will review the various means that programmes have employed to achieve these goals, highlighting the technical details that must be overcome along the way.

Policy documents

Mine action information management now has a lengthy history. Mine action databases go back to 1992 and the IMSMA Field Module (FM) is into its sixth year and third version. Although they have certainly provided an essential service by maintaining a record of mine action activities, information management systems have yet to live up to their promise of consistently supporting more effective management. There remain a relatively small number of mine action information practitioners — mainly employed by the Geneva International Centre for Humanitarian Demining (GICHD), the Swedish Explosive Ordnance Disposal and Demining Centre (SWEDEC), the Swiss Ministry of Defence, the Vietnam Veterans of America Foundation (VVAF) and the United Nations — who rotate through the various mine action programmes. There is little written instruction for these practitioners. They often have backgrounds that include database and GIS skills and sometimes come from the military. But, for the most part, they learn the fundamentals of mine action information management in the programme itself, which is perhaps why there seems to be a fairly high barrier to entry into this field.

One of the difficulties for mine action programme managers is that many do not know what to expect from their information system. They often have a general idea of what they would like the system to do, but this may or may not be realistic. There is no performance-based specification they can use in order to evaluate their information department in the mine action programme. If the computers are running and data seem to be getting entered there is a sense that the system is to some degree working; however, there is often a frustration among programme managers that their information systems do not provide them with the information they would like to have.

The most effective use of information systems in mine action has occurred in programmes where there has been a tight integration between operations personnel and the database section. This was clearly seen in Kosovo from 1999 through 2002 where outputs from the information system were required by operations staff in the issuing of survey and clearance tasks. This tight integration is often difficult to achieve due to the structure of the mine action programme, or due to weaknesses in either the operations or database sections (or both).

The International Mine Action Standards (IMAS) provide only general guidance, in

- **IMAS 5.10: Information Systems** (scheduled for publication in 2004 but which had still to be issued in late 2005); and
- **IMAS 8.10: General Mine Action Assessment,** which provides a helpful general overview of the information management cycle but is too general to provide useful guidance to the field-based manager.

The UN Mine Action Service (UNMAS) sector policy on information management[1] provides a helpful general overview of how information management should fit into the mine action programme and how it should relate to other agencies. This policy document lays out the expected benefits of a mine action information system:

- define and analyse the landmine problem;
- develop and manage appropriate mine action programmes;
- assess and measure progress; and
- mobilise, allocate and monitor resources.

The UNMAS policy document highlights the importance of coordination to limit duplication of effort, standardisation of survey and reporting structures, maintenance of metadata (data about data), securing data against loss, data sharing and exchange, and the recording of best practices in information management.

The wider standards community has not played a role. For example, at least two International Organization for Standardization (ISO) standards could be applied to mine action information management to some degree, but neither has been:

- **ISO 15489: Information and Documentation — Records Management.** This standard has as its goal "*… [enabling] organisations to develop policies,* *strategies and programmes which will ensure that information assets have the essential characteristics of accuracy, integrity and reliability*".[2] The problems that ISO 15489 is intended to solve are familiar to mine action information practitioners, although they occur, perhaps, on a much smaller scale in mine action. Corporations with tens of thousands of documents clearly have a more complex problem than mine action centres with a more modest document production.

- **ISO 19115: Geographic Information — Metadata.** Metadata is data which are stored to describe various aspects of the content, source, accuracy and usability of other data. When using paper map products the user assumed that the map producer — for topographical maps this was usually a government mapping agency — was providing a product which met an expected level of accuracy. With traditional map products this was somewhat intuitive: no one would try to accurately position a minefield on a small-scale provincial map printed at a scale of 1:500,000. Instead, a map at a scale of 1:50,000 would be obtained, where one centimetre on the map is equal to 500 metres on the ground. With digital data it is more problematic: without metadata the user cannot know how the data were collected and to what standards. In mine action, this applies to base geographic data, such as roads, political divisions, towns and so on, as well as to minefield locations. The mine action community has yet to adopt a metadata standard for its spatial data.

Programme life-cycles

The post-conflict, developmental and "autonomous" phases of mine action bring with them a varying group of players, differing imperatives and widely different challenges. These phases blend from one to the next or, as experienced in Afghanistan and Iraq, can regress back to renewed conflict.

The post-conflict phase is characterised by an unfamiliar situation, a data-poor environment and a high level of interest by all parties in obtaining more information. In the immediate post-conflict phase (often even during the conflict as, for example, security permitted in longstanding conflicts in Angola and Iraq) there is a strong interaction between the military and civilian organisations.

Lessons learned over the last ten years, from Bosnia and Herzegovina to Kosovo and Afghanistan and now Iraq, have resulted in a close cooperation between the military, governments, NGOs and the UN. This cooperation is reinforced by imperatives: military forces see benefit from humanitarian activities and non-military actors rely on the military both directly and indirectly for their security. Mine action players have a particularly keen interest that military units in their vicinity are aware of their movements and activities lest they draw hostile fire while working with explosives.

The developmental phase is characterised by more experienced managers looking to improve resource allocation by better defining priorities.

The autonomous phase should see a refined reporting system in place which provides the required inputs for planning and prioritisation.

Requirements for data with respect to both content and quality, and capabilities to collect it vary throughout the programme life-cycle. Early on in a programme's life (and even well into it, such as during a typical landmine impact survey) very vague data may be collected, which becomes somewhat persistent in the information system. Mechanisms need to be in place where "old" data can be retired if it has outlived its utility. And yet there is a fear of disposing of any data lest some valuable clues be lost.

In a well-developed programme, detailed clearance progress figures may be of interest to a detailed examination of the productivity of the organisations and methods being employed. The challenge to mine action database designers is to meet the competing goals of a flexible system that adapts to regional and temporal differences in requirements yet is also internationally standardised to assist in cross-border comparisons of the mine threat and response.

Databases and information management in mine action

Database work conjures up images of technicians carefully maintaining computer hardware and software, and diligently making backups to safeguard data entered into the system by droves of low skill data entry clerks. Information management suggests that something has been done to transform the data into valuable information which will lead decision making. In reality there is a finer distinction between databases and information management, and the importance of the technical aspects of the work is overshadowed by the primacy of the processes which are used to collect, manage and use the data which is the focus of the effort.

This section deals with mine action databases — both the data that go into them and the software of which they are composed. It also reviews information technology trends which have shaped the course of development of mine action information management. The use of the data stored in the database is left for a subsequent section.

Early mine action database systems

At least five major mine action databases preceded the IMSMA Field Module[3], and the northern Iraq MAP database was developed in parallel to it. As will be seen later in this section the development of mine action information management has paralleled the development of the personal computer (what is commonly referred to as the PC: Intel-processor-based hardware running the Microsoft operating systems, first DOS and later Windows). Without exception these databases stored their textural data in simple table structures and had no integrated Geographic Information System (GIS). The Cambodia database stands out as an early example of a simple yet effective system which made the best use of the available technology of the day. By the mid-1990s the database was integrated with an automated mapping component that allowed links to be established between geographical features stored in *AutoCAD* — a leading application for creating engineering drawings — and attribute data stored in their *FoxPro* database. In Bosnia, a separate geographical database is maintained in *MapInfo*, however it is not directly linked to their *Paradox* database. No early attempts to integrate automated mapping — a precursor to GIS — at the minefield level with the database were made in Mozambique, Angola or Afghanistan.

Prior to IMSMA the US Army Central Command undertook to develop a Demining Information Management System (DIMS). A hardware package, the Demining Support System, was also developed and deployed as part of the US Department of State demining support programme. The Demining Support System was a militarised PC system intended to withstand difficult environmental conditions. In reality it was prohibitively expensive and was predominately installed in comfortable office locations. Neither of these initiatives made a large impact at mine action programmes — DIMS was discontinued in favour of IMSMA and the Demining Support System was replaced by standard specification computer hardware.

The major strengths of the locally designed databases were that they exactly matched the perceived requirement in the country. The main limitations were that the perceived requirements were often somewhat limited and they were susceptible to collapse if a few key personnel left the organisation. Some of the themes related to databases which preceded IMSMA are summarised below.

- **Survey contents.** In locally developed systems the data collected are exactly those which the local organisation is interested in. This point is closely related to the next — in locally developed systems the survey and clearance process can be exactly modelled in the database. This suggests that most programmes by end-2003 were not conducting field operations which completely adhere to the IMAS standards.
- **Data entry workflow.** Locally developed systems allowed complete customisation of the data entry forms to focus on the elements that were of the most interest to the programme, including extensive data quality checks. This resulted in high quality data for a small number of data fields, but also excluded many data fields that were considered important among the broader community.
- **Decentralised use.** The distributed use of a database may lead to technical problems because changes to the same data in disparate locations must be avoided. IMSMA's solution has been to limit the ability to enter or edit data to one location. This inflexible approach does not meet the needs of many mine action programmes. In Afghanistan, a very distributed system was established — the database was maintained regionally, with some data entry being conducted at the field operator level. The Afghan system relied upon communication between database operators to ensure that data were not edited in two locations, rather than by guaranteeing it by software design. In Bosnia, daily synchronisations of the database are achieved between two regional offices and the headquarters. Decentralised use remains a weakness of IMSMA. While it can be set up to work regionally the configuration and synchronisation process is somewhat cumbersome and options, such as allowing a separate organisation (e.g. the

International Committee of the Red Cross — ICRC) to maintain victim data, are not supported.

- **Limited scope of system.** Focused on minefields rather than communities. The assessment of the socio-economic impact of hazard areas on communities by recording blockages and the tight integration of the GIS systems were underdeveloped or completely missing from mine action information management prior to IMSMA.
- **Varied functional support to operations, reflecting the specific breadth of the respective programme.** Could have integrated modules for mine risk education, victim assistance, quality assurance, field task management and asset allocation. Only the northern Iraq MAP information system had all these capabilities. IMSMA was not initially designed to have such capabilities and some have been added over time.
- **Influence of key personnel.** Databases prior to IMSMA tended to be very reliant on the individuals who established them. The local databases in Afghanistan, Cambodia and Mozambique were severely compromised by the departure of key personnel. In Afghanistan, the mine action centre was able to continue working with the system but limited in its ability to modify and extend it. In Cambodia and Mozambique, the departure of international technical advisers led to the complete collapse of the system.

The technological backdrop

All mine action databases have been installed on software running on Microsoft operating systems using hardware based on Intel (or compatible) processors. Mine action practitioners were early adopters of available hardware and software. While database and GIS applications date back to the 1960s, and many of the largest database and GIS companies have product lines dating back to the early 1980s, professional level systems were all Unix-based until the mid-1990s. This changed with the advancing pace of processor speed and graphics card capabilities in the Microsoft Windows/Intel-dominated personnel computer market.

Hardware and operating systems

The choice of the PC platform was a natural one for mine action as it became available for a reasonable price as the discipline was developing. Early practitioners were also database-centric: GIS was not to become a relatively well known technology until later in the 1990s.

Database software can generally be processor- and disk-intensive for a very large system, however, in mine action this is not necessarily the case. Database software is certainly not graphics-intensive. This allowed early mine action database practitioners to develop systems locally, using readily available and relative affordable IBM compatible PCs. GIS would not be widely available on the desktop PC until the late 1990s.

The IMSMA database has proven to require relatively fast processors throughout its design history due to a combination of design decisions. These factors will be discussed in more detail in the database software section below, however the resource requirements for the IMSMA database have been a significant issue for mine action centres, particularly when faced with an upgrade to a new version of the system.

GIS software tends to be processor-, graphics- and storage-intensive. The degree to which each of these three elements is important influenced the speed at which subsets of the GIS software toolbox became common on Wintel systems — and became widely available to mine action centres. Again, more detail is found below in the discussion on GIS software.

Two of the major milestones are the debut of the IBM PC, and the Microsoft *Windows NT* operating system. The emergence of the IBM PC running Microsoft *DOS* in the early 1980s made database software available on an inexpensive and portable platform. It also saw a precursor to GIS become available on the desktop, computer-aided design (CAD): automated mapping systems based on CAD software which drew points, lines and polygons became possible.

The emergence of Microsoft's *Windows NT* and Intel's Pentium processor in the mid-1990s brought a combination of greatly increased processing power and a more secure and stable *Windows* operating system to the desktop. Intergraph Corporation, a major GIS and mapping software/hardware vendor, shifted its focus from Unix to developing *Windows NT*-based applications which ran on its Intergraph-branded Wintel hardware. At the time this was a major departure from the Unix focus of major GIS and mapping software vendors.

Database software

The most familiar database applications are relational database management systems (RDBMS). The early market leader on the PC was Aston-Tates *Dbase* software, which spawned the industry standard *.dbf* file format, which still remains in broad use today. Current offerings for the desktop include MS *Access*, and Corel's *Paradox*. Large commercial databases are run on *Oracle*, IBM *DB2*, or Microsoft *SqlServer* platforms. Many academic users choose the open source *PostgreSQL* database, while many data-driven web applications are powered by the open source *MySQL* database.

What these RDBMS share is a common conceptual basis for their design and a common language to interact with data stored in them:

- **Relational structure.** An underlying structure of a collection of tables (or relations) which are joined together by key fields which are stored in each pair of joined tables.
- **SQL.** All RDBMS databases make use of structured query language (SQL) to retrieve and update data stored in the tables. SQL has been an ISO standard since 1987; the current ISO standard SQL99 was published in 1999. SQL is a very easy language to become familiar with, but quite difficult to master. What makes SQL difficult to master is its unfamiliar three-value logic (*True*, *False* and *NULL* [or *undefined*]), and its set-based logic.

What distinguishes between the various RDBMS databases are performance, "scalability", functionality, ease of use and cost. Databases designed for broad use as part of office automation software suites focus on ease of use, whereas large commercial databases are the purview of database professionals and focus on performance and scalability. There are "middle ground" products available at no cost to the end user that are primary used by system developers who need to store data for use in their applications but do not require the high end functionality provided by the expensive commercial systems.

The advantages of RDBMS systems are that they help to maintain data integrity and provide for fast transaction processing:

- Data redundancy can be reduced, and consistency enhanced, through the "normalisation" of tables. For example, rather than storing the town, sub-district, district and province of a survey in the survey table, only one identifier code for the town need be stored. This identifier then relates to a town table, which relates to a sub-district table, and so on. If district boundaries change, only the relationships between the sub-districts/districts/provinces need be edited, rather than having to search through all the survey records affected by the change.
- Individual transactions with relational databases are faster than with other data storage schemes — this is not very important in the context of mine action, but is vitally important in applications such as banking or point-of-sale data capture.

There are also significant disadvantages to RDBMS systems:

- While they are very efficient for data storage, they are less convenient for data retrieval. As one eminent member of the industry put it: *"Entity relationship models are a disaster for querying because they cannot be understood by users and they cannot be navigated by DBMS software."*[4] This means that RDBMS systems are not appropriate for end users. The problem is that by normalising data (breaking it into separate tables to reduce redundancy), the end users are no longer able to look at the data in one location; rather, views of the data must be constructed.
- In IMSMA v3, for example, there are nearly 100 tables, and views can require joins between tens of tables at a time. This is further complicated by language translation in IMSMA — even after constructing the final flat table view, much of the data remain in a pseudo-English coding which needs to be translated into natural language (in IMSMA v3 this could be English, French, Spanish or Portuguese).

But data management does not always involve database software.

- Document management systems store data in its original textual form and then allow full text search and automated indexing of the documents contents.
- Document-based data storage using a more structured form than document management systems, but with more flexibility than databases, is permitted by the relatively recent technology of XML. The *eXtensible Markup Language* was published as a standard in 1996 and has since gained wide acceptance as a data storage format. By using user definable tags within the document, XML adds structure and meaning to text stored in this format. XML is being used as the basis for mine action data exchange in the GICHD-sponsored maXML project which will be further discussed in the Data Analysis and Exchange section below.
- Users with modest data management requirements often prefer to work in a spreadsheet application such as MS Excel rather than RDBMS.

A flat table of data stored in a spreadsheet can be easily edited and searched by users not comfortable with the complexities of database administration. It is not uncommon to find earnest professionals maintaining "databases" of several thousand records in a single flat spreadsheet file. *Excel* is very popular in mine action centres for maintaining priority lists of minefields and monthly clearance figures. For IMSMA v3, the IMSMA project has developed IMSMA XL as a tool which extracts the contents of predefined IMSMA reports directly to Excel rather than only allowing print output.

Reliance on Microsoft and ESRI software

The IMSMA project's dependence on Microsoft *Access* has been inconvenient for the developers as each successive version of *Access* has been accompanied by incompatibilities with previous versions. *Access 97* was entirely incompatible with *Access 2000* and mandated a new version of IMSMA. MS *Access XP* (2002) was "less incompatible", however it does not support IMSMA error-free. IMSMA v3 was not updated to support MS Office versions after MS *Office 2000*, which was already three versions old by 2004.

Use of ESRI's *ArcView* GIS software as the basis for the geographic display of data in IMSMA has also been troublesome, but for different reasons. Export restrictions to Iraq and Sudan resulted in restrictions on the use of IMSMA in those countries.

A few computers in a central database office can be upgraded to support the requirements of IMSMA running on the latest Microsoft and ESRI software. But this is less reasonable a proposition for the far greater number of potential IMSMA users outside a central IMSMA database room — e.g. in the operations, planning and MRE departments, and in regional and site offices.

An alternative to relying on proprietary software and its uncontrollable release cycles was offered by the open source community. The open source software movement has been popularised by the LINUX operating system but has significance far beyond LINUX. It embodies literally thousands of projects.[5] It is also not necessarily about free software. Open source means that source code must be openly available,[6] but many open source projects operate as commercial ventures. Open source is as much a philosophy about how to create software as it is a process of writing software.

Potential benefits to making the IMSMA software itself open source (as opposed to hosting it on an open source operating system and supporting it with open source application software) would include improving the overall quality of the IMSMA product by subjecting the underlying programme code to (perhaps only marginally) wider review and decreasing its dependence on proprietary software which can compromise its usability. There are at least a few technical advisers and mine action programme staff with a moderate level of programming skill. When experiencing problems with the system these users would be directly able to advise the developers of possible solutions by reviewing the programme code. This is generally not currently possible because the IMSMA programming code is not publicly available. With access to the IMSMA programme code base other software development projects in mine action or the broader humanitarian field would be able to learn from the experience of the IMSMA developers, and be better able to make their software integrate into the IMSMA environment.

The development of IMSMA

The IMSMA project grew from calls for standardisation of data collection, a desire to have a "starter kit" ready to deploy to new mine action centres and a desire to make information centrally available to UNMAS. The IMSMA project is sustained by a Swiss government donation and is managed by the GICHD.

IMSMA advanced from screen mock-ups on display at the April 1999 Meeting of State Parties to the Anti-Personnel Mine Ban Convention in Maputo to a fielded system in August 1999 in Kosovo. The combination of strong technical support from the Swedish Rescue Services, operations staff drawn from Western militaries familiar with using information technology in the course of daily work and the highly integrated mine action centre in Kosovo assisted in making a success of the first field implementation of the system.

The first version of IMSMA was coded by a single programmer, supported by one field support person and overseen by a project team leader at the Eidgenössische Technische Hochschule Zürich (ETHZ or Swiss Federal Institute of Technology in Zurich) within the Center for Security Studies. A training coordinator at the GICHD oversaw training events in Geneva supported by field visits that combined database installation and configuration with user training. By end-2003 the centre of activity had moved to the GICHD which employed an IMSMA programme manager and six support staff. The development of IMSMA had shifted to a more focused-tendered-contract approach with well-specified design parameters and timelines.

The user interface to the IMSMA Field Module has remained virtually unchanged from v1 to v3, as have the data entry forms. Successive versions have focused on adding functionality — both in terms of working with the database and in terms of the range of mine action data collected. Major changes implemented along its development path are summarised in Table 1.

A formal review of information management requirements for mine action was commissioned by UNMAS and awarded to Price Waterhouse Coopers. Field work was conducted in October and November 2001, with the final report released in mid-2002.[7] The Price Waterhouse Coopers study reported two major observations from its field work. The first was the description of an "IT/IMS Lifecycle Concept within Mine Action Programmes".[8] The second an influence diagram summarising key aspects of IMSMA development on four axis — technical, functionality, training and educational materials.

Figure 1. IMSMA development timeline

A summary of IMSMA's development

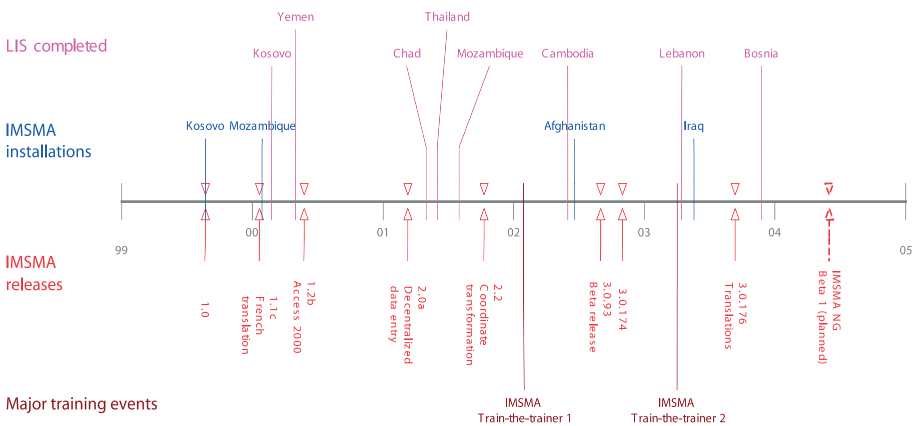


Table 1. Summary of functionality introduced into IMSMA by version

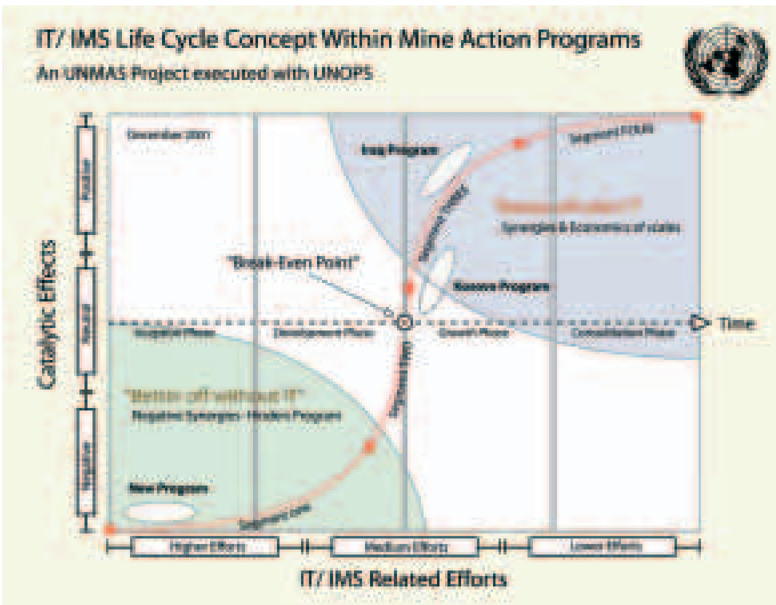
Version		
1.1c	French translation	User interface and data fields can be switched to another language. Translation to French implemented.[a)]
1.2b	Access 2000	Microsoft Access 97 and Access 2000 databases are incompatible, which required an IMSMA version for Office 2000.
2.0	Tasking tool	Mechanism for grouping together various objects in the database into one electronic folder.
	Decentralised data entry	Allows database to be installed regionally with mechanism for synchronisation with a central office.
2.2	Coordinate transformation	Support for geographical coordinate transformation between different datums and projections.
3.0	MS SQL Server / MSDE	Data storage moved from a MS Access database to a SQL Server / MSDE database.
	MRE	New form added to plan and record MRE training.
	Summary reports	The selection of summary reports is expanded to number nearly 100.
	Status and business rules	An explicit status is assigned to each report stored in the database to clearly indicate if it should be considered for planning survey and clearance operations. Business rules are added to check for status errors.

a) The translation process works by replacing all standard content – the labels on database forms and reports as well as the data in fields which have a limited set of valid values — with translated content. For example a data field with a limited set of predefined values such as Vegetation (the set of possible values includes trees, shrubs, grass land) would have its contents translated in the user interface and on reports.

The life-cycle diagram describes four phases in the adoption of information management resources and plots the mine action programme's experience against two axes:

- **Catalytic effects.** The benefits accrued to the mine action programme for its investment in IT/IMS [Information Technology/Information Management System].
- **IT/IMS related efforts.** The level of effort required — in terms of personnel and resources — to establish and maintain the technologies introduced.

Figure 2. Price Waterhouse Cooper graph



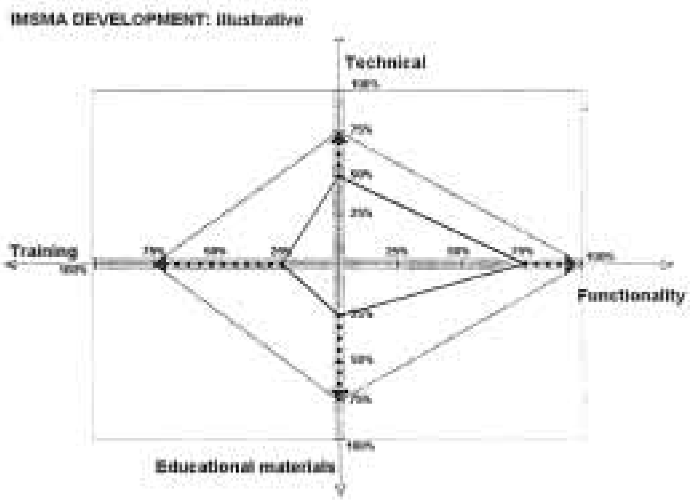
Price Waterhouse Coopers draws two general conclusions from Figure 2, one general and one IMSMA-specific:

- In general, the introduction of information technology requires a large initial investment in equipment, skilled personnel, training and adaptation of processes for little or no immediate apparent gain. Over time the organisation benefits from the introduced technologies and this is accompanied by a reduction in efforts required to sustain the systems.
- With regard to IMSMA this suggests that resistance to IMSMA will be highest the further along the curve a programme sits.

This IT/IMS lifecycle will be considered again in the next section where various IMSMA migration experiences are reviewed.

Figure 3 suggests that, to date, IMSMA development has focused on technical aspects of the database and its functionality, and that the area which will benefit most from new investment is in training and educational materials.

Figure 3. Price Waterhouse Coopers influence diagram



The Price Waterhouse Coopers report succeeded in identifying the main themes in information management and making general comments about their current status, but failed to provide any useful detailed recommendations. The core of the report consisted of point form notes on each of the 38 recommendations, and where detailed recommendations were made they seemed rather unsubstantiated.

Migration to IMSMA

A significant amount of data has been imported into IMSMA in Afghanistan, Iraq, Kosovo and Mozambique. Migration to IMSMA has partially occurred in Bosnia and Herzegovina and Cambodia as a result of landmine impact surveys activities.

The migrations to IMSMA can be broadly categorised as either having occurred in programmes which fit into the lower left quadrant of the Price Waterhouse Coopers life-cycle matrix or were accompanied by a wider programme of change which included in its scope the adoption of IMSMA. In the programmes in the second category, it is not so much the effectiveness of the outgoing information system that lead to resistance to change — although programmes did not want to change to an information system with less functionality than they were already accustomed to — but rather the inability of the programme to independently increase the level of effort or competence that would be required to complete an effective IMSMA installation.

In programmes that have been running with an effective information management system, the current caretakers of the system often would not have the depth and breadth of knowledge required to migrate to IMSMA due to personnel changes. It is therefore only with an increase in information management skills that the programme is able to adapt to the new system.

In addition to fears about lacking the capability to install and maintain IMSMA, programme staff also worry about losing valuable data in the transition. IMSMA does not have an easy import mechanism — and the IMSMA project was not always proactive in providing assistance in moving data from locally developed systems into IMSMA. Often there is an impression that changing from a locally developed system to IMSMA will necessitate months of manual re-entering of data into a newly installed IMSMA database. Both local efforts and assistance from ETHZ have successfully transferred a good deal of data into IMSMA.

Table 2. Data imports from legacy systems to IMSMA

Kosovo	1999	Dangerous areas collected by NATO prior to establishment of MAC. Conducted by ETHZ in Zurich.
Mozambique	2000	Dangerous areas collected from 1992-2000 in two systems. Conducted locally.
Afghanistan	2001/2002	Minefields. Conducted locally with ETHZ support on site.
Cambodia	2002	Impact survey data which had been entered into another database created for the survey. Conducted by LIS implementing agency, and assisted by ETHZ in Zurich.
Iraq	2003	Complete database from N. Iraq programme. Conducted by ETHZ in Zurich.

The GICHD conducted a series of consultant studies to assist programmes in planning for conversion to IMSMA. In Afghanistan and Bosnia and Herzegovina comprehensive evaluations of the existing information management systems were conducted and then contrasted with the IMSMA. In both cases a detailed analysis of the existing system was presented highlighting its strengths and weaknesses. In both of these cases the existing information systems were a strong source of pride among the mine action programme personnel who had developed them and still maintained them. These systems were effectively maintained by national staff members, not international technical advisers as has been the case in other programmes, such as Cambodia. Both GICHD studies recommended that the existing systems be replaced by IMSMA because they lacked an integrated geographic information system and the scope of the data being maintained was very limited: IMSMA defines a far greater breadth of data fields.

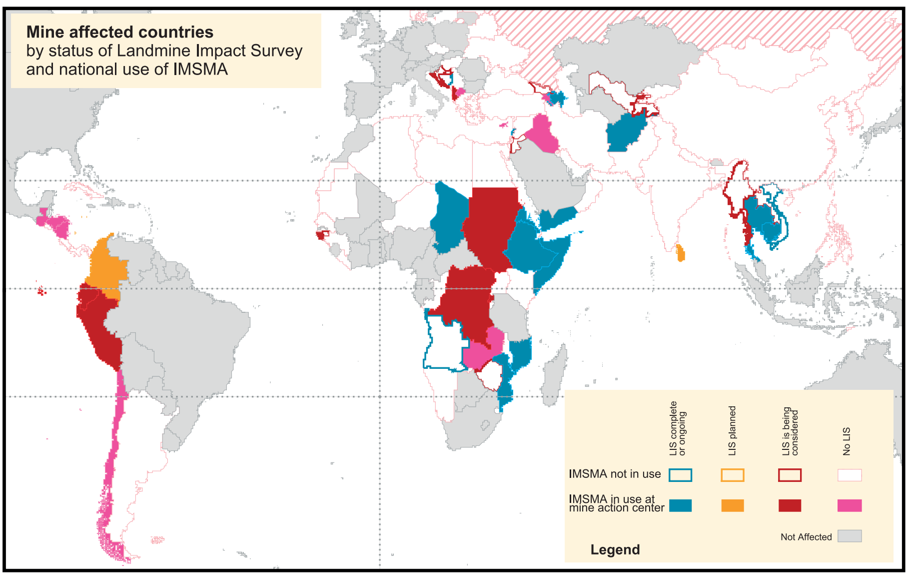
Landmine impact survey

The global LIS process was developed in parallel with IMSMA and, in some ways, the success of each project helped to reinforce the other. The LIS evolved from a desire to have objective means for distributing funding to mine-affected countries. It heralded a shift from reporting the numbers of mines and the physical area of minefields to discussions of community impact.

The Survey Action Centre (SAC), based in Washington, DC, owes its existence to the Global LIS process and serves as the custodian of the survey as well as taking a leading role in fundraising, conducting advance survey missions and tendering of survey activities.

There has been something of a symbiotic relationship between the LIS and IMSMA. IMSMA has facilitated and helped to ensure the standardisation of the LIS data collection and analysis, and the LIS has provided a solid base of data for IMSMA. In Afghanistan and Bosnia and Herzegovina an element of the rationale to conduct the national survey was to move the mine action programmes to IMSMA. In the map of mine-affected countries by status of LIS and use of IMSMA (*Figure 4*) the broad coverage of both of these can be seen.

Figure 4. IMSMA/LIS summary map



A formal review of the global landmine survey process was commissioned by the Survey Action Centre and awarded to Scanteam, a consultancy based in Sweden with extensive experience in the humanitarian sector.[9] Field visits to five countries[10] that had undergone surveys were conducted in 2003, and the preliminary report was discussed at the Survey Working Group meeting in October 2003. The intent of the review was to identify lessons learned regarding the conduct of the survey, to recommend ways in with the survey results can be made more useful and to identify means by which the survey process should be modified.

A number of recommendations in the report address information management issues and, while the recommendations are very general, they provide more detail and breadth than those in the Price Waterhouse Coopers report.

Incorporation of existing data into the LIS

The decision to conduct an LIS has been particularly controversial in countries with long-standing clearance programmes such as Afghanistan, Bosnia and Herzegovina, Cambodia and Mozambique. For mine-action-related data many field operators expected the LIS to take the current state of knowledge, validate it and improve upon it. Survey implementers have been equally concerned to not have the quality of their product negatively affected by the incorporation of untrustworthy existing datasets. The task of attempting to assess the quality of existing data and incorporate them into the survey methodology has been seen as too difficult and for the most part has not been attempted. While the Scanteam review correctly identifies the incorporation of existing data into the LIS process as an issue, it is one of the less helpful of the report's recommendations. It fails to suggest any new ideas about how to progress towards the goal of balancing the requirements of field operators (who want the most information possible) and the survey practitioners (who value a controlled statistical analysis). All of the impact surveys have struggled to incorporate existing data into the study.

In Mozambique, a countrywide survey had already been conducted by the HALO Trust a few years prior to the start of the impact survey. SAC developed a retrofit survey protocol which was used during the early planning for the Afghan survey. In all cases, little if any use of existing mine action data has been made during the course of LIS fieldwork due to difficulties in obtaining existing data from field operators, the time and expense required to train surveys in its use, and a desire from the LIS implementers not to compromise the quality of their surveys by letting other factors influence the community interview. For other data from non-mine action related sources, Scanteam observes that "links and hooks" are required to assist in incorporating LIS data with other datasets. This topic will be discussed in more detail in the section on data analysis and exchange.

Survey data detail

The study recommends that the standard questionnaire should be reviewed to focus on collecting only "first order" data. Other variables should only be included if it is clear that they will be used by actors for important decisions. This recommendation has implications on cost and data quality. There has been a general desire to make the greatest possible use of the LIS field work by maximising the number of questions asked during the survey.

While collecting data that are not used is expensive, the further danger is that data that are not used are never carefully reviewed with a resultant severe impact on quality. A general problem with all data collected in IMSMA is that many programmes have no interest in much of the data contained in the standard data collection forms. When the data are collected anyway to populate an international standard database data quality can be woefully poor.

Management tools

The Scanteam study recommends that management training should focus on what is currently in use and attempt to work from the current state of the art. It further emphasises that capability and commitment are the keys to successfully introducing new management tools. This recommendation is directed at the survey integration training provided by Cranfield Mine Action as a standard post-survey component.

Scanteam observes that the "one-size-fits-all" strategic planning training approach, where each mine action programme receives a standard package, should be looked at with a view to better fitting the training to existing processes. The capability and commitment within the mine action programme must match the methods being introduced.

Data transfer

The study team observed difficulties in transferring IMSMA data to other databases for use by other mine action organisations. This will also be discussed further in the section on data analysis and exchange. The recommendations here are again perhaps too general to be very useful. The barriers to data exchange are rarely technical — it is now a standard capability of Microsoft Office to export databases in XML, so no one is reliant on the *Mine Action eXtensive Markup Language* (maXML) initiative to accomplish this. While maXML will lower the bar on the technical difficulties involved, the larger barrier is almost always a matter of national or organisational policies which restrict data access or exchange.

Follow-on technical assistance and the cost of maintaining the database

The Scanteam report observes that continued maintenance of the LIS data almost always requires continued donor funding for continuing technical assistance. In most LIS, the survey's database personnel were more highly paid and more skilled than the database staff at the mine action programme. Often some of these LIS staff remain at the mine action programme following the LIS, sometimes as part of a follow-on assistance donation with higher salaries than normally paid by the national authority. If no salary augmentation is available the lower pay available to them when working directly for the national authority often makes retaining these skilled workers difficult. The report correctly observes that this approach is unsustainable; yet this is true of most aspects of mine action information systems — equipment, training and software, as well as technical assistance. The suggestion that maintenance of the data be entrusted to another government organisation, such as the Ministry of Statistics, calls into question the utility of attempting to maintain information systems in mine action programmes.

Field personnel fault the LIS process for not providing sufficient detail to plan clearance operations. In particular this has focused on the way that suspected hazard areas (SHAs) are depicted in the current LIS. The SHA is estimated as an area lying a given distance and direction from the interview location (or optionally from a physically closer viewing point). This obviously leads to a very general geographic description of the SHAs and sometimes wildly inaccurate estimates of their area.

This has, in turn, led to the depreciation of the importance of the estimated SMA areas to such an extent that they are no longer discussed. It has also led to calls for perimeters to be collected where appropriate during an LIS.[11] IMSMA up to v3 has not allowed this: SHAs are only shown as representative circles. This is particularly problematic for long, narrow minefields such as may be found for extended distances along a fence line, road, border or natural feature.

No guidance is provided by SAC on how LIS data should be maintained over time. If a mined area identified during the LIS is cleared, this can be reflected in IMSMA and, in IMSMA v3, the community impact will also be recalculated based on this clearance. However, as details of the affected community change over time, and as more is learned about the hazard area during technical survey, there is currently no mechanism to adjust the impact score of the community.

Emergency survey

In the immediate aftermath of the wars in Kosovo, Afghanistan and Iraq, there was a desire to conduct a rapid assessment of the mine action problem. Such a rapid assessment would not allow for the lengthy training and long interviews prescribed by the LIS process. In Kosovo and Afghanistan these emergency surveys were kept relatively compact and simple. The long run-up to the war in Iraq in early 2003 left a long planning window during which a more elaborate emergency survey was planned.

The Emergency Survey Tool for Iraq (ESTI) was designed by a subgroup of the Survey Working Group, and developed at UN request for the GICHD by the IMSMA developers at the Swiss Federal Institute of Technology in Zurich. It stores its data in an *MS Access* database, but the user interface is a purpose-built application which integrates a mapping tool into the same application as the data entry forms. This approach has the advantage that the application has no outside software dependencies — all programmes required to run the emergency survey tool are provided on the CD-ROM without licensing costs.[12] A potential advantage or disadvantage (depending on your perspective) is that this also limits the functionality of the application. The only database and GIS tools available were those from the programmers. On balance this seems to be an advantage as it can simplify the use of the system for the average user. Power users then have the option of using any tools they desire to interact with the data stored in *MS Access*.

The goal of creating an easy-to-install application requiring minimal training was to a large extent achieved. The installation package contained all the required software resources on one CD, including comprehensive map data for all of Iraq. Once installed, users were able to enter data into forms that followed the same layout as the data entry sheets. Once data were entered it was very simple to print individual survey forms and individual survey maps.

The biggest fault of the ESTI survey is that it was developed without regard to the LIS, and without thought of how the data would be analysed and later incorporated into IMSMA. The intellectual starting point for this survey seems to be the idea that a quick survey needed to be conducted immediately following conflict, much more rapidly than an impact survey.

What resulted from the survey design process was a bloated questionnaire spanning seven pages populating a database with hundreds of fields.

The version of the tool finally fielded was v4.1[13] and included no tools to analyse the data. Rather than be a subset of the LIS it became a superset of LIS and the technical survey collection forms. The combination of a lack of a migration strategy for the data into IMSMA and the absence of any analysis framework for the data collected will severely limit the use of the data collected during this exercise.

What seems to have gone wrong is that, rather than focusing on what analysis was required, the survey designers looked at the broad overview of everything that might be collected. The level of detail was overwhelming: for example, details of the months during which there is access to the community and dangerous areas were compiled for each of five different categories of vehicles — a total of 30 fields of information.

The ESTI tool also caused some confusion among users. It was designed as a tool that could be used in the field by individual survey teams to directly enter data following the survey. This has never been the case with previous IMSMA tools, which have always been designed to only operate in the mine action programme, and usually by specialised users. ESTI users did not always understand the distinction between IMSMA and ESTI, and were somewhat dismayed by the difficulty of looking at the results of their efforts due to the absence of analytical tools.

In the end the tool was not used as intended — in the hands of survey teams — probably because there was little advantage seen in doing so. Central installations were made where survey forms were collected and entered by a few specialised operators, as has been the case with LIS data entry.

Military data sources

Data exchange between civilian mine action programmes and military organisations occurs when ongoing military operations overlap with civilian mine action. This has been the case in both Afghanistan and Iraq, where US-led forces have maintained data in the Tactical Minefield Database (TMFDB), which is part of the US Army's Maneuver Control Systems- Engineer (MCS-ENG).

The TMFDB, developed at the US Army Topographic Engineering Center in Alexandria, Virginia, supports data import from IMSMA but the usefulness of this functionality is limited by a number of factors. The army is interested in knowing the location of obstacles and when a minefield is reported: because all they need to know is that an obstacle exists at the reported location and should be avoided. No effort is made to confirm information, or to collect more detailed information at a later date. The standards for information gathering for TMFDB are therefore very low. To then directly transfer these data into IMSMA would introduce very suspect, and perhaps duplicate, data into the database.

In Iraq, the data contents of the TMFDB were relatively modest (a few thousand records) and most of the new data entered after the cessation of major conflict consisted of the locations of improvised explosive devices. The most expeditious way of sharing data between military and civilian users is file overlays: rather than importing and exporting data into and out of databases, layers of geographic information can be exchanged and overlaid on each other in a GIS.

Minefield records detailing locations of minefields have been available in Bosnia and Herzegovina and Lebanon and have provided good information regarding minefield locations and mine types. In Bosnia, these are sometimes used to evaluate the quality of minefield clearance: if the record indicates that more landmines were placed than were recovered during the clearance, then questions are asked. This has not generally been the case in most mine-affected countries as it is often the case that records were not kept, were of poor quality or were not available.

Records of bomb drop locations have been provided by the US Army's Central Command to programmes in Afghanistan, Iraq and Kosovo. These records were limited to cluster munitions, which are of special interest to mine action programmes because of the high risk to civilians posed by the significant number of unexploded sub-munitions at each strike location. Other data have been provided in the case of Laos and Viet Nam, albeit several decades after the end of the conflict.

Mine risk education

Mine risk education (MRE) data collection and storage was added to IMSMA in v3 after a consultative process in 2001 led by UNICEF. Prior to this, MRE data have been stored in extensions to IMSMA in Kosovo and the northern Caucasus (for UNICEF programmes in Chechnya).

MRE in IMSMA v3 consists of a two-page data collection sheet, which strives to record a broad range of MRE activities: from briefings conducted during mine action operations (such as clearance) to specialised MRE team briefings and media campaigns.

As has been the case in the design of other data collection sheets, more attention was paid to the data fields to be collected than to what would be done with the collected information. To the extent that MRE is a pervasive activity that takes place during all other mine action operations, it could be argued that, for some MRE activities, all that was required was a tick box indicating that it occurred. If a limited amount of additional detail is desired, the "one-form-fits-all" design strategy will be overwhelming: for any given activity perhaps 60 per cent of the form will be non-applicable. It is still too early in the deployment life of IMSMA v3 to judge how useful the MRE form in IMSMA has been in practice.

Landmine victim data

Victim data have been an integral part of IMSMA since the first version and have not been significantly modified over the intervening versions. On the surface, victim data appear to be one of the easier parts of mine action data to collect and manage — it records discrete events which happen to individuals. But the problems in practice have been many.

Foremost among the difficulties is the variety of players involved in mine victim data. The basis of mine victim information gathering is establishing a reporting network which collects information from hospitals and clinics. This is generally conducted by the ICRC and/or an NGO involved in other aspects of mine action. While victim reports may make their way from this collection network to the IMSMA database at the mine action programme, this relies on a high level of cooperation between the mine action programme and the ICRC or NGO collecting the data.

A review of victim data collection was conducted in 2001 by James Madison University[14] and followed up by a workshop in 2002.[15] The review aimed to improve the collection of casualty data worldwide and focused on creating a core set of data fields by comparing field data collection from a broad selection of countries. IMSMA victim fields were compared against eight other non-IMSMA-based casualty databases and fields were rated on a scale of 1-5 ranging from “Essential” to “Do not collect”. The review correctly observed that perhaps the larger problem in victim data collection is the collection itself, rather than the specific fields of information collected. It identified the various problems associated with collection — secrecy, difficulty in counting victims who die without reaching a medical facility, the variety of organisations involved, and the technical and funding issues of running a database. Unfortunately ways in which to address these issues were not explored.

A further complication with victim data is the way in which victims are recorded during the LIS. The LIS collects details including the names of recent victims — those in the past two years — and only a summary count of those which occurred more than two years prior to the survey. A pragmatic approach was taken by the IMSMA developers in storing LIS victim data, namely they are stored separately from other victim data within the impact survey document. In practice, this has meant that there is a duplication of victims in IMSMA: a properly maintained database would have the LIS victims duplicated in the “normal” victim reports. LIS victims are not routinely cross-referenced with victims recorded by other means and stored in the standard IMSMA victim container.

In most mine-affected countries the best victim databases are maintained by ICRC (not IMSMA) which are often shared with the mine action programme and then re-entered into IMSMA. A better implementation of this process, not supported in IMSMA through v3, would see a satellite installation of IMSMA at ICRC (or wherever the lead on victim collection is located) with data exports being passed to the main IMSMA database for the country.

An as-yet unresolved issue this raises is the maintenance of LIS impact scores. The recent victims have a very strong influence on a community’s impact score, which is calculated from victims collected during the LIS and stored separately from other victim data. In the year following an LIS the impact score should be revised, based on the moving two-year window of recent victims. This does not occur because the main repository of victims in IMSMA does not enter into the impact score calculation. A simple fix is not normally possible because of the duplication between these two sets of victims.

Mine action accident data

The database of demining accidents (DDAS) — those which occurred during the course of mine action as opposed to accidents among the general population — has been maintained since 1998 by Andy Smith[16] as a personal project. Mr. Smith is a longstanding member of the mine action community whose work has included numerous projects intended to improve the safety of deminers. By 2002, the DDAS contained details of nearly 600 accidents which occurred in mine action programmes worldwide. The intent of the DDAS is to provide a powerful "lessons learned" archive, which can be used to highlight the danger of risky behaviour to deminers and trainers.

Mine accident data of this sort are also stored in IMSMA, but the detail of the fields is different and there is no opportunity to aggregate the data globally, as has been achieved with the DDAS. With the GICHD having taken over stewardship of the database in 2002, it would seem appropriate to harmonise the IMSMA demining accident form with that being used in the DDAS.

Minetype databases

The wide deployment of western militaries in mine-affected regions throughout the 1990s — particularly in the Balkans — led to a number of initiatives to compile information on landmine and other explosive remnants of war hazards that they were encountering. Western militaries deployed with NATO to Bosnia were faced with a widespread landmine problem and were unfamiliar with the largely locally produced landmines they were encountering. Databases of information provided to them included photos or diagrams and details of physical characteristics such as size, colour and material composition. This information was intended for a broad audience to assist in identification rather than for the much more specialised audience of specialised disposal technicians. Four of the major efforts are summarised in Table 3.

The US Naval Explosive Ordnance Disposal Technology Division (NAVEODTECHDIV) developed the Ordata ordnance database to serve as a comprehensive source of information on explosive ordnance. It was incorporated into the IMSMA Field Module database as it was publicly available (the SWEDEC database is not) and contains both landmine and UXO entries. The database was incorporated "as is", maintaining the data structure of the original product to facilitate keeping the IMSMA version of Ordata up to date with its current release.[17]

Table 3. Mine-type databases

Database	Compiler	Content
Minefacts	US DoD	Landmines only
CFSME	Canadian Military	Landmines only
Ordata	US Navy	Landmines and comprehensive UXO
SWEDEC	Swedish Military	Landmines and comprehensive UXO

Selecting a good set of ordnance data for use in IMSMA is a frustrating and time-consuming task with Ordata, often resulting in confusion for data entry staff and an almost impossible task for automated report generation. A freshly installed IMSMA system contains no ordnance information — users must go to the appropriate administrative screen and select ordnance for use in survey and clearance reports. Ordata classifies ordnance into categories such as anti-personnel and anti-tank mines, projectiles, mortars, rockets, etc. The complete range of ordnance is reflected in literally thousands of entries, but programmes are rarely, if ever, interested in recording the details of any ordnance beyond mines and cluster munitions. It is very often interesting to note the exact model of an anti-personnel or anti-tank mine — for example, a PMN-3 — but such detailed information is rarely desired for an 82mm mortar. Furthermore, data such as country of origin will rarely be available for entry, but must be specified to select the appropriate Ordata entry. Data entry staff are frustrated because they are faced with a list of several devices that vary only minutely by details which are rarely relevant in the mine action context. Database report writers summarising the data entered are faced with a difficult data structure — that is just the nature of Ordata — and difficulties in summarising by general categories (such as anti-personnel mines, anti-tank mines, cluster munitions, etc.).

A better approach would have been to create a simple device table with the most common types selected (for example anti-personnel and anti-tank mines, cluster munitions, other ERW under 82mm diameter, and over 82m diameter) and allow programmes to add detail as required to these general headings.

Data quality control

Entering data into the database is never the problem. While the task of entering hundreds or thousands of reports into a database can seem daunting, the reality is that a single data entry operator can enter upwards of ten impact survey forms in one day, and many shorter survey forms, such as clearance progress reports.

The challenge is to enter high quality data into the database. In a mine action programme far removed from field activities this can be a daunting task. The commonly observed model of an IMSMA office being far removed from the operations staff in a mine action programme further challenges data quality. A problem with the storage of coordinate data in the Afghanistan programme illustrates the data quality challenge.

Before 2001, when GICHD began working with the Afghanistan programme toward transferring their information system to IMSMA, no GIS system was used with the database. GIS was in use to a degree, but only for thematic mapping at the provincial level. Detailed survey reports were carefully prepared by field surveyors and passed to regionally based data entry operators who also had a good understanding of field work and were very experienced in their jobs. Detailed summaries of data entered were prepared monthly at the national level and carefully reviewed. It was a highly evolved and effective system for the data contained in the summary reports, which were mainly concerned with elaborate area calculations.

The problem was that the system only supported the summary reports prepared each month, and these were not a comprehensive picture of the mine problem. When it came time to try to implement a GIS component to the database, it was found that all the coordinate data stored was incomplete and often inaccurately entered. Thousand of coordinates for minefields had to be manually re-entered to support the new analysis.

This is a widely recognised problem. It was the subject of a 2002 GICHD-sponsored meeting of mine action information practitioners at James Madison University,[18] and was one of the driving forces for the GICHD regional coordinator approach to supporting IMSMA (support issues are the subject of a section later in this chapter). It is widely agreed that the key to high quality data is to only collect and enter that which is relevant and directly applicable to the organisation which will use it. This implies that if the data are critical to the organisation it will be regularly reviewed and when it is flawed this will be noticed.

But this is directly at odds with two of the underlying goals of having an information system such as IMSMA, which are:

- to have standardised data available across mine action programmes — to allow for country to country comparisons, but perhaps more importantly, to supply analytical tools to assist programmes in using the database as an information system (this is a topic in the next section on data analysis); and
- to maximise the value of field work — the desire here being to collect as much data as possible during expensive field work so that a wide cross-section of end users can benefit from the results.

There is no easy solution to the data quality problem. Data that are not reviewed will always be of poor quality. Some simple steps for improving the chances of storing high quality data (but often the limitations of the mine action programme mean these do not occur) include:

- tight integration of the information management staff with operations;
- experienced and well-trained data entry operators who are familiar with field survey practices; and
- wide availability of the information system so that the data is actively used.

In this section the many facets of mine action data and databases have been presented — the hardware and operating systems they are hosted on, the application software that provides the database functionality, and large scale survey efforts that have put very substantial quantities of data into them.

The quality of data stored in IMSMA databases is troubling in many countries, but this would likely still be the case were they using any database other than IMSMA. Indeed data quality was also generally poor in the databases which preceded IMSMA.

The next two sections deal with the non-database element of mine action information. In the next section the large field of geomatics is scanned for its importance in mine action — the software tools, data, and field survey tools which are used to collect spatial data, show it on maps, and analyse it in conjunction with the database. This is following by a section on reporting and analysis.

Geographical information systems

Geographical information systems (GIS) allow users to display, maintain and print spatially-referenced data, with map production being just one of many benefits. They have four components, each of which requires careful attention to create an effective system: software, hardware, data and processes. With the exceptions of Bosnia and northern Iraq, GIS has not been widely used in mine action outside of IMSMA, and therefore this section focuses on GIS in the context of IMSMA. While IMSMA's core job has been in supplying software, field support personnel have had to address each of the four components of a GIS to build capacity in mine action programmes.

GIS software

GIS software is processor-, graphics- and storage-intensive. Until the mid-1990s this meant that higher priced UNIX systems remained dominant among GIS practitioners. The result was that GIS software took much longer than database software to come to the desktop PC, and thus a broader market.

There are perhaps three separate markets for GIS software: map production, environmental science and business geographics.

Map production

Map production is not concerned with analysis, it just wants to take data and present them in a final printed form. Precise layout of text — for example, getting river names to follow the river's curve and only appear once on each map sheet, control of line styles and colour management — is an important aspect of map production systems.

Intergraph Corporation dominated this market in national mapping offices and the military during the 1980s. For lower-end users, extensions to CAD software were marketed as Automated Mapping and Facilities Management software (AM/FM).[19] *AutoCAD* provided the mapping capability in the Cambodian Mine Action Centre (CMAC) throughout the 1990s.

Environmental science

This market is interested in conducting analysis with spatial data: paper-based presentation is a secondary consideration. ESRI has been the dominant force in this market with its *Arc/Info* product. *Arc/Info* is a complex, expensive, feature-rich application widely used in governments and universities. ESRI software forms the basis of all GIS solutions implemented in IMSMA-related software.

Business geographics

Business geographics is concerned with making business decisions: for example, planning new retail locations by considering population distributions, transportation infrastructure and existing retail locations. The analysis requirements and data standards are less rigorous than in the scientific community and the map production standards are less rigorous than in the mapping community.

This market was essentially created by *MapInfo*, which still dominates it. *MapInfo* was created as a Wintel application, unlike ESRI's *Arc/Info* which, until the late 1990s, was essentially a UNIX application. *MapInfo*'s strength has been its ease of use which, combined with early availability on the PC platform, made it popular with users who were not GIS specialists.

All of the above applications are **vector-based**: i.e. they model the world by representing it as points, lines and polygons. In addition to storing the representation of features, other information, referred to as attributes, is stored in database tables and related to the geographical features by a common key. This model of storing the geographical feature data separately from attribute data was adopted to improve the performance of the GIS. Specialised proprietary data structures for the geographical data were developed by GIS companies to allow for efficient spatial analysis.

With advances in computing power and performance of database software, many GIS software vendors are storing spatial data along with attribute data in databases. For example, ESRI's *ArcGIS 8* software can store its data in geo-databases; the database used can range from *MS Access* to *Oracle*. Databases and GIS still remain very different disciplines but trends such as this are helping to merge them and make GIS more of a mainstream information technology.

Along with the trend towards incorporating the spatial data into the database, there is a parallel move towards incorporating the GIS into the end user application. Since the mid-1990s it has been possible to purchase GIS components that can embed GIS functionality into end user applications. The benefit is enhanced ease of use, streamlined workflows and reduced deployment costs. GIS objects have been used in mine-action-related applications by Cranfield Mine Action (for northern Iraq) and the GICHD (in the Emergency Survey Tool for northern Iraq).

Raster-based GIS is fundamentally different to vector GIS. Whereas vector GIS models the world as a collection of points, lines and polygons, raster GIS models the world as a picture in which features are distinguished by their colour and form. There are two main subsets within raster GIS:

- **Image analysis.** Usually used in conjunction with satellite imagery, objects are classified by their physical characteristics. These include radiometric signature (sensors record separate data for each band of wavelengths measured), shape, size and texture. This has application in mine action in attempts to use remote sensing techniques to identify minefields.
- **Spatial modelling or spatial analysis.** Raster layers are created to model the influence of a series of factors, which are then combined to determine their combined effects. For example, vulnerability analysis is conducted by creating separate raster layers which represent a series of factors which contribute to a population's hardship — recent conflict, landmines, drought, rural locations — assigning a weighting to each factor and then calculating the combined result.

Digital terrain models (DTMs) are a third type of spatial data. DTMs model the earth's relief by storing coordinate triplets — horizontal geographic coordinates as well as elevation. DTMs are less widely used in demining since they require specialised software. In addition, elevation models of sufficient quality to support detailed analysis tend to be more expensive than other forms of spatial data used in mine action and are less likely to be available for mine-affected countries. Medium-scale DTMs are most often produced by digitising contour lines off, for example, 1:50,000 scale topographic maps and then processing them into DTMs.

Spatial data are regarded by the geomatics[20] community as a key element in a country's infrastructure. Much as transportation infrastructure is a key element in a manufacturing economy, spatial data are a key element in an information economy.

Spatial data

Maps are fundamental to the presentation of mine action data and greatly assist in survey and clearance operations. Many mine action programmes have taken on the task of creating their own digital data for use in mapping system and there has been considerable donor support in providing base mapping.

The poor infrastructure in many mine-affected countries extends to spatial data. Topographical base mapping is often old and out of date, the underlying geodetic network — ground reference points with well known coordinates, to which aerial photography is traditionally referenced — is often in very poor condition and government institutions entrusted with maintaining this infrastructure often have inadequate technical capability. The use of global positioning system (GPS) technology overcomes one problem in that accurate coordinates can be obtained without the use of a physical geodetic network in place on the ground. But it also presents a second in that many mine-affected countries do not have an established transformation process to take spatial coordinates from what is often an old inaccurate official system (often still in use by way of existing paper map stocks) into a system compatible with GPS. Donor projects have focused on developing digital map products in some mine-affected countries: for instance, in Mozambique the same CIDA project that funded the LIS also funded a project with the national mapping agency DINAGECA to create a set of digital base maps for the entire country.[21]

The suitability of various remote-sensing image products for mine action was investigated at the Belgian Royal Military Academy. Their PARADIS (A Prototype for Assisting Rational Activities in Humanitarian Demining Using Images from Satellites) project assessed the utility of various types of map products during the course of mine action operations, from general planning and prioritisation to survey and clearance field work. It then went on to conduct limited field work to validate the utility to mine action of satellite imagery at a variety of resolutions and developed a set of software tools to assist in conducting mine-action-related tasks with images from remote sensing platforms.

Poor availability of high quality spatial data is a limiting factor to the effective use of geographic information systems in developing countries. But, in many cases, the mine action community has been a leader in the introduction of geomatics technologies in the countries where it has been active, assisting the development of national geomatics institutions.

Imagery

The International Institute for Geo-Information Science and Earth Observation (ITC)[22] in the Netherlands studied the use of traditional photo interpretation methods in the demarcation of minefield perimeters. Fieldwork was conducted in Mozambique where large scale aerial photographs were taken; these were then transported to the Netherlands for processing and photo interpretation. Photo interpretation is a manual process whereby a highly experienced operator studies a detailed photograph for objects of interest — in this case, the boundaries of a minefield. The technique was found to be effective for minefields that had been part of a deliberate defensive position: the interpreters were able to identify trench lines and wire fencing not visible from the ground. This technique is most effective for well-defined areas[23] with professionally laid minefields: unfortunately, these are not the typical case or only representing a part of a problem in an area.

Point positioning

Global positioning system

The GPS system dates back to the launch of the first satellites in 1978. In 1983, the GPS programme was declassified and in 1989 the first hand-held GPS receiver was manufactured. In 1990, "selective availability" was activated. Throughout the 1990s, GPS accuracy was significantly degraded by selective availability, which deliberately introduced errors into the signal for civilian users, limiting accuracy for most users to approximately 100 metres. On 1 May 2000, selective availability was deactivated, instantly decreasing the error in handheld receivers by between one-sixth and one-twelfth of what it had previously been.

Errors in GIS measurement are uniformly poorly understood in mine action programmes. Expensive differential equipment has been deployed with an expectation of accuracy to one metre; actual results may vary from centimetres to tens of metres. The factors contributing to error are the geometry of the satellites, the error in the signal itself and errors due to the receiver and its use.

- **Dilutions of precision** (DOPs) are determined by the geometry of the current satellites visible above the receiver's mask angle with respect to the user receiver's antenna. DOPs can be degraded (i.e. made larger) by signal obstruction due to terrain, foliage, building, vehicle structure and so on.
- **URE** (user range error) is an estimate of "signals in space" errors, i.e. ephemeris data, satellite clocks, ionospheric delay and tropospheric delay. These errors can be greatly reduced by differential and multiple frequency techniques. Differential correction sources include user-

provided reference stations, community base stations, governmental beacon transmissions, FM sub-carrier transmissions and geosynchronous satellite transmissions.

- **UEE** (user equipment errors) includes receiver noise, multipath, antenna orientation, EMI/RFI. Receiver and antenna design can greatly reduce UEE error sources, though usually at a substantial cost.[24] Multipath occurs when the GPS signal is reflected off a flat surface before reaching the GPS receiver. It can be a large source of error when GPS is used near structures.

Expected horizontal error for a good quality handheld GPS receiver with a DOP of 1.5 (good conditions and no multipath) at the 95 per cent confidence level (2.45 sigma) is approximately 7 metres.[25] With differential techniques this drops to 1 metre or less depending on the quality of equipment and the technique employed. DOP can have severe effects on GPS positional accuracy and is generally poorly understood by GPS users. It is a scaling factor which describes the geometric quality of the constellation of satellites being observed. *Positioning accuracy = Dilution of precision * Measurement precision*.[26] In poor conditions, it can increase to 10, which would degrade the accuracy of a handheld receiver to 70 metres.

Differential GPS (DGPS) equipment has been used in mine action in, among other locations, Afghanistan, Bosnia and Herzegovina and Mozambique. Care needs to be taken in recording DGPS measurements as the maximum possible accuracy will not always be achieved. The DGPS correction signal can be lost, which degrades system accuracy to that of a single GPS receiver. This, coupled with a high DOP value, can result in very inaccurate results.

As mentioned earlier a further problem associated with use of GPS is related to the rather specialised field of geodesy. Coordinates captured using GPS are measured with respect to a worldwide reference system which is tied to physical points on the earth's surface. Countries with modern geodetic infrastructures know how to accurately convert coordinates captured using GPS back to older systems for use with existing maps or ground monuments. In many mine-affected countries prolonged periods of conflict have precluded the modernisation of the geodetic networks — which can be an expensive and troublesome process (for example, due to accuracy problems in the original geodetic network) — and accurate transformations from GPS to local coordinate systems are not available. For example, Bosnia and Herzegovina stands out in Europe as the only country which does not have such a transformation officially defined.

Distance and bearing survey techniques

The wide availability and low price of high quality GPS receivers now means that in most cases better accuracy can be obtained using non-differential GPS than most minefield surveyors were able to obtain using distance and bearing methods.

It is not always possible to use GPS for political and technical reasons. In Taliban Afghanistan the use of GPS was not permitted, and in sensitive military zones worldwide it has the potential of putting surveyors into danger. A poor view of the sky — for example, due to obstructions from trees or physical relief (e.g. a mountain ridge or a drainage valley) — yields very inaccurate (+/ — 100m) or no coordinates.

Although a number of programmes, including Afghanistan and Mozambique, have calculated minefield perimeters using compass and bearing techniques, they have not adopted basic field survey software to assist in adjusting and plotting survey results. There is a need for more concrete recommendations on the technical aspects of coordinate collection during field survey. The old UN level 2 survey standard specified that minefield turning points should be collected to accuracy in the order of one metre, but did not suggest practical means by which this could be achieved.

Software functionality, either within IMSMA or perhaps better in a separate dedicated survey application, would assist field surveyors in improving the quality and accuracy of distance/bearing field work. Comprehensive survey software of this type is routinely used in areas such as construction and cadastre (land parcel) survey — and the requirements of mine action surveyors are far more modest than in these areas.

Integrated survey systems

There is a relatively long history of survey systems which integrate a GPS with a computer for data capture. Many consumer grade GPS receivers have a limited data capture capability, for example, allowing the user to save coordinates and enter a short textural description. Sometime handheld GPS will also provide a low resolution display of the result on a small LCD along with other background data the user has previously loaded. By connecting a GPS to a laptop computer real time position can be displayed inside a geographic information system.

The Swedish Armed Force's EOD and Demining Centre (SWEDEC) has developed an integrated survey system intended for use by military EOD teams since the mid 1990's. This system has combined a laptop computer running an ordnance database, a GPS receiver for point positioning, and laser rangefinding binoculars to record points up to several hundred metres from the operator's position. A new version of the system has been developed which replaces the laptop computer with a handheld computer and connects the three components using Bluetooth technology — a short-range wireless link.

Field trials of the SWEDEC EOD-IS-SURVEY system using the IMSMA Technical Survey form began in 2003 and will continue during 2004. The system pairs a handheld computer (MS Pocket PC) with the position measurement instruments (GPS, laser rangefinding binoculars) to assist in recording perimeters of mined areas and the details of the survey form during technical survey.[27] Technical survey data are entered directly into the handheld computer on site in IMSMA-compatible data entry forms and then exported to *maXML* format for import into the IMSMA FM. Geographic information captured with the GPS and laser rangefinding binoculars can be visualised and edited in a GIS running on the handheld computer.

For a survey system designed to be used during technical survey, the absence of any discussion of the expected accuracy in the system documentation is disappointing. The accuracy of the GPS device alone will be similar to that of other 12-channel standalone receivers, that is, approximately 7 metres (at the 95 per cent confidence level) under good conditions. The accuracy of a point determined using the laser rangefinding binoculars would be lower, limited by the accuracy of the angle measurement and the quality of the lasing target (for example, heavy foliage can lead to uncertainty in what target is being lased).

IMSMA supports export to *ArcPad* software (*ArcPad* is only available for handheld computers using the MS Windows Mobile [MS Pocket PC] operating system, not for the Palm OS), but has not provided tools to assist in handheld computer-based data entry or edit.

The increase in quality and lower price of GPS receivers, laser rangefinding binoculars and field-portable computer equipment will continue to make the task of obtaining accurate minefield perimeters easier and less error prone.

GISs in use in mine action

GISs' most obvious role in mine action is in map production. The IMSMA software's tight integration with ESRI's *ArcView* GIS software allows users with minimal training to produce maps showing minefield locations. The most difficult aspect of map production in mine action centres is the initial configuration of the various required elements — this section has served to describe the challenges than mine action centres face in establishing a GIS capability. Once the complete system has been configured, map production is almost transparent to the end user.

GIS has important implications beyond mere data display and map production. The power of GIS software is in the analytical capabilities it affords. These require a greater deal of training and experience — both in using the software and in analytical approaches to data analysis. A thorough understanding of the mine action environment is also required to conduct effective analysis of mine action data. The next section looks at ways in which database and GIS tools are used in concert to make use of data collected by mine action centres and field operators during survey campaigns such as those conducted for national landmine impact surveys.

Data analysis and exchange

General reporting

Regular use of the data in the database, as already noted, is fundamental to high data quality and ensures a return on the investment in the hardware, software, personnel, training and processes that made the data available. Most mine action centres provide poor access to their databases for a combination of reasons that include physical, technical and skill-related factors.

- The software and hardware requirements for running the applications are not always met outside of the database office. In the case of IMSMA, users must have a relatively recent computer (for IMSMA v3, a 2002 model with medium- to high-end specifications should be sufficient), *MS Access 2000* (this is not included in the *MS Office*, Standard Edition) and a good network connection to the database server. The software configuration on the client computer can take up to one hour.

- Although many standard reports are now available in IMSMA v3, they will often have to be customised to fully meet managers' needs. This requirement increases significantly as data collection diverges from the standard IMSMA forms.
- Data retrieval is not simple and intuitive even when using pre-configured reports: it demands a relatively high level of computer skill and training.

Until 2001, the IMSMA developers at the ETHZ considered their role to be limited to providing the IMSMA Field Module as a data collection environment. They did not want to direct users on how they would use the system and get involved in advising mine action centres how to make use of the data in the IMSMA database. This line of thinking held that mine action programmes had a better sense of their information management requirements than the developers in Zurich, and that the end user would be left to develop solutions to their reporting and analysis needs locally.

During this period (1999-2001) there was also a concept of an IMSMA Global Module which would hold all data contained in IMSMA Field Module databases in a central server located in Zurich. The data on this server would be made available via the Internet to central managers, such as those at UNMAS. Complex and expensive data warehousing software and Internet mapping tools were installed to power the web platform.

But, although the infrastructure was in place, there was almost no data. The appropriateness of having detailed operational data compiled and available from a central location was extensively debated among the UN staff at HQ and in the field. Country programmes were not formally engaged to provide it and interest in continuing the effort at UNMAS drifted to a more general reporting model in which only summary data were provided on a periodic basis. There was no decisive case for having full database detail available in the central server, and the effort required to obtain regular updates from each mine action programme was never expended.[28]

An attempt was then made within the IMSMA project to apply the data warehousing techniques developed to summarise IMSMA data within the Global Module to a tool which would be used directly by programmes to analyse their data. The goal was to have an easy-to-use interface for non-technical end users wishing to explore the contents of the IMSMA database. The various obstacles to easy access to data, which still exist in IMSMA v3, are the typical issues related to working with relational databases as well as issues specifically related to IMSMA and to mine action. This effort sought to assist the user by creating a simpler data structure from which reports could be more easily conducted by addressing the following issues.

- **Flattening of the relational database structure.** The collection of nearly 100 tables in IMSMA is reduced to only a few, perhaps five, from which all analysis starts.
- **Translation of keys stored in the database to natural language.** This

is required for something like one-third of all IMSMA fields.

- **Providing meaningful summaries for area calculations.** There is a desire to compare areas stored in LIS, minefield survey, clearance and completion reports.
- **Providing insight into the status of hazard areas stored in the database.** Prior to IMSMA v3 it was not readily apparent whether a hazard area reported during an LIS was cleared during subsequent clearance operations.

A prototype of the resultant *IMSMA Analysis* application was provided to participants in the first Train-the-Trainer course in early 2002. Although the application was never widely used in programmes, it clearly demonstrated to the IMSMA developers the need to focus increased attention on the use of the data stored in the database.

Individual IMSMA field data collection forms mixed data known *before* the activity starts with data that are discovered *during* the activity. For example, the clearance form has a perimeter which represents the perimeter prior to clearance and progress reports which detail the course of the clearance operation. The same data were included in both the minefield and the clearance forms to increase the flexibility of the system: users need not use the minefield report if they choose not to. However, this made analysis very difficult: there was no way to know which data was correct (if they differed) in the database and necessitated looking in both locations, as only one may be complete. To compound the problem, some users would use the clearance form's perimeter fields to store the perimeter as cleared.

The new focus on data use at ETHZ led to a clear distinction between process-related data — which refer to an activity such as a technical survey or clearance operation — and the hazard data itself. This clear distinction between processes and hazards is one important aspect of the IMSMA redesign process which was undertaken in 2003.

Although it is difficult to provide a standard set of reports for all programmes, it is possible to identify general types of reports desired. For example, most programmes are interested in showing quantity of work by organisation. This was difficult to do in IMSMA prior to v3 because there was no standardisation of organisation names in the database: organisations were entered as free text fields and spelling inevitably varied, for example, HALO; HALO Trust; etc.

Some aspects of the relational database are always summarised in the same way, such as the gazetteer of place names summarised in a province/ district/subdistrict hierarchy and device types summarised as anti-personnel, anti-tank and UXO. Prior to IMSMA v3, little assistance was provided in pre-configuring such data to streamline the building of new reports.

IMSMA Analysis was also used to replace the far more complex and expensive technologies used for the IMSMA Global Module when the functionality was repackaged for a mine-action-specific web-mapping product. In late 2001, IMSMA *Web Reports* were developed to allow programmes to provide a web portal to their IMSMA databases. The web reports are hosted on the ETHZ server in Zurich, where a copy of the country's IMSMA database is loaded into a warehousing-style data structure. While a free service, this has not been aggressively adopted by programmes: thus far, only publicly available LIS data for Chad and Yemen[29] and victim data from Nicaragua[30] have been made available in this format.

The simplest model for providing end users with access to relational databases is to pre-configure standardised summary reports for them to print. The somewhat limited selection of summary reports available in IMSMA prior to v3 was expanded to nearly 100 in v3. While there is now a much higher chance that there is a summary report that nearly meets the needs of a given end user, it is still likely that specific fields of interest to a specific user will not be available in the standard report and it remains difficult to modify these reports.

The strings of queries which lead to the final report are complex and not documented for mine action programme database administrators. Adding to their complexity are filters which allow the user to limit the record returned, for example, by report date or province. In addition, the queries which lead to the reports are similar in intent to those which provide data to GIS themes. However, they are implemented entirely separately, requiring users to make complex edits in two locations to see the same information in the GIS map-based view and the tabular summaries from the database.

In 2003, an UNMAS initiative led to the GICHD developing an IMSMA Quarterly Reporting tool. This initiative could be seen as a replacement for the IMSMA Global Module. Rather than attempting to gather the entire contents of databases centrally, the approach was to collect only a quarterly summary. The technical work for this project was again conducted by the IMSMA development team at ETHZ. The Quarterly Reporting tool is not widely used (if at all) due to weak commitment at UNMAS following key changes in personnel in 2003. However, it does again demonstrate some interesting approaches to solving the complex problem of generating reports from IMSMA that will satisfy a wide base of users. It also uses a much-improved user interface that is both faster and more intuitive than the IMSMA Field Module.

The Quarterly Reporting tool is not an *MS Access* application like the Field Module. Rather, it is a stand-alone compiled application[31] developed within Microsoft's *.NET* environment which optionally connects to the IMSMA database. The user builds a quarterly report by deciding first whether to use IMSMA data or to enter all data manually. Data imported from IMSMA can be edited within the Quarterly Reporting tool if it is found to be inaccurate. The Quarterly Report is laid out in three sections:

- **Programme overview.** This summarises the extent of mine/UXO contamination, programme objectives and achievements, problems encountered during the quarter, and organisations and assets involved in mine action.
- **Impact of the problem.** This summarises mine incidents and demining accidents during the previous quarter, year and five-year periods.
- **Progress of mine action operations.** This summarises clearance and MRE activities over the previous quarter, year and five-year periods. For clearance, the metrics are area (reduced/cleared/marked) and devices destroyed. For MRE, the metrics are direct and indirect

beneficiaries. Other Internet mapping interfaces have been deployed using much simpler data structures and user interfaces than the IMSMA *Web Report*.

- The **South Eastern Europe Mine Action Centre** (SEEMAC, further discussed in the section on regional initiatives) has a sophisticated ESRI *ArcIMS* web server that shows the extent of the mine problem in the SEEMAC countries. The SEEMAC GIS project has defined a summary set of data which it collects periodically to update the system.[32]
- The **Iraq National Mine Action Authority** has a simple, web-based interface to a variety of mine action information on its website.[33] The web interface is based on MapInfo's *MapX* map component and displays small-scale vector mapping features such as province boundaries, and point and polygons representing hazard areas identified by the mine action programme. Some basic attribute information is available for the hazard features.

Data analysis

Data analysis is distinguished from reporting as being an activity that is conducted by specialised personal on an infrequent basis. Data analysis typically has significant resources associated with it and may be conducted as part of a larger project.

The LIS tables in the IMSMA FM are differentiated from the rest of IMSMA in that their content was specified by the LIS process and each field was included for a specific reason.[34]Following data collection, LIS data are processed through a series of perhaps 20 queries into three master tables:[35]

- **Community master table.** This is the main table used for analysis. It summarises most fields found in the LIS. It contains one field for each community survey.
- **Victim master table.** This contains more detail on victim-related fields.
- **SHA master table.** This contains details of the suspected hazard areas, with one field for each suspected hazard area.

These queries were developed and maintained by the Survey Action Centre. In fact, they have not been included as part of IMSMA until recently. While the analysis of LIS data has been a marked success for data quality and usage in IMSMA, there have, on occasion, been problems. For example, in IMSMA v2 new fields were added into IMSMA to record the results of the expert opinion data collection process. The expert opinion fields were added to the IMSMA LIS community survey table, although, more correctly, they should have been added to the city table, as expert opinion collection precedes community survey and is conducted for all communities in the city table. Due to an incomplete understanding of the intent at ETHZ the fields were added into an inappropriate location in IMSMA and are of little use.

The three master tables summarise data found in more than 20 tables in the IMSMA FM, and represent the use of a number of data warehousing concepts. They take a complex relational table structure and reduce it to three flat tables which the end user exploits without having to be concerned with the underlying storage data structure.

It is striking that, with such an early example of effective data use in IMSMA, this model of data use was not earlier applied to other areas of the database. In fact, in the last two major IMSMA-related survey content definition exercises — for MRE and the Iraq Emergency Survey — the data fields were specified without explicit consideration of the analysis requirement. This is backwards survey design: the analysis requirement definition should always precede the definition of data fields.

The procedures described above enable a social scientist to analyse the LIS data. Following the Yemen survey, it was recognised that mine action programmes required additional assistance in incorporating these results into a strategic mine action plan for the country. The Survey Action Centre, the UN and Cranfield Mine Action (CMA) developed a post-survey strategic planning course to assist mine action programmes to integrate the results of the landmine impact survey into national mine action plans. CMA, based at Cranfield University, UK, provides middle and senior management training to local staff employed at mine action centres — both at the Cranfield campus and in the field.

The strategic planning course included the use of a software tool developed by CMA, the first version of which was called *Pathway*. This strategic planning tool assists senior mine action staff in developing resource requirements and incorporating them into a national mine action plan — often covering a five-year period. The various major versions of the software are summarised in Table 4.

These tools represent a work-in-progress as CMA refined the way in which they delivered strategic planning training and the way they chose to interact with the LIS data stored in IMSMA. Early versions of the software were only available to programmes in the context of the strategic planning course, but this approach gave way to making the software freely available from its website in 2003. Early versions of the software were also less tightly focused on strategic planning, moving beyond developing the strategic plan to data maintenance and operational planning. The *Freeway* software, made broadly available in 2003, is strictly a strategic planning tool which has dropped all pretence of maintaining the underlying data on which the plan is based.

Table 4. CMA strategic planning software

Pathway	2001	Only available as a part of the CMA strategic planning interventions. It was not customisable; rather, it was modified as required for each country where it was used. Data are read from the IMSMA FM database.
Highway	2002	A derivative of *Pathway* that was not dependant on IMSMA allowing the software to be used with a non-IMSMA database in Afghanistan.
Freeway	2003	Freely distributed and available for download from the CMA website. It has its lineage in *Pathway* and *Freeway*.

Pathway had three main functional areas. First, it allowed the user to define in words the programme's strategic vision. Pathway then connected to the IMSMA LIS data and imported a subset of data into its own data structure. From this point on it no longer worked in conjunction with IMSMA and never updated IMSMA. The user was able to prioritise individual suspected hazard areas which were listed by their impacted communities in a flat table list view and change their status to remove them from the rest of the application's analytical functions. This had the undesirable effect of editing IMSMA data outside of IMSMA.

The main strategic planning functionality allowed the user to specify in general terms what resources would be available for survey and clearance over the planning horizon, which was specified in years. The software would then model the resources required — in terms of numbers and cost — to result in a "No impact" and/or "No mine problem" result. By adjusting the resource mix the user was able to graphically observe how this affected the desired result.

Highway's main departure from *Pathway* was that it in no way linked to IMSMA: it stood as an intermediate product between *Pathway* and *Freeway*.

Freeway removed the hazard level prioritisation capability found in *Pathway* and increased the detail of the planning model. *Freeway* v1 does not in any way obtain data from the IMSMA FM database.

Multi-criteria analysis is another form of data analysis that has been applied to the strategic planning exercise, in particular in Croatia. Multi-criteria analysis strives to make priority setting more transparent by assigning explicit weights to discrete factors identified as being important for clearance prioritisation.[36]

Multi-sectoral analysis is a particular strength of GIS software. There are quite a number of examples of this being applied to mine action. Two well documented activities and one less formally documented are described here.

1. Prioritisation of dangerous areas using GIS in Kosovo

VVAF's work in developing a prioritisation model for dangerous areas is described in detail in their publication *Decision Support for Mine Action*.[37] Due to wide-scale disruption to communities, interview-based impact assessment was not viable. In order to gauge impact, dangerous areas were assigned a score based on their proximity to "livelihood areas".

By gathering available data layers as well as creating new layers (for example, classification of agricultural areas using *Landsat* imagery, possible at a relatively modest level of effort for a small region such as Kosovo) an impact model was developed. While recognising that operational factors often carried more weight in clearance task assignment than the prioritisation model, VVAF nonetheless concludes that it had a significant impact on the course of mine action in Kosovo.

2. Multi-sectoral GIS analysis in Lebanon agricultural data[38]

Lebanon has a relatively well developed information infrastructure, which, coupled with its small geographic area, made it appear an ideal candidate for the inclusion of data from non-mine-action sources into the LIS data analysis. Much of the data available which would further illuminate "community endowment" (for example, service and utility data such as health clinics, hospitals and electricity) were not available with full national coverage, an important criteria for inclusion.

The search for data sources led to only one promising data set: an agricultural census conducted at the individual landowner level. After protracted communications between the Ministry of Defence (with which the LIS was partnered) and the Ministry of Agriculture, access to the data was obtained. The resulting analysis provided an interesting sidebar to the main LIS analysis, but again highlighted the difficulty in obtaining data from non-mine-action sources.

3. Vulnerability analysis at Humanitarian Information Centres

UNOCHA's (United Nations Office for the Coordination of Humanitarian Affairs) Humanitarian Information Centres (HICs, further described later in this section) include mine action data with other layers of information in a geographical information system to create a vulnerability index which summarise the estimated combined affect of a variety of factors on the population during humanitarian emergencies. Data introduced into the model ranged from the very general (trends in population movement) to the quite general (regions affected by drought) and the detailed (land cover and minefield locations). This approach was extensively used in Afghanistan in 2002 following the American-led war.

Data exchange

Exchanging data between mine action databases is technically very simple but in practice is highly problematic. It is technically simple because most databases conform to a standard data access technology called open database connectivity. Open database connectivity allows communication between different types of databases, so that, for example, it is possible to read *FoxPro*, *Paradox* and *SQLServer* data from within *MS Access*.

Exchanging data is very problematic in practice because, more often than not, the meaning of the data stored in the accessible tables is unclear. So while it may be relatively trivial to read the data, the meaning of the data is not explicitly described by its structure. Database tables contain fields with short names. While this may be helpful to users who are familiar with the database and the way in which it supports the organisation where it is used, they are an inadequate descriptor for general use. As an example, a clearance table may store four different representations of area: "prepared by machines", "cleared by demining", "calculated from the surveyed perimeter" and "reported during technical survey". The way in which the user should understand the meaning and use of these various reporting of area requires a detailed explanation.

Importing data into IMSMA is difficult because, in addition to the data represented on data collection sheets, IMSMA also stores data required by the system, such as data entry operator, date entered and status information. Other data, such as the nearest town and items of ERW, are not directly stored but linked to by internal codes. Furthermore, the valid content of many fields in IMSMA is limited to a finite list.

Data export from IMSMA in all versions through v3 has been accomplished by either saving the data to an *MS Access* database for distribution or summarising the database contents in flat tables and distributing the summary in a format appropriate for use in a GIS (ESRI Shape files).

Data import has required the painstaking design of routines specific to the data being imported; this has been done for database conversions to IMSMA in Afghanistan, Kosovo, Mozambique and northern Iraq. On a more limited scale, if a list of 200 bomb strike locations has to be entered into IMSMA Dangerous Areas, it has often been quicker to just manually enter the data rather than design an import routine.

The mine action XML (maXML) project aims to improve the ability to import and export data in mine action databases. It defines a neutral data structure for mine action through which mine action databases can communicate. Rather than having to write an import routine between all systems which would like to exchange data, one import routine is written for each system for maXML. Funded and managed by GICHD as part of the IMSMA project, development work is done by FGM Inc — an American company specialising in software systems development and integration.

The maXML project has succeeded in defining a neutral data structure and will provide the import/export mechanisms for IMSMA. To take a practical example, the designers of the EOD-IS-SURVEY system do not need to be concerned with how to import data into IMSMA, rather they store the collected technical survey data as maXML and the existing import routine is used to bring the data into IMSMA.

A workflow for managing the direct import of survey data into IMSMA has not yet been addressed. An opportunity must be afforded the IMSMA database administrator prior to import and review the new survey data for accuracy and completeness, and to ensure that they have not already been imported previously into the database.

An added benefit of XML data exchange is that the data are self-documenting. Descriptions of the meaning of the data (metadata) are included in the XML file.

Multi-sector approaches

Humanitarian information centres (HICs) — established in countries during humanitarian emergencies — are a cornerstone of the UNOCHA's approach to improving national, and sometimes regional, coordination during complex emergencies. They have been an important element in sharing mine action information with the broader humanitarian community since Kosovo. HICs are currently operating in Afghanistan, southern Africa, the Horn of Africa, Iraq, Liberia, the Democratic People's Republic of Korea, Sierra Leone and the Palestinian Occupied Territories.[39]

UNOCHA describes the general role of HICs in the following terms:[40]

> "*A space where the humanitarian community can share and access information resources in order to improve the planning and delivery of humanitarian assistance.*

A provider of information products and services that enable the humanitarian community to deliver assistance more effectively, following principles of good practice in information management.
A focal point for data collection, analysis and dissemination in support of the provision of humanitarian assistance, developing and supporting data standards.
A facilitator for initiatives and activities related to information management in the field, particularly in collaboration between other humanitarian actors in support of existing co-ordination structures.
An advocate for a culture of information-sharing in the humanitarian community, generating awareness of good practice and making it possible for agencies to develop common standards and practices in the field."

Their importance for mine action information management has been both as a source of data and as a means of distribution of mine action information:

- **Gazetteer maintenance.** A cornerstone of sharing data is the use of a common gazetteer of place names. HICs have generally taken on the task of maintaining a standard gazetteer for the humanitarian community. This standard gazetteer can then be used in IMSMA, which ensures that other sector information can be linked to mine action data at the community level.
- **Base mapping**: both for use in the IMSMA GIS and as a map supplier to mine action field operators.
- **Mine action information distribution.** General mine action data (for example, point locations of minefields) is provided to the HIC for inclusion on hard-copy map products at medium to small scale (e.g. 1:250,000 and smaller), and used in spatial analysis.

Assisting the end user

Establishing and maintaining an information management system in mine-affected countries is a challenging undertaking. There is a complex mix of elements which must combine to achieve success. The database can not succeed in isolation — it must have a close view of both field activities as the producers of data and operations personnel who are the main users of the output of the system.

A key element in providing assistance to mine action centres has been technical advisers. Mine action has a long history of employing international staff to provide technical assistance to programmes. Very few mine action programmes have not had technical advisers work with them at some point in their history. In many programmes the three key adviser positions are a chief technical adviser who works with a national programme manager, an operations adviser who is concerned with field operations, and an information management adviser whose purview is the maintenance of the database and its associated reporting procedures.

Training sessions — centralised and local — and comprehensive system documentation accompany the IMSMA Field Module database. GICHD has recently introduced regionally based staff as a mid-level support between training sessions and dedicated technical advisers.

Advisers

The focus of advisers tends to be on the technical aspects of the job rather than the leadership, training and planning aspects that might lead to improvements in sustainability. Advisers working in mine-affected countries tend to be somewhat isolated and often do not benefit from lessons learned in other programmes.

UNOPS and UNDP have placed many mine action information management technical advisers in mine action centres. Terms of reference tend to be similar, requiring familiarity with database and GIS software in general and IMSMA in particular.

To help foster a community of mine action information practitioners James Madison University hosted annual mine action information workshops in Virginia in the US starting in 2000, and in 2003 GICHD hosted the meeting in Geneva. Each meeting has had a central topic: Information Management and Coordination: The Way Ahead (2000); Mine Action Systems Interoperability (2001); Data Integrity and Reliability (2002); and Geographical Information Systems (2003). These gatherings have drawn both national staff and international and advisers working in mine action programmes worldwide and have helped to spread lessons learned more widely.

The US Army's Fort Leonard Wood base houses the Humanitarian Demining Training Center (HDTC), which teaches IMSMA to US Army Special Forces teams as part of its curriculum. These teams then deploy to work with military units involved in mine action in mine-affected countries. HDTC activities tend to be more focused on field clearance than headquarters activities such as information management; however they have on occasion provided assistance related to IMSMA.

The Swedish Rescue Services Agency (SRSA) has been a visible provider of technical assistance for mine action information beginning in Kosovo and more recently in Afghanistan, Iraq and Sudan. Two SWEDEC staff were among the ten or so participants in the first IMSMA Train the Trainer course in 2002.

VVAF's Information Management and Mine Action Programme (iMMap) has provided technical advisers and trainers to mine action programmes in Afghanistan, Iraq and Sudan. They also had two staff among the first group to receive the IMSMA Train the Trainer course.

Training

Starting in 1999 with the first installations of the IMSMA Field Module, field relations staff working with the IMSMA developers at the ETHZ in Zurich conducted field visits during the initial deployment of the software. The field visits went far beyond merely installing the software and providing training in its use — extending to provide assistance in the broader range of elements required to make an effective information system. For example, consultation would be conducted with other organisations to identify suitable gazetteer data, and assistance was provided in identifying and configuring digital map data to be used in the system's GIS. The number of field relations staff at ETHZ grew from one in 1999 to a high of five in late 2001, as the total staff working on the IMSMA project in Zurich grew from three to 13 over the same period.

A major shift in the GICHD's approach to supporting IMSMA in the field occurred in 2002 with the introduction of regional coordinators. The concept of IMSMA regional coordinators grew from the recognition that the greatest barrier to effective use of IMSMA was not related to the actual software, but rather to a lack of skills in the mine action programmes and that developing these skills was a longer-term project not addressed by short, infrequent courses. Regional coordinators have been designated for five regions:

- Asia, based at the GICHD;
- Eastern Europe and Central Asia, based at the GICHD;
- Latin America, based in Nicaragua;
- Middle East and North Africa, based in Lebanon; and
- South and Central Africa, based in Ethiopia.

Documentation

IMSMA documentation through 2001 consisted of a *User Guide*, an *Administrator's Guide*, and a *GIS User's Manual*. These were rewritten in 2001 to produce two expanded documents — a *User Guide* and an *Administrator Guide*, which were made available in Adobe PDF and a compiled HTML version on all IMSMA installation CD-ROMs. In 2002, these were further expanded to include a *Trainer's Guide* and other specialised documentation:

- **Trainer's Guide and Exercise Book.** Contained training plans and step-by-step exercises for basic and advanced user training. Provided to participants of the IMSMA Train-the-Trainer course.
- **IMSMA Standards Guide.** Technical document which describes the structure of the system. Intended for software developers creating IMSMA add-ons. Was not widely distributed but was available upon request.
- **IMSMA Data Collection Guide.** Detailed explanation of the contents of each field in the database. Draft document, was made available upon request.
- **IMSMA HW/SW requirements.** A detailed description of the hardware and software recommendations for IMSMA for small, medium and large installations. Posted on IMSMA website.

In addition to the text-based materials, an attempt was made at ETHZ to develop computer-based training. Two *Macromedia Flash*-based applications[41] have been prepared to provide an interactive learning environment for some of the more complex functionality in IMSMA. These tools, described below, have been included in IMSMA installations from v3:

- **Entity relationship diagram explorer.** This tool describes the content of the IMSMA database and shows the relationships between its tables. The target audience is a database administrator who must work with the IMSMA tables directly to create new summary reports.
- **Decentralised data entry.** This tool describes in detail the workings of the IMSMA decentralised data entry functionality. It is intended for

the IMSMA manager who is planning on using this functionality to better understand its intended use and limitations.

The usability of all IMSMA documentation is limited by its poor integration into the application. The user and administrator guides can be launched from within IMSMA, but there are no context-sensitive features, which can make it difficult to quickly find content. The *Flash*-based interactive tools are very high quality products, but suffer from the same poor integration: they are only available as stand-alone applications which are launched outside of the IMSMA FM.

ETHZ has also attempted to collect lessons learned in using the system with two initiatives:

- a "lessons learned" document in compiled HTML format installed with the IMSMA FM; this is mainly a collection of observations on using the system by the support staff and developers at ETHZ; and
- field user "lessons learned" can be posted to a message board maintained on the ETHZ IMSMA website[42]; this has never been widely used, however, and lessons learned during the course of IMSMA field use remain for the most part undocumented.

Technical advisers employed by the UN — UNMAS, UNOPS and UNDP — have developed a broad understanding of issues related to using IMSMA in mine action programmes and during the course of LISs. Little information regarding their experiences is publicly available, and there is no formal internal information-sharing process in place.

Regional and donor initiatives

A regional effort within the Southern Africa Development Community sought to establish a regional database in Maputo and deliver information technology training to mine action programmes in the participating countries. The project began in 1999, placed database hardware within the National Demining Institute in Maputo and delivered general basic office skills computer training to mine action programme staff. This project does not appear to still be operating.

Canada's International Development Agency, CIDA, delivered an integrated package to develop mine action information management in Mozambique. This project began in 1998 with a consultancy report[43] that recommended three parallel courses of action to create a solid base for information management in the country:

- First, the LIS, which CIDA funded.
- Second, technical assistance to ADP. Three Canadian Forces advisers were provided to the Accelerated Demining Programme to improve field survey and information management within this clearance programme.
- Third, development of the Geomatics infrastructure. This activity began with a consultancy report which planned the further course of action[44] and resulted in all of the existing 1:50,000 topographic map sheets being scanned and geo-registered.

Finally, the SEEMAC GIS programme provided staff positions in participating programmes in South-Eastern Europe and assisted in the procurement of spatial data including *Landsat* imagery and new aerial photography.

Conclusions

IMSMA is now the *de facto* standard database for mine action. The initial motivation for a standardised mine action database came from the top — managers at the UN in New York wanted standardised data worldwide to better allocate mine action resources. This vision of centrally collecting the contents of the databases at the international level has long since faded. The ultimately widespread adoption of IMSMA — it is now used in over 80 per cent of mine action programmes — was driven by individual programmes requesting access to the system in hopes that it would improve efficiencies but also to join an international body of practice. For the most part mine action programmes have warmly embraced this standardisation effort.

A second motivation for the development of IMSMA was to provide a generic mine action database suitable for deployment anywhere in the world rather than starting anew from a blank screen each time. This vision has largely been achieved — IMSMA is now in use in most mine action centres worldwide and it quite literally does provide a starting point. It is often extensively customised and used in very different ways in different programmes to meet local requirements.

The first five years of mine action information management systems — the period pre-IMSMA — saw the development of databases in large programmes that had a requirement but, more importantly, the capacity to devote significant resources to this task. These databases were not well rounded — they focused on the particular sort of data and reporting that were of specific interest to the individuals working in the programme at the time and did not benefit from a wider body of experience.

The next five years saw the development of IMSMA through three major versions and, with the exception of the northern Iraq programme, very little database development elsewhere. As IMSMA progressed from v1 to v3 it grew in size, complexity and capability. Important new functionality included robust decentralised data entry, integrated coordinate transformations and the addition of mine risk education. The only major technical change during this period was the move to a more robust database working in the background to better support multiple users on an office network.

The IMSMA Field Module — clearly the flagship product of the project — has been far more successful than numerous other software tools which have emerged from the developers at the ETHZ over the years — Global Module, Analysis, Quarterly Reports, Web Reports, ESTI, XL. The failure of most of these projects to be used in the field parallels the failure of many other mine action research and development projects in Western countries. The common factor in many of these failures is excessive attention to ideas developed in offices in New York or Zurich at the expense of understanding user requirements in the field.

The current course of the IMSMA project marks a sharp turn from that of the previous five years. The GICHD's creation of regional IMSMA representatives addresses one of the main points highlighted by Price Waterhouse Coopers in their review of mine action information management. Namely that far more attention has been given to developing the IMSMA software than to assisting users in the field in making appropriate use of it. Rather than relying on technical advisers — a resource many programmes cannot afford — the GICHD has stepped forward to directly provide this service to the users of its software.

The role of the software developers in the IMSMA design process also looks to be very different over the next five years. Two IMSMA-related projects are underway which are not being coded by the Field Module developers in Zurich. The Field Module development post-version 3 was tendered though a request for proposals in 2004, leading to the development of a new version in 2005 by a US-based organisation. This may be a very positive development since it allows IMSMA development to more closely focus on field requirements — something that has until now been inhibited by the limited field experience of the programmers and sporadic contact with users. It also carries with it the danger of relearning old lessons and remaking old mistakes as the body of knowledge accumulated by the IMSMA developers over the last five years is lost.

The balance of power between headquarters staff and information management professionals seems to be firmly weighted towards headquarters staff, given the experience during the design of recent surveys. Important lessons learned during the landmine impact survey process seem to have been forgotten. By focusing on data rather than data use surveys such as the emergency survey in Iraq have degraded their effectiveness by failing to focus on analysis. Fielding data collection forms that do not have a focused intent yields poor quality data.

Geographic information systems are now widely used in mine action. For most programmes this means that they have the capability to print maps showing the mine threat. While automated mapping is a very modest use of the geographic tools made available by IMSMA, it is a huge advance from what was available before and places mine action among a very select group of GIS users in many of the countries where it is used.

Technology assisting field data collection — such as that of the GICHD/ SWEDEC EOD-IS-SURVEY project — is an extension to the IMSMA project. Assisting the data collector improves data quality by reducing errors in the field and assists standardisation.

Mine action programmes do not seem to want, and perhaps do not require, complex software to assist in planning and prioritisation. The wide variety of management styles, relatively simple resource allocation requirements, and the field focus of mine action managers all contribute to depreciating the value of developing software tools focused on planning and prioritisation. Yet there is still a feeling among many programmes managers that they are not getting what they want from their databases. Satisfying these managers will require efforts to simplify existing IMSMA functionality rather than adding extensive new features to the system.

IMSMA has reduced the dependence of individual mine action programmes on individuals to keep their mine action information systems operating. While the loss of a technical adviser or other key member of the programme can still be problematic it is now much easier to obtain outside assistance — particularly with the advent of the GICHD's regional IMSMA representatives — and train replacements.

The information management requirements of mine action programmes vary widely, but a common requirement is simplicity. Enhancing ease of use should be the mantra of an IMSMA developer. Scalability is an important element of ease of use — functionality that is not required in a small mine action programme should not complicate the use of basic features. Many mine action centres require small, simple and flexible tools. It is the minority that require a large complicated information system. A key element of getting the database into use is improving the ability of non-database staff to directly interact with the system. This implies that IMSMA should be easier to install, offer a smaller client for basic use, and be more mobile.

Survey design is a key element of information management and it should not be the sole dominion of either the policy or technical communities. There is a healthy practice of providing wide review of new survey documents though venues such as the Survey Working Group chaired by the Survey Action Centre, but review is not equal to discussion and critical analysis. More leadership on survey design practices, including a more formal recording of best practices and lessons learned, will help to improve future survey designs. First and foremost among these best practices is the primacy of analysis. Field survey cannot be an unfocused data collection effort — the data selected for collection should follow from its planned use. Too often the process of considering how to use the data has followed its collection.

Editor's note:

Since the article was written the IMSMA system has undergone a major redevelopment and version 4 is due to be released in late 2005. This new version addresses many of the issues raised in the chapter.

The latest version of IMSMA is designed as a decentralised system and will replace existing systems within the next two years. This new release is based upon open-source dataware and is being developed using the platform independent Java programming language. The new system will contain a fully-integrated GIS based on the Arc Engine software package. It allows users to perform interactive map-based navigation throughout the entire content of the database.

This first release of IMSMA version 4 will undergo a series of pilot tests starting in late 2005 before it is made available for general release. The new system is designed for use by operations and management staff and contains a number of technical improvements, which will reduce the cost of operations and maintenance.

Endnotes

1. UN (2001a).
2. McLean (2002).
3. Cambodia (1992), Afghanistan (early 1990s), Mozambique (1992), Angola (1994), Bosnia (1996).
4. Kimball et al. (2002).
5. *Sourceforge.net* — the self-proclaimed world's largest Open Source software development website — hosts nearly 75000 Open Source software projects.
6. This is not generally the case with software. Once the source code has been written in some programming language (for example C++ or C#) it is then compiled into an executable application. The act of compiling the source code makes it unavailable to the end user. In applications that are not compiled (such as the IMSMA FM), the source code can be hidden behind a password — although this is much less secure since it can usually be removed with readily available utilities.
7. UNMAS (2002b).
8. This was elaborated in the interim report which followed the field work in late 2001.
9. *www.scanteam.no*.
10. The evaluation looked in detail at the LIS efforts in Bosnia, Cambodia, Chad, Ethiopia and Mozambique.
11. Morete (2003c).
12. The database elements of the tools are based on the Microsoft.NET framework and do not have any end user licensing costs associated with it — except of course that they must be using the Microsoft Windows operating system. The mapping components are built using ESRI software tools, and are freely distributed for use in mine action as part of an ESRI agreement with GICHD.
13. The repeated modifications to the system which saw its versions numbers proceed through to version 4 over the course of a few months was largely the result of a creep in the specifications set by UNMAS although there were also programming issues which led to revision.
14. James Madison University (2001).
15. Landmine Casualty workshop, James Madison University, Harrisonberg, VA., 13-14 May 2002.
16. Smith (2003).
17. Updating of Ordata in IMSMA has not been required as no new updates have been issued during the life of the IMSMA project.
18. For a summary of the Data Integrity and Reliability Conference see *maic.jmu.edu/journal/6.2/notes/whitneytolliver/whitneytolliver.htm.*
19. In AutoCAD Release 11 it became possible to store information in a database which was related to point or line features in the CAD file. The extended entity data (Xdata) facility was added, providing a means to attach data to entities, via DXF, AutoLISP and ADS, and group the data by "registered application" names. Autodesk website: *betaprograms.autodesk.com/history/general_4545_r11_history.htm*.
20. Geomatics refers collectively to such spatially concerned disciplines as geodesy, mapping, remote sensing and image analysis, land survey, and cadastre.
21. Ryerson and Batterham (2000).
22. International Institute for Geo-Information Science and Earth Observation, Hengelosestraat 99, P.O. Box 6. 7500, AA Enschede, The Netherlands, *http://www.itc.nl/*.
23. The margin of error in flight path planning is small since the field of view of the camera taking the large scale photos is very limited.

24. *www.edu-observatory.org/gps/gps_accuracy.html.*
25. *users.erols.com/dlwilson/gpsacc.htm.*
26. *www.pobonline.com/CDA/ArticleInformation/features/BNP_Features_Item/0,2338,72407,00.html.*
27. SWEDEC (2003).
28. With the IMSMA database size typically ranging from 50-100 MB, data forwarding to Zurich would not be a matter of a simple email attachment.
29. Chad and Yemen IMSMA web reports, *www.imsma.ch/en/news/news_detail.asp?id=34.*
30. Nicaragua IMSMA web services country edition, *www.imsma.ch/en/project/countryedition.asp*.
31. The IMSMA Field Module is a superset of MS Access — MS Access — must be installed prior to installing the IMSMA Field Module and all of the normal functionality of MS Access is available to the user. In a compiled application such as IMSMA Quarterly Reports all of the applications functionality is provided by the programmers. An advantage to this approach is that IMSMA Quarterly Reports do not require the user to purchase any licensed software on which it is dependant. A disadvantage is that the functionality is limited to that provided by the applications programmers.
32. SEEMAC GIS web portal, *www.see-demining.org/main.htm. Note*: The ArcIMS-based mapping server was not operating when this site was checked in early 2004.
33. Iraq National Mine Action Authority, *www.iraqmineaction.org*. The web mapping is available via a link at *195.54.141.188/midiscovery/.*
34. More correctly, the content was provided in detail by the social scientist working from SAC/VVAF in the early days of the survey.
35. These queries are specified in the SAC LIS Protocol 16, and are referred to as the P16 queries.
36. GICHD (2002b).
37. VVAF (2002).
38. Benini (2003).
39. www.humanitarianinfo.org.
40. www.humanitarianinfo.org/abouthics.html.
41. Macromedia Flash is a de facto standard in vector-based animation. Vector-based animation results in small file sizes, which has led to wide adoption for creating animations for websites.
42. *www.imsma.ch/en/discussion.*
43. Focseaneau (1998).
44. Ryerson and Batterham (1999).

10 Capacity development in mine action

Ted Paterson

Summary

The effort to foster indigenous mine action capacities in developing countries and economies in transition has achieved a mixed level of success. International assistance generally has succeeded in developing the capacities of individuals for the front-line tasks relating to mine clearance, survey, quality assurance, medical support of clearance operations, mine risk education and victim assistance. In most cases where the contamination is likely to require a sustained effort, indigenous capacity for continuing these training programmes has also been developed.

However, capacity development of the type needed to establish new organisations or to improve the management cadres and systems of poorly performing organisations has been much more hit-and-miss. In the first decade, the failures at this level of capacity development outweighed the successes, in part because short-term emergency thinking dominated, no successful models existed in the new field of mine action, and most of the early programmes began in the difficult situations of complex emergencies and failed states.

The need for better coordination within the donor arena is also one of many frontier issues concerning capacity development of networks, which is needed to ensure that a group of otherwise capable organisations works effectively in concert. There is now a general awareness of the institutions and processes required to make the organisations within a country's mine action arena function as a reasonably coherent network. But much less progress has been made concerning linkages between the mine action programme and other arenas.

Introduction

This chapter looks at capacity development in mine action, currently the subject of a major study by the GICHD. The chapter first discusses the definition of capacity development, before looking at efforts at capacity development in some of the world's major mine action programmes.

What is capacity development?

Capacity development is a broad concept and, hence, one of those things that everyone knows "when they see it" but finds difficult to describe. It helps to have some introduction to the basic concepts and a common vocabulary. In brief, capacity development refers to (i) the ***target*** entity (or entities — individuals, organisations, etc.), which exists in (ii) a socio-cultural-political-economic ***environment***, (iii) the ***objective*** or type of capacity that is to be enhanced via (iv) a ***process***, and (v) the people or agencies pursuing the capacity development which, in the field of international development, usually entails ***partnership*** between one or more organisations in both the recipient country and the international community.

These concepts of capacities within a capacity development process operating at different levels are captured in the following definition adopted by the OECD Development Assistance Committee (DAC — the "official donors club"). Capacity development is…

> *"…the process by which individuals, groups, organisations, institutions, and societies increase their abilities to: (1) perform core functions, solve problems, define and achieve objectives; and (2) understand and deal with their development needs in a broad context and in a sustainable manner…".*

Further, the definition defines the core capacities of an organisation, community, sector, etc., as:

- *defining, analysing the environment or overall system;*
- *identifying needs and/or key issues;*
- *formulating strategies to respond to or meet needs;*
- *devising or implementing actions; assembling and using resources effectively and sustainably;*
- *monitoring performance, ensuring feedback, and adjusting courses of action to meet objectives;*
- *acquiring new knowledge and skills to meet evolving challenges.*"[1]

Many development efforts have run aground because of problems with partnership and process. Some recipient governments — through disinterest, bad policies, or internal conflict — proved to be weak partners. Many donors have also proved to be poor partners by pushing their own interests or by promoting development in a manner to increase the so-called success rate of their projects but which overwhelmed local capacities and disenfranchised local organisations.

The capacity development processes used (education and training plus technical assistance based largely on the counterpart model) were often poorly delivered because the wrong type of training was given or the international experts did not have the required expertise or aptitudes. More fundamentally, such approaches, which worked in post-war Europe and Japan, were simply inadequate in more difficult environments: the tools were not up to the task of sustainable capacity development.

Box 1. Lessons of success and recipes for disaster in capacity development

A comparison of successful and unsuccessful capacity-building efforts in international development yields the following lessons of success:

- Capacity is an indigenous phenomenon and its development arises principally from local responses to changing opportunities — from learning-by-doing;
- The path of capacity development is largely determined by local factors: highly standardised plans ("blueprints") are unlikely to be successful;
- Capacity development arises from complex interactions among parties and at different levels (national, sectoral, community, etc.) as well as within organisations;
- Capacity development can be assisted but not driven by outside agencies.[a)]

a) Adapted from Browne, 2002:6-7.

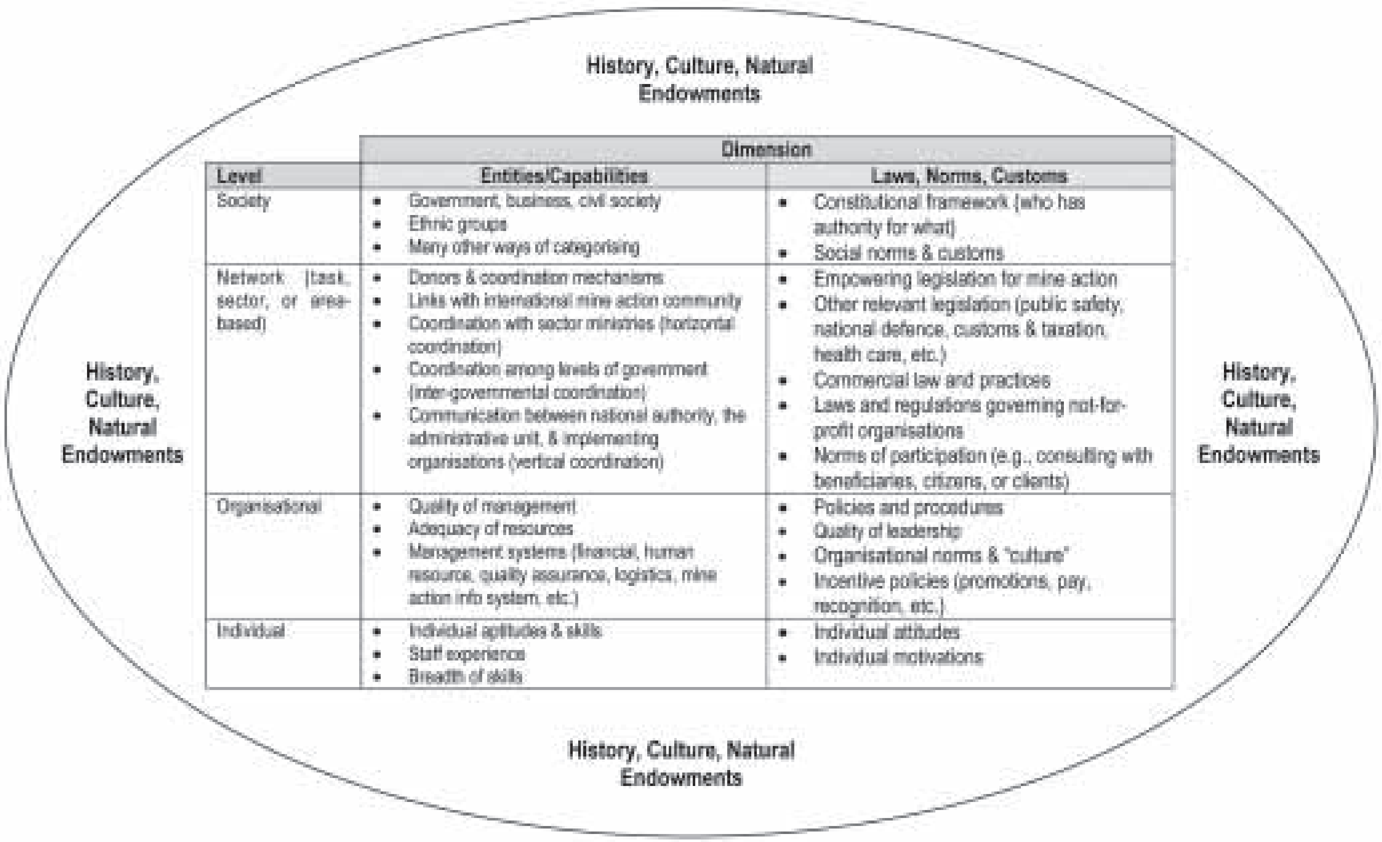
The lessons in Box 1 can be summarised in the following principles: (1) local ownership; (2) flexible, long-term approaches; (3) participation of stakeholders (those who "have a stake in" or will be affected by a planned action); and (4) demand-led rather than supply-driven donor assistance. Conversely, where a number of these principles are violated, we may have a potential recipe for disaster. These principles will be used in subsequent sections in assessing capacity building in mine action.

The failure of so many donor-funded capacity development efforts has made practitioners more aware of the critical role of the socio-cultural-political-economic environment within which the target entity exists, as it determines to a large extent how well the entity will perform. For example, well-trained individuals will not be able to achieve much if the organisation in which they work has the wrong mandate, is badly managed or lacks the bare minimum of resources required for proper functioning. Similarly, a capable organisation will achieve little if other organisations with which it needs to work in a "network"[2] are incapable or unwilling to cooperate.

Accordingly, a national mine action centre might have excellent staff and an adequate budget, but the country's mine action programme could still flounder if the mine action authority is riven by petty politics, if the implementing organisations refuse to cooperate for fear of losing their direct funding from donors, or if local political authorities steal the land from poor households once it has been cleared. Therefore, capacity development efforts should be based on clear-headed assessments of the broader environment, which will often uncover glaring problems requiring parallel measures to (ideally) address these problems directly or (at minimum) guard against the main risks such problems create.

For just one example, some of the principal donors to the mine action programme in Bosnia wanted most clearance contracts to be awarded via competitive tenders and a central element of their capacity development strategy was to help create local demining firms which would compete for those tenders. This was a reasonable strategy but it did not factor — in the risks posed by Bosnia's extremely corrupt political and commercial environment

Figure 1. Capacity development framework for mine action



Level	Dimension: Entities/Capabilities	Dimension: Laws, Norms, Customs
Society	• Government, business, civil society • Ethnic groups • Many other ways of categorising	• Constitutional framework (who has authority for what) • Social norms & customs
Network (task, sector, or area-based)	• Donors & coordination mechanisms • Links with international mine action community • Coordination with sector ministries (horizontal coordination) • Coordination among levels of government (inter-governmental coordination) • Communication between national authority, the administrative unit, & implementing organisations (vertical coordination)	• Empowering legislation for mine action • Other relevant legislation (public safety, national defence, customs & taxation, health care, etc.) • Commercial law and practices • Laws and regulations governing not-for-profit organisations • Norms of participation (e.g., consulting with beneficiaries, citizens, or clients)
Organisational	• Quality of management • Adequacy of resources • Management systems (financial, human resource, quality assurance, logistics, mine action info system, etc.)	• Policies and procedures • Quality of leadership • Organisational norms & "culture" • Incentive policies (promotions, pay, recognition, etc.)
Individual	• Individual aptitudes & skills • Staff experience • Breadth of skills	• Individual attitudes • Individual motivations

that had emerged during the 1992-1995 war. No special measures were put in place to insulate mine action from the pervasive corruption and the programme soon was the target of many allegations that eroded donor confidence and reduced their financial support.

Of course a "clear-headed assessment" of a country's socio-cultural-political-economic environment can itself be a daunting task and some tools are needed. SWOT (strengths-weaknesses-opportunities-threats) and PEST (political-economic-social-technical) analyses are widely known techniques and are employed in the strategic planning exercises facilitated by Cranfield University. The following capacity development framework (*Figure 1*) can complement such tools to ensure important issues from each "level" (individual, organisation, network, society) are considered and some thought is given to both (for lack of a better term) dimensions of capacity development: the "hardware" of entities and capabilities, plus the "software" composed of laws, norms, cultural beliefs, and so on.[3]

Capacity development in the first decade of mine action: 1989-1998

While the International Committee of the Red Cross (ICRC) has for decades provided medical care and rehabilitation for landmine victims, and individual initiatives to help communities cope with landmine and unexploded odnance (UXO) contamination were undertaken by (mainly) international NGOs prior to 1989, mine action as a distinct and large-scale humanitarian endeavour dates from late 1989 in Afghanistan. Other large programmes that began in the first decade were Cambodia (1991), Mozambique (1992/93), Angola (1994), Lao PDR (1994), Bosnia and Herzegovina (1996), Croatia (1996), and northern Iraq (1997).[4] International assistance was also provided — mainly through military channels — to programmes such as Nicaragua (from 1993) and Rwanda (1995), where the mine action was conducted primarily by the local military.

Four points need to be made when assessing the success of capacity development efforts during this period.

1. Mine action was a new humanitarian field and proven models did not exist for programmes on how these might best be established. As expected, the period saw a good deal of trial and error, and heated disagreement between the various professions and organisations that came to form the mine action community (military, health care professions, commercial firms, international NGOs, official donors, etc.). Initially, the various programmes adopted quite different strategies and virtually all of them had to adjust these one or more times as they learned what did and did not work in that particular environment.
2. Complicating this fact, much of the landmine and UXO contamination stemmed from fluid civil wars without established frontlines, often waged by ill-disciplined forces that targeted civilians as much as rival combatants but that could also (unlike civil conflicts from earlier periods) obtain modern munitions, including landmines, from foreign governments and weapons dealers. The result was complex patterns of

contamination, often with few records of where the landmines were. Thus the experience of modern armies and civil defence forces in post-war clearance could not simply be replicated in developing and transition countries.

3. The donor environment for mine action was very different in the early 1990s to that in the later build-up to the Anti-Personnel Mine Ban Convention. Donors came on board with support for mine action at different times and advocated different approaches. There were no specialist agencies with recognised mine action expertise to provide leadership that would be accepted by other organisations involved. Even within the UN system, no focal point was appointed until 1994.
4. Most programmes were initiated in countries that remained in, or were just emerging from, civil wars. Some of these countries did not have recognised governments exercising effective control over the country and therefore the establishment of national authorities and mine action centres was either foredoomed or required time-consuming negotiations, in some cases with factions that did not want landmines cleared as they were not yet committed to peace.

There were recognised successes but far more failures during this period. The most successful programme was for **Afghanistan**.[5] The initial plan of the United Nations Office for the Coordination of Humanitarian Affairs to Afghanistan (UNOCHA)[6] was to train thousands of refugees in basic demining skills, expecting them to clear their own communities after what was expected to be a massive repatriation following the Geneva Accords (April 1988). However, the continuation of fighting stopped the bulk of refugees from returning to Afghanistan and made it impossible to anticipate when a recognised national authority would be in place to assume responsibility for the contamination problem.

This task fell to UNOCHA, which filled the dual role of mine action authority and the national mine action centre but balked at assuming direct responsibility for operations. UNOCHA advanced the concept of establishing Afghan mine action NGOs which circumvented many ponderous UN administrative rules and promised to create an indigenous capacity that eventually could be put at the service of a national authority. Continued fighting meant that this transfer of authority did not take place during the first mine action decade,[7] but significant indigenous capacities were indeed developed in terms of the thousands of trained personnel, the numbers and sizes of capable mine action organisations and the experience garnered by senior and middle-level managers, some of whom have since gone on to assume key posts within the international mine action community.

A unique feature of the Afghanistan programme — and one that demonstrates the central role UNOCHA played in both the creation of the Afghan NGOs and their continued evolution — is that some of the NGOs were established expressly to provide services to all other organisations within the Mine Action Programme for Afghanistan (MAPA). Thus, as set out in Table 1 above, the Mine Clearance Planning Agency conducts all surveying and maintains the mine action data base on behalf of UNOCHA; the Mine Dog Centre (MDC) supplies all mine detection dogs and handlers for both survey and clearance; and the Monitoring Evaluation and Training Agency (META) conducts quality assurance monitoring and evaluation of survey, clearance and MRE activities, and operates the central training facility that offers a range of programmes, including middle management training. These core organisations within MAPA operate akin to a business conglomerate, with plans and performance targets being set or endorsed by the centre but with each of the units having a good deal of autonomy over its day-to-day operations and core business functions (accounting, personnel management, etc.).

Table 1. Afghan NGO partners in the MAPA[a)]

Afghan NGO	Year established	Main function within MAPA
Afghan Red Crescent Society (ARCS)	Pre-existing (MAPA partner since 1991)	Mine Risk Education (MRE)
Agency for Rehabilitation & Energy Conservation in Afghanistan (AREA)	Pre-existing (MAPA partner since 1997)	Community-based clearance
Afghan Technical Consultants (ATC)	1989	Clearance
Demining Agency for Afghanistan (DAFA)	1990 (as SWAAD)	Clearance
Mine Clearance and Planning Agency (MCPA)	1989	Survey (plus, until 1997, training)
Mine Detection and Dog Centre (MDC)	1994 (the centre was managed by RONCO from 1989-93) for survey (via MCPA)	Mine detection dogs and clearance (in conjunction with a number of NGOs).
Monitoring Evaluation and Training Agency (META)	1997 (previously was part of MCPA)	Training, monitoring, and evaluation
Organisation for Mine Clearance and Afghan Rehabilitation (OMAR)	1989 (as OMA)	MRE and, since 1992, clearance

a) A number of other international NGOs are MAPA partners, most of which are involved with MRE and/or victim assistance. HALO Trust continues to conduct clearance operations.

The mine action programme in **Cambodia**[8] began within the context of a UN peace-building mission (UNTAC— the UN Transitional Authority in Cambodia) whose mandate specified in the Paris Agreement (October 1991) included monitoring the withdrawal of foreign forces, supervising the cease-fire, assisting the repatriation and resettlement of refugees, and facilitating the elections scheduled for May 1993. Mine action was placed under the military arm of UNTAC.

With only an 18-month mandate, it focused on training and equipping local deminers to undertake tasks in direct support of UNTAC responsibilities (such as mine clearance from repatriation routes, refugee reception centres and resettlement areas), gave scant attention to longer-term mine action requirements, and had little communication with the Cambodia Mine Action Centre (CMAC) or its governing council, which had been established by the

Supreme National Council (the transitional authority until the elections) as the national mine action centre and authority. As a result, no provisions were made until immediately before UNTAC's departure to create a conduit for international funding to support continuing mine action operations or even to transfer UNTAC mine action equipment to CMAC.

Arrangements to keep CMAC operating were cobbled in place by March 1994 but it was not until the end of that year that a Steering Committee was established to serve as a policy forum for the government and donors. Because no attention had been given during the UNTAC mission to training managers or mine clearance trainers, CMAC remained largely dependent on expatriate advisers.

An initial five-year strategy was not completed until mid-1995 and an evaluation in December 1995 found that both strategic and annual planning still remained weak, in part because top managers and their advisers had to "fill-down" to address more mundane tasks in the absence of a cadre of properly trained middle managers. Also, operations were hampered because of delays in receiving disbursements of donor pledges to the CMAC Trust Fund. However, by the end of 1995, CMAC was up and running, had built significant in-house capacity for clearance and marking (to complement that of some international NGOs) and had instituted both a decentralisation programme to facilitate coordination with provincial authorities and development agencies.[9]

The situation facing those responsible for mine action in **Mozambique**[10] bore a number of parallels to Cambodia. The UN Operation in Mozambique (UNOMOZ) also had a peace-building mandate although, based on problems experienced in such situations in the past, its *"… operational concept … was based on a strong inter-relationship among the political, military, electoral, and humanitarian components…"*.[11] The UN Department of Humanitarian Affairs (DHA) initiated early efforts to obtain information on the nature and extent of landmine contamination and a preliminary plan was developed by January 1993, within three months of the start of the UNOMOZ mandate. This, however, was referred to the Ceasefire Commission comprising representatives from the UN and the warring parties (FRELIMO and RENAMO) and became a hostage to the tortuous negotiations in that highly politicised forum. The plan was not approved until 11 months had passed and during this lag the UN did not initiate certain preparatory actions such as establishing the training school.[12]

The plan proposed the training of demobilising soldiers to develop indigenous capacity but centred on the short-term needs of the UNOMOZ mission, particularly the opening of the major transportation corridors using commercial contractors. This initiated a "feeding frenzy"[13] among some donors seeking to promote the interests of their country's firms, leading to challenges to the tendering process and ill-will within the international community.

Once the successful bidder finally was selected, administrative difficulties within the UN caused a further seven-month delay before the contract was signed in July 1994. In the meantime, the training school opened and the UN created the Accelerated Demining Programme (ADP) to employ the graduates in clearance tasks, proposing in July 1994 that the government should eventually absorb this as the implementing arm of a future national MAC — a recommendation that was roundly attacked by some donors who advocated that clearance be left to the international NGOs[14] and commercial firms already present in the country. The government finally established the National Mine Clearance Commission (CND in its Portuguese acronym) in May 1995, but it had virtually no capacity and the UNDP did not get a project in place to provide technical assistance until the passage of another year. This project saw 85 per cent of the funds going to expatriate salaries and lacked a counterpart strategy, with the result that little indigenous capacity building took place.

Angola[15] proved to be another sad saga, this time due largely to bureaucratic turf battles between the UN Angola Verification Mission (UNAVEM) and the Central Mine Action Unit (CMAO) established in 1994 by the Office for the Coordination of Humanitarian Assistance fielded by DHA. As normal within peace-building missions, UNAVEM gave strong priority to the operational requirements to meet its short-term objectives, with little thought to long-term sustainability. UNAVEM was responsible for training local deminers but did not coordinate with CMAO, which was responsible for their deployment (while UNAVEM engaged commercial contractors to clear major routes). Meanwhile, DHA administrative procedures hamstrung CMAO. Vacancies remained unfilled for months and there was a rapid turnover of key personnel, which destroyed continuity.

The government's establishment of the Angolan National Institute for the Removal of Explosive Devices (INAROEE) in May 1995 only added to the confusion as no mention was made of UN support[16] or of the respective roles of CMAO and INAROEE. Further complications arose from the rapid turnover of CMAO Programme Managers (four in two years, with gaps totalling six months due to recruitment delays) and reportedly frosty relations between this string of CMAO managers and the Director General of INAROEE. In short, CMAO was itself in crisis for most of its existence and in no position to assist in the development of indigenous capacity within INAROEE (which, regardless, ignored CMAO). As was the case in Mozambique, most of the mine action was provided by international NGOs and commercial firms.

Laos[17] was the next large mine action programme that came into existence and represented a distinctly different context. There had been no large-scale conflict for many years and a recognised government was in place, so the programme grew out of not a UN peace-building mission but rather the development activities of an international NGO (the Mennonite Central Committee), which subsequently requested Mines Advisory Group (MAG) to assume responsibility for its risk education efforts and to initiate a clearance project. This began in late 1994.

Discussions among the government, UNDP, UNICEF and MAG led to the establishment of the Lao PDR UXO Trust Fund in late 1995, followed by a decree establishing the Trust Fund Steering Committee and the Lao National UXO Programme coordinated by UXO LAO, a semi-autonomous public institution. In May 1996 UXO LAO commissioned a national survey — completed the following year by Handicap International — which provided a firmer base for planning than existed to that point in most other mine-affected countries.

Given the significant decentralisation in Lao PDR, coupled with poor transportation and communication links, plans developed in advance of the survey completion provided for coordination offices in each heavily contaminated province. Three provincial offices were opened in 1996, followed by four in 1997. A number of donors each "adopted" one or two provincial programmes, allowing for a rapid expansion in geographic coverage.

While the first implementing partners (MAG and GERBERA, a German firm) had hired and trained local personnel and continued to manage their provincial programmes, most new partners provided equipment and technical advisers and worked with local personnel hired and trained by UXO LAO (from 1996 the US provided assistance to a national training facility). UNDP ran a programme to support capacity development in UXO LAO itself. Meanwhile UNICEF and a consortium of international NGOs established an awareness programme featuring community visits, the introduction of MRE into the school curriculum and mass media (principally radio).

Toward the end of the first mine action decade, the break-up of Yugoslavia led to two large programmes in **Croatia** and **Bosnia and Herzegovina**[18] (BiH). These represented stark contrasts both to previous efforts to initiate national programmes and to one another. First, these former Yugoslav Republics are not developing countries, but rather are making the transition from socialism to a market-based economy. Both had large numbers of skilled workers, particularly in technical and scientific fields, and — given that Yugoslavia's economy had been based on the dual concepts of "market socialism" and "self-management" — a cadre of experienced managers. Yugoslavia had also had a large, disciplined military based on conscription, with most adult males having at least basic training for handling landmines and other explosive ordnance. The capacity development requirements for Croatia and BiH alike were thus very distinct from those in most developing countries. On the other hand, the establishment and evolution of their programmes could not have been more different. Starting in 1996, Croatia financed its mine action effort almost entirely from its own resources, receiving only modest assistance from the international community.[19]

Also starting in 1996, in the very difficult political environment following the Dayton Agreement, the Bosnian programme almost immediately fell into near total dependency on the international community, whose members proved incapable of effective coordination on mine action (and on many other issues). Throwing money at the problem, donors began a number of large but disjointed initiatives in 1996 and 1997, which (as discussed later in this paper) turned a difficult problem into a debacle. Among these initiatives, however, were a number of efforts to build capacities for mine action in the local military, civil defence corps, firms and NGOs, making Bosnia perhaps the most fertile laboratory for experimentation in capacity development.

Finally, starting in 1997, UNOPS developed under the Oil-for-Food Programme a comprehensive mine action programme in **northern Iraq**[20], building on more limited MAG and NPA activities already underway. The northern Iraq Mine Action Programme (MAP) started small but grew in a few years to be one of the largest mine action programmes anywhere. It developed a large and diversified asset pool, four local demining NGOs and EOD teams, dog teams, local mechanical contractors, MRE and an extensive victim assistance network, with well developed national capacity which ran the programme in 2003 during the second Gulf War and was taken over as the core of the national mine action programme when the UN programme ended. Due to the political situation of the time, it was not easy to visit the MAP and thus it was not too well known by those not directly involved.

The DHA report — *The Development of Indigenous Mine Action Capacities*

In December 1994, the UN Secretary-General designated the Department for Humanitarian Affairs (DHA) as the focal point for landmines. In October 1996, DHA commissioned what was to prove a landmark study *"to identify the factors which affect the development of indigenous mine action capacities"* and an analysis of the role played by DHA in supporting *"the initiation and evolution of mine action activities through various stages of programme development".* The study team undertook case studies of four countries — Afghanistan, Angola, Cambodia and Mozambique — and published an overall report and the individual case studies, which contained more detailed findings concerning each of the countries.

In brief, the country findings were that Afghanistan was successful, Cambodia had started badly but seemed to be performing better, Mozambique had started very badly but was putting the necessary components of a proper programme in place, and Angola was and remained a disastrous experience. Interestingly, from this selection of countries, the UN was steadily less successful in fostering capable mine action programmes as time went by. It appeared the UN — and the international community — was not learning from its past mistakes but seemed instead to be prone to more and more damaging errors and omissions.

Common problems were: (1) a lack of proper coordination among UN agencies including, in some cases, divided responsibility for initiating the humanitarian mine action programme in a country; (2) failures to consult all stakeholders when developing programme plans and (in some cases) to develop a consensus that mine action is a humanitarian, non-partisan activity; (3) subordinating the long-term needs, including indigenous capacity development, to the short-term requirements of peace-building missions; (4) extremely unresponsive administrative procedures; (5) failure to employ expatriate experts with the skills and aptitudes needed to develop local capacities or on properly designed assignments (for example, most were in-kind serving military on six-month tours of duty and their tasks and reporting requirements often were unclear); and (6) inattention to the need for developing indigenous skills in management and in disciplines other than landmine clearance which are needed for an integrated approach (e.g. survey, community education for mine risk education, information management). Another common weakness was the failure to incorporate a broad range of socio-economic information to allow a better understanding of how landmine contamination adversely affects civilians and, hence, to set proper priorities.

The study first endorsed the views that (1) mine action is a humanitarian endeavour that is distinct from how militaries address landmine threats to their operations, and (2) an integrated approach (comprising advocacy, mine risk education, survey and marking, as well as clearance and stockpile destruction) is required. These views led directly to the strong recommendation that mine action programmes should not be subsumed into peace-keeping/peace-building missions, which typically have a short mandate and, understandably, focus narrowly on survey and clearance required to ensure the safety of the international troops and the fulfilment of their missions.

The bulk of the other recommendations related directly to the role of the UN in support of twin objectives:

- Rapid response to address the threat, which often is most acute when peace emerges and refugees return home; and
- Developing indigenous capacities as a prerequisite for a longer-term programme that is sustainable and cost-effective.

Thus the recommendations spoke to the need for the UN to augment its own capacity for capacity development. The report emphasised the need for a clear UN focal point[21] with a number of coordination functions (needs assessment and preparation of a preliminary plan; resource mobilisation; information exchange for cross-fertilisation) plus a lead role in advocacy (for a total landmine ban and on behalf of victims), but ***without responsibility*** for direct implementation of programmes, in large part because UN Secretariat administrative procedures were so cumbersome that — until these were overhauled — the only viable strategy was to circumvent them by contracting out the work to bodies which were not bound by these procedures.[22]

To ensure rapid response, the report urged the UN focal point to be proactive in (1) collecting and analysing information on the presence of landmines, (2) ensuring appropriate clauses concerning landmines are included in peace agreements, and (3) organising multi-disciplinary assessment missions to provide a basis for determining a profile for a national programme and the nature of the assistance required. To ensure an early start on the development of indigenous capacities as well as the proper coordination of international assistance efforts, the UN focal point should be proactive in the establishment of a mine action centre and the early creation of a national mine action authority.

Thus, the report advocated a more systematic process for initiating new programmes in a manner that would more likely result in the indigenous capacity development. This entailed: first, better preparedness (monitoring the use of landmines around the world); second, the early dispatch of multi-disciplinary assessment missions; third, the early preparation of a "programme profile" for an integrated programme (including mine risk education). Concerning the other side of the equation — the capacity development requirements in recipient countries — the report noted that differences in the various mine-affected countries precluded a one-size-fits-all approach, but still fleshed out common requirements for integrated national programmes. In brief, these were:

- a national mine action authority responsible for setting overall policy and good governance functions (e.g. commissioning external audits and external evaluations) which would also appoint the head of the national mine action centre (MAC); and
- a national MAC responsible for ensuring the programme adheres to the policies set by the national authority and specifically for:
  - development of an overall plan;
  - maintaining the central data base on minefields, clearance, etc.;
  - establishing a system to set priorities for survey and clearance;
  - resource mobilisation; and
  - quality control, including regulating mine action organisations.
- the national MAC should not itself undertake the operational activities such as clearance and mine risk education, etc., but instead should contract independent agencies such as national and international NGOs to perform these tasks.[23] (This was perhaps the report's most controversial recommendation.)

While noting that international NGOs and firms often began operations quicker and with less fanfare than the UN or host governments, the report made little mention of the development of indigenous organisations (NGOs, firms, etc.) to undertake operational tasks.

Capacity development since the DHA Report

A. Reforming the UN policy and architecture

The *Development of Indigenous Mine Action Capacities* report was well received and many of its recommendations were implemented to revamp the UN architecture and improve its performance vis-à-vis mine action. These changes were subsequently outlined in a new policy statement — *Mine Action and Effective Coordination: The United Nations Policy*[24] — which confirmed that UN support for mine action will:

- be guided by the fundamental humanitarian principles of neutrality, impartiality and humanity;
- take an integrated approach;
- give due attention to the issues of national ownership, sustainability and capacity-building, with the development of indigenous capacity to be incorporated at the outset and to include the abilities to (i) develop overall policy and direction, (ii) plan, coordinate, manage and sustain a programme that is accountable, cost-effective and able to address the pressing humanitarian and socio-economic impacts of contamination.

The new architecture was:

- the focal point was shifted from DHA to the Department of Peacekeeping Operations (DPKO), which created a new UN Mine Action Service (UNMAS).
- UNDP was given lead responsibility for supporting local capacity building *"…in situations where the problem of landmines is not only a*

humanitarian emergency".[25]

- To improve administrative performance, UNDP and UNMAS would contract the United Nations Office for Project Services (UNOPS) to manage the implementation of entire programmes or of key components (such as the recruitment of technical advisers and contracting of operational capabilities from NGOs and commercial). To this end, UNOPS established a specialised Mine Action Unit in early 1998.[26]
- Other UN agencies were assigned more specific roles relating to their core mandates.[27]
- An Inter-Agency Coordination Group on Mine Action, chaired by DPKO, was established to facilitate inter-agency coordination.
- A broader Steering Committee on Mine Action, also chaired by DPKO, was formed comprising the Inter-Agency Coordination Group plus key non-UN partners such as the International Committee of the Red Cross and the International Campaign to Ban Landmines (ICBL).
- A Voluntary Trust Fund for Assistance in Mine Clearance (VTF) was created to obtain contributions for the financing of (i) coordination of UN Mine action, (ii) assessment missions, (iii) the initial phases of new programmes, and (iv) bridge financing to programmes when necessary.[28]

These reforms have done much to alleviate confusion over roles and responsibilities within the UN system vis-à-vis mine action. UNMAS maintains information on landmine use and contamination (and thus is prepared to respond quickly to new requests) and is responsible for coordinating multi-disciplinary assessment missions and preparing the initial programme plan. The new policy guidelines included a model Terms of Reference for such missions, designed to define the scope of the problem and the appropriate response to address both urgent needs and, when required, the requirements for a sustainable indigenous capacity.

Concerning capacity development, missions are to obtain *"information on local capacities available and mine-action activities already initiated"* including clearance, mine risk education and victim assistance activities underway. The missions are also to collect data that could be relevant to the proposed capacity development strategy, including the status of national reconciliation, the commitment of various parties to support mine action and donor views.

Overall, these changes clearly have improved the UN system's capacity to assess requirements, then initiate and implement programmes. The need to keep mine action distinct from peace-keeping operations is well recognised. The specialised mine action units in DPKO, UNDP, UNICEF and UNOPS strengthen "institutional memory" so lessons from experience are more likely to be reflected in amendments to policies, procedures and operations.[29] The Inter-Agency Coordination Group on Mine Action appears to function effectively and in September 2001 developed a five-year strategy for UN mine action activities.[30]

B. Capacity development of core national capacities

Concerning standard elements in a programme profile, broad agreement has emerged on the advantages of having (i) mine action legislation to empower both (ii) a national authority to set overall policy and direction and (iii) a national MAC to execute that policy by performing certain core functions directly (developing strategic and annual plans for integrated programming, maintaining the central data base, regulating mine action activities, including quality assurance) while coordinating the activities of other mine action actors. In countries receiving substantial donor support, the advantages of a formal committee of donors for policy dialogue and coordination purposes is generally recognised.[31]

It appears the performance of the UN system in supporting mine action has vastly improved since the DHA report and, since 1998, the process of establishing new programmes and developing indigenous capacities has been smoother in many countries. The number of countries receiving mine action assistance from at least one of the UN agencies has continued to grow, reaching 20 in 1999 and more than 35 in 2005. At the same time, the challenges present in many of the "second decade" countries — measured in terms of the impact of the contamination on civilian populations, the degree of political stability and the existing reservoirs of local capacities — have been far more modest than in, say, Afghanistan or Angola.[32]

Finally, a number of UN-assisted programmes initiated in the first mine action decade continue to experience problems. Until the underlying political problems in a mine-affected country are more or less resolved, the eruption of renewed conflict can arrest capacity development and reverse years of survey and clearance work. But the continuing problems are also due in part to the "path dependent" nature of capacity development — once a programme starts down the wrong path, it is very difficult to turn it around (*see Box 2*).

Box 2. History matters: the political economy of mine action reform

Research into how institutions evolve over time confirms that institutions are "path-dependent" – that is, there is a broad range of options to choose among when first creating a new law or some other institution, but once the institution is established, the options for reforming it become more limited. This is because an institution creates incentives (rewards and penalties) to which individuals and organisations adapt, developing strategies for reaping the rewards and avoiding the penalties. Those benefiting most from the institution will try to defend their interests by blocking efforts to repeal or reform the source of their benefit. In international development for example, "bad" institutions which generate rewards captured by the wealthiest and most powerful are often targeted by outside agencies for radical reform, but these reforms are fiercely and often successfully stopped or watered-down, keeping the evolution of the institution pretty much in line with its historical path. For example, the senior military corps may be able to delay demobilisation following a war, even though the threat justifying a large and expensive military has disappeared.

Why is it so difficult to reform an institution that benefits a few at the expense of the many? Precisely because the benefits are enjoyed by only a few, each has a significant interest in the status quo and it is easy for the small number of beneficiaries to organise for the protection of their common interest. Conversely, the costs (which may be large in total) are spread across society whose individual members each bear but a small proportion and may not even be aware of the burden. For example, many of the military costs may be financed by borrowing or "off budget" by companies owned by the army that are granted, say, timber concessions, so the burden is not even apparent in today's taxes. Instead, the burden is shifted to the future for debt repayment or projects to restore the environment. So, the costs may be spread over millions of citizens, each of whom cannot readily identify what their share is. It is not easy to organise millions of people who may not even be aware how, or how much, a proposed reform will benefit them. Therefore, the few who reap great benefit from the status quo can readily organise to block a reform that would help the unorganised millions.

The same phenomenon exists with respect to organisations. At least few people benefit a great deal from the organisation, even though it may be dysfunctional or obsolete. They will fight vigorously any efforts to reform or eliminate the organisation. For example, most of the early mine action programmes started on the wrong foot, and both the strategies and the organisations created to implement those strategies had to be reformed. The necessary changes took years to put in effect except for Afghanistan, where the initial effort to train "village deminers" was quickly seen as a failure. But no new organisations had yet been established, and there was no a recognised government with which to deal. In the unusual case of Afghanistan, there was no small group that received large benefits from the initial strategy and that would organise to defend the status quo.

Consider Bosnia. The Dayton Agreement in 1995 established an overall "State" government plus two "entities" — one dominated by Bosnian Serbs and the other a federation of Bosnian Muslims and Bosnian Croats, itself divided into 10 cantons. The antipathy among the leaders of the rival ethnic populations was such that none was content to share any real power with the others. The Constitution left the overall State government virtually powerless, with few of the authorities that one associates with a sovereign country,[33] while the Federation government had little real authority over the cantons, most of which were fiefdoms of either Bosnian Muslims or Croats. Above this Kafkaesque constitution, the international community installed a High Representative with executive authority, turning the country into a quasi-protectorate. However, the High Representative lacked authority over one key group of actors — the members of the international community that appointed him.

Unlike a coalition of the willing, this community was unwilling to coalesce around any coherent strategy for mine action (or for much else). The UN attempted to create a central MAC, but the World Bank created separate project implementation units in the two entities. The Bank and the US State Department decided on a clearance strategy centred on competitive tenders for commercial firms, while the UN tried to build clearance capacity within the MAC; UNHCR mobilised its own teams; Norway and some other donors supported international NGOs; and the European Union (belatedly, after finding the hundreds of deminers it had trained had no organisation to employ them) opted for the establishment of explosive ordnance disposal (EOD) and mine clearance capacities within the civil protection corps of both entities.

The US Defense Department launched a programme which, incredibly given the situation and seemingly at odds with stated US policy on the matter, featured separate initiatives to train and equip the three distinct militaries (Bosnian Muslim, Serb and Croat) for demining. Meanwhile, the international community repeatedly pressed Bosnian authorities to assume responsibility for mine action in the country. A Demining Commission was duly appointed but, in the eyes of some observers, exerted its authority largely by funnelling donor funds to favoured clearance companies — a perception that led to the High Representative's dismissal of the Commissioners in October 2000.[34]

Some progress has been achieved since then, albeit at a distressingly glacial pace given the extent of the contamination problem. A new Demining Commission was appointed in 2001 and, with the enactment of a Demining Law in 2002, the central MAC finally was given a degree of authority over the entity MACs. In 2003, a strategic plan was prepared, although four distinct annual workplans must still be prepared (one each for the two entities, one for the "inter-entity" boundary line and one for the District Brcko, which is being directly administered by the Office of the High Representative).

Clearance costs seem to be reasonably under control, with the Slovenian International Trust Fund for Demining and Mine Victims Assistance in charge of the competitive tendering process, which has dampened at least the more lurid claims of corruption. Cost control is fostered by excess capacity: measured in terms of registered organisations, qualified deminers or amounts of demining equipment, prevailing funding levels employ only about one-third the capacity at hand.

Controlling operating costs in this manner, however, comes at the price of having tens of millions of dollars in training and equipment investments lying idle. In short, major donors were separately engaged in micro management and achieved micro capacity development successes: but on the macro level the national programme floundered for want of adequate central institutions. One result has been significant over-capacity and excessive expense.

C. Capacity development for indigenous NGOs[35]

As discussed earlier, UNOCHA in Afghanistan encouraged the formation of local NGOs[36] from the very early days of mine action and this has widely been viewed as a success. Surprisingly, there have been only modest attempts at replicating this approach. Table 2 lists the 13 local demining NGOs identified in three countries with large and long-standing mine action programmes. Afghanistan still accounts for almost half the total and no local demining NGO was registered in either Mozambique or Bosnia until 1998, nine years after the first Afghan NGOs had been formed.[37]

The local mine action NGOs in Afghanistan are, for the most part, robust. Collectively they receive the bulk of the funding for mine action, most of which was channelled via UNOCHA until 2002 (and via UNMAS since), and clearance costs in Afghanistan compare very favourably to those achieved by most other large programmes. In addition, and in spite of decidedly lukewarm support from UNOCHA, some of these NGOs have started to branch out into other development activities within Afghanistan[38] or by competing for mine action contracts internationally.[39]

Neither of the local NGOs in Mozambique was assisted with its capacity development and neither receives direct donor funding (in fact, less than two per cent of mine action funding to that country has been directed to either local NGOs or local firms). Still, one NGO has had regular success competing for modest contracts issued by the mine action programme or by construction companies. The second had been, to 2002, less successful but was managing to survive.

In BiH, the first local mine action NGO, APM (*Akcija Protiv Mina* — Action against Mines) had been created in 1998 with the assistance of Handicap International (HI). Unlike the other demining NGOs, APM adopted a community focus and undertook any demining activity (survey, marking, EOD, clearance, mine risk education) required to render the target community (usually, groups of returning refugees) secure and sustainable. As such, it attempted to raise donations for the organisation's overall budget rather than taking contracts to clear a certain area for an agreed price per square metre. It has received significant funding from donors including Austria, Canada (the principal donor), Denmark, France, Germany, Ireland and Switzerland, and, also from UNICEF and the Open Society Fund.

In spite of such extensive support, APM was close to moribund by the end of 2002, in large part because its governance structure followed Yugoslavia's traditional "self-managed" enterprise approach. The board of directors is composed entirely of employees who repeatedly blocked attempts by the programme manager and HI to introduce cost-cutting measures to make the organisation financially viable. In other words, the NGO was captured by its employees who ran it in part to maintain their incomes.[40]

For some time APM had considerable flexibility to operate in this manner because its community-focus approach was not readily summarised by easily monitored indicators (such as cost per square metre of land cleared) so donors had difficulty monitoring performance and kept sending good money after bad.[41] The case of APM neatly encapsulates the difficulties that can arise in any but the most straightforward capacity development endeavour and points strongly to donor incapacity for capacity development.

Three other local NGOs (Bosnian Muslim, Serb and Croat) were established in 1999 with the encouragement of the then Demining Commissioners and the US State Department, which provided start-up demining equipment and vehicles and earmarked funding for them via the International Trust Fund for Demining and Mine Victms Assistance (ITF). Although two of these "US" local NGOs experienced difficulties related to their leadership,[42] all three were still operating at the end of 2002 and had track records in terms of clearance costs and quality that exceeded those of local and international demining firms in Bosnia.[43]

Table 2. Local NGOs involved with survey and/or clearance and/or quality assurance/control

	Pre-existing	Own initiative	International NGO initiative (*see notes*)	UN initiative	Other (see notes)
Afghanistan (6 NGOs = 46% of the total)	AREA			ATC (1989) MCPA (1989) OMAR (1989) DAFA (1990) MDC (1994)	
Mozambique (2 NGOs = 23%)		AfroVita (1997) Necochaminas (1997)			
Bosnia (5 NGOs = 38%)	UG ZOM (2000)		APM (1998)		BH Demining (1999) Pro Vita (1999) STOP Mines (1999)
Totals (13 NGOs)	**1 (8%)**	**3 (23%)**	**1 (8%)**	**5 (38%)**	**3 (23%)**

Notes: Information drawn from GICHD (2004a).
APM (*Akcija Protiv Mina*) was established under the umbrella of a Handicap International programme. As of late 2002, it was in crisis and may since have stopped operations.
MDC (Mine Dog Centre) was encouraged to establish as an Afghan NGO, but assumed responsibility for the assets and activities of RONCO,, which began the dog programme in 1989 under an US Department of State contract.
BH Demining, Pro Vita, and STOP Mines were encouraged to form by the BiH Demining Commission and the US Department of State.
MCIDC was created in July 2001 as the Canadian International Demining Centre in Mozambique (CIDC, hence MCIDC). It did not have legal status as a Mozambican organisation at the time of the study, but was considered informally to be “local”.
Mozambique has announced plans to convert ADP (Accelerated Demining Programme) into a local NGO, but this had not been done by the time of the study.

The latest Bosnian demining NGO — UG ZOM— was established in 2000 by a number of decommissioned military engineers. It has not received any funding for capacity development but has been successful in winning a steadily increasing number of contracts and sub-contracts and appears to be a capable organisation.

In both Bosnia and Mozambique, there are questions whether the local demining NGOs are simply companies in disguise, seeking to benefit from simpler start-up procedures, laxer government regulation, tax incentives and the preference by some donors to provide grants to NGOs rather than profit-seeking enterprises. It does appear that few if any of the local organisations that were studied conform to the "classic" definition of an NGO (i.e. with public good or social justice as the principal motive behind its creation and operations). However, few if any of them adhere to the classic definition of a profit-maximising business: rather, they appear to be somewhere in the middle and seek to create good jobs in the midst of economies suffering from high unemployment.[44]

Perhaps the most surprising fact apparent from Table 2 is that international mine action NGOs have supported the creation of only one local NGO[45] in the countries that were studied — this in spite of the policy pronouncements of most of the international NGO community. For example, "The Bad Honef Framework" adopted by the ICBL states:

> *"mine affected people and communities have the right to shape their own lives and … the implementation of the humanitarian action … to promote autonomy rather than creating new dependencies is crucial."*[46]
>
> *"To correspond as best as possible with the needs and aspirations of affected communities, local institutions should be supported both in establishing themselves as well as in their work (capacity ehancement)."* [47]

Further, the joint Statement of Principles for Handicap International, Mines Advisory Group and Norwegian People's Aid includes as a core principle *"the need to support the principle of transfer of competence to the affected communities"*.

This is not to say that international mine action NGOs have been bystanders when it comes to indigenous capacity development. They have provided basic training in mine action skills for local personnel who then worked within a programme usually managed by expatriate staff fielded by the international NGO. They have been important sources of innovation in mine action and have often served as conduits for replicating innovations (such as the use of explosives detection dogs and the use of integrated demining techniques) across programmes. In both cases, this creates the opportunity to develop "new and improved" local capacities.

They have also worked as a contractor to a donor or the UN, to develop capacities within a national programme (including its MAC), usually by fielding technical advisers. Finally, they often have worked through existing local NGOs to provide MRE, funding, materials and advice. But they appear to have done little in the way of facilitating the establishment of new local NGOs which would eventually assume responsibility for the management of mine action programmes, particularly in the field of mine survey and clearance. Why?

There appear to be a number of interrelated reasons for this apparent failure of international NGOs to "walk the talk". First, as the APM case demonstrates, the creation of sustainable local organisations is a far more difficult task than capacity development at the individual level. It is also high- risk, as there are numerous factors emerging from higher levels (dysfunctional task networks, unfamiliar social norms, poor legislation and regulation) that can constrain or even reverse hard-won progress. Typically, international NGOs have little leverage to make local governments institute the requisite reforms in matters such as not-for-profit law.[48]

The creation of sustainable local organisations is particularly difficult during humanitarian emergencies because: (i) the urgency of the human needs is inconsistent with flexible, open-ended approaches required for capacity development; (ii) donors want their humanitarian aid to go directly to the people at risk and not be diverted to "luxuries" such as local capacity development; and (iii) the humanitarian aid tap quickly gushes forth and just as suddenly runs dry — the initial flood of aid will overwhelm rather than enhance the capacity of most local NGOs and any that survive may be unable to downsize to a sustainable level during the ensuing drought once the humanitarian crisis subsides.[49]

Finally, there are the incentives facing international mine action NGOs. Mine action is the *raison d'être* for some of the major demining NGOs and an important programming area for others. While most of these organisations support the principle of local ownership and capacity development, in practice the emergence of capable local demining NGOs could jeopardise the survival of the international NGOs. Even when mine clearance is not the principal activity for an NGO, vagaries in its funding may set up strong disincentives for establishing capable local counterpart organisations.

D. Capacity development of local demining companies[50]

While some mine-affected countries have actively promoted the emergence of publicly-owned local demining firms,[51] there have been few explicit efforts to develop capacities in privately-owned demining firms. Again, Bosnia offers the greatest number of examples. In 1997, RONCO assisted with the formation of three mine clearance firms (again, one each owned by Bosnian Muslims, Serbs and Croats), using personnel that it had earlier trained and directly managed on a contract with the US State Department.[52] These firms first served as joint venture partners or sub-contractors with RONCO and other international firms bidding on clearance tenders issued through the World Bank's Emergency Landmine Project.[53] Eventually, they were able to meet the pre-qualification requirements (experience and financial) and could bid for contracts in their own right.

Since then, at least nine other local firms have entered the mine clearance market,[54] only one of which appears to have ceased operations. Few if any of these received any special capacity development assistance. Rather, they benefited from the vast surplus of deminers trained under various donor initiatives, while many have obtained other clearance assets (explosives detection dogs, equipment, vehicles) brought into the country by international firms that subsequently left the market, or have constructed their own mechanical clearance vehicles from surplus army equipment.

In addition, there are active rental markets for mine clearance assets, so firms bid on contracts and, should they win, rent the necessary dogs, equipment and, in some cases, manual demining teams from firms that have not won bids. Many of the local firms manage other activities such as protection services. In short, the existence of market demand in the form of contracts issued on a competitive basis, coupled with ready access to specialised mine action assets and the fact that demining can readily be combined with other business lines, has induced local entrepreneurs to establish demining firms.

The pattern has been similar in Mozambique, with the main difference that many of the local companies were formed by foreigners with permanent residency status or through joint ventures with foreign firms operating in the country. Unsurprisingly, the foreigners (individuals or firms) appear to have better access to financing and to marketing opportunities such as clearance contracts tendered by construction firms.

In brief, in countries where the legal framework allows the creation of firms and where there is significant funding allocated to landmine clearance, market incentives provide sufficient inducement for entrepreneurs to establish capable local firms for such things as mine clearance and quality inspections. Where the competitive pressure is strong, these firms will seek market niches and secondary rental markets will develop for factors of production (manual demining teams, mechanical devices, dog teams, etc.) allowing firms to specialise and, presumably, increase their productivity.

However, the experience during at least the early days of Bosnia's programme indicates that the attempt to introduce a competitive market for mine clearance in a corrupt environment should be ***preceded*** by a concerted effort to ensure a robust regulatory regime is in place. This requires strong and accountable organisations at the heart of the mine action programme, which in turn implies the need for far better cooperation among donors than was present in Bosnia.

E. Capacity development of local militaries[55]

Support to local militaries to enhance their mine action capabilities has always been a contentious issue, particularly in countries in, or emerging from, conflict because such assistance might also enhance a military's capacity to engage in conflict. For example, the UN policy guidelines issued in 1998 stated that *"training and support for mine action will not, in principle, be provided to the militaries of mine-contaminated countries."*

However, local militaries may represent a very significant capacity that is potentially available for mine action and, where a military is reasonably professional and under the control of recognised authorities who are not faced with ongoing or latent conflict, it is natural to at least consider their use in addressing a country's contamination. A decision to do so may also elicit additional international support in the form of military-to-military assistance for a country's mine action programme. Indeed, mine clearance by the local military, supported by training and equipment from foreign militaries, has been a reasonably successful strategy in countries such as Nicaragua, Rwanda, Thailand and Yemen.[56]

In the light of these considerations and successful experiences, the UN soon adopted a more pragmatic policy governing its support for military involvement in mine action, which will now be considered should the recipient government request it and where such support:

- does not compromise the humanitarian principles of neutrality and impartiality;
- is not provided to militaries involved in open or latent conflicts;
- is only provided where the mine action programme — and the military's activities within that programme — is under the control of civilian authorities and is conducted in accordance with IMAS.[57]

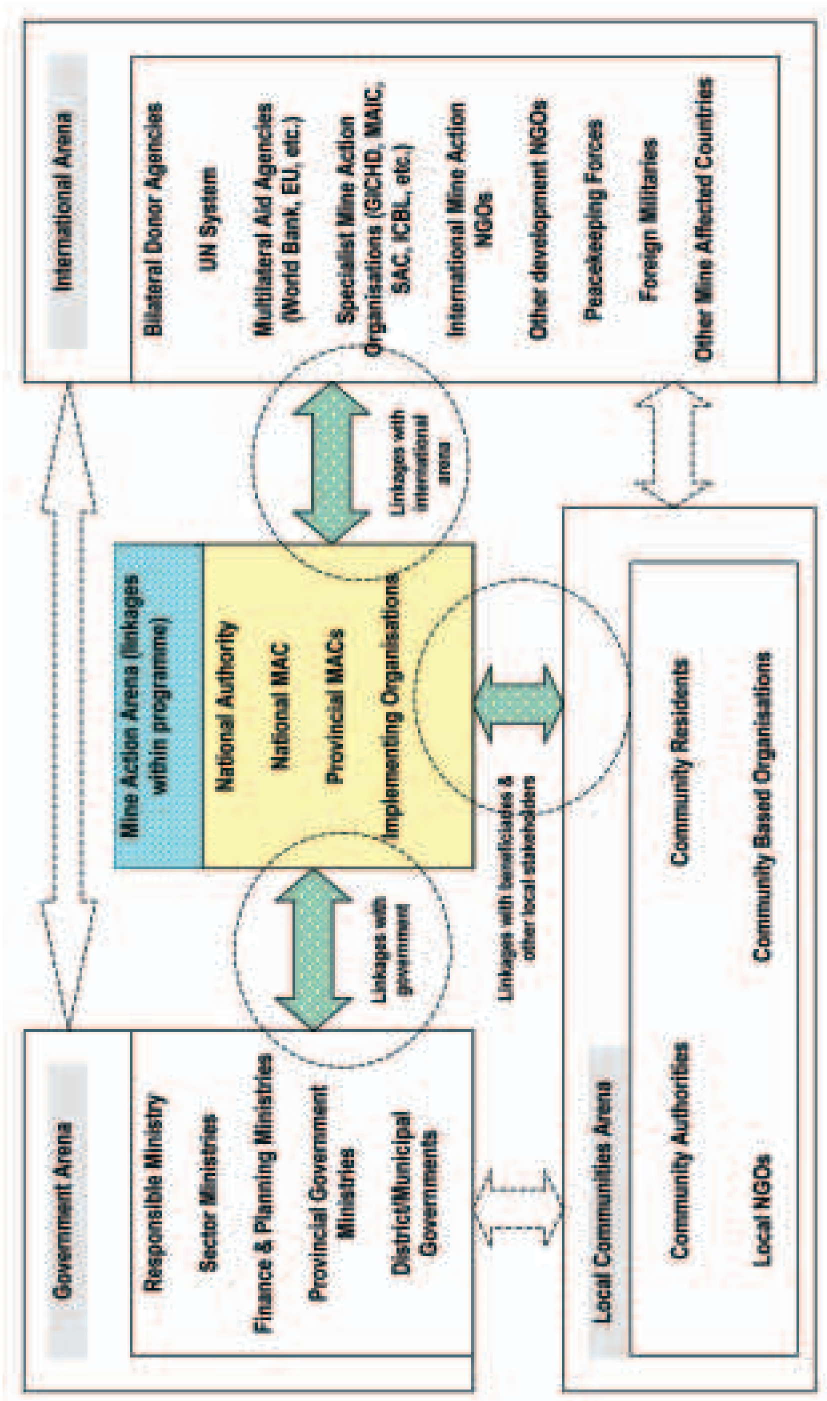
When the recipient military already is well led and reasonably disciplined, training and equipment provided by foreign militaries (with the US being most active in this area) has been effective in enhancing their capacities for mine action. However, outside militaries have been far less successful in fostering safe and effective mine clearance where the indigenous military is suffering from poor leadership, low morale and high turnover, such as often is the case during accelerated demobilisation programmes or in countries where the economy has been shattered by warfare and the government cannot justify or pay for armed forces which are both large and well equipped.[58] This is because, until recent times, foreign militaries had done comparatively little to develop their capacities for capacity development in fields outside their core mandates (traditional military operations and, in some countries, peace-keeping and peace-building). A number of donor countries have, however, begun new initiatives to better prepare their own forces for non-traditional roles in mine action[59] and may be more effective at sustainable capacity development in the future.

Assessment and current frontiers

The effort to foster indigenous mine action capacities in developing countries and economies in transition is very much a glass half-empty/half-full story. International assistance generally has succeeded in developing the capacities of individuals for the front-line tasks relating to mine clearance, survey, quality assurance, medical support of clearance operations, MRE and victim assistance. In most cases where the contamination is likely to require a sustained effort, indigenous capacity for continuing these training programmes has also been developed. These achievements provide benefits in particular to the successful trainees (at least those obtaining employment).

Where the incentives are right, some of the more entrepreneurial of these individuals will go on to establish local organisations (even though, in competitive environments, the unlucky and incapable will cease operations). In short, the transfer of technical skills to individuals is fairly easily accomplished and the problems that have occurred have in the main stemmed from coordination failures among the donors and with the government. In the case of Angola, for example, this led to an inordinate delay in mounting the training programmes; in Bosnia's case, donor competition led to grossly excessive investment in basic capacity development activities such as training and equipping people for manual demining. A further concern is that sometimes a notable lack of political will to address the issue exists within the

Figure 2. The architecture of mine action: actors, arenas and linkages



government of an affected country.

The development of individual capacities, together with the provision of equipment, funding and the like, is also a boon to existing organisations that have established capacities and can absorb new responsibilities when assisted appropriately. However, capacity development of the type needed to establish new organisations or to improve the management cadres and systems of poorly performing organisations has been much more hit-and-miss. In the first decade, the failures at this level of capacity development outweighed the successes, in part because: (i) short-term emergency thinking dominated, (ii) no successful models existed in the new field of mine action, and (iii) most of the early programmes began in the difficult situations of complex emergencies and failed states.

More fundamentally, donors and the UN organisations could not muster the extra individual and collective capacities for capacity development required in such trying circumstances. After the excellent *Development of Indigenous Capacities* study, the UN addressed many of its shortcomings, most fundamentally by establishing the coordination structures required to learn from experience and then to apply these lessons. There is better understanding of the essential components of the architecture of a national programme — comprising both organisations (national authority, MAC, implementing partner) and institutions (mine action legislation, national standards based on IMAS, quality assurance regime, etc.) — and the process needed to put that architecture in place (preparedness, early assessment mission which considers existing capacities and capacity development requirements as well as the nature and scope of the contamination problem and the political landscape, LISs).

Of course, such understandings are not sufficient conditions for success in capacity development, particularly in failed States and when the political landscape of the recipient country remains unsettled. But they do provide points of underlying agreement that donors, when they are willing, can build upon to mobilise their collective capacities for capacity development in a more coherent fashion.[60]

Enhanced donor coordination will also be necessary in one of the frontier issues for capacity development in mine action; the transition of mine action programmes from donor dependence to sustained financing by the local government. This is likely to involve downsizing of most programmes, both to match the government's fiscal capacity and in recognition that the most pressing contamination priorities will have been addressed in many cases, leaving a "residual" contamination problem (a state of affairs that was reached in Kosovo following a short but intense clearance programme). Ideally, the transition should not be abrupt, but the experience from other humanitarian and development sectors that have gone out of fashion or "off the boil" suggests that a dignified disengagement of donors is more likely to be the exception than the rule.

The need for better coordination within the donor arena is also one of many frontier issues concerning capacity development of networks, which is needed to ensure that a group of otherwise capable organisations works effectively in concert. There is a general awareness of the institutions and processes required to make the organisations within a country's mine action arena function as a reasonably coherent network (donor support groups, steering committees, technical working groups for clearance, MRE, and the like, plus a national strategic plan), although of course these elements are not fully in place in all programmes and most programmes exhibit some common weaknesses, such as failure to truly integrate MRE with the survey, marking and clearance functions.

However, much less progress has been made concerning linkages between the mine action programme and other arenas, as depicted by the dashed circles in Figure 2. The links between a country programme and the international arena have already been touched upon, but it is worth noting some of the tentative steps taken to strengthen linkages between mine action and (i) a country's government arena (both national and sub-national governments), and (ii) the local communities arena.

Two interrelated issues stand out concerning links with the government arena. First is the extent of local funding for mine action, which in most countries must increase dramatically if indigenous capacity is to be sustained. To date, among mine-affected State Parties to the Anti-Personnel Mine Ban Convention, only a few countries, such as Croatia, Jordan, Nicaragua and Yemen, have been making significant financial contributions to mine action.

Second is the need to link with national, regional and sectoral planning authorities so that mine action better supports a country's development priorities. Some pilot efforts have commenced in recent years, with the most interesting ones addressing the links between mine action and sub-national governments. For example:

- In Cambodia, a follow-up project to the LIS provided assistance to four provincial land use planning authorities, allowing them to access mine action data and analyse them in combination with other spatial and non-spatial data so mine action priorities would support land use and physical development requirements.
- In Croatia, a decision support system based on multi-criteria analysis was used to assist mine action planning both at the county level and for key parastatals (electrical utility, water authority).

As yet, there has been very little by way of incorporating mine action into the national development system. In one example, an annex on demining has been added to the draft Poverty Reduction Strategy Paper (PRSP — a national development plan with a poverty focus) prepared by Bosnia and Herzegovina. However this annex presents the "sector plan" for mine action, serving to inform readers about the scope of contamination and the key points from the recent five-year mine action strategy paper. There appears to be little in the PSRP or its Demining Annex concerning how mine action should be integrated into the strategies for other sectors (such as agriculture, where the relevant chapter only mentioned landmines three times and said nothing precise about how landmine contamination constrained agricultural development) and, in turn, how mine action planners can be informed by sectoral or national development priorities.[61]

There also have been a few interesting initiatives designed to strengthen the links between a mine action programme and those in the local community arena. One example is the participatory community development approach advocated by the International Peace Research Institute, Oslo (PRIO), based on its work in Mozambique.[62] A second and more recent initiative is the pilot Task Assessment and Planning (TAP) effort being implemented by the Survey Action Center and Handicap International as an extension to Bosnia's landmine impact survey. In this, specially trained TAP surveyors conduct follow-up visits to communities that have been identified by the LIS as highly impacted. The TAP team makes a rapid assessment — in conjunction with community representatives and others — of which individual hazards affecting the community should be addressed as a priority. Such efforts are promising, but much remains to be learned about how best to work with actors in the local community arena.[63]

Endnotes

1. Cited in Browne (2002).
2. It sometimes is useful to distinguish between "task networks" (e.g. national authorities and donors developing a strategy for a sustainable mine action programme), "sectoral networks" (e.g. all the organisations supporting agricultural development), and "area-based networks"(e.g. all the development organisations active in a province).
3. More complete treatment of this analytical framework will be provided in the forthcoming report from a parallel GICHD study, which focuses on capacity development in mine action.
4. In addition, Kuwait instituted a massive programme following the Gulf war of 1991. However, its government decided to eliminate the mine threat as quickly as possible. As such, it did not seek to augment its indigenous capacity and opted for clearance by international companies. In a sense, Kuwait's vast financial resources gave the capacity to "rent" what it required from the market.
5. This and subsequent sections on Afghanistan draws on: Eaton et al., Afghanistan volume (1997), Van Ree et al. (2001), and GICHD (2004a).
6. Originally this was UNOCA — United Nations Office for the Coordination of Humanitarian and Economic Assistance Programmes relating to Afghanistan.
7. This process has only recently started.
8. This and subsequent sections on Cambodia draw on: Eaton et al., Cambodia volume (1997), and GICHD (2003a).
9. In February 1995, a Royal Decree confirmed CMAC status as an autonomous Cambodian organisation.
10. This and subsequent sections on Mozambique draw on Eaton et al., Mozambique volume (1997), Millard and Harpviken (2000), GICHD/UNDP (2001), Appendix 3, and GICHD (2004a).
11. Eaton et al., Mozambique volume (1997: 11).
12. UNDP and UNOPS did, however, do the groundwork so that commercial tenders for road clearance could go forward as soon as the Ceasefire Commission approved the plan.
13. Eaton et al., Mozambique volume (1997: 17).
14. Principally, HALO Trust and NPA. Also, Handicap International was active in mine awareness.
15. This draws on Eaton et al., Angola volume (1997), and Craib (1996).
16. It should be emphasised that the government had never approved the plan to create CMAO or any of the plans that CMAO subsequently produced.
17. This and subsequent sections on Laos draw on GICHD/2001 (2001), Appendix 2.
18. This and subsequent sections on BiH draw on Paterson, "The Case of Bosnia and Herzegovina" in *The Role of the Military in Mine Action*, GICHD (2003a); and Paterson, "The Case of Bosnia and Herzegovina" in GICHD (2005a).
19. In 1996 the UNDP established a mine action centre to assist the government to develop its own mine action centre and provide training in humanitarian demining. Within a year the merger of the two began, and the Croatian MAC (CROMAC) came into formal existence in early 1998, with the UNDP remaining in an advisory capacity.
20. This and subsequent sections on northern Iraq draw on UNOPS (2004).
21. In October 1997, prior to the publication of the report, the Secretary-General designated the Department of Peacekeeping Operations (DPKO) as the UN focal point.
22. This was, of course, the strategy adopted successfully by UNOCHA in

Afghanistan. Note that some UN agencies do not fall under the UN Secretariat and can adopt their own policies and procedures.
23. This — along with the recommendation that the UN focal point should not be involved in the direct implementation of mine action activities — is consistent with the emerging view that governments can be "reinvented" by the separation of "steering" and "rowing" functions. In other words, higher bodies should "steer" by setting policy direction, monitoring progress, and making corrective changes in course as required. These policy-making bodies should leave the "rowing" to other organisations that specialise in the necessary operational activities.
24. This was submitted by the Secretary-General to the General Assembly and "welcomed" by that body in its resolution A/53/26, adopted 17 November 1998.
25. In practice, this meant that for new programmes UNDP will take the lead in "normal situations" where there is a recognised government to deal with and there is no ongoing conflict or peace-keeping mission, but UNMAS will take the lead in situations such as Kosovo (which is not a country).
26. Among other things, this unit has developed a comprehensive manual for Mine Action Programme Managers.
27. For example, UNICEF was confirmed in the lead role for mine awareness education, and would work with UNHCR on mine awareness programmes for refugees. The World Health Organisation would take the lead within the UN family on victim assistance. The World Food Programme and the Office for the Coordination of Humanitarian Affairs were also assigned specific responsibilities.
28. The policy states that individual trust funds should be established to provide transparent, accountable and cost-effective financing mechanisms for long-term UN programmes.
29. For example, UNOPS no longer simply accepts "in-kind" contributions of military technical advisers, but instead asks the contributing country to submit a list of candidates whose qualifications are vetted before the selection is made.
30. *United Nations mine action: a strategy for 2001-05*, UN doc. A/56/448/Add.1.
31. There also appears to be a consensus among donors that the mine action centres should not become directly involved in clearance operations, but nonetheless a number of mine-affected countries continue to have clearance capabilities integrated into the centre or in a parallel parastatal organisation.
32. Although places such as Somalia, Southern Sudan and (perhaps soon) the Democratic Republic of the Congo represent as much challenge as anyone might wish.
33. Even defence falls under the entity governments and the State government has virtually no fiscal authority, depending on handouts from the entities and the international community. Meanwhile, the country has no control over its monetary policy as its Central Bank is headed by a foreigner appointed by the international community and it is forced to operate as a currency board.
34. Another casualty of the corruption scandals appears to have been any further interest by the World Bank in financing stand-alone mine action projects: the Bank has decided that it lacks a "comparative advantage" in the mine action field.
35. This section draws principally on GICHD (2005a).
36. There is some controversy whether such organisations are "true NGOs". We will not pursue the debate but interested readers can consult Fowler (1997), Chapter 2.
37. The first local demining NGOs were established about six years after the beginning of mine action in Mozambique but less than two years after mine action started in Bosnia.
38. OMAR has been particularly active in pursuing such opportunities. AREA began as a development NGO and mine action is a secondary activity for it.

39. MCPA managed the LIS in Yemen and was slated for a contract to help the UN create mine action NGOs in Iraq until visa problems prevented the assignment. Other NGOs have sent survey and clearance teams to countries such as Somalia.
40. Proper legislation can impose minimum standards of governance that could reduce — but not eliminate — the likelihood of such problems. See also Irish and Simon (1999).
41. This was in spite of the fact that Canada (the major donor) had funded a long-term Canadian technical adviser. The individual had a military background and seems to have focussed mainly on safety and quality control, oblivious perhaps that the "business" side of the operations was seriously flawed. The crisis for APM only came when HI — which had been the conduit of donor funding — refused to renew its relationship and stopped sending the donor money.
42. In one case, the executive director had been implicated in the scandal that led to the dismissal of the Demining Commissioners; in the other, the executive director had died in 2002.
43. The cost performance is due in part to the fact that they received equipment donations.
44. A number of the local demining firms appear to have much the same motivation.
45. A lso, that attempt was abandoned as a failure in 2002. See the chapter on Bosnia in GICHD (2004a).
46. paragraph 1.
47. paragraph 19.
48. Many local governments view local NGOs as anti-government organisations, while public sector organisations such as mine action centres often see them as potential competitors for scarce donor resources. Major donors may have some leverage in such situations but overt manipulation of the local government runs counter to the recipient ownership approaches being adopted.
49. See also Smillie (2001) for a discussion of the problems of developing local NGOs in the midst of humanitarian crises.
50. This section draws principally on GICHD (2004a).
51. For example, Croatia established MUNGOS as a state-owned enterprise.
52. These three firms also had access to rent mine clearance equipment and vehicles from the Agency for Demining and the Removal of Mines in the Territory of BiH. This US$3 million of equipment had originally been procured by RONCO using US State Department financing and could not be donated directly to a privately-owned company or used to generate profits. Thus the Agency was established under the control of the Demining Commissioners (public servants) as a repository for the equipment. Allegations that RONCO, through the three local firms it had established, had access to this equipment at below-market rates and thus had an advantage in bidding for contracts was one of the issues that poisoned relations within the mine action and donor communities in Bosnia.
53. One of the objectives of this project was to promote the entry of demining companies — both international and national — to address the country's contamination problem.
54. There are also two firms that specialise in inspections on behalf of the Slovenian Trust Fund.
55. This section draws principally on GICHD (2003a) and OECD/DAC (1998) "*Civilian and military means of providing and supporting humanitarian assistance during conflict, comparative advantages and costs*".
56. Recurring criticisms have been that the militaries do not often use appropriate MRE methods and that they give too much weight to their own survey and clearance

requirements relative to civilian safety and broader socio-economic needs when setting priorities. In addition, there is little evidence that clearance by local militaries is less expensive than clearance by civilian organisations, even when only the incremental costs of using the military for mine clearance are considered.

57. United Nations (1999).

58. As discussed earlier, foreign militaries have also provided extensive technical assistance to mine action centres administered by the local government or by the UN, using channels such as peace-keeping missions, assignment of military engineers on an in-kind arrangement, or secondment of military personnel to fill UN positions. This assistance proved useful for establishing basic operations during the emergency response phase but far less effective in promoting sustainable capacity development because the tours of duty were too short, the military personnel could perform the technical job but lacked the skills and aptitudes to serve in an advisory capacity, and the UN programme manager or local government officials were loathe to dismiss unsuitable advisers because they had come"free" from a foreign military.

59. Included in these are the Swedish EOD and Demining Centre (SWEDEC), established in 1996 as that country's centre of excellence for humanitarian mine action, the Mine Information and Training Centre (MITC) in the UK, and the US Center of Excellence in Disaster Management and Humanitarian Assistance at Tripler Army Medical Center (which has a broader mandate that just mine action).

60. A remaining impediment here — and one that merits further study to understand how great this impediment is in practice — is the difficulty of UN agencies in formulating multi-year capacity development programmes and "selling" these to supportive donors. Instead, most funds are solicited through annual appeals and the UN agencies cannot truly make commitments for which they have not secured the funding.

61. A second example is the Integrated Mine Action Development Strategy (IMADS) intended for Mozambique. This sought to create a multi-disciplinary research and policy unit at the MAC which would link with development planning authorities to better align mine action with the country's socio-economic requirements. (See GICHD/UNDP (2001),Box 8, p. 78.) The author has not been able to learn the current status of this initiative.

62. Millard and Harpviken (2000).

63. It also needs to be emphasised that the linkages between a mine action programme and both the government arena and the local community arena have both complimentary and substitution aspects. For example, if the national government does not have the capability or desire to incorporate local concerns into its development priorities, then the mine action programme will need somehow to obtain information on local concerns directly from the mine-affected communities (or alternatively via, say, NGOs working with those communities). In this case, the link with the local communities arena serves as a substitute for the information which should be (but which is not) coming from the government. Alternatively, where local priorities are reasonably well reflected in government development plans, mine action needs only complimentary input from local actors: not so much determining the priorities but rather issues of timing, logistics, etc. The latter is a far less onerous task.

11 Is mine action making a difference ... or avoiding the question?

Ted Paterson

Summary
Mine action programmes in heavily contaminated countries will not be able to declare victory in the short- to medium-term. Therefore, they need to equip themselves adequately for the long haul. This implies something more fundamental than new tools for their tool kits: it implies learning how to learn. This ability is required if programmes are to assess their performance in terms of results that make a difference to people in mine-afflicted communities, which is necessary to maintain the support of donors and, increasingly, of host governments. Even more critically, the ability to assess performance in terms of meaningful results is necessary to improve such performance over time.

Introduction

The preceding chapters have described the evolution of mine action. This final chapter seeks to answer a broader, strategic question: has mine action really made a significant, long-term difference to the lives of the people it is trying to help? For few things in mine action cause more frustration and misunderstanding among donors, recipient governments and programme managers than the question: what results has the programme achieved? Study after study has decried the fact that, while there are abundant data detailing the number of landmines destroyed, the area of land cleared and the number of people receiving mine risk education, there are little data allowing an assessment of whether these achievements have enhanced the well-being of people in mine-afflicted communities.[1]

This means we can assess the efficiency and safety of mine action activities — "has the job been done right?" — but we fall short when trying to assess the more difficult but ultimately more important questions that determine, "has the right job been done?" These questions are:

- **Relevance** — are the objectives set for the programme consistent with government and donor policies, and the requirements of the beneficiaries?

- **Effectiveness** — have we achieved the planned objectives and enhanced the well-being of people in mine-afflicted communities?
- **Sustainability** — will the benefits to these people and communities last?
- **Impact** — what are all the consequences, intended and unintended, for better or for worse, of our mine action?[2]

Simply put, mine action practitioners often cannot demonstrate that they are doing — or even aiming at — "the right job". This deficiency will pose ever greater problems as donors seek an accounting of the benefits generated with their funds and as host governments try to gauge what mine action (relative to other claims on the public purse) promises for their citizens and for the country's overall development.

There are numerous attempts under way to rectify this shortcoming, but for the most part these represent only partial measures — pieces of a larger puzzle. In fairness, the mine action puzzle is unusually complex. The community faces the challenges that always arise when trying to focus more tightly on results — what might be termed "garden variety" management problems. But it also faces "exotic" challenges because many mine-afflicted countries represent such difficult and rapidly changing environments.

This chapter devotes most attention to what some are terming "operational mine action"; that is, demining activities (survey, clearance, and marking) coupled with mine risk education (MRE), which together aim to reduce risks to people in mine-affected communities and to remove the constraints imposed by this contamination on the development.

Also, the focus is on those results intended to directly benefit the people in mine-affected countries rather than achievements in developing indigenous capacities for managing mine action programmes (which are covered in Chapter 9).[3] "Results" is a generic term referring to the consequences or effects of actions we have taken. As such, when we discuss the topic of results we need to think in terms of cause-and-effect chain reactions: our actions cause certain effects, which in turn cause knock-on effects, and so on. Of course, there are many different consequences arising from mine action. Some are planned while others are unanticipated; some endure while others quickly pass; some are good and others bad; and, of course, some are more important than others. To avoid complete confusion, we need to use terms in a consistent fashion *(see Box 1: The language of results).*

Box 1. The language of results

In this chapter, we will adhere so far as possible to the following terms and definitions, which have evolved in the field of "results-based management" as it has been applied in international development circles:

- **Inputs:** the financial, human, and material resources used by the programme.
- **Outputs:** the goods (e.g. demined land) and services (e.g. mine awareness training) which are directly produced by a project or programme.
- **Outcomes** (or intermediate outcomes): the short- and medium-term effects arising from people making use of the outputs delivered by a project or programme (e.g. increased food production from demined land).

- **Final outcomes** (or impacts): the long-term and sustained effects (positive and negative; intended or unintended) arising from a project or programme (e.g. enhanced well-being for rural households because of better nutrition).

Source: DAC/OECD (2002).

To avoid confusion, when referring to long-term effects we will employ the term "final outcome" rather than "impact" (which is more commonly used in the international development field) because the mine action community uses the word "impact" in a very general sense (similar to how RMB practitioners use the term "results").

In one sense, discussing the impact of mine action implies simply that we are concerned with the consequences of mine action for people in mine-afflicted communities. Therefore, a word of caution needs to be introduced. The author does not wish to imply that the vast majority of those working in mine action are not concerned with the consequences of mine action for people in mine-afflicted communities, or that most mine action programmes are not achieving results in terms of meeting the human needs of such people even when the programmes do not make these aims explicit in their lists of objectives *(see Box 2: Evaluating socio-economic achievements in Kosovo).* Rather, the chapter explores the degree to which the performance of mine action programmes can be assessed in terms of who has benefited, in what way, and by how much?

The evidence suggests that — in spite of the widespread concern for the well-being of people in mine-affected communities — we remain for the most part unable to assess mine action performance in this fashion. Why?

Box 2. Evaluating socio-economic achievements in Kosovo

In late 2001 an evaluation was conducted of the UN Mine Action Programme in Kosovo.[a] The evaluators state the programme had not collected sufficient data to analyse socio-economic achievements. At the same time, the proliferation of funding agreements coupled with inadequate information-sharing among donors meant that no-one had a complete record of mine action costs. Therefore, no comparison of costs and benefits could be made as there was no proper accounting of costs and there was no estimate of benefits at all. However, the report was, in the main, laudatory because the programme succeeded in achieving its main objectives of clearing virtually all the identified hazards and transferring responsibility for dealing with the residual threat to a local organisation.

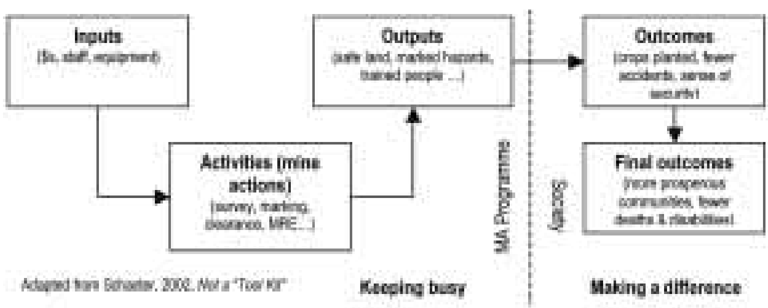
About the same time, an "impact assessment" was conducted of the Danish Church Aid mine action programme in Kosovo.[b] The assessment team made an excellent effort to "visualise" the "*varied and complex range of social and economic benefits*" arising from the programme, and to generate a rough count of the numbers of people who benefited directly and indirectly from various types of mine action. The team's assessment was that substantial socio-economic benefits did accrue to a large number of beneficiaries. But again, they were unable to arrive at a clear picture of the cost-effectiveness or cost-benefit of the programme because of the "*absence of critical data*".

a) The Praxis Group (2002); b) Horwood et al. (2001).

The immediate reason for this failing seems clear. Plans for mine action programmes often do not clearly specify the results they are designed to achieve.[4] Where the intended results are provided, the list rarely is clear concerning the target beneficiaries and the types of benefits we hope will accrue to them. When plans do not specify these things as performance targets[5] to be achieved, no provision is made during the implementation of the programme to collect data concerning who has benefited and in what manner. In the end, little can be said about whether the programme has delivered the expected benefits to the intended beneficiaries.

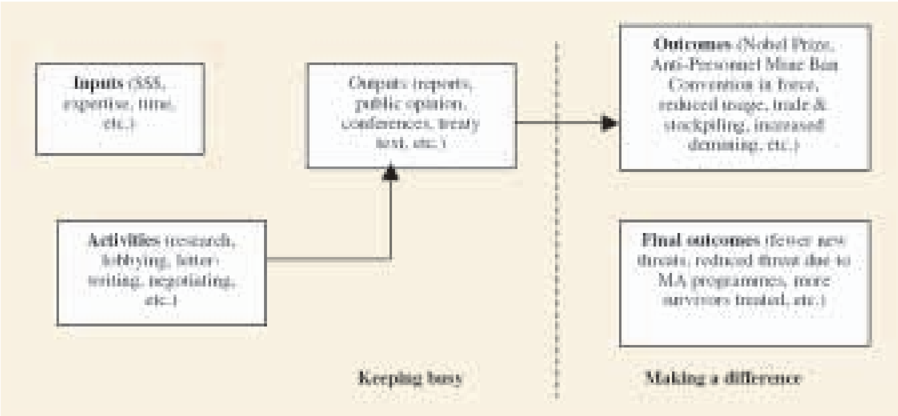
Conversely, most mine action programmes can say a great deal about how they have used their resources to clear landmines, train citizens, and so on — in the apt phrase of one programme management expert, how they are "keeping busy". But few programmes can say who has benefited, in what manner, and by how much — on how they are "making a difference" to people in mine-affected communities? This distinction between keeping busy and making a difference is central to a results-based perspective, and is illustrated in both the Diagram 1 and in Box 3: *The results of the International Campaign to Ban Landmines.*

Diagram 1. The basic results-based management (RBM) perspective



Box 3. The results of the International Campaign to Ban Landmines

The international campaign emerged in the early 1990s from a number of NGO initiatives leading to the formation of the International Campaign to Ban Landmines coalition in 1992. It then gathered momentum as, first the International Committee of the Red Cross and UN agencies began advocating for a complete ban on anti-personnel mines (in 1994), and then, by 1996, agreement was reached with a number of States to push for an immediate ban. At the first Ottawa Conference in October 1996, 50 States committed to work for a total ban. At a second Ottawa Conference in December 1997, 122 nations signed the Anti-Personnel Mine Ban Convention, to come into force six months after its ratification by 40 nations, which was achieved in September 1998. By the end of November 2005, more than 144 countries had ratified the treaty, with a further handful of signatories. One study summarised the achievements quite simply: "*The campaign to ban landmines has been widely celebrated as one of the most successful examples of humanitarian advocacy.*"[a)]



The distinguishing feature of any results-based approach to management is, simply put, an overarching focus on results throughout the programming cycle, and particularly those results of the “making a difference” variety (which, in the mine action community, are usually termed socio-economic impacts). Thus:

- plans should specify as clearly as possible both the results a programme is designed to achieve and how progress toward those results will be measured;
- provisions should be made to collect the data required to monitor performance in terms of progress toward the planned results;
- periodic reports to stakeholders provide information on progress toward the intended results as well as on how funds and other resources have been used;
- evaluations should be commissioned for more thorough examinations of what results have obtained and how the programme’s design and management could be changed for better performance — achieving even better results — in the future.

In many ways, results-based management is the new religion within international development circles, and has been adopted by official donor agencies, commercial contactors and, increasingly, NGOs — including those active in humanitarian as well as development assistance *(see Box 4 on CARE).*[6]

Box 4. CARE International project standards

This set of standards, adopted by the CARE International Programme Working Group in April 2002, is an excellent outline of an RBM system for humanitarian, reconstruction and development work.

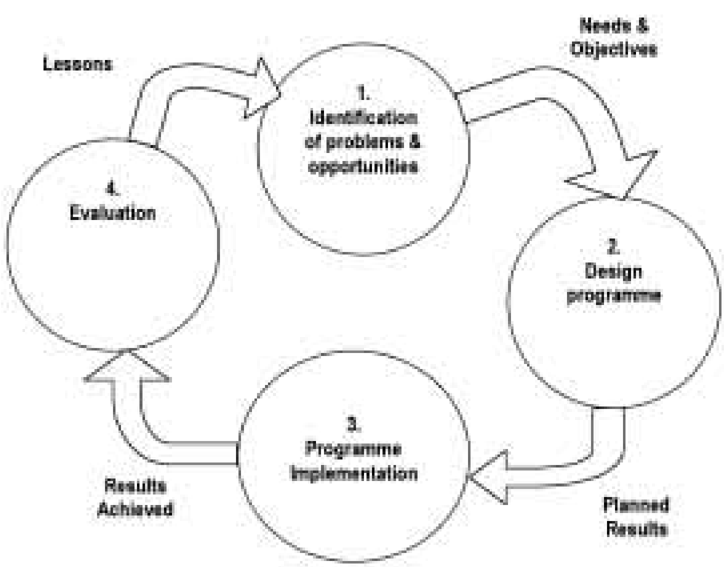
Each CARE project should:

1. Be consistent with the CARE International Vision and Mission, Programming Principles and Values.
2. Be clearly linked to a Country Office strategy and/or long term programme goals.
3. Ensure the active participation and influence of stakeholders in its analysis, design, implementation, monitoring and evaluation processes.

4. Have a design that is based on a holistic analysis of the needs and rights of the target population and the underlying causes of their conditions of poverty and social injustice. It should also examine the opportunities and risks inherent in the potential interventions.
5. Use a logical framework that explains how the project will contribute to an ultimate impact upon the lives of members of a defined target population.
6. Set a significant, yet achievable and measurable final goal.
7. Be technically, environmentally and socially appropriate. Interventions should be based upon best current practice and on an understanding of the social context and the needs, rights and responsibilities of the stakeholders.
8. Indicate the appropriateness of project costs, in light of the selected project strategies and expected outputs and outcomes.
9. Develop and implement a monitoring and evaluation plan and system based on the logical framework that ensures the collection of baseline, monitoring and final evaluation data, and anticipates how the information will be used for decision-making; with a budget that includes adequate amounts for implementing the monitoring and evaluation plan.
10. Establish a baseline for measuring change in indicators of impact and effect, by conducting a study or survey prior to implementation of project activities.
11. Use indicators that are relevant, measurable, verifiable and reliable.
12. Employ a balance of evaluation methodologies, assure an appropriate level of rigour, and adhere to recognised ethical standards.
13. Be informed by and contribute to ongoing learning within and outside CARE.

Source: CARE Design, Monitoring and Evaluation website: *www.kcenter.com/care/dme/*

Diagram 2. The programming cycle: learning from experience



The broad strategy underlying RBM is that performance will improve progressively as the programming cycle is repeated. The success of the strategy depends on how well we can apply the lessons of experience. Therefore, learning is a central theme in results-based management.

This desire to improve performance in the "making a difference to people" sense lies at the core of any results-based or performance management system.[7] Among mine action practitioners however, there remains controversy over whether their performance should be assessed in terms of socio-economic benefits, and the next section touches on this controversy.

Mine-centred or people-centred mine action?[8]

> *"It is not for you to complete the work, but neither are you free to withdraw from it."*[9]

The first decade: 1989-1998

Large mine action programmes were first established in countries in the midst of, or just emerging from, anarchic "complex emergencies".[10] The international community responded (sometimes with a distinct lack of enthusiasm or success) with a combination of humanitarian assistance and peace-keeping missions. Mine action programmes often served a dual role, being viewed both as a necessary element for the peace-keeping mission to carry out its mandate and as a humanitarian operation, clearing routes and resettlement areas for refugees and to enable the delivery of humanitarian assistance.

In these emergencies, military engineers were thrown into the fray to deal with the landmine contamination. Where peace-keeping missions were fielded the focus for mine action centred on support to the operations of the international forces. When mine action did address humanitarian concerns, the people involved understood the problem principally in terms of numbers of landmines and contaminated areas. They accorded priority to the most heavily mined areas rather than investigating which hazards posed the greatest danger to people and their livelihoods.[11] Because not all hazards could be cleared in the short-term, basic mine awareness training was provided to at-risk civilians and aid workers.

The first major multi-country assessment of mine action provided a withering critique of those programmes with a dual mandate, as the peace-keeping contingent exercised authority over mine action (Angola, Cambodia, and Mozambique) and humanitarian aims were accorded secondary priority.[12] Instead of seeing mines as a military problem with humanitarian overtones, the report advocated a view centred firmly on the well-being of the people affected by landmine contamination: *"Mines are first and foremost a humanitarian concern …* [which] *… needs to be redefined and understood in terms of reducing the vulnerability of people who are directly affected."*

For shorthand, we will term this the **people-centred perspective**, defined as a view in which the aim of mine action is the enhancement of the well-being of people in mine-afflicted communities. With such a perspective, the clearance of hazards and the destruction of landmines are seen simply as means to an end: ***not as ends in themselves***.

Making progress? Mine action since 1998

There has been far greater attention accorded to the socio-economic implications of landmine contamination since the publication of the DHA report.[13] The UN adopted a people-centred perspective in its landmine policy published in 1998, stating…*"It is not so much about mines as it is about people and their interactions with a mine-infested environment."*[14] At about the same time, a group of international NGOs active in mine action endorsed *The Bad Honnef Guidelines.*[15] They also advocated a people-centred focus in which *"The needs and aspirations of people affected by mines are the starting point"*.

In the aftermath of these policy pronouncements, a flurry of studies was launched to flesh-out the concept of socio-economic impact as applied to landmine contamination.

- In late 1997 the Mine Action Programme for Afghanistan initiated the Socio-Economic Impact Study (SEIS) to generate *"a clear and precise picture of the mine problem confronting civilians"*.[16]
- In 1999, the Geneva International Centre for Mine Action (GICHD) began its multi-country study on socio-economic approaches to Mine Action for the UNDP.[17]
- About the same time, the International Peace Research Institute, Oslo (PRIO) started its Assistance to Mine-Affected Communities (AMAC) project in Mozambique, which has resulted in a series of publications on community-level impacts.[18]

In 2000-2001 there was a spate of publications with a somewhat narrower focus, examining the contribution mine action was making to economic production (as opposed to the broader range of social and economic benefits). The principal messages were that, when viewed in purely economic terms, demining has not been a bad investment (and sometimes yielded extremely high economic returns) so long as it was carefully targeted *(see Box 5: Is mine action a good investment?).*

These studies largely focused on an analysis of the benefits accruing from mine action (principally demining) that had already been conducted. The research strategy was to gauge what had worked and what had not, both to generate preliminary performance assessments of programmes in terms of socio-economic results and to generate recommendations intended to improve such performance through better targeting and better work processes (e.g. more collaboration with community authorities and development agencies).

Another initiative launched in 1999 had a different, albeit complementary objective. The Survey Action Centre, working with the Afghan Mine Clearance Planning Agency (MCPA), conducted the first landmine impact survey (LIS) in Yemen. An LIS is a ***needs assessment*** rather than a ***performance assessment***: that is, it attempts to document the scope and pattern of the contamination problem rather than to assess how well mine action programmes have been resolving the problems experienced by civilians in mine-afflicted communities. Its purpose is to *"facilitate the prioritizing of human, material and financial resources* *supporting humanitarian mine action at the national, regional, and global level."* [19, 20] However, it also provides a "baseline" against which future performance can be assessed.

Box 5. Is mine action a good investment?
Cost-benefit studies of demining

In 2000-2001, a spate of studies were published on the economic returns of landmine clearance.[a)] The general methodology is straightforward:[b)] cost-benefit case studies of representative types of land and structures are done and an estimate for the entire programme is generated by extrapolating the findings. In general, the results have been encouraging. In Afghanistan (the most thorough study), for example, the economic benefit of the land cleared by the mine action programme in 1999 was estimated to be about US$46 million dollars against a cost of about US$23 million. Thus an average of US$2 in benefits was generated for each US$1 in costs. (There were additional benefits stemming from the reduction in deaths and injuries, but quantifying such benefits is a dodgy exercise.)

The very positive results estimated for clearance in Afghanistan stem from the fact that huge amounts of valuable land had been mined (e.g. urban areas, irrigation works, roads). Also, most agricultural crops are produced on the small proportion of the total land close to water sources. Other countries have different patterns of contamination and economic activity.

In Bosnia, for example, many residential areas were mined or contaminated with UXO but there are relatively few areas of intensive agriculture and the agricultural economy has not recovered much since the war. Therefore, the net benefits (i.e. after clearance costs) in urban areas are very high, but those from clearance of agricultural land are often negative.

In Laos, urban areas are for the most part free of UXO contamination and there are three broad types of rice cultivation (the preponderant form of agriculture). Clearance of irrigated "dry season" rice land and rain-fed "wet season" rice land is warranted on economic grounds alone, while clearance of upland rice growing areas is not.

There also are some countries where the costs of clearance exceed the economic benefits for the bulk of the contaminated land. For example, Mozambique and Angola are sparsely populated and most agriculture has low productivity. In many areas there is ample land available, so farmers are not forced to cultivate land they suspect. In such countries, widespread clearance of rainfed agricultural land is not warranted on purely economic grounds, but smaller, tightly targeted clearance of, say, water sites and irrigated crop land might well be justified on economic grounds.

a) The first of these (Harris, 2000) was seriously flawed and not to be trusted (see Paterson, 2001). The others were GICHD/UNDP (2001), Gildestad (2001), and GICHD (2001). Note that the study by Gildestad was subsequently revised (Byrd and Gildestad, 2001). In the revised version, some of the estimated benefits were reduced, principally because of adjustments in the data for cropping patterns. However, the conclusions were not significantly affected by the revisions. The author has used the initial report because it contained slightly more detail allowing a decomposition of costs and benefits.

b) Further detail is given in GICHD/UNDP (2001, Chapter 3).

The picture that emerged by mid-2001 was broadly positive. Landmine clearance seemed to be delivering results in terms of socio-economic benefits, and the scale of these benefits appeared to outweigh the high costs assuming clearance was carefully targeted. The LIS also provided a better method for conducting needs assessments and, hence, for targeting the most severely impacted communities. However, a number of issues remained unresolved.

First, it is far from clear how much of the gap between social scientists and mine action practitioners has been bridged by this first generation of studies. All the studies suggest that very large performance improvements could be achieved — even in the best managed programmes — with better targeting. However, few programmes have overhauled their systems for determining clearance priorities and — for those which have — it remains unclear whether better targeting has, in fact, been achieved.[21]

Achieving better results on the ground is not, of course, a simple task. Each country has unique social and economic features and each mine action programme must determine how best to gauge the varied socio-economic benefits that might accrue from clearance operations. One problem every programme must face is that there are many different types of socio-economic benefits. There is no consensus on how much weight should be given to, say, (i) economic benefits of the type highlighted in cost-benefit studies relative to (ii) the public safety concerns which feature prominently in community rankings derived from landmine impact surveys (LIS).[22]

A further complication is that most evidence concerning the socio-economic results achieved by mine action relates to clearance operations, and most of the ***quantifiable*** evidence concerns economic benefits. What of mine risk education and, more broadly, reducing the numbers of deaths and injuries from landmines and UXO?

In fact, no study has yet been able to demonstrate a correlation between any type of mine action and a reduction in the numbers of either landmine and UXO accidents or victims *(see Box 6).* For example, in the evaluation of the UNMAS Mine Action Programme in Kosovo, the consultants noted: *"It has yet to be proven in any programme, however, that mine action interventions alone cause a reduction in civilian casualties — many factors are believed to have an effect on the civilian accident rate."*[23]

Box 6. The evidence on mine action saving lives and limbs

The human toll exacted by landmines and UXO has been well documented and was the principal impetus behind the international campaign to ban landmines. But what do we know about the actual contributions made by clearance, marking and mine awareness to a reduction in the number of deaths and disabilities? Unfortunately we know very little, at least in quantitative terms. Take the numbers of deaths and injuries from landmines, which often rise after the end of a conflict as refugees return along routes and to communities that may be contaminated. The numbers of accidents then decline as people become aware of the hazardous areas. This knowledge may come from MRE or because minefields have been marked by survey teams, but more generally from seeing landmines, hearing from other community members, or because some unfortunate person or animal has detonated a mine. Mine clearance also makes a contribution to risk reduction, but in heavily contaminated countries this is modest because only a tiny portion of hazardous areas can be cleared in any one year.[a)]

Complicating the matter further, in at least some countries landmine accidents result from knowingly risky behaviour because people are driven by economic necessity.[b)] In other countries, the laying of new mines may be a factor in the number of injuries as people pursue ethnic vendettas or lay mines to protect their vacant homes, opium fields, etc. With all these factors influencing the level and trend of accidents, it is extremely difficult to isolate which factor has led to what portion of the decline in numbers. This could conceivably be accomplished with abundant data of excellent quality. Unfortunately, in most countries data on landmine accidents are incomplete and often of very poor quality.

As a result of these complications, there is not a single study that has demonstrated any statistically meaningful link between the numbers of landmine accidents and any component of mine action[c)] or mine action in general.

a) For example in Bosnia, the Landmine Monitor in 2002 reports that about 4,000 km^2 are suspected of contamination, while less than 5.5 km^2 was cleared in 2001, slightly more than one-tenth of one per cent of the suspected area (and perhaps only two per cent of the "priority 1" contaminated areas)!

b) Bottomley (2001, 2003).

c) One study for Afghanistan reported a correlation between MRE and landmine accidents (CIET, 1997). Unfortunately, it was a positive correlation, so there were more accidents in communities that had received mine awareness training! A number of people have voiced their concerns about the methodology used in the study.

A second conundrum is the ever-present tension between "top-down" planning and community priorities emerging from the "bottom-up". Where priorities are set on the basis of responses from mine-afflicted communities, it is difficult to know in advance what types of socio-economic benefits will stem from such bottom-up community choices. Therefore, it is difficult to identify indicators and design monitoring systems that adequately reflect the varied benefits which might accrue. Without such systems, data are unavailable for analysis, for reporting on the results being achieved and for learning how to achieve better results in the future.

Conversely, it is relatively easy to design monitoring systems when priorities are determined rigidly on the basis of criteria set at the top. However, it is extremely difficult for national authorities to design systems for setting priorities in a top-down fashion which adequately accommodate the varied needs of mine-afflicted communities. It is even less likely that criteria and performance indicators imposed by donors will prove to be helpful, as Rae McGrath has often stressed: *"The indicators of success set by donors rarely match exactly those of the affected community, often totally ignore the priorities of the indigenous authorities and may only consider overlapping interests in other sectors of development where those projects are funded by the same donor."* [24]

In fact, priority-setting requires some balance between top-down guidelines to provide strategic direction and the flexibility to respond to bottom-up demands. But the first generation of socio-economic studies did not really address how to work out an appropriate balance or how to devise priority-setting systems that are both practical and sufficiently flexible to accommodate community-level requirements.[25] We will return later in this chapter to the need for top-down and bottom-up balance.

Such problems reveal the gap that remains between the results which could, in theory, be achieved and those results which, in practice, mine action programmes can demonstrate they are achieving.

In fact — and in spite of the emergence of the people-centred perspective and the studies that have begun to illuminate the socio-economic dimensions of mine action — demining programmes have continued to report their performance mainly in terms of the number of devices destroyed and the areas of land surveyed and cleared, with scant information concerning how many lives have been improved, by how much, and in what manner *(see Box 7: Key developments reported by the Landmine Monitor in 2003).* In the case of MRE, the numbers of training sessions and trainees are reported, but little information is provided on the results of such training in terms of how people have benefited (e.g. enhanced sense of security, fewer casualties).

Box 7. Key developments reported by the Landmine Monitor in 2003

Each of the country reports in the Landmine Monitor Report begins with a brief summary of key developments (including what are termed "results" in this chapter). As these excerpts demonstrate, the traditional performance measures — area cleared, devices destroyed, people trained — still feature centrally and, for a number of countries, dominate the report.

Angola: … NGOs reported clearing more than 2.8 million square metres of land, surveying more than 7.8 million square metres of land, and destroying more than 5,000 mines and 13,000 UXO … 543,713 people received mine risk education in 2002…

Azerbaijan: In 2002, two national NGOs cleared 1,118,000 square metres of land, marked another 1,221,000 square metres for clearance, and identified and registered another 66,352,000 square metres … 30 mine risk education seminars were held in 12 mine-affected regions, which trained 525 medical staff.

Croatia: Destruction of Croatia's stockpile of 199,003 anti-personnel mines was completed in October 2002. In 2002, Croatia returned 60.4 square kilometres of land to the community through clearance and survey.

Laos: In 2002, 8.4 million square metres of land was cleared and 98,963 items of UXO destroyed. Mine risk education was provided in 683 villages, reaching 160,053 people.

There are, of course, good reasons for continuing to report the traditional performance measures for mine action, such as the landmines and areas cleared, and the number of people trained. First, such data remain important for assessing the efficiency of operations. Second, these data are comparatively easy to collect and does not divert scarce resources from directly productive activities. Third, this information underpins the quality control and assurance function, which in turn is essential for assessing whether operations are providing acceptable levels of safety for both civilians and mine action personnel.

Indeed, the problem lies not with the results being reported but with those which are not. What the traditional measures of mine action results fail to provide is any clear sense of how and to what degree mine action is effective in making a difference in the lives of people in mine-afflicted communities.[26] Again, many reasons have been advanced to explain why this remains the case, including:

- when a new category of endeavour emerges, such as mine action, it takes time for a community of practitioners to form and for lessons to be learned and applied. Mine action has been going through this learning process *(see Box 8)*;

Box 8. Learning how to address new development problems

Developing countries and donors are periodically confronted with new problems such as HIV/AIDS, complex emergencies or landmine contamination. It takes time to understand the true nature of the problem, then to formulate relevant objectives and devise solutions for one or two countries, and finally to learn how to adapt projects in order to replicate solutions in other countries. The nature of this evolution is depicted below.

	PROJECT TYPE			
	Experimental	**Pilot**	**Demonstration**	**Replication**
Unknowns or design problems	True nature of the problem	Known	Known	Known
	Appropriate project objectives			
	Possible alternative solutions			
	Method of implementation	Method of implementation		
	Appropriate technology	Appropriate technology		
	Required inputs or resources	Known		
	Adaptations needed for local conditions	Adaptations needed for local conditions		
	Transferability or replicability	Transferability	Replicability	
	Acceptability by local populations	Acceptability by local populations	Acceptability by local populations	
	Dissemination or delivery systems	Dissemination or delivery systems	Dissemination or delivery systems	Dissemination or delivery systems
	Not yet a concern			Large-scale production

Characteristics	
Higher	Lower
← Uncertainty and risk →	
← Political vulnerability →	
← Innovation required →	
← Addition to existing knowledge →	
← Need for creative management →	
← Need for flexibility →	
← Need for rare or specialised skills →	

(Adapted from Rondinelli, 1983, 90)

In the case of mine action, the nature of the contamination problem was poorly understood initially, many of the initial projects had unclear or conflicting objectives, and many of the proposed solutions, implementation strategies and technologies were inappropriate. For example, the simple application of military demining standards and approaches was found to be unsuitable for "humanitarian mine action".

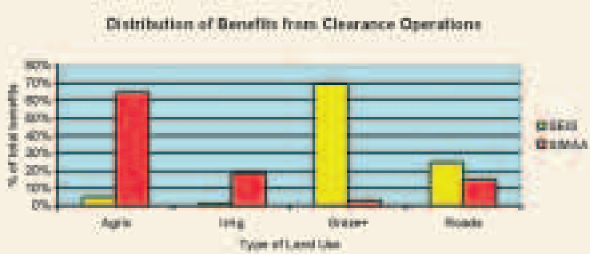
- the learning process has been inhibited as mine action programmes have been financed largely through emergency aid channels, which impose short planning horizons (usually, up to a year) and may prohibit spending on "luxuries" such as applied research to accelerate the learning process.

These points reinforce the essential role of learning how to perform well and how to improve performance over time. However, few people in the mine action community are trained in the social sciences. They do not know how to plan for or how to identify and make sense of socio-economic benefits. A comparison of two studies that attempted to quantify the economic benefits resulting from the Afghanistan clearance programme provides a concrete example of the scale of this problem. The two studies arrived at remarkably different conclusions with completely different implications relating to policies and priorities *(see Box 9: Same programme, different benefits?).*

Box 9. Same programme, different benefits?
Two studies of Afghanistan's Mine Action Programme

In late 1997, the Mine Clearance Planning Agency (MCPA) initiated the Socio-Economic Impact Study (SEIS)[a] in a first attempt to quantify the social and economic effects of both landmine contamination and clearance operations. MCPA published the final report in December 1999. This was well received, but donors had questions regarding the methodologies used to analyse the survey data and how the quantitative estimates of benefits (expressed in dollar terms) were derived. Accordingly, the World Bank engaged an international economist supported by an Afghan statistician to conduct another study (SIMAA[b]) using cost-benefit analysis.

Both studies concluded that the mine action programme was delivering substantial socio-economic benefits, but similarities ended there. The SEIS study concluded that almost 70 per cent of total benefits stemmed from livestock production (largely from grazing land), with crops produced on agricultural land accounting for less than five per cent of the benefits. The SIMAA study concluded the exact opposite was true, with the bulk of benefits coming from crop production and very little from livestock production.



Note: Graze+ = SEIS figure for "grazing areas + livestock products" (p. 3), and SIMAA data for "economic loss of livestock" (Table 8.9, p. 40 plus author's own calculations)

Obviously, the two studies carry remarkably different implications for determining clearance priorities. The impression given by the SEIS report is that clearance of grazing land is very worthwhile because of the importance of livestock production. The conclusion of the SIMAA study, using more rigorous methods for economic analysis of the data, is that clearance of grazing land is rarely warranted. In point of fact, grazing land has accounted for about 30 per cent of all land cleared in Afghanistan.

Sources: a) MCPA (1999:3); b) Bjorn Gildestad (2001), various tables & authors own calculations.
Note: The SIMAA Report was subsequently revised and issued in December 2001 as: Byrd and Gildestad, *The Socio-Economic Impact of Mine Action in Afghanistan: A Cost-Benefit Analysis* (available from the World Bank's website for its Afghanistan programme). In the revised version, some of the estimated benefits were reduced, principally because of adjustments in the data for cropping patterns. However, the conclusions were not significantly affected by the revisions.

Learning to deliver results

The crux of the issue: how much to invest in learning?

Landmine and UXO contamination creates three main problems for civilian populations:

1. the risk of an accident leading directly to the loss of life or limb;
2. contamination and suspected contamination (collectively, hazards) block access to resources that may be important to people's ***traditional*** livelihoods, making them more vulnerable to other risks (drought, disease, crop failure, and so on) or, in extreme cases, forcing them to engage in extremely risky behaviour to use the resources in spite of the hazards *(see Box 10*): *Taking risks to survive*);
3. hazards constrain investments intended to improve the ***future*** well-being of households, communities and countries.

Box 10. Taking risks to survive

In recent decades, social science researchers have devoted increased attention to the relationships between poverty and vulnerability. In brief, many households slip in and out of poverty (or, in a more pronounced form, absolute deprivation) for a variety of factors, and efforts to fight poverty should include measures to: (i) reduce the sources of vulnerability (often termed "shocks") and (ii) increase the capacities of households to cope with shocks. Such coping mechanisms are often termed "survival strategies", which can be analysed at the level of individuals, households, communities, etc.
For example, landmine hazards which block access to a resource represent a shock to any household that previously used that resource. Household survival strategies could include migration to another community, doing without the resource by using other household assets more intensively, using political

influence to get the hazard cleared, and so on. At the extreme, when access to vital resources is blocked and no alternative survival strategies are viable, households might take matters into their own hands and attempt to regain access to the resource (e.g. by clearing contamination or trying to find a path through the hazard). Undoubtedly, such a survival strategy is risky. However, it may be the least risky strategy available!

Ruth Bottomley (2003: 9-10) captures these concepts succinctly in her report on "village demining" in Cambodia:

> "*Humanitarian mine action has tended to focus on the notion of **absolute risk**, seen in terms of injuries sustained through contact with landmines … However, for many villages the risk posed by mines is only one of the many risks with which they live, which gives them little choice but to see the mine risk as relative to other risks. The risk of not being able to feed a family or to secure land can sometimes only be addressed through undertaking a high-risk activity such as mine clearance. The objective of villagers is to somehow balance the multitude of risks they face in order to survive.*"

The implication of such analysis is that mine action programmes need to do more to understand household capabilities and the various risks they face including, but not restricted to, landmine contamination.

In their efforts to address these problems, mine action managers face two principal constraints. First (in common with managers everywhere) they have a resource constraint which makes it virtually impossible to eliminate all hazards in the short- to medium-term. Second, they lack information concerning (i) where accidents are most likely to occur, (ii) how people create their livelihoods[27] and (iii) what plans are being made for future investments. In other words, mine action managers lack information on the precise nature of the three main problems that landmines create for civilians.

The resource constraint forces choices to be made, setting priorities to identify which hazards will be addressed first (and by what type of actions) and which left for later. The information constraints mean managers do not have the information required to identify the right priorities in terms of delivering the most socio-economic benefits per dollar.

This creates a fundamental dilemma: what proportion of the scarce resources available should be diverted from direct mine actions and invested in acquiring information about the nature of the problem and the way mine action can best address it? Reasonable people will have reasonable differences of opinion on this question and, of course, much depends on the actual situation prevailing in a country. For example, when the scale of the contamination is reasonably well known and manageable with the resources at hand and, at the same time, the population is in flux so the social and economic features we could observe today will change significantly over the short- to medium-term, the costs of obtaining much socio-economic data may outweigh the benefits. Data gathered today about the status of the population will have a limited "shelf-life" because the population is unsettled and, regardless, the problem can be solved before the population re-establishes a peacetime economy.

Kosovo may be as close as we will come to this situation. The extent and nature of the contamination was reasonably well known from combatants' records, and was manageable given the influx of mine action organisations and funding. Also, we knew little about Kosovo's socio-economic features.[28] More importantly, however, the conflict led to large-scale migration and widespread social and economic disruption, and it would take years before the situation settled down. Therefore, the serious hazards could be dealt with before we would learn how to incorporate detailed socio-economic considerations when setting priorities.[29] Thus, there would be little pay-off from large investments in learning about Kosovo's socio-economic features.

This example highlights the critical point that acquiring and analysing information is an investment that pays off over time; other things equal, the pay-off is higher if the contamination is greater, meaning the programme will last longer. How long will mine action programmes last? The Anti-Personnel Mine Ban Convention suggests that *"Each State Party undertakes to ensure the destruction of all anti-personnel mines under its jurisdiction or control, as soon as possible but* ***not later than ten years*** *after the entry into force of this Convention for that State Party."*[30] (emphasis added). If all the mines will be cleared within ten years, perhaps it's best to get on with demining as efficiently as possible, and not expend much on learning to deliver good results in socio-economic terms.

But this conclusion neglects some critical facts. First, the Anti-Personnel Mine Ban Convention deals only with anti-personnel landmines — but mine action programmes address a broader range of "explosive remnants of war", including anti-tank landmines and unexploded ordnance. There is a very real danger that lower priority would be (and, seemingly, has been in some countries) accorded to UXO if a programme measured its achievements solely in relation to an objective of making a country mine free, in spite of the fact that in many countries UXO cause more civilian deaths and injuries than do landmines. Second, the Convention seems to have set a laudable but, for some countries, an impossible goal within a foreseeable timeframe. In such cases, mine action would not be a means to an end but rather a means without end![31]

Some still argue that the solution is to put up more money and that countries which have adopted the Mine Ban Convention have an obligation to do so. But both donors and governments in mine-afflicted countries face many pressing demands and ploughing ever more money in pursuit of the mine-free ideal will starve other worthwhile programmes of funding and harm many more people than are helped. Also, of course, diminishing returns set in rapidly and costs will increase dramatically as we try to clear the more remote and random landmines. In the words of the Programme Manager in Kosovo, *"We don't want a thousand deminers roaming the countryside searching for the last landmine."*

Assessing the contamination problem and the human needs

Given that, for some countries at least, there is no quick fix to the contamination problem, hard choices will need to be made and, put simply, more information may lead to better choices. But acquiring data costs money and — as is true in demining — we don't want a thousand surveyors scouring the country for the last bit of data.[32]

The logic that data have a cost as well as a benefit underlies the strategy adopted by the Survey Action Center for landmine impact surveys. An LIS is a systematic survey designed to provide a snapshot of the socio-economic impact of landmines on communities. It is meant to be comprehensive, in the sense of identifying all communities which are affected. This is a large undertaking[33]and both cost and time considerations mean it would be unfeasible to collect and verify the accuracy of all the potentially relevant details in every community, some of which will have suffered little or no adverse impact. Therefore, the survey focuses on a few types of data to generate a rough picture of the landmine impact for each community — the numbers of recent victims and the types of resources to which access is blocked by hazards. Using a simple scoring system, communities are then broadly categorised by level of impact: high, medium, low, and no impact.

In itself, this seems a modest result from a big undertaking. However, it gains value if the information leads to learning, where managers make better decisions which in turn lead to more or better targeted benefits. Unfortunately, it appears in many cases that national authorities have not adjusted their priorities in the light of the evidence from the LIS, suggesting that learning how to deliver more socio-economic benefits for their citizens may not be their principal objective.[34]

In some countries however, often belatedly, the output from the LIS does appear to be influencing decision-making, particularly in terms of (1) making officials aware of the need to reallocate resources to correspond more closely to the geographic pattern of highly impacted communities, and/or (2) designating highly impacted communities as priorities. For some examples (all taken from the Landmine Monitor Report in 2003):

- The Cambodian Mine Action and Victim Assistance Authority *"… has also noted that, as of 2002, the distribution of clearance resources did not correspond to the areas of greatest socio-economic and humanitarian need. At the end of 2002, 63 per cent of the severe and high impact areas in Battambang, Pursat and Siam Reap provinces received approximately 30 per cent of the clearance capacity".*
- In Yemen, *"Using the results of the survey, a five-year strategic plan was developed to clear the 14 high impact communities by 2004. By the end of 2002, six of these communities had been cleared and declared safe."*
- In Mozambique, the National Demining Institute *"… produced its first Five Year National Mine Action Plan: 2002-2006 (NMAP). The plan and its priorities are based on the information and findings of the landmine impact survey".*

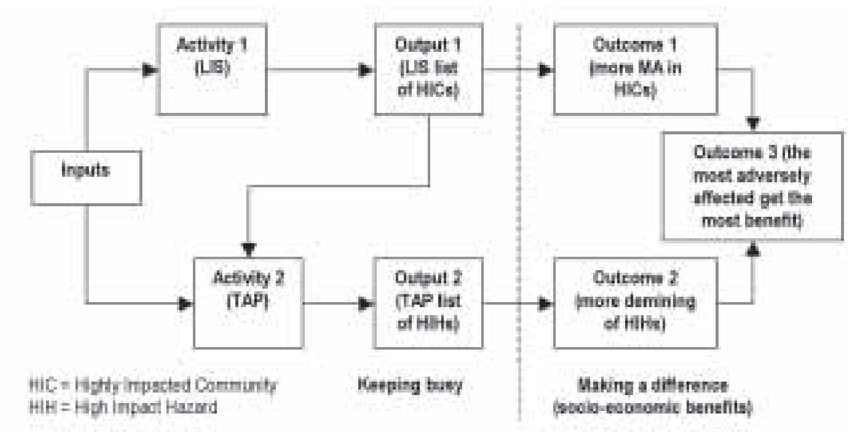
The LIS can also pay dividends in providing a tighter focus for future investments in learning. In Bosnia for example, a pilot project is being conducted with highly impacted communities. Each of these communities may be affected by a number of distinct hazards and each hazard will create different problems in socio-economic terms. Therefore, once the LIS identifies a highly impacted community (HIC), a second team is dispatched to conduct a more thorough task assessment and planning (TAP) survey.[35]

The TAP attempts to identify both those hazards which pose an acute risk of an accident and those which constrain use of particularly valuable resources (land, residences, previously well-used paths, etc.). These specific hazards will become priorities for expensive clearance operations, while others which pose little danger and promise few socio-economic benefits in the short-term will be marked.

Thus, the LIS identifies the communities for which a TAP survey will be most valuable, which means not as many scarce resources need to be spent on the TAP process. In turn, the immediate result (or output) of the TAP is a list of high impact hazards (HIHs). This is a potential benefit to the most affected people in the most affected communities, but the potential is only realised (i.e. becomes an "outcome") if the HIHs are indeed cleared on a priority basis.

The logical chain of events leading from LISs and TAPs to learning how to create socio-economic benefits is depicted in Diagram 4. (*Note, for lack of space the diagram does not depict final outcomes.*)

Diagram 4. Planned results from LISs and TAPs



The experience with LISs and TAPs also highlights a useful strategy for acquiring information and progressive learning. Start with "big pieces" providing an understanding of the problems in coarse terms and, over time, fill in details in those areas and issues which appear to offer the greatest return in terms of a more refined understanding of the socio-economic problems arising from landmine contamination. The LIS deals with communities as a whole and identifies the ones in which we need to take a closer look. The TAP then focuses on highly impacted communities and breaks their contamination problems down into smaller pieces (i.e. individual hazards) for a more detailed investigation.[36]

Toward solutions: top-down versus bottom-up approaches

While an LIS provides a "needs assessment" we still must devise ways to meet these needs. Indeed, meeting the human needs caused by landmine contamination is what constitutes results of the "making a difference" variety.

Broadly, there are two approaches. National authorities could try to devise a strategy for meeting the human needs and then determine priorities from the top. The polar opposite approach would be to emphasise the capacity to respond flexibly to priorities identified by those directly affected by the hazards. To date, the bottom-up approaches appear to have dominated in mine action.

Take Bosnia and Herzegovina for example.[37] The international community imposed the following set of criteria to guide mine action on the various Bosnian governments following the 1995 Dayton Peace Agreement:[38]

- humanitarian purposes, for the return of refugees and displaced persons;
- economic purposes for the expansion of agricultural and grazing land and rehabilitation, reconstruction and development.

Hazards are classified by the mine action centre into three broad categories in the following order of priority. Note that these categories do not correspond exactly to the criteria; specifically, there is less focus on the return of refugees and displaced persons.

- Category I: locations in regular civilian use or needed for refugees/internally displaced persons return or needed for reconstruction and development projects;
- Category II: locations in occasional use or adjacent to Category I tasks; and
- Category III: peripheral locations.

This process results in a so-called Category I list of priorities that is at least five times larger than can be demined with the funds available.[39] It is safe to say that the criteria established from the top provided very little strategic direction, and other processes were employed to determine the true priorities. Indeed, the true priorities were based almost entirely on the rankings of municipal officials.[40] In 2000, the MAC reported the following pattern of clearance (based on planned land use):

Agriculture	19.6%	Other	2.7%
Bridges	0.1%	Repatriation	0.2%
Communications	0.3%	Returnee housing	0.6%
Education	0.5%	Roads	1.1%
Electric power	17.1%	Telecommunications	0.9%
Housing	47.5%	Urban	2.8%
Industry	3.9%	Utilities	1.3%
Infrastructure	0.6%	Water/waste management	0.7%
Natural gas/heating	0.2%		

Source: ICBL (2001).

Two things are immediately apparent from this list. First, the amount of detail makes it confusing and it is hard to discern any strategic direction. Second, the emphasis given in the criteria to refugees and displaced persons appears to have had little effect on the actual pattern of clearance — less than one per cent of actual clearance was in support of "repatriation" and "returnee housing". Thus, watering down the criteria imposed from the top allowed the MAC greater flexibility to respond to the demands emerging from the bottom-up, but then these demands were "all over the map", without a readily apparent focus.

It is clear that the results desired by the international community when its members imposed the criteria for setting priorities — the return of refugees and displaced persons — were not being achieved. But what can be said about the results that were achieved? Very little, for two reasons. First, it is unclear what the pattern of planned land use really added up to because of the seeming lack of focus. Second, no one knows whether the actual use of the land corresponded to the planned land use as reported to the MAC to justify priority clearance. No post-clearance land use surveys were conducted because (in the words of one MAC manager) they were "*too busy getting mines out of the ground*" to check on what actual use had been made of land which had been cleared.

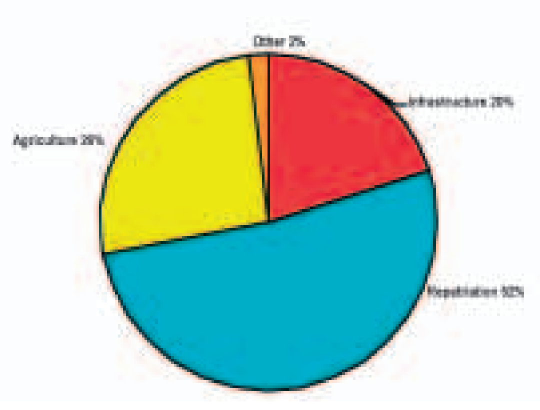
As is well known by now, there were widespread concerns that the priorities identified from the bottom-up by local officials sometimes reflected private interests rather than the public good.[41] In other cases, local officials identified priorities to advance the interests of their ethnic group and refused to request clearance of property belonging to members of other ethnic groups. Eventually the World Bank ended its mine clearance project early because of corruption allegations and the original demining commissioners were removed from office in late 2000 for conflict of interest.

The experience in Bosnia aptly illustrates the chief dangers inherent in a strategy based predominantly on responding to bottom-up demands. These are:

- the possibility that operations will not have a coherent focus or strategic direction;
- the possibility that the priority-setting process will be hijacked to serve the interests of local officials and elites, rather than those most in need.[42]

On the other hand, many of the problems created by landmine contamination are of a local nature and residents in the affected communities will have better understanding of their true needs than outsiders could possibly possess. When outsiders (whether national officials, foreign advisers or managers of mine action organisations) determine priorities without prior consultations with local residents the results are likely to disappoint.[43]

Diagram 5. Bosnia: planned use of land cleared in 1st half of 2003



Since its nadir, the MAC in Bosnia has gone some way to re-establishing the credibility of the Bosnian mine action programme. An important element of this resurrection has been the formulation of a far more coherent strategy for delivering meaningful results. Its plan for 2003 stated *"… that the process of humanitarian demining has to be aimed at the population return"*.[44] In turn, this strategy statement has resulted in tighter targeting of clearance in support of repatriation of refugees and displaced persons.

The example of Bosnia shows that progress can be made in the space of one or two annual planning cycles once managers turn their minds to the core question: how will mine action make a difference to people in mine-afflicted communities? The programme now has a strategically important focus at the macro level — repatriation of refugees and displaced persons — and preliminary indications are that it is making meaningful inroads in that regard. In addition, the TAP process should help increase the likelihood at the micro level that individual tasks will lead to worthwhile benefits to worthy beneficiaries without undue delay.

Further progress can be expected provided the MAC initiates some form of post-clearance land use survey to verify that land is being used by the intended beneficiaries for worthwhile purposes and without undue delay. Of course, such surveys are likely to uncover some surprises, particularly in a troubled society such as Bosnia's where elites will try to capture a disproportionate share of the benefits and where, quite simply, little goes according to plan. But these surveys are necessary both to understand the true results stemming from the clearance programme and to understand the remaining problems so that better results can be achieved in the future.

Summarising this section, the top-down versus bottom-up quandary cannot be solved by an either-or decision; the two approaches are complementary. Strategic direction must be formulated at the top, giving priority to certain ***problems*** over others. But bottom—up input is required to devise the appropriate ***solutions*** to specific problems. Further, some follow-up is necessary to assess whether the intended benefits accrued to the intended beneficiaries, both to reduce the danger of elite capture and to identify coordination problems (e.g. clearing land so an NGO can dig a well, but the NGO changes its plans without advising the clearance agency).

Working smarter, not harder

> *"There is nothing so useless as doing efficiently that which should not be done at all."* (Peter Drucker)

What's so hard about working smarter?

The concept that good management is all about achieving results is far from new. It emerged concretely in the writings of Peter Drucker starting almost 50 years ago.[45] However, the private sector adopted the concept first and it was not until about 1990 that governments in most industrialised countries made concerted efforts to introduce results-based management (RBM) to improve performance in their public services, including their donor agencies.[46] The Organisation for Economic Cooperation and Development (OECD)[47] defines RBM as:

"… a broad management strategy aimed at achieving important changes in the way government agencies operate, with improving performance (achieving better results) as the central orientation."[48]

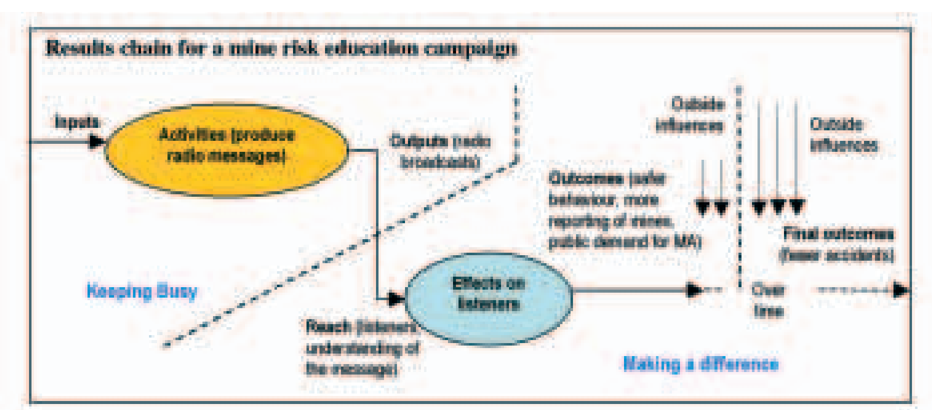
The slow adoption of this management approach by the public sector was due principally to the difficulty in defining and measuring "results" for public services. Concrete statements about how an organisation is performing require some way to measure its performance. In the private sector, a firm's financial "bottom line" or profitability is the ultimate goal and money provides a convenient means for measuring achievements. RBM can be viewed as an effort to define bottom lines for organisations such as government agencies and NGOs for which (in the words of Drucker) "*there is no bottom line*".

A sound RBM system integrates *planning* (what is the nature of the problem, what results do we need to achieve to overcome that problem, and how will we achieve those results?), *prioritisation* (what criteria do we use to select those tasks that will lead to the results we are seeking?), *monitoring and evaluation* (are we achieving the results we intended, and are our assumptions holding true?) and *performance improvement* (what have we learned that can help us improve planning and implementation?). The heart of this system is, however, a means for measuring performance at different levels (output, outcome, final outcome) because:

- *what gets measured gets done;*
- *if you don't measure results, you can't tell success from failure;*
- *if you can't see success, you're probably rewarding failure;*
- *if you can't see success, you can't learn from it;*
- *if you can't recognise failure, you can't correct it;*
- *if you can demonstrate success, you can win public support.*[49]

The trouble is that, when there is no clear bottom line, there is no simple measure that provides an unambiguous gauge of performance. Rather, a set of measures is required covering each stage in the "results chain" whereby inputs allow mine action activities to produce outputs which reach beneficiaries who use them to achieve intermediate and (ultimately) final outcomes. A results chain, using a radio mine risk education campaign as an example, is illustrated below:

Diagram 7. Results chain for a mine risk education campaign



The diagram also illustrates the fact that programme managers have a fair degree of control in producing the outputs, but they exert progressively less control as we move to outcomes in the short- and medium-term, and eventually to final outcomes. First, they need to ensure the outputs reach the ***intended*** beneficiaries and are used by those people in some worthwhile fashion or the planned outcomes will not be achieved.

Second, as more time passes, further outcomes are influenced by a range of factors outside the control of the programme or even its direct beneficiaries. Therefore, planning for the achievement of intermediate and final outcomes needs to be based on assumptions concerning these outside factors. Thus, success in terms of making a difference depends as much on understanding the likely influence of outside factors — so that reasonable assumptions can be made — as it does on the efficiency and safety with which outputs are produced.

The fact that intermediate and final outcomes are determined in part by outside influences points to the need for monitoring systems[50] that extend to the intermediate and final outputs. Programmes need to assure themselves and their stakeholders that what they expect to happen with the mine action outputs is truly happening.

For example, a programme clears agricultural land on the assumption that this land will be used for crops. If much of the land is not so used, the assumption is faulty and some research is warranted to determine why. Indeed, Sara Sekkenes found in Angola that *"Demining land for cultivation in a village surviving on subsistence farming provides little improvement if the farmers, after decades of war, have no seeds and tools left. They will go hungry despite the clearance of many hectares of productive land to a cost of maybe tens of thousands of dollars."*[51]

Pitfalls to overcome

While a focus on measurable results offers distinct advantages, it also introduces dangers. One is an over-concentration on a few indicators that are easily measured may introduce "perverse incentives" leading to unintended and undesirable outcomes.

A well-known example of perverse incentives comes from the field of education. The desire to enhance education quality has led many governments to measure school performance based on the pass rates on standardised tests achieved by each school's students. As a consequence, most schools "teach to the test", coaching their students to pass the standardised tests rather than teaching them more fundamental skills such as critical thinking. Even worse, some schools force their weakest students to drop out before the tests, so their scores do not lower the school average, resulting in a poor assessment of the school's performance.[52] The effort to measure school performance in order to improve educational outcomes created a perverse incentive for school administrators that led to poorer education for some students.

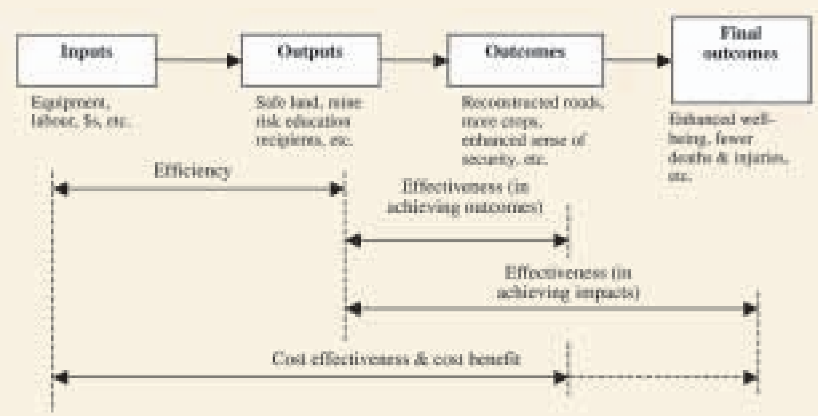
This phenomenon is common in mine action, particularly because performance still is judged on too narrow a range of "keeping busy" indicators for which data happen to be cheap and easy to collect. Measures such as landmines destroyed, areas cleared and the numbers of mine risk education presentations and trainees allow assessments concerning operational efficiency. But there is growing evidence that this narrow focus on efficiency has created perverse incentives which are leading to ***less effective*** performance *(see Box 11 below).*

Box 11. Efficiency versus effectiveness

There is widespread confusion in the mine action field concerning the difference between *efficiency* and *effectiveness*. *Efficiency* compares inputs relative to outputs, measured either in physical units (productivity) or in monetary terms (cost efficiency). *Effectiveness*, however, is a measure of whether, and the degree to which, objectives (intermediate and final outcomes) have been achieved. Both are important because it is quite possible for a project:

- to be very efficient in producing outputs but still be completely ineffective because those outputs do not reach or are not used by the intended beneficiaries or customers (for example, the world's most efficient manufacturers of horse-drawn carriages went bankrupt after the internal combustion engine appeared on the scene); and
- to be effective but inefficient, in which case the well-being of the intended beneficiaries is enhanced but by less than was possible given the resources expended. For example, military air transport was very effective in getting humanitarian supplies to refugee camps during the Rwanda crisis, but was 4-8 times more expensive than commercial air transport and 20-24 times more expensive than commercial trucking.[a]

In fact, a thorough assessment requires a comparison of inputs (or costs) and benefits (outcomes). Such measures are termed cost-effectiveness (when the benefits are expressed in non-monetary terms, such as tonnes of food grown) or cost-benefit (when the benefits are expressed in monetary terms, such as the value of the food grown on demined land). The difference in these terms is easily illustrated by a RBM diagram.



a) JEEAR (1996:103)

Prime examples in which the desire for efficiency has diverted attention from effectiveness are the reports from many countries that minefields have been selected for clearance because they were easy to clear, allowing programmes and individual demining organisations to report that their costs were falling.

Also, proposals in a number of countries to introduce mobile teams to clear small hazards that are blocking vital community resources have faced fierce resistance from "traditional" clearance organisations, who argue that these mobile teams are inefficient.[53] Undoubtedly, such teams are inefficient if measured against the area cleared, but there is growing evidence they can be extremely effective in enhancing the well-being of target beneficiaries.[54] For example,

> *"The above statistics suggest that spot task/EOD teams can be extremely time and impact-efficient. The social impact of spot tasks is high and very positive … Also it is significant that the majority of beneficiaries did not express economic benefit from spot task clearance but instead expressed high levels of social/psychosocial benefits…"*[55]

This quotation — and the general thrust of the report from which it is taken — also points to another problem frequently experienced as programmes try to raise their focus to results that make a difference. Generally these more important results are more difficult to measure.

In the example above on Danchurchaid's programme in Kosovo, Horwood and his co-researchers surveyed residents in communities that had benefited from spot clearance by small teams and then conducted semi-structured interviews with a random sample of those who completed the questionnaire. Their findings were illuminating: 97 per cent of those polled said they had less stress because of the spot clearance and 100 per cent said their quality of life had improved.

These data were collected after the fact. Danchurchaid had not conducted a baseline survey nor had its monitoring system collected such data before the spot clearance tasks were conducted, so it is unclear how fearful of mines and UXO the beneficiaries were before the clearance was done. Regardless, the example shows that a little forethought can help clarify the precise nature of these more important results (outcomes, rather than outputs), and that cost-effective monitoring systems can be designed to gauge whether mine actions are making a difference to people's lives. It would be preferable if a quantitative indicator of performance was available, and ideal if that indicator could be expressed in monetary terms for a ready comparison against the costs of providing the service.[56] But we live in the real world and good evidence of performance is better than no evidence at all.[57]The Community-Based Risk Reduction Programme *(see Box 13)* provides another example in which organisations involved in a mine action programme have taken reasonable steps to marshal evidence concerning performance. In this case, the project's objectives were clearly laid out and plans provided for an early evaluation of the pilot. This found the project was not delivering on all the expected results, but it was generating some unforeseen benefits which could be increased with slight modifications. Based on these findings, the modifications have been made and there is reason to expect the project will make a difference to the people of Cambodia.[58]

Box 12. The Community-Based Mine Risk Reduction Pilot Project (CBMRR)

In early 2001, CMAC, Handicap International Belgium, UNICEF and other members of the Mine Awareness Working Group designed a strategy for a more sustainable and community-oriented approach to mine risk education in Cambodia. This was based on the concept that contamination posed two general types of risks: (1) losses of life and limb through accidents, plus the resulting physical and psychosocial consequences for survivors and the families of victims, and (2) risks to livelihoods and community development, by denying households and communities access to land and other resources. A pilot project was formulated, with the following goal: to reduce the mine and UXO risks for communities and individuals living in contaminated areas by developing their capacity to fully participate in the prioritisation and planning of mine action and using their own community resources for mine risk education. Specific objectives were:

- to establish an effective and sustainable community-based mine risk reduction network of volunteers in mine/UXO-affected communities;
- to facilitate the access of mine/UXO-affected communities to appropriate mine action activities, victim assistance programmes and community development responses; and
- to maintain and improve a public information campaign to raise awareness among mine/UXO-affected communities.

Critically, the pilot project provided for external evaluations of progress towards its goal and objectives. The first took place in late 2002, only a year into the pilot. It documented encouraging progress in some areas, problems in others, and some unanticipated developments (chiefly that many mine action and development bodies viewed the CBMRR chiefly as a way of obtaining information from the villages rather than disseminating information to the villages).

A key finding is that the villages were reporting high priority contamination problems via their Mine/UXO Committees — but the Cambodia Mine Action Centre is not always able to respond promptly to the requests. This in part was due to transportation difficulties in the wet season, but in part because insufficient resources had been allocated to support the project by responding to requests. Without better response, community confidence in the project may erode. As a result, the CMAC plan for 2003 states, "*a new project will be developed with the Mine Risk Reduction teams. These small and multi-skilled teams will be deployed in support to the CBMRR program. The teams will be used for risk reduction and quick response to small tasks identified by the communities*".

Source: Project Development Group (2003); CMAC, Integrated Work Plan 2003.

Mine risk education is a good illustration of another type of performance measurement problem. We expect to see a decline in the numbers of deaths and injuries from landmine accidents following the delivery of MRE in a community. However, deaths and accidents also tend to decline in communities that receive no MRE as residents become more familiar with where the contaminated areas are, as they develop alternatives to using those areas (e.g. clearing new crop land or paths around the contamination), and so on. So accidents decline in communities that have received MRE and in those that have not. Can we attribute any portion of the decline in the first community to MRE? Perhaps, if we had evidence that the decline in accidents was systematically faster in communities that received MRE. Unfortunately, we rarely have evidence that we can be confident of because the data on landmine victims are often incomplete and, regardless, we rarely know whether the two sets of communities are even comparable in terms of socio-economic factors and, more fundamentally, contamination risk. For example, if MRE is well targeted, it presumably is being delivered to the most vulnerable communities. In this case we might find the numbers of accidents in communities receiving MRE has remained higher than those having no MRE, but we could not safely conclude that MRE is not working. This is termed the "attribution problem" — we cannot attribute the results observed to the actions of the programme.[59]

There is another problem common to most programmes, including mine action. Progress toward many of the most important objectives cannot be assessed for some time. For example, technical advisers are often fielded with a dual mandate to get something up-and-running (say, teams for explosive ordnance destruction or EOD) and to develop indigenous capacities to keep it working in the long term. Whether EOD teams are trained and deployed on schedule is quite apparent, but it takes time to determine whether indigenous capacities have been developed to manage those teams effectively, particularly when the technical adviser is still on hand to provide advice and prevent egregious errors. So the adviser's success in establishing the EOD teams can be monitored when still on the job, but the success in developing indigenous EOD supervision and management skills will only be apparent some time after the adviser has departed.

Failure to take reasonable steps to address this type of problem implies that performance can only be measured against indicators which show measurable changes in the short-term. In our technical adviser example, this creates incentives for an adviser to focus mainly on establishing the EOD teams even at the expense of developing indigenous capacities (which ultimately is of more importance). When such incentives abound, it should be no surprise that the results are disappointing. In point of fact, poor performance of technical advisers in developing indigenous "mid- and high-level" capacities is a phenomenon that has drawn comment in virtually every evaluation conducted of mine action programmes.[60]

Standing still is not an option

It should be clear that it is not a trivial task to demonstrate that a programme is performing well in terms of making a difference to the lives of people in mine-afflicted communities. But such an effort pays dividends in terms of bolstering support for the programme and learning to improve performance over time. And these dividends multiply over time.

One further spur to action needs mention: if mine action programmes do not come to grips with how to set performance targets and to document the results they are achieving in terms of enhancing the well-being of their target beneficiaries, they will have no credible defence when and if negative consequences of mine action come to light. In Cambodia, for example, allegations arose in April 1999 concerning falsified payroll records in the Mine Action Centre (CMAC). This led to a string of further scandals culminating in claims that the agency was clearing land for military commanders, logging firms and a former leader in the Khmer Rouge. As it had not set clear performance targets in terms of, say, the numbers of poor households that would benefit, CMAC was not collecting and reporting data about who the ultimate beneficiaries were and had little evidence to demonstrate whether most of the cleared land went to poor peasants. The perception quickly spread that abuse was the norm.[61] Mine action organisations operating in Cambodia have since begun to document and report on the end-use of land they have cleared[62] but tremendous damage was done to CMAC's reputation and to the level of donor support to Cambodia's mine action programme.

There are twin morals to this and similar tales. If programmes do not clarify *what results* they are aiming for in terms of *what benefits* will reach *which beneficiaries* for *what purposes* — and then monitor, document, and report on their achievements of these beneficial results — then: (i) only the bad results can be reported, and (ii) bad results are more likely because opportunists will take advantage of lax monitoring.

Conclusions

Mine action programmes in heavily contaminated countries will not be able to declare victory in the short- to medium-term. Therefore, they need to equip themselves adequately for the long haul. This implies something more fundamental than new tools for their tool kits: it implies learning how to learn. This ability is required if programmes are to assess their performance in terms of results that make a difference to people in mine-afflicted communities, which is necessary to maintain the support of donors and, increasingly, of host governments. Even more critically, the ability to assess performance in terms of meaningful results is necessary to improve such performance over time. Accordingly:

1. Mine action programmes in heavily contaminated countries should:
    - provide for a comprehensive needs assessment (such as a landmine impact survey) to provide a coarse-grain picture of how contamination is impacting communities throughout their country — the assessment should be regularly updated as the situation changes, including due to advancing work of mine action;
    - provide for more targeted surveys of heavily impacted regions and communities to provide progressively more detail pictures of how contamination is impacting communities, households, and individuals.
2. Plans for all programmes and projects in heavily contaminated countries should:
    - specify objectives at the intermediate and final outcome levels, and set performance targets for each to clarify the results they aim to achieve;

- specify relevant performance indicators for each result or, where it is unclear what indicators should be used or where data on an indicator are lacking, outline the concrete steps that will be taken to rectify such omissions within the period covered by the plan;
- incorporate a clear plan for monitoring the results achieved during implementation, and for reporting these results to host governments, donors, and other stakeholders;
- provide for periodic evaluations.

3. All mine action programmes should initiate a system of post-clearance surveys to determine whether the land and facilities cleared are (i) being used (ii) in the expected manner (iii) by the intended beneficiaries and (iv) without undue delays.

4. The international mine action community should establish an action research network to promote learning about the social and economic dimensions of landmine contamination and of mine action, with a particular focus on narrowing the gap between social scientists and mine action practitioners, by:

- identifying common problems and emerging issues affecting major mine action programmes;
- recommending issues that warrant study because of their practical potential for improving the results being achieved by mine action programmes;
- promoting the rapid dissemination of key findings from studies, evaluations, pilot projects and other action research activities designed to generate new information about the interaction between people and landmines;
- recommending new pilot projects to accelerate the practical application of key findings generated by research and evaluations.

Endnotes

1. See for example, Anderson et al. (2001). Another observer has aptly termed debates over the number of mines as "a persistent distraction" (Horwood, 2000: 3).
2. The standard criteria for evaluating development programmes are efficiency, effectiveness, sustainability, impact, and relevance (OECD/DAC, 1992).
3. Also, this chapter does not constitute a "how to" manual for results based management. Interested readers could consult the following documents listed in the Bibliography: CIDA (all listings), OECD/DAC (both listings), Schacter (2000 and 2002), and UNDP (2002a).
4. For two of many examples: "*There exists no clear official policy document regarding a priority framework for humanitarian demining in Angola*" (Sekkenes, 2000: 11) and "*There has been a lack of clear goals and objectives for the operations of NPA in Cambodia. There are no terms of reference or project appraisal documents stating the specific mandate of NPA's role in Cambodia…*" (Coopers and Lybrand Consulting LNS, 1996).
5. A brief guide on performance targets is: USAID, 1996, *Establishing Performance Targets*, Performance Monitoring and Evaluation TIPS, Number 8, available from *www.dec.org/usaid_eval/.*
6. For another NGO example, see Chris Roche, 1999, *Impact Assessment for Development Agencies: Learning to Value Change*, Oxfam Publishing, Oxford.
7. "Results-based management" and "performance management" are equivalent terms. The former is used mainly in the public sector and, therefore, within most official donor agencies and the international development community more broadly.
8. In reality, probably everyone with significant exposure to mine action accepts the proposition that "*It is not so much about mines as it is about people and their interactions with a mine-infested environment*." (UN, 2001). Thus, few people could fairly be characterised as completely "mine-centred" or completely "people-centred". The real world rarely plays out in such stark terms and, while it is easier to describe ends of a spectrum, we need to remember that we are dealing with questions of degree.
9. Touger, E. et al. (1998).
10. This term was coined in the late 1980s to describe the situation in Mozambique. Such emergencies feature intra-state conflict, a blurring of lines between combatants and civilians, violence directed largely against civilians, fluidity in terms of conflict zones and populations on the run, and a breakdown of the state and loss of legitimate authority over increasing swaths of the country (DAC, 1999, *Guidance for Evaluating Humanitarian Assistance in Complex Emergencies*, OECD, Paris).
11. For an example from Mozambique, "*ADP was originally criticised for concentrating on mine-dense fields at the exclusion of examining socio-economic impact … early tasks were in logistically favourable areas…*" GICHD/UNDP (2001:152). Reports from Bosnia claimed that "*… much of the effort is focused on farmland and pastures, not built-up areas, which take longer to rid of mines…*" (Aida Cerkez-Robinson, *Undermining Demining: Mine removal snarled in conflicting interests, mismanagement*, Associated Press, 28 May 2000).
12. Eaton et al. (1997).
13. *Ibid*.
14. UNMAS (1998), para. 5.
15. Formally, *Guidelines for Mine Action Programmes from A Development—Oriented Point of View: The Bad Honnef Guidelines*, reproduced as Annex F of UNMAS (1998), *op. cit*.
16. MCPA (1999: 8).
17. GICHD/UNDP (2001).

18. Millard and Harpviken (2000, 2001).
19. SAC & MCPA (2000: 3).
20. The LIS have also spawned some additional research on how communities adapt to landmine contamination (Benini et al., 2002).
21. For example, Cambodia recently has established Land Use Planning Units (LUPUs) to establish clearance priorities in concert with local officials. However, it appears that not all clearance organisations take guidance from the LUPUs and, regardless, there has not been time for a thorough study of how well the LUPUs have performed in practice.
22. The amount of overlap between these two objectives also is unclear: in many cases, the most valuable land may also represent the greatest risk to civilians.
23. The Praxis Group (2002: 73-74).
24. German Initiative to Ban Landmines (1999:42).
25. The Operational Handbook issued by GICHD for the UNDP in 2002 represents a first attempt at this, but further progress will depend largely on efforts by programmes to apply the broad guidelines contained in this document to the specific realities they face in mine-afflicted countries.
26 . For one example of many, "*The MACC information/survey systems have not collected sufficient data to allow a substantive and detailed analysis of the socio-economic impact of mines/UXO or an analysis of the mine action programme's effectiveness in reducing this impact. The evaluation team is therefore unable to conclusively determine whether the effectiveness of mine action activities … has met or exceeded expectations* (The Praxis Group, 2002: 17).
27. An outline of the "livelihoods approach" is beyond the scope of this chapter. Interested readers can refer to Westley and Mikhalev (2002) for an example from Kosovo, and Pain (2002) for one from Afghanistan. Also see the Livelihoods Connect website: *www.livelihoods.org/index.html.*
28. "*The situation of poverty in Kosovo is unclear. Previous assessments, conducted prior to the conflict, have indicated that between 30% and 50% of the population were living in poverty. It is widely assumed that the impact of the conflict, continuing economic stagnation, and an extremely high rate of unemployment have substantially increased the rate of poverty. However, there is no confirmation of the above poverty estimations from available data or analysis, and data since 1989 is scarce.*" (Mikhalev et al., 2000, *Kosovo: A Preliminary Poverty Profile Review of Secondary Materials*, Oxford Policy Management Group, [unpublished], quoted in Westley and Mikhalev, 2002).
29. Of course, some basic socio-economic considerations were taken into account. See Appendix 1, Case Study of Kosovo, in GICHD/UNDP (2001), and The Praxis Group (2002) for a more complete discussion.
30. However, the Convention also states that a State Party may request an extension "*If a State Party believes that it will be unable to destroy or ensure the destruction of all anti-personnel mines…*".
31. This phrase is from Arjuna Parakrama, "Means without End: Humanitarian Assistance in Sri Lanka", in Smillie (ed.) (2001).
32. There also is no certainty that raw data will be converted into useful information — data presented in the right format and level of detail to the right person in the right place at the right time.
33. In Cambodia, over 6,400 villages were found to be affected in the survey, which cost US$3.5 million.
34. Of course, such inaction may stem from weak presentation and dissemination of the LIS findings by those in charge of the survey. For example, the LIS reports delivered to provincial authorities in Thailand were in English, which few of them understood.

Problems may also arise because donors or the implementing organisations they are funding prevent the reallocation of resources to more heavily impacted areas.
35. Sara Sekkenes of NPA was an early advocate of the TAP process, in large part to avoid problems in which land and buildings that had been cleared at great expense would lie unused because (in Angola) poor farmers had no seeds to plant or (in Bosnia) ownership was disputed or the owners were afraid to return to a community dominated by members of another ethnic group.
36. Managers of demining operations are, of course, perfectly familiar with this principle when applied to landmine hazards. They first undertake a general survey designed to get a "coarse-grained" picture of the contamination as a whole, and subsequently undertake more detailed (and expensive) technical surveys of those hazards which seem to warrant immediate attention (see van der Merwe, 2002). The key issue is that a similar strategy is required to learn about socio-economic concerns.
37. This example draws mainly on Paterson and Tatiæ (2002).
38. The Dayton Agreement also established a remarkable constitution for the country. The central government is extremely weak and virtually all authority resides with two "entity" governments; one dominated by Bosnian Serbs and the other a loose federation of Bosnian Muslims and Bosnian Croats in which much of the authority is further devolved to 10 cantons. Over this unworkable mess, the international community has appointed a proconsul (the "High Representative"), making Bosnia a semi-protectorate. Thus, the international community can impose its decisions on local authorities.
39. The BHMAC now plans to introduce a more structured system of determining priorities to address the recognised problem that "*… the final choice was relatively subjective as it is simply difficult to separate the highest priority from a large group of generally important tasks*" (Lisica, 2003, "Bosnia and Herzegovina Mine Problem: Priority Setting", *Journal of Mine Action*, Vol. 7.2, pp. 14-16).
40. The MAC also responded to requests from the international community and NGOs, but there were relatively few of these. A good deal of clearance was also commissioned by electrical utilities or conducted by the entity armed forces, but these priorities were set by a different process and used different lines of funding.
41. For example, "*…much of the effort is focused on farmland and pastures, not built-up areas, which take longer to rid of mines and are therefore unprofitable. Deminers are paid by the size of the area regardless of how long it takes to clear*", Aida Cerkez-Robinson, *Undermining Demining: Mine removal snarled by conflicting interests, mismanagement*, Associated Press, 28 May 2000. One donor official interviewed in 2002 by the author said a tour of the clearance priorities identified by municipal officials in one canton revealed that they were (in his characterisation) *"the mayors' backyards*".
42. In Bosnia, conflicts of interest within communities have a peculiar complexity. Many of those in greatest need are those displaced by ethnic cleansing. The Dayton Agreements provided for their right to return, but in many cases they are prevented by local officials, who often represent the groups responsible for the ethnic cleansing. In such a situation, local officials might honestly be representing the interests of community members who are there but working against the interests of community members who are not there, but would return if they could. What constitutes the community?
43. Millard and Harpviken (2000).
44. BH-MAC (2003: 4).
45. The key books were *The Practice of Management* (1954) and then *Managing for Results* (1964).
46. Two good sources on results-based management are Schacter (2002b) and DAC/

OECD (2000).
47. This is an international grouping of the so-called “developed nations“, and incorporates the Development Assistance Committee (DAC) which includes the principal donor nations.
48. OECD/DAC (2000).
49. From Osborne and Gaebler, 1992, *Reinventing Government*, Chapter 5, “Results-Oriented Government”, cited in Quinn Patton (1999: 27).
50. In international development, we typically speak of “monitoring and evaluation” (M & E) systems. The mine action community more often talks the language of “quality management” systems. These are two sides of the same coin. We do M & E to ensure our objectives and standards are met: meeting quality standards requires regular monitoring and periodic evaluation.
51. Quoted in Maslen (2004b).
52. See for example, T. Lewin and J. Medina, “To Cut Failure Rate, Schools Shed Students“, *The New York Times*, 31 July 2003, Section A, p. 1.
53. Such resistance has been reported in a number of countries such as Afghanistan, Cambodia, and Mozambique. Over-reliance on efficiency measures puts more flexible and responsive approaches at a disadvantage even though they may deliver higher — but hard to quantify — benefits.
54. In many cases the critics have also claimed the mobile teams are ineffective, but on close examination such claims represent confusion concerning the meaning of “effectiveness“. For example, a recent critique of mine action in Bosnia (Banks, 2003, and Banks and Banks, 2003), which otherwise contains a good deal of valuable information, is marred by this confusion between efficiency and effectiveness.
55. Horwood et al. (2001: 21).
56. An excellent guide to the selection and use of performance indicators is USAID, 1996, *Selecting Performance Indicators*, Performance Monitoring and Evaluation TIPS, Number 6, available from *www.dec.org/usaid_eval/*.
57. The type of survey conducted by Horwood and his co-researchers in Kosovo is a tool piloted by the market research field. A similar approach was used in Bosnia to gauge satisfaction among municipal officials with the system for setting clearance priorities (Paterson and Tatiæ, 2002: 16-18). A brief guide is: USAID (1996), available from *www.dec.org/usaid_eval/*. One expert has stated that “*Monitoring outcomes is basically a question of market research. Who are the beneficiaries…where are they located?*” (Marchant, 2001: 92)
58. Of course, continued monitoring and evaluation is required to ensure this happens, and to generate additional insights about how to continue performance improvements.
59. See Mayne (1999) for a good discussion of how to deal with attribution issues.
60. The evaluators usually fault the process of selecting technical advisers and stress the need to employ only those with “*suitable skills and aptitudes*“. However, an alternative explanation is that the advisers are perfectly capable, but are simply reacting rationally to the perverse incentives they face.
61. Information obtained from *www.ngoforum.org.kh/* — the NGO Forum on Cambodia website — accessed on 2 October 2003.
62. See for example, HALO Trust (*www.halotrust.org/asia.html*).

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Glossary of terms and acronyms

ADP	Accelerated Demining Programme (Mozambique)
AM/FM	automated mapping and facilities management software
AMAC	assistance to mine-affected communities
ANFO	ammonium nitrate and fuel oil
APM	*Akcija Protiv Mina* (Action against Mines)
ARCS	Afghan Red Crescent Society
AREA	Agency for Rehabilitation and Energy Conservation in Afghanistan
ATC	Afghan Technical Consultants
AXO	abandoned explosive ordnance
BiH	Bosnia and Herzegovina
CAD	computer-aided design
CBMRR	community-based mine risk reduction
CBR	community-based rehabilitation
CCW	Convention on Certain Conventional Weapons
CIDA	Canadian International Development Agency
CIDC	Canadian International Demining Corps
CIET	Community Information and Epidemiological Technologies
CLT	community liaison team
CMA	Cranfield Mine Action
CMAA	Cambodian Mine Action Authority
CMAC	Cambodian Mine Action Centre
CMAO	Central Mine Action Office (Angola)
CMVIS	Cambodian Mine/UXO Victim Information System
CND	National Mine Clearance Commission (Mozambique)
CNIDAH	Inter-Sectoral Commission on Demining and Humanitarian Assistance (Angola)
CROMAC	Croatian Mine Action Centre
CTSC	Countermine Training Support Center
DAC	Development Assistance Committee (OECD)
DAFA	Demining Agency for Afghanistan

DDAS	database of demining accidents
DGPS	differential GPS
DHA	Department of Humanitarian Affairs (UN)
DIMS	Demining Information Management System
DOPs	dilutions of precision
DPKO	Department of Peacekeeping Operations (UN)
DTM	digital terrain model
DNT	dinitrotoluene
DoD	Department of Defense (US)
ECD	electron capture detection
ELISA	Enzyme-Linked Immunosorbent Assay
EMAO	Ethiopian Mine Action Office
E-MINE	Electronic Mine Information Network
EOD	explosive ordnance disposal
ERW	explosive remnants of war
ESTI	Emergency Survey Tool for Iraq
ETHZ	*Eidgenössische Technische Hochschule Zürich* (Swiss Federal Institute of Technology, Zurich)
FAE	fuel/air explosive
FDS	*Fédération suisse de déminage* (Swiss Demining Federation)
FM	field module
GICHD	Geneva International Centre for Humanitarian Demining
GIS	geographic information system
GLS	Global Landmine Survey
GM	global module
GMAA	General Mine Action Assessment
GPR	ground penetrating radar
GPS	Global Positioning System
GSDI	global spatial data infrastructure
HDTC	humanitarian demining training center
HF	high frequency
HI	Handicap International
HIC	humanitarian information centre
HIH	high impact hazard
HMX	high melting point explosive
ICBL	International Campaign to Ban Landmines
ICRC	International Committee of the Red Cross
IDP	internally displaced person
IMADS	integrated mine action development strategy
IMAS	International Mine Action Standards
IMMAP	Information Management and Mine Action Programme
IMSMA	Information Management System for Mine Action
INAD	National Demining Institute (Angola)
INAROEE	National Institute for the Removal of Obstacles and Explosives Ordnance (Angola)
IND	National Demining Institute (Mozambique)
IR	infrared
ISO	International Standardization Organization

ISU	Implementation Support Unit
ITC	International Institute for Geo-Information Science and Earth Observation
ITF	International Trust Fund for Demining and Mine Victims Assistance (Slovenia)
KFOR	Kosovo Protection Force
KPAB	Knowledge, Practices, Attitudes and Behaviour
LIS	landmine impact survey
MAC	mine action centre
MAG	Mines Advisory Group
MAPA	Mine Action Programme for Afghanistan
MAST	mine action support team
MAT	mine action team
maXML	Mine Action Extensible Markup Language
MCPA	Mine Clearance and Planning Agency
MCS-ENG	Maneuver Control Systems-Engineer (US Army)
MCTU	Mines Clearance and Training Unit (Cambodia)
MDC	Mine Detection and Dog Centre (Afghanistan)
MDD	mine detection dog
META	Monitoring Evaluation and Training Agency (Afghanistan)
MIS	Mines Information System
MIT	Massachusets Institute of Technology
MITC	Mine Information and Training Centre
MRE	mine risk education
MREWG	Mine Risk Education Working Group
NATO	North Atlantic Treaty Organisation
NAVEODTECHDIV	US Naval Explosive Ordnance Disposal Technology Division
NGO	non-governmental organisation
NMAA	national mine action authority
NPA	Norwegian People's Aid
NQR	nuclear quadrupole resonance
NVESD	Night Vision and Sensors Directorate (US Army)
OAS	Organization of American States
OAU	Organisation of African Unity
OBOD	open burning and open detonation
OCHA	Office for the Coordination of Humanitarian Affairs (UN)
OECD	Organisation for Economic Co-operation and Development
OMAR	Organisation for Mine Clearance and Afghan Rehabilitation
ONUMOZ	United Nations Operation in Mozambique
PARADIS	Prototype for Assisting Rational Activities in Humanitarian Demining Using Images from Satellites
PC	personal computer
PCD	post-clearance documentation
PCE	post-clearance evaluation
PDA	personal digital assistant
PEST	political-economic-social-technical
PLP	phantom limb pain

PPE	personal protective equipment
PPR	post-project review
PRIO	Peace Research Institute, Oslo
PRSP	poverty reduction strategy paper
RBM	results-based management
RDBMS	relational database management systems
RDX	cyclotrimethylenetrinitramine
R&D	research and development
REST	remote explosive scent tracing
SAC	Survey Action Center
SC-VASER	Standing Committee for Victim Assistance and Socio-Economic Reintegration
SEEMACC	South Eastern Europe Mine Action Coordination Centre
SEIS	Socio-Economic Impact Study (Afghanistan)
SFOR	Stabilisation Force
SHA	suspected hazardous area
SNC	Supreme National Council
SOP	standing operating procedure
SQL	structured query language
SRSA	Swedish Resource Services Agency
SWEDEC	Swedish Explosive Ordnance Disposal and Demining Centre
SWG	Survey Working Group
SWOT	strengths-weaknesses-opportunities-threats
TAP	task assessment and planning
TEA	thermal energy activity
TIA	task impact assessment
TMFDB	tactical minefield database
TNMA	Technical Notes for Mine Action
TNT	trinitrotoluene
TQM	total quality management
UEE	user equipment errors
UN	United Nations
UNAVEM	United Nations Angola Verification Mission
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNHCR	Office of the United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNMAS	United Nations Mine Action Service
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs to Afghanistan
UNOMOZ	United Nations Operation in Mozambique
UNOPS	United Nations Office for Project Services
UNTAC	United Nations Transitional Authority in Cambodia
URE	user range error
UXO	unexploded ordnance
VVAF	Vietnam Veterans of America Foundation

VTF	Voluntary Trust Fund for Assistance in Mine Clearance (UN)
WAAS	wide area augmentation system
WFP	World Food Programme
WHO	World Health Organization
WRF	World Rehabilitation Fund

Notes on the authors

Paddy Blagden started in mine action in 1991, following a career in the British Army that ended with the rank of Brigadier. He set up the original United Nations mine action office, worked as a consultant for the World Bank, the European Union and others, was the Technical Director of the GICHD, and now carries out more consultancy, mostly on programme evaluations.

Colin King served 14 years in the British Army, mostly in bomb disposal, with operational service including the Falklands, the Gulf, and Bosnia and Herzegovina. He also led the first British army team to train Afghan volunteers in mine clearance and bomb disposal. He was second-in-command of the army counter-terrorist search squadron before becoming an instructor at the British bomb disposal school. He then worked as a foreign weapons intelligence analyst for the Ministry of Defence before commanding a Squadron of Gurkhas in Hong Kong. Colin now runs a consultancy company undertaking bomb disposal assessments and training in war zones all over the world, with recent work for the British and US governments in Iraq, Lebanon and Kosovo. He also edits reference yearbooks on mine clearance and bomb disposal for Jane's information group.

Rachael Mann took up a position as Research Assistant for the United Nations Research Institute for Social Development (UNRISD) in 2000 and became involved in mine victim assistance research with GICHD. In 2001, Rachael joined HALO Trust as Projects Officer and worked in Cambodia. In 2004, Rachael left HALO Trust and moved to Scotland where she is currently Parliamentary Researcher for Lewis Macdonald MSP, Deputy Minister for Environment and Rural Affairs.

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Mark Yarmoshuk has been involved in mine action information management since 1998. As an officer in the Canadian Army he led a contingent of three Canadian Military combat engineers who spent 15 months providing support to technical survey teams at a landmine clearance programme in Mozambique. After leaving the military he has worked extensively with the IMSMA development team at ETH Zurich, and mine action programmes in Afghanistan, Bosnia and Herzegovina, Iraq, Lebanon, and Mozambique. He continues to work in humanitarian information management. Mark Yarmoshuk is a Civil Engineer (PEng, Ontario, Canada) and holds a post-graduate diploma in Geomatics from the University of New Brunswick, Canada.

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