



EAST-WEST CENTER

Toxic Waste: Hazardous to Asia's Health

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I S S U E S

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The U.S. Congress established the East-West Center in 1960 to foster mutual understanding and cooperation among the governments and peoples of the Asia-Pacific region, including the United States. Principal funding for the Center comes from the U.S. government, with additional support provided by private agencies, individuals and corporations and more than 20 Asian and Pacific governments.

The Center promotes responsible development, long-term stability and human dignity for all people in the region and helps prepare the United States for constructive involvement in Asia and the Pacific.

SUMMARY While international attention focuses on the widespread fires causing air pollution in Southeast Asia, a less obvious health threat is sickening thousands of Asians. Hazardous waste threatens millions of people in Asia, a booming region that seems intent on industrializing at almost any cost. More and more such wastes, sometimes called toxic wastes, are being produced and released into the environment, triggering severe health problems. Asia's high population density and often tropical climate put it especially at risk for contamination. But while regulations have increased, enforcement is inadequate and often undermined by corruption. Asian governments seem to believe that cleanup can come after economic development. The U.S. experience, however, shows that it is a matter of pay now, or pay much more later. Meanwhile, even as public outcry grows over highly toxic sites and industries, a new wave of health problems is raising concerns about far more subtle poisons. Unless serious action is taken soon, the costs to human health and the environment—which are already incalculable—will continue to escalate.

Hazardous waste and our modern lifestyle are created by the same industrial processes

When the Three Gorges Dam, the world's largest, is completed in China, it will flood more than 1,600 major manufacturing facilities along the Yangtze River. Many sites are saturated with hazardous waste, including the massive Chongqing steel mill, described at one time by the World Bank as among the 10 most dangerous industrial facilities in the world.

No environmental cleanup is planned before the area is submerged. The city of Chongqing now discharges more than 300 million tons of untreated industrial wastewater, sewage, and hazardous waste into the Yangtze River each year. What was once carried downstream will instead back up behind the dam. In the words of one senior environmental planner, Chongqing, now known as the "Gateway to the Three Gorges," will become the "largest toxic toilet bowl in the world."

The case of Chongqing highlights an alarming trend. Asian economies are booming, but growth is coming at tremendous cost. Insufficient emphasis on pollution prevention means more and more hazardous waste is being produced. Chemical contamination now stains the environment of every Asian country, sickening thousands of people and killing many others. In 1995, China alone produced more than 650 million tons (half a ton per person) of hazardous waste. If it continues at this rate, China will produce more than 1 billion tons annually soon after the year 2005.

The blight of toxic waste is not unique to Asia, of course. The United States generates more hazardous waste per capita than any other country, roughly one ton per person per year, or 265 million tons per year. Controlling hazardous waste is difficult in industrialized, fully regulated countries, let alone in developing ones. In Asia, unfortunately, the attitude seems to be "develop the economy first, clean up later." This virtually guarantees that more money will be spent to clean up waste than would have been spent to prevent waste generation in the first place. It is a lesson the United States is learning the hard way, and one that Asia should avoid repeating.

What is Hazardous Waste?

Hazardous wastes are the unwanted liquid, semiliquid, and solid industry byproducts that are corrosive,

ignitable, reactive, or toxic. (See p. 4, "Hazardous Waste.") Thousands of industrial processes using more than 72,000 chemicals create hazardous waste. Of course, these processes also contribute to the modern lifestyle, producing the much-loved automobile, worm-free apples, headache-relieving drugs, blue jeans, and the all-powerful computer chip.

Some common generators of hazardous waste on the industrial landscape include petroleum refining; production of plastics, pharmaceuticals, chemicals, and textiles; mining and minerals processing; electronics and paper manufacturing; food production; wood preservation; and hospitals. Almost all industrial waste in the United States is regulated. Citizens create hazardous waste when they discard used paints, thinners, oils, bleaches, batteries, and pesticides. While unregulated, this consumer-produced waste is enormous.

When hazardous waste is improperly released—dumped into rivers and oceans and onto the ground—it readily contaminates surface and groundwater and finds its way into food chains. (The most notorious example of this occurred in Minamata, Japan, in the 1950s. Methylmercury that had been dumped into the local bay made its way into fish and shellfish that was a large part of the local diet, poisoning residents and severely damaging their unborn children.) Soil contamination may affect children playing in the dirt as well as plants and animals. Contamination of plants and animals, in turn, provides another exposure pathway to humans. Improper incineration of hazardous waste, currently a popular method of disposal in Asia, contaminates the air and further disperses pollution.

The precise health effects of exposure to hazardous wastes, typically via ingestion, inhalation, or through skin contact, are mostly unknown. It is evident, however, that such exposure can cause cancer and genetic damage; adversely affect neurological and neurobehavioral systems; affect reproductive or endocrine systems; and trigger severe eye, lung, and skin problems. (See p. 4, "A New Wave of Health Problems.") Genetic damage takes its toll generation after generation, as severe environmental pollution in Central and Eastern Europe has shown.

Why Asia Is at Risk

Hazardous waste is a particularly urgent issue in Asia. The region's high population density heightens potential exposure to chemicals. The 1984 disaster in Bhopal, India, is a classic example. The methylisocyanate gas released at the Union Carbide plant there killed more than 6,000 people and injured thousands more. The Indian government estimates that the accident ultimately harmed 200,000 people, many of whom suffer from illnesses that developed years after initial exposure.

At the time of the incident, thousands of people lived within several miles of the plant. Asian countries generally lack the strict zoning, commonly found in developed countries, that keeps people from living close to potentially dangerous industrial plants. In China, for example, 80 percent of the industrial facilities that generate hazardous waste are centrally located within cities.

Government regulators in Asia now have a common mantra: "We don't want another Bhopal here." There is a new emphasis on better management of potentially dangerous chemicals and better construction and maintenance of the facilities that use them. Disposal of the resulting waste, however, is another story. Chemical wastes are routinely dumped into the ocean and rivers, flouting both international and local law.

Asia's climate is another factor making it especially susceptible to contamination. Much of the region is tropical, and large stream and river systems form its industrial lifeblood. Waterways are used for commercial transportation, as well as for bathing, washing, recreation, fishing, and drinking water. While most Asian rivers have long been defiled by fecal and other bacterial sources, they have now entered another league of contamination, one much tougher to remedy. In Bangkok, it is common to see children playing and people washing their dishes in the Chao Phraya River, which is heavily polluted with local industrial discharges. Similarly, the rivets of Java; the Pasig in the Philippines; the Red River in Vietnam; and the Yangtze, Liaohe, Yellow, Songhua, and Pearl rivers of China are sources of hazardous chemical exposure. In 1995, China dis-

charged more than 6.4 million tons of hazardous waste, virtually untreated, into rivers, lakes, and the ocean.

Toxic waste that doesn't go into natural waterways often ends up in antiquated sewer or surface drainage systems in Asian cities. These systems have inadequate treatment plants or, in most cases, none at all. At any rate, they are not designed to handle hazardous waste. During the rainy season, flooding exacerbates the problem, further spreading the danger.

Hanoi's water drainage system, for example, was built in 1873, and much of its nearly 100 miles of culverts and piping has collapsed over the years. Flooding is common in some areas. More than 230 small and medium-sized factories discharge hazardous waste to this system. Studies have shown high levels of mercury and copper as well as insecticides and herbicides in the city's wastewater. (See p. 4, "Wastes from Hospital Spread Disease.")

Myths About Hazardous Waste

Several common misconceptions about hazardous waste complicate the situation in Asia. The first is that Asia can't afford to deal with hazardous waste issues until its economies are fully developed. The experience of the United States shows, however, that it is a matter of pay now, or pay much more later.

The U.S. Superfund program, targeting abandoned sites, has resulted in enormous litigation and relatively little cleanup, making it an unworkable and unpopular model. Unfortunately, no successful model exists. The only certainty is that it is less expensive to prevent hazardous waste problems than to correct them. A few countries are trying to regulate current waste generation, but they are having decidedly mixed success.

A second popular misconception is that nature will cure the problem on its own. In tropical areas, natural organic wastes from agriculture or animals degrade rapidly when discarded into the environment. Chemical wastes are abandoned in similar fashion with the same expectations, but they have a much longer life and can exert toxic effects for generations.

This cavalier approach to disposal is evident, for example, deep in the forests of Papua New Guinea. A portable timber treatment called "CCA" (chrome,

Chemical wastes are routinely dumped into oceans and rivers

Hazardous Waste

Waste materials containing heavy metals, such as lead, cadmium, chromium, arsenic, and mercury, comprise one basic category of hazardous waste. Organic-based pollutants, including polychlorinated biphenyls (PCBs), benzene, tetrachloroethylene (TCE, used in dry cleaning), and refinery sludges, comprise another. Medical or infectious wastes make up a special category. Many hazardous wastes are a combination of many chemicals.

Industrial air emissions and wastewater are not typically defined as hazardous wastes, although they do threaten human health and the environment. Nuclear waste is not considered under the standard definition of

hazardous waste, although "mixed waste" refers to chemicals contaminated by radioactivity. Control efforts are fraught with definitional nuances, as wastes are added and removed from regulatory purview.

Researchers have turned their attention to the effects of exposures to soupy mixtures of hazardous waste. The complex biological responses to combined chemicals—a heavy metal plus an organic contaminant or two (or 10)—are difficult to understand. Some chemicals are less toxic when present as a single chemical but much more toxic when, combined with another, they act synergistically.

A New Wave of Health Problems

Two key questions in environmental cleanup (known as "remediation") are: How much money should be spent to reduce a given risk to human health and the environment? To what levels must hazardous waste be remediated? Some believe there are levels of pollution to which people can be exposed before adverse effects occur. New research, however, may alter this view. Emerging evidence points to a whole new wave of problems on the horizon.

Certain chemicals are now believed to act synergistically at very low levels, much lower than the parts per million range found at hazardous waste sites. Termed estrogenic mimics, endocrine disrupters, or environmental estrogens, they alter the endocrine systems of humans and animals and may lead to reproductive abnormalities and diseases, as well as significant changes in the genetic makeup of humans.

Estrogenic chemicals are present in plastics (and the gases they give off for years after they are manufactured)

and in levels of pesticides deemed permissible for our drinking water and food. THC, the active ingredient in marijuana, is itself an estrogenic mimic.

High-exposure, "emergency" waste sites have largely been dealt with in the United States, and the focus has turned to low dose and low exposures. In Asia, exposures are both extremely high as well as subtle and low dose. The new research on environmental estrogens has profound implications for hazardous waste management, cleanup levels, and occupational exposure limits. It could lead to tightening of discharge limits for all pollutants.

The research also suggests that some protection from these estrogenic mimics can be found in so-called phytoestrogens—naturally occurring estrogens in some plants. In particular, soy products, wheat, flax, and rye may have a protective effect and act to suppress the growth of estrogen-dependent cancers such as breast and prostate cancer.

Wastes from Hospital Spread Disease

In 1992, a visit by the author to the Bac Mai Hospital in Hanoi found the sprawling hospital, built on stilts to accommodate seasonal flooding, virtually without running water, its water delivery system corroded beyond use. Hospital officials said the U.S. trade embargo prevented them from obtaining funding for a new water supply. They were seeking outside advice on medical waste management, calling it one of the highest priorities in Hanoi.

At the hospital, patients were bathed by hand, and when necessary, placed on a porous structure where buckets of water were poured over them. The effluent spilled onto the floor, out the building's drains, and into open concrete channels facing the hospital compound.

Medical personnel also discharged effluent from washing surgical and diagnostic instruments, unused chemotherapy drugs (carcinogens themselves), and other chemicals in the same way.

The wastewater eventually emptied into the collapsing underground sewage system. Local residents drew water for bathing and washing dishes and clothes directly from these subterranean cisterns, which also were contaminated with industrial chemical discharges. Hospital officials indicated that disease—at times the very diseases they were treating—was spreading from the hospital to surrounding neighborhoods.

copper, arsenic) impregnates wood, preventing insect infestation. But when the doors to the pressure chambers are opened, an extremely toxic chemical soup is discharged. This bright greenish-blue residue will contaminate streams, lakes, and soils for many years to come.

A third fallacy common in Asia is that western technology will provide a fix. Not only is this not true, but tragically, just the opposite is happening in some cases. Many hazardous waste technologies that have been banned in the United States are now being sold in Asia. One Canadian businessman, for example, is selling extremely polluting medical-waste incinerators in the Philippines, Indonesia, and Thailand that could not be legally marketed in the United States or Canada. Some companies have shamelessly printed slick brochures with the motto "U.S. EPA-Approved" although the Environmental Protection Agency neither approves nor licenses technologies. Some salesmen from the United States and Canada suggest that Asians don't need or understand state-of-the-art environmental technology. This industrial neocolonialism is unwarranted and unwelcome.

Another myth widespread in Southeast Asia is that dumping chemical waste on soils—where they can filter down to the groundwater—is acceptable because groundwater is less used than surface water. Contaminated groundwater, however, can contaminate surface water. In simple terms, a river is a surface manifestation of the groundwater in the surrounding geologic area. In Malaysia, several hazardous waste dumps have polluted rivers miles away by leaching chemicals through soils. Heavy rains only spread the threat more quickly.

More temperate parts of Asia rely on groundwater as much as does the United States. Northern China and Korea depend heavily on it for human consumption, despite extreme contamination. Studies of groundwater in some areas of China have shown levels of lead (toxic to nervous system development) at 35 times the drinking-water standards for the country. An infamous metal-plating waste site in Shenyang, China, has adulterated the groundwater for 20 towns, causing widespread health problems as well as deaths. The plant's wastewater, laced with toxic chromium, was used to irrigate rice fields.

When Asia decides to clean up its chemical disposal sites, it will first have to spend millions of scarce dollars researching the movement of chemicals through soils and groundwater. Unfortunately, most research done elsewhere will be of limited value given the unique hydrogeology of Asia.

A Long Way to Go

Less than half the Asian countries surveyed by the author in 1996 had even a single hazardous waste landfill or incinerator, the two most popular control technologies. The lack of basic infrastructure makes it impossible to keep up with ever-increasing amounts of waste. China, for example, already has more than 6.6 billion tons of toxic waste in storage, covering 135,850 acres.

In Asia, as elsewhere, toxic waste management is a business that must make a profit. Unless the market can justify such a facility, it will not be built, no matter how great the need. Often, the volume of waste needed to make a facility profitable must come from more than one plant, yet the high cost of collecting waste from many factories can keep a treatment facility from being viable. Delays in establishing a waste management center in Negri Sembilan, Malaysia, for example, were due largely to the private operator's insistence that the government guarantee an adequate supply of waste, thereby assuring a certain profit margin. Similar problems have held up hazardous waste incinerators in the Philippines, Indonesia, and Thailand.

The difficulties can be especially great when the many thousands of small Asian manufacturers come into the picture. They present a twin challenge: how to make each of them aware of the dangers of the waste they are generating and how to economically collect waste from so many scattered factories.

With too few waste-treatment plants, Asian countries are often dumping hazardous waste into municipal landfills in a practice called "co-disposal." The thinking behind co-disposal is that the large amount of general refuse will absorb the toxic chemicals. The 1996 survey indicated that co-disposal is allowed by fully half the Asian countries, up from the last survey in 1992. Yet virtually no reliable research indicates that co-disposal is a long-term

Waste disposal technologies banned in the U.S. are being sold in Asia

solution. Every one of these disposal sites is a potentially severe health problem, since all landfills leak.

International Shipment of Waste

With the dearth of advanced disposal facilities in Asia, many multinational companies are shipping their hazardous waste to the United States, Canada, or England. This adds enormous costs to disposal and increases the risk of accidents in transport. The need for innumerable government licenses can delay shipments indefinitely. One company has 60,000 drums of high-level PCBs awaiting shipment from an ASEAN country to the United States for incineration. The waste has been languishing for 10 years in storage drums subject to humidity and corrosion.

An international agreement that was designed to restrict dumping of hazardous waste by rich countries on poor ones has complicated the situation. In theory, the Basel Convention on Transboundary Movements of Hazardous Wastes and Their Disposal allows shipments only if the receiving country can manage the waste appropriately. In practice, however, the agreement has blocked some waste shipments that may have been appropriate.

At the same time, it has allowed other hazardous cargo, deemed recyclable, to be shipped all over. The United States sends lead-acid batteries to Asian countries, for example, under the guise of their being recoverable or recyclable waste. The lead may be recovered, but acids and other battery contaminants are dumped into the environment.

Meanwhile, illicit traffic in toxic waste is spreading throughout the Pacific. In the last few years, Singaporean officials have fought off several attempts to offload illegally shipped hazardous wastes collected from around the region. This widespread practice is often overlooked in large Asian ports, but must be addressed.

The State of Regulation

Enforcement of hazardous waste regulations is compromised by the same corruption that often undermines enforcement of other environmental regulations. This issue, however complicated and culturally nuanced, is not sufficiently out in the open. The environmental agencies are not necessarily to blame for

lack of enforcement. Government offices responsible for increasing economic output often have greater influence.

One way in which governments try to control waste pollution is to require that factories pay a fee in order to discharge waste directly into the environment. The intention is to make it too expensive to pollute. While the strategy is sometimes successful, too often the result is simply more corruption among regulators. Only tighter enforcement of regulations, and a justice system willing to back it up, will stop the cycle of corruption and pollution.

Interestingly, even the private sector is starting to complain. An October 1996 survey conducted in the Philippines by the local Chambers of Commerce of the United States, the European Union, and Canada concluded: "The lack of commitment to enforce environmental standards in industry and provide facilities for the proper treatment and disposal of industrial wastes would be a discouragement to foreign companies to invest here and/or expand their current presence in the Philippines."

Preventing Pollution

With disposal so problematic, it makes sense to create as little hazardous waste as possible. In the United States, some larger companies, notably DuPont, Monsanto, and 3M, have seen spectacular reduction of hazardous waste generation. DuPont has recently announced a policy goal of "zero discharge" and 3M has reduced its hazardous waste generation by over 500,000 tons per year, saving hundreds of millions of dollars. New research, technology, and policies have markedly reduced the generation of hazardous waste by these businesses, and have made them more profitable.

Unfortunately, these examples are not typical, and pollution prevention so far has been more talk than action. Referring to its *Toxics Watch 1995* report, INFORM President Joanna Underwood concluded: "There's no question that what we are seeing suggests that a serious approach to pollution prevention—source reduction—isn't instilled in the chemical industry."

Pollution prevention is nevertheless a buzzword in Asia, especially among young, visionary environ-

Illicit traffic in toxic waste is spreading throughout the Pacific

mental engineers. Some countries have experimented with formal pollution prevention programs, incentives, and pilot projects. These initiatives, unfortunately, seem to have met with fates similar to many of those in the West. Director General Tan Meng Leng, of the Malaysian Department of the Environment has complained that his department's pilot project aimed at reducing hazardous waste generation in certain large industries was a failure.

Despite the good intentions of pollution prevention programs, many of them have failed because of several common problems: a misperception by industry that they must completely re-tool their processes, lack of experience with management solutions such as purchasing alternatives, and market entrenchment of technologies such as incineration and landfilling. Research shows that the most marked reduction of hazardous waste generation is accomplished by changing basic housekeeping, providing incentives for employees to participate in pollution prevention, and more importantly, changing management attitudes.

Newly industrializing Asian governments seem to be missing their chance to articulate firm policies on pollution prevention. Establishing these policies would give older factories an incentive to employ pollution control techniques, increasing their efficiency and competitiveness and reducing the need for costly cleanup later. It would also attract clean technology early in the country's economic development.

The Pressure Is On

Many environmental organizations in Asia focus on toxic and hazardous waste issues. While U.S. law allows public access to environmental information, many Asian countries forbid it. Data on multinational companies' environmental records are available through the Internet, but are often buried in corporate reports, shareholder resolutions, and lawsuits.

The 1996 survey of hazardous waste management indicated that virtually every Asian country has "public activism" regarding hazardous waste but just over one half "allow" public input on the issue. This tendency to shut out the public may change as citizens acquire more information via the Internet and put pressure on the authorities.

Frustrated with poor enforcement of hazardous waste laws, citizens in many countries, including Indonesia, Vietnam, China, and Taiwan, have taken to eco-vigilantism. Often with the cooperation and advice of employees inside offending facilities, they have disrupted manufacturing and even closed factories. In Taiwan, such citizen action has become a regular if unorthodox enforcement mechanism.

In China, environmental demonstrations are on the rise, and even the *China Environment News*, a government publication available worldwide, has begun to cover them. In one recent case, residents dug a moat around a chemical factory alleged to have discharged its hazardous waste into surrounding farmland. The moat prevented trucks from moving in and out of the plant, and the factory was shut down.

Conclusion

Hazardous waste in Asia is not getting the attention it deserves. Asian leaders have a chance to make pollution prevention a cornerstone of industrial policy at an early stage of economic development, rather than playing an expensive cleanup game later, as in the West. Remediation technologies developed in the West will be of some use in Asia, but they should not be relied upon to solve all problems. Indeed, new worries over the dangers of even very low levels of chemical exposures give added urgency to preventing pollution in the first place. Changing attitudes toward hazardous waste in Asia will require the political will of those at the highest level.

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