A Green Venture Fund to Finance Clean Technology for Developing Countries

Darius Nassiry and David Wheeler

Abstract

Climate negotiators in Cancún reached agreement that long-term climate finance will include a commitment by developed countries to mobilize US$ 100 billion per year to help developing countries combat climate change. However, that level of investment will require substantial capital from private investors, particularly for innovation and commercialization. We propose a public-private green venture fund (GVF) to promote development and deployment of low-carbon technologies for developing countries. The GVF will use a fund of funds model backed by public "cornerstone" equity. In this paper, we propose a structure for the GVF and explain the design rationale, operating principles and key parameters for two funds of funds for technology innovation and deployment. We also highlight some key issues to be considered, including differential treatment of public and private investors and possible approaches to setting technology priorities.

Center for Global Development
www.cgdev.org

Working Paper 245
March 2011

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CGD is grateful for contributions from the UK Department for International Development in support of this work.

Darius Nassiry and David Wheeler. 2011. "A Green Venture Fund to Finance Clean Technology for Developing Countries." CGD Working Paper 245. Washington, D.C.: Center for Global Development.
http://www.cgdev.org/content/publications/detail/1424898

The authors thank CGD colleagues Ben Leo, John Simon, and Jan von der Goltz for their helpful comments and Matt Hoffman for his assistance in preparing this paper. We are also grateful to Michele de Nevers for her invaluable comments and thank Simon Johnson at the Massachusetts Institute of Technology for his feedback and suggestions. For useful information and insights, our thanks (in alphabetical order by organization) to Lucy Heintz and Ritu Kumar, Actis; Toru Kubo, Asian Development Bank; Tim Mills, Capital for Enterprise Limited; Hywel Rees-Jones, CDC Group; Kirsty Hamilton, Chatham House; Peter Storey, CTI-PFAN; George McPherson, Global Environment Fund; Nick Rouse, Emerging Africa Infrastructure Fund; Ulrich Grabenwarter, European Investment Fund; Cyrille Arnould, Global Energy Efficiency and Renewable Energy Fund; Corinne Figueredo, IFC; Peter Rossbach, Impax Asset Management; Mark Davis, Norwegian Investment Fund for Developing Countries (Norfund); Ryan Glenn Anderson, Norwegian Agency for Development Cooperation; Andrew Reicher, Private Infrastructure Development Group; Jonathan Maxwell, Sustainable Development Capital LLP; Ashley Smith, Martin Johnston and Ian Cook, UK Carbon Trust; Eric Usher, UNEP Finance Initiative; Vince Reardon, REEEP; and Rob Wylie, WHEB Ventures. While comments and suggestions were gratefully received, this does not indicate that these individuals or their organizations endorse this proposal or its conclusions. The authors are responsible for any remaining errors of fact or interpretation.

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1. Introduction

As global temperatures reach record levels[1] and the link to greenhouse gas emissions becomes increasingly evident,[2] there is an urgent need to promote low-carbon economies in developing countries whose emissions are growing rapidly.[3] Holding the global average temperature increase below 2°C[4] will require significant new investment in development and deployment of clean energy technologies. Recent estimates of the required investment include USD 60 billion per year in 2020,[5] USD 139-175 billion per year over the next two decades,[6] and over USD 400 billion a year between 2010 and 2030, rising to over USD 1 trillion per year from 2030 to 2050.[7,8,9]

In addition, new technologies will be needed to expand the portfolio of clean energy technology options and reduce the costs of existing technologies. For example, an IEA scenario in which global energy-related CO2 emissions decline to half their 2005 levels by

[1] See NASA (2011)

[2] See National Academy of Sciences (2010).

[3] See Wheeler and Ummel (2007).

[4] See Stern (2006), Chapter 16, page 393; Barker et al., page 653; and World Economic Forum (2009b), Summary of Recommendations, page 9; and Deichmann et al. (2010).

[5] See Project Catalyst (2010a), page 1; and Project Catalyst (2010b), pages 4 and 16.

[6] See World Bank (2010), page 257; World Bank (2009); and, Huhtala and Ambrosi (2010). The IEA (2009) estimates that incremental investment in non-OECD countries would total USD 197 billion in 2020; see page 295.

[7] See the BLUE Map scenario in International Energy Agency (IEA) (2010b), pages 47 and 53 and 565.

[8] Separately, the IEA (2010a) estimates the global incremental cost of achieving their 450 Scenario compared to their Current Policies Scenario amounts to USD 18 trillion over 2010 to 2035. The incremental cost relative to their New Policies Scenario amounts to USD 13.5 trillion over the forecast period; see pages 62, 400 and 410.

[9] The UNFCCC estimates USD 267-670 billion per year will be needed in additional costs for development, deployment and diffusion of mitigation technologies. See UNFCCC (2009c), Table 7, page 24 and paragraph 95, page 25. Also see UNFCC (2009b), Table IV-17, page 59.

2050 assumes the commercial availability and deployment of many new technologies.[10] Rapidly-expanding private investment will be essential for significant progress on this front. Acknowledging this reality, the UN climate agreement reached in Cancún highlighted the need for private capital when it confirmed that mobilizing USD 100 billion per year by 2020 will require funds that "may come from a wide variety of sources, public and private, bilateral and multilateral."[11] In this effort, venture capital (VC) can play a critical role in the early and growth stages of clean technology investment, while private equity (PE) and infrastructure fund investments can contribute to financing deployment of later-stage, more mature technologies.[12]

Despite the need for increased private financing, critical financing gaps limit private investment in clean technology.[13] In comparison to options in other sectors, investment in early-stage clean technology innovation is hindered by longer investment periods before exit, more capital-intensive development that requires large follow-on financing, smaller investment sizes coupled with similar due diligence costs and management fees, and higher execution risks than later-stage financing.[14] As a result, VC investment in clean technology has tended to focus on later stage investments or follow-on financing, not early-stage deals.[15] Many new technologies also face a 'valley of death' at commercialization because they are too capital intensive for VC investors, but have technology or execution risks that are too high for PE and project finance investors.[16] This is a particular obstacle for clean energy because of substantial capital requirements for commercialization of energy projects.[17] Even after commercialization, lack of access to risk capital, project scale, and gaps in business skills remain significant barriers to investment for widespread deployment. These challenges

[10] See IEA (2010b), pages 69-70.

[11] See UNFCCC (2010), paragraphs 98 and 99. Also see the Secretary-General's High-level Advisory Group on Climate Change Financing (2010a), page 5.

[12] See Appendix B for the definitions of venture capital and private equity used in this paper. For an overview of different forms of financing for renewable energy,see Justice et al. (2009).

[13] Clean technology encompasses renewable and low-carbon energy (generation, storage, efficiency and infrastructure), as well as other clean technologies (agriculture, water and wastewater, air and environment, recycling and waste, manufacturing/industrial, transportation and logistics, and advanced materials); see Appendix C for a summary description of clean technologies.

[14] See New Energy Finance and UNEP (2008) and Crespo (2008).

[15] In 2010, early stage VC deals in clean technology totaled USD 2.1 billion, compared to late stage VC and private equity expansion capital totaling USD 6.6 billion. See Bloomberg New Energy Finance (2011c).

[16] See New Energy Finance (2009). Also see Berlin (2010).

[17] See New Energy Finance and UNEP (2008), page 22; and Clean Energy Group and Bloomberg New Energy Finance (2010). Also see Grubb (2004).

are compounded in developing countries,[18] where investors seek higher rates of return to compensate for higher perceived risks, including the absence of stable, supportive policies and well-functioning legal and regulatory systems, lack of creditworthy counterparts, and inadequate infrastructure[19,20]

Global investment in clean energy reached USD 243 billion in 2010 (up 30 percent from 2009). This included VC and PE investment of USD 8.7 billion (up 28 percent from 2009)[21], with early stage VC attracting USD 2.1 billion and later-stage VC and PE USD 6.6 billion.[22] Significantly more capital has flowed to deployment-stage investments in industrialized countries and rapidly growing emerging markets, particularly China, than in low-income countries in Africa and other regions.[23]

Still, clean energy investment has been limited because many technologies are in the innovation stage and have not yet achieved learning and scale economies. Public subsidies will be needed to accelerate innovation and investment, promote learning and scale economies, and progressively reduce costs to the point where commercialization and deployment of low-carbon technologies become attractive to more private investors.

Mobilization of public funds has begun, with some grants and subsidized loans for pre-commercial technology development,[24] advance market commitments for technology deployment,[25] and prize competitions for technology innovation.[26] Numerous proposals have

[18] For example, see Vincent (2009). Also see Deutsche Bank Climate Advisors (2009a) and (2009b).

[19] See Bird (2009) and UNEP (2009b). Ritchie (2009) finds that "incremental costs of readiness are potentially material and likely to impair the deployment of low-carbon technologies in developing countries" because of proportionately higher preparation costs for smaller project sizes; higher costs to implement 'first mover' transactions; and higher costs of capital.

[20] See UNEP and Partners (2009), UNEP SEFI (2007) and World Economic Forum (2010) and (2009). For discussion of policy issues related to scaling up renewable energy in developing countries, see Hamilton (2010) and (2009).

[21] See Bloomberg New Energy Finance (2011a) and (2011b).

[22] See Bloomberg New Energy Finance (2011c).

[23] For example, see UNEP and Bloomberg New Energy Finance (2010), figures 26 and 37.

[24] The Clean Technology Fund administered by the World Bank "promotes scaled-up financing for demonstration, deployment and transfer of low-carbon technologies"; see http://www.climateinvestmentfunds.org/cif/node/2

[25] For example, on DFID's initiative on AMCs for low carbon energy; see http://www.dfid.gov.uk/Global-Issues/Policy-and-Research/Climate-and-environment/Climate-Change/Low-Carbon-Advance-Market-Commitments/ and http://www.dfid.gov.uk/r4d/SearchResearchDatabase.asp?OutputID=184268

also advocated public interventions to reduce barriers to investment in clean technology innovation, commercialization and deployment.[27] In this complex environment, no single public sector intervention represents a 'silver bullet'.[28] However, success is more likely for public interventions that are designed to be compatible with and reinforce private investment incentives.

2. Proposal for a green venture fund

In an effective, incentive-compatible strategy, public-sector participants should leverage their funds to guide private-sector investment without attempting to dictate its precise path. An appropriate strategy must tackle two key challenges for low-carbon growth: (1) under-investment in clean energy innovations that have potential applications in developing countries; and (2) under-investment in deployment of commercially-available clean energy technologies in developing countries. To address both issues, we propose a public-private green venture fund (GVF) that will use a fund of funds structure[29] – a two-tiered approach to mobilize the resources, insight and experience of the private VC and PE communities.

In the proposed GVF, public investors participate in a limited number of privately-managed funds of funds that, in turn, invest in clean technology innovation and deployment. Our model incorporates elements from recent donor-backed investment programs[30] and complements several venture fund concepts,[31] including subordinated equity funds,[32] a government corporation to support private investment in early-stage commercialization,[33]

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[26] See http://cep.mit.edu/ and http://micleanenergyprize.com/; other examples include http://www.xprize.org/future-x-prizes/energy-and-environment and http://www.zayedfutureenergyprize.com/.

[27] For a summary of potential policy mechanisms, see World Economic Forum (2010), pages 38-47; Secretary-General's High-level Advisory Group on Climate Change Financing (AGF) (2010b), pages 11-12; International Energy Agency (2010), pages 12-13; also see UNEP and Partners (2009), pages 6-7.

[28] See Secretary-General's High-level Advisory Group on Climate Change Financing (2010b), pages 1-2.

[29] A fund of funds makes investments in other funds, rather than making investments directly in portfolio companies. See Metrick (2007), page 541.

[30] In particular, see the UK Innovation Investment Fund and California initiatives described in Appendix F.

[31] For example, see: UNEP SEFI (2007), page 33; Tirpak and Staley (2008); Racine (2009); UNEP (2009a); UNFCCC (2009c), page 67, paragraph 259(b); UNFCCC (2009b), page 73, Table IV-22; World Economic Forum (2009b), page 70; and, World Bank (2010), page 301.

[32] See Global Climate Network (GCN) (2010), and Center for American Progress and (GCN) (2010a) and (2010b).

[33] See Jamison (2010), page 16; for a description of the Clean Energy Accelerator Corp., also see http://climateinc.org/2009/08/the-clean-energy-accelerator-corp/.

and a public/private commercialization fund in which public investors receive capped returns.[34]

Specifically, the GVF will comprise two funds of funds, each backed by 'cornerstone' public investment to be matched or exceeded by private capital:

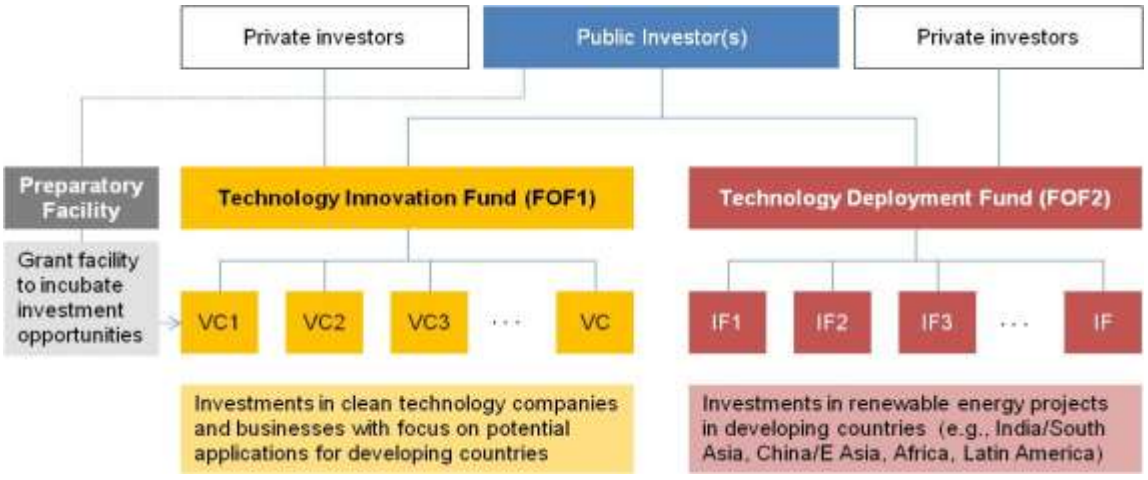
- A Technology Innovation Fund will provide capital to expand investment in clean technology innovation, particularly early-stage investment in clean energy technologies. It will invest in a group of clean technology VC portfolio funds that invest in clean technology companies, with a focus on commercialization of clean and low-carbon energy technologies with potential applications for developing countries.

- A Technology Deployment Fund will provide capital to increase private investment in deployment of existing clean energy technologies in developing countries. It will invest in infrastructure funds (IF) that invest in low-carbon energy and clean technology companies and projects in developing countries on a regional basis (e.g., India/South and South East Asia, China/East Asia, Africa, and Latin America). We subsequently refer to the VC and IF funds as Portfolio Funds.

- The GVF will also include a Preparatory Facility to support business incubation and project preparatory activities as a way to help ensure adequate deal flow.

The proposed structure of the GVF is depicted in Figure A below.

Figure A. Proposed structure of the GVF



[34] See Yanosek (2011).

3. Design Rationale

Since the proposed GVF uses an existing market mechanism, it will enable public investors to pursue key innovation and deployment objectives while focusing private investors' attention and capital on relevant clean technologies. This approach also leverages private capital more effectively than public participation in a single fund, or in direct standalone investments. As a recent LSE report noted: "Banks do not generally provide equity financing and the type of investment community that does so in the developed world is hardly present in developing countries. Equity-focused public financing mechanisms are therefore needed that are either structured as *funds* that can take direct investments in companies and projects, or as *'funds of funds'* (which can also be referred to as cornerstone funds) that invest in a number of commercially managed funds, each of which then invests in projects or companies. The cornerstone funds approach can be more catalytic, leveraging private capital both into the fund itself and later into the investments that the fund makes." [35]

The Technology Innovation Fund and Technology Deployment Fund complement each other. Both phases of the process are necessary for promoting clean energy, and both are under-capitalized. As the UNFCCC notes, "Public finance is particularly important at the earlier stages of the technology development process, and currently no international public finance is available for these stages. It is equally important that public finance is used to support the rapid uptake of clean technologies in the deployment and diffusion stages by leveraging the maximum amount of private finance possible."[36]

While funds of funds typically give their fund managers sole authority to make investment decisions, they may have advisory boards of limited partners who provide guidance to the fund managers. Public investors can identify potential synergies between the two GVF funds of funds by requiring cross-representation on their advisory boards. For the Deployment Fund, this will provide an early view of promising new technologies for future scale-up. The Deployment Fund may also provide a potential exit for some Development Fund investments if they are ready for commercial deployment, which will depend on the timing of investment decisions, the stage of technology maturity, market conditions and other factors.

The proposed fund of funds approach can also complement other donors' efforts. For example:

[35] See Stern (2009), Section 4 – Spending public finance to leverage private investment: specific instruments for specific challenges, page 15.

[36] See UNFCCC (2009b), page 70, paragraph 304.

- The IFC invests directly in clean technology venture funds, focusing on later-stage investments, in addition to lending money directly to clean technology companies.[37]

- In Asia, the Asian Development Bank (ADB) is investing up to USD 100 million in five clean energy-focused private equity funds and may launch a similar clean energy venture fund.[38] In addition, DFID, ADB and IFC are currently in the design phase with institutional investors to develop a Climate Public-Private Partnership (CP3) to mobilize private investment in low carbon energy and resource efficient infrastructure in Asia.[39] According to press reports, the CP3 began in early 2011 to tender for asset managers "to run a private equity, green infrastructure fund of funds in Asia, with co-investment rights for other capital providers such as pension funds."[40] The CP3 concept resembles a fund of funds structure focused on deployment stage investments and builds on a World Economic Forum blueprint: "Donors contribute toward the cornerstone equity, attracting institutional investors to invest alongside them. Private fund managers bid for parcels of the equity and build their funds accordingly. [International financial institution] risk reducing mechanisms are applied at the Fund scale."[41]

- In Europe, the Global Energy Efficiency and Renewable Energy Fund (GEEREF), a EUR 108 million fund of funds, has taken a policy-driven approach[42] with a number of constraints on investments: "GEEREF primarily invests (between 10% if no less than €2mln, and 50% if no more than €20mln) in [renewable energy] and sustainable energy infrastructure funds [whose] focus is mainly on sub-investments in equity (or quasi-equity) below €10mln."[43] Launched in 2008 as a public-private vehicle, GEEREF has not attracted private capital to date. Separately, Germany's Federal Ministry of the Environment and KfW Entwicklungsbank recently set up a global climate protection fund with USD 100 million and the aim of raising USD 500 million over the next five years, to support investments in energy efficiency and renewable energy by small and medium-sized enterprises (SMEs) and households in developing countries.[44]

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[37] See http://www.ifc.org/ifcext/gict.nsf/Content/Cleantech.

[38] See ADB (2008), Sethuraman (2009, and Sato and Okada (2010) .

39 See Bretton Woods Project (2010).

40 See Wheelan (2011).

[41] See Wraughay (2010).

[42] See http://geeref.com/pages/home. Also see Bird (2009), Behrens (2009), and Commission of the European Communities (2006a) and (2006b).

[43] See United Nations Economic Commission for Europe (2010), page 17.

[44] See BMU and KfW Entwicklungsbank (2010).

- In the U.S., the Overseas Private Investment Corporation (OPIC), which supports U.S. investment in emerging markets by providing loans and loan guarantees, including long-term debt to private equity funds, has invested in clean energy and water funds.[45] OPIC recently announced that it will provide at least USD 300 million in financing for new private equity funds that could ultimately invest more than USD 1 billion in renewable resources projects in emerging markets. The financing will be in the form of loan guarantees between USD 35-150 million per fund, with OPIC's investment representing up to 33% of a fund's total capitalization.[46] OPIC aims to invest in funds focusing on "renewable energy, resource efficiency, and the preservation of scarce natural resources," particularly funds that "focus more on growth or expansion private equity investments than seed or early-stage technology investments."[47]

Our proposed GVF will also complement the Clean Technology Fund (CTF) that is administered by the World Bank as part of the Climate Investment Funds. The CTF promotes demonstration of low carbon development and mitigation of greenhouse gas emissions through public and private sector investments, and supports low carbon programs and projects that are embedded in recipient countries' national plans and strategies.[48]

Our proposed use of public cornerstone investment is also consistent with recent research which suggests that government-backed funds perform at least as well as funds that do not have government support. A 2009 study reviewed the experience of 28,800 high technology firms across 126 countries that received government support through direct provision of venture capital via government-owned VC funds (GVC), government investment in independently managed VC funds (partial GVC), or provision of subsidies or tax concessions to venture capitalists (indirect GVC): The study concludes that "Enterprises with moderate government venture capital (GVC) support outperform enterprises with only private venture capital (PVC) support and those with extensive GVC support, both in terms of value creation and patent creation."[49]

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[45] See http://opic.gov/investment-funds/full-list.

[46] See http://opic.gov/news/press-releases/2009/pr120610, http://opic.gov/investment-funds, http://opic.gov/investment-funds/description

[47] See http://www.opic.gov/investment-funds/calls-for-proposals/global-renewable-resources-funds

[48] For additional detail on the CTF, see http://www.climateinvestmentfunds.org/cif/keydocuments/CTF and http://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/Clean_Technology_Fund_paper_June_9_final.pdf

[49] See World Economic Forum (2009a), Executive summary, page viii, and page 37.

4. Operational Elements

In the proposed structure, public investors will provide anchor or 'cornerstone' equity investment in each GVF Fund of Funds (FOF). This 'cornerstone' investment will make the public investors strategic, founding limited partners (LP) in each FOF.

- Public investors will invest 25-50 percent of total capital in each FOF on a *pari passu* basis with private investors, which will invest the remaining 50-75 percent of capital.[50]

To identify and select qualified FOF managers, the public investors or their advisors will issue a request for proposals (RFP). The RFP will specify a competitive process through which the public investors will identify and select qualified private fund managers (Fund Managers) for each FOF. The RFP will specify the target capitalization, geographic focus, technology priorities and other related terms and conditions for each of the FOFs.

The RFP will also describe the strategic and financial objectives of each GVF FOF and request prospective fund managers to describe in their proposals how they will achieve these objectives. The objectives will provide an overall policy framework for both the Technology Innovation Fund and the Technology Deployment Fund that includes:

- Achieving competitive financial returns;

- Creating diversified clean energy investment portfolios in early-stage (FOF1) and deployment phases (FOF2) of technology development;

- Increasing private investment in early-stage investments in clean energy technologies with potential applications in low-income developing countries (FOF1); and,

- Expanding deployment of clean energy technologies in new markets in low income and developing countries (e.g., India/South and South East Asia, China/East Asia, Africa and Latin America) (FOF2).

[50] Capital invested by investors may be in the form or equity, debt or mezzanine debt; generally we have assumed that public investors would invest equity in order to be on equal footing with private investors in each Fund of Fund. *Pari passu* means both sets of investors have the same rights and privileges.

The Fund Managers will mobilize and manage private investment in their respective FOFs.

- The managers of each FOF will obtain investment commitments from private investors, including institutional investors, pension funds, and high net worth individuals. They will make investments that are consistent with the strategic and financial objectives of the GVF, manage their FOF on commercial terms, and implement exits that maximize financial returns for investors.[51]

- In legal terms, each Fund Manager will be the general partner (GP) of his/her respective FOF. Private investors in the Technology Innovation Fund or Technology Deployment Fund will be limited partners (LP) of each FOF.

In addition, to help ensure bankable opportunities, the GVF will include a Preparatory Facility supported by grant funds from public investors, particularly for early-stage innovation.

- Following standards agreed with Fund Managers, the public investors will let them apply to the Preparatory Facility if they believe a potential target company needs business incubation or project preparation services.

- If a Fund Manager identifies a potential target that requires incubation before it is ready to receive investment, the Manager can direct the company to the Preparatory Facility.

- In the initial stage, the estimated cost of the Preparatory Facility will be approximately USD 10-20 million in grant funding from public investors.[52] This amount will be substantially higher if preparatory activities include FOF2 investments, which will require more feasibility studies, environmental impact reports, and financial structuring.

[51] FOF managers should not receive special fees for directing more funds to the policy target areas, as such an approach could pose a conflict of interest that would deter private investment. The public investors should also carefully consider the potential for conflict of interest in offering co-investment opportunities to the Fund managers alongside target investments.

[52] Cost estimates are based on indicative costs of activities from the Carbon Trust (2008), Appendix A, page 22. We estimate $100,000 per company to support business incubator services for 10-20 companies per year (or one company per Portfolio Fund, assuming 10-20 Portfolio Funds) over a period of five years.

5. Principal Benefits

The principle benefit of the proposed fund of funds structure – in contrast to public participation in portfolio funds or direct investment in companies – is risk diversification. As the Stern Review notes: "The uncertainties and risks both of climate change, and the development and deployment of the technologies to address it, are of such scale and urgency that the economics of risk points to policies to support the development and use of a portfolio of low-carbon technology options."[53] Investors at the FOF level will benefit from a broad portfolio by investing in a number of funds, each with different managers, investment strategies, and exposure to different companies. FOF investors will also gain exposure to different 'vintage years' as each Portfolio Fund enters, manages and exits portfolio companies at different times.

Among its other benefits, the proposed FOF structure also:

- Offers the GVF higher potential leverage in attracting private capital than direct public investment in individual VC or infrastructure funds, as private investors invest at both the FOF and portfolio levels;

- Leverages and expands the expertise of private investment fund managers as they identify clean technology investment opportunities in developing countries, while educating the managers about potential returns from these opportunities;

- Allows public investors to promote investment in and gain access to a diversified portfolio of clean technology companies, creating options to co-invest in companies that offer specific clean technologies; and,

- Offers the potential for repayment of public investments, which can reduce the fiscal burden for taxpayers or enable recycling of the funds into additional clean technology investments.

For private investors and fund managers, the proposed cornerstone fund structure:

- Enables private fund managers selected by the FOF managers to reach their capital targets with less private capital and thereby reach 'first close' faster;

[53] See Stern (2006) Chapter 16, page 393.

- Allows private investors to make smaller investment commitments, while still allowing growing companies to raise enough capital to develop their new technologies;

- Provides access to the public investors' network of relationships with multilateral and bilateral donors and other institutions, which may offer additional support such as direct debt or equity investments, political risk insurance, loan guarantees or carbon finance; and,

- Helps foster development of an 'ecosystem' of venture capital and private equity professionals and technology entrepreneurs focused on potential investment opportunities in low income and developing countries.[54]

For public investors, the proposed approach:

- Increases private financing of clean energy technologies, particularly early-stage investments, including technologies with potential applications in low income and developing countries;

- Mobilizes and directs private investment capital on the margin toward clean energy technologies with applications for these markets;

- Builds on lessons learned from previous public efforts to promote innovation, including focusing on technologies that may not be currently popular among VC investors, and emphasizing early-stage investments when private investors are funding later-stage firms;[55]

- Expands the number of qualified fund managers who can identify and invest in clean energy technologies that are relevant for developing countries;

- Broadens recognition of clean-technology investment opportunities in developing countries; and,

- Accelerates innovation and investment, promotes learning and scale economies, and progressively reduces clean energy technology costs, thereby lowering the cost of climate change mitigation.

[54] For discussion of potential benefits of publicly-backed funds of funds, see European Venture Capital Association (2010a) and (2010b).

[55] See Lerner (2009) and (2002).

6. Key Fund Parameters

This section describes the target capitalization, size of investment, geographic focus, and investment term of the Technology Innovation Fund and Technology Deployment Fund.

6.1 Technology Innovation Fund

a. Target capitalization

The target capitalization of the Technology Innovation Fund in the initial stage will be USD 100-200 million, which will permit investments of approximately USD 10-20 million in 10-20 VC Portfolio Funds. Assuming an average investment of USD 100 million in each VC Portfolio Fund and 10 VC Portfolio Funds, this will mobilize USD 1 billion in investment and give the Technology Innovation Fund a share of about 10 percent in 20 VC Portfolio Funds – enough for a meaningful share of each Fund manager's capital base and an incentive for each manager to respect the policy framework and investment priorities set by the public investors.

b. Stage of investment

The Technology Innovation Fund will invest in Portfolio Funds that invest in companies in the spectrum from early to late stage, with an emphasis on early-stage investment. This will help ensure that the GVF 'crowds in' private capital which, as previously noted, has recently tended to favor lower-risk, later-stage investment opportunities.

c. Geographic focus

The Technology Innovation Fund will invest in VC Portfolio Funds in markets where technology venture capital is most active, specifically, the UK, Europe and North America[56] – i.e., markets where investors are likely to identify investments with superior financial returns within the policy framework specified by the public investors. This approach departs from the view that VC investment intended to help developing countries must focus on VC funds or investment opportunities in developing country markets. It also recognizes that both private capital and opportunities to invest in technology innovation are predominantly located in developed country markets, where institutional, legal and regulatory systems

[56] For example, see Preqin (2010), page 2.

support innovation, and where financial and capital markets offer investors better opportunities to enter and exit investments.

Early stage companies will probably not focus on geographic regions, concentrating instead on end-markets which promise early profitability, even if they are not in developing countries. Public investors will therefore need to specify sufficiently broad policy objectives as a framework for private investment, because early stage companies cannot (and should not) emphasize policy over profitability or they will risk losing private investors' support.

The Technology Innovation Fund may also invest on a selective basis in emerging market economies, such as China and India, which produce a growing share of global carbon emissions. These markets also have nascent VC activity and offer promising potential opportunities for early-stage clean technology investments.

As an indication of the number of potential fund targets for investment, as of early 2011 over 130 VC funds are either raising capital or reaching first or second close for investments that include clean technology or renewable energy.[57] Of these, approximately 30 funds are focused on the U.S., a similar number on Europe, and some on opportunities in China or India.[58]

d. Term of investment

The Technology Innovation Fund in the initial stage will have a term of 15 years: 5-7 years to invest in its Portfolio Funds, and 7-8 years for exit.

6.2 Technology Deployment Fund

a. Target capitalization

The target capitalization of the Technology Deployment Fund in the initial stage will be USD 1-2 billion, which will permit investment of approximately USD 100-200 million in 10-20 infrastructure Portfolio Funds. This capitalization reflects higher capital requirements at the

[57] Source: Preqin funds in markets focused on clean technology or renewable energy (data as of February 2011). Includes funds classified by Preqin as: Early stage; Early stage (Seed); Early stage (Start up); Growth; Late Stage; Natural Resources; and, Venture (General). Excludes: Balanced; Buyout; Co-Investment; Direct Secondaries; Fund of Funds; Hybrid; Infrastructure; Mezzanine; Real Estate; Special Situations; Unknown; and Venture Debt.

[58] Ibid. and authors' analysis. See Appendix G.

deployment stage, as compared with the innovation stage. Assuming an average size of USD 100 million for a 10 percent share in 10 infrastructure Portfolio Funds, this will mobilize USD 10 billion in capital and give the Technology Deployment Fund a meaningful position in focusing Portfolio Fund managers' attention on the framework and priorities set by the public investors.

b. Stage of investment

The Technology Deployment Fund will invest in Portfolio Funds that invest in companies or projects at the stage of commercial deployment (i.e., at a point where technology risk is not a primary concern because the technology is proven). The additional resources from the Technology Deployment Fund will help these Portfolio Funds reach financial close faster and expand their investment portfolios in their target developing countries sooner than would otherwise be possible.

c. Geographic focus

The Technology Deployment Fund will invest in regional infrastructure Portfolio Funds with an initial emphasis on Asia, specifically China/East Asia and India/South East Asia. These regions offer the potential for strong investment returns because of their high projected growth rates and opportunities to invest in clean technology projects. According to a recent survey, China and India rank among the top five markets worldwide in investor attractiveness for renewable energy,[59] because of government-led commitments to renewable energy deployment, high projected growth rates and rapidly-growing demand for energy.

The Technology Deployment Fund may also invest selectively in other regions, such as Sub-Saharan Africa, depending on availability of attractive investment opportunities.

As an indication of the number of potential fund targets for investment, as of early 2011, over 40 infrastructure funds are either raising capital or have reached first close worldwide.[60] Of these, approximately 20 are focused on countries or regions outside of the U.S. and Europe, with over a dozen including renewable energy as an industry preference.[61]

[59] See Ernst & Young (2010), page 9. See Appendix D for overall results of the survey.

[60] Source: Preqin infrastructure funds database (data as of February 2011). Includes infrastructure classified by Preqin as: Debt/Mezzanine; Mezzanine; and, Primary. Excludes: Fund of Funds; Real Asset Fund of Funds; or Blank.

[61] Ibid. and authors' analysis. See Appendix H.

d. Term of investment

The Technology Deployment Fund in the initial stage will have a term of 15 years: 5-7 years to invest in its Portfolio Funds, and 7-8 years for exit.

7. Key Issues for Consideration

Key issues for the GVF include how to set technology priorities, and whether to subordinate public investors to private investors or differentiate their treatment.

7.1 Setting Technology Priorities

Technology selection will be a critical issue for the GVF, as private investors will focus on financial returns and public investors will consider development impact. Private investors view clean technology as an opportunity that reflects long-term drivers: climate change, resource scarcity, urbanization, business sustainability, and environmental awareness. The fund of funds approach will serve clean technology policy objectives if it can find a sufficient number of portfolio funds whose investments are related to these overarching objectives.

The GVF will only succeed if public investors design policy frameworks that provide sufficient flexibility for fund managers to seek competitive returns. Policy frameworks will be codified in Limited Partnership Agreements with FOF managers. In setting the frameworks, public investors can frame technology priorities in a number of ways, including:

- **Technology transfer priorities.** According to the UNFCCC technology needs assessments, the highest priorities should be assigned to renewable energy technologies, energy efficient appliances, agricultural crop management, forest, water and land management, transportation vehicles, and waste management. Among renewable energy technologies, solar photovoltaic (grid and off-grid) is the UNFCCC's first choice, followed by wind turbines and biomass.[62]

- **Potential greenhouse gas abatement.** According to McKinsey, opportunities exist for cost-effective greenhouse gas abatement in energy efficiency (including improvements in vehicles, buildings and industrial equipment), low-carbon energy supply (including electricity production from wind, hydropower, and biofuels), and terrestrial carbon

[62] See UNFCCC (2009d), pages 20-25.

(including forestry and agriculture).[63] These cost-effective options may be attractive from both public and private investment perspectives.

- **Low-carbon technologies based on stage of development.** According to the World Bank, greenhouse gas emissions can be reduced by accelerating deployment of existing mitigation technologies, but breakthroughs in energy efficiency, carbon capture and storage, renewables and nuclear power are needed to achieve more ambitious medium-term emissions targets.[64] From this perspective, investments in viable technologies – such as second generation biofuels, concentrating solar power and electric vehicles – may be suitable candidates for the Technology Innovation Fund. Similarly, commercially viable technologies – such as solar photovoltaic, wind, geothermal, and building, transport or industrial energy efficiency – may be suitable priorities for the Technology Deployment Fund.[65]

- **Technologies and stages of investment not currently popular among VC investors.** According to recent data, top sectors for private VC investment in clean technology in 2010 were solar energy, transportation and energy efficiency.[66] According to a 2009 survey of institutional investors with approximately $1 trillion in assets under management, clean technology investment themes of interest were renewable energy (97%), energy efficiency (64%), and water (49%).[67] To maximize long-term value for developing countries, public investors may wish to focus attention on high-potential technologies that are relatively neglected by private investors.

Target-setting by public investors can focus on a variety of objectives, including fixed investment values, numbers of investments, or portfolio shares. Public investors will be well-advised to use the definitional framework employed by private clean technology investors.[68] Drawing on the considerations noted above, Table 1 provides illustrative clean technology investment targets for each Fund of Funds. These targets may strike a balance between public and private interests. The ranges are indicative, and are intended to serve as a starting point for discussion between public investors and potential private fund managers about investment targets.

[63] See McKinsey & Company (2009), pages 7-19.

[64] See World Bank (2010), page 289.

[65] See World Bank (2010), page 207, Figure 4.11.

[66] See Cleantech Group (2011).

[67] See Deutsche Bank (2010).

[68] See Appendix C for descriptions of clean technology segments.

Table 1. Indicative ranges for technology priorities

Technology segment	Indicative target (as a percentage of total investment)
Clean and low-carbon energy (including energy generation, energy storage, energy efficiency and energy infrastructure)	50-70%
Other clean technologies (including agriculture, water and wastewater, recycling, manufacturing, and transportation)	30-50%

The Technology Innovation Fund and Technology Deployment Fund will pursue financially-attractive investments in their respective Portfolio Funds which emphasize clean technologies that are relevant for developing countries. The Technology Innovation Fund will operate largely in Western capital markets while actively promoting relevant clean technologies. For the Technology Deployment Fund, the developing-country relevance of a particular technology will be evident from its inclusion in appropriately-targeted Portfolio Funds.

7.2 One Fund or Two?

A second key issue relates to structure: Should the GVF be a single FOF with two classes of shares for different investments, rather than an umbrella for two separate FOFs? In principle, a single FOF could invest in both innovation and deployment stage investments and offer different investors separate classes of shares (e.g., Class A shares for innovation-related portfolio funds, Class B shares for deployment-related funds). In addition, from a practical standpoint, launching and capital-raising for one fund would probably be easier than launching two at the same time. However, we believe that two separate funds can offer better differentiation in investment strategies than a single fund, and more effectively appeal to different investors' objectives. Private investors attracted to each FOF will be different, because the two FOFs will have different risk/reward profiles. The Technology Innovation Fund will appeal to investors seeking the relatively high risks and high rewards associated with VC investments, while the Technology Deployment Fund will attract investors with moderate risk tolerance and correspondingly moderate return expectations.

7.3 *Pari Passu* vs. Subordinated Returns

A third key issue is whether to treat public investors differently from private investors. We believe that private investors will be more likely to invest alongside public cornerstone equity at the FOF level if they are confident that the fund managers' investment choices are

'returns-led' rather than 'mission-led.'[69] For example, recent experience from GEEREF suggests that capital mobilization in this context may be hindered by subordinated treatment of private investors.[70] *Pari passu* treatment will help assure them that the GVF intends to focus on financial returns and prioritize commercial objectives within the broad framework set in the RFPs for fund managers.

8. Conclusion

This paper proposes a public-private fund of funds backed by public cornerstone equity that will mobilize private capital to promote two objectives: innovation for clean energy technologies with potential applications in low-income countries, and commercialization of clean technologies that can be deployed in developing countries. This market-oriented approach will promote development and deployment of clean technologies at the requisite scale, and in time to avoid catastrophic climate change. We believe the GVF can succeed if it provides commercially-attractive returns to private investors. The challenge for GVF managers will be to pursue an investment strategy that retains its focus on developing-country objectives while remaining flexible enough to compete effectively with other private investment opportunities.

[69] See World Economic Forum (2009b), Recommendations, page 60.

[70] For example, in GEEREF "public investors' shares are subordinated to those held by private investors, with a 'waterfall' mechanism whereby, once the fund is liquidated, the latter will receive their investment plus a certain return before any other distribution to public shareholders." See United Nations Economic Commission for Europe (2010), page 17. For an illustration of the differential payment 'waterfall' to public and private investors, see http://www.bih.co.bw/up_bih/file_98.pdf

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Appendix A. Interviews

The following organizations and experts were interviewed in preparation of this paper (listed in alphabetical order):

1. Actis (Lucy Heintz and Ritu Kumar)
2. Asian Development Bank (Toru Kubo)
3. Capital for Enterprise Limited (Tim Mills)
4. CDC Group (Hywel Rees-Jones)
5. Chatham House (Kirsty Hamilton)
6. CTI-PFAN (Peter Storey)
7. Global Environment Fund (George McPherson)
8. Emerging Africa Infrastructure Fund (Nick Rouse)
9. European Investment Fund (Ulrich Grabenwarter)
10. Global Energy Efficiency and Renewable Energy Fund (Cyrille Arnould)
11. IFC (Corinne Figueredo)
12. Impax Asset Management (Peter Rossbach)
13. Norfund (Mark Davis)
14. Norwegian Agency for Development Cooperation (Ryan Glenn Anderson)
15. Private Infrastructure Development Group (Andrew Reicher)
16. Sustainable Development Capital LLP (Jonathan Maxwell)
17. UK Carbon Trust (Ashley Smith, Martin Johnston and Ian Cook)
18. UNEP Finance Initiative (Eric Usher)
19. REEEP (Vince Reardon)
20. WHEB Ventures (Rob Wylie)

Appendix B. Definitions of key terms

Clean Energy (also Low Carbon Energy Technology) – Includes advanced vehicles (including vehicle efficiency, electric/hybrid vehicles, and fuel cell vehicles); bio-energy (including biofuels and biomass combustion for power and heat); energy efficiency (for commercial and residential buildings and industrial facilities); other renewable energy (geothermal, hydropower, ocean/marine/tidal energy and wind power); smart grids (transmission and distribution systems, end-use systems, distributed generation and information management); and solar energy (solar photovoltaic power, concentrating solar power and solar heating and cooling).[71]

Infrastructure fund (IF) – Fund that draws institutional investors and pension funds and targets 'infrastructure' as the core asset. Key IF characteristics include: investors interested in long duration, steady low risk cash flow; medium term investment horizon of 7-10 years; and low risk and return in the range of 15 percent internal rate of return.[72]

Private equity (PE) – Equity capital invested by specialized financial intermediaries who focus on later stage and more mature technologies or projects. Key PE characteristics include: investors with a medium risk appetite; interested in companies and projects with more mature technology; return requirements in the range of 25 percent internal rate of return.[73]

Venture capital (VC) – Equity capital invested by specialized financial intermediaries who focus on early stage or growth stage technology companies. Key VC characteristics include: investors with a high risk appetite; interested in investing in early-stage companies and new technologies; return requirement of many times amount of investment (50-500% internal rate of return).[74]

[71] Adapted from International Energy Agency (2010c) with exclusion for nuclear energy (nuclear fusion and fission), carbon capture and storage (including storage and use of CO2 from power plants, industrial processes and fuel transformation activities); cleaner, high efficiency coal combustion (for power and heat generation)

[72] Based on Justice et al. (2009).

[73] Ibid.

[74] Ibid

Appendix C. Clean technology segments and example technologies[75]

Segment	Examples
Low-carbon energy	
Energy Generation	Renewable and distributed energy generation (wind, solar, biomass, marine, tidal); biofuels (biodiesel, ethanol, cellulosic); waste to energy; geothermal heat and electricity generation
Energy Storage	Fuel cells for stationary and mobile storage; micro-fuel cells; advanced rechargeable batteries (e.g., NiMH, Lithium ion, Zinc Air); heat storage; flywheels; super and ultra capacitors
Energy Efficiency	Smart metering sensors and control systems in applications; energy efficient appliances (e.g., LED lighting); chemical and electronic glass; energy efficient building materials (e.g., windows and insulation); smart/ efficient heating; ventilation and air conditioning systems (HVAC); building automation and smart controls; automatic energy conservation networks
Energy Infrastructure	Power conservation; wireless networks to utilizes for advanced metering; power quality monitoring and outage management; integrated systems for management of distributed power; demand response and energy software
Other clean technology	
Agriculture	Bio-based materials; farm efficiency technologies; micro-irrigation systems; bio-remediation; non-toxic cleaners; organic fertilizers and natural pesticides
Water and Wastewater	Water purification, desalination, filtration, contamination detection and monitoring; control systems and metering for water use; advanced sensors for pollutants; separation of water into usage types; wastewater recycling and re-use; biological and mechanical (non-chemical) wastewater treatment
Air and Environment	Air purification products and filtration systems; pollutions sensors and gas detectors; remediation; leak detection; multi-pollutant controls; catalytic converters; fuel additives to increase efficiency and reduce emissions
Recycling and Waste	Recycling technologies; waste treatment; hazardous waste remediation, bio-mimetic technology for advanced metals separation and extraction; waste destruction (gasification, biological composting)
Manufacturing/Industrial	Advanced packaging; natural chemistry and industrial biotechnology; sensors for industrial controls and automation; smart construction materials; precision manufacturing instruments; chemical management services
Transportation and Logistics	Hybrid drive technologies; efficient engines; recyclable materials for cars; car-sharing tools; transportation efficiency sensors; logistics management software; fleet tracking; traffic control and planning technology.
Advanced Materials	Green chemistry and industrial biotechnology; advanced and composite materials; bio-materials; nano-materials; thermal regulating fabrics; environmentally-friendly solvents

[75] Sources: Cleantech Group (2010a); Robeco Private Equity (2009)

Appendix D. All renewables country attractiveness index[76]

Rank[1]		Country	All renewables	Wind index	Onshore wind	Offshore wind	Solar PV	Solar CSP	Biomass/ other	Geothermal	Infra-structure[2]
1	(1)	US[3]	70	71	75	58	72	75	64	67	68
2	(2)	China	67	72	75	62	64	38	56	49	71
3	(3)	Germany	64	66	64	69	73	28	64	55	64
4	(4)	India	61	62	70	41	65	61	56	43	60
5	(5)	Italy	60	60	63	52	64	58	55	65	64
6	(5)	Spain	59	60	65	45	64	69	52	35	60
6	(7)	UK	59	65	63	73	49	0	57	36	65
8	(7)	France	57	59	60	55	61	23	57	29	60
9	(9)	Canada	53	60	65	46	42	0	49	34	62
10	(10)	Portugal	52	54	59	42	58	22	45	33	58
11	(11)	Greece	51	53	57	42	60	43	43	34	56
11	(12)	Ireland	51	58	58	58	36	0	47	28	61
11	(13)	Australia	51	51	54	41	57	46	46	59	54
14	(14)	Sweden	49	52	52	53	43	0	55	34	52
15	(15)	Netherlands	48	54	52	58	47	0	41	22	44
16	(15)	Poland	45	50	53	41	42	0	41	22	46
17	(17)	Denmark	44	47	44	56	40	0	45	32	51
17	(17)	Belgium	44	50	48	56	35	0	35	26	47
19	(17)	Brazil	43	44	48	33	44	29	46	21	42
19	(20)	Norway	43	48	49	44	30	0	44	30	49
19	(20)	Japan	43	45	47	38	49	24	34	39	48
22	(22)	Turkey	41	42	45	35	42	28	36	42	43
23	(22)	New Zealand	40	46	50	35	31	0	33	49	41
23	(22)	South Africa	40	42	46	34	34	44	34	31	41
25	(25)	Czech	35	34	46	0	56	0	39	32	45
26	(26)	Austria	34	29	40	0	53	0	47	33	48
27	(27)	Finland	33	33	33	34	25	0	47	22	33

Source: Ernst & Young

1. Ranking in issue 23 is shown in parenthesis.

2. Combines with each set of technology factors to produce the individual technology indices.

3. This indicates US states with Renewable Portfolio Standards (RPS) and favorable renewable energy regimes.

[76] Rankings as of February 2010. Source: Ernst & Young (2010), page 9.

Appendix F. Precedent fund of funds initiatives

The **UK Innovation Investment Fund (UKIIF)** provides a recent example of the proposed approach for public cornerstone investment.

- In 2009, the British government launched the UKIIF as a pair of funds of funds that would invest in portfolio funds that then invest in businesses in strategically important sectors in the UK, including life sciences, clean technology and advanced manufacturing. Following a competitive tendering process, Hermes Private Equity was selected as manager of the **Environmental Innovation Fund**; and the European Investment Fund, an arm of the European Investment Bank, was selected as manager of the **UK Future Technologies Fund**. The British government surpassed their initial goal to leverage private investment capital one-to-one with the government's GBP 150 million equity investment: at first closing in early 2010, the UKIIF had GBP 325 million to invest.[77] Three departments invested GBP 150 million in the UKIIF, which then raised an additional GBP 175 million in private capital.

Two other recent examples of public co-investment in clean technology funds of funds are the Green Wave initiative in California and the California Clean Energy Fund:

- In 2004, California launched the **Green Wave initiative** calling on the California Public Employees' Retirement System (CalPERS) and the California State Teachers' Retirement System (CalSTRS) to invest USD 1.5 billion of state-controlled assets in new clean energy and environmental technologies, reduce energy consumption in real estate investments and encourage transparency regarding environmental liabilities.[78] The

[77] See Hermes (2009) and Central Office of Information (2010). The Department for Business, Innovation and Skills, the Department of Energy and Climate Change and the Department of Health contributed to the UKIIF. Hermes launched the HPW Environmental Innovation Fund with GBP 50 million of UKIIF capital alongside commitments of GBP 75 million from their existing client base to reach first closing of GBP 125 million in January 2010. See http://webarchive.nationalarchives.gov.uk/+/http://www.dius.gov.uk/innovation/ukiif/ukiif-fund-of-fund-managers and http://www.bis.gov.uk/ukiif.

[78] The State of California Treasurer "urged [CalPERS and CalSTRS] to invest a combined $500 million in private equity investments, venture capital, and project financing to develop 'clean' technologies" and " a combined $1 billion of their stock portfolios into environmentally screened funds through leading active public equity investment managers with proven track records"; see http://www.treasurer.ca.gov/greenwave/index.asp and www.treasurer.ca.gov/greenwave/green_facts.pdf. Also see Murphy and Naimon (2007).

initiative reportedly catalyzed an estimated USD 4 billion in clean technology investments.[79]

- Also in 2004, following the state's electricity crisis and subsequent bankruptcy settlement, the **California Clean Energy Fund (CalCEF)** was formed as a USD 30 million non-profit VC fund to accelerate clean technology development. CalCEF launched its first investment vehicle, CalCEF Fund I, using a fund-of-funds approach, allowing CalCEF to invest in three venture funds, and recycle profits into new investments using an evergreen model. In 2008 CalCEF launched its second investment vehicle, the CalCEF Clean Energy Angel Fund I, as a separate for-profit entity, focusing on early stage clean technology investment. As a result, CalCEF built up a portfolio of over 40 companies in low-carbon transport, cleaner fossil fuels, energy efficiency, green building, energy storage and renewable energy.[80]

[79] See Australian Conservation Foundation, page 16.

[80] See http://www.calcef.org/ and http://www.calcef.org/press/CalCEFInvestorSummary2010.pdf

Appendix G. Ten largest venture funds in market with industry focus on clean technology or renewable energy[81]

a. Funds focused on Rest of World (by size)

Fund	Vintage	Target Size (Mn USD)	Fund Status	Location Focus	Fund Focus
AVIC Fund of China	2010	2,949	First Close	China	ROW
Shanghai Financial Sector Investment Fund	2009	2,923	First Close	China	ROW
Huarong Yufu Fund	2010	1,475	First Close	China, Greater China	ROW
Guosheng CLSA Industrial Investment Fund	2009	1,461	Raising	China	ROW
Al Masah MENA Growth PE Fund I	2011	500	Raising	MENA	ROW
DB Masdar Clean Tech Fund	2010	500	Second Close	United Arab Emirates, Global	ROW
Maybank MEACP Clean Energy Fund	2010	500	First Close	Asia	ROW
Pittsford Ventures V	2010	400	Second Close	Brazil, China, India, US	ROW
China Environment Fund IV	2010	350	Raising	China	ROW
Nature Elements Capital Fund	2010	350	Raising	China	ROW

b. Funds focused on the U.S. and North America (by size)

Fund	Vintage	Target Size (Mn USD)	Fund Status	Location Focus	Fund Focus
VantagePoint Venture Partners VI	2011	1500	Raising	North America	US
Blackstone Clean Technology Partners	2010	500	First Close	Global	US
Lionhart Talon Private Equity Fund	2010	400	First Close	Canada, US	US
Vanterra C Change Transformative Energy & Materials Fund I	2010	300	First Close	Global	US
Flagship Ventures Fund IV	2010	250	Raising	US, North America	US
The Waste Resource Fund	2009	250	First Close	Global	US
FA Technology Ventures III	2010	200	Raising	US	US
GEF US Growth Fund II	2010	200	First Close	Canada, US, North America	US
Arborview Capital Partners	2010	175	Raising	Canada, US, North America	US
Easton Capital Partners III	2010	175	Raising	North America	US

[81] Source: Preqin funds in market focused on clean technology or renewable energy (data as of February 2011) and authors' analysis.

c. Funds focused on Europe and the UK

Fund	Vintage	Target Size (Mn USD)	Fund Status	Location Focus	Fund Focus
AF Eigenkapitalfonds Für Deutschen Mittelstand	2010	629	First Close	Germany	Europe
Englefield Capital Fund III	2011	521	Raising	West Europe	Europe
Green For Growth Fund	2009	420	First Close	Albania, Bosnia & Herzegovina, Croatia, Macedonia, Turkey, Serbia, Montenegro	Europe
Qatar-UK Clean Technology Investment Fund	2010	381	Raising	UK	Europe
Yellow&Blue Clean Energy Investments	2008	315	First Close	Belgium, Germany, Luxembourg, Netherlands, UK	Europe
Capenergie II	2011	260	First Close	France, Germany, Europe	Europe
Emerald Cleantech Fund III	2010	252	Raising	North America, Europe	Europe
Northzone VI	2010	252	First Close	Europe	Europe
R Capital III	2010	252	Raising	Europe	Europe
Zouk Cleantech Europe II	2010	252	Raising	Europe	Europe

Appendix H. Ten largest infrastructure funds in market focused on ROW and including greenfield as a project stage preference and renewable energy as an industry preference (by size)[82]

Fund	Target Size (Mn USD)	Fund Status	Location Focus	Project Stage Preferences	Industry Preferences
ADCB Macquarie Infrastructure Fund	1,000	First Close	Middle East, North Africa, GCC	Brownfield, Greenfield, Secondary Stage	Distribution/Storage Facilities, Energy, **Renewable Energy**, Roads, Sea Ports, Social, Utilities, Waste Management, Water
African Infrastructure Investment Fund II	1000	First Close	South Africa, Africa	Brownfield, Greenfield	Aviation/Aerospace, Energy, Railway, **Renewable Energy**, Roads, Sea Ports, Social, Telecom, Transportation, Utilities, Water
Macquarie Korea Growth Fund	830	Raising	South Korea, Asia	Brownfield, Greenfield, Secondary Stage	Clean Technology, **Renewable Energy**, Roads, Sea Ports, Utilities, Water
Cordiant Emerging Infrastructure Loan Fund	750	Raising	Emerging Markets	Brownfield, Greenfield, Secondary Stage	Bridges, Clean Technology, Energy, Logistics, Railway, **Renewable Energy,** Roads, Sea Ports, Telecom, Transportation, Tunnels, Utilities, Waste Management, Water
EMP Utility Fund	500	Raising	Asia, Middle East, North Africa	Brownfield, Greenfield	Energy, Renewable Energy, Utilities, Water
Islamic Infrastructure Fund	500	First Close	Afghanistan, Indonesia, Malaysia, Pakistan, Bangladesh, Central Asia, Maldives	Brownfield, Greenfield	Education Facilities, Energy, Healthcare/Medical Facilities, Railway**, Renewable Energy,** Roads, Sea Ports, Telecom, Transportation, Utilities, Waste Management, Water
Mubadala Infrastructure Partners Fund	500	First Close	Turkey, Middle East, North Africa	Brownfield, Greenfield, Secondary Stage	Bridges, Education Facilities, Energy, Government Accommodation, Healthcare/Medical Facilities, Parking Lots, Railway, **Renewable Energy**, Roads, Satellite Networks, Sea Ports, Social, Telecom, Transportation, Tunnels, Utilities, Waste Management, Water
MEACP Clean Energy Fund	350	Raising	Asia	Brownfield, Greenfield, Secondary Stage	Clean Technology, Distribution/Storage Facilities, Energy, Natural Resources, Renewable Energy, Utilities, Waste Management, Water
Argan Infrastructure Fund	260	First Close	Africa, South Asia	Brownfield, Greenfield	Clean Technology, Distribution/Storage Facilities, Education Facilities, Energy, Environmental Services, Healthcare/Medical Facilities, Logistics, Parking Lots, **Renewable Energy,** Satellite Networks, Sea Ports, Telecom, Transportation, Utilities, Waste Management, Water
African Energy Infrastructure Fund	250	Raising	Africa	Brownfield, Greenfield	Distribution/Storage Facilities, Energy, Natural Resources, **Renewable Energy,** Transportation, Utilities
Bunyah GCC Infrastructure Fund	250	Raising	Turkey, GCC, MENA	Brownfield, Greenfield	Energy, Government Accommodation, Logistics, Railway, **Renewable Energy**, Roads, Sea Ports, Social, Transportation, Utilities, Waste Management, Water

[82] Source: Preqin infrastructure funds in market (data as of February 2011) and authors' analysis.