

PUBLIC PRIVATE^{QUITY} PARTNERSHIPS:

ACCELERATING THE GROWTH OF
CLIMATE RELATED PRIVATE EQUITY INVESTMENT

IN PARTNERSHIP WITH:



GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET



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Acronyms and Abbreviations

ADB	Asian Development Bank
CCGT	Combined-Cycle Gas Turbine
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
COP15	15th Conference of the Parties
CSR	Corporate Social Responsibility
CW	Carbon Warehouse
Defra	The Department of Environment, Food, and Rural Affairs
DFID	Department for International Development
EE	Energy Efficiency
EBRD	European Bank for Reconstruction and Development
EU-ETS	European Union Emissions Trading Scheme
ERPA	Emissions Reduction Purchase Agreement
ERUs	Emission Reduction Units
ESCO	Energy Service Company
GHG	Green House Gasses
FIs	Financial Institutions
GP	General Partner
IFC	International Finance Corporation
IFI	International Financial Institution
LP	Limited Partner
IPO	Initial Public Offering
KfW	Kreditanstalt für Wiederaufbau
MAC	Marginal Abatement Cost
MACC	Marginal Abatement Cost Curve
MCCF	Multilateral Carbon Credit Fund
PE	Private Equity
PE/VC	Private Equity and Venture Capital
NASDAQ	National Association of Securities Dealers Automated Quotation System
PEF	Private Equity Funds
PSPEF	Publicly Supported Private Equity Fund
PPP	Public Private Partnerships
SPC	Shadow Price for Carbon
UK	United Kingdom of Great Britain and Northern Ireland
UNFCCC	United Nations Framework Convention on Climate Change
US	United States of America
US\$	United States Dollar
VC	Venture Capital
VCF	Venture Capital Funds
WACC	Weighted Average Cost of Capital

Executive Summary

Mitigating climate change by reducing greenhouse gas emissions in developing countries will require considerable investments—estimated by the World Bank’s 2010 World Development Report to be as much as \$4.6 trillion to keep global average temperature rise within 2 degrees Celsius by the end of the century. Most of this investment will need to come from private businesses. Many of the investments will require risk taking and innovation, involving new technologies and new business models. Many investments will be small and face uncertain cash flows. Climate friendly projects with just these characteristics—small size, risky and requiring innovation—will need sources of capital able to deal with the level and types of risk involved. They also need investors able to add value through improved governance and mentoring of management.

Not all sources of capital are able to respond to this challenge. Far from being fungible, capital tends to fall into specific categories. Equity—the at risk capital which claims profits from the business—is clearly different from debt, which comes with a much lower risk appetite and an expectation of fixed returns.

Among the various types of capital, Private Equity/Venture Capital (PE/VC) is uniquely suited to financing climate friendly investments that are risky, innovative, and relatively small. PE/VC funds will certainly not provide more than a fraction of the \$4.6 trillion investment needed—but they fill a key niche.

PE/VC FUNDS FILL AN IMPORTANT NICHE

PE/VC funds:

- **Make risky investments:** PE/VC funds provide firms and projects with a form of financing that is more patient and flexible than debt. PE/VC funds are among the only investors willing to provide cash to medium sized companies to burn while they develop into profitability
- **Provide cornerstone finance:** PE/VC funds are able to provide equity finance to earlier stage companies that cannot access debt financing (cash flows too risky and too few tangible assets) and are too small to access securities markets, but too large to rely on friends and family. The equity financing provided by PE/VC funds allows the companies to invest and access other forms of financing such as debt
- **Help companies do business better:** PE/VC funds help the companies in which they invest to build up their governance, managerial and technical

capacity. This provides much needed support, especially in developing countries where such capacity is often lacking

- **Identify and develop business opportunities:** PE/VC funds take an active role in developing the pipeline of projects and companies in which they can invest. This often means helping companies in which they wish to invest to build up the systems (such as governance, accounting and personnel) needed to absorb outside financing, systems which are often lacking in companies in developing countries.

The ability of PE/VC funds to provide both expertise and capital means that they are uniquely positioned to initiate investments in nascent climate industries.

THE PE/VC MARKET FACES BARRIERS THAT SLOW INVESTING IN CLIMATE FRIENDLY PROJECTS IN EMERGING MARKETS

There are both capital market and carbon market barriers that hinder the development of the PE/VC market for climate friendly investing in emerging markets:

- **Fund manager formation:** New investment areas need new fund managers. However, putting together a new fund is risky, costly, and time-consuming. Few professionals with the right skills have the appetite to do it. Unfortunately, a shortage of good fund managers slows the rate at which the entire market can develop.
- **Raising capital:** Mitigating climate change requires investments in new sectors, technologies and business models. These investment types often have no track record of historic returns. The fund management teams who have the skills to tackle these areas are often new too, with no track record. Yet typical investors in PE/VC funds rely on track records of teams and sectors in deciding where to place their capital. This leads to a chicken and egg problem. A fund or sector needs a track record of returns to attract capital, but without a track record of returns it is unable to raise financing and so cannot invest and build a track record.
- **Deploying capital:** Small, innovative climate friendly projects may impose high management expenses on PE/VC funds, which are uneconomic within the industry-standard two percent management fees. Such pioneering investing can benefit the development of a whole industry, since it produces models for others to follow, but it is often hard for the pioneers to capture this aspect of the

benefits they produce. Further, PE/VC funds—like any other investor in climate friendly projects—suffer from difficulties in capturing the positive externalities from carbon emissions reductions in a form that can attract finance.

ROLE OF THE PUBLIC SECTOR

The public sector—particularly the International Financial Institutions (IFIs) and bilateral donors—can help to overcome the barriers holding back the PE/VC market. To assist with the formation of funds and raising capital, public sector financial institutions can:

- **Anchor new funds:** IFIs can identify promising new fund management teams and commit capital to them. Anchoring includes letting teams with potential know where they need to strengthen their offering (for example, by bringing additional skills), helping the fund with structuring and documentation, and introducing the fund to other potential investors. The advice and introductions are made credible by the IFI committing capital to the fund. Anchoring has successfully kick-started PE/VC investing in areas as diverse as early stage climate friendly infrastructure in Asia, plantation forestry in Africa, and clean technology in China. Anchoring can be a commercially successful strategy. IFC's return on first time private equity fund teams between 2000 and 2010 was higher than the top quartile benchmark of emerging market funds.
- **Finance new fund development:** Public institutions can provide capital to new management teams to help them finance the costs of setting up a new fund and getting commitments to the fund from investors. Firms currently do this on a commercial basis but largely in developed PE/VC markets. IFIs and donors could do this in emerging markets. The capital provided could be a quasi-equity investment in the fund manager, which would return capital to donors from returns on the fund if it is successful. IFC does not do this now, but its experience with first time funds suggests that this approach could be commercially successful, as well developmentally positive.
- **Invest in a new fund on a concessional basis through a waterfall structure:** In a classic fund structure, all investors, including any public institutions, participate *pari passu*—that

is, they share equally in profits and losses. Public institutions have an opportunity to offer a 'waterfall structure', which subordinates their returns to the returns of private investors in certain circumstances. The waterfall can be designed to attract private investors by dampening their losses if the fund does badly or leveraging upside if the fund succeeds. This approach contributed to the development of the Venture Capital (VC) sector in Israel. In Israel, the Yozma fund deployed US\$100 million of government capital in 1993 into select VC funds using a waterfall structure. This helped catalyze the development of an industry which had US\$9.6 billion under management by 2001. In other words for every dollar invested by the Israeli government in 1993 by 2001 US\$96 had been invested by the private sector.

To help overcome the barriers to deploying capital profitably, public sector institutions can:

- **Support pioneer investments:** Grants can be provided for pioneering activities such as feasibility studies and regulatory approvals for new types of investment. Given the scale of the pioneering needed, there is potential for governments to increase the level of support provided and to proactively route it through the PE/VC funds. In order to mitigate potential moral hazards and to increase the alignment of interest between public and private capital, support could be provided through a loan facility that is repaid out of the fund manager's future earnings. This facility could help cover the upfront costs enabling PE funds to provide business and market development services as part of their investment strategy.
- **Provide improved carbon payments:** Public sector institutions have an opportunity to create a new kind of carbon payment mechanism that will provide revenue certainty for carbon emissions reducing projects. While this mechanism could in the long term provide an additional revenue stream in the short term it can be used as collateral against which projects can raise more debt. Such a new carbon payment mechanism would be particularly helpful in catalyzing further private equity investment as the increased leverage would help to shift the equity returns on many climate friendly projects from marginal to commercially attractive.

Through a combination of the above five interventions, public sector institutions could greatly accelerate the development of the PE/VC market in climate friendly investing in emerging markets.

Public sector institutions around the world are working on ways to bring more private finance into investments in emerging markets that mitigate climate change. This paper argues that there is an important role for Private Equity and Venture Capital (PE/VC) funds. IFC has been actively investing in climate friendly private equity funds and is interested in understanding how public private partnerships could be developed to scale the market. To that end, IFC contracted Castalia Ltd (www.castalia-advisors.com), to prepare this report. This paper suggests that:

- **PE/VC funds have unique role** to play facilitating climate friendly investments (Chapter 2)
- **These funds face important barriers** that limit the flow of PE/VC into climate friendly investments (Chapter 3)
- **Public sector institutions have a range of interventions** they can use to overcome those barriers and so increase PE/VC finance of climate friendly investments in emerging markets (Chapter 4).

The audience for this report is policy makers and others interested in the role that public support for PE/VC funds can play in supporting climate friendly investments. It is intended to help shape conversations about how public capital can effectively be deployed to leverage private finance to stimulate the growth of climate friendly private equity investment in emerging markets.

The Distinctive Combination of Private Equity and Venture Capital to Mitigating Climate Change

Mitigating climate change requires vast investment. The World Bank estimates “the volume of financing needed to meet the additional costs by the international community for climate change-related development at between \$180 billion and \$250 billion per year. However, this sum represents only the additional or incremental costs: it would need to leverage nearly 20 times that amount—or up to as much as \$4.6 trillion—from underlying investment finance from other public or private sources.”¹

These investment needs are diverse, and catalyzing the necessary finance to address the challenge of climate change will require

interventions across all asset classes. Among the various types of capital, Private Equity/Venture Capital (PE/VC) is uniquely suited to financing climate friendly investments that are risky, innovative, and relatively small – and thus likely to have the most transformational impact. PE/VC funds will certainly not provide more than a fraction of the \$4.6 trillion investment needed—but they fill a key niche.

Indeed over the last decade there has been a significant growth in climate friendly investment by PE and VC firms. From very few deals in 2000 the market has grown to US\$ 20 billion per year in 2010.

Figure 2.1: Number of Climate Friendly Deals Closed by PE/VC funds between 2000 and 2010 by Geography

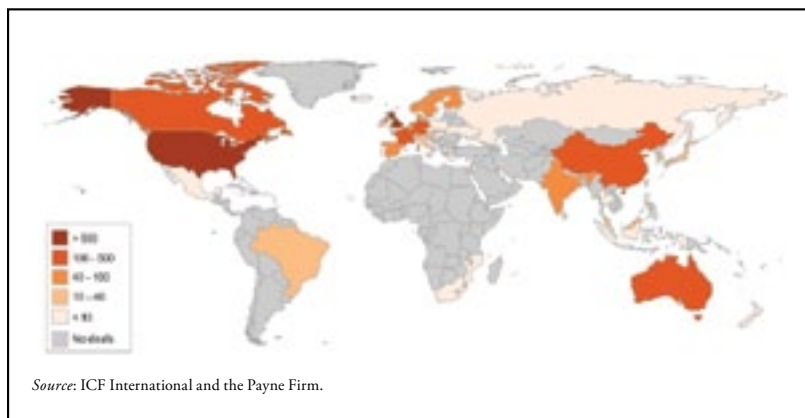
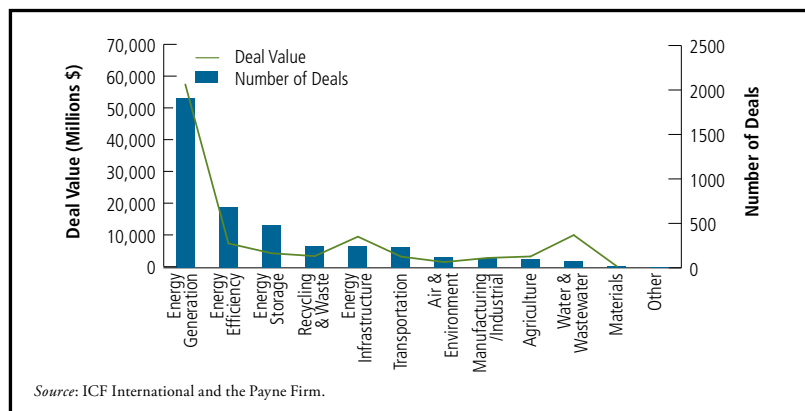


Figure 2.2: Deal History in the Climate Friendly Investment Market, by Primary Industry



While the market has grown there is considerable opportunity to accelerate the deployment of PE/VC capital in emerging markets. As can be seen in Figure 2.1, most deals are occurring in developed countries, with more than 50 percent of activity in the United States and United Kingdom. Less than 10 percent of climate friendly deals are in emerging economies, and of these more than 80 percent have occurred in India and China. As a result, less than 2 percent of PE/VC fund activity is spread across all the emerging markets outside of India and China, despite these countries making up 20 percent of the world’s economy. Further most investment in emerging markets has been made by international firms investing from overseas. There is still a very limited number of locally developed climate friendly private equity funds in emerging markets.

Investments have to date also targeted a common niche with 3,334 deals, or 80% of the total number of climate friendly deals focusing on technology development, particularly in energy generation, as shown in Figure 2.2.

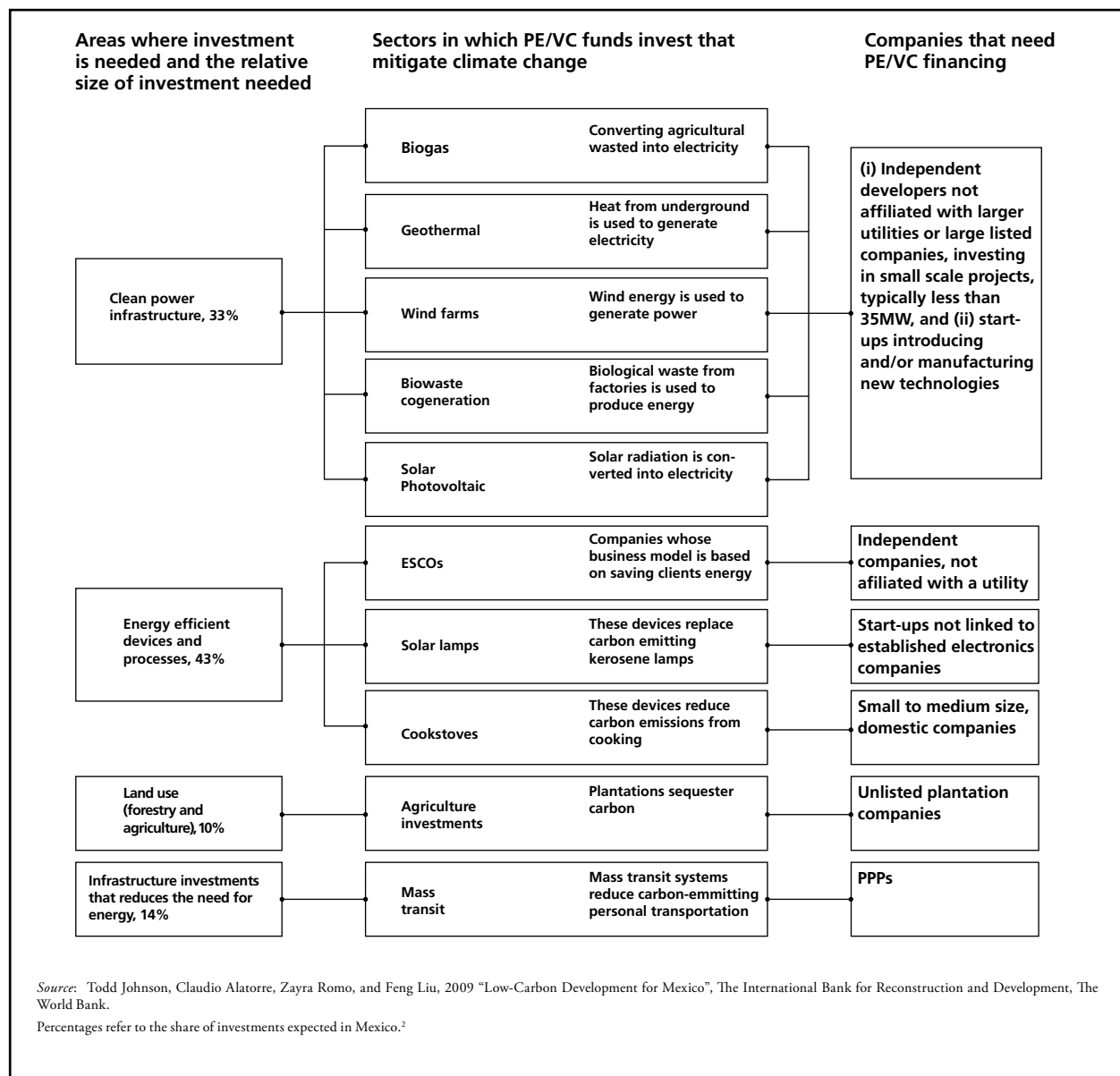
¹ This investment is required to keep global average temperature rise within 2 degrees Celsius. Page 2 World Bank, 2010 “Beyond the sum of its parts, combining financial instruments to support low-carbon development” The International Bank for Reconstruction and Development.

2.1 THE ROLE FOR PE/VC IN EMERGING MARKET CLIMATE FINANCE

As shown in Figure 2.3 in emerging markets there is an untapped potential for private equity and venture capital to support technology deployment and business growth in

Clean Energy and in other sectors including energy efficiency, land use and forestry, and climate-friendly transportation. Opportunities also exist along the supply chains in these industries, both upstream and downstream.

Figure 2.3 Examples of Sectors that Mitigate Climate Change



² These percentages are different for countries other than Mexico. For instance in Indonesia there is substantial potential to reduce emissions from changing land use. In Indonesia the two largest sources of GHG emissions are peatlands (which makes up 38 percent of GHG emissions in 2005) and the degradation of natural forests (which contribute around 40 percent of emissions). Dewan Nasional Perubahan Iklim, 2010 "Indonesia's greenhouse gas abatement cost curve" August 2010

2.1.1 CLEAN TECHNOLOGY DEVELOPMENT

Mitigating climate change requires that consumers and companies use energy more efficiently, and that energy is generated from new, renewable resources. This requires innovative new devices and processes.





Innovations in energy efficiency and renewable energy technology are likely to come disproportionately from smaller companies that are supported by, or need support from, PE/VC funds. Large investments have already been made by Venture Capital (VC) funds in this space. In the United States alone, VC funds invested more than \$1 billion on clean technology in the first three months of 2011³ Kortum and Lerner⁴ find that companies supported by Venture Capital Funds produce five

times as many patents per dollar of R&D expenditure than other firms' spending on R&D. Smaller firms often need PE/VC funds to provide them with capital because they cannot access finance from banks or security markets. They are also able to earn the returns that PE/VC funds expect from their ability to achieve fast top line growth.

The disruptive and innovative role of start-up companies can be seen in the climate mitigation investment area. Box 2.1 shows how VC funds have contributed to the development of solar lantern technologies. Solar lanterns replace kerosene lamps which emit carbon dioxide. Castalia's research suggests that 100 million households who rely on kerosene lamps could afford to buy a solar lamp. If solar lantern companies achieve

Box 2.1: Solar Lamps: an Industry Accesses PE/VC Fund Financing to Expand

Large, well established, electronics companies were slow to supply solar lamps to poorer consumers. The market was not thought to be particularly large, and designing solar lamps for consumers at the bottom of the pyramid was difficult for multinational companies used to selling products to wealthier consumers. A number of start-up companies filled the gap, introducing innovative products and business models. The table below shows that leading solar lamp companies relied on PE/VC fund financing to expand (d.light and Duron), or are actively seeking PE/VC fund investors to grow (Barefoot Power and Greenlight Planet).

Example of device	Name	Investment and Financing
	Barefoot Power (Australia)	<ul style="list-style-type: none"> Equity and loan support from Oikocredit €1 million grant from EIB Seeking \$5 million from other finance providers including PE/VC funds.
	d.light (United States)	<ul style="list-style-type: none"> Raised start-up capital by winning business plan competitions \$6 million Series A financing from PE/VC fund investors \$5.5 million Series B financing by the initial investors and Omidyar Network.
	Greenlight Planet (India)	<ul style="list-style-type: none"> Grant funding Initial funding from an angel investor Currently looking to social impact funds to grow its business.
	Duron	<ul style="list-style-type: none"> Raised start-up capital through grants Seed Capital from Angel Investors (Idealab, Quercus Trust, Solgenix).

³ Tiffany Hsu, 2011 "Clean-tech venture capital jumps 54% in first quarter 2011" LA Times, May 2, 2011 (<http://latimesblogs.latimes.com/greenspace/2011/05/cleantech-venture-capital-jumps-54-q1.html>).

⁴ Samuel Kortum and Josh Lerner, 2000 "Assessing the contribution of venture capital to innovation" RAND Journal of Economics, Vol. 31, No. 4, Winter 2000, pp. 674-692.

their objective to serve all these consumers, annual carbon dioxide emissions from kerosene lamps would fall by 8 million tons.⁵ Yet companies in this space typically have almost no assets, and negative cash flow, so banks will not lend to them.

Take d.light as an example. d.light is pioneering the sale of solar lamps to poor consumers in India, Africa, and the Pacific Islands. The firm was initially unable to obtain debt finance. It had few tangible assets because its business model required substantial investment in the development and marketing of innovative products. In its early years d.light relied on financing from PE/VC funds such as the Acumen Fund, Gray Matters Capital, Nexus Venture Partners, Draper Fisher Jurveston, and Garage. This financing enabled d.light to sell more than 250,000 lamps by 2010 and the company hopes to provide lighting to 50 million people by 2015.⁶

PE/VC funds are also supporting “better place”, a company that is pioneering the roll out of battery service stations where electric vehicles can swap drained batteries for a recharged battery in much the same way that a car fills up with gasoline. This infrastructure allows electric vehicles to achieve the same range and convenience as conventional fossil fuel powered vehicles.⁷ Another beneficiary of PE/VC financing is Changelight, a Chinese company that researches and produces LED chips and high efficiency solar cells.⁸ Investment is therefore happening but it is still at a very nascent stage with a limited number of investors actively looking for opportunities.

2.1.2 CLEAN POWER INFRASTRUCTURE

To meet GHG emissions reductions targets, substantial investment is needed in biogas, geothermal, wind farms, and other renewable energy generation. Investment will be needed in grid connected installations, mini grids and in devices such as solar lamps. In many cases these technologies often use relatively small, decentralized power plants. These plants are often developed by smaller companies with limited resources which need cornerstone investors such as PE/VC funds.

These segments have growth characteristics that offer opportunities for smaller applications. Additionally, many of the clean power technologies are new, for instance wind and biomass generation use rapidly developing technology. Innovative geothermal plants are being developed as well.

Given the scale and the relative novelty of the technologies, smaller developers can be expected to play an important role. Innovation will be crucial to supporting the development of the industry as it helps to lower the costs of technology enabling scale up by larger utilities. Innovation will also be required to develop new business models for the deployment of clean energy solutions. Small scale enterprises will need to be backed with capital and expertise if they are to get through their start up phases and into full production.

There is already considerable investment in clean energy by private equity funds.⁹ For instance, Berkeley Capital has raised \$74.12 million for its Renewable Energy Asia Fund (REAF). The fund will focus on investing in small hydro, wind, solar power, and biomass in India and other developing countries in Asia.¹⁰

Still, the investment need is greater than the current private equity activity. Project developers report that an absence of third party financing is holding back investment. An example is asiaBIOGAS, a developer with experience developing a range of biogas technologies in South East Asia. Despite its experience and technical credentials, it has found that an absence of third party equity financing has constrained its ability to develop projects. Opportunities also exist to utilize telecom towers, which are not connected to the grid, as foundation customers providing power to them with a high renewable energy content. While there is a very significant market and demand for such an approach, the key aspect of it is that the power company needs to have the appropriate balance sheet in order to assume the risk that comes from the demand of the mobile operators or tower companies. Private equity funds could supply the crucial cornerstone equity for such ventures.

5 Castalia research on the potential market for products and services that extend access to energy

6 David Wolman, 2010 “Want to Help Developing Countries? Sell Them Good Stuff — Cheap” Wired October 2010 (http://www.wired.com/magazine/2010/09/st_essay_pennies/).

7 Israeli Cleantech Partners supported better place, better place is described on its website (<http://www.betterplace.com>) and Israeli Cleantech Partners is described here: (<http://www.israelcleantech.com>).

8 Changelight received financing from Sequoia Capital (<http://www.sequoiacap.com/china/changelight>).

9 Asieh Monsour, Stella Yun Xu and Mark Fulton, 2009 “Infrastructure Investments in Renewable Energy” RREEF (http://www.dbadvisors.com/content/_media/1175_InfrastructureInvestmentsInRenewableEnergy.pdf).

10 VCC, 2009 “Berkeley Energy Raises \$74M Cleantech Fund To Invest In India, Asia” VCCIRCLE (<http://www.vccircle.com/500/news/berkeley-energy-raises-74m-cleantech-fund-to-invest-in-india-asia>).

2.1.3 ENERGY EFFICIENCY

As much as half of the total abatement in Green House Gases (GHG) needed globally is expected to come from increased energy efficiency.¹¹ Analysis of abatement costs consistently show energy efficiency investments as among the lowest cost approaches, often generating financial and economic returns that should more than justify the investment, even before the benefits of GHG abatement are taken into account. Yet the potential for energy efficiency gains in private companies and government facilities remains largely unexploited. This is often because the managers of those companies and facilities do not have the expertise, focus, or incentive to pursue energy efficiency. Other barriers include agency problems, in which energy efficient investment would be a cost to the landlord, but the benefit would go to the tenant in lower utility bills. People buying buildings and equipment often cannot easily assess the difference in lifetime energy costs between different options, and so may choose not to pay more for more efficient options, even when doing so would be in their own interest.

Energy Service Companies (ESCOs) are a solution to some of these problems. As described in Box 2.2, ESCOs are companies that specialize in increasing energy efficiency for large energy users in the private and public sectors. They install devices, and implement processes, which reduce companies' and governments' energy usage. The ESCO provides the capital, focus, and expertise needed to make energy efficiency happen, and typically is rewarded with a share of the savings in energy costs.

Because ESCOs invest in energy efficient equipment and its installation, and then are paid from a share of the energy savings, they need capital. Without significant collateral ESCOs can find raising debt challenging and are generally able to leverage their assets less than other companies. ESCOs therefore need substantial quantities of equity—more than can be provided from friends and family and retained earnings. However, they are generally too small to raise equity on a stock exchange. As a result, a lack of private equity constrains their ability to grow. An example is Gestión Integral Energética SA (GIE), a Colombian ESCO. GIE provides services to smaller clients that the ESCOs associated with large utilities in Columbia don't consider worth serving. However, GIE and other similar ESCOs struggle to access equity financing. They report that there are many companies that they could profitably serve if they had access to additional equity financing.

Box 2.2: Energy Efficiency Business Models

There are two major business models based on improving energy efficiency (EE). The first is to profit from producing more energy efficient equipment. This includes sellers of industrial equipment as well as consumer appliances such as washing machines and light bulbs.

The second is the Energy Service Company (ESCO) model. These companies install equipment, or redesign buildings and industrial systems and processes, to reduce their customers' energy usage. The customer does not pay for this service. Rather, the ESCO bears the up-front cost and then makes back its investment by receiving a share of the resulting energy savings. In this way the ESCO provides service (reduced energy consumption) and finance by bearing the up-front cost and only receiving its return over time.

One of the earliest examples of an ESCO was Time Energy from Texas. In the 1970s it started selling a device to automate the switching off and on of lights and other equipment to save on energy costs. Many potential users doubted that significant savings would result from installing the devices, and so sales were slow. To overcome these doubts the company decided to install the devices up-front and ask for a percentage of any savings that resulted. This approach led to a large increase in sales. This model has been widely adopted since then.¹²

2.1.4 LAND USE AND FORESTRY

PE/VC funds also have an important role to play investing in plantation forestry. Expansion in plantation forestry has the potential to sequester large amounts of carbon dioxide. Take East Africa for example. The World Agroforestry Centre¹³ estimates that in Kenya, Zambia, and Uganda there is potential for 30 million hectares of plantations. In a scenario where this land would otherwise be grassland, these plantations would sequester enough carbon emissions to offset the emissions that eighty 500MW coal powered stations make over 20 years.

Reaching even a fraction of this potential will be difficult without access to private equity. Large scale expansion in greenfield plantations are difficult to finance using debt because plantations can take more than seven years to start

11 IEA, 2009 "World Energy Outlook 2009 Fact Sheet, Why is our current energy pathway unsustainable?"

(http://www.iea.org/weo/docs/weo2009/fact_sheets_WEO_2009.pdf)

12. Bullock, Cary, and George Caraghair. 2001 "Guide to Energy Services Companies" The Fairmont P, Inc., 2001. 10 Mar. 2008

13. Figures for Kenya, Uganda and Zambia are taken from Jonathan Hasket, "Potential for Land Use Carbon in Africa: Forest and Agroforestry Carbon" World Agroforestry Centre (www.africaclimatesolution.org/.../Potential_for_Land_Use_Carbon_in_Africa_06042009.pps).

generating revenue, meaning that the investment cannot cover debt payments from cash flows for seven years or more. It is difficult to raise finance for plantations through public equity offerings because integrated forestry companies (of the kind typical in East Africa) have had difficulties achieving fair value in public equity markets—which makes listed forestry companies wary of investing in plantation assets.¹⁴

As a result, PE/VC funds are behind a number of the companies pioneering investment in plantations in East Africa. For instance, Green Resources, one of the continent's largest plantation companies, received financing from Phaunos Timber Fund.¹⁵ Another leading player in the region is New Forests Company which received financing from HSBC's Principal Investments fund.¹⁶ These companies, and others, have financed large increases of the land under plantation in the region using PE/VC fund investment.

2.1.5 TRANSPORT INFRASTRUCTURE

Since around 20 percent of anthropogenic GHG emissions come from transport, efficient transportation infrastructure is clearly important in abating emissions.¹⁷ This will mean new investment in efficient urban transit systems such as metro rail and bus rapid transit, as well as multi-modal freight terminals and efficient ports and rail networks for the transport of heavy cargo. Efficient toll roads can also reduce emissions if they provide more direct routes, less stop-start driving, and cut time idling in traffic.

PE/VC funds are an important source of finance for ports, rail, and for Public Private Partnerships (PPPs) which enable many public transportation projects. The rehabilitation of London's underground was financed by private equity, as was Sydney's airport rail link. Private equity is also investing in port assets globally. In India for example, private equity is backing the expansion of Karaikal Port in Tamil Nadu.¹⁸ A PE firm managed by Warburg Pincus has invested in the development of Gangavaram Port in Andhra Pradesh—the deepest port in the country.¹⁹ Infrastructure funds have made large scale investments in public transport infrastructure in developing countries. IDFC Private Equity has invested in public infrastructure in India and 3i Infrastructure has raised a \$1.2 billion fund to invest in transport infrastructure in India.²⁰

2.2 HOW PE/VC INVESTING ADDS VALUE

Many climate-friendly projects and companies are small, innovative, and face unfamiliar risks. These projects and companies need capital that is able to deal with the risk and uncertainty involved and as a result securing debt finance can be problematic without sufficient collateral. Equally smaller businesses are often caught between having the necessary scale to access the public markets but requiring too much capital to be funded through friends and family. Climate related businesses in new sectors also in many cases require investors who can provide additional support and services helping to improve governance, management capacity and business processes, as they undergo rapid expansion. As Figure 2.4 illustrates Private Equity and Venture Capital Investors provide a mix of capital and expertise that can support fast growing climate friendly businesses in some of the key growth sectors that were identified above.

However private equity is among the most expensive sources of capital. Twenty percent plus returns on capital are a common target. In addition, the costs of the fund manager—the management fee and the carry—must ultimately come out of the returns on the investment. Clearly then, PE/VC funding for a company only makes sense when other types of funding are not suitable or available, or when the fund manager is able to add significant value to the investment.

PE/VC funds use four main techniques to achieve their desired returns:

- **Revenue growth:** Higher sales, coupled with constant or declining unit costs, increase the total value of profits and thus the value of the company. For example, a supplier of energy efficient appliances could expand its distribution network, increasing sales and profits proportionately
- **Margin expansion:** Prices can be raised or costs cut thus increasing the firm's profitability and thus the price at which it can be sold. For example, a solar PV company could improve its procurement of solar panels, thus pushing down input prices

14. Neilson suggests that integrated plantation forest companies are not "able to realize the true value of their planted and managed native forest holdings in the companies' share prices" and so these companies have a large incentive to disinvest from plantation holdings and a corresponding absence of incentive to invest in plantations. D Neilson, 2007 "Corporate Private Sector dimensions in planted forest investments". Food and Agriculture Organizations of the United Nations.

15. Capitaleritrea, 2009 "Phaunos Timber Fund Raises Stake in East African Forester Green Resources" (<http://www.capitaleritrea.com/region/phaunos-timber-fund-raises-stake-in-east-african-forester-green-resources/>).

16. HSBC, "Principal Investments, Africa" (<http://www.hsbcnet.com/pi/africa>).

17. Roger Gorham, 2002 "Air Pollution from ground transport an assessment of causes, strategies and tactics, and proposed actions for the international community" The Global Initiative on Transport Emissions, A Partnership of the United Nations and the World Bank, Division for Sustainable Development, Department of Economic and Social Affairs, United Nations (<http://www.un.org/esa/gite/csd/gorham.pdf>).

18. <http://www.avcj.com/avcj/news/2103237/ascant-capital-commits-usd45m-karaikal-port-expansion>.

19. <http://www.gangavaram.com> ; <http://www.business-standard.com/india/news/gangavaram-port-hopes-to-break-even-in-3-yrs/447560/>.

20. <http://www.3i-infrastructure.com/3i-india-infrastructure-fund.html>.

Figure 2.4: Some Climate-Friendly Investments that Need PE/VC

	Type of company	Ability to provide collateral	Volatility and Risk of Cash Flow	Ability to access securities market	Benefit from managerial advice	Need for private equity financing
Clean power infrastructure Biogas Geothermal Solar Photovoltaic Wind farms	Independent developers	Developers have few tangible assets until project is financed	In early to late stages projects have high likelihood of failure	Developers are too small to access securities markets	Advice on contractual risks, structuring contractual arrangements, regulatory risks and risk management techniques	✓
Biowaste congeneration	Small-scale projects	Same as above	Equity needed in financing to absorb any volatility in cash flow, even though cash flow relatively stable	Projects are too small to access securities markets		
Energy efficiency ESCOs	Companies not affiliated with a utility	Banks sometimes don't accept contracts with clients as collateral	Risk of non-payment by firms	Too small	Potential to facilitate transfer of technology and practices	✓
Clean technology development Solar lamps Cook stoves	Start-up companies	Companies have few tangible assets	High risk and volatility in start up phase	Too small	Strategic and managerial advice have increased value	✓
Land use and forestry Plantations	Independent developers	Plantations are a source of collateral	Plantations produce little on-going cash flows to service debt	Limited	Value from bringing in the best practice management of plantations	✓
Transport Infrastructure PPPs	PPPs	Collateral depends on the nature of the PPP	Risk of non-payment by government	Only particularly large PPPs can access securities markets	PPPs do not benefit from management advice	✓

- **Multiple expansion:** The Price to Earnings ratio (or similar valuation metric) at which investors value a company increases. In essence, a new buyer is willing to pay a higher price per dollar of expected future earnings than the PE/VC fund paid for it. This is generally achieved by decreasing risk levels (for example, taking a renewable energy project from permitting to operations). It can also be achieved by increasing the prospects for growth, for example, pioneering the entry of the investee company into a new market
- **Increased leverage:** The amount of debt taken on can be increased thus reducing the firm's cost of capital and thus increasing its value. For example, a biogas company can take on more debt as it becomes more established. This would allow equity to be taken out of the company, and increase the return on the equity that remained.

In developed country markets, leverage and multiple expansion are the techniques commonly associated with PE funds.²¹ These techniques—buying a company, loading it with debt, and then selling it at a higher price to someone else—can be controversial.

In emerging markets, these techniques can be less easy to deploy and PE/VC funds must focus largely on revenue growth and margin expansion. While debt is harder to raise PE/VC funds do still provide a crucial source of capital against which further finance can be leveraged. For climate related investments PE and VC funds look to achieve returns by:

- **Funding risky new technologies and business models** which creates value by allowing the firm to achieve revenue growth
- **Identifying and developing promising companies**, through significant due diligence and pipeline development PE funds actively seek and create new investment opportunities and will often spend considerable time supporting businesses prior to an investment.
- **Helping companies do business better** through improved governance, strategies (including a shift to lower carbon operations), and systems which facilitate equity investments and helps firms to achieve higher revenue growth and margins. This approach can also expand multiples, since with better management and governance systems, risk is reduced.

²¹ VC Funds in contrast focus more on Growth. They are looking for firms with low sales but great potential, such as new technology companies.

- **Being the cornerstone investor** in a growing company, and so bringing in other, lower-cost debt capital that would not otherwise be available thus increasing the firm's leverage

The following section lays out in greater detail how private equity funds have the potential to support the growth and development of climate related businesses by providing a combination of growth capital and expertise. A fuller description of the basics of how Private Equity and Venture Capital investing works can be found in Appendix A.

2.2.1 FUNDING RISKY NEW TECHNOLOGIES AND BUSINESS MODELS

VC investors in particular often seek to finance highly risky technology companies, knowing that many will fail, but counting on those that succeed to do so well that they more than offset the losses. For this approach to make sufficient returns to warrant the risks, the firms that succeed need to achieve dramatic revenue growth.

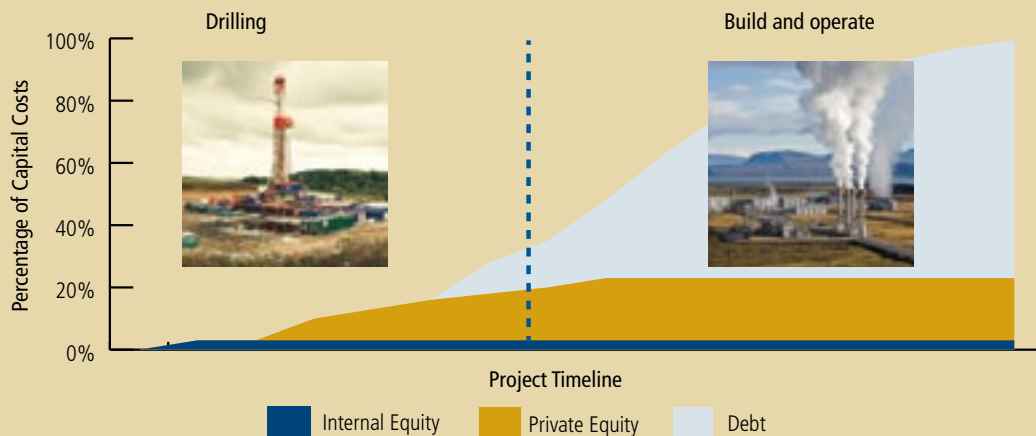
This ability to take risk is in complete contrast to banks. Typically, banks demand that borrowers have steady positive cash flows that can pay interest on the debt, and tangible assets that can be used as collateral. These requirements work for companies investing in real estate or machinery, but firms investing in intellectual property or new business models struggle to get bank finance.

Geothermal energy is a renewable technology that absolutely requires risk capital. Geothermal energy is one of the few renewable resources that provides reliable power 24 hours a day, 365 days of the year, at prices which can be competitive with fossil fuels. Unfortunately, early stage geothermal development is much riskier than conventional power plant development. The only way to tell if the geothermal resource will generate power is to drill a well. But drilling the well costs millions of dollars—often a substantial portion of the total geothermal development cost. Few investors are ready to put up millions of dollars, knowing that it could all be lost if the well is not successful. Box 2.3 describes how private equity investors have been willing to take on this risk.

Box 2.3: The Role of Private Equity in Financing Geothermal Projects

Broadly speaking, the development of a geothermal plant as shown below occurs in two stages, (i) finding the geothermal source and drilling wells to establish the source's potential and (ii), construction of the plant.²² The first stage is completed with the drilling of production wells. This is a risky exercise, as drilling does not always lead to a productive well. Each well, productive or not, is very expensive at US\$3 million–US\$6 million each, depending on various factors. The high risk of failure precludes debt financing and the

large amount needed to drill each hole makes it difficult to raise financing from friends and family. Early wells therefore are often financed through third party equity, with Private Equity funds such as ArcLight, USRGs, and Denham Capital providing the needed financing. This financing allows the project's geothermal potential to be demonstrated. Once the well has been proved, the remainder of the development costs, consisting of negotiating contracts and constructing the plant, can largely be financed using debt financing.



Source: Adapted from Todd Bright, 2010 "Geothermal Power—Private Equity Perspectives" Denham Capital.

²² This discussion relies on two reports (a) John McIlveen, 2011 "A Geothermal Incentive Design" GRC AGM San Diego and (b), John McIlveen, Mark Vernest and Khurram Malik, 2008 "A Geothermal Primer" Jacob Securities. The numbers referred to in the text do not necessarily map directly to the numbers implied by the graph.

2.2.2 IDENTIFYING AND DEVELOPING INVESTMENT OPPORTUNITIES

PE/VC funds invest heavily in finding companies that are in need of their capital and assistance. Fund managers then work with promising companies to refine their strategies, business plans, and management teams to turn “diamonds in the rough” into true gems. PE/VC is almost unique in this regard. Banks and stock exchanges tend to be more passive, waiting for firms in need of capital to come to them, and expecting the companies to develop sound plans on their own before they will invest.

A typical infrastructure PE fund, for example, will need to identify a pipeline of potential investments from the fund raising stage. A renewable generation fund therefore will seek out developers with promising projects, and offer to provide them with capital. Throughout the investing phase of a fund's life the management team is using industry networks to seek out new opportunities.

Many times, PE/VC funds come into contact with companies and entrepreneurs who have part of what they need to be successful, but not the complete package. The strategy to commercialize a technology might need to be rethought, or the firm's management team strengthened. The fund will work with the company to figure out how to turn its idea into an investable business proposition.

Aloe Capital did this when it worked with Indian entrepreneurs Arul Chalamalasetty and Mahesh Koli to create Greenko. Greenko buys, builds, and runs clean technology power plants in India. The company began by purchasing distressed biomass plants across the country and rehabilitating them. It then began to build its own biomass power plants and its own run-of-the-river hydro plants. Today Greenko directly employs 600 people (1,300 including contractors) and reduces carbon emissions by 1,448,909 tons a year.²³

2.2.3 HELP COMPANIES DO BUSINESS BETTER

PE/VC funds increase the value of the companies in which they invest in a number of ways. Besides providing needed capital, they replace and recruit senior management, provide technical advice, contribute to strategic decisions, and facilitate access to debt and equity financing from other finance providers.²⁴ PE/VC funds have a particular incentive to increase the value

of the companies that they provide finance to. Through their carried equity interests in the companies in which they invest, the fund managers benefit from any increase in the companies' value from increased growth, improved efficiency, multiple expansion or leverage.

IFC has found that providing advice and support also helps safeguard the investments PE/VC funds make. PE/VC funds typically buy minority stakes in the companies in which they invest. In emerging markets the legal protections for minority shareholders are often quite weak. Providing advice and support helps the PE/VC funds to be seen as real partners to the majority shareholders and so increases the likelihood that the majority shareholders will respect their legal rights.²⁵

An example of a PE/VC fund providing advice that helped a company improve its performance is Tsinghua Venture Capital (THVC) whose Clean Energy Fund purchased a 37 percent stake in PowerU, an energy services company in China. THVC acted as a sounding board for PowerU's management and helped the company appoint a financial officer.²⁶ Before THVC invested in PowerU, the fund manager helped the company improve its financial and accountings systems and skills, paving the way for THVC's equity investment. Similarly, GEF's Africa Sustainable Forestry Fund has been able to increase the value of its investments in forestry companies by facilitating the introduction of modern management techniques, increasing the productivity and thus the value of the companies in which it has invested.²⁷

Infrastructure funds investing in early-to-late stage renewable energy projects often provide developers with substantial advice and support. PE/VC funds help to mitigate development and contractual risks; for instance, by structuring and securing appropriate contractual arrangements and terms with suppliers, development and operating partners. They also apply risk management techniques such as risk transfer to subcontractors and suppliers through performance bonds, guarantees, and warranties.

E+Co's support for Bio2Watt illustrates the value an experienced investor can bring to an entrepreneur. Bio2Watt is a South African company introducing 'animal waste to energy' plants in South Africa. These plants reduce methane emissions,²⁸ produce electricity, and improve the management and disposal of animal waste. Through its capital, expertise and networks E+Co assisted

23 Venture Intelligence, 2010 “Private Equity Pulse on Cleantech” July 2010 (<http://www.ventureintelligence.in/pepulse-ct-2010.pdf>).

24 Hannu Jungman, 2003 “The Value Adding Role of V2C - Searching Evidence from the value-added provided by Private Equity investors” *Frontiers of E-Business Research* 2003.

25 Udayan Gupta, 2011 “Institutional Investor International Finance Corp's Private Equity Gamble Pays Off” September 23, 2011

26 David Blanchard, 2005 “Equity capital investment in China's Energy Efficiency Sector” <http://3countryee.org/public/EquityInvestmentEEChina.pdf>.

27 Castalia market intelligence.

28 Methane is a powerful greenhouse gas

Bio2Watt to develop its pioneering projects in South Africa. E+Co helped the entrepreneur select the right technology, develop environmental impact assessments and negotiate Power Purchase Agreements (PPAs). E+Co used its extensive international network to facilitate investments in the company by international investors and assisted Bio2Watt to secure grant funding (see Box 4.6 for more details on the investment).

2.2.4 BEING THE CORNERSTONE INVESTOR

The unique characteristics of PE/VC funds enable them to become cornerstone investors. A cornerstone investor helps to attract the rest of the capital that a company needs to grow.

- **PE/VC provides a risk-bearing cushion that allows banks to lend.** For example, Global Green Power, a bio-energy company in the Philippines, needed \$60 million to establish biomass power plants. Banks were willing to lend \$44 million. However, banks would only lend if the company could raise \$16 million in equity.²⁹ Until Global Green Power attracts this outside equity investment, its innovative, carbon-mitigating plan cannot be implemented. This risk bearing cushion is particularly important in developing countries. For example, in developed markets, banks are often willing to finance wind farms with a debt-equity ratio of 90:10 (nine parts debt finance to one part equity). In developing countries the comparable figure is often far lower. For example, in Vietnam banks typically will only finance on a debt-equity ratio of 50:50 (one part debt finance to one part equity), and in some other countries a debt-equity ratio of 70:30 is the norm³⁰
- **PE/VC firms have strong connections with other financiers, facilitating information flow and trust.** Entrepreneurs often do not know what banks need to see to persuade them to lend. Entrepreneurs also may not know which financiers are interested in their type of company. PE/VC firms are in touch with other financiers because the PE/VC funds are repeatedly seeking capital for their portfolio companies. This means the PE/VC firms know what banks and other financiers are looking for, and so can provide an efficient bridge between their investee companies and other financiers. Just as importantly, because PE/VC firms are playing a repeated game, they have an incentive to only seek loans for companies that will be able to repay. This reduces the risk the lenders face in evaluating the investment, and so make it more likely that a company backed by a PE/VC fund will be able to raise debt finance. This provides a channel through which PE/VC funds are able to increase

the value of the companies they invest in by increasing the leverage of investee companies. Their connections with lenders allows the companies they invest in to take on more debt thus increasing their leverage and the return PE/VC funds make on their investments

- **PE/VC funds strengthen businesses, and so improve access to capital.** By making businesses better at what they do—for example, by strengthening the senior management team, and making sure management information and accounting systems are in place, PE/VC firms naturally make their portfolio companies more attractive to other investors. This process culminates when the PE/VC fund exits. A fund's exit from an investment generally involves sale to a larger company, or listing on a stock exchange. The new owners are generally much more able to raise capital than the entrepreneurs originally were, assuring a supply of capital for continued investment. Because the new owners can more easily raise capital they are able to pay a higher price for the earnings the firm generates (as measured by the ratio between the price per share and the earnings per share). This allows the PE/VC fund to earn a return on their investment from the resulting “multiple growth” as they pay a lower price for the firm's earnings and sell their investment for a higher price.

The crucial role PE funds can play as cornerstone investors is apparent in the development cycle of renewable power projects. Many innovative renewable projects are developed by independent project developers—individuals and small firms who specialize in spotting new project opportunities. As Figure 2.5 illustrates, these independent developers are able to finance the early stage of projects, but struggle to finance mid-stage to late-stage project development.

Lenders (both mezzanine and senior debt providers) are generally willing to finance much of the construction costs, once all permits and contracts have been finalized. However, it can cost millions of dollars to get through the late stage development process of getting all the approvals to use the site and the renewable resources, and negotiating a long term contract to sell the power.

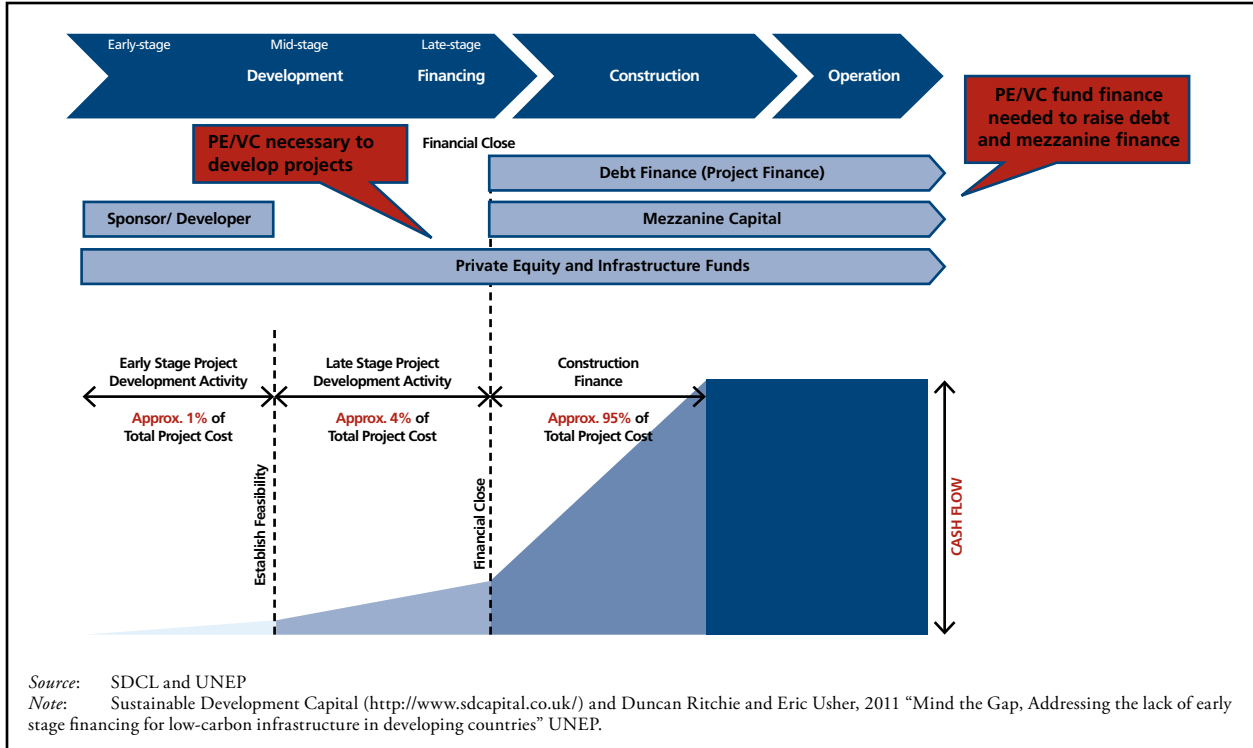
Some PE funds—such as InfraCo Asia—are willing to take on this risk, and thus get the renewable projects across the line and into the stage where more conventional capital will flow to finance the project.³¹ Therefore, they play a key role in developing a pipeline of new energy infrastructure projects.

²⁹ This equity would essentially absorb the first \$16 million losses if the business plan did not work as expected.

³⁰ Interviews with market participants.

³¹ InfraCo Asia is supported by the PIDG group of donors. Additional information on InfraCo Asia can be found at <http://www.infracoasia.com/>.

Figure 2.5: PE/VC Funds Financing of Projects by Independent Developers



3 Barriers to Development of PE/VC Market in Climate Friendly Investing

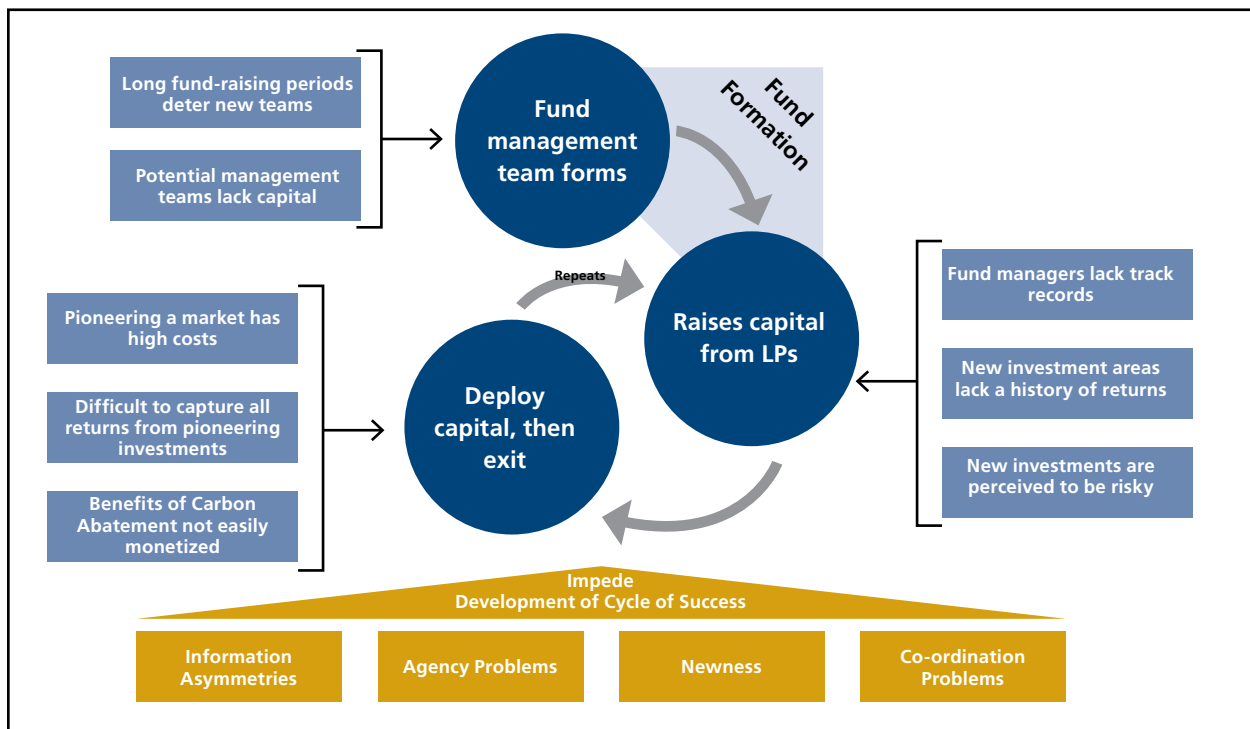
The previous chapter has noted that PE/VC can play an important role in financing and supporting the growth of new dynamic low carbon enterprises. It has also highlighted that while PE and VC funds are active in the market there are significant opportunities to scale up and accelerate climate friendly investment. However a number of barriers stand in the way of PE/VC being available to climate friendly projects in the desired quantities. Figure 3.1 illustrates the development dynamics of the PE/VC market. New fund management teams will have to form. The new managers need to raise funds from limited partners. The funds need to be deployed into profitable investments. As fund managers deploy capital profitably, they can raise more capital from the limited partner community, in a virtuous circle. This should be a virtuous circle of market development.

Unfortunately, the virtuous circle is slowed by four underlying factors: information asymmetries, agency problems, newness, and coordination problems (these are shown in brown in Figure 3.1).

Information asymmetries³² and agency problems³³ plague capital markets generally. Investors are looking for returns at least commensurate with the risks involved. Firms seeking investment generally have better information about their likely future performance and risk than the investors. But firms also have incentives to overstate likely performance, and understate risks. The investor is left in the unfortunate position of knowing that the firm has the best information (an information asymmetry), but also not feeling fully able to trust what the firm says (an agency problem).

The problems are worse for LPs placing funds with a fund manager. The LP wants a fund manager with the expertise to make high returns. Many would-be fund managers will say they are experts and can generate high returns. The LP finds it difficult to validate the would-be manager's claims of expertise (an information asymmetry), but is not able to simply take the claims at face value (because of the agency problem).

Figure 3.1: Development dynamics of the PE/VC market



32 Information asymmetries arise from asymmetric information, which is defined as “a situation where economic agents do not all have the same information”, this concept is closely related to the issue of agency problems discussed in footnote 33 (John Black, 2003 “A Dictionary of Economics” Oxford University Press, USA. September 18, 2003).

33 Agency problems arise from the principal agent problem which is defined as “The problem of how person A can motivate person B to act for A’s benefit rather than following self-interest. The principal, A, may be an employer and the agent, B, an employee, or the principal may be a shareholder and the agent a director of a company. The problem is how to devise incentives which lead agents to report truthfully to the principal on the facts they face and the actions they take, and to act for the principal’s benefit. Incentives include rewards such as bonuses or promotion for success, and penalties such as demotion or dismissal for failure to act in the principal’s interests.”(John Black, 2003 “A Dictionary of Economics” Oxford University Press, USA. September 18, 2003).

To offset information asymmetries and agency problems, investors use information on track records of managers. They also look at past investment returns. Reputations for competence and integrity are important. By definition, in a new area, track records and history are lacking. Reputations and networks are being newly made. As a result, in a new area like climate friendly investing in emerging markets, where managers lack track records, LPs can find it almost impossible to tell who to invest with. Rather than risk placing money with someone who “talks the talk but cannot walk the walk”, LPs may not invest in such a sector at all.

Coordination problems, too, put grit in the cogs of market development. To get deals done, many actors need to come together. Project developers need to bring in outside equity. Debt finance needs to be forthcoming. The equity investors, the lenders, the project developer, and entrepreneurs all need to know how to find each other, and work together.

In well developed markets, each niche in the investment eco-system is filled. Information and social networks allow the players to find each other. Precedents and competition

provide a guide as to how value can be divided between the parties, reducing time-wasted in zero-sum negotiations. New investment areas have none of these advantages. The first private equity fund investing in biomass generation in Bangladesh will not find lenders accustomed to financing biomass plants. The legal precedents governing the respective rights of senior and junior lenders in ESCOs in the Philippines do not yet exist.

The underlying factors of information asymmetry, agency problems, newness, and coordination problems give rise to at least eight specific barriers (shown in blue in Figure 3.1). These barriers:

- Slow the rate at which competent people coalesce into fund management teams
- Slow the rate at which fund managers can raise capital for the fund
- Diminish the ability of the fund to deploy capital profitably.

These barriers interact. If deployment was easier, LPs would be quicker to commit capital to funds. If fund-raising was quicker,

Box 3.1: Other Barriers to Investment

There are barriers which affect all climate friendly investing, whether carried out by PE/VCs or not. In addition, there are barriers which affect all PE/VC investing, whether climate friendly or not. This box mentions some of the main barriers in each of these categories.

Barriers to all climate friendly investing (whether PE/VC or not)

- **Lack of carbon payments**, or other mechanism to translate the environmental benefit of greenhouse gas emissions reductions into financial rewards. This is a particular obstacle for many green power infrastructure and land use projects
- **Government actions**, which may inadvertently make economically viable investments unprofitable, or simply impossible. Three important areas where government imposes barriers are:
 - **Ownership**: government owns many of the entities where investment is needed and so private sector investment can only go ahead if government establishes a Public Private Partnership
 - **Taxes and subsidies**: these often distort investments in favor of GHG producing processes. For example, subsidies of fossil fuels are common.

- **Regulation**: in many cases government regulatory regimes can deter investment (for example, when power prices are held below cost) or fail to provide the enabling environment needed (for example, when there is no legal regime to facilitate commercial forestry).

Barriers to all PE/VC investing (whether climate friendly or not)

- **Inadequate rule of law**: PE/VC funds tend to prefer investing in countries with fast judicial processes and strong, fair, and efficient enforcement of business law. A lack of effectively enforced laws governing the rights and obligations of limited and general partners deter PE/VC investment
- **Tax regimes**: Corporate tax levels, and in particular the treatment of capital gains and the repatriation of profits by foreign investors, are important for PE/VC funds. Where countries do not have investor PE/VC friendly tax regimes, PE/VC investment will be slowed.

more teams would set out to become fund managers. For now, these factors together combine to limit development of the market to below its potential. Of course there are other barriers that affect investments in climate-friendly sectors in emerging markets generally, or that affect general PE/VC investment in emerging markets. Some such barriers are summarized in Box 3.1. These barriers should not be discounted. However, they have been well canvassed elsewhere, so this paper concentrates on the barriers specific to climate friendly PE/VC investing in emerging markets.

3.1 BARRIERS THAT SLOW FUND MANAGER FORMATION

New investment areas need new fund managers—existing PE/VC fund managers generally lack experience in climate-friendly investing in emerging markets. There is a niche for new fund management teams that bring together individuals with relevant sector experience. A successful new fund manager might combine individuals with previous private equity investing in mainstream energy projects with individuals who have gained a deep knowledge of clean energy through work as project developers or consultants.

Indeed, new fund managers are forming. Examples include Inspired Evolution Investment Management, which launched the Evolution One fund to invest in clean technology in Southern Africa.³⁴ Another example is MAP Capital which seeks to invest in clean energy projects in Asia, with a focus on Indonesia and Southeast Asia.³⁵

Despite this, many skilled people who could form fund management teams are deterred by the costs and risk involved. Paradoxically, while the need for new fund managers is greatest in new areas, new areas may also be the hardest for managers to establish themselves in. Fund raising cycles may be even longer than in other parts of the PE/VC market. MAP Capital has been fund-raising for more than four years, despite having an experienced team, and a commitment from OPIC.³⁶ Many new teams may be capital constrained. Therefore it will be difficult for them to sustain the expenses, and the long periods without income, that raising a fund entails.

3.1.1 LONG-FUND RAISING PERIODS DETER POTENTIAL MANAGEMENT TEAMS

Raising a fund takes at least a year, and often several years. Even after years of effort, success is far from guaranteed. Understandably, this deters potential fund management teams from the attempt.

People who are already working in private equity in a more established area may decide to stay in the area they know. The risks are lower, the rewards perhaps as high. When E+Co worked to raise a PE/VC fund to make climate friendly investments in South East Asia, it found it very difficult to find qualified fund managers and those it did find were difficult to recruit because they had more promising options that were less risky. The same is true for project developers or consultants who may stick with what they know. A risky leap into a long period without earnings, in the hope of eventual private equity success, can be daunting.

It must be pointed out that creating new fund management teams is difficult in any area of private equity investing. But in areas already well-served by fund managers, the time a new fund manager takes to get established does not impede the development of an entire market segment, since there are already enough fund managers with track records operating.

In contrast, in climate-friendly investing in emerging markets, if managers are not attracted to the sector, the process of wearing down the other barriers—such as lack of data on sector returns—cannot begin.

3.1.2 POTENTIAL MANAGEMENT TEAMS LACK CAPITAL

Long periods fund raising mean long periods without earning. Typically, significant travel is needed and this is expensive. Investment pipelines need to be developed. Potential investors demand face to face meetings. All this is only possible if the would-be management team has enough capital to pay living expenses and outgoings. Most people with skills and expertise to be fund managers do not have the capital to do without income for a year or two, let alone to fund other expenses on top of that.

³⁴ <http://www.inspirevolution.co.za>.

³⁵ ADB, 2008 “Proposed Equity Investment in Asian Clean Energy Private Equity Funds, Report and Recommendation of the President to the Board of Directors” Project Number: 41922, March 2008 (<http://www.adb.org/Documents/RRPs/REG/41922-REG-RRP.pdf>).

³⁶ <http://www.opic.gov/investment-funds/full-list> accessed 9 October 2011.

Again, this problem may be worse for climate-friendly PE/VC investing in emerging markets than it is in many other areas. Travel costs are higher when building funds that link (typically developed country-based) investors with developing country projects. Additionally, because the area is nascent, there are fewer people in the sector who have already earned the sort of wealth that allows them to strike out on their own as fund managers.

3.2 BARRIERS THAT SLOW CAPITAL RAISING

Limited partners (LPs) investing in funds prefer fund managers with a proven track record, investing in sectors that generate profits more than commensurate with their risks. In a new area, fund managers do not have track records; return histories are lacking, and risk perceptions high.

3.2.1 FUND MANAGERS LACK TRACK RECORDS

Those talented people who do persevere and form fund management teams face a chicken and egg problem. Almost all limited partners want to invest with fund management teams with track records of having successfully managed private equity funds before. The traditional approach to selecting managers places track record at the center of the investment process. Indeed many institutional investors have written or unwritten rules against placing funds with managers who have not previously operated a fund. There are a number of explanations used to justify this approach. One reason is that investors need to conduct more careful due diligence on a new fund management team which is costly. Another reason is that large investors such as pension funds outsource decision making to investment agents who need to explain to the pension funds why they have made the investments they have. Reference to the track record of a fund manager provides an easier (and seemingly more objective) justification than defending a personal judgment of a new manager's ability to invest effectively. Clearly, without some way to break through, progress of PE/VC finance in a new area, such as climate change, will be slow.

THVC shows how good new teams can struggle to raise funds. THVC was a first time management team that wanted to invest in clean technology in China in 2002. It would be the first fund to do this. THVC was struggling to raise funds in light of the limited history of returns that the fund managers (as well as the sector) had. Initially THVC raised a relatively small fund of around \$25 million.³⁷ This was only a quarter of the minimum size needed for a sustainable fund—the management team had to meet their expenses from the management fee, which by industry tradition is set at around 2 percent of assets under management. Therefore, with a small fund, the management fee was not enough to cover proper fund management expenses. Despite this, THVC pressed ahead with investing the money that had been committed. This allowed the firm to build up a history of returns. On the back of this, THVC has now been able to raise \$300 million in funds, and has been a leading investor in a large number of pioneering clean technology companies in China.

3.2.2 NEW INVESTMENT AREAS LACK A HISTORY OF RETURNS

Limited partners make choices about which sectors to invest in. Clearly in making a judgment on where to allocate capital, investors like to know the past history of returns in different sectors.³⁸

This creates another chicken and egg problem. Until private equity has been investing in an area, there will be no history of returns. But without a history of returns, limited partners are reluctant to come in—even when underlying investments in the area actually have the potential to earn good returns.

3.2.3 NEW INVESTMENT AREAS ARE PERCEIVED TO BE RISKY

A related problem to the lack of return history is high perceived risk. Fear of the unknown is a commonly observed trait of the human psyche. Studies suggest that this fear also operates in investors' minds.³⁹ In other words, just because an area is unknown, there is a human tendency to assume that risks in that area are higher than they really are. As a result investors tend to invest in that which they find familiar.⁴⁰

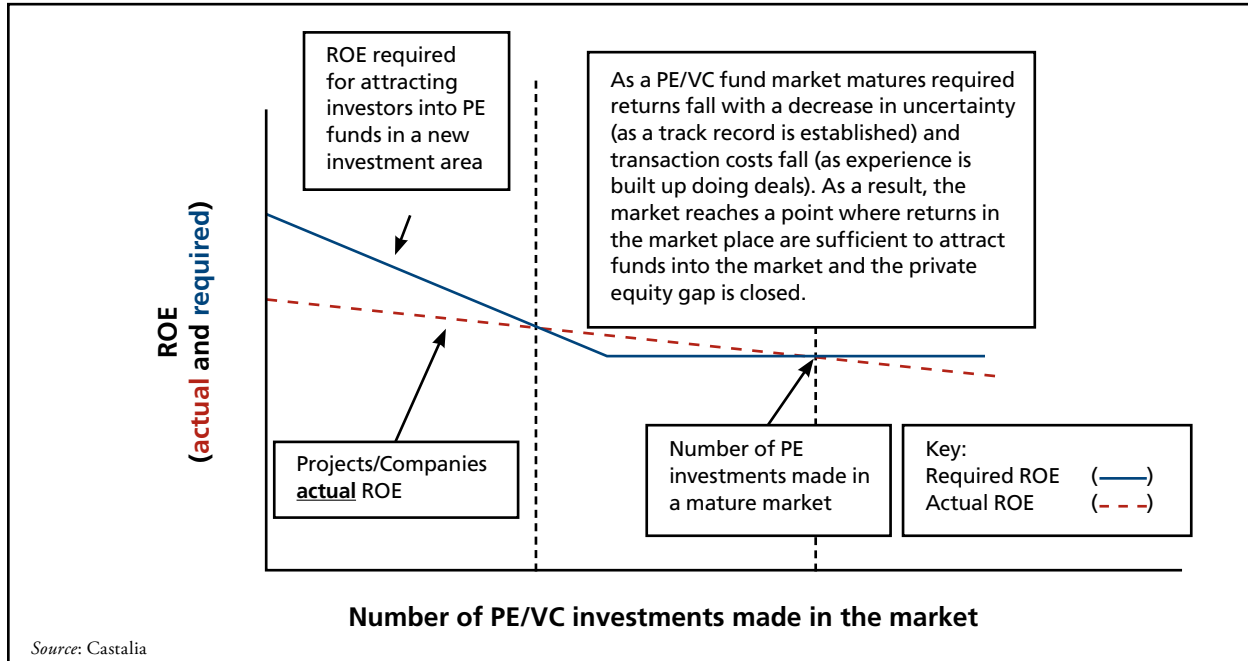
³⁷ According to Blanchard (2001) the THVC's fund had at least US\$25 million committed, its follow on fund aimed to raise US\$30 million.

³⁸ The need to demonstrate that investing will be profitable in comparatively little known markets is thought to be an important inhibitor of Foreign Direct Investment (FDI). For instance, see DeCoster, Gregory P. and William C. Strange (1993), "Spurious Agglomeration", *Journal of Urban Economics*, Vol. 33, pp. 273-304.

³⁹ Note that this effect is different from the simple lack of information problem of the previous heading. Lack of information removes the (apparently) objective basis on which investors would like to justify their capital allocation decisions. It does not suggest that the new area is worse than areas with returns history, just that there is no information to justify a decision to invest. In contrast, fear of the unknown leads to the conclusion that an unknown area is actually a worse investment destination than a known area, because it is riskier.

⁴⁰ Huberman, Gur, 2001, "Familiarity breeds investment", *Review of Financial Studies* 14, 659-680; and Kalok Chan, Vicentiu Covrig, and Lilian NG, 2005 "What Determines the Domestic Bias and Foreign Bias? Evidence from Mutual Fund Equity Allocations Worldwide". *The Journal of Finance*, Vol. LX, No. 3, June 2005.

Figure 3.2: Why Does a Private Equity Investment Not Occur in a Market with the Potential for Healthy Returns



This tendency to fear the unknown creates yet another chicken and egg problem, as Figure 3.2 illustrates.

In an unfamiliar area like climate-friendly investing in developing countries, perceived risk may be above what risk perceptions would be in a more mature market. Underlying investments in the sector may offer returns above what would be required in a more mature private equity market. However, if these underlying returns are below the return investors require given the high risk perceptions in an immature market, it may be that no investment takes place. If, however, some initial investment does occur, then perceived risk and hence required returns drop and, when they drop below the actual levels being achieved, significant amounts of investment can flow. As investment increases, the best opportunities are taken up first, and so in time actual returns are forced down.

Biomass generation in the Philippines may be a sector trapped at a stage where high perceived risks prevent investments being made, if the story told by Global Green Power is anything to go by. Global Green Power aims to develop, finance, build, and operate biomass power plants in the Philippines. These biomass plants work well elsewhere in the world, but are new to the Philippines. The company is seeking PE/VC investment to build the plants. However, it has been unable to attract

investors. The returns the company expects to achieve would be high enough to attract PE/VC investment in a company that already had a track record in the Philippines. However, due to the lack of an operating track record and the perceived risk of investing in the Philippines investors are unwilling to commit equity.

Investors report that once a single plant is up and running profitably, required returns would drop to a level that Global Green Power projects can comfortably achieve. Thus if Global Green Power could successfully finance the first plant it could attract financing for the other three plants that are in the advanced stages of planning. From the investors' point of view though, not knowing if a firm can deliver on its promises, or if the feedstock can be secured, or how the regulatory regime will evolve, is a genuine barrier to early investment.

Another example is the experience of commercial plantation forestry in Africa. The sector has strong profit potential, and strong potential to mitigate climate change. Despite this, it has been difficult to get investors to consider the market. As a result, the CDC (the Fund of Funds owned by the UK government), the IFC, and others supported the establishment of the GEF Africa Sustainable Forestry Fund (GASFF) by the Global Environment Fund. GASFF has achieved a first close of

\$84 million on the “first private equity fund to focus solely on sustainable forestry in Southern Africa”.⁴¹ Early indications are that GASFF is likely to earn healthy returns in the market.⁴²

3.3 BARRIERS TO DEPLOYING CAPITAL IN CLIMATE FRIENDLY INVESTMENTS

Fund managers that have been successful in raising their fund then face a number of barriers to deploying capital into areas that, at first sight, seem as if they should be profitable. Pioneering investments are more costly to complete, while the benefits of the pioneering efforts can be hard to capture. Additionally, there is the problem that the environmental benefits of carbon abatement are still not easily monetized.

3.3.1 PIONEERING A MARKET HAS HIGH COSTS

In a new area—such as investing in new technologies and business models in emerging markets—deal structures, documents, business models, everything, needs to be developed for the first time.

Consider a PE/VC firm interested in backing Energy Service Companies (ESCOs) in a market such as the Philippines, where they are not yet widespread. The business case seems clear. ESCOs solve a well-recognized problem—that commercial and industrial companies often lack the management focus and knowledge to invest in energy efficiency. ESCOs’ value proposition is that they will make the energy efficiency investments, provide the capital and expertise required, and get paid out of a share of the savings produced. The model has proved to work in the United States, Colombia, and elsewhere. Energy audits in the Philippines indicate that high returns from energy efficiency investments are likely.

Pioneering this market may involve large costs—costs that are hard to estimate in advance. Few firms or individuals in the Philippines know how to operate the ESCO business model, while foreign ESCOs will not be at home in Philippines business culture. Since the concept is new, pioneering ESCOs will have to educate a skeptical market about how the model works. ESCO contracts that work under Philippines law will need to be drafted. Banks will need to be persuaded to provide debt finance, something they will be initially reluctant to do, since ESCOs have few realizable fixed assets. The first investors, then, must shoulder the burden of creating the entire market.

3.3.2 DIFFICULTIES IN CAPTURING ALL THE RETURNS FROM PIONEERING INVESTMENTS

Worsening the high costs of pioneering a market are the difficulties of capturing the benefits. It might be argued that the additional costs of pioneering a market should be more than offset by additional returns. Indeed in some cases, early movers can seize the best opportunities, or gain such a commanding lead on the market, that their initial cost and risk bearing is more than rewarded. In climate change markets this is not always true. Sometimes the returns for “first movers” are not much higher than those for firms that follow. For instance, in many markets prices are often fixed (for instance through Power Purchase Agreements) or the first mover’s cost of production is no lower than those that follow. As a result, the market’s development can be delayed as companies in the industry are not willing to invest while they wait for another company to demonstrate that investing is indeed profitable. Once a company invests and demonstrates the technologies’ profitability, they are willing to follow as the risk of investing falls. As a result there is potential for a market failure as the companies wait for someone else to invest so that they can free ride on the information generated by the first mover’s investment. The result is that investment takes longer to occur than it should.⁴³

Bio-gas production from agri-processing plants is a recent example of an industry where good commercial returns are possible, but this potential could not be unlocked until an early mover demonstrated the technologies’ commercial viability. In Thailand in the late 1990s, it became clear that the use of the effluent from cassava processing plants for biogas production had the potential to generate substantial returns and reduce carbon emissions. However, the owners of cassava processing plants, and other plants with similar effluent, were wary of investing given that the technology had not been proven to be profitable in Thailand. This barrier was overcome when E+Co, an impact investor, invested in KWTE in order to enable it to create a plant to produce methane from SWI, a cassava-processing factory.⁴⁴ The plant was successful and profitable. A number of owners of similar plants in the area saw this success and also invested in the technology. Within five years, KWTE was sold. E+Co’s annualized investment return was healthy, based in part on the sale of carbon credits.

41 Tom Minney, 2010 “GEF Africa sustainable forestry fund” Africa Capital Markets News (<http://www.africacapitalmarketsnews.com/551/gef-africa-sustainable-forestry-fund/>).

42 Castalia market intelligence.

43 This market failure is discussed in detail in Ricardo Hausmann & Dani Rodrik, 2002. “Economic Development as Self-Discovery,” NBER Working Papers 8952, National Bureau of Economic Research, Inc.

44 Interviews with E+Co.

3.3.3 THE BENEFITS OF CARBON ABATEMENT ARE NOT EASILY MONETIZED

In well-functioning markets, prices that business are paid reflect the social benefits they create. However, where businesses generate externalities this equation between social benefit and revenue breaks down. Clearly this is a major problem for climate friendly investing.

Carbon emissions are considered to be a global negative externality, but are not generally priced. The failure to earn revenue from emissions reductions can make the difference between earning a commercial return and not. Thus where there is no financial reward for reducing carbon emissions, private equity funds will not be able to deploy capital into some climate friendly projects, because the returns will be too low.

The Clean Development Mechanism (CDM) does provide payments and these do reward companies for reducing GHG emissions. However, it is difficult for companies to raise debt or equity financing against the payments from the CDM. There are a number of reasons for this. An important one is that financiers are uncertain about the price at which the credits will be sold—most notably due to uncertainty about whether there will be an extension (or replacement) of the Kyoto protocol. For this reason, debt and equity providers do not take into account expected CDM payments when providing finance.⁴⁵

Some emerging markets provide financial support to renewables. For instance, Jamaica offers a 15 percent premium on the power price to renewable energy when setting bulk purchase tariffs for electricity. The Philippines is planning feed-in tariffs with a similar aim. In general though, many carbon abatement projects find it difficult to capture the value of their abatement effects.

⁴⁵ Interviews with a wide range of investors and developers suggest that few (if any) financiers incorporate carbon payments into debt or equity financing decisions.

4 Mechanisms to Facilitate Private Equity Fund Investing

Given the global benefits of increased PE/VC in climate change, the global community has an interest in overcoming the barriers to it. The public sector, including multi-lateral agencies and governments, can leverage private capital into climate friendly investments.

The public sector has a long history of leveraging private capital into PE/VC fund markets. Public sector initiatives played a pivotal role in the development of the PE/VC fund markets in the United States and United Kingdom, the countries that today have the most active PE/VC fund markets across the board and specifically for climate friendly investments.⁴⁶ The white text boxes in Figure 4.1 illustrate a number of interventions that use public capital to leverage PE/VC fund development. These interventions aim to accelerate market development by boosting fund formation, and by overcoming barriers to profitable deployment of PE/VC capital in climate friendly investments in emerging markets.

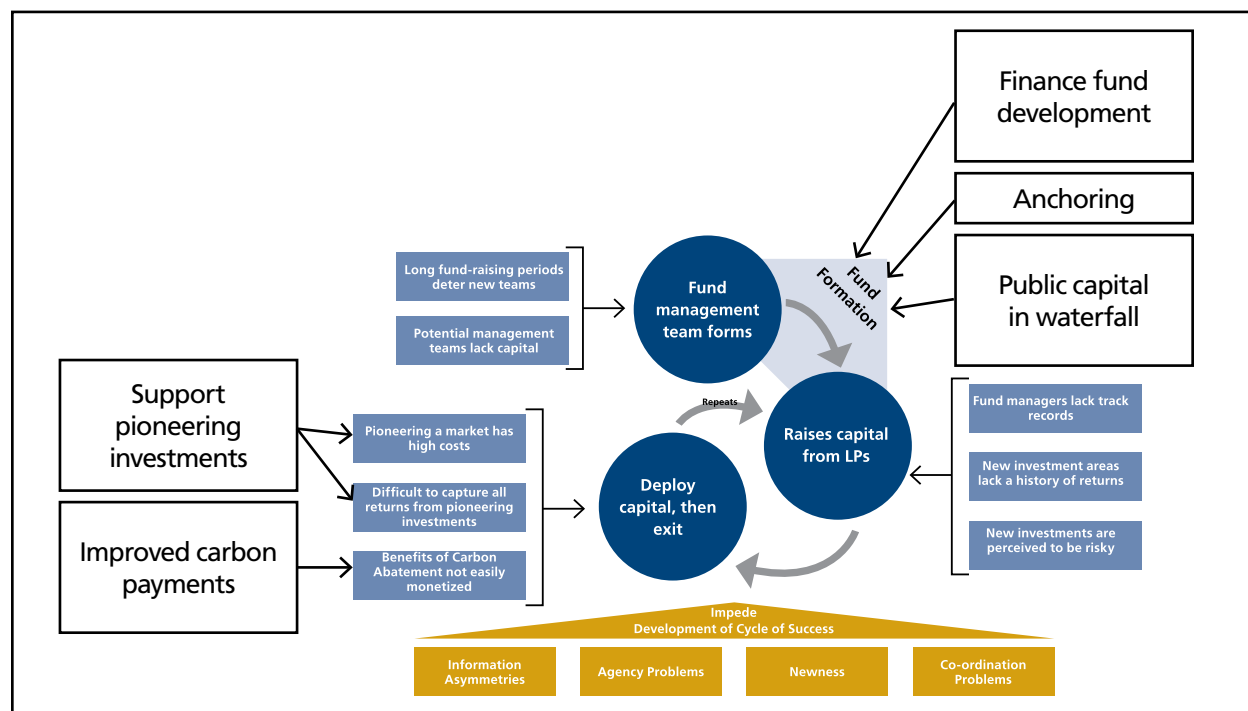
Fund formation is particularly difficult in a new area because a new area needs new management teams. New teams do not have track records, so LPs are reluctant to invest with them. The three main interventions public sector financial institutions can bring to bear here are:

- **Anchoring:** Selecting, improving, and validating a new fund so that other investors also commit capital
- **Financing fund development:** Provide capital and funding to help new funds get through the costly fund raising stage
- **Public capital in the waterfall:** Putting public money into a new fund on terms that either protect the downside or leverage the upside for private LPs, encouraging them to invest.

Deploying capital can also be challenging in climate friendly investing in emerging markets, These investments break new ground—which is always costly and risky. Moreover, the key benefit of carbon emission reduction often does not translate into secure revenue. Public sector institutions should consider:

- **Supporting pioneering investments:** Concessional finance for operational activities can help offset the costs of pioneering, and reflect the information value of these activities
- **Improved carbon payments:** There is scope for an alternative approaches to carbon payments that could lower transaction costs and make it easier to raise debt finance.

Figure 4.1: Interventions to Overcome Barriers to PE/VC Fund Investment



⁴⁶ Lerner suggests that the federal government's Small Business Investment Companies (SBIC) programs played an important role in the development of the United States Venture Capital industry in the 1960s and that the United Kingdom government supported Industrial Development Finance Corporation (ICFC) played a key role in the development of the United Kingdom venture capital market. Page 37-41 of Lerner, 2009 "Boulevard of Broken Dreams" Princeton University Press.

4.1 ANCHORING

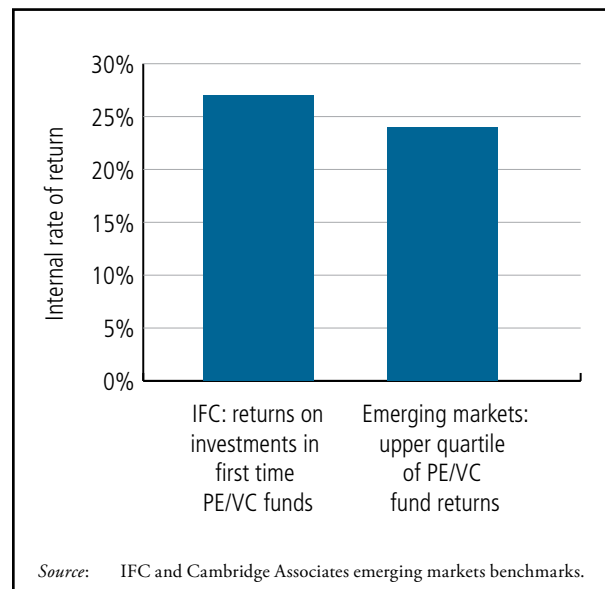
Public sector financial institutions can anchor PE/VC funds by taking the lead on finding, and investing with, good new fund managers. Given other commercial opportunities, private investors may not be interested in putting sufficient effort into doing due diligence and investigating the fund manager's investment thesis in the climate friendly area. By contrast, public financial institutions have the ability to take the lead. IFC has played this role successfully in developing new emerging market PE/VC funds, as Box 4.1 describes.

To help develop emerging fund managers, the IFC invests a substantial proportion of its funds with new fund managers. During the early 2000s, the IFC supported many first time PE/VC funds in nascent markets with little previous PE/VC fund activity. As shown in Figure 4.2 the IFC's investments in these first time funds were relatively successful. The IFC's investments in first time funds outperformed global benchmarks, and also outperformed IFC's investments in follow on funds in more established markets. These returns are high because these funds are often entering markets where few PE/VC funds are active, so they face little competition when investing in companies. This enables them to spend time on due diligence, invest on more favorable terms, and so generate higher returns.⁴⁷

IFC believes the differentiating factor in fund returns is the manager's skill set, not whether this is a first time fund.⁴⁸ This thinking is starting to gain traction elsewhere. A survey conducted by the consultancy firm Green Peak Partners and the investment manager of Capricorn Investment Group, found LPs are now placing more emphasis on the qualities of a fund's management team than on a firm's historical track record.⁴⁹

Another good example of anchoring in fund formation is the way EIB backed the Dutch Infrastructure Fund (DIF) by providing the first capital commitment. The EIB's due diligence of the company, and structuring the legal documentation to best market standards, gave comfort to private sector investors. This helped DIF raise further funding, including from financial investors who had not previously invested in PE funds in this sector.

Figure 4.2: IFC's Returns from Investing in First Time PE/VC Funds Outperform Follow on Funds and Industry Benchmarks (2000-2010)



In climate friendly investing, Berkeley Capital shows the value of CDC⁵⁰ as an anchor investor. Berkeley Capital is a private equity fund focused on the development of new renewable energy infrastructure assets in Asia. CDC was Berkeley Capital's first investor. Berkeley Capital states that CDC played a:

critical role in the successful launch of the Fund". Examples of the activities that CDC engaged in included "introductions to other potential LPs, [making themselves] available to speak with other potential LPs about CDC[s] due diligence process and [its] investment decision, an understanding approach to fundraising delays, and...[n]egotiat[ing] the Fund's documentation to provide additional comfort to potential LPs⁵¹

⁴⁷ These investments made up a substantial proportion of the IFC's investment. The institution placed over 40% percent of its PE/VC fund portfolio with first time funds. This amounts to a commitment of more than US\$600 million across 50 funds. The results are unaudited and taken from internal analysis of the IFC portfolio of Private Equity Funds.

⁴⁸ David Wilton, 2010 "A Comparison Of Performance Between First Time Fund Managers & Established Managers Moving Into A New Market. How Important Is Track Record?" Chief Investment Officer, Private Equity, IFC. [http://www.ifc.org/ifcext/cfn.nsf/AttachmentsByTitle/PerformanceComparisonFirstTimeFMandEstablishedManagersMovingtoNewMarket/\\$FILE/Comparison+of+Performance+Between+First+Time+Fund+Managers+and+Established+Managers+Moving+to+a+New+Market.pdf](http://www.ifc.org/ifcext/cfn.nsf/AttachmentsByTitle/PerformanceComparisonFirstTimeFMandEstablishedManagersMovingtoNewMarket/$FILE/Comparison+of+Performance+Between+First+Time+Fund+Managers+and+Established+Managers+Moving+to+a+New+Market.pdf).

⁴⁹ "First-time managers can hold their own" Private Equity Fund Manager via Factiva 3 September 2011.

⁵⁰ CDC is a Development Finance Institution within the government of the United Kingdom (www.cdcgroup.com).

⁵¹ Berkeley Energy, 2010 "Written evidence submitted by Berkeley Energy to the International Development Committee" United Kingdom Parliament (<http://www.publications.parliament.uk/pa/cm201011/cmselect/cmintdev/605/605vw04.htm>).

Box 4.1: IFC's Experience Investing in First Time Funds

As shown in Figure 4.2 IFC earned healthy returns from investing in first time funds during the 2000s. At the beginning of the decade, when the IFC's staff first thought through how to make investments in PE/VC funds, they thought they would make these decisions based on the returns the funds had generated in their previous iterations. This is the standard approach that institutional investors use when investing in PE/VC funds. What became clear was that this approach would not work in the areas where IFC wanted to invest countries with little PE/VC fund activity. These countries had few funds with any type of track record. As a result, IFC needed to establish new metrics that identified good fund management teams where no team had a track record. Two key metrics turned out to be:

- **Skill set:** IFC has found that the main drivers of returns for PE/VC funds in emerging markets are growth, and efficiency improvements in the firms invested in. People with the skills needed for this type of investment typically have experience in senior management or consulting in the target sectors and countries. The need for these skills is in contrast to developed markets where leverage and multiple expansion are more commonly the drivers of value creation. As a result in developed markets PE/VC funds place more emphasis on ensuring that they have skills commonly found in investment banks
- **Team cohesion:** a PE/VC fund is a partnership that must work together over ten years or more. It must make difficult, irreversible investment decisions, often under time pressure. The resulting pressures can pull PE/VC fund partners apart and lead the funds to fail. To avoid these problems the IFC has had to become attuned to the team dynamics of nascent fund management partnerships to ensure that they invest with those that are likely to retain their cohesiveness over the life of the fund and beyond.

In identifying new fund management teams the IFC generally avoids issuing calls for fund managers in the formalized tender type process that public sector institutions tend to favor. Rather the IFC tries to be always 'in the market'. This gives it opportunities to work with good fund management teams as they arise. It also reduces the problem of selecting teams that are skilled in public procurement processes, but who lack real sector or investing experience.

More often than not, fund management teams approaching IFC may be strong in some areas, but lack a key component for success. Sometimes the team knows the sector well but does not have anyone who can structure equity investments. Sometime the fund's investment thesis needs development. Where the fund is promising in other respects, the IFC gives the team feedback on what needs to change before IFC will fund them. This advice is especially valuable since it is difficult to find elsewhere. It is credible, since IFC actually will back fund managers to fill the gaps identified. The IFC also provides advice to teams on structuring and legal documents. Again, this kind of advice is hard to get elsewhere, and puts funds in a better position to attract investment from other LPs.

The IFC introduces new fund managers to other LPs that may be interested in investing. The IFC's recommendations are respected because the IFC's approach has achieved high returns (as Figure 4.2 demonstrates) and because the IFC itself is investing in the fund and so is putting its own money behind the recommendations it is making.

Source: Interviews with David Wilton and other IFC staff

Funding from IFIs and bilateral donors can also reduce political risk for climate-friendly funds. National governments, in general, are wary of mistreating companies or funds in which International Financial Institutions or bilateral donors have an ownership stake. For this reason, private limited partners consider that the political risk of investing in emerging markets is lower when they co-invest with a donor or IFI.

In summary, by being an early investor in a fund, an IFI becomes an “anchor” for private investors. The key benefits private investors see from this anchoring are: evidence of a thorough due diligence on the fund manager; a seal of approval on the fund documentation; likely assistance to the fund in developing key relationships, including with other investors; and mitigation of the political risk inherent in investing in emerging markets.

4.2 FINANCING FUND DEVELOPMENT

New teams with the potential to manage funds face difficulty paying the bills while they raise capital. In other markets, investors have seen a profit opportunity in providing financial backing to new fund management teams. There may be a role for public sector institutions to play a similar role in climate friendly investing. This support could be offered on purely commercial terms as an equity investment in the fund manager, or on a more concessional basis. In either case, it will be critical to guard against moral hazard in making funding decisions.

Equity Seed Capital for Fund Managers

In other markets, investors have seen a profit opportunity in providing financial backing to new fund management teams. These investors identify promising new or early-stage fund managers and provide seed capital to launch private equity firms. An example is the Northern Lights Capital Group as described in Box 4.2. In return for their investment, Northern Lights Capital Group receives a share of the returns of the fund management team. Given the double risk of this investing strategy—first that the fund manager will in fact succeed in raising a fund, and then that that fund will make money—investors will seek high returns on their investment.

There may be both the opportunity and the need to develop something similar to provide financial backing to new fund managers in emerging markets climate friendly investing. The barriers to fund raising in the sector are more severe than in many other sectors. Worsening this, fund managers in developing countries may have less personal capital to sustain their fund raising efforts.

Box 4.2: Northern Lights Capital Group—Commercial Seed Investment

Northern Lights Capital Group illustrates how a business model to support nascent fund management teams can work to facilitate climate friendly investments. Northern Lights is a firm that invests in new or early stage fund managers. The company invests equity in promising fund managers to cover operating costs during the formation of the firm. Northern Lights also provides strategic guidance and business support to help find limited partners and raise capital. In return, they share in the management fee and carry of the fund manager.

In 2010, Northern Lights invested in Nereus Capital, a private equity firm targeting renewable energy investments in India, providing capital to get the firm off the ground. Northern Lights is currently helping the firm to raise capital and plans to become an LP in their first fund. Nereus expects to make investments in renewable power projects of US\$5 million to US\$35 million in size.

Source: Discussion with Northern Lights Capital Group; Bloomberg Business Week (<http://www.businessweek.com/news/2010-12-15/northern-lights-invests-in-nereus-to-target-india.html>).

IFC’s experience suggests that backing first time funds financially could offer good returns. IFC does not typically seek a share of the fund managers it invests with. Were it to do so, the average returns, coupled with the economics that would likely have been available in exchange for an anchoring role and some working capital investment, would probably have generated a strong return on investment. This suggests that public sector entities could provide capital for this approach on a fully commercial basis.

Concessional investment support to fund formation

If the public sector wished to prioritize the development of new fund managers, more concessional seed capital structures would be possible. Funding could be provided to nascent teams as a reimbursable grant which would be repaid as a percentage share of the fund manager’s earnings (carry) in the event that the team was successful. The share of the carry could be negotiated on a case by case basis and would need to ensure that sufficient incentive was left for the team but that public capital was equally able to participate and share in any future upside. By decreasing its return expectations the facility would be providing operating capital at concessional rates. However, by sharing in the economics, public capital would be reimbursed for its risk while creating a potentially

evergreen facility. Established as a multi donor trust fund this facility could be ring fenced from IFIs investment operations in order to prevent any conflicts of interest or institutional capture of new teams.

Clearly, funding new managers has significant risks. One particular risk is moral hazard—the likelihood that some managers will use the funding to pay themselves, without achieving the intended objectives. Design features that could mitigate the moral hazard risk include:

- Financing of this sort should only be committed by those public entities with an ability to judge a team’s drive and likelihood of success
- Financing should only cover part of the costs, so that the members of the fund management team still commit a substantial share of their personal wealth to fund development
- Funding could be largely or entirely limited to third-party costs, such as travel expenses and lawyers, reducing the temptation to consume the financing in salaries for the would-be managers.
- Funding should be provided in tranches once key milestones had been delivered.

Initial capital commitment to allow investment during fund raising

An additional option for speeding fund formation would be for a public sector institution to invest an initial commitment with a fund manager to allow it to start investing in projects, while it continues raising capital from other investors. This would allow the fund manager to build track record faster, and take advantage of projects in its pipeline that it might otherwise be too late to invest in. Such a commitment could also allow the fund manager to start earning a management fee, helping to cover some of the costs of the team while fund raising continues. The chance of being able to start investing more quickly could encourage more fund management teams to form.

Some investors appreciate the value of backing a fund manager without requiring investment from other LPs. In fact, this is done quite often. Guy Hands (a leading British private equity fund manager who now runs Terra Firma) got his start when Nomura agreed to back him with the capital he needed, creating Nomura Principle Finance Group. The first LP to invest in Valiance Capital, Generali, allowed for Valiance to start investing before other LPs invested.⁵² An example of an IFI

Box 4.3: Avoiding Moral Hazard

Once the public sector starts subsidizing PE/VC funds development expenses or providing capital on terms more favorable to the market there is the risk that the money will be spent wastefully. While moral hazard is always a concern when providing concessional finance or grant funding there are ways to mitigate it.

An example of a funding arrangement that could lead to moral hazard is to provide grants to PE/VC funds to evaluate different types of technology for use in a renewable energy infrastructure project. A concern arises because the PE/VC fund may use the money wastefully. This is clearly a problem if the manner in which the money is spent is not monitored carefully. In this case the PE/VC fund may well just use it to improve their profitability or pay themselves higher salaries. However, even if the provider of the grant carefully monitors the fund’s expenditure it may be difficult to stop less obvious forms of waste. For instance, the PE/VC fund could spend the money investigating technologies that are highly unlikely to succeed in the context in which they are considering investing.

Moral hazard can be mitigated. An example discussed in the text is to require the PE/VC fund to pay back the “grants” if the fund it operates is successful (thus converting the grant into a type of concessional loan). This helps mitigate moral hazard because PE/VC funds will spend the money more carefully if they expect to pay it back. This type of scheme can mitigate moral hazard but not eliminate it in all circumstances. For instance, a fund that does not expect to succeed, and so won’t expect to pay back the grants, will feel far less reason to use the money carefully.

Given how difficult it is to mitigate moral hazard entirely, there is always the chance that PE/VC funds (or any recipient of grant or concessional finance) will use money wastefully. In light of this difficulty, the public sector needs to consider whether the likely benefits from catalyzing the market outweigh the potential for waste that arises from the resulting moral hazard.

Note: Moral hazard: “the danger that if a contract promises people payments on certain conditions, they will change their conduct so as to make these conditions more likely to occur. For example, moral hazard suggests that if possessions are fully insured, their owners are likely to take less good care of them than if they were uninsured, or even to connive at their theft or destruction.” The Oxford Dictionary of Economics (<http://www.enotes.com/econ-encyclopedia/moral-hazard>).

⁵² Interviews with market participants.

doing something similar is the IFC SME Ventures program.⁵³ The program provides risk capital to small businesses in selected IDA countries through independent investment funds selected on a competitive basis.

That said, IFC and most other IFIs do not generally allow an investor to start investing their money⁵⁴ until at least three LPs in total are committed to the fund. Most are unwilling to be the majority investor in any fund or project. There are good reasons limited partners will not commit funds until others commit. Chief among these is that each investor wants to benefit from the others' due diligence. Committing funds to a fund manager is a risky decision. Each investor wants the reassurance that other investors also think it is a good decision.

If a public sector institution were to allow fund managers to start investing with only one LP committed, additional safeguards would be needed to overcome risk and moral hazard. This could include closer than usual supervision of the fund manager. The public sector institution would also encourage the fund manager to go on to raise funds from other LPs, to ensure that the fund appeared to the market as a normal PE/VC fund, and not the captive instrument of a single public sector institution—this would be important for the catalytic function to be achieved.



4.3 PUBLIC CAPITAL IN THE WATERFALL

Public sector institutions can also create a “waterfall structure” that changes the risk-return relationship for other investors and thus encourages them to commit to a fund.

Generally, all investors in a fund invest on an equal footing or “*pari passu*”. In a *pari passu* structure, all investors benefit from any profits or suffer from any losses in proportion to their investment, on an equal basis. A public sector institution has the option to make a fund more attractive to private investors by agreeing to take more risk, or lower returns, than the private investors. This can be achieved by moving away from the *pari passu* principle and using a “waterfall” structure”. Box 4.4 describes the success of public capital in a waterfall structure in catalyzing the Israeli VC market.

Waterfall structures can either dampen the losses that the private sector experiences if the fund loses money (downside protection), or leverage the returns they receive if the fund does well, providing “upside leverage”. (It is also possible to design a structure that does both).

The provision of downside protection or upside leverage is in principle similar to tools that are in standard use by governments trying to increase investment in particular areas or sectors. Leveraging upside is akin to providing tax breaks that increase returns for those investments that are successful. Providing downside protection is similar to the provision of guarantees to mitigate the losses to investors whose investments fail. In either case, the underlying intent is identical to that described here. The government is trying to increase the returns to private sector investors in a particular sector and thus increase investment there.

How the waterfall works

“Leveraging upside” and “dampening downside” increase returns for private sector investors by transferring the fund’s returns from one group (the public sector) to another (private investors). When the upside is leveraged, this transfer occurs if the fund succeeds. The public sector takes a return smaller than its proportionate share of the profits, and consequently “ramps up” the private sector’s returns. With downside protection the transfer occurs if the fund fails to reach a certain return. The public sector then takes on a greater than proportionate share of the losses, which reduces the private sector’s losses.

⁵³ [http://www.ifc.org/ifcext/media.nsf/AttachmentsByTitle/AM08_SME_Ventures/\\$FILE/AM08_SME_Ventures_IssueBrief.pdf](http://www.ifc.org/ifcext/media.nsf/AttachmentsByTitle/AM08_SME_Ventures/$FILE/AM08_SME_Ventures_IssueBrief.pdf).
⁵⁴ Sometimes referred to as “reaching a first close”.

Box 4.4: The Yozma Fund: A Successful Waterfall Structure

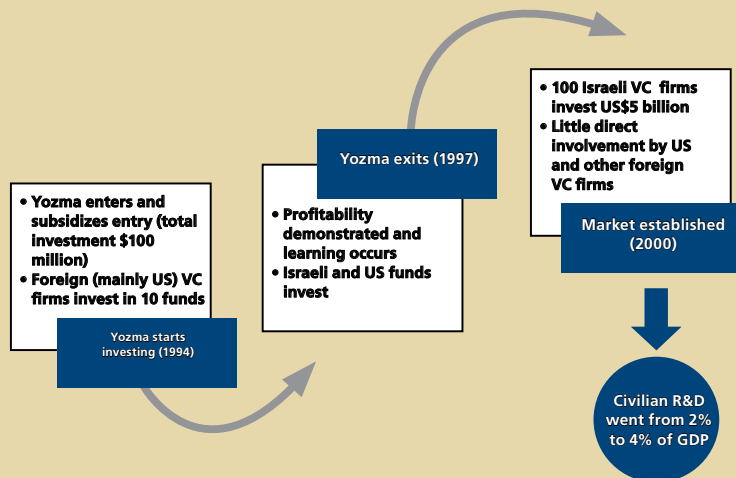
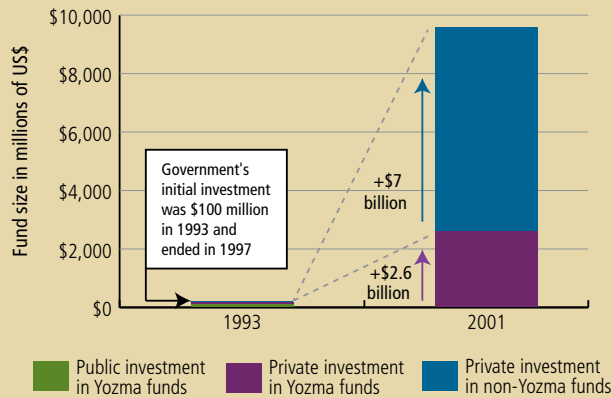
Israel’s Yozma Investment fund provides a useful illustration of how public sector intervention mechanisms help catalyze private investment into the PE/VC sector. Yozma was a government supported \$100 million “fund of funds” that successfully catalyzed the Israeli VC industry during the early 1990s. Through Yozma, the Israeli government provided matching funds of up to \$8 million to foreign investors that set up VC funds in Israel. The government provided these funds as equity. However, the other investors (or LPs) in these funds had the option to buy out the Israeli government’s original investment after a few years. Effectively they would pay the Israeli government a nominal interest rate on the money the Israeli government had invested, thus providing upside leverage to investors. Buying out the government would only be attractive if the fund was successful. In addition to the financial incentives, “the project adopted a legal structure for the venture funds that foreign investors would be comfortable with. Included were features such as a ten-year fund life, limited partnerships modeled on those standard in the United States.”(a)

The Yozma fund co-invested with 10 funds from outside Israel. The funds that Yozma invested in were so successful that the public sector was bought out of eight of the ten funds by the private sector investors or LPs. The funds no longer needed government support as they were able to raise their funding from the private sector for subsequent funding rounds. Most of them were able to expand over time. The enormous returns achieved attracted other funds into the market. Many of these funds were invested with Israelis who had worked on the original ten funds and who could now raise funding given their impressive track records. By the end of the 1990s there were 100 Israeli VC funds. As shown in the figure over the page these funds had \$7 billion under management by 2001. The original Yozma funds had \$2 billion under management by 2001 up from \$200 million in 1993 (including public and private investments). In total, the overall market was \$10 billion by 2001 compared to around \$30 million in 1992.

The VC industry in Tel Aviv is now the second largest center for VC finance after Silicon Valley, larger than Boston’s and, as a percentage of GDP, Israel now has the largest VC industry in the world.

Some ascribe the success of the Yozma fund to the internet bubble on the NASDAQ and other exchanges. However, this does not appear to be the case. Yozma was well on the way to successfully establishing an Israeli VC industry by 1995 when the bubble was only just starting to develop in the United States. The Israeli early stage VC industry has continued to be successful into the 2000s after the bubble burst in the early 2000s.(b)

It appears that the industry has led to substantial benefits for the Israeli economy. The increased availability of finance for technology start-ups should have made investing in civilian R&D more attractive and so should have increased the number of projects available to be financed. In line with this, civilian R&D increased from 2 percent to 4 percent of GDP over the period of the Israeli VC industry’s growth.(c)



Source: Yigdal Erlich, “the Yozma Group—Policy Success Factors” http://www.insme.org/documenti/Yozma_presentation.pdf (accessed December 10 2010) and Senor and Singer (1999).

Notes: (a) Page 156-157 Josh Lerner, 2009 “Boulevard of Broken Dreams” Princeton University Press.

(b) Gil Avnimelech and Morris Teabal, 2004 “Targeting venture capital: lessons from Israel’s Yozma program” Chapter 5 in Anthony Bartzokas and Sunil Mani (eds), 2004 “Financial Systems, Corporate Investment in Innovation, and Venture Capital” Edward Elgar Publishing.

(c) Markku Maula and Gordon Murray, 2003 “Finnish Industry Investment Ltd: An International Evaluation” Ministry of Trade and Industry.

The way that leveraging upside and dampening downside increase returns for private investors (LPs) is shown in Figure 4.3 and Figure 4.4. For illustrative purposes a \$100 million fund with a one year life is assumed (footnote 55 highlights a number of further simplifying assumptions).⁵⁵

Figure 4.3 compares a waterfall structure that leverages upside (the right hand graph) to a straight *pari passu* investment (the left hand graph). Upside leverage only “kicks in” if the fund generates a profit, otherwise losses are shared equally. Therefore, Figure 4.3 shows a scenario in which the fund has generated \$20 million in profit. In the *pari passu* structure (left hand graph) these returns flow equally to the donor and private LPs (50 percent to each). In contrast, in the waterfall structure 90

percent of the returns flow to the private LPs, increasing their returns from 20 percent to 36 percent if the fund succeeds. The donor LP funds this by accepting a smaller share of any profits generated (\$2 million rather than \$10 million).

Figure 4.4 does the same comparison for downside protection. As downside protection only helps if the fund loses money, Figure 4.4 shows a scenario in which the fund has experienced \$20 million in losses. In the *pari passu* structure (left hand graph) these losses flow equally to the donor and private LPs (50 percent to each). In contrast in the waterfall structure, these losses fall disproportionately on the donor LPs, increasing their losses from 20 percent to 36 percent. This reduces the private LP’s losses from \$10 million to \$2 million.

Figure 4.3: A Waterfall Structure that Increases Upside Leverage Relative to a Pari Passu Structure

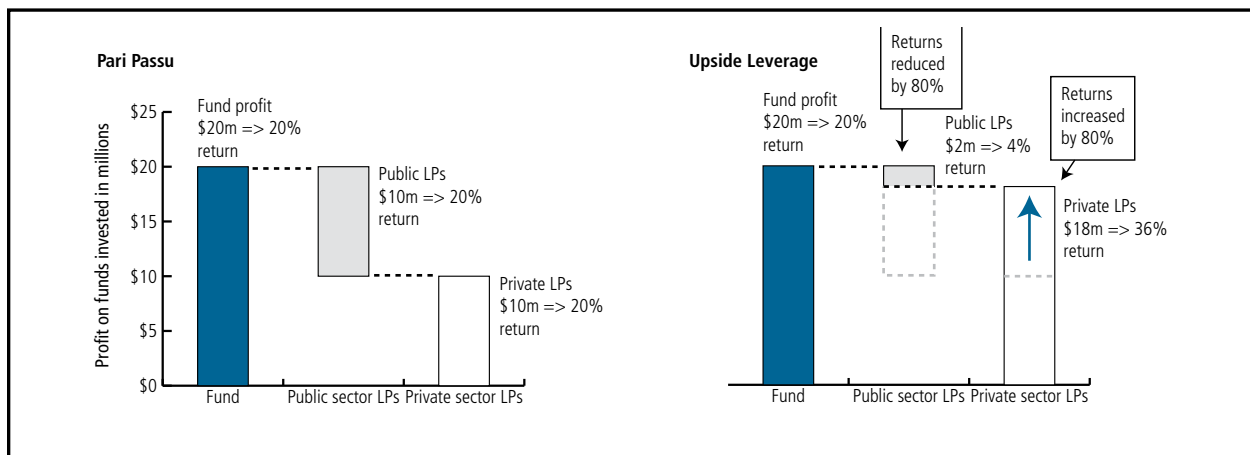
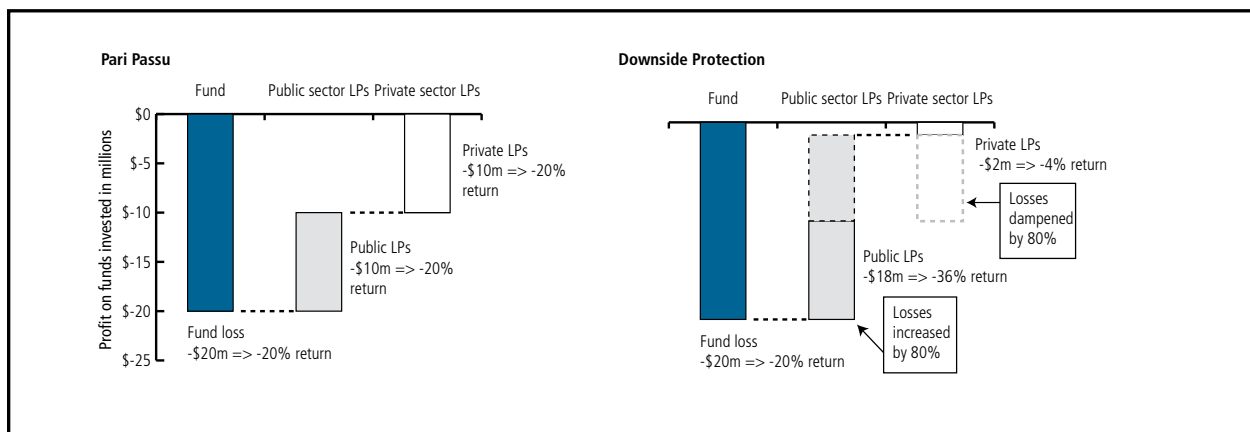


Figure 4.4: A Waterfall Structure that Dampens Downside



55 To make the numbers easier to follow the public and private sector LPs have equal stakes (which is not necessarily the case). It is assumed to have a one year life (whereas a fund would typically have life of 10 years), there is no inflation, and risk free investments offer zero return. The fund is assumed to either “succeed” and earn a 20 percent return or “fail” and lose 20 percent of the funds invested, and if it’s assumed to have a 50 percent chance of succeeding and a 50 percent chance of failing, the value of the subsidy is the same with either. That is, with either structure (used alone), the public sector LPs can expect (on average) to lose \$4m and the private sector LP can expect to earn \$4m. Thus either approaches to providing the subsidy increases the private sector’s return from an expected value of \$0 to \$4m. This assumes away any tax issues.

Box 4.5: Public Capital in Waterfall Structure: Lessons from International Experience

An analysis of the experience of successful and unsuccessful funds (presented in Appendix B) suggests that the public sector should (a) “seed fertile ground”, that its total contribution should be set at (b) the “golden mean” (not too small or large), and that (c) the funds must have a commercial investment focus.

Seed fertile ground

The Israeli Yozma fund, a very successful government supported “fund of funds”, was extremely effective at capitalizing the Israeli PE/VC industry during the 1990s largely because it was launched in a “project rich environment”. Israel had a long and strong history of developing new civilian and military technologies. As a result, when the VC funds started looking for technology start-ups to invest in, there were many viable candidates and they could quite easily find firms that had significant growth and profit potential.

An interesting contrast to the Yozma experience is that of the New Zealand Venture Investment Fund (NZVIF). New Zealand tried to replicate the Yozma experience and so structured its fund in a very similar way. Despite the similarities between the two funds, NZVIF has been less successful so far and it is taking far longer to find projects to invest in. A plausible reason for this is that New Zealand does not yet have the pipeline of start-ups with promising new technologies for the VC funds to invest in.

Choose the golden mean fund size

A fund needs to be large enough to cover the minimum costs of running it effectively. This puts a floor on how small a single publicly supported PE/VC fund can be. A number

of PE/VC funds have been created by states in the United States which were as small as \$10 million. As a result, they had hardly any effect. At the same time there is a risk in being too large. A Canadian program granted generous tax incentives to invest in trade union managed PE/VC funds. It appears that there was far more money in these funds than could be usefully invested and so fund returns were poor. In addition, it appears that these funds crowded out the private sector, and so private VC activity fell as a result.^a

Create and run the fund on a commercial basis

The basis for a successful market catalyzed by a publicly supported fund is that it paves the way for other funds to follow. It is less likely to do this if the private sector investors or LPs in the fund don't have a commercial rationale for investing or if the fund is run on non-commercial grounds. For example, the members of the German fund called the Deutsche Wagnisfinanzierungsgesellschaft (WFG) that was created in the 1970s to invest directly in new companies, had been pressured by the government to invest in the fund to help catalyze the market for technology focused VC funds in Germany. As a result, the banks saw this as an exercise in Corporate Social Responsibility (CSR) and thus pressured the managers to dampen the fund's returns by making socially conscious investments. Consequently, the WFG failed to effectively catalyze Germany's PE/VC industry.^b

Sources: a. Josh Lerner, 2009 “Boulevard of Broken Dreams” Princeton University Press

b. The information on the WFG comes from (a) Caroline Fohlin 2006 “Venture Capital Revolutions Germany and the United States in the Post-War Era” (<http://www.econ2.jhu.edu/people/fohlin/FohlinPUB-PRIV-VCrev-w-tabs10-29-06.pdf>) and (b) Ralf Becker and Thomas Hellman, 2002 “The Genesis of Venture Capital Lessons from the German Experience” CESifo Working Paper Series number 883., 15 November 2002.

This example has been set up so the two different waterfall structures increase the expected returns for the private LPs by the same magnitude. In this example, with either approach the expected value of the incentive to the private investors is **identical** (making numerous simplifying assumptions described in footnote 55 including assuming away taxes).

Nevertheless, the two approaches **appear** quite different after the fact. With downside protection, the funds transferred to the private LPs come out of the donor LPs principal, and hence has the **appearance** of a grant. In contrast, with the upside leverage the transfer is funded out of the profits generated

by the fund. The two approaches also differ in terms of the incentives they give investors.

Choosing the waterfall design

Providing investors with upside leverage has better incentive properties than providing them with downside protection. Examples of programs that provide upside leverage include the Yozma Fund (as discussed in Box 4.4) and the NZVIF (as discussed in Box 4.5). The advantages of leveraging investors' upside returns are twofold:

- **Attracting the right kind of investors (overcoming adverse selection):** leveraging firms' upside will only be attractive to those investors who believe the fund has the **potential** to do well. Thus, when the upside is leveraged this ensures that private sector investors' decision to invest can be taken as something of a vote of confidence in the fund's prospects. In contrast, if investors' downside is sufficiently protected they may invest even if they have little confidence in the fund's investment mandate
- **Giving fund managers the right incentives (overcoming moral hazard):** leveraging upside for the fund manager gives it a stronger incentive to achieve higher returns. Leveraging investors' upside gives them a strong incentive to pressure the fund manager to achieve returns. In contrast, if the subsidy is used to dampen returns the investors have less incentive to pressure the fund manager to achieve returns. An example of this is the WFG where the investors had so little incentive to achieve returns that they are reported to have resisted efforts by the fund manager to increase returns.

While the ideal mechanism for providing a subsidy is to leverage the upside, some investors may only be attracted to a PE/VC fund if downside protection is provided. For instance, as discussed in Box 4.5, the WFG needed to provide downside protection to attract conservative, risk averse banks, to the structure.

The subsidy question

Waterfall structures do amount to a public sector subsidy to the private investors in the firm. By agreeing to take lower returns for the same risk level, the public or IFI investor must expect to transfer resources from the public to private sector. This is most clearly true when the public sector loses some of the value of the principle invested, but it is also true when the public investor misses out on some or the profits from a successful investment. Given that these waterfall structures do involve a resource transfer, or at least an opportunity cost, compared to *pari passu* investing, the question arises how this can be justified.

The obvious justification is that by increasing investment in PE/VC funds targeting low emissions projects, the public sector contribution achieves the global good of increasing greenhouse gas abatement. While more indirect and risky than, for example, subsidizing a wind farm directly, PE/VC waterfalls have the potential to achieve much larger abatement levels per dollar of public subsidy. The reason is the development of PE/VC market has the potential to take-off in a virtuous circle, in the way Yozma led to a take-off of the Israeli PE/VC sector (and hence the high tech economy in Israel).

Another justification is based on risk perception. If it is true that perception of risk is excessive in a new area, then the returns demanded by private investors will be above the levels that in a sense "should" be demanded. This suggests that the public sector might in fact be able to achieve a reasonable risk-adjusted return on investment, even though the return is below what private investors receive initially.

Finally, there may be a justification driven by taxation issues. If public and private sector LP investors are *pari passu*, and the fund generates a return (net of fees and carried interest) to its investors of 15 percent, the public sector investor receives a 15 percent gross and net return as an LP as it pays no tax on its profits. However, a private sector investor will receive a 15 percent gross return and a 10 percent net return assuming a 33 percent tax rate on its profits. Therefore, as an LP investor in the Fund, the public sector investor receives a higher net return than does the private sector investor. In this sense, a subsidy in a waterfall structure may be thought of as bringing public sector returns more into line with private sector returns, but doing so in a way that provides developmentally-positive incentives to private investors.

4.4 SUPPORTING PIONEERING INVESTMENTS

Pioneering new markets and investment structures has costs which are higher than investing in mature markets. The benefits of the pioneering may, at a social level, outweigh the costs. However, for a private investor, the pioneering may not be worthwhile, because the costs are born by the first investor, while the benefits are often reaped by others. The public sector may have a role to play helping investors meet the costs of pioneering new climate-friendly investment areas.

E+Co's experience illustrates the point. E+Co is an impact-oriented debt fund now moving into PE/VC investing. As discussed for the example of Bio2Watt in Box 4.6, E+Co incurs pioneering costs in:

- **Explaining the equity product:** clean energy entrepreneurs such as improved cookstove manufacturers in Africa are not familiar with the concept of outside equity investment. E+Co needs to explain to entrepreneurs why it may make sense to give up a share of profits and control in exchange for growth capital
- **Enterprise development services:** E+Co needs to provide what are essentially technical assistance services to potential investee companies, putting in place governance structures, financial reporting systems, and the other infrastructure of a successful business. This is needed not only to help companies to grow, but to make them investable in the first place

Box 4.6: E+Co's Support for Bio2Watt Leads to the Introduction of Environmentally Friendly Technology to South Africa

Bio2Watt (PTY) Ltd is a pioneering company introducing technology to South Africa that converts agricultural waste to energy. In playing this role it has faced a number of challenges. The support and finance E+Co has provided has been critical to the company's success so far.

In 2006 the founder of Bio2Watt, Mr. Thomas, left his stable job at a large corporation in South Africa to develop a renewable energy development business, fulfilling a dream he had for several years. He set out to identify large sources of waste that could be collected easily for conversion to energy. He focused on manure which is relatively easy to collect compared to other forms of agricultural waste. He found a potential source for the manure at Beefcor farm which is half an hour drive from Johannesburg, near the town of Bronkhorstspuit. The farm had 20,000 head of cattle and a million chickens. The farm was struggling to manage the vast quantities of waste these animals produce on a daily basis and so was receptive to Mr. Thomas's proposal to take the waste away for use in power generation. The farm's waste had the potential to power a 3MW plant while reducing greenhouse gas emissions. To turn this potential into reality he had to find the appropriate waste to energy technology for South African conditions, pass numerous regulatory hurdles, develop the business and find financing. E+Co helped him overcome each of these challenges.



Source: E+Co (<http://leandco.net/>) and Bio2Watt (<http://www.bio2watt.com>).

Note: (a) Waste Solutions (<http://www.wastesolutions.co.nz/>)

Selecting the appropriate technology—Mr. Thomas first looked to German technology due to Germany's large waste to energy industry. But this technology was not economically viable in South African conditions. E+Co used its network to introduce Mr. Thomas to Waste Solutions, a New Zealand producer, with experience in waste to energy systems in South East Asia (a). These systems were more suited to South African conditions and were able to produce power at a lower cost, far closer, to that charged by South Africa's monopoly power producer, Eskom.

Satisfying regulatory requirements—the plant needed to submit an Environmental Impact Assessment. Because this was the first plant of its kind in South Africa, the Department of Environmental Affairs was cautious and requested a number of additional studies. In the end the Environmental Impact Assessment cost twice as much as expected.

Supporting the business's development—E+Co helped Bio2Watt to engage the legal firm Edward Nathan Sonnenbergs (ENS) which provided legal services for the sixteen contracts required to get the plant up and running. Examples of the contracts included supply agreements and power purchasing agreements. E+Co has also helped Bio2Watt establish proper governance processes and participated as B2W's partner in all of its important negotiations and meetings.

Finding finance and funding—Mr. Thomas used up his savings during the early stages of businesses development and so finding additional funding was crucial. E+Co assisted Bio2Watt to secure grants from the Dutch government to support the project development costs. E+Co itself provided debt and equity, and helped Bio2Watt to raise equity from investors in E+Co's international network.

Once Bio2Watt has successfully launched its first plant in South Africa it plans to launch similar plants in the rest of South Africa and throughout Sub-Saharan Africa.

- **Management of a small fund with small individual investments:** many climate friendly companies in emerging markets are small, meaning that smaller funds, with smaller bite-sizes per investment make sense. This is natural in a pioneering area.

However, the transaction costs do not reduce in proportion to the smallness of the investments and funds, meaning that the fund management costs per dollar of assets under management exceed the two percent that is standard in the PE/VC world.⁵⁶

⁵⁶ Interview with Christine Eibs Singer CEO of E+Co.

Box 4.7: Examples of Approaches to supporting Pioneer Investments

EC ASEAN Cogen Programme

This program promotes the implementation of biomass, coal, and gas cogeneration projects in ASEAN countries. It does this by providing a grant of 15 percent of the cost of EU made equipment for projects that demonstrate the technical and financial viability of these technologies in ASEAN countries. The Cogen program also provided technical assistance to companies implementing co generation technologies.

UNEP's Seed Capital Assistance Facility (SCAF)

UNEP, the African Development Bank, and the Asian Development Bank launched the Seed Capital Assistance Facility which is designed to facilitate energy investment funds to provide seed financing to early stage clean energy enterprises and projects in developing countries. SCAF offers two main “support lines” to fund managers targeting the clean energy investments through a SCAF agreement:

- **Enterprise Development Support:** This line of support is an annual grant to fund managers to develop a pipeline of early stage investment opportunities by providing services to early stage companies or projects. These services include training and coaching of clean energy entrepreneurs or project developers and feasibility studies for potential projects
- **Seed Capital Support:** Seed capital support is designed to provide support for covering the higher costs of early stage companies or projects. The additional costs can include technical assessments, contract negotiations, environmental impact assessments, and permitting. The support is a grant that is provided on a project to project basis and typically in the range of 10 to 20 percent of the investment.

In addition to the two support lines, SCAF has also provided seed capital of US\$150,000 to fund managers interested in investing in clean energy opportunities to cover the initial operating costs of starting a fund. To date, SCAF has supported five fund managers with seed capital, and are targeting five more in the coming year.

Source: Discussion with Eric Usher with UNEP, SCAF website (<http://www.scaf-energy.org/about/introduction.html>) and for the EC Cogen Programme (<http://www.cogen3.net/aboutcogen.html>).

In addition, a number of climate friendly business models are new—examples include renewable energy IPPs in many countries and ESCOs. Business partners, banks, and regulators all need to be educated. New deal structures and legal documents need to be developed.

To unlock climate friendly investments and start the virtuous cycle of PE/VC market development, the public sector may consider covering some of the pioneering costs. A number of public sector institutions provide grants which cover part of the cost of developing climate friendly projects. These are intended to offset the pioneering costs of new, often small projects. They typically cover such things as the costs of pre-feasibility studies, market studies, and tests of the technical feasibility of the idea.

Generally speaking, the public sector may support market pioneering through:

- Grants to assist with pipeline development
- Grants to cover part of the cost of feasibility studies

- Grants for training and enterprise development services to investee companies.

As noted earlier, developing new investment opportunities and supporting and mentoring companies post investment are crucial to the success of a private equity fund. Consequently, public capital that is deployed to support such efforts needs to ensure that it does not distort the existing commercial incentives of the fund manager, does not create excessive transaction costs and that it uses structures that reduce moral hazard. One option could be to offer fund managers loans rather than grants to develop the critical resources necessary to effectively deploy capital. These loans could be used to supplement the management fee of undersized funds; contribute towards due diligence and other transaction expenses in innovative deals and will enable managers to deploy additional resources to directly support and grow their investee companies.

The loan could be structured such that it only becomes payable if the PE/VC fund earns a return above its hurdle rate. If the hurdle rate is not reached, the loan would become a grant. This mechanism provides the fund with equity-like capital but at

debt rates of return. Such concessionality would help to offset the increased costs of pioneering. Under this structure the fund manager is given an incentive to use the money appropriately but is not left with a debt burden if the fund fails to exceed its hurdle rate. Further, securing the return against the entire performance of the fund (and not to a specific investment) helps to spread the risk and increase the likelihood of return reducing the burden to the public sector. The advantages of this approach include:

- **Incentives are aligned:** The GP has an incentive to use the money carefully because the GP will pay back the money if the hurdle rate is exceeded
- **The cost of the subsidy is minimized:** A subsidy is only incurred if the fund fails to meet its targets. This reduces the cost of the donor support because the loan is repaid if the fund succeeds
- **The returns to the LPs are not affected.** An advantage of providing concessional finance in this way is that the LPs can invest in the fund on a standard commercial basis
- **Transaction costs are reduced.** Standard industry practices can be used to call capital from the loan for pre agreed eligible expenses.

4.5 IMPROVED CARBON PAYMENTS

Many climate friendly projects are only financially viable if they receive revenue for the value of the carbon emissions reductions they cause. The Clean Development Mechanism (CDM) was created to provide such revenue. In practice, the CDM has not worked as well as hoped. The transaction costs of getting the carbon revenues are high. Recent collapses in prices and trading volumes means the revenues are lower than expected. Without a fixed price structure carbon payments can't be used to leverage investment.

Public sector institutions have an opportunity to create a new kind of carbon payment mechanism that will provide revenue certainty for carbon emissions reducing projects. Such a mechanism would allow carbon revenues to be used to raise debt, and would increase equity returns on projects.

Development of a new bilateral based carbon payment mechanism

Governments could overcome some of the shortcomings of the CDM by offering contracts to purchase carbon emissions reductions in the future, at prices which are fixed now. Using

an option mechanism, governments could commit to purchase a specified quantity of emissions reductions, at a period in the future, at a “strike price” which would be set when the contract was signed. For example, the contract might allow a wind farm to sell up to 0.8 tons of carbon emissions reduction, at \$20 per ton, each year for the next 15 years, if it displaces electricity generated with coal. To make this work, governments would create a fund to offer carbon options. The fund would need to have the financial backing to pay the agreed strike price when the emissions reductions are achieved.

Such a mechanism is particularly well suited to help increase the level of PE/VC investment. Crucial to this structure is the ability of projects to use the mechanism to help raise more debt. By being able to increase leverage equity returns that were marginal become commercially attractive.

To understand how such an agreement could work, a hypothetical example is presented that is in line with the experience of Global Green Power (as discussed in 3.2.3, Global Green Power has well developed plans to build low emissions biomass power plants in the Philippines). A biomass power plant is expected to generate carbon credits during operations, and a price floor on the carbon price would ensure that the revenues of a biomass plant would increase by at least 10 percent over the life of the project. Carbon revenues would allow the project to: i) directly increase the dividends paid to equity investors, ii) borrow against these revenues (increasing leverage), or iii) a combination of i and ii. If 100 percent of the carbon revenues are directed towards paying more dividends to equity investors, the return on equity will increase by 5 percentage points—from 22 to 27 percent.

If 60 percent of the carbon revenues are used to increase debt (from 60 to 70 percent of capital costs), and 40 percent directed towards paying more dividends to equity investors, the return on equity increases by 8 percentage points—from 22 to 30 percent. Six percentage points of this increase are explained by the increase in leverage. This suggests that using carbon revenues to increase leverage could increase returns to equity investors more than if exclusively used to increase dividend payments to equity investors. The 8 percentage point increase would be enough to put returns to a level at which many PE/VC funds would be willing to invest in what is an untested technology. Further by catalyzing the first investment a track record is demonstrated reducing the risk and transaction costs for subsequent investors.

Crucial to attracting the additional debt is the certainty of the carbon revenue. Currently, there are two key risks that any financier relying on carbon revenue faces. The first is the price at which carbon emissions reductions can be sold in the future.

The second is whether the project will actually deliver the carbon reductions. The carbon put option will remove the price risk. The other risk—delivery of the emissions reductions—will remain. However, for many projects this risk is one that banks can get comfortable with. Take the example of a renewable energy project. Banks are happy to lend against future power sales, because through the quality of the technology and the operator involved they can get comfortable that power will be generated. For a renewable generator, carbon emissions reductions are simply a by-product of power production, suggesting that lenders will be comfortable lending against future carbon revenues for many projects, provided the price risk can be removed.

Beyond the financial incentives that accrue specifically to equity investors, the advantage of using PE/VC funds as routes to market for carbon payments include:

- They are already in touch with climate friendly projects seeking finance, so costs of originating deal flow for the carbon payment would be low
- They are already putting together financing packages for these projects, reducing transactions costs for investors (since all the financing can be arranged at one time, working with a limited number of entities).

There is an opportunity for the public sector to use public resources to unlock a virtuous circle of climate-friendly PE/VC investing in developing countries. PE/VC demands high returns, but has unique characteristics that enable it to back innovative, risky ventures and technologies, finance energy efficiency projects, and boost development of renewable generation and efficient transport infrastructure. Unlocking this potential requires the removal of barriers that now slow the development of the PE/VC market.

Removing barriers to fund formation

Potential PE/VC fund managers are deterred from trying to create climate friendly PE/VC funds targeting emerging markets because of the high costs and risks. Many potential fund managers lack the capital needed to sustain a one or two year capital raising process, with no income and no guarantee of success. A lack of well-qualified fund managers with clear skills and experience in climate-friendly investing in emerging markets in turn limits the capital that can be raised for this sector. These difficulties are accentuated because investors consider climate friendly investing in emerging markets to be highly risky and there is no history of returns. These problems can be overcome with time. As investments are made, track records and investment histories will follow. In all likelihood, greater familiarity with the sector, its technologies, business models, and countries of operation will reduce the perceived risk. However, the public sector has an opportunity to accelerate this process.

The challenge is to overcome the current chicken and egg situation, in which a lack of past investment in the sector limits the flow of capital in, and so perpetuates the lack of data and track records that deter fund investors. The public sector can co-invest in funds and attract private capital into those funds through the use of the following three techniques:

- **Anchor new funds:** Invest in new funds, provide them with advice on how to improve their team and structure and introduce them to other potential investors
- **Finance new fund development:** Provide new management teams with financial support to get them through the costly fund raising stage
- **Public capital in the waterfall:** Invest in funds on terms that encourage private investors to invest in the fund by dampening their downside or leveraging their upside.

While co-investing approaches have had clear successes, there have also been failures, in which the public sector money was lost, or the development objective not achieved. Key lessons from previous experience include:

- **Seed fertile ground:** The Israeli Yozma fund was successful because it was launched in a “project rich environment”. Similarly structured initiatives in places that lacked the underlying investment opportunities have not done as well
- **Choose the golden mean fund size:** The fund size must be related to the size of the potential market opportunity. Too small, and it can fail to catalyze the market. On the other hand, public sector support that is too large crowds out private capital and depress returns, as too much money chases too few investments
- **Create and run the fund on a commercial basis:** Private investors are attracted to funds with fully commercial objectives. Anything else will depress returns and send mixed messages, possibly retarding the development of private investor interest in the sector.

Remove barriers to investing

Many climate friendly projects earn lower returns than in a sense they “should”, either because carbon abatement benefits are not easily monetized, or because of the costs of pioneering new sectors. IFIs and donors can help overcome these problems in the following ways:

- **Fund the costs of pioneering:** National and international public sector institutions can help offset the costs of pioneering new business structures and educating markets. These costs are significant barriers to the first mover PE/VC funds. To offset the cost, public sector institutions can provide grants and loans at concessional rates
- **Improved carbon payment mechanism:** Bilateral donors have an opportunity to create a carbon payment mechanism which could offer guaranteed minimum prices for future carbon sales. This would greatly help with project financing, while the cost could be quite low. Channeling the carbon payment mechanism through suitable PE/VC funds would help ensure that the funds reached their targets, and also aid with financing, given the cornerstone role that PE/VC funds play in many financial structures.

The potential for market development

Removing these barriers to the development of the PE/VC market could create a virtuous cycle. Easier fund raising would encourage more fund managers to form. More funds would mean more investment, building up track records, and investment history. The benefits of early pioneering would come through in lower costs going forward. Perceptions of risk would fall. Improved carbon payment mechanisms would make more

climate friendly projects profitable, further improving investor perceptions of the sector, and increasing capital flows. As this process unfolds, more and more climate friendly investments in emerging markets would be able to access PE/VC funding. This would be a significant boost for the myriad of companies with climate-friendly projects that need equity to finance start-up costs or to accept the risk of volatile and risky cash flows, but are too large to rely on finance from family and friends. Clean technology development, energy efficiency investments, renewable generation projects, efficient transport infrastructure and land use and forestry projects all can benefit from the specific characteristics of PE/VC financing.

In all of these areas of climate friendly investing, PE/VC finance can make a distinctive contribution by:

- Funding risky new technologies and business models
- Identifying and developing investment opportunities
- Helping companies do business better through improved, governance, strategies, and systems
- Being the cornerstone investor in a growing company, and so bringing in other, lower-cost capital that would not otherwise be available.

In this way, donor and IFI action to boost the development of PE/VC funds can allow PE/VC capital to play an appropriate part in financing the \$4.6 trillion in climate-friendly investment estimated to be needed annually.⁵⁷

⁵⁷ Page 2 World Bank, 2010 “Beyond the sum of its parts, combining financial instruments to support low-carbon development” The International Bank for Reconstruction and Development.

Appendix A: The Basics of PE/VC Funds

It is common to speak generally of capital as if all sources of capital are equally available under all circumstances, and can be used for the same purposes. In fact, capital tends to fall into specific categories, and is not easily fungible between them. For example, equity—the at-risk capital which claims profits from the business—is clearly different from debt, which comes with a much lower risk appetite and an expectation of fixed returns.

Equally importantly, different providers of capital tend to follow well-defined and predictable procedures and investment strategies, and are suited to projects and companies whose characteristics are aligned with the risk perceptions and modes of risk management adopted by these providers. For example, banks typically require collateral for lending. Stock markets provide risk capital, but involve high transactions costs and are generally only suited to larger undertakings able to explain their business and the risks involved to the general public.

Private Equity and Venture Capital fund managers raise money from institutions such as pension funds, insurance companies, and sovereign wealth funds. The investors are generally referred to as “limited partners”(LP).⁵⁸ High net worth individuals, family offices, and foundations can also be limited partners.

The PE/VC fund unites fund managers, who have expertise and no money to invest, with limited partners who have the money

Box 5.1: The Difference Between Debt and Equity

Typically, firms need finance when they don't have sufficient funds on hand to make an investment. When financiers provide these funds to enable businesses or projects to invest, they receive a claim on the recipients' future income (debt) or a claim on their future profits (equity).

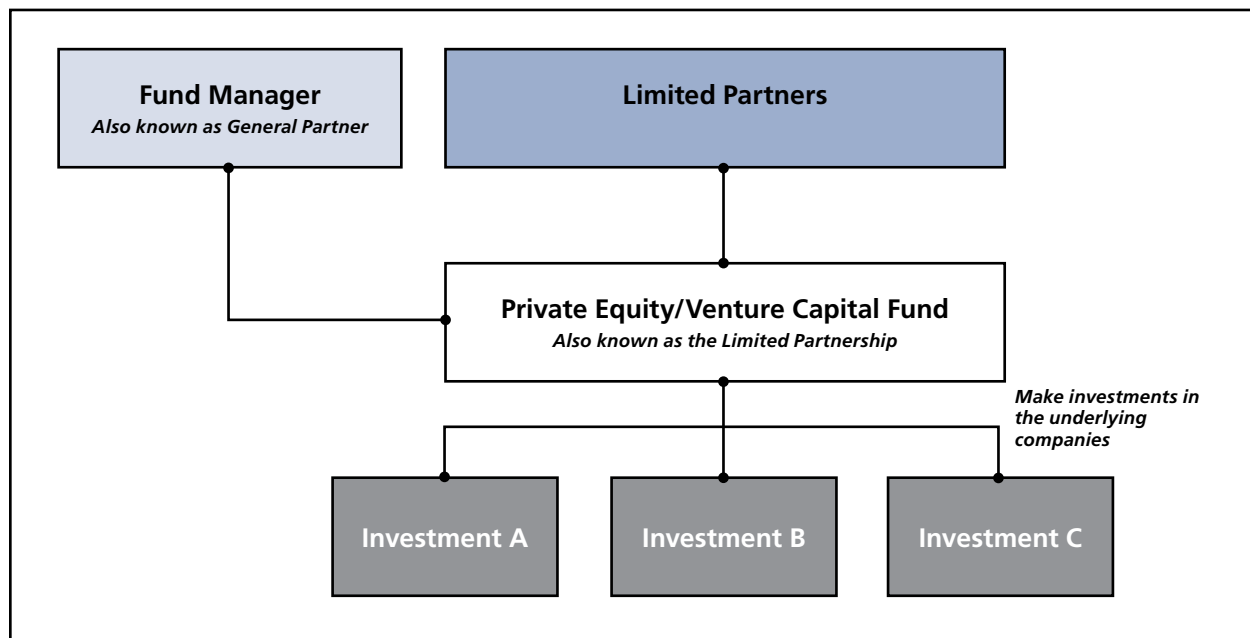
A provider of **debt financing** provides funds in exchange for a claim on a pre-determined amount of the borrower's income. An example is a mortgage where the bank finances the purchase of the house in exchange for a pre-determined set of payments from the borrower. These cover interest, various fees, and the principal borrowed.

In contrast, a provider of equity financing does so in exchange for a claim on a proportion of the firm's profits. A common form of **equity financing** is the issuance of shares on securities markets. The investor provides funds to the firm in exchange for a share of the firm's profits paid through dividends.

In practice the “debt-equity dichotomy does not do justice to the richness of claims encountered” with many sources of financing falling between the two.

Source: Jean Tirole, 2006 “The Theory of Corporate Finance” Princeton University Press.

Figure 5.1: Generic Structure of a PE/VC Fund



⁵⁸ This is because private equity funds are typically structured as partnerships. The investors are “limited partners” because their liability is limited to the amount they invest. The fund manager typically is also the “general partner” in the fund, and takes management responsibility.

to invest but lack investing expertise in an area. The typical PE/VC structure aims to create an alignment of interests between the limited partners and the fund manager. The fund manager charges the limited partner a management fee, usually around 2 percent of the value of the assets invested. This fee is to pay salaries and expenses. The fund managers also get a “carried interest”—essentially a share of the returns they create for the limited partners. In a typical set-up the fund manager gets 20 percent of the returns the fund earns.

This so-called “2 and 20” structure is what achieves the alignment of interests. The 2 percent management fee provides the fund managers with the money to live on and run the fund while returns are being generated, while the 20 percent “carry” can be a powerful reward for generating returns. For example, the fund manager of a \$100 million fund would have \$2 million a year to pay salaries and expenses for a small management team. If the manager turns the \$100 million into \$300 million, then the team could get 20 percent of the \$200 million profit, or \$40 million. Clearly this is highly motivating to the fund managers, allowing them to earn investment rewards from the expertise, even though they do not have their own capital to invest.

In recent years variants on the “2 and 20” model have been developed. Often the “carry” is only earned on returns above a certain hurdle level, for example 8 percent. Limited partners have been reducing management fees below 2 percent for some funds, and fund managers have been proposing innovative ways of structuring the carry. However, the basic idea of the team being paid a fee to cover salaries and expenses, and then being rewarded with a share of the upside, remains the same.

The life cycle of a fund

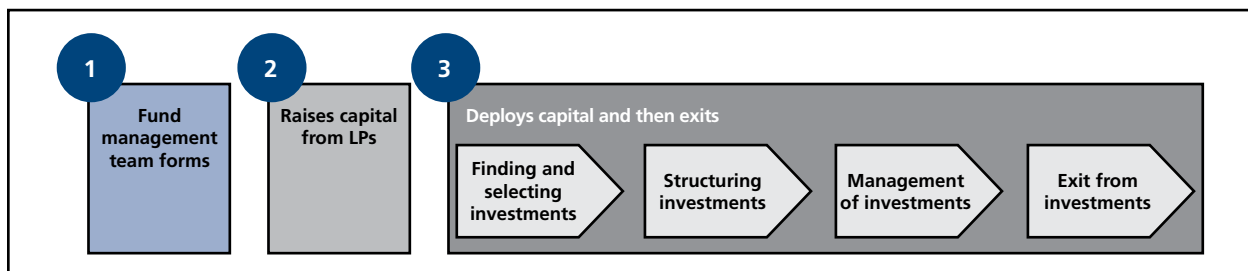
Private equity funds go through several distinct stages, which may be summarized as:

- **Formation of fund management team**
- **Raising capital from LPs**
- **Finding and selecting investments**
- **Structuring the Investment**
- **Management**
- **Exit.**

These are illustrated in Figure 5.2. While every fund is unique, it is not uncommon for the fund management team to spend two years fund-raising; that is, persuading limited partners to invest in the fund. Successful fund raising requires convincing limited partners that the fund managers have:

- **A well-justified investment philosophy, allowing them to select good projects and companies in which to invest**
- **A track record of successful investments**
- **The skills required to identify good investment opportunities, structure investments and manage them.**⁵⁹

Figure 5.2: Life Cycle of a PE/VC Fund



⁵⁹ [http://www.ifc.org/ifcext/cfn.nsf/AttachmentsByTitle/PerformanceComparisonFirstTimeFMandEstablishedManagersMovingtoNewMarket/\\$FILE/Comparison+of+Performance+Between+First+Time+Fund+Managers+and+Established+Managers+Moving+to+a+New+Market.pdf](http://www.ifc.org/ifcext/cfn.nsf/AttachmentsByTitle/PerformanceComparisonFirstTimeFMandEstablishedManagersMovingtoNewMarket/$FILE/Comparison+of+Performance+Between+First+Time+Fund+Managers+and+Established+Managers+Moving+to+a+New+Market.pdf).

Once the target level of funding is reached, the fund is said to “close”. At this point, it can start investing.

The money in the fund cannot earn returns until it is invested, so fund managers want to deploy the fund capital quickly. However, managers need to scrutinize a large number of opportunities, rejecting most of them, in order to select those with the best prospects for superior returns. This process of origination and due diligence means that the investment phase can take around three years before the entire fund is committed.

Once a fund is committed, the fund manager’s focus turns to increasing the value of the investee company. The fund will generally have a representative on the board. The fund may suggest new business strategies, help to arrange additional finance, bring in new members of the senior management team, and generally use connections and skills to add value to the investment.

The last phase of the fund’s life is exit—this is where the fund sells all the investments it has made. Over the life of the fund—typically ten years—all returns will be realized in cash. While the need to sell out all investments within a defined period limits the strategies that can be pursued, the overwhelming advantage is that it removes any argument about the returns earned. Returns are simply the difference between the cash put in, and the cash paid out at the end. The fund manager gets paid its carry out of the increase in cash over this period. While funds are opportunistic, willing to sell when they see an opportunity to maximize returns, the ten year life of a typical fund means that seven years after close, most funds are concentrating on a program of selling, or “exiting from”, their investments.

Type of PE/VC investing

Within the general type of investment approach described above there are four broad types, with four different investment philosophies, that are worth highlighting:

- **Venture Capital (VC) funds:** funds that look for the next big thing by investing in start-up companies that are often pre-profit or even pre-revenues. This model started in

Silicon Valley and has backed many successful technology companies, including Google. The VC model assumes that most of the investments will fail, but the ones that succeed will make it big. VC funds are now backing companies developing new, climate friendly technologies. An example is Draper Fisher Jurvetson’s investment in d.light, a company pioneering the sale of solar lamps to low income consumers⁶⁰

- **Growth equity funds or expansion funds:** funds that look for businesses that are already operating, have positive operating cash flows, and unrealized growth potential. Many growth funds invest in small and medium enterprises which are light in fixed assets (and therefore cannot easily raise debt finance), but too small to list on the stock exchange to raise equity. Climate Change Capital, a PE fund, invested in Power Plus Communications AG (PPC). This investment allowed PPC to expand its business selling communication technology systems used in smart grid applications⁶¹
- **Infrastructure funds:** these provide capital for economic infrastructure (for example, wind farms, waste water treatment plants), and public private partnerships such as mass transit projects. For instance, Macquarie Mexican Infrastructure Fund has invested in wind farms in Mexico⁶²
- **Timber management organizations (TIMOs) and forestry funds:** these invest in plantations and plantation companies. Forestry funds are conventional PE/VC funds that invest in forestry companies. An example is Phaunos Timber Fund which invested in Green Resources, a forestry company investing in greenfield plantations in East Africa.⁶³ TIMOs, on the other hand, are funds that purchase and manage forest land (typically plantations) on behalf of investors.

Missing from this list are Leveraged Buy Out (LBO) Funds. From a developed country perspective this is odd because these are the predominant category of PE/VC funds in these markets. These funds purchase established companies by raising debt against the companies own cash flows. However, LBO Funds are not particularly important in climate friendly investments and play a relatively small role in emerging markets. For these reasons LBOs are not a focus of this paper.

60 http://www.dlightdesign.com/about_investors.php.

61 <http://www.climatechangecapital.com/private-equity/investments.aspx>.

62 New Energy World, 2011 “Macquarie Mexican Infrastructure Fund, FEMSA buy Mexican wind project” <http://www.newenergyworldnetwork.com/renewable-energy-news/by-technology/wind/macquarie-mexican-infrastructure-fund-femsa-buy-mexican-wind-project.html>.

63 <http://www.phaunostimber.com/>.

Appendix B: Funds Reviewed

Table B.1: Background on the Funds

Name of Fund	Country or Multilateral	Objectives	Market or government failure targeted	Period of the funds operation (start/end)	Size of the Fund
Deutsche Wagnis –finanzierungsgesellschaft (WFG) ⁶⁴	Germany	Government aimed to increase the commercialization of new technologies	Failures in the financial market inhibit promising technologies from attracting finance	The fund began in 1975, government involvement ended in 1984 ⁶⁵	Initially the fund had capital of DM 50 million (or Euro 25.56 million)
Finnish Industry Investment Ltd. (FII) ⁶⁶	Finland	Accelerate the availability of risk capital for start-up companies in a manner that is profitable	Improve conditions for firms (SMEs particularly) by making equity investments in VC organizations	The fund began in 1995 and is on-going	100 percent government owned, initial investment of 53.8 million Euro. Over period 1995-2001, more than 200 million invested
Global Energy Efficiency and Renewable Energy Fund (GEEREF)	EC, Germany, Denmark, and Norway ⁶⁷	GEEREF aims to cut GHG emissions, increase access to energy service and support financial sustainability ⁶⁸	The externality caused by GHG and financial market imperfections lead to too little investment (it will catalyze private and public capital)	First investment appears to have been made in 2009 ⁶⁹	The target funding size for GEEREF is €200-250 million and as of September 2009, GEEREF has secured a total €108 million ⁷⁰
Yozma Venture Capital Ltd.	Israel	Facilitate the growth and development of technology companies in Israel	Financial markets lead to failure to provide capital to new technology companies	1993 to 1997. New Yozma funds are still on-going	Yozma is fully owned by the government, the initial investment was \$100 million ⁷¹
New Zealand Venture Investment Fund (NZVIF)	New Zealand	To accelerate the development of the VC industry and increase the commercialization of research	Information asymmetries and lack of skilled people lead to under-development of the VC industry	Since 2002	\$160 million NZD \$40 million NZD for the seed co-investment fund.

Table B.2: Success and Failure of the Funds Reviewed

Name of Fund	Extent of success or failure
Deutsche Wagnis –finanzierungsgesellschaft (WFG) ⁷²	The WFG experienced significant losses (returns less than -25 percent) and did not induce the development of a market
Finnish Industry Investment Ltd. (FII) ⁷³	Coinciding with the introduction of the FII the VC market boomed in Finland. It is not thought that the FII was crucial to this growth. The FII has failed to increase investing in early stage firms
Global Energy Efficiency and Renewable Energy Fund (GEEREF)	GEEREF has made number of investments but it is too early in the fund's life to tell whether they will be successful
Yozma Venture Capital Ltd.	The Yozma group contributed to the development of a \$10 billion VC industry (the largest in the world as a ratio of GDP) ⁷⁴
New Zealand Venture Investment Fund (NZVIF)	NZVIF has invested \$80 million NZD matched by \$400 million NZD from the private sector. Since NZVIF was established six venture funds have been created. Before this there were no funds exclusively operating as VC funds

64 The information on the WFG comes from (a) Caroline Fohlin 2006 "Venture Capital Revolutions Germany and the United States in the Post-War Era" and (b) Ralf Becker and Thomas Hellman, 200 "The Genesis of Venture Capital Lessons from the German Experience" 15 November 2002.

65 The fund was intended to run for 15 years.

66 This section is largely taken from Markku Maula and Gordon Murray, 2003 "Finnish Industry Investment Ltd: An International Evaluation" Ministry of Trade and Industry.

67 <http://geeref.com/posts/display/1>.

68 European Commission, 2006 "Mobilising public and private finance towards global access to climate friendly, affordable and secure energy services: The Global Energy Efficiency and Renewable Energy Fund" Communication from the Commission to the Council and the European Parliament.

69 GEEREF, 2009 "GEEREF Pumps €12.5 million in Renewable Energy In Asia" December 11, 2009 <http://geeref.com/posts/display/18>.

70 <http://geeref.com/posts/display/1>.

71 Page 156 Josh Lerner, 2009 "Boulevard of Broken Dreams" Princeton University Press.

72 The information on the WFG comes from (a) Caroline Fohlin 2006 "Venture Capital Revolutions Germany and the United States in the Post-War Era" (<http://www.econ2.jhu.edu/people/fohlin/FohlinPUB-PRIV-VCrev-w-tabs10-29-06.pdf>) and (b) Ralf Becker and Thomas Hellman, 2002 "The Genesis of Venture Capital Lessons from the German Experience" CESifo Working Paper Series number 883., 15 November 2002.

73 This section is largely taken from Markku Maula and Gordon Murray, 2003 "Finnish Industry Investment Ltd: An International Evaluation" Ministry of Trade and Industry.

74 Page 157 Josh Lerner, 2009 "Boulevard of Broken Dreams" Princeton University Press.

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