# Towards an International Green Fund[1]

by
Patrick Bolton
Columbia University,

Roger Guesnerie,
Collège de France

and
Frederic Samama
Amundi, Credit Agricole Group

September 2010

PRELIMINARY AND INCOMPLETE DRAFT

**Abstract:** This paper argues that an important institutional tool to accelerate the transition of the global economy towards greater reliance on renewable energy is the establishment of an International Green Fund (IGF). Such a fund would provide and coordinate financing of green investments and research and development on renewable energy around the world. With the support of such a fund, long-term investors who are already pursuing green investment projects on an ad-hoc basis would be able to scale up these investments and reap larger returns from learning-by-doing and scale economies.

[1] We owe special thanks to Laurence Wilse-Samson for superb research assistance. We are also grateful to Alice Balague, Fabrizzio Ferretti, Marc Goldberg, Peter Goldmark, David Jhirad, Rob Lake, Gilonne d'Origny, Ailsa Roell, Shari Spiegel, and Adam Wolfensohn for their help and insightful comments. The views expressed in this paper are those of the authors and do not necessarily reflect the position of the Credit Agricole Group.

## Contents

# 1. Introduction

Until very recently most of the focus of climate policy has been on putting in place restraints on carbon emissions, and providing incentives to reduce emissions around a system of cap-and-trade in carbon emission permits. A parallel, but less coordinated effort has been to provide subsidies (or tax breaks) to research and investments in renewable energy technologies. To make a real difference in reversing climate change, most commentators agree that we need not only higher and more broadly enforced restraints on carbon emissions, but also a significantly reduced dependence on fossil fuels, which can only be obtained through technological progress and the development of renewable energy technologies (see e.g. Koonin et al., 2010).

This paper argues that an important institutional tool to accelerate technological breakthroughs in renewable energy is the establishment of an International Green Fund (IGF), which provides not only the funding of investments and the global coordination of development of new technologies, but also offers scientific and technical expertise as well as advisory services to governments in the implementation of their green policies.

The formation of green funds has already been suggested by prominent policy makers and discussed in international policy forums, but a workable model has not yet been found. There have also been several private initiatives in setting up green investment funds—such as *Generation Investment Management* and *Wolfensohn & Company*—as well as several major Sovereign-Wealth-Fund green investments. As important and worthy as these endeavors are, however, they remain a drop in the bucket relative to the investments that are required to make a significant difference to climate change.

What is needed over and above these uncoordinated green fund initiatives is an international institution that helps coordinate and scale up green investments around the globe. In this paper we explore one possible avenue for the creation of such an IGF built around co-investments and shared governance by Sovereign Wealth Funds

(SWFs) and other long-term investors. We believe that for such long-term investors there will not only be satisfactory financial returns available from investing in an IGF, but also significant social returns. Long-term investors are particularly well placed to reap significant financial returns from green investments given that Governments around the world are likely to introduce carbon taxes and other restraints on carbon emissions in the medium term. This likely *future* regulatory response presents long-term investors with the opportunity to be in a position to benefit through investment in low-carbon technologies *now*. Long-horizon institutional investors – such as sovereign wealth funds – are therefore a natural investor clientele for an IGF.

Indeed, SWFs have already undertaken several significant green investments on an individual fund basis. However, we believe that there will be significant benefits from coordinating their investments through a single IGF vehicle. There are at least four sources of gains from coordination. Coordinating the sourcing and deployment of new technologies could dramatically shorten the development cycle. In addition, it is integral to the standard-setting and knowledge-sharing required in the development and deployments of new technologies possessing network externalities such as are found in energy. Furthermore, co-ordination may help overcome political constraints. Already sovereign wealth funds use external asset managers in part to address political sensitivities. Investing through an IGF will serve that purpose as well. Finally, co-ordination is required in the context of systemic risks. A model here is the IMF, which co-ordinates financial rescue efforts to prevent contagion. Similarly, there may be a necessity to co-ordinate and share knowledge around climate change and natural catastrophe response and mitigation.

An IGF funded and governed by SWFs is not only advantageous to SWFs, but is also likely to be the fastest route towards the establishment of such a green international institution. Indeed, the more traditional approaches to the establishment of an IGF through multilateral government agreements have so far failed. The Copenhagen Accord has proposed the creation of a multilateral *Copenhagen Green Fund* to support developing country mitigation and abatement; as well as promote technology transfer.

The Accord also includes a joint commitment by developed countries to a "goal of mobilizing" $100bn / year to assist developing countries with mitigation and abatement. Unfortunately this goal is unlikely to be achieved. Moreover, several countries have expressed their opposition to the creation of such a fund. Similarly, an IMF staff position note proposing the creation of a "Green Fund" by the IMF has been rejected by the IMF Board in March 2010 on the grounds that the organization lacks the "mandate" and "expertise" for such an undertaking.

We thus explore in this paper the idea of creating a *new* mostly commercially oriented IGF financed mainly by Sovereign Wealth Funds, but also involving investments from other institutional investors such as pension funds or the Development Banks. The Fund would be governed by the investors and managed by financial specialists with knowledge of green infrastructure investment and possibly private equity experience, assisted by renewable energy scientists and engineers. However, we envision an organization that would involve all of the relevant stakeholders: investors; government policy makers; scientists; and high-tech entrepreneurs to create faster, and deploy more efficiently, the new technologies which will be needed to significantly reduce and mitigate the possible effects of climate change.

We begin by reviewing the context. Climate change is commonly recognized as likely to impose significant costs, with very large tail risks. Current approaches to reversing climate change are inadequate and there is a need to find mechanisms to source, finance and develop breakthrough technologies. In the second section we briefly review the particular difficulties in financing green technologies, reflected in a large *funding gap*. The current literature recommends a combination of taxation (either a direct tax or a cap and trade system) and support for R&D as forming optimal policy. In the third section we turn to the motivation for an International Green Fund. We outline the benefits from investors coordinating their investment in this developing area where the technology is still relatively immature, and we survey the different structures that have been discussed in Copenhagen and elsewhere. We turn then to

our proposal in section four, sketching a possible governance structure for an SWF-owned and operated International Green Fund. Our concern in the final section is to describe in greater detail the *benefits of green investments* for SWFs more generally, and why it is that we feel that SWFs are perhaps the uniquely suitable investors in such a fund.

## 2. Background

There is a growing consensus that climate change is becoming a momentous threat and challenge, demanding a coordinated and massive response from governments and business. The highly respected Stern Report (2007) for example predicts that, unabated, climate change could cost the world at least 5% of GDP each year; and if the more dramatic predictions are realized, this could rise to in excess of 20%. [2]

As large as these potential costs are, the likely institutional response to reversing climate change also presents long-horizon investors with significant investment opportunities. While the expected orders of magnitude of investment needed to meet the challenges of a warming climate vary, they are surely very large. Reducing carbon emissions by 50 percent by 2050 has been estimated to require a total of $45 trillion in investment, or a yearly average of $1.1 trillion (IEA, 2008). A large fraction of this projected total amount concerns infrastructure investments, which are likely to present sufficiently patient investors with the chance for good financial returns. Long-term investors can and should also provision now for the almost certain future regulatory response, which will open up a whole host of investment opportunities.

### *1.1 Taxes and cap and trade*

There are currently measures in place in various countries that effectively set a price for carbon emissions. In all expectation the number of jurisdictions that introduce some form of carbon emission pricing is likely to grow in the near future, and so is

[2] Admittedly, these cost estimates may be inflated as a result of dividing estimated climate change costs by lagged GDP numbers and possibly discounting future costs with an excessively low discount rate.

the tax on carbon emissions. Metcalf (2009) summarizes the literature on policy responses that target greenhouse gas emissions. There are essentially two main approaches to pricing carbon emissions: i) cap-and-trade, and ii) a carbon tax system. As he notes, there are numerous design difficulties to be confronted, such as, which greenhouse gases to cover and whether administration is most efficient upstream or downstream. Metcalf discusses a number of cap-and-trade systems that have been implemented and notes that a central difficulty is the determination of the initial cap, which in some jurisdictions may have been too generous. Another difficulty with cap-and-trade is price volatility of the carbon emission permits. As for carbon taxes, models of carbon tax design already exist in some countries, as in Scandinavia and the Netherlands. Early experience has revealed problems in the form of too many industry-specific exemptions; varying tax rates across industries that are unrelated to emissions; and a lack of harmonization across countries. A related but different type of tax is a source tax such a coal, gas or petrol tax, which also already exists in several countries.

### *1.2 The issuance of "green bonds"*

A more recent innovative institutional response is focused on promoting climate finance and investments in green technologies. A first initiative by the World Bank has been to finance green investments with so-called *green bond* issues (see Reichelt, 2009). The first dollar denominated bond was launched in 2009, following an inaugural Green Bond in 2008. The proceeds from these issues went to a dedicated account out of which the World Bank supports eligible projects. A second initiative is infrastructure "climate bonds" (see Kidney et al. 2009). This is a joint project of the Network for Sustainable Financial Markets (NSFM) and the Carbon Disclosure Project (CDP). The idea is to help kick-start the development of a liquid green market and to define standards for climate bonds. One interesting novel design is to index green bond coupons to carbon prices. Mackenzie and Ascui describe how carbon bonds might be funded: "they could be guaranteed by developed country governments to minimize the risk for investors and maximize their capacity to raise climate finance. They could be repaid out of general taxation, overseas development

assistance, proceeds from auctioning emission allowances in cap-and-trade schemes, returns on investment of some of the bond proceeds in low carbon technologies, the sale of carbon credits under a post-2012 climate change agreement, or a combination of these" (2009: 15).

### *1.3 Infrastructure investment and R&D finance*

Carbon taxes and cap-and-trade make way for the infrastructure investments and R&D that are required to reduce carbon emissions. Barrett (2009) considers some of the largest infrastructure investments and possible new technologies needed to reverse carbon emissions, such as $CO_2$-free energy options including wind, solar, and nuclear power. As is well understood, to be able to scale up wind power requires new transmission infrastructures and electricity storage technologies. Concentrated solar also requires new transmission systems and space solar likely requires reduced "Earth-to-orbit transportation costs" (ibid.). Nuclear power also involves very large initial capital outlays and, importantly, waste disposal and proliferation remain major threats inhibiting its expansion (see Daedalus, 2009, 2010). Other, more cutting edge technologies that may become profitable investment opportunities in due course are various forms of carbon capture technologies and hydrogen fuel, but the development of these technologies will require large-scale complementary investments.

## 2. The challenges of financing green investments

As we have hinted at above, there are currently several renewable energy options available, each at different research and development stages, and each with as yet uncertain promises. Large parts of the solar, wind, or nuclear industries are far from technological maturity and their ultimate cost-effectiveness depends both on how far they are scaled up and on infrastructure deployment, for which investment outlays may be several multiples of the cost of R&D. In particular, the ability to link

upstream development with the downstream R&D is likely to be key to creating viable new green companies that can have a rapid large scale impact on climate change mitigation.

To accelerate the development and scaling of low-carbon technologies, a new type of financing is thus needed: one that links both *technology management and investment* (traditionally practiced by venture capital in regions where technology is created such as Silicon Valley, Boston, Cambridge, London, Copenhagen, Munich, Paris, or Tel Aviv) with *infrastructure and project financing* (traditionally practiced by private equity or infrastructure teams in regions where energy is needed such as the GCC countries, BRICs and other developing and high growth countries).

### *2.1 A funding gap*

As estimated recently by Martin Arnold (2010) in a report for the *Financial Times*, "total clean-tech investment needs to reach $500bn a year to hold global warming to less than 2 degrees Celsius, beyond which scientists say climate change becomes irreversible and catastrophic [...] [l]ast year, 77 clean-tech funds raised a total of $26.9bn, down sharply from the 104 funds that raised $48.5bn in 2008 according to Prequin". There is an opportunity here for SWFs to exploit this funding gap. This is illustrated by charts provided by Bloomberg New Energy Finance (UNEP et al, 2010), see figures A1 and A2 in the appendix. They illustrate that investment in the sector in 2009 *totaled* $162bn, where asset finance is included. The second figure, also from New Energy Finance, illustrates that while growth was very strong between 2004 and 2007, it has been stagnant since the onset of the financial crisis.

### *2.2 Complementary taxation and R&D*

Carbon emission taxation and R& D of renewable energy sources are complementary climate policies for at least three reasons, as suggested by Guesnerie (2007). First, the price of emissions abatements established through cap-and-trade raises the potential profitability of research. Second, the long life-cycle of energy technologies, which can last between 30 and 50 years, may delay a switch to renewable energy, unless the

transition is brought forward in time through tax incentives. Third, the most promising technologies requiring massive research investments (photovoltaic, nuclear, hydrogen, carbon sequestration) will have to wait for a considerable amount of time to see the technological breakthrough move on to the industrial stage. Hence, "undertaking resolute action to reduce emissions and extensively investing in research are not mutually exclusive alternatives but are both levers for creating synergy" (p.4).

Another source of complementarity is highlighted in Acemoglu et al. (2010). They consider a two-sector directed technical change model in which there are two effects impacting innovation – a market size effect and a price effect. A larger market and a higher price both attract more innovation. The increasing market size of the polluting sector furthers its cost advantage, and so delays in the implementation of climate change mitigation policy mean that *future policies must be more onerous*. A combination of R&D subsidies (aimed at the knowledge externality) and carbon taxes (aimed at the environmental externality) comprise optimal policy. For a review of this literature more generally see Guesnerie and Tulkens (2008, Eds.), and Popp (2010).

In sum, therefore, governments will inevitably have to introduce a price on carbon emissions as the urgency of climate change becomes more apparent, and this presents long-horizon investors with a major investment opportunity in renewable energy. Moreover, since other investors are not as forward-looking in providing for a future regulatory environment in which carbon emissions are costly – either within a cap and trade, or a carbon tax system – patient capital investors are uniquely positioned to exploit their position of market power.

### *2.3 Banks may no longer be able to play their traditional catalytic role*

Following the industrial revolution in Great Britain in the 18th century, most other episodes of industrialization and "big push" economic take-off have been kick-started and facilitated by coordinated bank investments in steel plants, railways, shipbuilding, etc.: in short, the *catalytic* role of major banking cartels (see e.g. Rosenstein-Rodan, 1943 and Da Rin and Hellman, 2002). With these important historical precedents in

mind, it seems logical to assign a similar role to today's banking industry towards a new big push into a renewable-energy based economy. Unfortunately, however, in the aftermath of the global financial crisis the state of most large banks is so fragile that it is unlikely that they will play this pivotal role. This leaves an opening for new leadership.

## 3. The rationale for an International Green Fund

Investment returns in renewable energy production and infrastructure will be maximized if disparate investments in R&D around the world are coordinated and scaled up around common standards to maximize returns to scale. One important component of a coordinated global approach is the creation of one or possibly several international green funds (IGF). We identify four key sources of benefits from an IGF. The next subsection underlines the benefits of coordination. The second subsection develops the argument for a global fund. The third subsection points to the benefits of a private equity fund structure. The fourth subsection focuses on sovereign wealth funds as natural investors in such a fund. Finally, the fifth subsection argues that a new IGF sponsored by SWFs would propel SWFs to the most innovative alternative investments currently being undertaken by other institutional investors.

### *3.1 The benefits from coordination*

A first question that immediately arises is why SWFs cannot reap all available investment opportunities by simply investing in a combination of new asset financings, renewable energy technologies, equity markets, and Californian Venture Capital and Private Equity firms? What are the benefits of a new international structure?

The obvious answer is that individual institutional investors—no matter how large their assets under management—cannot alone implement a coordinated investment

strategy on a global scale. To be able to deploy promising new technologies worldwide they need to coordinate their investments with other sovereign wealth funds and long-term investors. There are, thus, at least four sources of gains from coordination:

1) coordinating the sourcing and deployment of new technologies could dramatically *shorten the development cycle*;
2) *standard-setting and knowledge-sharing* in the development and deployments of new technologies would help internalize network externalities in energy production, storage, and distribution;
3) coordinating investments through an intermediary institution helps *overcome political and national security constraints*;
4) coordination may be required to deal with *systemic risks*, such as natural cataclysms. A model here is the IMF, which coordinates financial rescue efforts to prevent contagion. Similarly, there may be a necessity to co-ordinate and share knowledge around climate change and natural catastrophe response and mitigation.

### 3.1.1 Shortening the development cycle

Combining the technology sourcing and deployment functions, in a professionally managed IGF, composed of climate & energy scientists, engineers, and specialists in project finance and private equity, could significantly reduce the time needed to implement new solutions. With the possible exceptions of subunits of the World Bank, Regional Development Banks, and the U.N., there is currently no international institution with a global perspective that is focused entirely on the development of renewable energy technologies and green investments that can be *sourced* and *deployed* globally.

Early stage green R&D may already be constrained by the number of scientists that have the training to undertake cutting-edge research. Research projects often receive generous grants from government and other sources. So, it is not obvious that there is

a clear lack of funding at this level, even if there is likely to be a significant lack of knowledge sharing and communication. UNEP and Partners (2009) also note that an institutional investors' optimal capital allocation might be far larger than a typical early stage R&D mitigation project. For this reason they favor public intermediary financing mechanisms that assist the creation of smaller scale dedicated mitigation funds, such as fund-of-funds structures.

However, more investment opportunities are likely to be present downstream, as the deployment stage of new technologies, where significant returns-to-scale are available through global coordinated deployment efforts via an IGF type vehicle. UNEP and Partners (2009) argue for various public financing mechanisms that could be used to leverage institutional investors into an IGF, including country risk guarantees, low carbon policy risk cover, currency funds to provide a currency hedges, the creation of low carbon project development companies, and first loss guarantees. They base these recommendations on their characterization of the constraints inhibiting large institutional investors' investments in climate change mitigation: country risk, low carbon policy risk, currency risk, a shortage of deal flow, and complexity stemming from the multiplicity of risks. Mackenzie and Ascui (2009) also note that efforts at climate change mitigation may spur the development of new and unconventional asset classes including, "sustainable forestry, energy-efficient property portfolios and CDM projects".

### 3.1.2 Standard-setting and knowledge-sharing

The IGF would not only be a neutral vehicle for global green investments, but it would also help develop protocols for the management and licensing of intellectual property. A parallel can be drawn here with CERN's Technology Transfer unit. CERN - the European Organization for Nuclear Research - has since 2000 had an active Technology Transfer Policy, aimed at "maximizing the technological and knowledge return to the Member States." The activities CERN undertakes under the Technology Transfer banner include Technology and Market Assessment; Protection and Management of Intellectual Property; Technology Promotion; and Technology

Dissemination. A similar set of activities could be envisaged as part of the mandate of an IGF. Similarly, the IGF could serve as a standard-setting forum to help coordinate development around common worldwide standards.

### 3.1.3 Sharing market and political risks

Drawing on the UNEP et al. (2010) report, one of the problematic features of green investments is that they are characterized by markets which are still fragmented, illiquid, and exposed to various risks which can be mitigated through coordination. The financial crises of the past decade have had a significant impact on particular kinds of investments (for example, PE/VC was markedly down while asset financing was down by a much smaller amount). Furthermore, the sector is exposed to *political decisions and regulatory uncertainty*. For example, the recent "green stimuli" have been driving specific kinds of technologies (e.g., smart energy technologies in the US)[3], while government incentives have been the source of some volatility (e.g. solar energy in Spain). Again, an IGF would be well placed to address each of these risks by diversifying investments across markets and by offering the protection of a more arm's length investment in infrastructure and energy distribution.

### 3.1.4 Dealing with systemic risks

Rising sea-levels, more extreme weather patterns, the inevitable by-product of global warming, will give rise to a higher incidence of natural cataclysms. An IGF could potentially serve the same role with respect to the prevention and mitigation of such

3 Time magazine has described part of the role of the stimulus bill as "converting the Energy Department into the world's largest venture-capital fund […] pouring $90 billion into renewable energy. including unprecedented investments in a smart grid; energy efficiency; electric cars; renewable power from the sun, wind and earth; cleaner coal; advanced biofuels; and factories […tripling] the number of smart electric meters in our homes, [quadrupling] the number of hybrids in the federal auto fleet and [financing] far-out energy research through a new government incubator modeled after the Pentagon agency that fathered the Internet." Grunwald, M. (2010), *How the Stimulus is Changing America*, **Time**, 26 August 2010, at http://www.time.com/time/nation/article/0,8599,2013683,00.html , accessed 7 September 2010. The White House press release of 17 February 2010,also outlines expenditure on "Advanced Batteries and Electric Vehicles [$2.4 billion in grants…] Smart Energy Grid [$3.4 billion in grants…and] Energy-Efficient Vehicles [$300 million in grants]" White House (2010), "Recovery by the Numbers", Press Release, 17 February 2010, http://www.whitehouse.gov/the-press-office/recovery-numbers

climate catastrophes as the IMF plays with respect to global financial crises. It could invest in early warning systems, infrastructure development, and coordinate rapid relief efforts.

### *3.2 Why a global fund?*

There is clearly a need for international co-ordination as the technology is likely not located in the region where it is most needed, and may be in the process of being developed in, as yet, undiscovered scattered small entities. Only a global approach can facilitate the creation of a network of contacts and expertise that would lead to an accurate assessment of the potential scale and value of various investments.

#### 3.2.1 The Copenhagen accord

The need for a global approach has been noted by many others. As stressed recently by the UN Secretary General's High Level Advisory Group on Climate Change Financing (AGF, 2010): "Members [...] acknowledged that the mobilization of climate change financing is key to reaching a global climate agreement". We note also the Copenhagen Accord, which emphasizes the "urgent" need for "enhanced action and international cooperation on adaptation". [4] It also agrees that "Non-Annex I Parties to the Convention [i.e. developing countries] will implement mitigation actions […] by 31 January 2010".

In its discussion on funding, the Accord also states a "collective commitment by developed countries is to provide new and additional resources, including forestry and investments through international institutions, approaching USD 30 billion for the period 2010-2012 with balanced allocation between adaptation and mitigation". Furthermore, "developed countries commit to a goal of mobilizing jointly USD 100 billion dollars a year by 2020 to address the needs of developing countries", "in context of meaningful mitigation actions and transparency on implementation". It notes also the need for a coordinated approach to financing. "New multilateral

4 See Draft Decision -/CP.15, Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention. Proposal by the President (FCCC/CP/2009/L.6, 18 December 2009)

funding for adaptation will be delivered [… with a] significant portion of such funding […] through the Copenhagen Green Climate Fund […which] shall be established as an operating entity of the financial mechanism of the Convention to support projects, programme, policies and other activities in developing countries related to mitigation including REDD-plus, adaptation, capacity-building, technology development and transfer."

In addition, the Accord recognizes the need to accelerate technological development and deployment: "In order to enhance action on development and transfer of technology we decide to establish a Technology Mechanism to accelerate technology development and transfer in support of action on adaptation and mitigation that will be guided by a country-driven approach and be based on national circumstances and priorities." [5] The Accord is also explicit on the need for technological expertise - a High Level Panel is to oversee the Copenhagen Green Climate Fund.

As sound as the fundamental logic of these proposals is, the political process around these mega international accord-building efforts has been despairingly slow and ineffective. This is why alternative, more realistic, *contractual approaches* must be explored. As Massai (2010) notes, amongst other weaknesses, the Accord "will be difficult to be implemented within the COP/CMP framework; [and] has been explicitly rejected by some parties." [6] The Copenhagen summit and its aftermath have more than ever before revealed how difficult it is to forge cooperative solutions within the context of the United Nations Framework Convention on Climate Change (UNFCC). The summit fell far below most observers' expectations due to a lack of clear consensus among major member countries. The developed country $100bn dollar per annum "goal" for mitigation of climate risk and adaptation in developing countries, as limited a commitment as it is, is likely to remain simply an aspiration.

5 See Draft Decision -/CP.15, Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention. Proposal by the President (FCCC/CP/2009/L.6, 18 December 2009)

6 As Massai (2010, p. 118, fn. 83) notes, "The adoption of the Copenhagen Accord as a COP decision was formally objected to by Tuvalu, Venezuela, Bolivia, Cuba, Nicaragua, Ecuador, Costa Rica and Sudan".

We think that this presents an opportunity for SWF investors to pursue a more flexible approach, allowing investors to opt-in to global financing initiatives (giving them the opportunity to tailor the nature and extent of their involvement), and avoiding the obstacles of a few countries holding up the entire process.

### 3.2.2 The recent IMF proposal

The creation of a global green fund has also received recent backing in a Staff Note of the IMF. Bredenkamp and Pattillo (2010) propose the creation of a fund that "could facilitate progress toward a binding global agreement on reducing greenhouse gas emissions and allow developing countries to begin scaling up their climate change responses without delay."

In their proposed framework, the Green Fund would be capitalized through a reserve asset injection by developed countries, possibly including Special Drawing Rights (SDRs). The Green Fund could then leverage this capital base by issuing highly-rated (and hence, low-cost) "green bonds" that could be sold to private and official institutional investors including, for instance, sovereign wealth funds. The Green Fund would combine these proceeds and provide developing countries with grants for adaptation and loans for climate mitigation. We provide an illustration of their proposed structure in Figure A.3

The Staff position note leaves open the entity that would have responsibility for managing the Green Fund. Interestingly, however, the IMF Board rejected the proposal with *Reuters* reporting that "the paper was the subject of much disagreement at an informal meeting earlier in March, where many members argued the IMF had no expertise or mandate to address climate change." [7] Our proposal for an IGF preserves the attractive features of this proposed plan of a green fund for the IMF - most importantly, the benefits from coordination – with, however, the idea of setting up a

7 Wroughton, L. "IMF Member Countries reject Green Fund Plan", *Reuters*, 25 March 2010, http://www.alertnet.org/thenews/newsdesk/N24143408.htm

more commercially oriented vehicle that would be responsive to the long-term interests of sovereign wealth fund investors.

### 3.2.3 Other international financing structures

The *European Climate Foundation* (2009) had earlier suggested the possible use of Special Drawing Rights (SDRs) to finance least developed country (LDC) climate change mitigation and adaptation. In their analysis, $100 billion of SDRs allocated to a climate fund(s) could be used to provide over the next 30-40 years an annual $7bn disbursement in grants, loan and equity financing to developing countries. Using SDRs would ensure predictability in funding flows, would provide incentives for performance, and in the near term would have a limited impact on developed country finances.

The *Climate Investment Funds* represent a partnership of the Multilateral Development Banks (MDBs) (with the World Bank as Trustee), though there is co-ordination with the Global Environmental Facility and the Adaptation Fund. Following World Bank approval in 2008, initial pledges totaled $6.1bn. They consist of a pair of funds disbursed by the MDBs – the Clean Technology Fund and the Strategic Climate Fund. The former aims to finance demonstration and deployment of low carbon technologies, with grants, guarantees and IDA concessional loans through programs in the Power and Transport sectors, and Energy efficiency programs. The Strategic Climate Fund supports targeted programs including: the Forest Investment Program (FIP) [8], the Pilot Program for Climate Resilience, and the Program for Scaling-Up Renewable Energy in Low Income Countries.

8 For example, World Bank Chief, Robert Zoellick, recently announced Mexico's participation in the FIP, a global initiative which, the WB reports, has received USD542m "in contributions for the reduction in greenhouse gas emissions from deforestation and forest degradation". World Bank (2010), "Mexico: 'Green' Funds to Boost Low-Carbon Growth", 22 July, http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/LACEXT/0,,contentMDK:22657954~pagePK:146736~piPK:146830~theSitePK:258554,00.html

The *Global Environmental Facility* provides grants to developing and transition countries in the areas of biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants. It serves as the financial mechanism for various international environmental conventions. It reports allocations totaling $8.8bn, which has been supplemented by $38.7bn in co-financing for a large number of projects in many countries around the world. Projects are managed by 10 implementing agencies such as UNEP, UNDP, and the World Bank. The Implementing Agencies are also responsible for project proposals. The 32 GEF member countries govern the organization through the GEF council. Funds are contributed by donors.

The *Global Bioenergy Partnership* (GBEP), whose secretariat is hosted in the UN Food and Agriculture Organization (FAO), is an international initiative to promote bioenergy for sustainable development, including public, private and civil society stakeholders. It describes its main activities as including: promoting "high-level policy dialogue", supporting "national and regional bioenergy policy-making and market development", and "[fostering] exchange of information, skills and technologies through bilateral and multilateral collaboration." [9]

Finally, George Soros has recently proposed a $10bn per year "Green Fund", financed by an air ticket surcharge, to help mitigate climate change in poor countries. [10] The fund would be modeled on the Global Fund to Fight AIDS, Tuberculosis and Malaria. He has also voiced public support for the agreement reached between Norway and Indonesia towards reducing rainforest degradation. [11] [12]

---

9 http://www.globalbioenergy.org/aboutgbep/purpose0/en/

10 "INTERVIEW-Soros proposes green fund from airline tax", Reuters, 26 May 2010, http://uk.reuters.com/article/idUKLDE64P2D620100526

11 "George Soros Hails Groundbreaking Agreement on Climate - Indonesia and Norway Join Forces to Preserve Forests", Open Society Foundations Press Release at http://www.soros.org/newsroom/news/indonesia-norway-climate-20100526

12 Norway has decided to assist the Indonesian government in its goal of reducing Indonesia's CO2 emissions by 26% against a 2020 business-as-usual trajectory. In terms of their financial commitment, Norway will provide a performance based investment of up to $1 billion over 7-8 years. This is a three phase partnership. In the initial phase, funds will be used to assist in developing the policy and institutional framework. The objective of the second phase is to make Indonesia ready for the contributions-for-verified emissions reductions, while at the same time initiating larger scale mitigation

### 3.2.4 Coordinated SWF initiatives

There have been many concerns raised by politicians and the press around SWF investments. These usually relate to vague worries around transparency or national security. De Palma et al. (2010) present an analysis of how the principal-agent framework in which SWFs operate (where almost unavoidably, the SWF has multiple objectives), can lead to misinterpretation of signals by recipient authorities. By combining funds through a transparent partnership such as envisaged by our International Green Fund, some of these concerns would be placated.

National Security is a particular concern in areas of critical infrastructure such as energy. One can easily imagine public outcry or political posturing in the United States over an SWF investment into a new energy grid. SWFs have reacted to some of the political concerns around transparency and national security with greater co-operation. The Santiago Principles are a set of 24 voluntary guidelines on investment practices and accounting standards – Generally Agreed Principles and Practices (GAPP) – which an International Working Group of (26) Sovereign Wealth Funds (IWG)[13] developed jointly with the aim of maintaining "an open and non-discriminatory cross-border investment regime" (Behrendt, 2010: 2). A further example is the April 2010 launch by the International Finance Corporation of a new $800 million "IFC African, Latin American, and Caribbean Fund". The International Finance Corporation will be joined in this by PGGM, KIC, the State Oil Fund of Azerbaijan, and a fund from Saudi Arabia. Our proposal builds on these examples of

---

actions through a province-wide pilot project. In the third phase, starting in 2014, the contributions-for-verified emissions reductions mechanism will be implemented nationally. The funding structure is phased, since it is largely tied to verified emissions reductions by Indonesia. It should be noted that Norway will not receive carbon quotas from Indonesia in terms of its obligations under the Kyoto protocol. REDD was excluded from the initial Kyoto commitment period, but is likely that REDD carbon markets will have a place in a future agreement (Forum for the Future 2009: 15). Some of the details of the deal are not clear, but it appears that the goal is for Norway purchase REDD credits from Indonesia in the future (the earliest transactions will be in 2014). At present the Norwegian assistance does not yield carbon credits.

13 The International Working Group has been succeeded by the International Forum of Sovereign Wealth Funds (IFSWF) which Gelpern characterizes as "the soft institutional counterpart to the emphatically soft law of the Santiago Principles" (2010: 55).

co-operation by formalizing a framework for strategic investment in carbon-neutral technologies. While an investment by a solitary SWF into a new US energy grid may be the recipient of a political backlash, it is much harder to imagine the same reaction to an investment from the International Green Fund.

### *3.3 Why the use of Private Equity?*

Private Equity is the subject of more and more interest among SWFs and other long term investors. As noted in the Innovest and WWF (2008) study, for example, part of the long-term investment goals of public pension funds can be met with asset allocations to alternative investments, real estate, private equity and hedge funds.

The finance literature is full of examples of the potential benefits of Private Equity funds. Existing studies focus on the expertise of such firms, which can monitor, assist and incentivize management to improve operational performance. More generally, private equity firms can provide capital when other forms of financing are not available, for example due to the informational asymmetries between portfolio companies and other lenders.

Arnold (2010) identifies four different forms of private equity investment into green technologies. Venture capital firms invest in early-stage companies. Second, some private equity groups seek growth through capital investment in mature companies. Specialist infrastructure investors are targeting green energy projects in particular. Finally, there are the buy-out firms which create value through introducing operational efficiencies or extending these efficiencies through further acquisitions.

### *3.4 A way to diffuse a "green culture" and reinforce the role of SWFs*

By investing in an IGF, there may also be benefits from the diffusion of a new green culture beyond simply the investment scope of the private equity fund. It will be challenging for policy makers to deliver the necessary frameworks to incentivize appropriate investment opportunities in the short time frame which climate change

presents. Leadership is required from investors to ensure that they are ready to develop and scale the institutional response as soon as governments establish the requisite policy frameworks.

One important intangible benefit provided by an IGF, in which important emerging market countries have a stake through their SWF arms, is that there will likely be an indirect inducement for governments to strengthen their climate change policies and, for example, better coordinate their tax incentives to reduce carbon emissions. By having an investment stake in low carbon technologies through their SWFs, governments around the world would be able to better design incentive programs, through for example coordinating these with recommendations of the IGF. This mechanism would also strengthen the legitimacy of SWFs and perhaps boost recognition of their possible roles within their respective countries.

### *3.5 A way to match the innovations of pension funds*

Many SWFs arguably lag behind pension funds in their use of private equity vehicles – and green-focused PE vehicles more specifically. The table below, from Innovest and WWF (2008) details some of the innovative steps taken by pension funds in terms of SRI and green investing. Innovest and WWF report that Dutch pension fund ABP has invested US$363 million in a climate change private equity fund and committed US$60 million to a sustainable timberland projects fund. More generally, ABP announced its intentions to "incorporate ESG factors in all of its investments in its $311 billion portfolio using two key approaches: bottom-up best-in-class stock selection and top-down theme driven investments."

| Fund | Best Practice |
|---|---|
| ABP | Incorporates ESG considerations into all of its investments; Utilizes a combination of strategies including best-in-class selection, engagement and thematic investment funds |
| CalPERS | Leading corporate governance activities that are publicly reported on; Specific environmental investment initiatives that include thematic investment funds, engagement, environmental screens |
| Environment Agency | Favours best-in-class selection approach, shareholder advocacy and engagement approach rather than negative screening; Fund managers evaluated on environmental performance and financial performance |
| USS | Focuses on engagement with companies rather than divestment; Collaborates regularly with other investors on engagement and research on ESG issues |

*Source: Innovest and WWF(2008)*

An example of this commitment is the recently announced partnership between ABP and a Canadian pension fund, OMERS, to start a €200m joint investment initiative targeting Canadian and Dutch start-ups, the Investing in the Knowledge Economy of the Future (INKEF) program. And as reported by UNEP and Partners (2009), ABP and Pensioenfonds Zorg en Welzijn in October 2007 committed $0.5bn to be cornerstone investors in the Ampere Equity Fund, dedicated to the "development, construction and operation of sustainable energy projects."

UNEP and Partners (2009) also report the example of CalPERS, which has "committed US$1.1 billion to building a best of breed, diversified portfolio of clean technology-focused investments". Innovest and WWF (2008) describe two potential approaches for the Norwegian Government Pension Fund Global (NGPFG) to follow (and by extension other SWFs), in order to be more aggressive in implementing a green technology strategy. A first approach would be to follow current best practice as demonstrated by various pension funds. The second approach is more ambitious and involves SWF investors taking a leadership role in the low-carbon transition. Thus, in their example, the NGPGF would actively facilitate SWF co-ordination; engage with research firms and other stakeholders; develop further positive screening indicators; host conferences on Sustainable Funds Management; invest in education; and promote innovation through, for example, the establishment of a climate venture capital fund.

Our proposal is in the spirit of this second approach. We believe that SWF investors are more natural leaders than pension funds in funding a transition to a low carbon future and hope that our proposal contributes positively to the debate about how best to harness this great potential.

## 4. An International Green Fund

The first purpose of the IGF is to facilitate coordination of green investments, which SWFs and other long-term investors would have already been contemplating on an independent basis. As such the governance structure of the fund should be built around investor control through a management board, with control rights allocated in proportion to committed investments. Along with the management board, the governance of the fund would also comprise a monitoring board charged with determining the outlines of the IGF's green investment strategy and verifying its implementation. The monitoring board, however, would not have any operational responsibilities.

The *monitoring board* would comprise independent experts on climate and green investments drawn from the countries with participating SWF or other long-term investors. Besides its monitoring role it would also serve as the link between the IGF and governments of countries involved either as recipients or funders of IGF investments. It would thus play a role in identifying new investment opportunities and negotiating subsidies, tax concessions, and other regulatory aspects involved in green investments.

The *managing board* would be composed of SWF and other long-term investor-appointed representatives. The managing board, just like a standard board of directors of a fund, would be charged with the appointment of the managing director and the executive team of the IGF. It would also be called on to decide on policies of strategic importance, such as the creation of a new dedicated fund, investments in

major projects, payout policy and other major funding decisions such as the issuance of a new green bond. The basic governance structure of the IGF is illustrated in Figure A.4 in the appendix.

Also, as most investments the IGF undertakes are likely to be of greater interest to some participating SWFs than others, the IGF should also allow for a fund-of-funds type structure, in which smaller scale dedicated mitigation projects may receive direct funding from specific SWFs and be managed autonomously. We illustrate this further in Figure A.4.

We also envisage a possible advisory body linked to the Fund which would provide countries with consulting services. It would have the pivotal role of managing intellectual property obtained from IGF investments, diffusing knowledge across countries, and coordinating the efforts of the different portfolio companies.

It is possible, furthermore, to consider either private investors or public pension funds at the Limited Partner (LP) level. For example, reinsurance companies (e.g. Swiss RE) might be considered "natural" investors since their costs are related to catastrophic events (cyclones, floods, hurricanes, etc.), the likelihood of which is increased by climate change.

The fund would invest globally in both the *development* of new technologies and importantly in the *deployment* of these new technologies. The fund, however, would be limited to investments in green asset classes, that is, investments that either significantly help reverse climate change or that help preserve biodiversity and nature. Within the main advisory structure there would be two areas of expertise, i) Private Equity specialists (mainly infrastructure and later stage asset financing), and; ii) Technology specialists (e.g. renewable energy scientists). In particular, and as we illustrate in Figure A.5, these specialists would provide advice for the selection of the appropriate level of funding for promising technologies and the appropriate countries in which to implement the new investments. As we have highlighted, the need for

financing renewable energy and R&D technology development is likely to be primarily concentrated in Europe and the United States, whereas natural Lead Users for deployment and direct investments might be concentrated in BRIC or GCC countries. The IGF could thus play a critical role in deployment around the world. By having SWFs as providers of the base capital of the fund, the choice of the appropriate country for deployment could be facilitated. It should be noted that it will be important to have a clear procedure and rely on technology specialists and private equity expertise in this process in order to politically insulate managers of the fund.[14]

We envisage various further functions an IGF might perform, such as:

- *Consulting*: An advisory department dedicated to providing governments with technical support on renewable technologies and renewable energy strategies might be created.
- *Ratings and Labels*: This department could analyze and signal to the market an assessment of the most efficient companies and technologies. This could be formally linked to a standard-setting process, or simply be a means of informally accelerating the acceptance of various foundational network technologies.
- *Research Network*: Researchers from around the world could share knowledge through the Fund. The IGF could monetize its knowledge investment through a variety of means – for example patents could belong to the IGF; or, the Fund could invest in licensing and royalty revenues emanating from a patent.

A key strength of this governance structure is its "open architecture". In particular, the flexibility SWFs and other long-term investors would have to opt into the IGF, or simply into some of its dedicated funds, and the general contractual foundation and commercially-oriented focus of the IGF ought to be a major asset. This opt-in approach, which allows motivated investors to tailor their commitment to their needs,

14 Bernstein, Lerner, and Schoar (2009) studied how the background of SWF leaders impacts their behavior. Active involvement by politicians (in comparison to external managers) results in a much greater likelihood of investing at home. Controlling for this differing propensity, SWFs with external managers tend to invest in lower P/E industries, while those with politicians involved in the governance process invest in higher P/E industries.

is likely to be easier to kick-start than more ambitious all-encompassing plans to find a once-and-for-all commonly negotiated compromise. This is not to say that the IGF would not be a large player – it is rather to note that it might be preferable to find something that works and then scale it up.

# 5. The importance of green investments for SWFs

Sovereign Wealth Funds and other long-term investors comprise a natural clientele for an IGF for at least five reasons, which we discuss in this section. First, green investing makes sense from an asset-liability perspective for intergenerational funds seeking to transmit and preserve wealth for future generations. Second, green investments are an asset class for which SWF investors are able to monetize their comparative advantage as providers of "patient" capital. Third, this is an asset class which has performed well in the recent past, and is likely to continue to do so in light of future climate mitigation regulation. Fourth, due to the exposure of many SWFs to oil price volatility, renewable energy ought to be considered as a valuable hedge. Finally, green investments will contribute to strengthening SWFs legitimacy as socially responsible investors.

## *5.1 Valuing the benefits of SWF green investments*

Most Sovereign Wealth Funds have a mandate to pursue intergenerational equity through the transfer of wealth to future generations. The wealth future generations inherit is not just financial but also physical and includes a preserved nature and biodiverse environment. This latter concern about the preservation of wealth could also be framed in terms of sound governmental asset and liability management, with climate change representing an off-balance sheet potential liability for nation-states. Indeed, several countries sponsoring SWFs are particularly exposed to climate change. Consider the illustration in Figure A.6 of the simulated effects of the impact of a 5.5 Degree Celsius rise by 2100. There is a good deal of overlap between where the major SWFs are located (East Asia and the Middle East) and the regions of the world most exposed to climate change. An OECD study (Nicholls et al., 2007) has ranked cities in

terms of their projected future population and financial asset exposure to *coastal flooding alone*. We illustrate this below in Figures A.7. If one looks only at asset exposures to coastal flooding, one finds that, for example, China's current exposed assets to coastal flooding total $234bn, and this is exposure is expected to grow.

As we have noted, SWFs – as long term investors - are positioned to sell insurance against some of these catastrophes. The premiums collected could be used to leverage investment (both financially and politically) into technologies facilitating climate change mitigation and abatement. UNEP et al. (2010: 56) emphasizes further the human costs of climate change. As they note, the WHO has reported a loss, in developing countries, of 3.4 billion life years from fossil fuel combustion through its effects on health (particulate exposure causes respiratory and cardiovascular disease). Promoting low carbon energy may save pension funds and sovereigns costs of providing medical care.

### *5.2 The recent performance of green investments*

A recent study by Innovest and WWF (2008) points to the strong performance of the FTSE Environmental Technology (ET) 50 Index over the preceding five years. In addition, it highlights that "a growing number of academic studies have demonstrated that SRI funds perform competitively with non-SRI funds over time." A green focus can, thus, have a purely commercial justification. The NYT has discussed the Kohlberg Kravis Roberts and Environmental Defense Fund initiative to "green" the portfolio companies of KKR by reducing greenhouse gas emissions and cutting waste, water use and the use of forest products and chemicals. KKR has reported savings of $16.4m through this program.[15] Furthermore, and in line with our focus on infrastructure (asset) financing, regulation – primarily through renewable energy standards – has increased investment in this sector in recent years and is likely to continue to do so in the foreseeable future. (UNEP et al, 2010: 35). In Fig A.8 we compare the performance of the FTSE Environmental Technology (ET) 50 Index

15 Woody, T. (2010) "K.K.R. Continues Greening Its Portfolio", New York Times, 9 February 2010, http://green.blogs.nytimes.com/2010/02/09/k-k-r-continues-greening-its-portfolio/

against a basket containing the S&P500, Nikkei and FTSE-same weight for each. We see, simply looking at asset prices, that the FTSE ET50 index outperformed the composite by 23% over 4.5 years.[16]

### *5.3 The hedging potential of green investments*

Most SWFs are either financed by revenues from oil sales, or heavily exposed to oil price volatility as oil importers.

#### 5.3.1 Oil exporter risk

Up to 66% of the SWFs assets are oil-financed. An obvious question facing these funds is thus how they should address their specific exposure to climate risk? The reversal of global warming and climate change trends will require a reduction in carbon emission rates, most probably involving an implementation of tighter carbon caps and/or direct taxes on carbon. As many scholars have pointed out, the introduction of carbon caps or taxes will increase the costs for oil producers, lead to higher oil prices, and thus to a gradual shift of demand away from these sources of energy. This in turn will reduce future revenues for oil producers and affect the flow of funds of SWFs based in oil producing countries. To the extent that carbon emission restraints will gradually be tightened and extended, SWFs of oil-producing countries may benefit by anticipating these climate regulation trends and investing in sectors that will prosper from the increased future taxation of carbon emissions. We consider for example the recent performance of the FTSE ET50 index against the oil price. We note that the correlation - in figure A.9 - is fairly low, at 0.58 (though, the index has underperformed the oil price by 18% over the last 4.5 yrs.), and thus may be useful to reduce the overall exposure to this commodity price.[17]

16 We did the same very basic exercise with the Wilder Hill New Energy Global Innovation (NEX) Index - while initially the NEX outperformed this basket, asset prices are presently in line. The NEX index "is comprised of companies worldwide whose innovative technologies and services focus on generation and use of cleaner energy, conservation and efficiency, and advancing renewable energy generally. Included are companies whose lower-carbon approaches are relevant to climate change, and whose technologies help reduce emissions relative to traditional fossil fuel use." http://www.nexindex.com/

17 We repeated the exercise with the NEX index and found a lower correlation at 0.47, but a worse underperformance at -43% over the last 4.5yrs.

### 5.3.2 Oil importer risk

We note also that oil importing countries are significantly exposed to oil price volatility. Countries have been investing in alternative energy technologies in response to oil price risk and for national security reasons. Traditional wisdom holds that a higher oil price promotes the development of alternative energy companies. But, surprisingly, Henriques and Sadorsky (2008) find that shocks to oil prices have had little significant impact on the alternative energy companies' stock prices. Perhaps this is due to the transitory nature of past oil price spikes and the lack of a sustained development policy of alternative renewable energy sources. An IGF could offer a vehicle towards a more sustained energy diversification policy and thus provide a better hedge against climate risk to oil importing countries.

### 5.3.3 An example of diversification

Some SWF countries have stated their goal to transition away from *oil* producing countries to become *energy* producing countries more generally. Luomi (2009), thus, provides a survey of the steps Abu Dhabi has taken in the development of green technology, primarily through the Abu Dhabi Future Energy Company (Masdar), and argues that these steps are justified due to their benefits in terms of "economic diversification and job creation for the growing national population, demand-side management of energy security, and transfer of technology and knowledge." Luomi also notes that the emirate itself is exposed to various potential negative effects of climate change "potentially [including] intensifying natural disasters, gradual sea-level rise, increasing water scarcity and food import dependence, and climate-change induced migration from poorer states in the region" (p.103).

The Mubadala Development Company owns the Abu Dhabi Future Energy Company, which is behind the "green city" Masdar Initiative (see Reiche, 2010a for an overview of the Masdar City project). This urban development venture is likely to produce many innovations in energy efficiency and urban infrastructure design around the use of renewable energies. It epitomizes in many ways the catalytic role a long-term investor can play in the transition towards an economy based on renewable

energy. The attraction of the Masdar project is particularly apparent when contrasted with Dubai, the other futuristic urban development project in the region. With its ambitious goal to build a city, cognizant of local tradition and climate constraints, around a 100% renewable energy model, the Masdar project is a model for future urban development around the world and stands out as an obvious type of project to be financed by an IGF and replicated in other parts of the world.

Indeed, building new *carbon neutral cities* is an area where coordinated approaches to knowledge-sharing and asset financings are likely to be particularly rewarding. There are large potential benefits to avoiding "re-inventing the wheel" and the scale of the investments is so large, that partnered investments are especially desirable. And sovereign investors are a natural investor class, since extensive public/investor co-ordination is required. Moreover the 21st century is going to be a century of continued rapid urbanization. A McKinsey (2009) study has estimated that 350 million people will be added to China's urban population by 2025 (p.16), and that "81 more urban centers will develop the characteristics of cities" (including 27 million people). As the McKinsey (2009: 34) study notes, "urban productivity policies […] would open up unprecedented opportunities for innovation in areas such as energy conservation, water recycling, and clean technology". The diversity of investment opportunities here is large – from architectural firms specializing in green build, to green real estate, to standard asset financings for renewable energy. Furthermore, by investing in new low-carbon cities through a transparent and commercially oriented International Green Fund, SWFs may avoid some of the knee-jerk protectionist demagoguery that has hindered earlier investments.

### *5.4 The political benefits of green investments*

Green investments provide a natural opportunity for SWFs to signal their socially responsible investor vision and to build a broad political constituency in support of their mission.

### 5.4.1 Resource company investments and political risk

By investing in low-carbon companies, SWFs are taking a step away from natural resources companies that may represent a potential political risk. As an example, the British government forced KIA to significantly reduce its ownership of BP. And if we imagine a situation, for instance, in which KIA or an American SWF had had a major stake in BP during the oil spill in the Gulf of Mexico, we have some perspective on the delicate situations that SWFs could potentially face.

Companies in carbon-intensive industries are already starting to face litigation concerning contributions to global climate change. For example, in July 2005, eight state attorneys general, the City of New York, and three land trusts brought suit against the five largest electric utilities in the US, on the grounds that they were substantial contributors to the "public nuisance" of global warming. The plaintiffs seek to have the utilities reduce their emissions. This case, which the district court dismissed, is under appeal. It and similar cases, which present a large potential liability, pose a significant risk to businesses. Even if some of the suits are unsuccessful, the costs of litigation and the reputational harm to the companies involved are damaging in their own right. For SWFs the pressure could easily come from either their governments or their citizens.

### 5.4.2 Investment in green technology strengthens legitimacy

The creation of an IGF could represent a compelling public relations scoop for SWFs, by getting worldwide recognition for their progressive socially responsible investment (SRI) strategies, and their commitment to the common good. On the one hand, this could facilitate the investment in other sectors/assets and help curb some of the knee-jerk protectionism they face, and on the other, it could improve their acceptance by citizens of their own countries (helping to insulate them somewhat politically) and thus build more certainty around their asset management strategies. While the above depiction represents a sketch of the "best-case" scenario, it is hard to see how the fund could have any potential downside in terms of PR. To emphasize this last point, for many SWFs a major concern is growing protectionism against

investments in foreign markets. SRI in this context is a strategy towards international legitimacy by signaling the norms and standards underpinning one's investing goals.

## 6. Conclusion

This paper makes the case for the establishment of an International Green Fund (IGF) financed and managed by SWFs and other long-term investors, which would provide not only funding of green investments, but also global coordination of R&D in renewable energy technologies, and scientific and technical expertise to governments. This fund could be started immediately on a small scale with a few strategic long-term investors, essentially around a commercially oriented model, but over time it also has the potential of becoming a major international institution providing a foundation towards a global approach to reversing climate change.

Much of the success of such an IGF, inevitably, rests on the implementation of stricter and wider carbon emissions regulations in the near future. The creation of an IGF would therefore be a bet on global future climate policy and also on technological breakthroughs in renewable energy production. This is a bet with good odds, however, as the likelihood of tightening climate policy is high. It is also especially attractive to long-term investors as they are in a better position to be able to profit from early green investments. In addition, this is an investment with high social and environmental payoffs. The returns on green investment will also depend on the ability of investors to appropriate a larger share of the global climate public good they are helping provide. Important institutional design issues for an IGF regarding the appropriability of these public goods, whether in the form of intellectual property rights or carbon emission abatements, will certainly need to be worked out in order to realize the full potential of such a fund.

## References

AGF (2010) "UN Secretary-General's High-level Advisory Group on Climate Change Financing (AGF) Report on the first meeting, 31st March 2010 in London prepared by the Secretariat" , http://www.un.org/wcm/webdav/site/climatechange/shared/Documents/LondonMeetingReport_31%20Mar%202010.pdf

Arnold, M. (2010), "Private equity: Specialist funds are keen to invest in clean technology", *Financial Times*, 3 June 2010. http://www.ft.com/cms/s/0/99da66aa-6ddb-11df-b5c900144feabdc0,dwp_uuid=34be96ea-6c7f-11df-91c8-00144feab49a.html

Barrett, S. (2009), "The Coming Global Climate–Technology Revolution", *Journal of Economic Perspectives*—Volume 23, Number 2—Spring 2009—Pages 53–75

Bredenkamp, H. and Pattillo, C. (2010) "Financing the Response to Climate Change", *IMF Staff Position Note* March 25 2010 SPN 10/06

Steven E. Koonin, John W. Rowe, Paul L. Joskow, and John Doerr (2010), "On the Future of Energy", *Bulletin of the American Academy*, *Winter 2010*

Da Rin, Marco and Hellmann, Thomas, (2002). "Banks as Catalysts for Industrialization," *Journal of Financial Intermediation*, Elsevier, vol. 11(4), pages 366-397, October.

Daedalus (2009, 2010), "The global nuclear future", vols 138, vols 139.

de Palma, André, Luc Leruth, and Adnan Mazerei (2010) "Regulating Sovereign Wealth Funds Operating Overseas through an External Fund Manager" *Centre National De La Recherche Scientifique*, Cahier n° 2010-13.

Ellerman A, D, Joskow (2008) "The European Union's CO2 Cap-and-Trade System in Perspective" Pew Center on Global Climate Change Report,

European Climate Foundation (2009), "Climate Finance: Using SDRs to Finance Climate Change Mitigation and Adaption," December.

Fitoussi, J.P., A. Sen, and J. Stiglitz (2010), "Commission on the Measurement of Economic Performance and Social Progress"

Forum for the Future, (2009), "Forest Investment Review", funded by the UK's Department for International Development and the Department of Energy and Climate Change. http://www.forumforthefuture.org/projects/forest-backed-bonds.

Gelpern, A. (2010), "Sovereignty, Accountability, and the Wealth Fund Governance Conundrum" Draft July 19, 2010 Forthcoming in *Asian Journal of International Law*.

Guenster, N., Derwall, J., Bauer, R. and K. Koedijk (2010) "The Economic Value of Corporate Eco-Efficiency", *European Financial Management*, no. doi: 10.1111/j.1468-036X.2009.00532.x

Guesnerie, R. (2007) "The Economic Design of Climate Institutions and Policies" *Conference « Finance et développement durable : opposition ou partenariat? » Collège de France and Paris School of Economics*, December.
http://www.pse.ens.fr/guesnerie/documents/divers/ConceptionEconomique_en.pdf

Guesnerie, R. and Henry Tulkens (2008) The Design of Climate Policy, MIT Press,

Henriques, I. and Sadorsky, P. (2008) "Oil prices and the stock prices of alternative energy companies". *Energy Economics*, 30(3):998–1010

Holm, Audrey (2010) "Infrastructures in the Face of Climate Change: What implications for Long-term investors?" *cdc Climat research* n. 22 May 2010 http://www.cdcclimat.com/IMG/pdf/Climate_report_22_Infrastructure_climate_and_long_term_investors_c_CDC_Climat_research_2010.pdf

Innovest and WWF (2008), "Fund Management in the 21st Century: The role of sovereign wealth funds in a low carbon future", September.

Jen, S and S. Andreupoloulos (2008), "SWFs: Growth Tempered – USD 10tn by 2015", Morgan Stanley, http://www.morganstanley.com/views/gef/archive/2008/20081110-Mon.html#anchor7146.

Jen, S. (2007) "Sovereign Wealth Funds". *World Economics*, 8(4):1

Luomi, M. (2009) "Abu Dhabi's Alternative-Energy Initiatives: Seizing Climate-Change Opportunities", *Middle East Policy*, Vol 16 Iss 4, 102-117

Mackenzie, C and Ascui. F (2009) "Investor leadership on climate change: an analysis of the investment community's role on climate change, and snapshot of recent investor activity" *Published by the UNEP Finance Initiative and UNPRI.*

Massai, L. (2010). "The Long Way to the Copenhagen Accord: Climate Change Negotiations in 2009", *Review of European Community & International Environmental Law*, Volume 19, Issue 1, pages 104–121, April 2010

McKinsey Global Institute (2009), "Preparing for China's Urban Billion", McKinsey&Company, February,
http://www.mckinsey.com/mgi/publications/china_urban_billion/

Metcalf, Gilbert E. (2009), "Market-based Policy Options to Control U.S. Greenhouse Gas Emissions", *Journal of Economic Perspectives,* Volume 23, Number 2, Spring 2009, Pages 5–27

Mezzacapo, S. (2009), "The so-called 'Sovereign Wealth Funds": regulatory issues, financial stability and prudential supervision", *European Economy, Economic Papers*, 378, April.

Nicholls, R.J., Hanson, S., Herweijer, C., Patmore, N., Hallegatte, S., Jan Corfee-Morlot Jean Chateau and Muir-Wood, R. (2007) "OECD Ranking of the World's Cities Most Exposed to Coastal Flooding Today and in the Future", extract from OECD Environment Working Paper No. 1, OECD, Paris, 2007. Available at http://www.oecd.org/dataoecd/16/10/39721444.pdf

Popp, D. (2010), "Innovation and Climate Policy", *NBER Working Papers*, Working Paper 15673

Reiche, D. (2010a), "Renewable Energy Policies in the Gulf countries: A case study of the carbon-neutral "Masdar City" in Abu Dhabi", *Energy Policy* Volume 38, Issue 1, January 2010, Pages 378-382

Rosenstein-Rodan, PN. (1943) "The Problems of Industrialisation of Eastern and South-Eastern Europe". *The Economic Journal*

Stern, N. (2007) The Economics of Climate Change – The Stern Review. Cambridge Press.

Tol, R. S.J. (2009), "The Economic Effects of Climate Change" *Journal of Economic Perspectives* Vol. 23, No. 2, Spring 2009 (pp. 29-51)

UNEP, SEFI and Bloomberg new energy finance (2010), "Global Changes in Sustainable Energy Investment 2009", United Nations.

UNEP and Partners (2009), "Catalyzing Low-Carbon Growth in Developing Economies: Public Finance Mechanisms to Scale Up Private Sector Investment in Climate Solutions."
http://www.unep.org/PDF/PressReleases/Public_financing_mechanisms_report.pdf
.
World Bank (2008), "Climate Investment Funds", at
http://siteresources.worldbank.org/INTCC/Resources/World_Bank_Climate_Investment_Funds_(CIF).pdf

## Appendix - Figures

*Figure A.1: Sustainable Energy Investment Types and Flows. 2009 ($bn)*

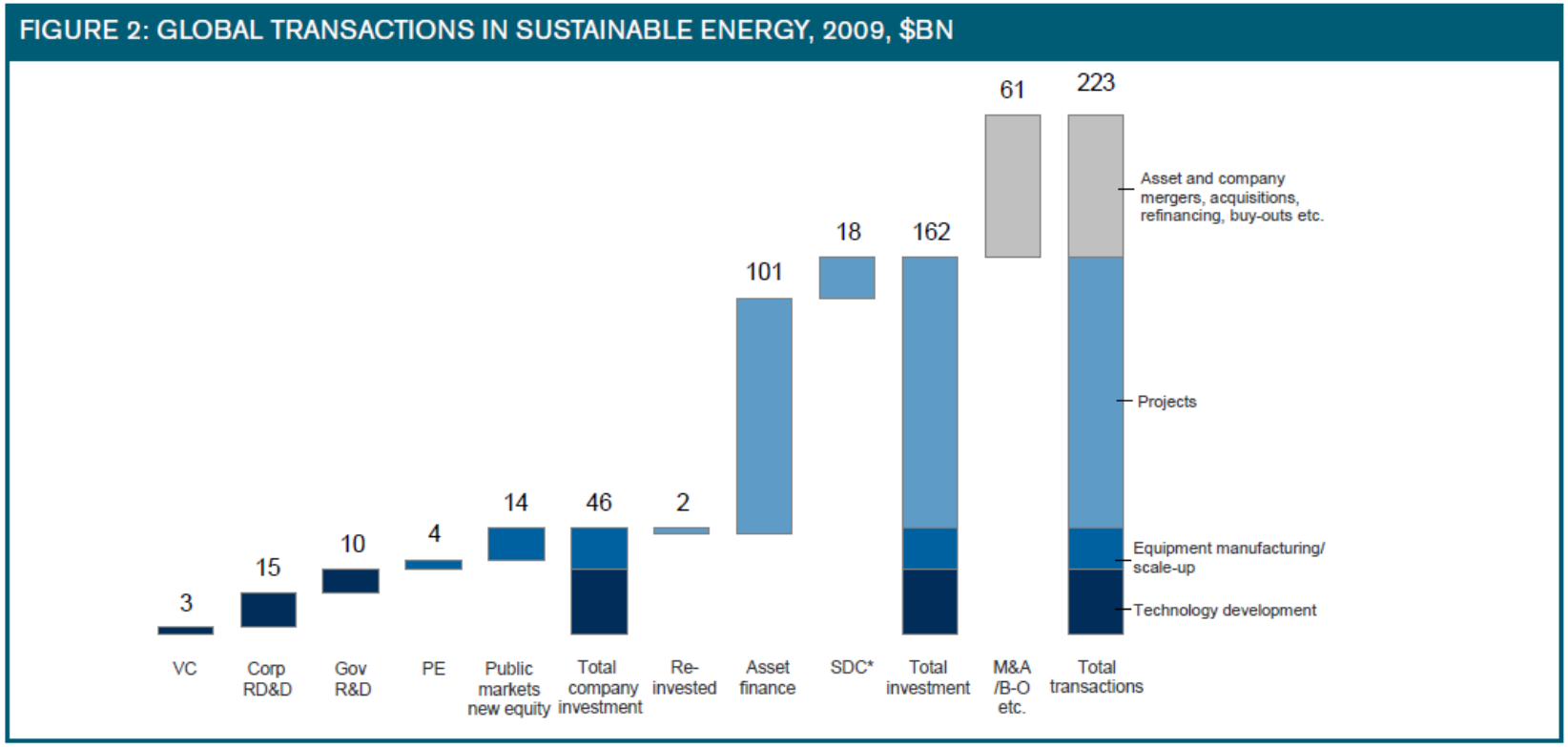
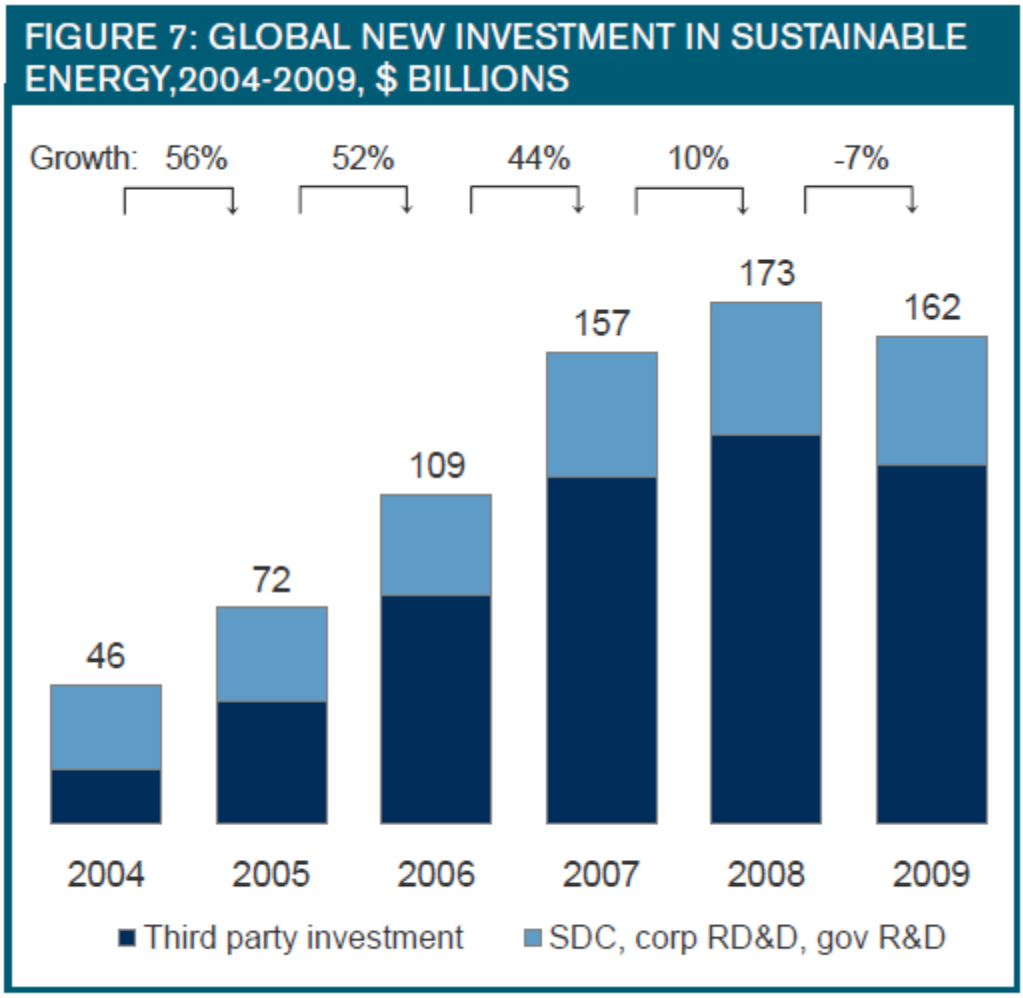


*Figure A.2: Annual Global Sustainable Energy Investment 2004-2009 ($bn)*




Source: Bloomberg New Energy Finance

*Figure A.3: An IMF Proposal*

**Figure 1. Green Fund Resource Flows in the Steady State**

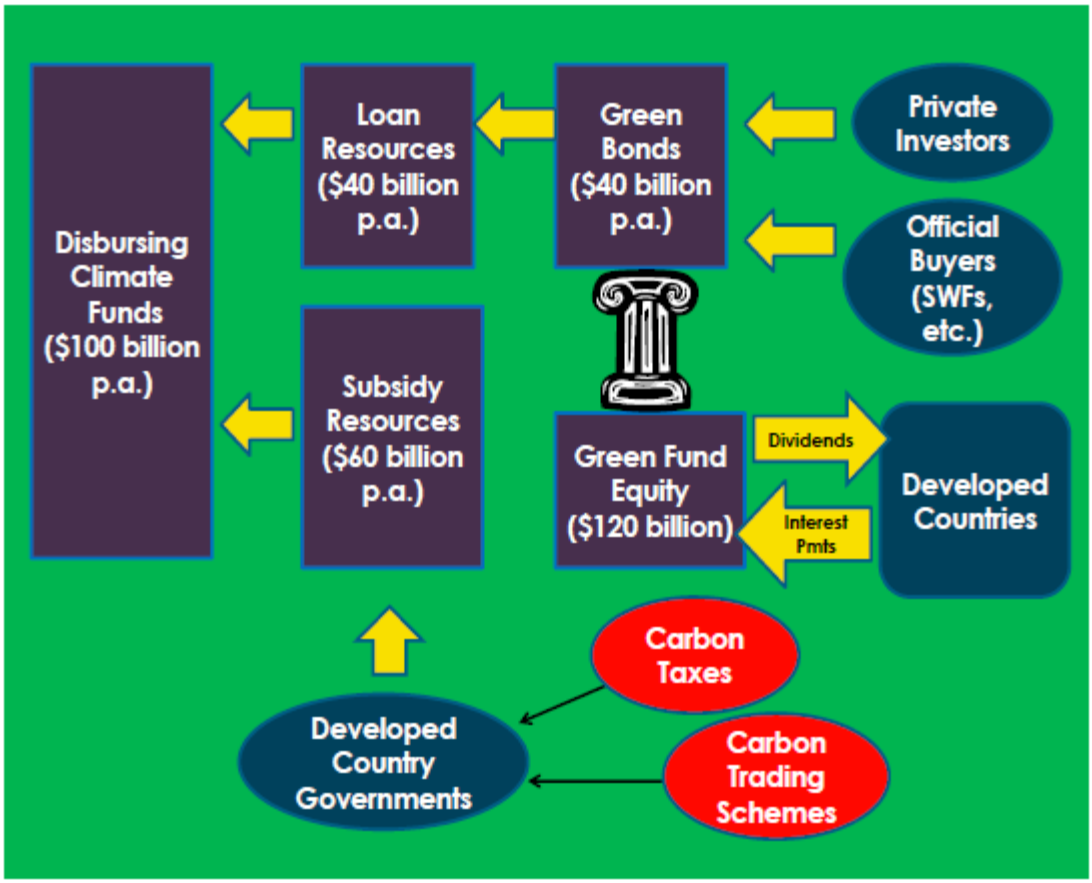


*Figure A.4: Proposed structure of the International Green Fund*

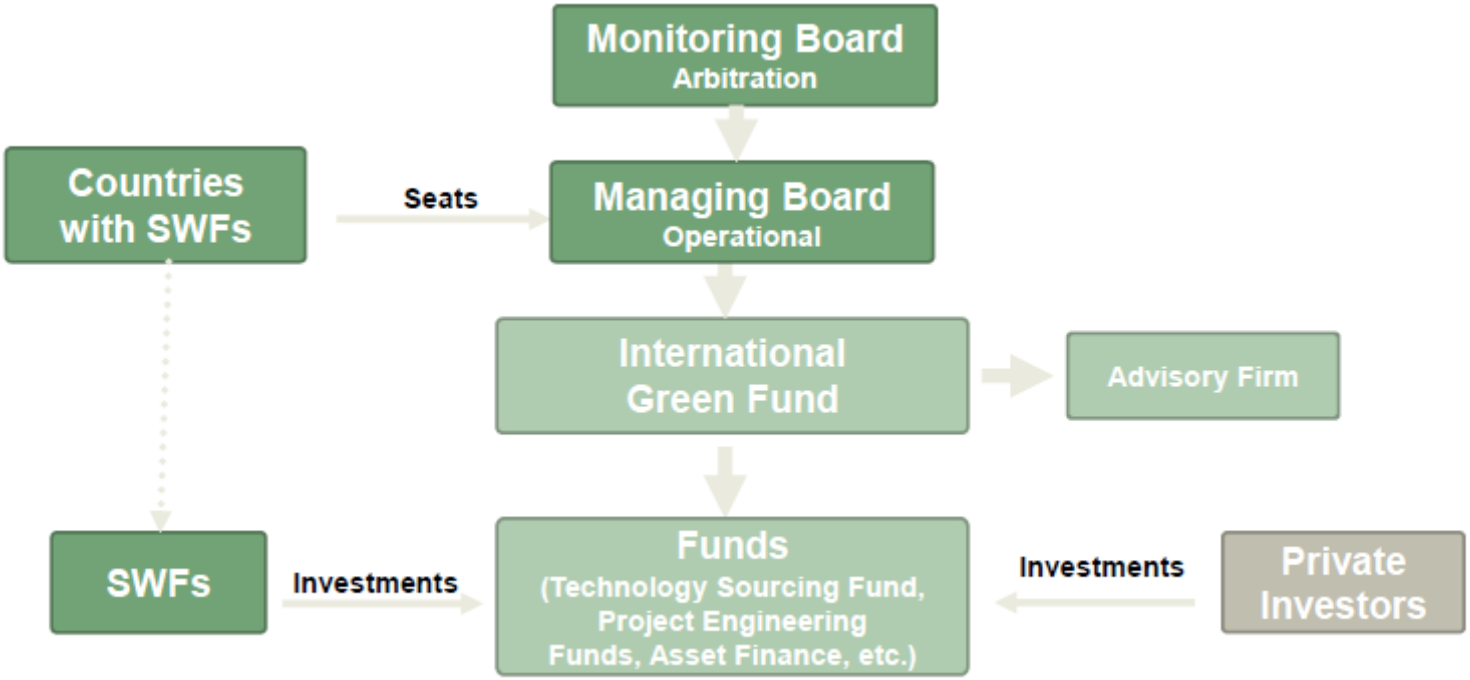


*Figure A.5 International Green Fund Function*

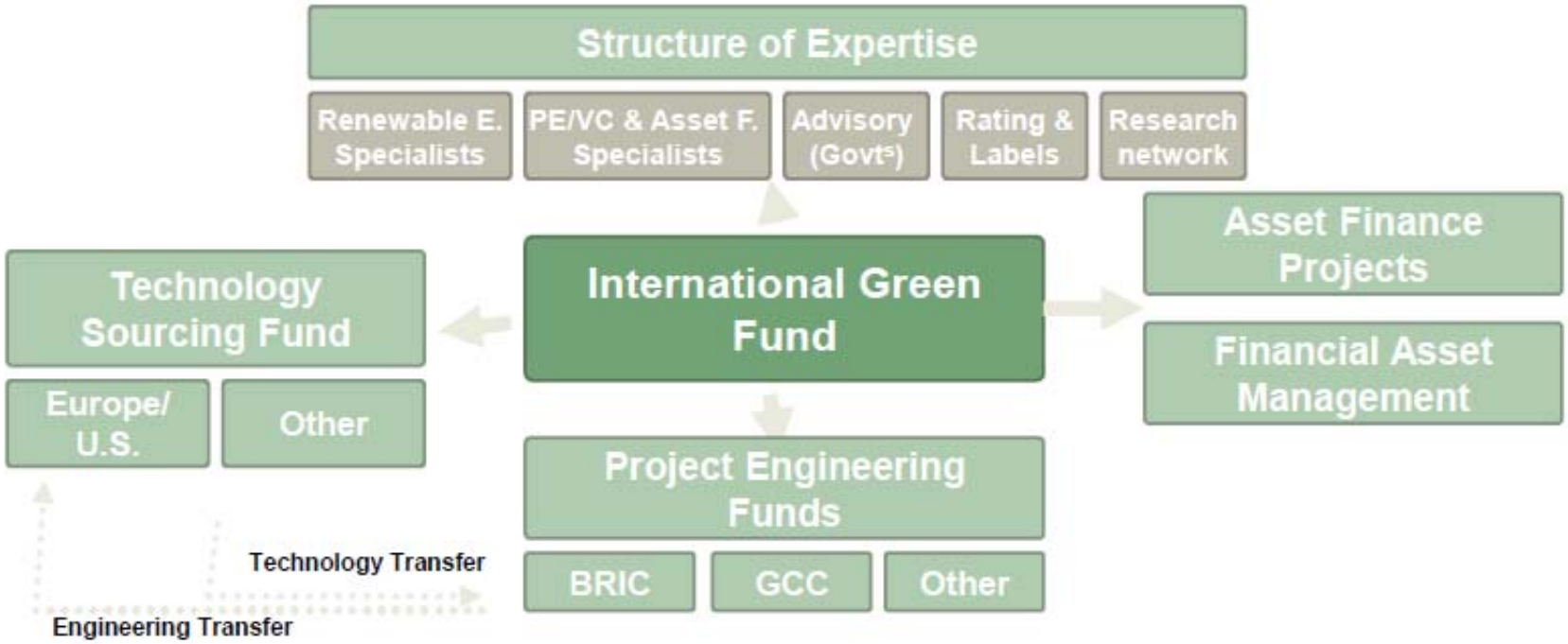


*Figure A.6 Global Climate Change Vulnerability*

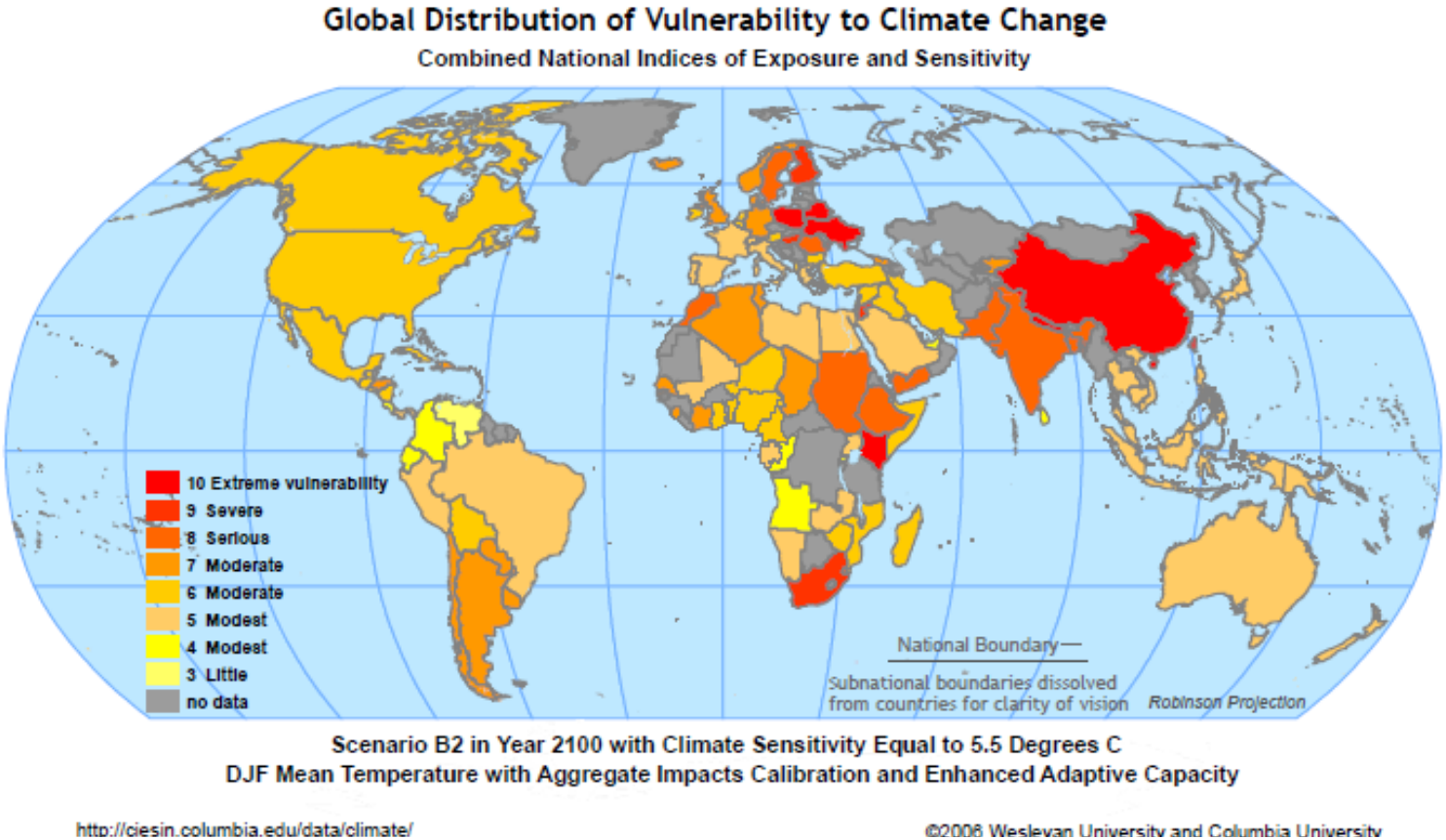


*Fig A.7 Exposure to Coastal Flooding*

| Rank | Country | Urban Agglomeration | Exposed Population Current | Exposed Population Future |
|---|---|---|---|---|
| 1 | INDIA | Kolkata (Calcutta) | 1,929,000 | 14,014,000 |
| 2 | INDIA | Mumbai (Bombay) | 2,787,000 | 11,418,000 |
| 3 | BANGLADESH | Dhaka | 844,000 | 11,135,000 |
| 4 | CHINA | Guangzhou | 2,718,000 | 10,333,000 |
| 5 | VIETNAM | Ho Chi Minh City | 1,931,000 | 9,216,000 |
| 6 | CHINA | Shanghai | 2,353,000 | 5,451,000 |
| 7 | THAILAND | Bangkok | 907,000 | 5,138,000 |
| 8 | MYANMAR | Rangoon | 510,000 | 4,965,000 |
| 9 | USA | Miami | 2,003,000 | 4,795,000 |
| 10 | VIETNAM | Hai Phòng | 794,000 | 4,711,000 |
| 11 | EGYPT | Alexandria | 1,330,000 | 4,375,000 |
| 12 | CHINA | Tianjin | 956,000 | 3,790,000 |
| 13 | BANGLADESH | Khulna | 441,000 | 3,641,000 |
| 14 | CHINA | Ningbo | 299,000 | 3,305,000 |
| 15 | NIGERIA | Lagos | 357,000 | 3,229,000 |
| 16 | CÔTE D'IVOIRE | Abidjan | 519,000 | 3,110,000 |
| 17 | USA | New York-Newark | 1,540,000 | 2,931,000 |
| 18 | BANGLADESH | Chittagong | 255,000 | 2,866,000 |
| 19 | JAPAN | Tokyo | 1,110,000 | 2,521,000 |
| 20 | INDONESIA | Jakarta | 513,000 | 2,248,000 |

*Table 1: Top 20 cities ranked in terms of population exposed to coastal flooding in the 2070s (including both climate change and socioeconomic change) and showing present-day exposure (Source: Nicholls et al (2007), OECD, Paris)*

| Rank | Country | Urban Agglomeration | Exposed Assets Current ($Billion) | Exposed Assets Future ($Billion) |
|---|---|---|---|---|
| 1 | USA | Miami | 416.29 | 3,513.04 |
| 2 | CHINA | Guangzhou | 84.17 | 3,357.72 |
| 3 | USA | New York-Newark | 320.20 | 2,147.35 |
| 4 | INDIA | Kolkata (Calcutta) | 31.99 | 1,961.44 |
| 5 | CHINA | Shanghai | 72.86 | 1,771.17 |
| 6 | INDIA | Mumbai | 46.20 | 1,598.05 |
| 7 | CHINA | Tianjin | 29.62 | 1,231.48 |
| 8 | JAPAN | Tokyo | 174.29 | 1,207.07 |
| 9 | CHINA, | Hong Kong | 35.94 | 1,163.89 |
| 10 | THAILAND | Bangkok | 38.72 | 1,117.54 |
| 11 | CHINA | Ningbo | 9.26 | 1,073.93 |
| 12 | USA | New Orleans | 233.69 | 1,013.45 |
| 13 | JAPAN | Osaka-Kobe | 215.62 | 968.96 |
| 14 | NETHERLANDS | Amsterdam | 128.33 | 843.70 |
| 15 | NETHERLANDS | Rotterdam | 114.89 | 825.68 |
| 16 | VIETNAM | Ho Chi Minh City | 26.86 | 652.82 |
| 17 | JAPAN | Nagoya | 109.22 | 623.42 |
| 18 | CHINA | Qingdao | 2.72 | 601.59 |
| 19 | USA | Virginia Beach | 84.64 | 581.69 |
| 20 | EGYPT | Alexandria | 28.46 | 563.28 |

*Table 2: Top 20 cities ranked in terms of assets exposed to coastal flooding in the 2070s (including both climate change and socioeconomic change) and showing present-day exposure (Source: Nicholls et al (2007), OECD, Paris)*

*Figure A.8 FTSE ET50 index vs. an equal weighting of S&P500, Nikkei and FTSE*


*Figure A.9 ET50 vs. the WTI price*