

OECD WORKING PAPERS ON FINANCE, INSURANCE AND PRIVATE PENSIONS

OECD Working Papers on Finance, Insurance and Private Pensions provide timely analysis and background on industry developments, structural issues, and public policy in the financial sector, including insurance and private pensions. Topics include risk management, governance, investments, benefit protection, and financial education. These studies are prepared for dissemination in order to stimulate wider discussion and further analysis and obtain feedback from interested audiences.

The papers are generally available only in their original language English or French with a summary in the other if available.

**OECD WORKING PAPERS ON FINANCE,
INSURANCE AND PRIVATE PENSIONS**
are published on www.oecd.org/daf/fin/wp

© OECD 2011

Applications for permission to reproduce or translate all or part of this material should be made to: OECD Publishing, rights@oecd.org or by fax 33 1 45 24 99 30.

Abstract/Résumé

THE ROLE OF PENSION FUNDS IN FINANCING GREEN GROWTH INITIATIVES

Abstract: It is estimated that transitioning to a low-carbon, and climate resilient economy, and more broadly ‘greening growth’ over the next 20 years to 2030 will require significant investment and consequently private sources of capital on a much larger scale than previously. With their USD 28 trillion in assets, pension funds - along with other institutional investors - potentially have an important role to play in financing such green growth initiatives.

Green projects - particularly sustainable energy sources and clean technology - include multiple technologies, at different stages of maturity, and require different types of financing vehicle. Most pension funds are more interested in lower risk investments which provide a steady, inflation adjusted income stream - with green bonds consequently gaining interest as an asset class, particularly - though not only - with the SRI universe of institutional investors.

Yet, despite the interest in these instruments, pension funds’ asset allocation to such green investments remains low. This is partly due to a lack of environmental policy support, but other barriers to investment include a lack of appropriate investment vehicles and market liquidity, scale issues, regulatory disincentives and lack of knowledge, track record and expertise among pension funds about these investments and their associated risks. To tap into this source of capital, governments have a role to play in ensuring that attractive opportunities and instruments are available to pension funds and institutional investors.

This paper examines some of the initiatives that are currently under way around the world to assist and encourage pension funds to help finance green growth projects. It is drafted with a view to inform current OECD work on engaging the private sector in financing green growth. Different financing mechanisms are outlined, and suggestions made as to what role governments in general, and pension fund regulatory and supervisory authorities in particular, can play in supporting pension funds investment in this sector. The paper concludes with the following policy recommendations: provide supportive environmental policy backdrop; create right investment vehicles and foster liquid markets; support investment in green infrastructure; remove investment barriers; provide education and guidance to investors; improve pension fund governance.

JEL codes: G15, G18, G23, G28, J26

Keywords: pension funds, green bonds, infrastructure, green growth

THE ROLE OF PENSION FUNDS IN FINANCING GREEN GROWTH INITIATIVES

By Raffaele Della Croce, Christopher Kaminker and Fiona Stewart *

TABLE OF CONTENTS

EXECUTIVE SUMMARY	6
THE ROLE OF PENSION FUNDS IN FINANCING GREEN GROWTH INITIATIVES	8
I. Green Growth Financing Requirements	8
II. Potential Role of Pension Funds in Green Investment	11
III. Barriers to Green Investing + Potential Solutions	18
Problems with Green Investment Policy Backdrop.....	18
IV. Pension fund initiatives in green investing	30
Type of Investors.....	30
Size of Assets	30
Objectives.....	30
IIGCC.....	30
Investor Network on Climate Risk (managed by Ceres).....	30
Investor Group on Climate Change.....	30
Australian and New Zealand investors.....	30
Long-term Investors Group.....	30
P8 Group	32
Other Groups.....	32

* This working paper was prepared by Raffaele Della Croce, Christopher Kaminker and Fiona Stewart from the OECD's Directorate for Financial and Enterprise Affairs and Environment Directorate. Though drawing on OECD Council approved recommendations and other work supported by OECD committees, the views expressed herein are those of the authors and do not necessarily reflect those of the OECD or the government of its Member countries.

The authors would like to thank Simon Upton, Helen Mountford, Jan Corfee-Morlot, Michael Molitor, Marie-Christine Tremblay, Celine Kauffman and all their OECD colleagues who provided valuable comments and input into the paper. Input and comments from the following experts was also most appreciated: Ben Caldecott (Head of European Policy, Climate Change Capital); Aled Jones (Global Sustainability Institute, Anglia Ruskin University); Sean Kidney (Climate Bonds Initiative); Frederic Ottesen, (Chief Investment Officer, Storebrand); Brian A. Rice (Investment Officer, California State Teachers' Retirement System); Richard Robb (Professor in the Professional Practice of International Finance, Columbia University); Shally Venugopal (World Resources Institute); Simon Zadek (Senior Visiting Fellow, Global Green Growth Institute), Ingrid Holmes (E3G).

V. Vehicles of Green Investing for Pension funds	36
Green Bonds.....	36
Structured Green Products	48
Green Infrastructure Funds.....	53
Other Initiatives.....	59
VI. Policy Recommendations	61
Drive Enabling Environmental Policy Backdrop	61
Create Right Investment Vehicles and Increase Market Liquidity.....	61
Support Investment in Green Infrastructure	62
Remove Investment Barriers	63
Education and Guidance.....	64
Improve Pension Fund Governance	64
BIBLIOGRAPHY	66
WORKING PAPERS PUBLISHED TO DATE	69
BOXES	
Examples of Regulatory Support for Renewable Energy	21
Mechanisms for Leveraging Private Finance.....	24
Build America Bonds.....	47
Case Study - CRC Breeze Finance Bonds	49
Case Study - Andromeda Finance Srl	52
Green Banks.....	60

EXECUTIVE SUMMARY

It is estimated that transitioning to a low-carbon and climate resilient economy and more broadly ‘greening growth’ over the next 20 years will require significant investment and consequently private sources of capital on a much larger scale than previously - particularly given the current state of government finances. There is already international agreement on the need to increase financing for climate mitigation and adaptation – with international financing commitments already having been made. With their USD 28 trillion in assets, pension funds – along with other institutional investors – potentially have an important role to play in financing such green growth initiatives.

Green projects – particularly sustainable energy sources and clean technology - include multiple technologies, at different stages of maturity (from new technologies to those already deployed on a large scale), requiring different types of financing vehicle. Institutional investors can access such projects via equity (including indices and mutual funds), fixed income (notably green bonds) and alternative investments (such as direct investment via private equity or through green infrastructure funds). Most pension funds are more interested in lower risk investments which provide a steady, inflation adjusted income stream – with green bonds consequently gaining interest as an asset class, particularly – though not only - with the Socially Responsible Investment (SRI) universe of institutional investors. Yet, despite the interest in these instruments, pension funds’ asset allocation to such green investments remains low (less than 1%), due to a number of factors.

The key to increasing pension funds’ allocation to this space is to make sure that green investments are competitive on a risk return basis. In order to really leverage private capital, pension funds outside the SRI space – which, though growing in importance, is still niche – will have to be tapped. Pension funds and other institutional investors will not make an investment just because it is green – it also has to deliver financially.

One important barrier to further investment by pension funds is the unsupportive environmental policy backdrop. Most green investments are currently uncompetitive, partly as they often involve new technologies which require support and have yet to be commercialised. However, they are also uncompetitive due to market failures – with existing, ‘black’ technologies mispriced due to pollution externalities not being accounted for and fossil fuels still being heavily subsidized.

Government policies are therefore needed to support the commercialisation of new technologies (R&D tax credits; accelerated depreciation; investment incentives; government support for venture capital funds; and output-stage support such as feed-in tariffs etc.) and to correct market failures through carbon pricing). To create this type of ‘investment grade’ policy, such support needs to be ‘*loud*’ (big enough to impact the bottom line), ‘*long*’ (for a sustained period) and ‘*legal*’ (with regulatory frameworks clearly established).

Another key barrier is the lack of financial instruments enabling pension funds to make these investments. The market for green investments remains small and illiquid and there is often a mismatch between pension funds’ long-term, relatively low risk needs and the financing vehicles available. Governments can again play a role to stimulate and develop the market – ensuring that adequate, investment grade-deals at scale come to the market for pension funds to invest in. For financial vehicles specializing in early-stage projects, public finance could invest alongside private capital, or institutional investors could take on subordinated equity positions, with public funds taking on the first tranche of risk. Alternatively, government bodies could provide loan guarantees. In addition governments and/or multinational agencies can use so-called ‘Public Financing Mechanisms’ to provide cover for risks which are new to pension funds or cannot be covered in existing markets (such a political risk, currency risk, regulatory and policy risk etc.). Standardizing and rating green investments would also help.

Though still small – a market for green investments is also starting to grow. Alongside more developed equity products (such as green indices comprising of listed companies operating in the green space), fixed income instruments are also being launched – notably green bonds, for which the OECD estimates that the market is now around USD 16 billion. Alongside the World Bank’s USD 2.3 billion issuance, other development banks have become involved (EIB, ADB) and the US government has introduced interesting initiatives. Other more exotic green financial vehicles have also been launched – with mixed success. Green infrastructure funds are also likely to be an important way for pension funds to pool their resources and invest in a portfolio of green projects (thereby sharing scale, knowledge and gaining diversification – all key issues for smaller funds which cannot invest directly). Another important initiative being launched by several governments (including the UK, Australia and possibly the USA) are Green Investment Banks – which will use public money and raise funds joint with the private sector to invest in assets relevant for climate change solutions.

A further barrier to pension funds’ investment in green projects is their lack of knowledge and experience not only with ‘green’ projects, but with infrastructure investments in general (which green projects are often a subsector of) and the financing vehicles involved (such as private equity funds or structured products). However, major pension funds around the world have been coming together in order to raise awareness of the climate change issue and the opportunities presented and to encourage the creation of financing vehicles which will allow them and their peers to get involved. Some of the major funds leading the way include ATP (Denmark’s largest pension fund), PGGM (the pension fund for the Dutch healthcare sector), CalSTRS and CalPERS (the Californian public sector funds).

What can governments do to support and drive these initiatives further? The most important thing is to provide clear and consistent environmental policies which will fix market failures and give institutional investors the confidence to invest in green projects. Without these policies climate finance from the private sector will not be forthcoming.

Governments need to ensure that adequate, investment-grade deals at scale come to the market in order to be able to tap the potential pension funds cash. This could include taking subordinated equity or debt positions, providing risk mitigation and issuing green bonds.

Support for infrastructure projects more generally is also required (as outlined in the *OECD Principles for Private Sector Investment in Infrastructure*) – including long-term planning and a sound regulatory environment supporting PPPs etc.

Inadvertent barriers to pension fund involvement may exist in terms of investment and solvency regulations (such as asset limits, restrictions on illiquid or non-listed investments/ solvency and accounting rules pushing funds into government bonds) – which should be reviewed.

Support for pension funds can also be given through data collection and education initiatives to improve the knowledge of pension fund trustees

THE ROLE OF PENSION FUNDS IN FINANCING GREEN GROWTH INITIATIVES¹

I. Green Growth Financing Requirements

Transitioning to a low carbon and climate resilient economy, and more broadly ‘greening growth’ will require shifting significant amounts of capital from fossil fuels and resource-intensive and polluting technologies to newer, clean technology and infrastructure. The appropriate investment landscape will also need to be supported by policy to drive additional capital towards ‘greening’ or accelerated phase-out of long-lived black assets such as coal-fired power plants, refineries, buildings and energy infrastructure.

Green growth can be seen as a way to pursue economic growth and development while preventing environmental degradation, biodiversity loss and unsustainable natural resource use. It aims at maximising the chances of exploiting cleaner sources of growth, thereby leading to a more environmentally sustainable growth model (see OECD 2010a). To do this it must catalyse investment, competition and innovation which will underpin sustained growth and give rise to new economic opportunities. This is the path that the OECD is advocating in its Green Growth Strategy, and energy policy needs to be developed as an integral part of this overall green growth framework (for more see OECD Green Growth Study: Energy Sector 2011e).

Investing in infrastructure and innovation will be crucial for ensuring new sources of growth that better reflect the full value to economic activity to society. OECD analysis shows that greener growth can deliver important economic gains. These can be realised through enhanced resource productivity, reduced waste and energy consumption, and from ensuring that natural resources are priced to reflect their true value. For example, a 17% increase in the type of investment needed to deliver low-carbon energy systems between now and 2050 would yield an estimated cumulative USD 112 trillion in fuel savings (IEA 2010a). It is estimated that just adapting to and mitigating the effects of climate change over the next 20 years to 2030 will require significant investment. The exact amount of financing needed to address climate change will depend on many factors, including the level of ambition of mitigation goals and adaptation objectives, and the extent to which ‘correct’ price signals or regulation are provided.²

This report does not propose to enter the discussions on financing and investment levels that will be needed to support green growth such as is done by the IEA (2010a) for the energy sector, but rather will look at where required flows may come from and how financial instruments such as green bonds might be used to shift flows to support green growth. However, for illustrative purposes it is useful to examine the ranges of estimates that are quoted. Smil (2010b) suggests that the scale of the envisaged global transition to non-fossil fuels is immense, approximately 20 times larger than the scale of the last historical energy transition (fossil fuel use was about 425 Exajoules (EJ) in 2010, compared with 20 EJ for traditional biomass in 1890).

Table 1 illustrates some of the financing and investment levels quoted for various purposes that would fall under the umbrella of greening growth. Estimates vary widely, and one figure that is quoted by the UN

¹ Although this report focuses on pension funds, it should be seen in the context of the OECD’s broader work on institutional investors. The OECD has recently launched a project on “Institutional Investors and Long Term Investment”. As part of this project further studies will follow, including for the insurance sector. See www.oecd.org/finance/lti

² See OECD note on ‘*Financing Climate Change Action and Boosting Technology Change: Key messages and recommendations from current OECD work*’ <http://www.oecd.org/dataoecd/34/44/46534686.pdf>

is USD 1.6 trillion per year in total³ investment required for a global energy transformation that simultaneously meets emission targets and facilitates an upward convergence of energy usages of developing and developed countries. Additionally, the IEA (2010a) calculates that the decarbonisation of the power sector will require additional investments of USD 9.3 trillion from 2010 to 2050 and the UN (2011a) estimates global replacement costs of existing fossil fuel and nuclear power infrastructure at, at least, 15 trillion–20 trillion (between one quarter and one third of global income).

Table 1: Ranges of Investment Needs for Green Growth

Financing Need	Capital Required (USD)	Source / Notes
Developed to developing country flows for climate change adaptation and mitigation	100 billion per year by 2020	UNFCCC (2010) Cancún decisions
Water infrastructure	800 billion per year by 2015	OECD Infrastructure to 2030 (2007)
IEA's Blue Map scenario of halving worldwide energy-related CO2 emissions by 2050	300 - 400 billion between 2010 - 2020; up to 750 billion by 2030 rising to over USD 1.6 trillion per year from 2030 to 2050.	IEA Energy Technology Perspectives (2010)
Clean energy investment needs to restrict global warming < 2°C	500 billion per year (by 2020)	World Economic Forum and Bloomberg New Energy Finance (2010)
Investment requirement for energy transformation (BAU + incremental needs)	65 trillion by 2050 or 1.6 trillion per year	UN World Economic and Social Survey 2011 and Global Energy Assessment (forthcoming)
Implementing 'sustainable growth'	0.5 - 1.5 trillion per annum in 2020 rising to 3 - 10 trillion per annum in 2050	WBCSD (2010)

Source: Authors compilation, drawing on sources as noted.

There is already international agreement on the need to increase financing for climate mitigation and adaptation (though governments diverge on key issues such as architecture and institutions for delivery of new financing to support climate action). Indeed, governments have already made international financing commitments – including the Cancun decisions agreed at United Nations Framework Convention on Climate Change (UNFCCC) COP 16 in December 2010, which reiterated the commitment made in the Copenhagen Accord, including the following:⁴

- new and additional resources approaching USD 30 billion for 2010-2012, with balanced allocation for adaptation and mitigation;

³ Total includes both the investment needs under a business-as-usual scenario investment and the additional investment requirements for scaling up renewable energy technology and enhancing energy efficiency.

⁴See Copenhagen Accord (UNFCC/CP/2009/11/Add1 p 7) <http://unfccc.int/resources/docs/2009/cop15/eng/11a01.pdf>

- developed countries to commit to a goal of mobilizing jointly USD 100 billion p.a. by 2020 to address the needs of developing countries. This funding will come from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources of finance;
- the Green Climate Fund shall be established as an operating entity of the financial mechanism of the convention to support projects, programmes, policies and other mitigation and adaptation activities in developing countries.

However, funding a transition to a low-carbon economy vastly exceeds the capability of the public sector – particularly given the current state of government finances.⁵ Such significant investment will require substantial private sources of financing on a much larger scale than before, both new flows and redirecting existing funds - though governments are still debating to what extent private finance should play a significant role, and if so how to account for it (see UNEP FI 2009).

The UN Secretary General’s High-Level Advisory Group on Climate Change Financing (AGF)⁶ studied potential sources of revenue that will enable the achievement of the level of climate change financing that was promised during UNFCCC COP15 in Copenhagen in December 2009. In their final Report, released in November 2010, they state that (UN AGF 2010 p12): “*enhanced private flows will be essential to economic transformation towards low-carbon growth; ultimately, these will need to be mobilized at a scale of hundreds of billions of dollars.*” In paper 7, looking at ‘*Public Interventions to Stimulate Private Investment in Adaptation and Mitigation,*’ four conclusions emerge (see Executive Summary UN AGF 2010b):

- Potential private investment in 2020 is substantial;
- For this level of private investment to be realized, a range of existing country and project specific barriers will need to be overcome by domestic and international public interventions;
- The existing menu of interventions is largely sufficient, but needs better packaging, strategic focus, and greater scale;
- The large potential for private investment to achieve climate -related objectives justifies using a substantial share of the public funding available in and before 2020 to stimulate this investment.

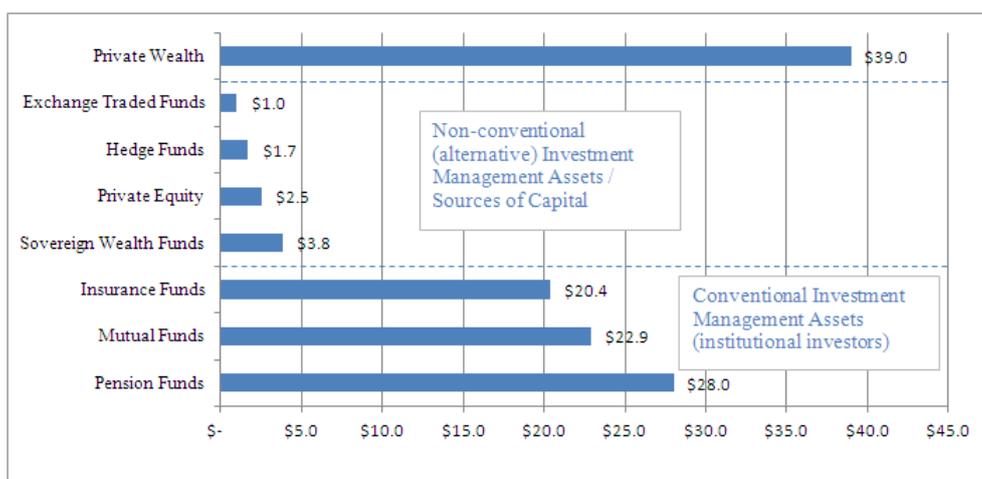
⁵ The IMF estimate developed country government debt-to-GDP ratios will rise to 110% by 2015 (IMF 2010).

⁶ The Secretary-General of the United Nations established the High-Level Advisory Group on Climate Change Financing in February 2010. Following its terms of reference, the Advisory Group worked around the goal of mobilizing USD 100 billion per year by 2020. See (UN AGF 2010a). Their report provides the first comprehensive analysis of the potential sources from across various options, and finds that it would be challenging, but feasible, to mobilise the necessary funds to meet the long-term USD 100 billion. Reaching the goal will likely require a mix of sources, both existing and new public sources, bilateral and multilateral, as well as increased private flows, including instruments to incentivize private flows such as carbon markets and other forms of carbon pricing.

II. Potential Role of Pension Funds in Green Investment

Pension funds, along with other institutional - and alternative - investors, potentially have an important role to play in financing green growth initiatives (see Jones et al 2010). With USD 28 trillion in assets held by private pension funds in OECD countries, and annual contribution in-flows of around USD 850bn,⁷ pension funds could be key sources of capital. This source of funds could be much larger if emerging markets are considered, given the potential for growth and diversification of pension assets in these countries.

Figure 1: 2009 Global Fund Management Industry, assets under management (AuM), USD \$tn



Source: OECD, TheCityUK estimates, adapted from *Investing in Climate Change 2011*, (Deutsche Bank 2011)

There is no unique definition among investors of what green investing entails.⁸ However, for the purpose of this paper, ‘green’ investments refer broadly to *low carbon and climate resilient* investments made in companies, projects and financial instruments that operate primarily in the renewable energy, clean technology, environmental technology or sustainability related markets as well as those investments that are climate change specific. In terms of the OECD’s Green Growth Strategy (OECD 2010a), these would include energy efficiency projects, many types of renewable energy, carbon capture and storage, nuclear power, smart grids and electricity demand side-management technology, new transport technologies floodplain levees and coastal protection as well as water infrastructure.

According to a recent survey from EDHEC (see EDHEC 2010) the reasons for green investing can be categorised in four groups:

⁷ Asset figures as of 2007 taken from *Private Pensions Outlook 2009* (OECD 2009a). Contribution figures as of 2009 taken from OECD statistics database

⁸ Focusing on sectors having to do with environmental issues, popular investments are climate change and renewable energy funds. Climate change includes green technology or clean technology funds looking at alternatives to energy sourced from conventional fossil fuels. A broad definition of “climate change themes” could take into consideration rail, water and electricity infrastructure that is not specifically dedicated to clean energy. The World Economic Forum in its Green Investing papers considers as subset of all “Green Investment” opportunities, only investment in clean energy (defined as investment in renewable energy and energy efficiency technology, but excluding nuclear power and large hydro).

- First, investors may be driven by ethical considerations (which can involve broader considerations than just green issues).
- Second, they may be interested purely in advantageous return profiles.
- Third, by making an environmental dimension an integral part of their investment decisions investors may simply be responding to legal or regulatory constraints.
- Finally, investors may be looking to improve their reputation by making a public showing of their concern for the environment

In other words there are two types of funds looking at green products. First the increase in ‘Socially Responsible Investing’ (SRI) has raised demand from ‘ethical funds’ for what are seen as ethical (including ‘green’) projects. This has been furthered by the creation of Environmental, Social and Governance (ESG) focus lists for investment banking equity research desks.⁹ Asset owners representing more than USD 15 trillion have recently signalled their support for U.S. and international action on climate change publicly (although only a portion of the portfolios of these investors are allocated accordingly).¹⁰

Many institutional investors are acutely aware of the ‘macro’ risks of climate change; but they generally believe they lack data adequate to shifting their portfolio investments. Given a choice between ‘green’ and ‘black’ investments with a similar risk/reward profile, they say they will choose green in recognition of those macro risks¹¹.

Secondly, the broader universe of pension funds may also be interested in these investments not so much because they are green, but because they provide an attractive return (whether environmental issues should be a considered within mainstream risk assessments by institutional investors is a topic beyond the scope of this paper). Pension funds are looking for long-dated assets with inflation protection, a steady yield and which have a low correction to the rest of their portfolio. This is particularly the case where investment or solvency regulations force funds into conservative assets which match their liabilities. If sizable assets are to be directed to green projects, financing instruments which meet the needs of this universe of broad, conservative pension funds will have to be created.

Green projects – particularly sustainable energy sources and clean technology - include multiple technologies, at different stages of maturity. The appropriate type of financing will be chosen according to the stage of development of the technologies. For example venture capital financing is normally suited for un-proven and un-tested technologies, while project financing is used for mature technologies such as wind and solar. Projects also have different phases – development, construction and operational – which require different financing methods (equity, then debt) and it is at the latter stages (e.g. operational refinancing) where instruments such as green infrastructure bonds become useful.¹²

⁹ See for example the Goldman Sachs GS SUSTAIN Methodology, available:

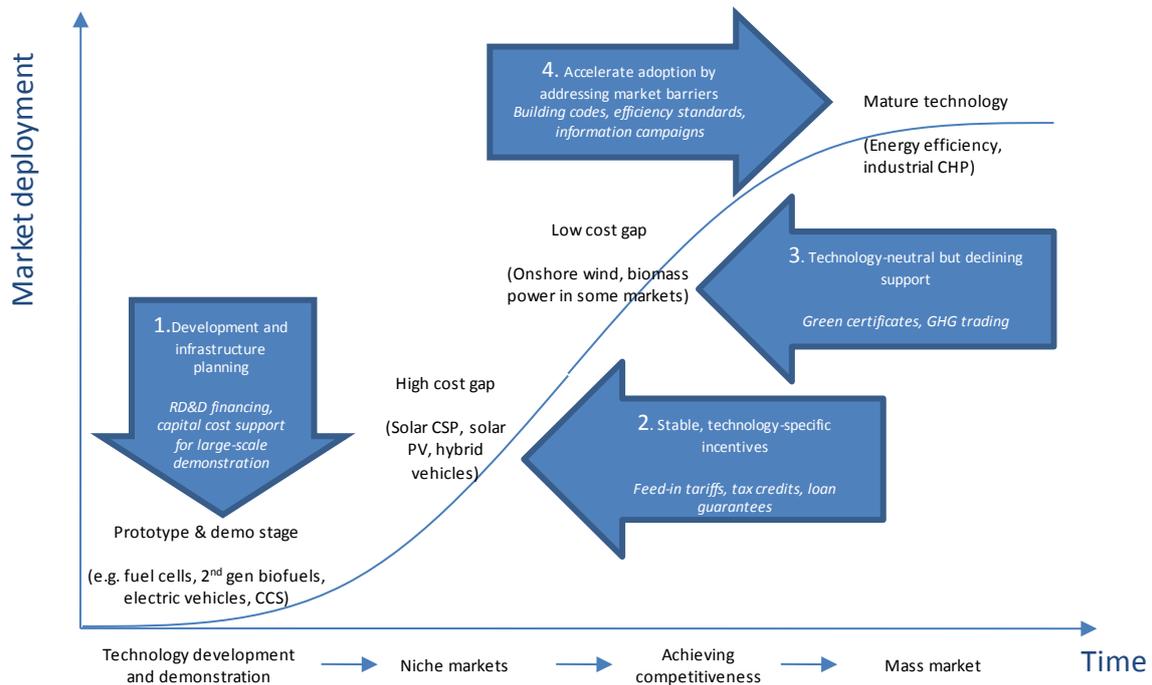
<http://www2.goldmansachs.com/ideas/environment-and-energy/goldman-sachs/gs-sustain/index.html>

¹⁰ <http://www.incr.com/Page.aspx?pid=1294>

¹¹ For an analysis of the extent of climate change impact on institutional investment portfolios see (Mercer 2011)

¹² (for more see Kalamova, Kaminker and Johnstone, OECD, 2011)

Figure 2: Market Deployment



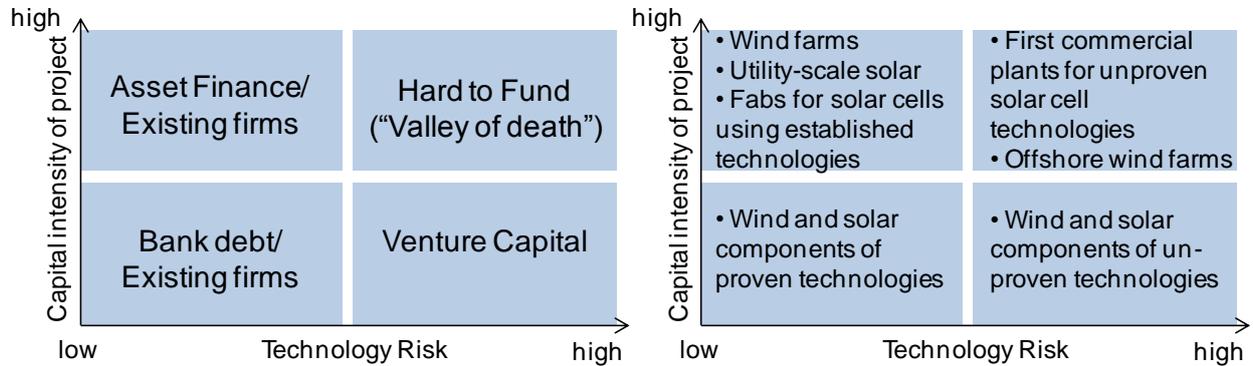
Note: The figure includes generalised technology classifications; in most cases, technologies will fall into more than one category.

Source: IEA (2010), *Energy Technology Perspectives 2010*, Kalamova, Kaminker and Johnstone, (OECD, 2011)

Government support policies need to be appropriately tailored to the stage(s) of development of a technology. Maturity of technologies and type of financing available will ultimately result in differences in risk/return profiles of green investment opportunities to investors. Other elements that further define the investment opportunity are the contractual approach, the phase of asset development (existing vs. new facility), the geography, etc. For example an investment in equity of a new technology financed through venture capital would be part of the high risk/high return portfolio allocation of an investor, while the development of solar infrastructure relying on government subsidies would typically have a lower risk/return profile.¹³

¹³ However deterioration of the fiscal position of many countries increased the risk of government subsidies being cut as recently happened in Spain and Italy in the solar sector, illustrating the continued calls for policy predictability and stability from financiers.

Figure 3: Focus of different sources of finance with respect to technology risk and capital intensity



Source: Adapted from Ghosh and Nanda (2010)

Though some pension funds – mostly larger, more sophisticated investors - are able to invest at the riskier end of the spectrum (i.e. in start-up, venture capital type projects focusing on clean tech and other innovations), this will only ever constitute a small percentage of their portfolios. The broad mass of pension funds will be more interested in lower risk investments (i.e. in deployable renewables etc.), which provide a steady, inflation adjusted, income stream – particularly where investment or solvency regulations require a relatively conservative approach to investment. Pension fund assets can therefore be expected to be directed more towards this type of green project (which are therefore the focus of this paper).

Institutional Investors can access green investments through traditional or alternative asset classes, more specifically:

- **Through equity:** vehicles for green equity investing include indices, mutual funds, and ETFs.
- **Through fixed-income:** investors have a choice of “green bonds”, that can be defined as fixed-income securities issued by governments, multi-national banks or corporations in order to raise capital for green projects.¹⁴
- **Through alternative asset classes:** the most common vehicles for green investing are real estate funds and infrastructure funds, which are often organised as private equity vehicles.

¹⁴ An important development for the long-term, as banks and utilities begin to face balance sheet pressures in the face of the enormous financing requirements of coming years, is the growth of asset-backed bonds. While in the early stage, these are expected to become the dominant refinancing vehicle in the latter part of the decade.

Table 2: An overview of vehicles for green investing

Asset class	Type of vehicle	Description	Example
Equity	Indices	Include only stocks of companies that have "good environmental practices".	Screening 1. FTSE4Good Environmental Leaders Europe 40 Index 2. S&P Global Eco Index
			Thematic 3. WilderHill New Energy Global Innovation Index 4. S&P Global Water Index 5. FTSE KLD Global Climate Index
	Mutual funds		1. Calvert Large Cap—screening large-cap stocks with good reputation for environmental consciousness 2. Winslow Green Growth –small-cap fund investing in eco-friendly companies 3. Guinness Atkinson Alternative Energy—investing in natural resources
	ETFs		1. PowerShares WilderHill Clean Energy Portfolio (PBW) 2. Claymore/LGA Green ETF (GRN)
Fixed-income	Bonds	Bonds are usually issued by federally qualified organisations to raise capital to solve environmental problems	1. European Investment Bank—Climate Awareness Bonds 2. U.S. Treasury—"Green Bonds" 3. SEB & Credit Suisse—World Bank green bonds to support low-carbon development in developing countries
Alternatives	Real estate	Real estate investment that is environmentally acceptable.	Micro: energy efficiency, recycling, etc. Macro: reducing greenhouse gases, carbon footprinting, less resource depletion, etc.
	Infrastructure/private equity	Funds that invest in, e.g., environmental technology infrastructure	1. Miaoli Wind Macquarie Int'l Infrastructure Fund 2. Carlyle Infrastructure Partners (CIP)

Source : EDHEC 2010

Other than asset finance (which has a long history of involvement in energy and related projects), the equity market is considered the better developed (and more rapidly growing – e.g. via SRI indices etc.) - market for green investing. In fact traditionally investors have invested in the equity of companies such as utilities that are exposed to environmental themes. In recent years new investment vehicles were created for those not able or willing to make their own direct investments.¹⁵ However, this listed equity type of investment is currently more the domain of SRI funds. As mentioned, whether environmental issues should

¹⁵ In 2004, there were only 10 quoted equity funds targeting the sector, almost all of them run by specialist companies such as Triodos, Sustainable Asset Management and Impax. By the end of 2007, the lay investor had the option of more than 30 funds, several managed by highstreet names such as Deutsche Bank, ABN Amro, HSBC or Barclays. By October 2008 these funds had over USD 42 billion in assets under management (see Figure 9). A number of Exchange Traded Funds had also been launched, including the Powershares Global Clean Energy Fund, which tracks the WilderHill New Energy Global Innovation Index (NEX) and soon grew to have over USD 200m in assets under management. Source World Economic forum Green Investing.

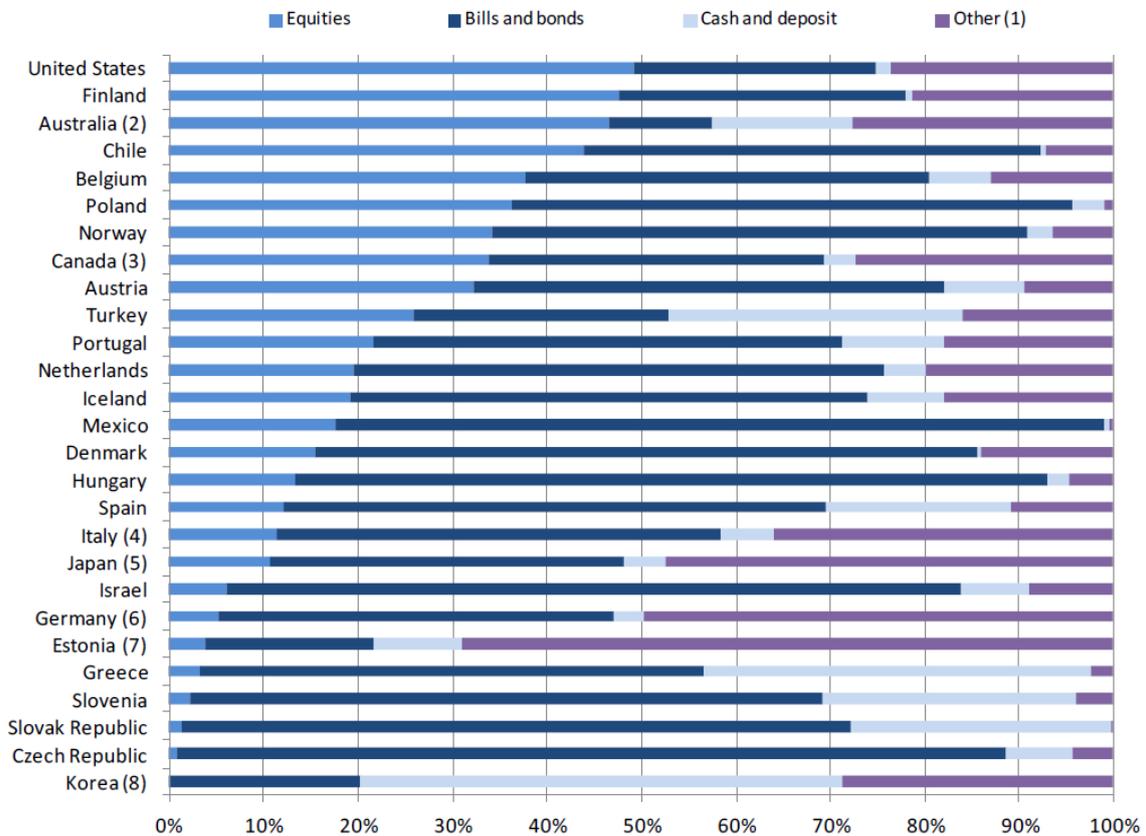
be a considered within mainstream risk assessments is a topic beyond the scope of this paper. As these are not new investment vehicles, listed equity investments are also not the focus of this paper.

This paper focuses on ‘green’ bonds and alternative investments in existing renewable energy technology as it is through these instruments that additional pension fund assets could be tapped for financing green growth related projects. It should be noted that pension funds are only one source of green financing and will only be able to provide substantial capital for a limited range of green projects. For governments to meet their ambitious targets, other forms of institutional investors, private capital and public funds will also be required (particularly for more risky, untested technologies).

For the purpose of this review, green bonds are broadly defined as fixed-income debt securities issued (by governments, multi-national banks or corporations) in order to raise the necessary capital for a project which contributes to a low carbon, climate resilient economy. To date, these have been issued predominantly as AAA-rated securities by the World Bank and other development banks and some other entities in order to raise capital specifically for climate change and green growth related projects. Though generally offering these bonds with the same interest rate as other instruments, and with the same credit rating, ring-fencing the financing for green projects allows the issuers to tap a broader range of investors, such as SRI funds (see section on World Bank bonds).

In most OECD pension funds, bonds remain by far the dominant asset class, accounting for 50% of total assets under management on average (OECD Pension markets in focus July 2011). Green bonds could therefore be a channel to direct significant pension fund capital towards green projects. However the market size for green bonds is still small and illiquid at USD 15.6 billion as of August 2011 (see next section for discussion). Veys (2010) points out that an asset allocation move from equities to bonds within pension funds (as has happened in recent years) is a more significant change to risk profile than an allocation within a financial sector (like bonds). Hence a shift in allocation to a different sort of bond (green bonds) is not as risky as it seems, especially if some of these come with the AAA rating.

**Figure 4. Pension fund asset allocation for selected investment categories in selected OECD countries, 2010
(as a % of total investment)**



Source: OECD Global Pension Statistics.

The past few years have seen another trend of significance in the financing of clean energy – the provision of investment vehicles such as private equity and infrastructure funds targeting opportunities in unlisted equity markets. These new investment vehicles represent “alternative” asset classes to the traditional equity and fixed income. Larger pension funds are able to invest directly in private equity and infrastructure projects and are therefore less likely to invest in these structured funds. However, these private equity and infrastructure funds are an important way to broaden the scope and allow a boarder range of smaller pension funds to also get involved. Again, if offering an attractive risk-return adjusted yield, these funds will be of interest to a broad range of pension funds, not just larger entities and not only SRI style investors.

III. Barriers to Green Investing + Potential Solutions

Despite their theoretical attractions, pension funds' asset allocation to green investments remains limited and is still at an early stage. Why is this?

Problems with Green Investment Policy Backdrop

Barriers to low-carbon investment may be financial, structural or technical. Financial barriers include fossil fuel subsidies, and the unpriced carbon externality. These discourage local businesses, project developers, vendors, technology providers from offering low carbon solutions to the market, and hamper institutional and market financing mechanisms enabling such businesses to grow. Structural barriers include network effects (need for flexible and sufficient grid capacity), fragmentation and transactional costs due to smaller scale of low carbon technologies and simply 'status quo bias'. These affect the viability and economic attractiveness of low carbon options. Finally, neither policy nor financing will achieve much if there are technology and technical capacity barriers that impede technological and business model innovation.

Many green projects are currently often not viable on a stand-alone basis due to mispricing in the markets which makes traditional or 'black' projects more attractive, due to climate change externalities not being priced into these projects or mispricing due to government policies, such as fossil fuel subsidies (and the introduction of carbon pricing through schemes such as the European Emissions Trading Scheme has not significantly altered this).¹⁶ These fuel subsidies, still prevalent in many countries, deteriorate the economics of low-carbon projects. The IEA (2010b) has estimated that government support for renewables will rise from USD 57 billion in 2009 to USD 205 billion in 2035 but by comparison, subsidies to fossil fuel consumption in emerging and developing countries amounted to USD 312 billion in 2009. OECD estimates that removing these subsidies could result in as much as 10% less greenhouse gas emissions globally in 2050 compared with business as usual. Government intervention is required to create a level playing field between energy sources: removing fossil fuel subsidies and pricing the carbon externality adequately will alleviate pricing distortions that currently work against low carbon technologies.

However, before private investors will commit large amounts of capital to this sector there must be transparent, long-term and certain regulations governing carbon emissions, renewable energy and energy efficiency (see Deutsche Bank's TLC framework).¹⁷ Such investments will only be made if investors are able to earn adequate risk-adjusted returns and if appropriate market structures are in place to access this capital. To quote the World Economic Forum's report '*Green Investing 2010*' (WEF 2010), "*While the world's investors may be ready to invest in clean energy companies and projects, they still have questions over the policy environment in which they operate.*"

If governments wish to encourage investors to finance climate change and green growth projects in future, clear and consistent policies over a long period of time are needed – most notably a clear signal in terms of carbon pricing (e.g. via emissions targets). For example, as Hamilton (2009) points out, renewable energy policy and regulatory framework is the critical element influencing where capital is deployed. Such policy needs to be 'loud' (i.e. with incentives which make a difference to the bottom line), 'long' (sustained for a period that reflects financing horizons) and 'legal' (with clearly established regulatory

¹⁶ For example Kalamova, Kaminker and Johnstone (2011) discuss how the renewable energy remains more costly than conventional forms of electricity generation, particularly where subsidies to fossil fuels remain in place and the cost of carbon pollution remain unpriced. The work of Michael Grubb at Climate Strategies shows how the emission trading scheme price is too low to effect greater investment in renewable energy (see www.climatestrategies.org).

¹⁷ http://www.dbcca.com/dbcca/EN/media/Paying_for_Renewable_Energy_TLC_at_the_Right_Price.pdf

frameworks) in order to create ‘investment grade’ policy. A clear regime of penalties and enforcement is also key for investors. The UK’s Capital Market’s Climate Initiative (CMCI) outlines the importance of such ‘investment grade policy’ as follows: “*Investors need to be confident that governments are serious. Investment grade policy will deliver risk-adjusted returns that are commercially competitive with existing high carbon investments.*” (CMCI 2011).

Government incentives and guarantees can then also be used – from support for research and development (R&D) - which affects operational efficiency- to investment incentives (capital grants, loan guarantees and low-interest rate loans), taxes (accelerated depreciation, tax credits, tax exemptions and rebates), and price-based policies at the output stage (which affect revenue streams - e.g. feed-in tariffs), or policies which target the cost of investment in capital by hedging or mitigating risk.

These incentives and mechanisms are not specific to pension fund investment but aim to improve the general policy framework for green investment and make the risk-return profile of these investments more appealing to investors – including pension funds. Incentives (such as guarantees or insurance from governments or a new Green Investment Bank) are likely to efficiently leverage public money, whilst tax incentives may also play a role. As the World Economic Forum’s report on green investing points out (see WEF 2010): “*Supporting green investment can be achieved in multiple ways: by modifying the rules of the energy markets, by promoting equity or debt investment, by means of tax rules or by creating carbon markets. The choice of mechanism must depend on local political and economic conditions*”.

Table 3: Types of renewable energy promotion policies along the stages of technology development

Classification	Policy examples	Stage of technology development		
		Research and Development	Capital investment	Large-scale Deployment
Energy market regulations	Feed-in tariff	Indirect impact	Indirect impact	YES
Direct financial transfer	Capital grants	YES	YES	
	Low-interest loan and loan guarantees	YES	YES	
	Government-funded/run venture capital funds	YES	YES	
Preferential tax treatment	Accelerated depreciation		YES	
	Investment tax credit		YES	
	R&D tax credit	YES	Indirect impact	
	Production tax credit		Indirect impact	YES
	Sales tax, energy tax, excise tax, VAT reduction			YES
Trade restrictions	Renewable portfolio standards (quotas)			YES
	Tradable renewable energy certificates			YES
Services provided by government at less than full cost	Public investment in infrastructure		Indirect impact	YES
	Government research and development	YES	Indirect impact	

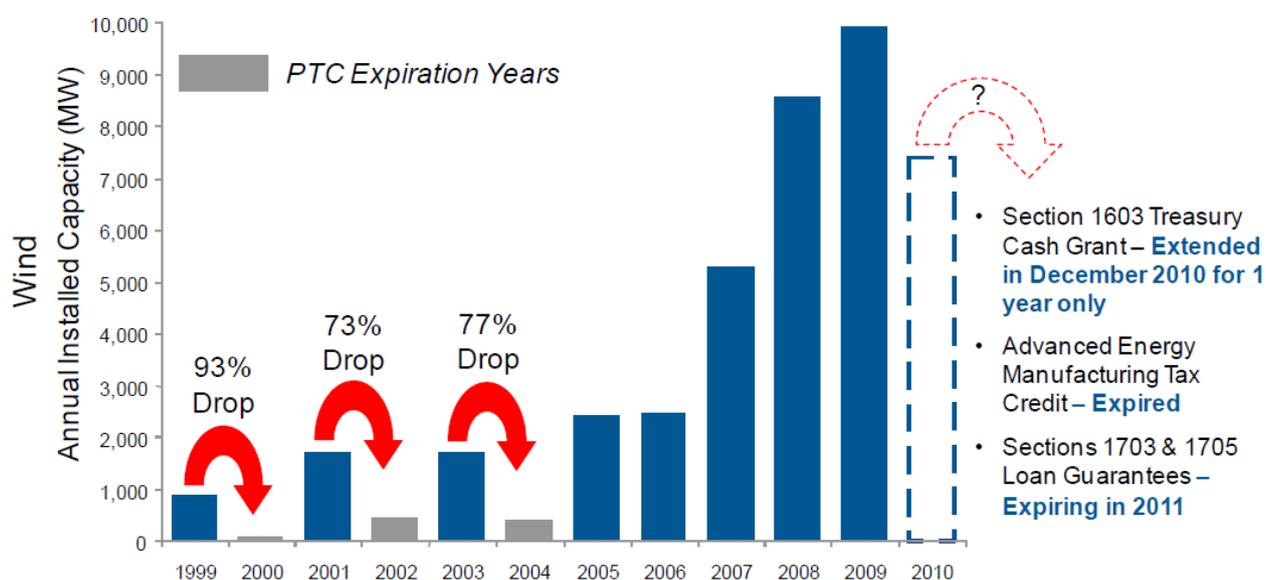
Source: (Kalamova, Kaminker and Johnstone, OECD, 2011)

Transparency, predictability and longevity of government programmes are necessary if investors are to initiate a project in green technologies. For instance, the degree of high uncertainty in American Production Tax Credits (PTC) was a contributing factor to investor exit from the wind power sector, in particular - illustrating the importance for governments of ensuring that programmes are not subject to excessive policy uncertainty (see Figure 2). Retroactive policy changes regarding solar power projects in Spain have also been concerning investors.¹⁸ Meanwhile, a survey conducted by the Institutional Investors Group on Climate Change (IIGCC) found that less than 10% of their members thought the EU Emissions Trading Scheme (EU ETS) provided a strong enough price incentive to switch to carbon-intensive investments and none felt that the EU ETS had provided the necessary long-term certainty (see CMCI 2011).

¹⁸ For example see IPE Article 25/6/2010, 'Danish pension funds take on Spain over solar tariffs'

http://www.ipe.com/news/danish-pension-funds-take-on-spain-over-solar-tariffs_35852.php?s=solar%20power#

Figure 4: US Investment in Wind Power in Relation to Production Tax Credits (PTC)



Source: Deutsche Bank (2011), American Wind Energy Association (2009), US PEF (2010)

However, predictability should not be mistaken for permanence. In the case of policies targeting investment in physical capital, it is important to ‘sunset’ many of the policies. With time the financial market will price risk efficiently (assuming policy regimes do not generate shocks continuously) and learning benefits will be exhausted. While policies to support specific green technologies may be needed to overcome barriers to commercialisation, the design of such policies is essential to avoid capture by vested interests and ensure that they are efficient in meeting public policy objectives. Focusing policies on performance rather than specific technologies or cost recovery is essential.

Other important elements of good design include independence of the agencies making funding decisions, use of peer review and competitive procedures with clear criteria for project selection. Support for commercialisation should also be temporary and accompanied by clear sunset clauses and transparent phase-out schedules.¹⁹ As noted before, support policies also require a good understanding of the state of development of green technologies; support for commercialisation should not be provided before technologies reach a sufficiently mature state.

Examples of Regulatory Support for Renewable Energy

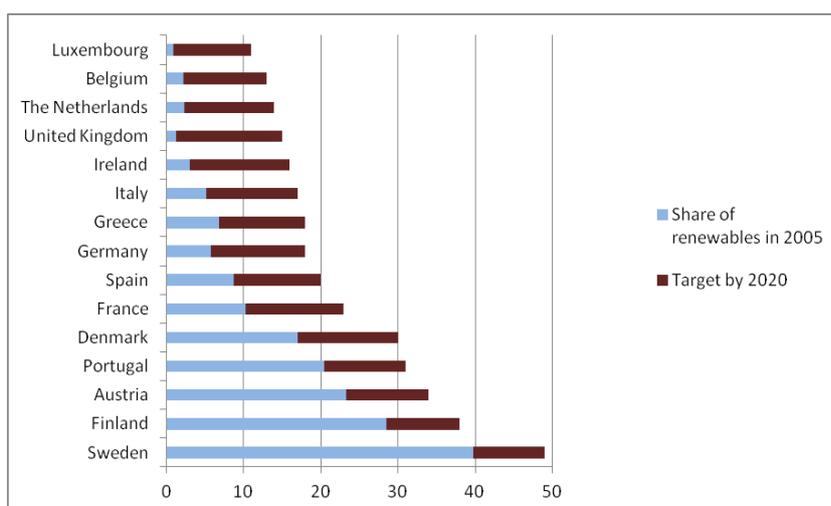
EU Regulation

In 2001, the EU adopted a Directive on the promotion of renewable sources for the production of electricity (known as the Renewables Directive). This non-binding legislation set targets for a 12% share of renewables in the EU's energy mix by 2010, with individual targets for each country.

¹⁹ An exception to this is the use of government forward procurement which sets targets for products and services to be purchased by government in the future to help stimulate and create demand for the development of these products – forward procurement commitments should be seen as a continuous mechanism for creating demand for new technologies and a simple process for government.

The requirement for EU members to maintain a supportive framework for renewables is now underpinned by the Renewable Energy Directive (2009/28/EC). In 2009, the 27 EU member states formally committed to green energy production targets as set out in the directive. The Renewable Energy Directive incorporates a mandatory target of achieving a 20% share of energy from renewable sources in overall EU gross final energy consumption by 2020. This overall commitment has been broken down into individual targets for each member state, taking into account existing levels of renewable energy production and the potential for growth. These national targets represent a legally binding undertaking for each of the 27 member states, to be implemented by each state through national legislation. Furthermore, member states have also committed to intermediate trajectory targets in the run-up to 2020 with mandatory ongoing reporting and action plans. The formal and binding commitments set out in the Renewable Energy Directive establish a credible and supportive policy framework across the EU.

EU15 renewable energy targets: Share in final energy by 2020 vs. share of renewables in 2005



Source: European Commission

Italian Regulatory Regime

Italy has historically had a comparatively higher dependency on energy imports than other countries of the EU. This dependency is a result of a rejection of nuclear energy, low fossil fuel reserves, and a lack of development of the renewable energy potential in Italy.

As a result of the EU targets and the Kyoto Protocol (Italy signed in May 2002), the Italian Government implemented a number of renewable energy directives, commencing with the Decree 387/2003 with subsequent amendments in 2005/2006 and the "Nuovo Conto Energia" (Italian Solar Decree) in 2007. The most important elements of these directives and associated amendments to the legislation were:

- The "Conto Energia", which is a 20-year incentive tariff paid to the Project;
- The "Ritiro Dedicato", which is the right to sell the Project capacity to the national grid for the market price of electricity;
- A single authorisation procedure which replaced all permits and licences required to build a photovoltaic (PV) solar power plant exceeding the threshold of 20kW.

These directives promoted the growth in the renewable sector. Italy is the third EU country after Germany and Spain to pass the symbolic marker of 1000 MWp of installed PV capacity.

Problems with Green Financing Vehicles

There are also specific problems with the financing mechanisms which need to be overcome. Governments can also encourage pension funds to invest in green projects by helping to provide appropriate investment vehicles. To attract institutional investment into green projects governments have to structure projects as attractive investment opportunities for investors, providing risk return profiles that match the expectations of investors when considering such assets.

What appears to be a common problem is the mismatch between the desired risk/return profiles of pension funds when investing in infrastructure – including green projects - and the opportunities offered in the market. Pension funds are ‘buy and hold’ investors and their main focus is on long term income rather than capital accumulation. Governments and International Financial Institutions can work to improve dealflow; ensuring adequate, investment-grade deals at scale come to the market for pension funds to invest in. For example via vehicles specializing in early-stage projects and public sector finance either investing alongside private sector and institutional investors or taking subordinated equity positions in funds.²⁰ Such initiatives may be even more relevant in developing economies.

²⁰ The Climate Bonds Initiative (www.climatebonds.net), for example, argue that by setting up an outflow for the renewable development pipeline – providing developers a means of offloading assets to low risk, low-return asset-backed securities-funded vehicles once the higher-risk/ higher-reward set-up is complete, the pipeline will flow faster and deeper as development capital is more easily recycled.

Mechanisms for Leveraging Private Finance

Leveraging refers to the process by which private sector capital is mobilised as a consequence of the use of public sector finance and financial instruments. Public finance can 'crowd in' private capital by compensating private investors for what would otherwise be lower than their required risk-adjusted rates of return (AGF, 2010). There is no uniform methodology to calculate leverage ratios of public to private finance, and different financial institutions report this ratio in different ways. Sometimes leverage ratios are expressed as the ratio of total funding to public funding; the ratio of private funding to public funding; or the ratio of specific public climate finance to broader public and private finance flows. The G20 defines leverage simply as the amount of private financing that can be mobilized per dollar of public or quasi-public support. For a more comprehensive discussion see (Brown and Jacobs 2011).

Table title: Summary of financial leveraging tools

Mechanism	Direct public financing or guarantees	Debt or equity?	Risk level	Mitigates many risks or few?	Estimated leverage ratio	When tool most useful /in what contexts?
Loan guarantees	Guarantee	Debt	High	Many	6x-10x	Countries with high political risk, dysfunctional energy markets, lack of policy incentives for investment
Policy insurance	Guarantee	Debt	Medium	Adaptable to many, but ultimately one	10x & above	Countries with strong regulatory systems and policies in place, but where specific policies are at risk of destabilising
Forex liquidity facility	Direct financing	Debt	Low	One	?	Countries with currency fluctuations
Equity 'pledge' fund	Direct financing	Equity	Low	Many	10x	Projects with strong IRR, but where equity cannot be accessed. Projects need to be proven technology, established companies
Subordinated equity fund	Direct financing	Equity	High	Many	2x-5x	Risky projects, with new or proven technologies, new or established companies

Source: adapted from Brown and Caperton (2010). Includes references to Justice (2009).

The Project Bond initiative: One example of the use of such leveraging mechanisms is the Project Bond Initiative launched by the European Union. The principal idea behind the Europe2020 Project Bond Initiative, is to provide EU support to project companies issuing bonds to finance large-scale infrastructure projects. The aim is to access new pools of capital like institutional investors.

The initiative will create a mechanism for enhancing the credit rating of bonds issued by project companies themselves. There are various ways this could be achieved: one possibility is for the EIB to provide the higher-risk subordinated debt finance to credit enhance the bonds issued by a project company. This could be done under a risk sharing agreement with the EU budget similar to that which is already used to guarantee certain risks associated with transport projects.

Irrespective of the means of credit enhancement, the final objective is the same in all cases: creating a class of high quality bonds that institutional investors would feel comfortable to buy.

Project bonds would not be issued by a sovereign or EU entity as were the Euro bonds proposed by Delors in 1993 and recently debated, but by project companies themselves.

A recent OECD report on infrastructure (see OECD 2011b) notes that in order to promote infrastructure investment by pension funds, a better alignment of interests between pension funds and the infrastructure industry is required in terms of: fees (which are too high); the structure of funds (which are too concentrated); and the investment horizon (which is too short). Improvements on these fronts would also help improve the deal flow into green projects. As discussed, it is only through providing stable investments via low risk instruments that the broad universe of pension assets will be tapped.

In addition to incentives, governments and public sector bodies have also been using risk mitigation techniques to partner with and assist institutional investors make green investments. These projects may involve new technologies and indeed new types of risk which pension funds have not been exposed before, and which are consequently difficult for them to assess or to hedge. The Overseas Development Institute has categorised these risks as follows:²¹

- General Political Risk
- Currency Risk
- Regulatory and Policy Risk
- Execution Risk
- Technology Risk
- Unfamiliarity Risk

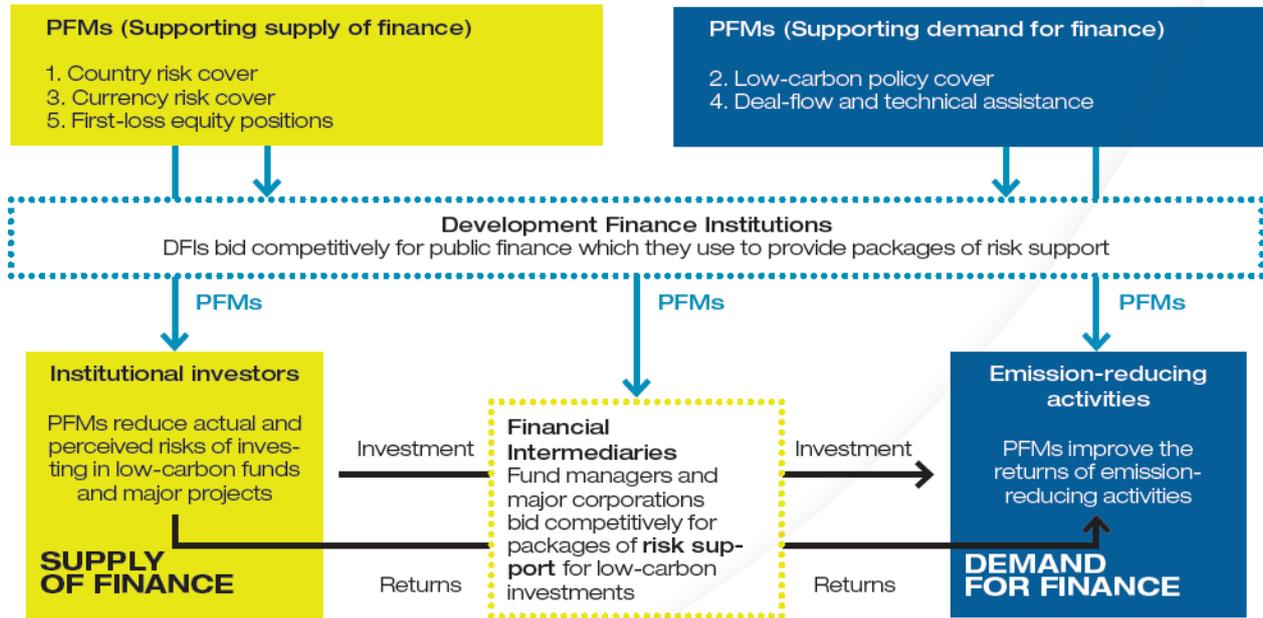
The specific risk concern will differ by country and by project. For example, the concerns of larger developing countries with capital markets but low credit ratings despite high renewables potential may well be different from those of smaller developed countries and very low credit ratings and no capital markets to speak of, and of course different again from developed countries. Furthermore, it is important to distinguish sourcing issues associated with smaller initiatives as compared to huge projects. Part of the problem of scale in any one place also concerns the geographical aspects of asset allocation by pension funds (though green bonds issued by international actors that blend geographic spread can help). The challenging question is whether there would be a growth in systemic domestic risk if they invested at scale – which leads to the currently hot debate in some countries as to the level of sovereign guarantee that makes sense by the ‘recipient’ country.

As Hamilton (2009) points out, financiers are not looking for a risk-free environment, but rather one in which risks can be understood, anticipated and managed. The UNEP FI has been examining Public Financing Mechanisms (PFM) which could be combined with financial instruments in order to mitigate these risks and thereby encourage the involvement of private sector sources of capital in green projects – particularly in developing countries.²²

²¹ See Brown and Jacobs (2011)

²² See UNEP (2009) See also World Bank/ PPIAF (2007)

Figure 5: PFM Increase the Supply of and Demand for Institutional Capital



Source: UNEP and Partners/ Vivid Economics (taken from UNEP (2009) p7)

Based on case studies, the following recommendations are made in the UNEP report:

- **Country risk cover:** insurance against country risk should be expanded and explicitly provided to support low carbon funds (e.g. provided by Multilateral Investment Guarantee Agency (MIGA) of the World Bank and the US Government’s Overseas Private Investment Corporation (OPIC));
- **Low-carbon policy cover risk:** insurance should be provided where countries renege on policy frameworks/ incentive schemes that underpin low-carbon investments;
- **Funds to hedge currency risk:** public finance could provide currency funds which offer cost-effective hedges for local currencies which would otherwise not be available in the commercial markets (e.g. provided by the Currency Exchange Fund supported by the Dutch Ministry for Development Cooperation);
- **Improving deal flow:** vehicles specializing in early-stage, low carbon projects could be developed and technical assistance provided; and
- **Public sector taking subordinated equity positions in funds:** public sector could invest directly in low carbon funds via ‘first equity loss,’ thereby improving the overall risk-return profile of such vehicles.

The Overseas Development Institute has also looked at such risk mitigation mechanisms.²³ In addition to the above, they highlight the use of pledge funds, whereby by public finance sponsors provide a small amount of equity to encourage larger pledges from private investors²⁴.

The World Economic Forum's report '*Green Investing 2010*' (WEF 2010) undertook an analysis of 35 different types of policy mechanism that can be deployed to spur the transition to a low-carbon economy which were broken down into five categories: *energy market regulation; support for equity investment; support for debt investment; tax policies; creating markets to trade emission credits*). These were ranked in terms of scale, efficiency and their multiplier effect. Sovereign or policy risk insurance (such as that provided by the Multilateral Investment Guarantee Agency) was ranked as low in terms of efficiency but high in terms of scale and multiplier.

In addition to the risk mitigation efforts discussed above, there is also the need for some sort of 'rating agency' or standard setter to 'approve' green projects (such as green bonds or green funds) to ensure that funds are used for green investments (and there is a common definition of 'green') and that insurance and guarantees can therefore be reliably offered. For example a recent report on pension funds and infrastructure (see Inderst 2010) notes that within the Prequin infrastructure database a surprising high number of energy funds claim a focus on renewable energy (176 out of a total of 263 funds). This means that methodologies for environmental integrity must be solidified and agreed on.²⁵

Towards this end, a London-based NGO, the Climate Bonds Initiative, has launched a 'Climate Bonds Standard and Certification Scheme', backed by a collection of institutional investors bodies and NGOs, including the US Investor Network on Climate Risk and the Australian Investor Group on Climate Change is one such organisation working to establish such standards.²⁶

Green Infrastructure

A further reason for the lack of green investments by pension funds is that their asset allocation to private equity and particularly infrastructure related assets in general remains limited. To provide some context, pension funds' asset allocation to infrastructure assets in general is less than 1% in most countries,²⁷ and pension funds' portfolios remain dominated by more traditional asset classes such as equities and bonds where investors have more experience, more data and generally feel more comfortable (outside the largest pension funds which are some of the world's most sophisticated investors). As discussed, aside from green bonds, it is through infrastructure and private equity related instruments that green projects will tap the broad mass of pension assets. Governments therefore need to consider how to increase pension funds allocation to these instruments in general if green investing more specifically can be expected to increase.

²³ See Brown and Jacobs (2011)

²⁴ These tools are also discussed in (Centre for American Progress 2010a and 2010b).

²⁵ OECD has started work on defining and measuring green foreign direct investment (FDI) with the aim to provide a statistical foundation in support of governments' efforts to evaluate the role of private sector investment flows and to assess policy performance in providing a framework for green investment (OECD 2011c). Follow up work could be envisaged to help pension funds and regulators share a common understanding of green investment and measure the scale and evolutions of such investment over time.

²⁶ See <http://climatebonds.net/proposals/standards/>

²⁷ See (IOPS 2011), (Inderst 2010) It should be noted that this does not include pension funds equity allocation to listed infrastructure companies.

The 2009 OECD Working Paper ‘*Pension Fund Investment in Infrastructure*’ (Inderst 2009) discusses barriers to pension funds’ investment in infrastructure projects in general – which can be seen to apply also to green investments. These include a lack of knowledge and experience with infrastructure investments (including direct investment and other investment vehicles used), a lack of transparency and data related to infrastructure investments, potentially high fees, additional risks relating to such investments (including regulatory, social and political risks), and other regulatory constraints (by asset class, due to liquidity and diversification requirements, solvency constraints etc.)

The paper concludes that governments have a role to play in ensuring that attractive opportunities and instruments are available to pension funds and institutional investors in order to be able to tap into this source of capital. Furthermore, economic transformation and green growth opportunities can be constrained or enabled by the existing infrastructure of an economy. Thus, shifting to a new, greener growth trajectory requires special attention to network infrastructure such as electricity, transport, water and communications networks. For many countries, especially those outside the OECD, there are opportunities to leap-frog by introducing greener and more efficient infrastructures, and to improve the climate resilience of infrastructures such as water supply facilities, roads and ports.

Table 4: Pension Funds' Infrastructure Investments: Barriers and Solutions

Barriers	Solutions
Lack of experience and knowledge (with infrastructure / private equity and other investment vehicles/ direct investments)	<p>Encourage improved knowledge and understanding of pension fund stakeholder and supervisors on infrastructure assets</p> <p>Encourage development of appropriate investment vehicles</p> <p>Support consolidation and pooling of pension funds</p>
Shortage of data (performance/ costs/ risks/ correlations)	<p>Support stronger efforts in independent data collection and objective information provision in the field of infrastructure investment</p> <p>Recommend upgrade of national and supra-national statistics data collection with a view to better capture infrastructure (and other alternative asset classes)</p>
Fees	Promote higher transparency standards in private equity vehicles and direct investments
<p>Political risks / regulatory instability</p> <p>Emerging market risks (currency etc.)</p>	<p>Enhance the investment environment</p> <p>Ensure stable regulatory environment</p> <p>Create platform for dialogue between investors/financial industry/governments (OECD)</p> <p>Development national, long-term policy frameworks for key individual infrastructure sectors, improving the integration of the different levels of government in the design, planning and delivery of infrastructures through the creation of infrastructure agency/bank, and the creation of a National Infrastructure Pipeline.</p> <p>Encourage the study of more advanced risk analysis beyond the traditional measures, including the specific risks of infrastructure.</p>
<p>Funding and accounting regulatory constraints</p> <p>Investment regulatory constraints (e.g. restrictions on asset classes/ liquidity/ non-listed/ diversification requirements/ leverage/ valuation rules)</p>	<p>Correct funding and investment regulation which is inadvertently preventing infrastructure investments</p> <p>Recommend the establishment of international guidelines for performance and risk management of infrastructure (and other alternative) vehicles</p>

Source: Authors based on (Inderst 2009) (OECD 2011b) (OECD 2007)

IV. Pension fund initiatives in green investing

Some pension funds and other institutional investors have already expressed their interest in - or indeed already are - investing in climate change related assets. Consequently, various industry groups have been formed in order to increase industry expertise in this area and to engage in a dialogue with governments to explain the sort of investment environment and financing vehicles which are necessary to support their greater engagement. They are also exploring how to pool resources in order to achieve the scale which investment in some of these projects requires.

Table 5: Institutional Investors Climate Change Groups

Group	Type of Investors	Size of Assets	Objectives
IIGCC	70+ European institutional investors, including major pension funds	EUR 6tn	Catalyse greater investment in low carbon economy
Investor Network on Climate Risk (managed by Ceres)	90+ USA institutions	USD 10bn	Identify opportunities and risks in climate change, tackle the policy and governance issues that impede investor progress towards more sustainable capital markets
Investor Group on Climate Change	Australian and New Zealand investors	AUS 600bn	Raise awareness, encourage best practice in terms of analysis and provide information relating to climate change
P8	World's leading pension funds	USD 3tn	Create viable investment vehicles to combat climate change and promote sustainable development
Long-term Investors Group	Mainly public sector financing institutions	USD 3tn	Identify long-term investment fund and vehicles

Source: Authors

IIGCC²⁸ etc.

The Institutional Investors Group on Climate Change (IIGCC) is a forum for collaboration on climate change for European investors. The group currently has around 72 members, representing around €6 trillion of assets and is chaired by Ole Beier Sorensen, Chief of Research and Strategy at the Danish public pension fund ATP.²⁹

²⁸ For further information see www.iigcc.org

²⁹ <http://www.top1000funds.com/latest-news/latest-news/pension-funds-to-sustain-climate-change-pressure.html>

One of the key objectives of the group is to catalyse greater investment in a low carbon economy by bringing investors together to use their collective influence with companies, policymakers and investors. It will continue to survey investors (including in collaboration with Mercer) on how they incorporate climate change into their long-term investment strategies.³⁰

A similar US based group investor network on climate risk has also been formed (Investor Network on Climate Risk - 90 institutions with USD 9 trillion assets),³¹ as has the Australian / New Zealand Investor Group on Climate Change.³² Ceres (Coalition for Environmentally Responsible Economies) is a national network of investors, environmental organizations and other public interest groups working with companies and investors to address sustainability challenges such as global climate change.³³ Ceres runs the Investor Network on Climate Risk (INCR) which has almost 100 members, (including CalPERS, CalSTRS, various US state retirement boards, state treasurers and comptrollers, Deutsche Asset Management, Blackrock Financial, TIAA-CREF, State Street Global Advisors and Prudential Investment Management), representing over USD 9.5 trillion in assets. This group is focused on climate-related risks and opportunities for institutional investors. INCR also has working groups focusing on specific issues, such as the Fixed Income Working Group which is educating investors on a fixed income vehicles in the low carbon space, as well as how to integrate environmental, social and governance (ESG) issues into the bond underwriting, disclosure, rating processes etc.³⁴

The IIGCC, Investors Network on Climate Risk and the Investor Group on Climate Change, along with the United Nations Environment Program Finance Initiative (UNEP FI) released a statement in November 2010, ahead of the COP16 Climate Financing Talks in Cancun, Mexico.³⁵ This stressed that: *“Private investment will only flow at the scale and pace necessary if it is supported by clear, credible, and long-term policy frameworks that shift the risk-reward balance in favour of less carbon-intensive investment”* – noting that investors are in particular calling for:

- domestic policy frameworks to catalyze renewable energy, energy efficiency, and other low-carbon infrastructure, so as to provide investors with the certainty needed to invest with confidence in receiving long-term risk-adjusted returns;
- international agreement on climate financial architecture, delivery of climate funding, reducing deforestation, robust measurement, reporting, and verification, and other areas necessary to set the global rules of the road, bolster investor confidence, and allow financing to flow;
- international finance tools that help mitigate the high levels of risk private investors face in making climate-related investments in developing countries, enabling dramatic increases in private investment.

³⁰ For information on Mercer’s Climate Change Report see <http://www.mercer.ie/summary.htm?idContent=1406410>

³¹ For further information see www.incr.com

³² For further information see www.igcc.org.au

³³ See www.ceres.org

³⁴ Taken from presentation made by Chris Davis, Director Investors Programme, Ceres, to P8 Summit, Brussels, February 2011

³⁵ See http://www.igcc.org/_data/assets/pdf_file/0015/15153/Global-Investor-Statement.pdf

See also Responsible Investor 30/11/2010 ‘Cancun special: institutional investors bullish as they arrive at COP16 for climate financing talks’ http://www.responsible-investor.com/home/article/igcc_cancun/P1/

P8 Group

The P8 Group³⁶ consists of 12 of the world's leading pension funds collectively managing USD 3 trillion. Members are made up of 4 funds from the United States, 4 from Europe, 3 from Asia and an Australian collective - including Universities Superannuation Scheme (UK), ABP (Dutch civil servants fund), AP7 (Swedish National Pension Fund), CalPERS and CalSTRS (the two largest US pension plans for California's civil servants and teachers), New York State Commons and the sovereign wealth funds from Norway and Korea.

The aim of the group is create viable investment vehicles that could be used to simultaneously combat climate change and promote sustainable growth in developing countries. They also intend to engage in lobbying for the best possible regulatory and financial environment that would enable such investments.

The International Finance Corporation (IFC) – the private sector arm of the World Bank group - has already been working for several years on how to galvanize institutional investors around the issues of climate change and investment in poor countries.³⁷ The organisation is looking at instruments - whether funds or funding facilities - that can combine the IFC's ability to source projects, know the investment landscape and risks in developing countries and bring projects to the table for potential P8 investment. One example is using the IFC's experience in debt structuring for projects where the different risk appetites of investors can be accommodated (i.e. the IFC or another development finance organisations takes the first loss position, the mezzanine could be taken up by IFC and the senior debt be taken by private sector banks or institutional investors). Such structures have been used to fund energy efficiency financing in Eastern Europe and school and health financing in Africa, as well as in other sectors, such as microfinance.

Activities of the group so far include 5 Summits (held in Europe and the USA), as well as organising a P80 Asia Summit in Korea in 2010 (in partnership with the Asian Development Bank and the UNEP FI), for funds across Asia to share knowledge and experience and engage in the 'green growth' agenda. The P8 Secretariat has also been working with the Asian Development Bank, the UK Government, and the International Finance Corporation to help design a new public-private partnership fund concept (CP3 Fund) for mobilizing large scale capital for Asia low carbon infrastructure investing (see later section on *Green Funds*). The World Bank³⁸ has also been in discussion with the P8 about ways to structure joint investment products that could channel funds into climate change projects.

Other Groups

The Caisse des Dépôts, the French public investment group, has joined with three other European public financial institutions – Cassa Depositi e Prestiti, KfW Bankengruppe and the European Investment Bank – to form the 'Long-term Investors Club'.³⁹ The group is working with other financial institutions from Europe, Asian and the Gulf, with total assets of USD 3 trillion. Long-term investors are defined as financial institutions which have low or no short to medium-term liability obligations, such as public financial institutions, sovereign funds and certain pension funds and insurance companies. The aim of the group is to address long-term challenges – such as finding the USD 2 trillion required to cover investment needs in transport, energy, water and telecom sectors by 2020-2030. The InfraMed Fund (for investments in urban, energy and transport infrastructures in the southern and eastern regions of the Mediterranean) and

³⁶See <http://www.responsible-investor.com/home/article/p81/>

³⁷ <http://www.responsible-investor.com/home/article/ifc/>

³⁸ <http://www.responsible-investor.com/home/article/charles/>

³⁹ See OECD Observer, No. 279 May 2010

the Marguerite Fund (2010 Fund for Energy, Climate Change and Infrastructure in the European Union) are examples of such a new type of financial engineering.

The Capital Market Climate Initiative (CMCI) is a UK initiative, bringing together experts from the financial and public sector to help deliver private climate financing at scale in developing countries by: identifying deliverable propositions to mobilize private capital; developing a base of evidence build developing country interest and support; and building private sector confidence in the feasibility of the task and opportunities. The project has two work streams, one developing a 'toolkit' of strategies that can be used to mobilize private capital in developing countries, the other supporting demonstration capital mobilization projects in four developing countries. Target implementation is for COP 18 in 2012.⁴⁰

Pension Funds

ATP

ATP is Denmark's largest pension fund with total assets of more than EUR 66 billion. As of 31 December 2009 ATP's infrastructure investments equated to 1.8% of the total portfolio. With just below 3% committed. ATP does not have a target for its infrastructure investments but has an overall target of 25-30% of its risk budget to inflation class.

ATP Pension Fund has invested in renewable energy infrastructure and technology, such as solar wind and hydro, as well as emerging technologies, such as biofuels and biomass for a long time. ATP invested DK 600 million in renewable and has committed 2.2 million to concrete assets and over DK 2 billion of equity in companies that are related to the renewable and clean energy sector.

At the COP-15 summit in December 2009, ATP pledged €1 billion to a new climate change fund for investing in emerging economies, with an open invitation to other European investors to join it. The new fund (run as a specialist entity within ATP with its own management) will invest in existing growth structures, aid programmes and funds in emerging economies that are overseen by the UN, World Bank and regional development banks. ATP have announced that its first investment (directly into a renewable energy project) will be made in the first quarter of 2011.⁴¹

PGGM

PGGM currently administers some EUR 100 billion of pension assets for five Dutch pension funds, including Stichting Pensioenfonds Zorg en Welzijn ("PFZW"), the second largest pension fund in the Netherlands. PGGM is especially interested in renewable energy opportunities and has already invested in wind farms. In December 2010 PGGM committed capital to the BNP Paribas Clean Energy Fund

CalSTRS

The California State Teachers' Retirement System (CalSTRS) has approximately USD 190 billion in assets and is the second largest public pension fund in the United States. In 2007, CalSTRS became the first North American pension fund to incorporate ESG risk analysis into its investment policies. At the same time, the CalSTRS Investment Department established its Green Initiative Task Force, a department-

⁴⁰ Taken from 'Leveraging Low-carbon private investment: AGF and UK policy', presentation made by Tamsin Ballard, UK Department of Energy and Climate Change, to P8 Summit, Brussels, February 2011

⁴¹ See Responsible Investor 30/11/2010 'ATP targets first direct renewable investment for €1bn emerging markets climate commitment' http://www.responsible-investor.com/home/article/atp_targets_first_direct/

wide initiative in which each asset class monitors and reports on ESG risks and opportunities relative to their investment space.

Since 2008, CalSTRS Global Equity investments have included a sustainable manager portfolio. With assets under management in excess of USD 600 million, this portfolio has a double bottom line goal of financial and sustainable outperformance and is one of CalSTRS best performing equity portfolios.

CalSTRS Private Equity Clean Technology and Energy Program has commitments in excess of USD 600 million and is a diversified portfolio of venture and buyout investments across the clean technology and clean energy universe. The program is global in nature and encompasses both fund investments and co-investments.

The CalSTRS Real Estate unit has established a Sustainable Returns Program whose goal is to increase the risk adjusted returns by incorporating conservation and sustainability in the development and management of the portfolio. Steps to sustainable returns include incorporating sustainability into the portfolio planning cycle; including sustainability measures in investment decisions, and establishing benchmarks to track resource use.

In 2008, the CalSTRS Fixed Income Green Program was initiated to screen and monitor fixed income holdings both in terms of ESG risk exposure and ESG opportunity capture. The Fixed Income unit has developed a Green & Sustainable Benchmark and monitors the percentage of holdings that meet the benchmark's criteria. The CalSTRS Fixed Income unit is also a lead order for green bonds issued by supranational agencies.

Since 2007, The CalSTRS Corporate Governance unit has made sustainability risk management one of its signatures initiatives. The corporate governance team engages portfolio companies, regulatory officials, government representatives, and fellow investors on the importance of managing, monitoring and disclosing sustainability risk mitigation efforts.

CalPERS

The Californian Public Employees' Retirement System (CalPERS) has approximately USD 231 billion in assets and is the largest public pension fund in the United States. Since 2006, CalPERS has committed USD 500 million to external managers in its Global Equity asset class who restrict companies with a negative environmental footprint. CalPERS has committed more than USD 1.5 billion to its private equity Environmental Technology Program, and has strongly advocated the reporting of environmental risk in its engagements with federal regulators and portfolio companies.

On the 10th of November 2010 CalPERS announced the investment of USD 500 million into a new internally managed strategy for investing in global public companies that are actively working to improve the environment and mitigate the adverse impact of climate change. The internal team at CalPERS responsible for managing the strategy will model it after HSBC's Global Climate Change Benchmark Index (HSBC CCI). As of year-end, the model had 380 securities across 36 countries with a minimum total capitalization of USD 400 million. In order to be included in the portfolio, companies must derive a material portion of their revenues from low-carbon energy production including wind, solar, biofuels and other alternative energy; water, waste and pollution control; energy efficiency and management including building insulation, fuel cells and energy storage; and carbon trading and other capital deployment and financial products.

The goals of CalPERS' Environmental Investment Initiatives are to achieve positive financial returns, while fostering energy savings, sustainable growth and sound environmental practices, including:

- AIM Environmental Technology Program: CalPERS Environmental Technology Program Board targets investments in environmental technology solutions that are more efficient and less polluting than existing technologies such as recycling; minimizing the use of natural resources; and reducing emissions, refuse, and contamination to air, water, and land. The primary objective of the Program is to achieve attractive investment returns over the long-term and help catalyze clean technologies.
- Corporate Governance Environmental Strategy: CalPERS Board has adopted a plan to shine a light on corporate environmental liabilities, improve transparency and timely disclosure of environmental impacts, and improving environmental data transparency.
- CalPERS Public Market Environmental Managers: CalPERS Board is investing in stock portfolios that use environmental screens.

V. Vehicles of Green Investing for Pension funds

Some larger pension funds are already making allocations to green investments via direct infrastructure investments and through private equity. Yet such direct financing mechanisms are only really an option for large pension funds with considerable in-house resources. Many smaller pension funds are likely to increase their asset allocation to such projects via green bonds, structured instruments, or green equity funds. As discussed earlier, in most OECD pension funds, bonds remain by far the dominant asset class in portfolio allocations, accounting for 50% of total assets under management on average. It is through these green bonds that significant pension fund assets could potentially be directed towards green projects. This section looks at some of the initiatives underway to provide pension funds and institutional investors with such opportunities. As the World Economic Forum (2011) note, general discussions of financing needs are no longer very productive and the debate needs to move on to project implementation.

Green Bonds

For the purpose of this review, green bonds are broadly defined as fixed-income securities issued (by governments, multi-national banks or corporations) in order to raise the necessary capital for a project which contributes to a low carbon, climate resilient economy. To date, these have been issued predominantly as AAA-rated securities by the World Bank and other development banks and some other entities in order to raise capital specifically for climate change and green growth related projects.⁴² Though generally offering these bonds with the same interest rate as other instruments, and with the same credit rating, ring-fencing the financing for such projects allows the issuers to tap a broader range of investors, such as SRI funds (see section on World Bank bonds).

Green bonds involve the issuing entity guaranteeing to repay the bond over a certain period of time, plus either a fixed or variable rate of return. They can be asset backed securities⁴³ (see Breeze Bonds Case Study – Box 3) tied to specific green infrastructure projects or plain vanilla “treasury-style” bonds issued to raise capital that will be allocated across a portfolio of green projects (such as the World Bank’s issuances).⁴⁴ Some green bonds utilised structured note mechanisms⁴⁵ (see following section on Structured Green Products), with payments linked to inflation or other underlying derivatives.

⁴² The first World Bank green bonds, sold to Japanese investors, were not earmarked for green projects, but provided a ‘green-linked’ return. However, the larger bulk of World Bank green bond issuance has been in the form of ‘vanilla bonds’ with proceeds linked to a ring-fenced portfolio of climate change solution investments.

A concern with the international financial institutions’ green bonds is that the capital raised through this mechanism has not led to greater fundraising that would have otherwise been the case, and therefore there is some concern that while they are now ring-fencing green projects into these bond funds it does not mean that they are doing any more green projects (i.e. it means they spend less of their ‘own’ money on green and just moving the green projects to the bond investments).

⁴³ Asset backed or securitized bonds are similar to ordinary bonds but have specific assets whose revenues pay the interest and principal. An ordinary bond’s payments are generally guaranteed by the company that issues them. In asset backed or securitized bonds a set of revenue generating assets are put into a special purpose company and these assets pay the bond holder their interest and principal. A hybrid instrument is the German Pfanderbrief, or property sector ‘Covered Bond’. This is an asset-backed instrument that is also guaranteed by the parent or originating entity.

⁴⁴ <http://treasury.worldbank.org/cmd/htm/WorldBankGreenBonds.html>

⁴⁵ A structured note is a debt obligation that also contains an embedded derivative component with characteristics that adjust the security’s risk/return profile. The return performance of a structured note will track that of the underlying debt obligation and the derivative embedded within it.

The World Bank has issued green bonds with returns partly linked to an index of traded ‘green’ companies, and another linked to the successful achievement of certified emission reductions in projects receiving funds, but these have been modest in scale of issuance and mostly aimed at retail markets, especially in Japan.

There are many classes of green bonds that have been issued or proposed, and they have taken on a confusing plethora of names such as green gilts, green retail bonds, green investment bank bonds, green infrastructure bonds,⁴⁶ multilateral development bank green bonds, green corporate bonds, green sectoral bonds, rainforest bonds and index-linked carbon bonds. One class of green bonds that has attracted attention recently is the *climate bond*, which is a type of green bond issued to raise capital for investments in projects which specifically mitigate or adapt to climate change. The labelling is designed to make it easier for investors to preference fixed income products that specifically address their macro concerns about climate change risks. These instruments have allowed governments to raise capital, or support the private sector in raising capital, to build renewable energy generation and its enabling infrastructure, widely implement energy efficiency measures in cities and industries and support adaptation measures that will boost the economic development of communities in the face of climate change.

The Climate Bonds Initiative argues for green bond issuance at investment grade ratings, consistent with risk/return profiles with existing asset allocation requirements, rather than suggesting a premium (or penalty) rate for the bonds. They propose that governments and IFIs step in to enhance fixed income offerings tied to climate change solutions to ensure investment grade is achieved.

In order to take advantage of feed-in tariffs and other government incentives, bonds have been issued exclusively for financing renewable energy or energy efficiency (see the discussion on CREB’s in the following section on US Government Green Bonds). The projects which underlie the bonds are subject to a certification mechanism to qualify for commercial advantages such as off-take price support⁴⁷ offered by governments or regulators. The credit risk of the bonds may be directly enhanced by government-related entities or indirectly through regulatory support for the underlying project.

Final demand for bonds comes from different core constituencies and a paramount issue for climate policy makers is how to find investors to buy green bonds. Green bonds have been designed to attract capital from institutional investors with SRI mandates, such as the Danish pension fund ATP, the UN Joint Staff Pension Fund and the Norwegian Global Fund, or as a means for governments to direct funding to climate change mitigation. These bonds have also been directed towards the retail sector; whilst sovereign wealth funds, hedge funds and private equity are also seen as important sources of demand (see Fig 1).⁴⁸ Veys (2010) points out that the minimum typical issuance size for an institutional investment grade bond

⁴⁶ Climate Change Capital describes green infrastructure bonds as being potentially the most important and describes them as “*bonds issued to refinance built and operating low-carbon infrastructure, such as offshore wind turbines and grid connections. They are asset-backed corporate bonds that would be rated by ratings agencies (so as to be investment grade) and issued in sufficient quantities to be easily tradable.*” <http://www.guardian.co.uk/environment/cif-green/2011/jan/11/what-are-green-bonds> See also (Caldecott 2010).

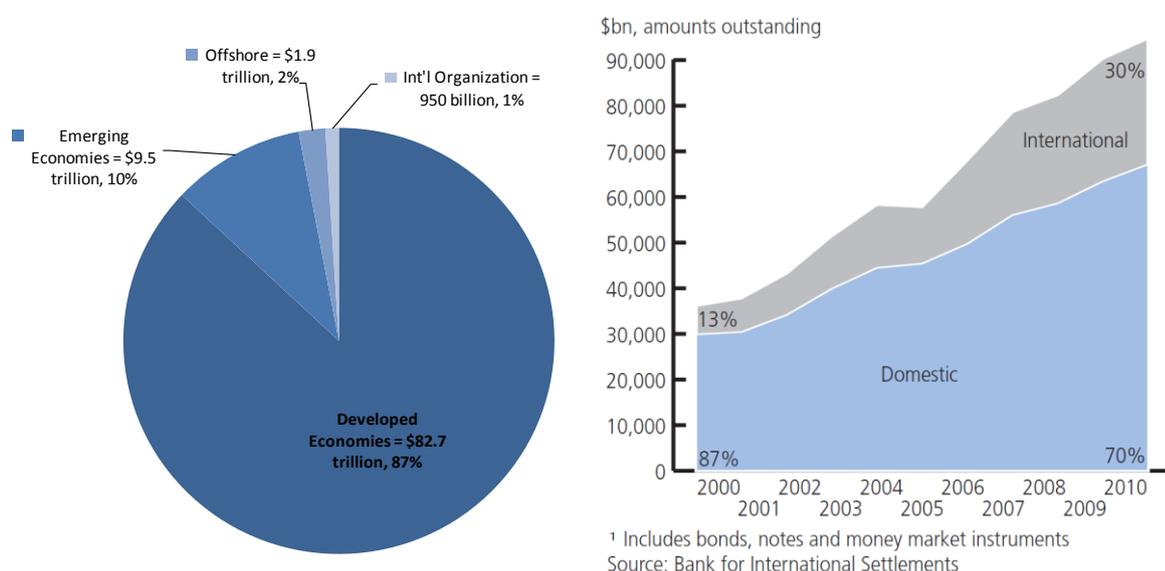
⁴⁷ A mandatory off-take system provides a government guarantee for purchasing the electricity generated, and purchasing supported electricity is ultimately the obligation of electricity users. Mandatory offtake may be implemented at market price or support price.

⁴⁸ McKinsey in 2007 dubbed the following as the “four new power brokers”: petrodollar investors, Asian sovereign investors, hedge funds and private equity buyout funds. While hedge funds and private equity have been battered by the crisis, their assets have mostly held steady while the other two have been on the upswing. <http://bis.org/statistics/secstats.htm>

(i.e. one that will have good liquidity) is about GBP 300 million. Bonds that are issued in lesser size will generally suffer from illiquidity.

The market size for all green bond issuances⁴⁹ to date is approximately USD 15.6 billion (with 2.3 billion issued by the World Bank alone), a drop in the ocean (0.017%) of the capital held in the global bond markets, with amounts outstanding increasing by 5% in 2010 to a record USD 95 trillion. In some 30,000 separate deals, USD 6.05 trillion in bonds were issued in 2010. With these statistics as context, there is clearly scope for scaled up issuances of green bonds (at least in the tens of billions per year) but if this capital is to be raised through a thriving and liquid green bond market, transparent policies based on long term, comprehensive and ambitious political commitment are needed. An encouraging step in the right direction is the UK Government’s commitment in the 2011 budget to fund a Green Investment Bank with GBP 3 billion over the period to 2015, with the Bank receiving full capital market borrowing powers from 2015, subject to public sector net debt falling as a percentage of GDP.

Figure 6: Global Bond Markets

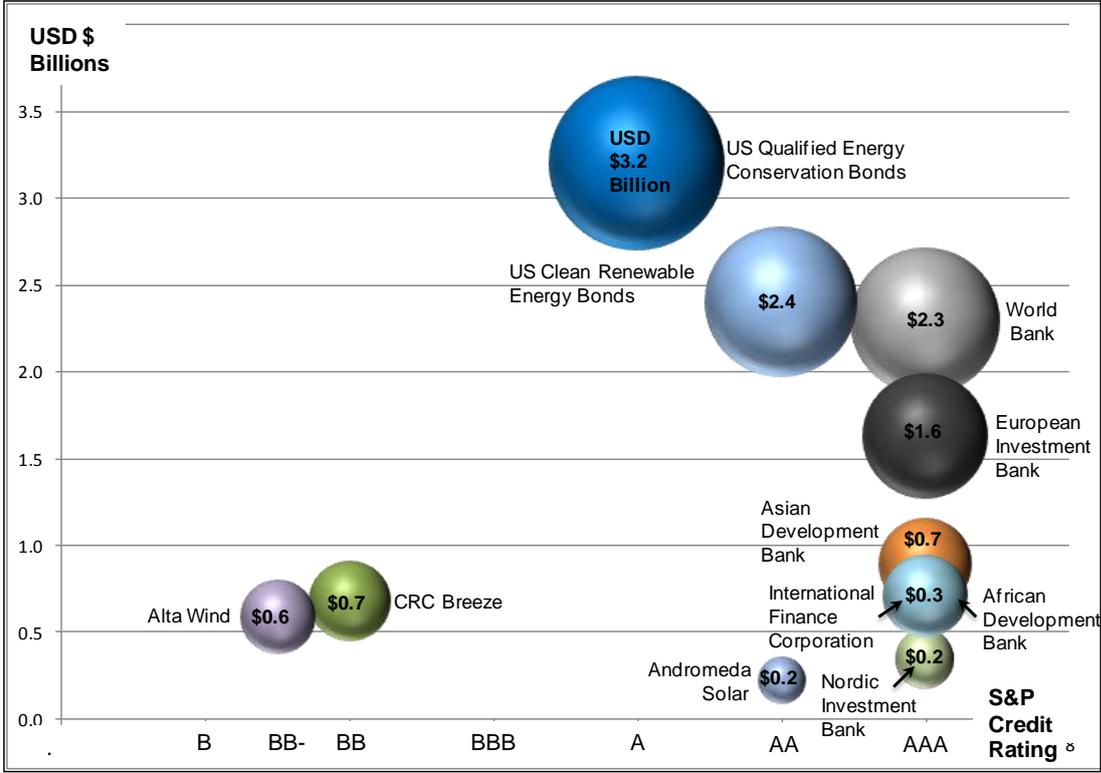


Source: OECD Analysis, TheCityUK Bond Markets 2011, Bank for International Settlements Quarterly Review 2011

The largest green bond issuances are primarily MDB related and clustered around the AAA rating. Such issuances may have peaked due to stringent MDB loan to capital requirements. There is room for expansion in the government and asset-backed markets.

⁴⁹ This market figure does not comprise the market for corporate bonds issued by corporations which may or may not use the proceeds for strictly ‘green activities’. For instance, in July 2011, Schneider Electric launched a corporate bond issue worth € 750 million. Schneider is not strictly speaking a clean energy company but is engaged in smart grid and energy solutions development. Climate Bonds Initiative estimates that an additional USD 30-40 billion in bonds may have been issued by corporations such as these.

Figure 7: Selected Large Green Bond Issuances



Source: OECD Analysis, Bank for International Settlements Quarterly Review

Table 6: Table of Existing Issuances of Green Bonds

Size Rank	Issuer	Year (s)	Type	Amount (USD) Millions	Notes
1	US Government agencies and utilities	2009-2012	Qualified Energy Conservation Bonds (QECCB) program	\$ 3,200.0	Originally tax credit enhanced bonds for EE, changed in 2010 to direct subsidy bonds
2	US Government agencies and utilities	2009-2010	Clean Renewable Energy Bonds (CREB) program	\$ 2,400.0	Tax credit enhanced bonds for RE
3	World Bank	2008-2010	Green Bond	\$ 1,896.7	For climate change projects at 2-10 year terms
4	European Investment Bank (EIB)	2007-2010	Climate Awareness bond	\$ 1,630.0	For investment in RE and EE. 3-8 year term
5	African Development Bank (AfDB)	2010	Clean energy bond	\$ 705.0	For investment in renewable energy sources and infrastructure. 3.5-7 year terms. EUR 470m (\$676m EURUSD 1.44) 20 year bonds issued through SPV against a combined portfolio of wind farms in Germany and France, tranches rated BBB and BB+ (downgraded in 2010 to BB and B due to insufficient wind)
6	CRC Breeze Finance (Breeze II)	2006	Wind ABS	\$ 676.0	
7	Asian Development Bank (ADB)	2010	Water bond	\$ 645.0	For improving water quality, management and irrigation. 2-3 year terms
8	Alta Wind Energy Center	2010	Wind project bond	\$ 580.0	25 year bond to fund the construction of 3GW of wind farms. Rated Ba3 by Moody's
9	Shepherds Flat Wind Farm	2010	Wind project bond	\$ 525.0	845MW wind farm in Oregon. 420million guaranteed by DOE. 22 year maturity
10	FPL Energy American Wind LLC	2003	Wind ABS	\$ 370.0	Bonds rated BBB- secured on the cashflow of 7 US wind projects
11	World Bank	2007-2008	Eco 3+ Notes	\$ 360.0	6 year terms linked to environmental equity index.
12	Airticity	2006	RE corporate bond	\$ 300.8	3 year bond to fund wind energy farms in Europe and US
13	Sunpower / Andromeda Finance	2010	Solar project bond	\$ 260.0	Secured on a 44MW solar park, partially guaranteed by Italian export credit agency SACE. 2 tranches at 18 year terms
14	Asian Development Bank (ADB)	2010	Clean energy bond	\$ 243.0	4-7 year term tranches for RE and EE investment
15	Destiny USA	2007	EE Green bond	\$ 228.0	For the construction of a green retail complex. 30 year term
16	REC Group	2009	RE corporate bond	\$ 212.5	5 year bond to fund activities of a solar energy company
17	International Finance Corporation (IFC)	2010	Green bond	\$ 200.0	For RE and EE in developing countries. 4 year term
18	Nordic Investment Bank (NIB)	2010	Environmental support bond	\$ 200.0	For financing its CLEERE lending facility on climate change, EE and RE investments. 3 year maturity
19	Kommunalbanken Norway (KBN)	2011	Clean energy bond	\$ 193.0	For climate change projects in Norwegian municipalities for Japanese retail investors
20	Kommunalbanken Norway (KBN)	2010	Clean energy bond	\$ 153.0	For climate gas emission reductions in Norwegian municipalities for Japanese retail investors
21	Max Two Ltd (Breeze I)	2004	Wind ABS	\$ 144.0	EUR 100m (\$144m EURUSD 1.44) 20 year bonds issued through SPV against a combined portfolio of wind farms in Germany and Portugal rated BBB- then downgraded in 2010 to B- due to insufficient wind
22	Alte Liebe 1 (Breeze III)	2006	Wind ABS	\$ 144.0	EUR 100m EUR 470m (\$144m EURUSD 1.44) rated BBB- (downgraded in 2011 B- due to insufficient wind) 19 year term first to be monoline wrapped. Issued against 6 wind farms in Germany
23	International Finance Corporation (IFC)	2011	Green bond	\$ 135.0	Supporting climate-friendly investments in developing countries. 3 year terms
24	Panachaiko Wind Farm	2010	Wind project bond	\$ 57.6	48.45MW wind farm in Greece developed by Acciona Energie
25	World Bank	2008	CER linked 'Cool' Urudashi bond	\$ 31.5	Linked to CERs issued by projects. 5 year term
26	European Bank for Reconstruction and Development (EBRD)	2010	Environmental Sustainability bond	\$ 25.0	For a portfolio of green projects aimed at promoting sustainable development. 4 year term
27	European Bank for Reconstruction and Development (EBRD)	2011	Environmental Sustainability Bond	\$ 23.0	For a portfolio of green projects aimed at promoting sustainable development. 4 year term. 6 year terms
28	Ecotricity	2010	RE corporate bond	\$ 15.4	To fund expansion of RE generation capacity. 4 years maturity
29	Georgetown Special Taxing District	2006	EE Green bond	\$ 14.5	For the construction of a green multi-use complex
30	US municipal governments	2009-2010	Property Assessed Clean Energy (PACE) bonds	\$ 9.7	To fund residential and commercial EE and RE installations
31	Novacem	2010	EE corporate bond	\$ 1.5	To fund the construction of a semi-commercial green cement plant
Total				\$ 15,579.2	

Source: Calculation derived through OECD analysis using the Climate Bonds Initiative database, Daiwa research and Energy Hedge Magazine

The World Economic Forum's policy analysis in its report '*Green Investing 2010*' (WEF 2010) ranks green bonds as high in terms of scale and medium in terms of efficiency and the multiplier effect.

For green bonds to be scaled up to support green growth, it is important for governments to distinguish between the economics of a low carbon project itself and the financing thereof. Selling output, subsidies, and tax incentives are about creating real assets (i.e. an economic project) that are then financeable. The second issue is the financing of those real assets, which is where green bonds come in. What governments could do is to compare the present situation where the average cost of capital is higher for renewable projects (because they can't access lower cost capital from institutional investors at operational refinancing) with a counterfactual where they can. For instance, a 1% reduction in the Weighted Average Cost of Capital (WACC) for a USD 1 trillion dollar investment programme equals savings of USD 10 billion a year. This or higher reductions in the average cost of capital may be possible if

one compares current rates for low investment grade infrastructure / utility bonds with project finance / bank lending.

World Bank Green Bonds

The World Bank's green bonds have been well received by investors since they were structured to have simple and standard financial features, such as equivalent credit quality and yield levels to other World Bank triple-A rated bonds so that there is no sacrifice to the end-investor in terms of returns. They were also issued into a liquid market and can be as easily traded as other 'plain vanilla' bonds issued by the World Bank. Because of these predictable and attractive features and the dedication to climate change, they attracted the interest of a broad range of investors – from retail and high-net-worth, to institutional investors with large allocations to fixed income (being especially attractive to those investors who incorporate ESG into their analysis). The relative “greenness” of the bonds is solid and linked to a due diligence process that the World Bank conducts to identify and monitor 'green' projects. The World Bank's issuances have been limited to USD 2.3 billion mostly because borrowing requirements are primarily determined by its lending activities for development (in this case climate change) projects and because of the highly prudent financial policies that restrict its lending to a maximum of one dollar in loans per one dollar of total capital (the current ratio being as low as 47 cents in loans per one dollar of capital).

The World Bank (IBRD) has issued over USD 2.3 billion equivalent of green bonds through 39 transactions in 15 currencies.⁵⁰ These are mostly 3-7 year, fixed and floating rate notes (i.e. which pay a variable rate of interest), issued via the AAA rated IBRD, designed to raise capital for projects that aim to combat climate change in developing countries. Projects funded include alternative energy installations, funding for new technologies that reduce greenhouse gas emissions, reforestation, watershed management and flood protection. Although the World Bank is issuing these bonds for the most part at similar yield levels to their conventional bonds, they may still face competitiveness issues vs. more conventional bond due to the lack of liquidity in this market – which could be a reason for governments and public sector institutions to issue such instruments, thereby helping the market to deepen and develop.

The first issue, or tranche, in the series (€233m) was made in Swedish Kronor in November 2008, with the second tranche (USD 300m) launched in spring 2009, which was bought by the state of California's pension fund. Subsequent tranches have been issued in other currencies (including Yen), as well as another Swedish Kronor bond which has attracted investors including the Swedish National Pension Funds (such as AP2 and AP3). Skandinaviska Enskilda Banken (SEB) has been working with the World Bank and is the lead underwriter for the Swedish Kronor bonds, and is said to be looking for international partners to increase distribution (particularly in southern Europe, parts of Asia and parts of the USA).⁵¹ Issuing bonds denominated in foreign currencies gives issuers the ability to access investment capital available in foreign markets. In 2007 the Bank also issued Euro denominated bonds targeted at retail investors.⁵² Issues in the series continue, as shown in Table 4.

Nikko Asset management has launched two World Bank Green Funds which can invest up to 100% of assets in World Bank Green Bonds. The bulk of Nikko's customers are in the Japanese retail sector. Nikko

⁵⁰ <http://treasury.worldbank.org/cmd/htm/WorldBankGreenBonds.html> To provide context, since the first issuance of the green bonds in November 2007, the World Bank has issued USD 51 billion of non-green bonds.

⁵¹ See FtFM 24/5/2010 'Swedish bank seeks partner to market green bonds.'

⁵² The return on the bonds was tied to the performance of an "Eco Index" which was linked to the equity performance of a set of companies defined by ABN AMRO as being green. The outstanding amount is about USD 297 million. They also then launched a small bond (about USD 30 million) that was linked to carbon credits, in this case UN Clean Development Mechanism certified emission reductions (CERs). These were specifically linked to particular projects and again retail targeted.

is also planning a World Bank Green Bonds fund targeting institutional investors, including pension funds in Europe and the Middle East.⁵³ Bank of America Merrill Lynch and the World Bank announced in May 2011 a plan to offer World Bank Green Bonds to Merrill Lynch Wealth Management investors on a periodic basis. Bank of America Merrill Lynch will arrange and offer the bonds to clients through the Merrill Lynch Global Wealth Management platform. The first World Bank Green Bonds to be offered through BofA Merrill Lynch were launched in the second quarter of 2011. Those bonds, which will mature on May 24, 2021, pay a 3.5 percent coupon for the first year that switches to a floating three-month USD-Libor based coupon after one year. They are being marketed as an opportunity for high net worth investors to support environmental solutions through a high grade fixed income investment.⁵⁴

⁵³ <http://beta.worldbank.org/climatechange/news/nikko-asset-management-set-launch-green-fund-world-bank-bonds>

⁵⁴ <http://mediaroom.bankofamerica.com/phoenix.zhtml?c=234503&p=irol-newsArticle&ID=1572461>

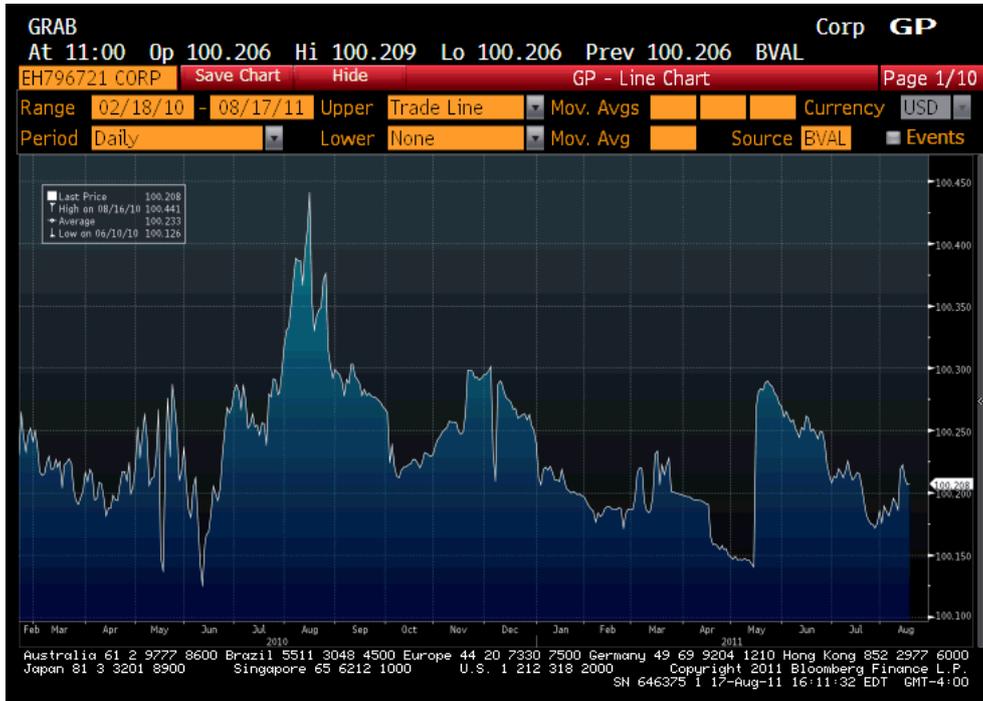
Figure 8: World Bank Green Bond Illustration

ISSUER INFORMATION		IDENTIFIERS		SECURITY INFORMATION		RATINGS		ISSUE SIZE		BOOK RUNNER/EXCHANGE	
Name INTL BK RECON & DEVELOP		Common 042534331		Country SNAT Currency USD		Moody's Aaa		Amt Issued/Outstanding		SEB	
Type Supranational Bank		ISIN US45905UGD00		Collateral Type Sr Unsecured		S&P AAA		USD 300,000.00 (M)		LUXEMBOURG	
Market of Issue Euro MTN		CUSIP 45905UGD00		Calc Typ(21)FLOAT RATE NOTE		Fitch AAA		USD 300,000.00 (M)			
Maturity 4/24/2012 Series EMTN				Maturity 4/24/2012 Series EMTN		Composite AAA		Min Piece/Increment			
NORMAL				Maturity 4/24/2012 Series EMTN				100,000.00/100,000.00			
Coupon 0.478 Floating QUARTLY				Maturity 4/24/2012 Series EMTN				Par Amount 100,000.00			
QUARTL US LIB+22.5 ACT/360				Maturity 4/24/2012 Series EMTN							
Announcement Dt 4/16/09				Maturity 4/24/2012 Series EMTN							
Int. Accrual Dt 4/24/09				Maturity 4/24/2012 Series EMTN							
1st Settle Date 4/24/09				Maturity 4/24/2012 Series EMTN							
1st Coupon Date 7/24/09				Maturity 4/24/2012 Series EMTN							
Iss Pr				Maturity 4/24/2012 Series EMTN							

THE BOND PROCEEDS ARE RESERVED FOR FINANCING CLIMATE FRIENDLY PROJECTS
ACCORDING TO THE "GREEN BOND" CRITERIA. 3(a)2 EXEMPT, SEC 1933
 Australia 61 2 9777 8600 Brazil 5511 3049 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2011 Bloomberg Finance L.P.
 SN 646375 I 17-Aug-11 16:08:35 EDT GMT-4:00

Source: Bloomberg Terminal

Figure 9: Price Evolution of a World Bank Green Bond



Source: Bloomberg Terminal

European Investment Bank

The European Union (EU) and its long-term financing institution, the European Investment Bank (EIB), have made climate change mitigation and adaptation a top policy priority. Indeed the European Commission recently adopted a ‘Low Carbon Economy Roadmap to 2050’ (see EC 2011), which states that: “*This will require major and sustained investment: on average over the coming 40 years, the increase in public and private investment is calculated to amount to around €270 billion annually, This represents an additional investment of around 1.5% of EU GDP per annum on top of the overall current investment representing 19% of GDP in 2009.*”

The EIB supports the EU’s goal of low-carbon and climate-resilient growth within and outside the Union. The EIB’s financing in these sectors is one of the largest among international financial institutions: in 2009, the Bank invested almost EUR 17 billion in climate action. Acting as a financial leader supporting innovative clean and climate-resilient technologies, the EIB is committed to catalysing investment with partners both within and outside Europe.

The EIB has been targeting investors with its ‘Climate Awareness Bonds.’ Around €1.15 billion has been raised since 2007. Funds raised are ring-fenced from the EIB’s general funding portfolio and used for EIB projects in the fields of renewable energy (such as wind, hydro, solar and geothermal energy production) and energy efficiency (such as district heating, co-generation, building insulation, energy loss reduction in transmission and distribution etc.).

The first bond was issued in 2007 in Euros. This is a 5 year bond, AAA rated (i.e. the rating of the EIB), with the coupon (or interest rate paid by the bond) indexed to the FTSE4Good Environmental Leaders Europe 40 Index, with a minimum rate guaranteed.⁵⁵ The following bonds, issued in November 2009, are denominated in Swedish krona, with an issuance size of SEK 2.25 billion, with a 6 year maturity and a fixed (2.95% coupon) and floating (i.e. variable depending on interest rates) tranche. These are also triple AAA rated and the lead manager was Swedbank.⁵⁶ The April 2010 issuance (again AAA rated) was lead managed by Daiwa securities and targeted at Japanese investors. The latest bond is denominated in Australian dollars (AUD 231 million, 4.27% coupon for 2 years) and South African rand (ZAR 1375 million 6.68% coupon for 3 years).⁵⁷ The EIB also issued ‘Earth’s Future Bonds’ in February 2010, targeted at individual investors in Japan.⁵⁸

The European Bank for Reconstruction and Development (EBRD) has issued its first green bonds on December 2010, with funds raised being used to finance environmental sustainability projects. The issue is largely targeted at the Japanese retail market. The AUS 25 million bond is denominated in Australian dollars and pays 4.80%.

Asian Development Bank

Asian Development Bank (ADB)’ s investments in clean energy increased from USD 668 million in 2007 to nearly USD 1.7 billion in 2008, helping install 4.7 gigawatts of renewable energy capacity and

⁵⁵http://businessresponsible.libcastcorp.com/episodes/uploads/i_communication_responsabilite_globale_seminaire_b_usiness_responsible_une_obligation_climatique.pdf

⁵⁶ http://www.eib.org/investor_relations/press/2009/2009-215-eib-launches-debut-swedish-krona-climate-awareness-bonds.htm?lang=en

⁵⁷ http://www.eib.org/investor_relations/press/2010/2010-067-issuance-of-climate-awareness-bonds.htm?lang=en

⁵⁸http://www.eib.org/investor_relations/press/2010/2010-062-earths-future-bonds-launched-to-fund-projectssupporting-climate-protection.htm?lang=en

reduce 30 million tons of Co2 emissions. In 2009 ADB invested USD 1.3 billion in clean energy and will further increase annual investment to USD 2 billion by 2013.

The ADB issued on the 29th of September 2010 USD 232.2 million in Clean Energy Bonds to support its renewable energy efficiency projects in Asia and the Pacific. The bonds were primarily issued to Japanese retail investors and included four tranches: four year bonds denominated in Australian dollars, four year and seven year bonds in Brazilian real, and seven year bonds in Turkish lira. Earlier in 2010 the ADB launched its first thematic bond –a water bond which raised USD 619 million in 2 and 3 year fixed rate notes. Although both bond issuances had mainly retail investors participation, the ADB believes there is a huge demand from both –institutional and retail – to fund sustainable and environmentally friendly energy, infrastructure and water projects.

US Government Green Bonds

The federal Energy Policy Act of 2005 established Clean Energy Renewable Bonds (CREBs) as a financing mechanism for public sector renewable energy projects. This legislation originally allocated USD 800 million of tax credit bonds issued between January 1, 2006, and December 31, 2007.

CREBs may be used by certain entities - primarily in the public sector - to finance renewable energy projects. The list of qualifying technologies is generally the same as that used for the federal renewable energy production tax credit (PTC). CREBs may be issued by electric cooperatives, government entities (states, cities, counties, territories, Indian tribal governments or any political subdivision thereof), and by certain lenders. CREBs are issued -theoretically - with a 0% interest rate. The borrower pays back only the principal of the bond, and the bondholder receives federal tax credits in lieu of the traditional bond interest.

The Energy Improvement and Extension Act of 2008 (Div. A, Sec. 107)⁵⁹ allocated USD 800 million for new CREBs. In February 2009, the American Recovery and Reinvestment Act of 2009 (Div. B, Sec. 1111)⁶⁰ allocated an additional USD 1.6 billion for New CREBs, for a total New CREB allocation of USD 2.4 billion to generate financing for renewable energy initiatives. These essentially function as low-interest loans to renewable project owners, providing them with an alternative to traditional sources of finance, many of which had dried up as a result of the recession. The Bonds are similar to production tax credits awarded to renewable projects, and apply largely to the same projects. However, they differ in that they serve as a financing tool rather than providing post-implementation tax relief; they are intended to help get planned projects, such as wind or solar farms, into construction. Under the scheme, the borrower, in this case a government agency or a utility, sells the bond to an investor such as a pension fund, which then becomes the bondholder. In normal bond conditions, the issuer then has to pay interest to the bondholder.⁶¹

The Energy Improvement and Extension Act of 2008 also authorized the issuance of Qualified Energy Conservation Bonds (QECBs) that may be used by state, local and tribal governments to finance "qualified energy conservation projects".⁶² QECBs were originally structured as qualified tax credit bonds until 2010,

⁵⁹ <http://thomas.loc.gov/cgi-bin/query/z?c110:H.R.1424.enr>:

⁶⁰ http://thomas.loc.gov/home/h1/Recovery_Bill_Div_B.pdf

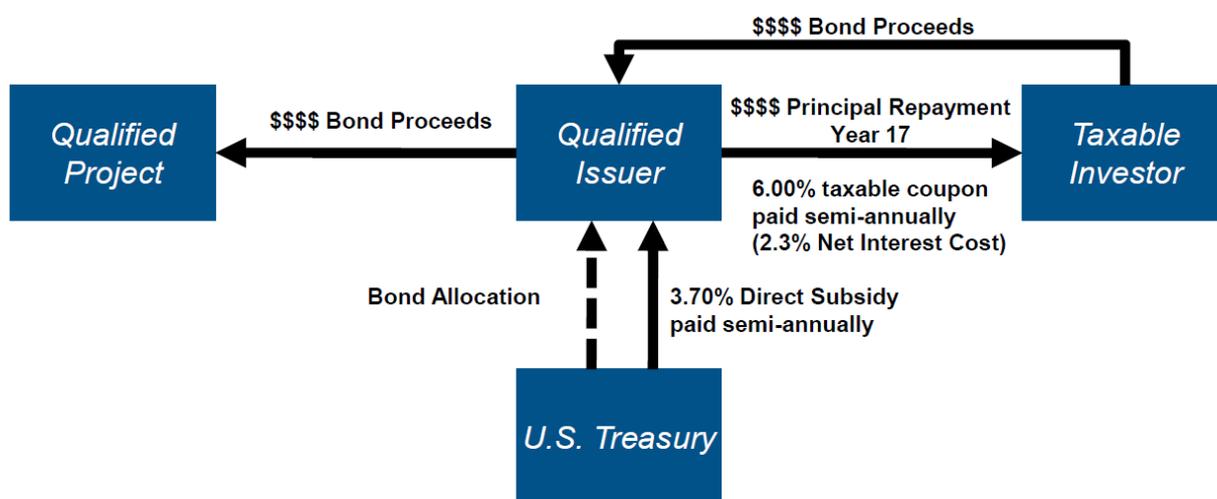
⁶¹ Database of State Incentives for Renewables & Efficiency (DSIRE)

⁶² The definition of "qualified energy conservation projects" is fairly broad and contains elements relating to energy efficiency capital expenditures in public buildings; renewable energy production; various research and development applications; mass commuting facilities that reduce energy consumption; several types of energy related demonstration projects; and public energy efficiency education. Renewable energy facilities that are eligible for CREBs are also eligible for QECBs.

and in this respect are similar to new Clean Renewable Energy Bonds or CREBs. However, the March 2010 HIRE Act (H.R. 2847 (Sec. 301)) changed QECBs from tax credit bonds to direct subsidy bonds similar to Build America Bonds (BABs). The QECB issuer pays the investor a taxable coupon and receives a rebate from the U.S. Treasury.

The October 2008 enabling legislation set a limit of USD 800 million on the volume of energy conservation tax credit bonds that may be issued by state and local governments. The American Recovery and Reinvestment Act of 2009, enacted in February 2009, expanded the allowable bond volume to USD 3.2 billion. In contrast to CREBs, QECBs are not subject to a U.S. Department of Treasury application and approval process. Bond volume is instead allocated to each state based on the state's percentage of the U.S. population as of July 1, 2008. Each state is then required to allocate a portion of its allocation to "large local governments" within the state based on the local government's percentage of the state's population.

Figure 10 QECB and New CREB Bond Mechanics Example



The important distinction between the US green bonds described here is that in the case of CREBs, the federal government pays interest directly in the form of a tax credit to bondholders, rather than subsidising payments issuers make to investors, as is the case, for example, with Build America Bonds (see Box 2).⁶³

⁶³ Financial Times (FTfm) 1/22/2010 'Success continues of Build America Bonds'

Build America Bonds

Though not strictly for 'green investments', another interesting financing mechanism introduced by the Obama administration in 2009 is known as **Build America Bonds (BABs)**. This program is part of the USD 787 billion American Reinvestment and Recovery Act. Through BABs municipalities could issue taxable debt and have the option of receiving a 35% rebate on their interest cost from the US Treasury.

Since the program began in April 2009 more than USD 165 billion of BABs were issued by local government or municipalities with institutional investors buying more than a quarter of the debt. The BABs program ended on 31st of December 2010. There are talks of a return of the bond program in 2011 however with a lower tax rebate.

BABs represent a significant shift in the way municipal debt is structured. Historically, interest earned on municipal bonds issued for most governmental purposes has been exempt from federal income taxation. This implicit subsidy limited the investor base mainly to retail and individual parties (they hold an estimated two thirds of the USD 2.8 trillion US municipal bond market through mutual funds or individual accounts).

Many institutional investors such as pensions, who are tax exempted, were natural buyers of BABs, which provided a perfect match of long term demand and supply and an introduction to infrastructure exposure via debt linked to capital project like schools, road expansion and bridge construction.

Note 1: Republican Congressman John Mica, Chair of the House of Representatives Transport Committee said: *"I can almost guarantee that a bond program will be one of a number of options considered in legislation to finance America's infrastructure projects. However, BABs terms were considered too generous and any future bond program would need to be anew iteration or reformed version."* Source Wall Street Journal, 30/12/2010

In the US municipal green bond sector a relatively recent introduction are PACE bonds (Property Assessed Clean Energy bonds). These PACE bonds have been used to finance energy efficiency and renewable energy improvements in buildings. Some notable features are that the package includes the up-front financing and the property owner does not pay up-front, which allows the property owner to enjoy immediate energy savings. Because property taxes are typically passed through to commercial/industrial tenants, the 'split' landlord/tenant economic incentive is eliminated. Because the lien travels with the property, it also transfers with the sale of the property. Because the metrics such as engineering studies on the efficiency savings, etc., are standardized, the county/municipal level programs are amenable to bundling, being aggregated across districts, and securitized in the form of bonds. The underlying premise is that fossil fuel costs will rise exceeding the financing costs.

The US Department of Energy had been heavily promoting the model since 2008, and the US Government provided loan guarantees to support PACE bond issuance by municipalities (who then on-lent funds to individual households). However, the PACE market was dealt a major blow in 2010 when the Federal Home Loans Agency, at the instigation of Fannie Mae and Freddie Mac, declared that they would not insure mortgages with PACE-debts added as senior debt (the reasons cited were a concern that senior debt in an era of declining property values threatened the main mortgage, and a lack of standards for the delivery of household measures meant that FHFA could not be assured that investments were value-beneficial). There has been minimal activity since that declaration, although a number of groups continue to work on ways to revive the model and as of August 2011 that seemed increasingly likely. It would seem that there are potential OECD applications where there are taxing authorities and, presumably, tax-paying property owners.

Recognizing the potential for PACE and the role private capital could play in its growth, in 2009 an innovative entrepreneurial financing initiative was formed called the Ygrene Energy Fund. Ygrene formed

a partnership with Barclays Capital and now offers no-cost PACE program design, administration and funding to cities and counties throughout the U.S.

A version of this municipal model, aimed at commercial building owners, has been adopted in Australia, with enabling legislation passed in the States of NSW and Victoria. While only just getting going, the expectation is that loans would be eventually aggregated for the purpose of issuing loan-backed securities.

A slightly different household financing model has been adopted by UK Government with its Green Deal programme. In that case repayments are collected through utility bills, with legislation created to compel utilities to participate. Green Bonds are expected to be issued as a re-financing instrument as the market develops; work done by the Climate Bonds Initiative and partners suggests is that the low loan default rate inherent in the Green Deal model will allow these bonds to be rated as investment-grade. The UK Government expects its programme to be a major part of a policy of retrofitting the bulk of UK homes over 20 years. This initiative potentially provides a useful example of regulatory government measure that will support investment grade debt without any further credit enhancement being required.

Structured Green Products

In addition to supranational or government issued bonds, other fixed income products such as structured and securitized products will likely form an increasingly significant part of private sector financing, as investors get used to the underlying assets.

In 2008, Société Générale offered the first “synthetic green bond” structured note⁶⁴ called the Environment Optimizer/Top Green Bond 1. In essence, this was a synthetic green bond linked to the performance of the Lyxor Dynamic Environment Fund, which offered exposure to the SGI Global Environment Index. This is notable because it is a product synthesized through financial engineering to give the investor exposure to the environment sector while protecting all of the invested capital through the use of a zero-coupon bond which will pay its face value at maturity.

The SGI Global Environment Index tracks the global environment sector and comprises stocks of companies including First Solar Inc., Gamesa, QCells, Suzlon Energy, United Utilities, Veolia Environment, REC Group, Severn Trent, Vestas Wind Systems and Waste Management. Every quarter the performance of the fund is measured over that quarter. The bond holder receives the return based on the index (with a minimum return of 0% guaranteed and the maximum return capped at 8%).⁶⁵

Structured finance and securitization of renewable energy assets

Across Europe there is increased attention to the funding gap that needs to be filled to meet renewable energy targets. A bond market for institutional investors would be a paradigm shift that could open up a new global-scale pool of capital to fund renewable projects beyond traditional financing from utilities and banks whose balance sheets are still constrained.

To take the wind energy sector as an example, to date most wind power production facilities of significant scale have been financed using the project finance model (see Kalamova, Kaminker and Johnstone, OECD, 2011). Under this model, funding is typically provided by one or more commercial banks on a limited recourse basis, relying on wind resource studies with underwriting criteria of 1.4x (or higher) debt service coverage and 60-70% loan-to-cost ratios. However, over the past years, the project

⁶⁴ Definition – this is a synthetic bond

⁶⁵ <http://www.structuredetailproducts.com/products/details/download/id/728176/brochure/f5554a9dcca1cf1c76659132230df1122e2eaab9>

finance model has started to shift toward a structured finance model and multiple wind projects and at least one solar project have been reported. The successful bond issuance for SunPower's Montalto di Castro solar PV park in Italy in December of 2010 could represent the start of a new form of financing for renewables projects in Europe. It made the world's first publicly-rated bond issue for a solar project. The bond was structured as an asset-backed issuance, with half placed to institutional investors. While some observers hoped that this might signal a vast new liquidity pool for the renewable energy market starting to emerge, it needs to be noted that the institutionally placed bonds were fully guaranteed by Italian export credit agency SACE, making them more akin to covered bonds than asset-backed securities. The second, non-guaranteed, tranche was sold exclusively via the European Investment Bank ("EIB"). While the bonds may provide a template for other bond issuances in 2011, it may be some time before non-guaranteed debt will find a ready market.

The EUR 470 million CRC Breeze II bonds are an important innovation in the world of green bonds for multiple reasons and present an interesting case study for policy makers who would consider structuring regulatory environments to be amenable to private sector capital markets innovations along these lines. Although they were preceded by USD 370 million FPL Energy wind bonds which were essentially corporate debt structured as a project financing, the Breeze II bonds were issued by a hedge fund through a Special Purpose Vehicle (SPV) and were the very first series of green asset-backed securities (ABS). According to Windpower Monthly (2006) they represented the first time the international capital markets had been tapped to finance renewable energy more generally. Breeze II represented a quantum movement toward the ABS model (see case study). Breeze has since been followed by two similar wind-energy asset-backed bonds in the US - the USD 580 million Alta Wind and the USD 525 million Shephard's Flat bond. The Breeze bonds were all downgraded in 2010 due primarily to the volatility of wind supply reflected in the low wind levels over the past four years, which had been significantly below historical averages. It is expected that in the years ahead the financing structures for issuing rated wind asset securitizations will continue to evolve into multi-tranched transactions underwritten on the basis of varying wind probability scenarios ranging from conservative to aggressive (and the ratings agencies will therein gain better historical track records).

Case Study - CRC Breeze Finance Bonds

Project Sponsor

This case study illustrates how private capital markets can finance renewable energy when the subsidy is right. The project's sponsor was the hedge fund Christofferson, Robb & Company (CRC). The bonds were all issued through a Special Purpose Vehicle (SPV) called "CRC Breeze Finance" and are secured on a number of wind farms in Germany and France.

Background

As described by Richard Robb, CRC's CEO, in 2005 CRC started looking at a securitisation of loans to wind farms as they felt it was a good fit with CRC's traditional business of investing in asset-backed securities and private structured credit transactions that help European banks transfer risk and improve their balance sheets or their return on regulatory capital. CRC decided that the money to be made at the time, at least in onshore wind, was through owning the farms, not lending to them and they discovered an opportunity for a solution that would buy a scale portfolio and benefit from efficiencies in operating, maintenance and financing. Once the wind farms are constructed, returns largely depend on how hard the wind blows, therein producing a return stream that would be highly valued by CRC's investors.

CRC bought its first onshore German wind farm within their Credit Fund in July 2005 so that they could learn about how they worked. In the worst case, they were confident in being able to sell it in a year if they changed their minds about the economics of wind.

Project Details

By the spring of 2006, CRC's Energy Fund acquired 430 MW of onshore wind farm capacity in Germany and France. CRC contributed the equity, and a bank lent the money needed to finance construction. Once the portfolio was assembled, the fund sold the projects to a special-purpose vehicle called CRC Breeze Finance, which issued €470,000,000 of asset-backed securities in a whole-business securitisation. According to Windpower Monthly (May 2006), this was the "first international financing where renewable energy infrastructure has been funded directly from the capital markets".

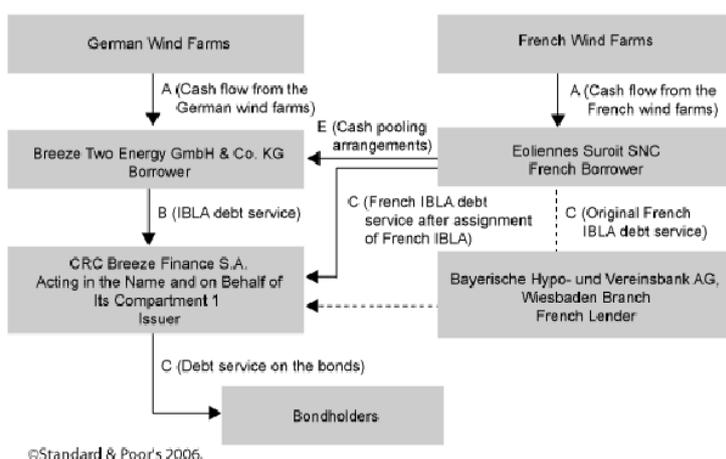
The bonds are structured so that the revenues from the wind farms pay interest and capital back on the bonds. The wind farms that were built convert the wind's kinetic energy into electricity. The revenues gained from selling the electricity is used to repay CRC Breeze Finance's long-term debt. CRC keeps the money that's left over. Even if the wind does not blow as hard as usual or operating and maintenance expenses turn out to be higher than we assumed, there is enough of a cushion that bondholders will be paid out on schedule. These revenues are reasonably consistent, so they fit neatly with the demands of the fixed income bond investor.

The CRC Breeze portfolio generates expected annual returns of about 8%, which were boosted to 15% with the help of leverage. None of this would have been possible without government subsidies. In Germany, the Renewable Energy Act guarantees a feed-in tariff for 20 years and mandates the grid operator to purchase all the electricity a wind farm can produce at the guaranteed price. Our feed-in tariff was about €83.6 per megawatt hour (MW/h), compared with free market prices that have mainly ranged from €30 - €70 per MW/h.

Bond Structure

The bond comprises a total of three tranches, two of which have been placed in the capital market. Two tranches of structured Eurobonds called "Breeze Two"; and a privately placed tranche C of EUR 120m have also been placed. Interest and principal payments on Breeze Two will come from the sale of electricity to grid operators. The 20-year senior bonds maturing in May 2026 (EUR 300m, with 5.3% coupon) and EUR 120m, respectively) are rated BBB by both Standard & Poor (S&P) and Fitch, while the 10-year subordinate bonds, maturing in May 2016 (EUR 50m, with 6.1% coupon), are rated BB+ by both agencies.

HypoVereinsbank (HVB) acted as structurer and consultant for the purchase of the investment project for Christofferson. The German bank also underwrote and distributed the bonds to a wide range of investors, including insurance companies, banks, pension funds and asset managers. The bonds are to be repaid in semi-annual installments through the end of the term.



Risks

According to S&P, the investors (such as pension funds) were exposed to the following risks:

1) The cash flow from each project depends directly on energy production that, in turn, depends on the wind resources. The lack of long-term on-site wind-resource data at most of the sites introduces the risk that projected

energy production levels, and therefore cash flows, might not be realized.

2) The revenues of the individual projects rely on support provided by the regulatory systems in France and Germany for renewable energy. Any change in these regulations could affect the support for the underlying wind projects, which could result in lower revenues than predicted. The existing regimes, however, were expected to be grandfathered should any changes in regulation be implemented.

3) There is some construction risk, as about 50% of the wind-power projects were still under construction at the time of the transaction.

4) There is some concentration risk from the employment of a new technology with little performance track record (the Vestas V90-2.0 MW wind turbine), which accounts for more than 20% of the portfolio.

5) There is an off-take price risk for the French wind farms in the years 16 to 20 of their operation. French renewable energy law sets prices only for the first 15 years of operations. Thereafter the wind farms will be exposed to the market price.

Risk Mitigation

1) The regulatory regimes in Germany and France are considered supportive, both for existing wind-power projects and the development of new projects. In particular, the regulation provides both price and off-take certainty for the wind energy produced over the life of the debt except for the French price risk post year 15.

2) Although the wind risk is prevalent, the projections benefit from two separate wind assessments by independent wind consultants. In addition, the base case assumes a wind probability of 90% of occurrence, based on one-year calculations.

3) The financial base case is robust, with a minimum debt service cover ratio (DSCR) of 1.64x for class A debt and a minimum DSCR of 1.3x for the class B debt. In addition, various stress scenarios show that the portfolio can sustain significant downside scenarios for both the senior and subordinated debt.

4) The overall portfolio benefits from cross-collateralization and satisfactory diversification because the projects are located at more than 30 different sites and in two different countries.

5) The developers that will operate the wind parks have a good track record in constructing and operating wind farms with more than 800 turbines (approximately 1,200 MW as at March 31, 2006) already up and running.

6) Off-taker counterparty risk is low.

7) The price risk for the French wind farms in years 16 to 20 is mitigated by a conservative price assumption in the financial model and by the portfolio benefit via full cross-collateralization.

Downgrade

On 21 July 2010, Fitch Ratings downgraded CRC Breeze Finance S.A.'s (Breeze II) EUR258.4m class A notes to `BB' from `BB' and EUR36m class B notes to `B' from `B'. The Outlook on class A remains Negative, while that on class B is Stable. These downgrades are an extension of the negative rating action that Fitch took on both classes of notes on 5 June 2009 and result from a combination of an achievable energy yield significantly below original expectations, higher than expected operating costs, and technical difficulties with some turbines.

Main risks identified in the downgrade:

-The volatility of wind supply. This is reflected in the low wind levels over the past four years, which has been significantly below historical averages.

-A deterioration in the project's liquidity because the operating and financial performance of the project was below expectations.

Sources: OECD Analysis, Interview with Richard Robb, S&P Presale Report (2006), Fitch Ratings Action (2011)

Case Study - Andromeda Finance Srl

The project consists of the development, construction, operation and maintenance of two photovoltaic (PV) solar power plants with 45.3MW and 6.1MW capacity located at two adjacent sites in Montalto di Castro, Italy. The site benefits from an existing high voltage substation, which facilitates the Project to export electricity to the grid. The high voltage substation is owned and operated by Terna, the Italian power grid operator.

Andromeda Finance Srl or Project Co will receive a fixed regulatory incentive for the electricity produced by the plant based on the Italian legislation to promote renewable energy production (see Box 1). In addition to this incentive tariff, Project Co will also be able to sell the electricity on the wholesale market at the prevailing market prices. The plant will benefit from priority dispatch rights (i.e. the right to sell its output first) thereby removing volume risk.

Andromeda Finance Srl issued two classes of bonds to finance the solar plant:

- EUR97.6m in fixed rate notes with a coupon of 5.715%, due Nov. 30, 2028 rated Aa2 by Moody's thanks to the benefit of the guarantee of the Italian export credit agency SACE S.p.A. ("SACE") and
- EUR97.6m in fixed rate notes with a coupon of 4.839%, also due Nov. 30, 2028 rated Baa3 by Moody's and subscribed by the European Investment Bank ("EIB").

Moody's said that the Baa3 underlying ratings reflect **project strengths** including a large portion of the revenues based on a fixed feed-in tariff paid by a government-related entity, as well as the straight forward construction and operation of the project, the reliable and established technology (monocrystalline silicon panels), the reputable world-class manufacturer and contractor providing comprehensive performance guarantees and a 20-year operation and maintenance contract, resources estimates being based on 14 years of data, as well as structural protections. The rating was marked down due to potential **project weaknesses**, including exposure to wholesale power prices (with Italian pricing potentially converging towards lower European levels), potential errors in the resource estimate, potential yield reduction which could stem from even minor deviations in the manufacturing process; and potential construction delays leading to lower feed-in tariffs.

Financing - Securitisation Structure: In order to finance the construction works, Project Co will raise project loans from two international banks, Société Générale (Aa2, negative) and BNP Paribas (Aa2, stable) (together, the Originators). In addition, Société Générale will provide a VAT Facility to Project Co of up to €22 million. The terms and conditions of the project bank loans and the VAT Facility are set out in the common terms agreement (CTA), the Project Loan Facility Agreement and the VAT Facility Agreement (together the Facility Agreements). The project loans (but not the VAT Facility) will be securitised through the Issuer, which is set up as a bankruptcy remote SPV under Italian Law No 130 (the Securitisation Law). The Securitisation Law sets out the legal framework for asset-backed securitisation transactions in Italy.

Incentive Tariff – "Conto Energia": In addition to the regulatory incentives discussed in Box 1, tariff incentives were also attached to this issue. The incentive is granted for 20 years and is based on remuneration for the electricity generated ("feed-in tariff"). Once granted to a PV plant, the tariff Euro/kWh rate of the feed-in tariff remains fixed for all the 20 years of subsidization and is not subject to any adjustment or inflation indexation.

The incentive scheme under the Italian Solar Decree shall apply to a maximum aggregate capacity of 1,200 MW of photovoltaic plants. However, plants built by private entities in the 14 months (or public bodies in the following 24 months) following the achievement of this limit are still eligible for subsidization under the Italian Solar Decree.

The value of the tariff is based on the size, the installation features of the plant and the date at which the plant enters into operation. Both the 6.1MW and a 45.3MW plants benefit from a fixed €346 /MWh (€0.346/kWh) feed-in tariff if the plants start operation in 2010.

In order to apply for the incentive tariff the Project must (i) have independent connection and independent meters, which are not shared with other generation facilities; and (ii) apply for grid connection. Once the plant is completed, the Project must notify the end of works to the grid operator (Terna) and request to be admitted to the incentive tariff.

The incentive tariff is granted upon "connection", which requires physical connection of the plant to the grid by

Terna. However, to mitigate the risks for photovoltaic project developers not accessing the 2010 tariff due to Terna's failure to connect to the grid, the Italian Parliament passed law No. 41 of 22 March 2010 (Decreto Salva Alcoa) pursuant to which the 2010 feed-in tariff will be granted even if a plant is not connected to the grid by the end of the year. The tariff is granted provided that the following conditions are met; (i) the plant is completely built by 31 December 2010; and (ii) the producer applies for the connection to the grid in time to obtain it by 31 December 2010 in accordance with the timeline set by the applicable regulations.

Sources: OECD Analysis, Interviews with SACE, EIB and SG, Moody's Presale Report (2010)

Green Infrastructure Funds

In addition to green bonds, green infrastructure funds are also being developed as financing vehicles which the broad mass of institutional investors can use to gain access to green growth projects. However, size remains a constraint with these funds. Even at the pre-financial crisis height, development and construction focused infrastructure funds (which is what almost all are) were not nearly large enough to deliver investment at the scale and pace required. Hence they will need to be combined with the other mechanisms discussed that can allow capital to be deployed (see Box 2 on leveraging mechanisms).

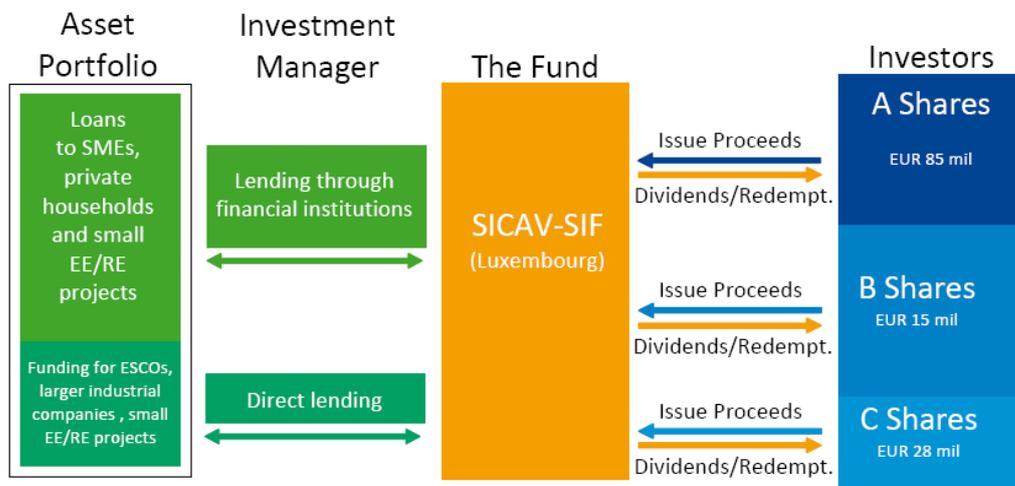
EU Funds

The EIB's traditional financing instruments are medium and long-term loans with fixed or variable interest rates in euro or other currencies. However the EIB offers also other financing instruments – including equity funds through which the EIB indirectly participates in companies and projects promoting low-carbon investments in particular in renewable energy, energy efficiency and forestry. The funds can have different geographical coverage and are established with the private sector and a range of international financial institutions. Though mostly targeted at retail investors, such instruments could be used to target institution investors, including pension funds, in future.

EIB financing may be accompanied by EU grants to finance investment promoting the reduction of energy consumption, pollution and CO2 emissions and by technical assistance to help build up the relevant administrative and institutional capabilities and to provide other technical support to promoters.

The Green for Growth Fund was launched in 2009 together with KfW (Kreditanstalt für Wiederaufbau, or Reconstruction Credit Institute - a German government-owned development bank) to provide financing, including loans, equity and technical assistance, for sustainable energy projects in the Western Balkans and Turkey. Financing is provided through financial intermediaries and energy service companies (ESCOs).

Figure 10: EIB Green Growth Fund



Source: EIB⁶⁶

In addition, the EIB has set up a series of other funds together with other institutions and the private sector to provide equity for investment in particular in renewable energy, energy efficiency and forestry: the *Dasos Timberlan Fund* (forestry), the *Marguerite Fund* or 2020 European Fund for Energy, Climate Change and Infrastructure and the *DIF Renewable Energy Fund*, to name but a few.

The *Global Energy Efficiency and Renewable Energy Fund (GEEREF)* is an innovative financing vehicle in the form of a fund of funds designed to promote energy efficiency and renewable energy in emerging markets outside the European Union. It is active in African, Caribbean and Pacific developing countries, but also supports initiatives in Latin America, Asia and the EU neighborhood countries.

On 1st of July 2011, the European Commission, the EIB, the Cassa Depositi e Prestiti (CDP) and Deutsche Bank launched the European Energy Efficiency Fund (EEEF) for energy efficiency and small scale renewable energy. The fund targets to raise the total volume from currently EUR 265 million to approximately EUR 800 million by attracting further investors. It has a layered risk/return structure to stimulate private investment with a fixed commitment of EU budget funds.

CP3 Fund

The IFC and Asian Development Bank (ADB) have been working in consultation with the P8 Group on launching an infrastructure fund for Asia, known as the Climate Public Private Partnership Fund (CP3). The mission of the fund is to mobilize large scale capital into low carbon investments in developing Asia, targeting projects in sustainable energy, water and waste treatment, land use (agriculture and sustainable forestry), sustainable transport (bio fuels, fuel cells, mass transport), and the built environment (sustainable buildings, infrastructure etc.). The fund aims to invest at scale for significant impact; to generate highly favorable risk-adjusted returns; to mobilize private sector capital; to develop investment infrastructure; to incubate quality low carbon specialist funds; to increase the pool of investible projects; to provide risk mitigation tools; to bridge knowledge gaps; and to build trust regarding such investments in the region.

CP3 aims to unlock several market failures in low carbon infrastructure investments in developing countries – including lack of capital (by providing early stage equity), a lack of projects (through

⁶⁶ http://www.ggf.lu/media/public/pdfs/downloads/factsheets/2010/GGF_At_a_Glance_2010_09.pdf

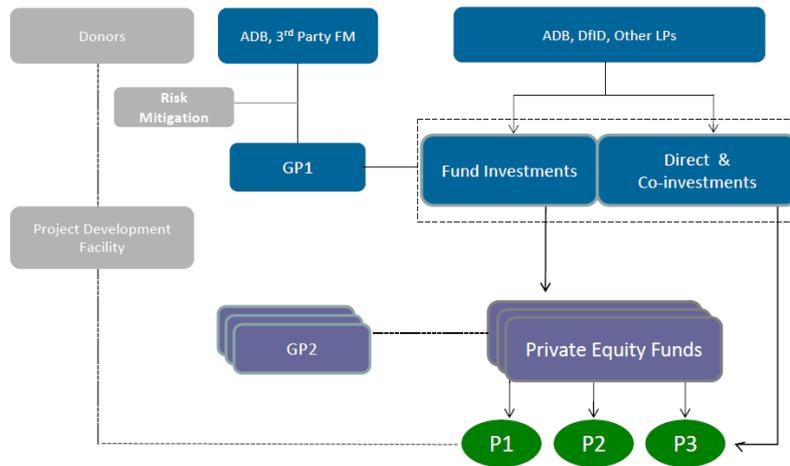
management support, technical assistance and capacity building), and the high risk perception of the sector (via risk mitigation provided by multinational development banks).⁶⁷ Multinational financial institutions will act as strategic investors, catalysing the involvement of private sector funds.

As described by the Overseas Development Institute (see Brown and Jacobs 2011), CP3 is essentially a ‘fund of intermediaries’ or fund investment platform with an independent management and investment team (in private equity terminology, the General Partner or GP1). The platform then invests in existing and equity funds and incubates new funds, each with their own investment scope (defined by country and sector) and each with their own manager (GP2). The structure and involvement of the multinational finance institutions allows affordable debt to be raised and the capital structure of the projects to be kept to the 4:1 debt to equity ratio.

The structure allows a range of pension funds to become involved (including smaller pension funds in the region which may only be able to invest in specific projects due to restrictions on overseeing assets). It is envisaged that this will be a USD 2-5 billion fund. Concessionary financing will be involved (i.e. mechanisms for the International Financial Institutions to take on some tranches of risk) and the project is seen as a way of testing various Public Finance Mechanisms to see how barriers to institutional involvement in such projects can be overcome. The design and consultation of this fund concept is ongoing and it is hoped that a launch will take place (with investment capital secured) in the course of 2011.

⁶⁷ See (Brown and Jacobs 2011).

Figure 11: CP3 Structure



Source: P8⁶⁸

UN Green Climate Fund

Under the UNFCCC Cancun Decisions, developed countries agreed to set up a Green Climate Fund with the capacity to raise resources on a scale commensurate with the Copenhagen Accord (USD 100 billion a year by 2020 - first proposed at COP15 in Copenhagen), which will be accountable to the UNFCCC⁶⁹ and will support projects, programmes, policies and other mitigation and adaptation activities in developing countries. It will comprise a Board of 24 members (equal membership from developed and developing countries) and will be administered by a Trustee. The World Bank will act as interim trustee.

An IMF Staff Briefing Note⁷⁰ proposed that the Green Fund would use an initial capital injection by developed countries in the form of reserve assets, which could include IMF Special Drawing Rights (SDRs), to leverage resources from private and official investors by issuing low-cost green bonds in global capital markets. SDRs are an arcane financial instrument but essentially constitute additional foreign exchange reserve assets of the IMF. Resources mobilized by the Green Fund could be channelled through existing climate funds, or via newly created special-purpose disbursement facilities.

Once its capital base is established, the fund could begin issuing highly-rated (and hence, low-cost) green bonds that could be sold to institutional investors. As a result, the Green Fund would be able to mobilize a multiple of its paid-in capital. In the steady state, the Green Fund would combine the proceeds from bond issuance with subsidy resources that would be provided through budgetary transfers from contributing countries.

To generate financing on the scale envisaged in the Copenhagen Accord (and given the phase-in assumptions outlined above), the fund would need to issue about USD 1 trillion in bonds over 30 years of operation. However, the UN AGF's Final Report notably did not consider this proposal in detail, observing

⁶⁸ Taken from CP3 presentation made by Robert van Zweiten, Director, Capital Markets & Financial Sector, Private Sector Operations Department, Asian Development Bank, to P8 Summit, Brussels, February 2011.

⁶⁹ United Nations Framework Convention on Climate Change

⁷⁰ <http://www.imf.org/external/pubs/ft/spn/2010/spn1006.pdf>

that the political acceptability of using SDRs is low due to lack of consensus on the appropriate role of SDRs in the international monetary system. Nonetheless, the issue of how to capitalize the Green Climate Fund remains on the agenda of the G20 for 2011.

As such, the UN (COP) entrusted a Transitional Committee (TC) with the design of the Green Climate Fund (GCF) for approval by the COP at its 17th session during December 2011 in Durban. In the meetings of the TC, the question of whether the GCF should raise funds from capital markets was highlighted by members.⁷¹ It was noted that many public finance institutions including both national development banks and international financial institutions - are structured to source some or all of their funding requirements from the capital markets, usually through sovereign backed bond offerings. It was also highlighted that many levels of government, such as municipalities, access bond markets to raise financing for public projects, especially infrastructure investments. It was suggested that the question of whether to raise funds from the capital markets could be left to the GCF Board to decide after thorough consideration of the legal structures and implications thereof.

However, caution was raised as to whether the GCF should take on the function of a financial institution by issuing bonds. It was suggested that this might crowd out rather than crowd in new funding and also raise issues of liabilities. When considering this approach, it may be important to clearly differentiate between borrowing by developing or developed country governments, borrowing by international financial institutions and borrowing by private industry. It was noted that care should be taken to ensure that the GCF does not increase the debt burden of already heavily indebted developing countries.

Private sector participants suggested in the meetings that an overall target should be to create investment opportunities with attractive risk adjusted returns that can compete with mainstream investment opportunities to attract private capital. Green bonds were cited as a good example of such an investment opportunity as they fit into existing (investment and financing) processes, complexity is low, they address the needs of private investors, can deliver attractive risk / return profiles and make mainstreaming possible.

Others Fund Proposals

Drawing on the experience of initiatives such as the CalPERS Green Wave programme in California, the United States Overseas Private Investment Corporation (OPIC), the UK Private Finance Initiative (PFI) and the strategic climate funds of the World Bank, the World Economic Forum's Task Force on Low Carbon Prosperity has proposed a potential mechanism for leverage private sector investment, following mechanisms known as 'Challenge Funds' or using 'Cornerstone Equity'.⁷²

⁷¹ UNFCCC, Workstream III: Operational Modalities Sub-workstream III.1: Finance Entry Points Scoping Paper (2011)

⁷² See 'Task Force on Low Carbon Prosperity Recommendations October 2009' <http://www.weforum.org/documents/gov/Environment/TF%20Low%20Carbon%20Prosperity%20Recommendations.pdf>

Figure 12: Challenge Funds

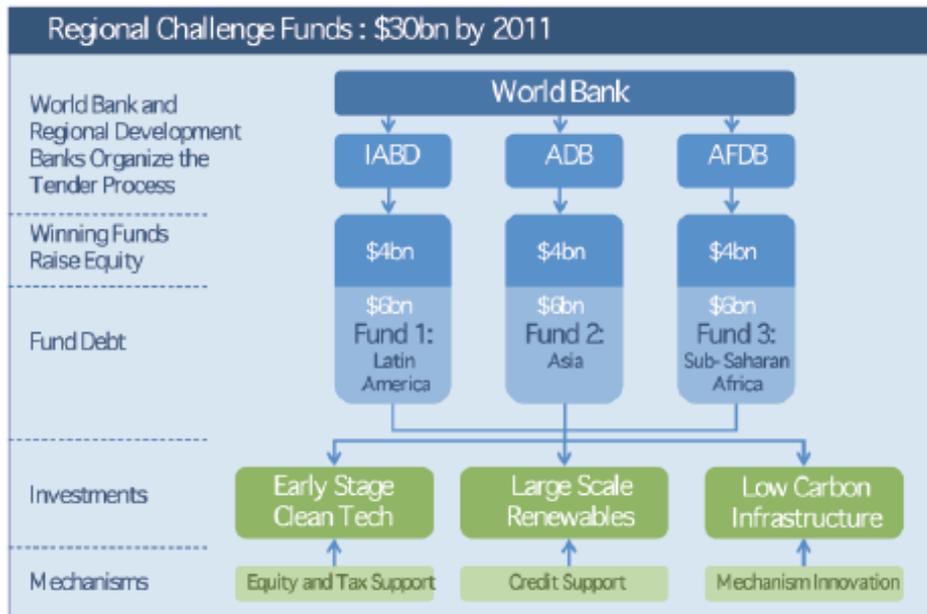
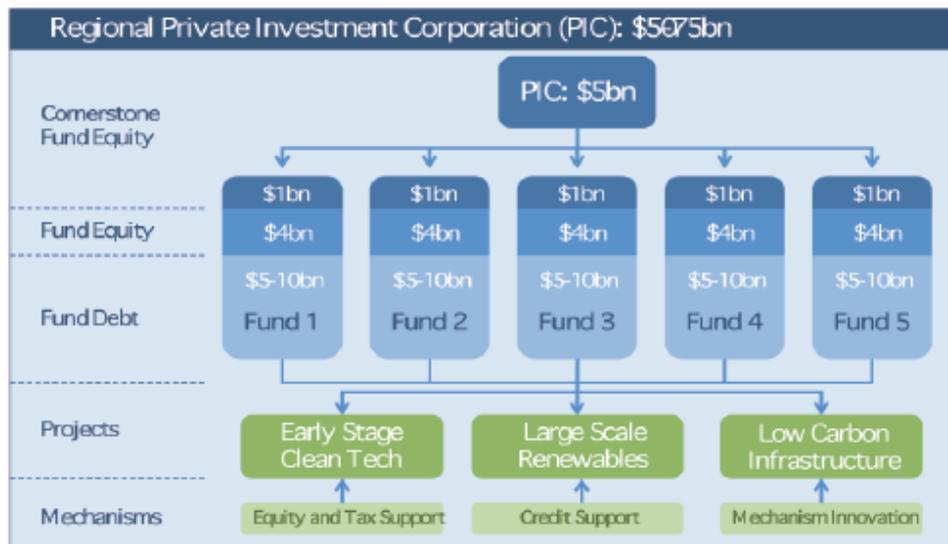


Figure 13: Challenge Funds using Cornerstone Equity



Source: WEF

*Other Initiatives*⁷³

Green Infrastructure Banks have been developed as a policy initiative in a number of countries. These are generally structured to use public sector balance sheets to take on some of the risk of developing assets relevant for climate change solutions– thus reducing the risk that private sector equity and debt has to take.⁷⁴ For example, the UK government is planning to launch a Green Investment Bank in 2012 (see box).⁷⁵

Though not providing green funding specifically, several countries have experience of instruments which have allowed pension funds to become involved with infrastructure investing. Such initiatives could be extended to the green financing arena. For example, **infrastructure securities funds** have been launched in Australia which provide access to a wide range of global equity stocks and other types of financial instruments (bonds, stocks, securities and notes) related to infrastructure, allowing for a greater diversification of positions towards infrastructure in countries that are still in an early stage of privatizing their infrastructure.⁷⁶

Also in Australia, unlisted wholesale funds exist, which are balanced funds that also include assets from other sectors beyond infrastructure. These have proven attractive to pension funds due to their degree of diversification, the long-term nature of the investments and the fact that they do not require a great capital contribution.⁷⁷

⁷³ See also ‘*Meeting the Climate Challenge: Using Public Funds to Leverage Private Investment in Developing Countries*’
<http://www2.lse.ac.uk/GranthamInstitute/publications/Other/Leveragedfunds/Meeting%20the%20Climate%20Challenge.aspx>

⁷⁴ See Financial Times 8/6/2010 ‘*The Future of Global Infrastructure*’

⁷⁵ See the UK Department for Business Innovation & Skills Green Investment Bank website
<http://bis.gov.uk/news/topstories/2011/May/green-investment-bank>

⁷⁶ See BBVA Pension Watch , July 2010

⁷⁷ See BBVA Pension Watch , July 2010

Green Banks

UK: the UK government is planning to launch a Green Investment Bank (GIB) in 2012. It will have a mandate to tackle risk that markets currently cannot handle, thereby acting as a catalyst for further private sector investment. Initial capitalization for the bank will be GBP 3bn, and the bank is expected to be able to borrow as of 2015 (once national debt begins to fall as a percentage of GDP), and it is estimated that £18bn of funding could be generated through syndication and co-financing by the private sector within four years for low-carbon energy projects. To leverage the initial capital the GIB will try to attract institutional investors through new financial instruments.

USA: in the United States, the Connecticut General Assembly signed into law Senate bill 1243 in June 2011, establishing the nation's first fully funded green investment bank. Aimed at providing low-cost financing for clean energy and efficiency projects, the new entity (which was backed by the Coalition for Green Capital), aims to offer Washington DC and other states a workable model for promoting investment in clean energy at a time of growing concern about the serious finance problems surrounding clean energy deployment.

Connecticut's newly constituted Clean Energy Finance and Investment Authority (CEFIA) will function like an investment bank or fund that can leverage its capital to provide low-cost financing to clean projects that a commercial bank wouldn't likely touch. The bank will be funded by a surcharge on residential and commercial electricity bills, which was previously paid into the state's Clean Energy Fund, amounting to USD 30 million a year. CEFIA will also administer the USD 18 million Green Loan Guaranty Fund. The total USD 50 million investment by the bank will enable Connecticut to leverage limited state resources with much larger amounts of private capital—and in this way will catalyze a self-sustaining flow of low-cost capital for innovative clean energy deployment projects, whether it be large-scale rooftop solar plants or commercial building retrofits or even high-voltage lines. In this vein, the new Connecticut institution keeps pace with and somewhat mirrors the UK's recently announced plan to capitalize their Green Investment Bank. More recently the Australian Government has announced an investment fund modeled loosely on a Green Investment Bank.

There is a separate ongoing push to create a US National Green Investment Bank. In mid-July, the US Senate Energy and Natural Resources Committee [passed](#) the Clean Energy Financing Act of 2011 with a [unanimous](#) vote.

If the bill would be passed on the floor, it would establish a Clean Energy Deployment Administration, or CEDA. Commonly referred to as a "Green Bank," CEDA would be an independent institution providing affordable financing for clean energy technologies that have had funding difficulties. As a recent article in Forbes explains, an infrastructure bank as proposed by Coalition for Green Capital CEO Reed Hundt and Thomas Mann of the Brookings Institution in The Washington Post could be funded with repatriated foreign earnings from U.S. corporations brought back at a reduced tax rate set at an auction.

Others: a number of multi-national development banks already perform similar functions to a Green Investment Bank within their remits. The European Investment Bank, for example, has an annual lending program for climate change solutions that dwarfs any of the current proposals for a new Green Investment Banks. Debate in relation to these banks has turned to the extent they still fund more carbon intensive projects while at the same time working to mitigate carbon emissions with their climate change related portfolios.

VI. Policy Recommendations

What role can governments (in general) and pension fund regulatory and supervisory authorities (in particular) play in supporting the involvement of pension funds in these types of green financing initiatives?

Drive Enabling Environmental Policy Backdrop

To date, OECD analysis and policy dialogues have helped countries to understand the climate change policy challenge and to advise them on how to improve policy frameworks overtime. Some of the key findings of the work to date with respect to private financing for climate action include:

- domestic policy frameworks have a central role to establish framework conditions, incentivise and stimulate private investment into low-carbon development (Corfee-Morlot et al., 2009, Kim et al. 2009; Kalamova et al. ;
- opportunities exist to improve the economic efficiency of current mitigation policy frameworks and/or policies in related areas (e.g. energy),⁷⁸ which will in turn sharpen the incentives for private sector investment in low-carbon economic development.

As discussed, clear and consistent policies over a long period of time are needed so that strategic and financial players have the confidence to invest in green growth projects. Most notable a clear policy signal is required in terms of carbon pricing, including the removing of fossil fuel subsidies. To make green related projects attractive and profitable, governments need to deploy both regulatory constraints (such as emission caps or carbon pricing) and incentives (such as subsidies, government guarantees etc.). Without a strategic focus on these policies climate finance from the private sector will not happen.

In order to incentivize pension funds to move this size of assets towards green growth will need tremendous long term incentives. These incentives can only come from government in the form of guarantees, tax incentives and with the help of innovative institutions like the proposed green infrastructure and investment banks.

Create Right Investment Vehicles and Increase Market Liquidity

In order to ensure that appropriate financing vehicles are available, providing suitably risk-adjusted, long-term income opportunities, governments and International Financial Institutions can also work to improve deal flow, ensuring adequate, investment-grade deals at scale come to the market for pension funds to invest in. For example via vehicles specializing in early-stage projects and public sector finance either investing alongside private sector and institutional investors or taking subordinated equity positions in funds. Such initiatives may be even more relevant in developing economies. Issuing green bonds can also help to improve the liquidity in these markets and thereby their depth and development.

In order raise the necessary scale of funds required, vehicles which are appropriate for all pension funds, including smaller funds (which lack the in-house expertise to invest directly in projects) will also need to be supported – such as green bonds and green funds. Only in this way will the necessary scale to

⁷⁸ For example see country specific recommendations on more cost-effective policy frameworks are provided by OECD [Economic Surveys](#) (climate chapter of the US review, energy chapter of the South Africa, Korea and Indonesia reviews, and [Environmental Policy Reviews](#) (China, Japan).

match future climate change and mitigation needs be met and the public sector be able to successfully leverage private sector investments into the field.

As the World Economic Forum report points out (WEF 2010): “First and foremost, any policy mechanism needs to be chosen according to the stage of development of the technologies that are to be developed or deployed, and hence the type of financing that the private capital markets should be encouraged to commit.”

As discussed, International Finance Institutions and governments can also assist by mitigating green growth project related risks which are new to pension funds and therefore difficult for them to assess or to hedge. Public Financing Mechanisms providing such mitigation such as the following could be combined with financial instruments:

- Country risk cover;
- Low-carbon policy risk cover;
- Currency risk cover;

Governments should also support the setting up of a ‘rating agency’ or standard setter to ‘approve’ green projects (such as green bonds or green funds). A simple step would be for the OECD member countries to participate in and support investor-driven ratings initiatives such as the Climate Bonds Standards Scheme. Governments could also use the eligibility criteria of such schemes as a base reference for preferencing policies around fixed income investments. This would ensure consistency of labelling with international debt issuance: for smaller countries in particular this will support access to internationally focused institutional investors.

The OECD has started work on defining and measuring green FDI with the aim to provide a statistical foundation in support of governments’ efforts to evaluate the role of private sector investment flows and to assess policy performance in providing a framework for green investment (OECD 2011c). Follow up work could be envisaged to help pension funds and regulators share a common understanding of green investment and measure the scale and evolutions of such investment over time.

Support Investment in Green Infrastructure

The OECD *Principles for Private Sector Investment in Infrastructure* (OECD 2007) outline how governments can enhance their investment environment to promote infrastructure development through private sector participation.⁷⁹ They are a relevant conceptual framework to encourage investment in green growth projects, which are mainly about infrastructure projects. The *Principles* focus on five main areas of policy making and include the following recommendations, which are also relevant for green projects:

- ensure the financial sustainability of projects through an assessment of long-term revenue flows, affordability for government and the costs and benefits of alternative modes of financing. Incentives and guarantees may be necessary to make returns on green projects comparable to ‘brown’;
- provide a sound institutional and regulatory environment for infrastructure investment, including facilitating access to capital markets through the phasing out of unnecessary obstacles to capital

⁷⁹ See also (OECD 2010c), (OECD 2008b), (OECD 2006)

movements and restrictions on access to local markets and removing regulatory barriers. For green investments, providing a stable policy environment around carbon pricing is required;

- ensure public and institutional support for the project and choice of financing;
- make the co-operation between the public and private sectors work by promoting transparency and appropriate contractual arrangements. Including environment performance criteria into contractual specifications / calls for tender could specifically assist the development of green growth related projects;
- promote private partners' responsible business conduct.⁸⁰

(OECD 2011b) also argues that in order to promote infrastructure investment in general by pension funds, national, long-term policy frameworks for key individual infrastructure sectors are required, - that are consistent with needed country and global emissions reduction trajectories - as well as improving the integration of the different levels of government in the design, planning and delivery of infrastructures through the creation of infrastructure agency/bank, and the creation of a National Infrastructure Pipeline. Likewise, governments should lay out their low-carbon policies in order to specifically encourage investment in green growth initiatives.

In addition, (OECD 2011b) recommends that an association of infrastructure investors should be formed, which would be able to bring forward institutional investors interests, and creating a platform for dialogue between investors, financial industry and governments. Within the green growth sphere, policy makers should be encouraged to engage with groups such as the IIGCC and INCR, and such a platform could build on the OECD's work on how to promote green growth.

Remove Investment Barriers

Recent changes in both pension regulatory frameworks and accounting rules in the OECD area (e.g. the Pension Protection Act of 2006, FAB 158 in US and IAS19) have put increasing pressure to reduce funding gaps in defined benefit plans (see OECD 2011b). It has been argued that such changes (including the move to market to market accounting) may be forcing pension funds into shorter-term assets and into matching their liabilities with government bonds (which require the smallest solvency buffers).⁸¹ Funding regulation is also often on a nominal basis, reducing the inflation projection attracting of such infrastructure investments.

In addition, there are concerns that the AIFM Directive and the Volcker rule (part of the Dodd-Frank Wall Street Reform and Consumer Protection Act in the USA) could negatively impact private funds and the alternative asset management industry increasing barriers to investment in infrastructure. However, the full impact and scope of these provisions is still not clear. New bank regulation (Basel III) is expected to increase credit and liquidity costs, affecting in particular long term bank debt and limiting its availability. This regulation could negatively impact infrastructure loans that are typically heavily structured and would be treated as long term and illiquid. Basel III changes will come into force in 2013 and will be introduced gradually.

Governments and regulators should therefore revisit their funding regulation to make sure that they are not inadvertently discouraging pension funds from making in long-term projects, which green projects will often require.

⁸⁰ See Environment Chapter in OECD Guidelines for Multinational Enterprises (OECD 20008b)

⁸¹ See for further reference; Yermo, J. and C. Severinson (2010) and Impavido et al (2009)

Other regulatory restrictions may also apply. For example, quantitative and qualitative investment restrictions on pension funds' investments still exist to a greater or lesser extent in most OECD countries (see (OECD 2009b)). Pension funds may therefore be unable to invest in climate change financing instruments due to restrictions on foreign currency or overseas investment, non-listed investments, or structured products, private equity, fund or funds or other restrictions on alternative investments. Pension fund regulatory and supervisory authorities may therefore wish to check that they are not inadvertently preventing pension funds from taking advantage of the opportunities offered by the climate financing initiatives.

Where pension regulatory authorities rely less on quantitative restrictions and more on the 'prudent person' investment rule, they may wish to clarify how green investments would comply with such regulations.⁸²

Education and Guidance

Pension regulatory and supervisory authorities may also have a role to play in provide education and guidance regarding the types of instrument which are available to pension funds in relation to green growth initiatives, advise of their suitability for different types of funds, and guidance of the sort of due diligence and risk management pension supervisors would expect pension funds to undertake before investing in such instruments. As the OECD's infrastructure paper (Inderst 2009) outlines, such a role could include:

- supporting stronger efforts in independent data collection and objective information provision in the field of infrastructure investment in general and green projects specifically;
- promote higher transparency standards (in terms of investment information, performance numbers, fees charged etc.)in private equity vehicles and direct investments;
- recommending the establishment of international guidelines for investment performance and risk measurement of infrastructure (and other alternative) investments;
- encouraging the study of more advanced risk analysis beyond the traditional measures, including the specific risks relating to climate change impacts or climate change regulations;
- encouraging improvements in knowledge and understanding of pension fund stakeholders and supervisors on green growth related investments.

Improve Pension Fund Governance

Pension fund knowledge regarding infrastructure and green investments could also be improved by appointing trustees and fiduciaries with experience of these sectors - particularly where investments are intended to be undertaken in-house. Such appointments would improve pension fund governance and oversight.

However, an increase in the scale and size of pension funds may be necessary in order to improve pension funds ability to undertake these investments. As noted in the paper, it is currently the larger funds that are involved in green projects as they have the resources to support the development of internal expertise and hence build the capacity to invest directly in green projects. Some pensions funds have therefore expressed the interest in pooling resources to invest jointly (in order to acquire expertise, lower

⁸² (Kaupelyte and Jankauskiene 2009) notes that pension funds investment into venture capital in the UK and USA increased after implementation of the prudent person rule.

fees, better align interests, exercise greater control over projects, to scale up their commitments, improve their knowledge and spread risks). Better pension fund governance of the green finance issue comes with greater scale (see (Stewart and Yermo (2008)). Governments and regulatory authorities should therefore encourage and work with the industry groups (described in this paper) which are striving to pool resources to develop greater expertise in the green investment arena.

Regulators and supervisors also have a role to play in encouraging pension funds to act as more long-term investors and to improve pension fund governance (see (OECD 2009c)). Given climate change related investments involve long-term commitments; pension funds need to be truly acting as long-term investors to align the interests (liabilities) of their beneficiaries with these assets.

However, the structure of corporate ownership has changed and become more disintermediated. Rather than shareholder interacting directly with the firms they invest in, pension fund members may have to go through many layers of decision-makers (from pension fund trustees, to investment consultants, fund of funds and external asset managers) before getting to the actual companies which they are the ultimate owners of. The incentives along this investment chain have become short-term and misaligned with the ultimate, long-term goals of the pension fund. Hence as institutional ownership has grown, the holding period of stocks has declined. Before pension funds can be expected to invest in green projects or financial instruments, they must be encouraged to once again act as providers of long-term capital.

What can be done to encourage institutional investors to be active, long-term investors?⁸³ On the one hand, barriers to active ownership and voting can be removed (such as taxation or takeover rules), incentives put in place (such as requiring voting disclosure), and collaboration initiatives encouraged. Regulators and industry bodies can also provide guidance as to how they expect institutional investors to behave and use supervisory inspections to examine and influence behaviour in order to realign incentives towards long-term, active ownership (e.g. checking the length of mandates given to external managers, the turnover of funds, fees paid, voting behaviour etc.). Pension funds can also be encouraged (or even required) to consider environmental, and social and governance (ESG) issues in their investment analysis.

⁸³ See *Corporate Governance Lessons from the Financial Crisis* (OECD 2009d)

BIBLIOGRAPHY

- Brown, J., Jacobs, M. (2011), 'Leveraging Private Investment: *The Role of Public Sector Climate Finance*', Overseas Development Institute Background Note <http://www.odi.org.uk/resources/download/5701.pdf>
- Caldecott, B. (2010), 'Green Infrastructure Bonds: Accessing the Scale of Low Cost Capital Required to Tackle Climate Change', Climate Change Capital <http://www.climatechange-capital.com/media/172622/ccl%20thinktank%20-%20green%20infrastructure%20bonds%20-%20accessing%20the%20scale%20of%20low%20cost%20capital%20required%20to%20tackle%20climate%20change.pdf>
- Centre for American Progress, (2010a), 'Leveraging Private Finance for Clean Energy: A Summary of Proposed Tools for Leveraging Private Sector Investment in Developing Countries' http://www.americanprogress.org/issues/2010/11/pdf/gcn_memo.pdf
- Centre for American Progress, (2010b), 'Investing in Clean Energy: How to Maximize Clean Energy Deployment from International Climate Investments' http://www.americanprogress.org/issues/2010/11/pdf/gcnreport_nov2010.pdf
- Capital Markets Climate Initiative (CMCI), (2011), 'Investment Grade Policy', report produced for Working Group 1
- Corfee-Morlot, J., B. Guay and K. M. Larsen (2009), "Financing Climate Change Mitigation: Towards a Framework for Measurement, Reporting and Verification", COM/ENV/EPOC/IEA/SLT(2009)6, OECD Publishing, Paris
- EDHEC, (2010), 'Adoption of Green Investing by Institutional Investors: A European Survey', http://docs.edhec-risk.com/mrk/000000/Press/EDHEC_Publication_Adoption_of_green_investing.pdf
- European Commission, (2011), 'A Roadmap for Moving to a Competitive Low Carbon Economy in 2050', COM(2011) 112 final http://ec.europa.eu/clima/documentation/roadmap/docs/com_2011_112_en.pdf
- Hamilton, K. (2009), 'Unlocking Finance for Clean Energy: The Need for 'Investment Grade' Policy', Chatham House Briefing Paper http://www.chathamhouse.org.uk/files/15510_bp1209cleanenergy.pdf
- Impavido, G., Tower, I., (2009), 'How the Financial Crisis Affects Pensions and Insurance and Why the Impacts Matter', IMF Working Paper <http://www.imf.org/external/pubs/ft/wp/2009/wp09151.pdf>
- Inderst, G., (2009), 'Infrastructure as an Asset Class', EIB Papers, Volume 15 No.1 http://www.eib.org/attachments/efs/eibpapers/eibpapers_2010_v15_n01_en.pdf#page=72
- Inderst, G., (2009), 'Pension Fund Investment in Infrastructure', OECD Working Papers on Insurance and Private Pensions, No.32, <http://www.oecd.org/dataoecd/41/9/42052208.pdf>

International Energy Agency (IEA), (2010), ‘*World Energy Outlook 2010*’

International Energy Agency (IEA), (2008), ‘*Energy Technology Perspectives: Scenarios and Strategies to 2050*’ http://www.iea.org/techno/etp/ETP_2008_Exec_Sum_English.pdf

Source: IEA (2010), *Energy Technology Perspectives 2010*.

IMF, (2010), ‘*Navigating the Fiscal Challenges Ahead*’ <http://www.imf.org/external/pubs/ft/fm/2010/fm1001.pdf>

International Organisation of Pension Supervisors (IOPS), (2011), ‘*Pension Fund Use of Alternative Investments and Derivatives: Regulation, Industry Practice and Implementation Issues*’, (forthcoming)

Jones, A.W., Hiller, B.T., (2010), ‘*Achieving Scale in Investment: Global Risk and Opportunity from Climate Change*’

Kalamova, M., Kaminker, C., and Johnstone, N. (2011), “*Sources of Finance, Investment Policies and Plant Entry in the Renewable Energy Sector*”, OECD Publishing, Paris

Kaupelyte, D., Jankauskiene, V.,(2009), ‘*Stimulating Pension Funds Investments to Venture Capital: Opportunities in European Union Countries*’, ISSN 1822 – 8402 Europe Integration Studies 2009 No.3

Kim, J., J. Ellis and S. Moarif (2009), “*Matching Mitigation Actions with Support: Key Issues for Channelling International Public Finance*”, COM/ENV/EPOC/IEA/SLT(2009)8, OECD Publishing/IEA, Paris.

Mercer, (2011), ‘*Climate Change Scenarios –Implications for Strategic Asset Allocations*’ <http://www.mercer.com/articles/1406410>

OECD (2011a), ‘*Towards Green Growth*’

OECD (2011b), ‘*Pension Fund Investment in Infrastructure: Policy Recommendations*’ (forthcoming)

OECD (2011c), ‘*Defining and Measuring Green FDI: Preliminary Findings and Issues for Discussion*’ (forthcoming)

OECD (2011d), ‘*The Benefits of Fostering Innovation in Storage and Grid Management Technologies under Imperfect Information*’ (forthcoming)

OECD (2011e), ‘*Green Growth Strategy for the Energy Sector*’ (forthcoming)

OECD (2010a), ‘*Interim Report of the Green Growth Strategy: Implementing our Commitment for a Sustainable Future*’ <http://www.oecd.org/dataoecd/42/46/45312720.pdf>

OECD (2010b), ‘*Transition to a low-carbon economy, public goals and corporate practices*’, www.oecd.org/daf/investment/cc

OECD (2010c), ‘*OECD Codes of Liberalization of Capital Movements and of Current Invisible Operations*’, http://www.oecd.org/document/59/0,3343,en_2649_34887_1826559_1_1_1_1,00.html

- OECD (2009a), *Private Pensions Outlook*
- OECD (2009b), *Survey of Investment Restrictions*’ <http://www.oecd.org/dataoecd/53/43/44679793.pdf>
- OECD (2009c), *Guidelines on Pension Fund Governance*’ <http://www.oecd.org/dataoecd/18/52/34799965.pdf>
- OECD (2009d), *Corporate Governance Lessons from the Financial Crisis*’ <http://www.oecd.org/dataoecd/32/1/42229620.pdf>
- OECD (2009d), *The Economics of Climate Change Mitigation: Policies and Options for Global Action Beyond 2012*’, OECD Publishing, Paris, www.oecd.org/env/cc/econ/beyond2012
- OECD (2008b)a, *OECD Environmental Outlook to 2030*, OECD Publishing, Paris, www.oecd.org/environment/outlookto2030
- OECD (2008b), *Guidelines for Multinational Enterprises*’, <http://www.oecd.org/dataoecd/56/36/1922428.pdf>
- OECD (2007), *Principles for Private Sector Investment in Infrastructure (OECD 2007)* www.oecd.org/daf/investment/ppp
- OECD (2006), *Policy Framework for Investment*’ <http://www.oecd.org/dataoecd/1/31/36671400.pdf>
- Stewart, F. and J. Yermo (2008), *Pension Fund Governance: Challenges and Potential Solutions*’, OECD Working Papers on Insurance and Private Pensions,
- No. 18, <http://www.oecd.org/dataoecd/18/29/41013956.pdf>
- United Nations Intergovernmental Panel on Climate Change (IPCC) (2011), *Special Report on Renewable Energy Sources and Climate Change Mitigation*’ (SRREN) <http://srren.ipcc-wg3.de/report>
- United Nations’ High Level Advisory Group on Climate Change, (UN AGF) (2010a), *Report to the Secretary-General’s High-Level Advisory Group on Climate Change Financing*’, <http://www.un.org/wcm/content/site/climatechange/pages/financeadvisorygroup/pid/13300>
- United Nations’ High Level Advisory Group on Climate Change, (UN AGF) (2010b), *Climate Change Financing – Report No. 7: ‘Public Interventions to Stimulate Private Investment in Adaptation and Mitigation*’ http://www.un.org/wcm/webdav/site/climatechange/shared/Documents/AGF_reports/Work_Stream_7%20Public_Private.pdf
- United Nations Environment Programme (UNEP) (2009), *Catalysing Low-carbon Growth in Developing Economies: Public Finance Mechanisms to Scale up Private Sector Investment in Climate Solutions*’ <http://www.energy-base.org/fileadmin/media/sefi/docs/publications/PublicPrivateWeb.pdf>
- United Nations Environment Programme Finance Initiative (UNEP FI) (2009), *Green Paper on Financing a Global Deal on Climate Change*’ http://ccsl.iccip.net/financing_global_deal.pdf
- United Nations Framework Convention on Climate Change (UNFCCC) (2008), *Investment and Financial Flows to Address Climate Change: An Update*’ (FCCC/TP/2008/7) <http://unfccc.int/resource/docs/2008/tp/07.pdf>

- Veys, A., (2010), 'The Sterling Bond Markets and Low Carbon or Green Bonds', http://www.e3g.org/images/uploads/The_Sterling_Bond_Markets.pdf
- Ward, M., (2010), '*Engaging Private Sector Capital at Scale in Financing Low Carbon Infrastructure in Developing Countries*', http://www.triplec.co.nz/assets/Uploads/papers/psi_final_of_main_report_full_version_31_may.pdf
- World Business Council for Sustainable Development (WBCSD) (2010), '*Vision 2050: The New Agenda for Business*', <http://www.wbcd.org/Plugins/DocSearch/details.asp?DocTypeId=25&ObjectId=MzczOTc>
- World Economic Forum (WEF) (2011), '*Scaling up Low Carbon Infrastructure Investments in Developing Countries*', the Critical Mass Initiative Working Report http://www3.weforum.org/docs/WEF_EI_CriticalMass_Report_2011.pdf
- World Economic Forum (WEF) (2010), '*Green Investing 2010: Policy Mechanisms to Bridge the Financing Gap*' http://www3.weforum.org/docs/WEF_IV_GreenInvesting_Report_2010.pdf
- World Bank, Public Private Infrastructure Advisory Facility (PPIAF), (2007), '*Review of Risk Mitigation Instruments for Financing Infrastructure*', <http://www.ppiaf.org/ppiaf/sites/ppiaf.org/files/publication/Trends%20Policy%20Options-4-Review%20of%20Risk%20Mitigation%20Instrument%20-%20Matsukawa%20Habeck.pdf>
- Yermo, J. and C. Severinson (2010), "The Impact of the Financial Crisis on Defined Benefit Plans and the Need for Counter-Cyclical Funding Regulations", *OECD Working Papers on Finance, Insurance and Private Pensions*, <http://www.oecd.org/dataoecd/22/11/45694491.pdf>

WORKING PAPERS PUBLISHED TO DATE

The full series is listed below in chronological order. Prior to March 2010, the series was named OECD Working Papers on Insurance and Private Pensions. All working papers can be accessed online at: www.oecd.org/daf/fin/wp.

2011

WP8: Funding in Public Sector Pension Plans - International Evidence

WP7: Reform on Pension Fund Governance and Management: The 1998 Reform of Korea National Pension Fund

2010

WP6: Options to improve the governance and investment of Japan's Government Pension Investment Fund

WP5: The New IAS 19 Exposure Draft

WP4: The EU Stress Test and Sovereign Debt Exposures

WP3: The Impact of the Financial Crisis on Defined Benefit Plans and the Need for Counter-Cyclical Funding Regulations

WP2: Assessing Default Investment Strategies in Defined Contribution Pension Plans

WP1: Framework for the development of financial literacy baseline surveys: A first international comparative analysis

OECD Working Papers on Insurance and Private Pensions

WP41: Policy Action in Private Occupational Pensions in Japan since the Economic Crisis of the 1990s

WP40: Pension Funds' Risk-management Framework: Regulation and Supervisory Oversight

WP38: Managing investment risk in defined benefit pension funds

2009

WP37: Investment Regulations and Defined Contribution Pensions

WP36: Private Pensions and Policy Responses to the Financial and Economic Crisis

WP35: Defined-contribution (DC) arrangements in Anglo-Saxon Countries

WP34: Evaluating the Design of Private Pension Plans: Costs and Benefits of Risk-Sharing

WP33: Licensing Regulation and the Supervisory Structure of Private Pensions: International Experience and Implications for China