Funding the Green New Deal:

Building a Green Financial System

A Policymaker Report from Re-Define

www.re-define.org

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Foreword and Acknowledgements

As Europe continues to grapple with an unprecedented financial and economic crisis and unacceptably high levels of unemployment, it is clear that there is a need for a new approach. At the same time, the International Energy Agency has just reported that global emissions of Green House Gases have just hit a new record level. Global warming and climate change are accelerating and unless decisive action is taken soon, we will all have to pay very large economic, social and human costs for our inaction.

A Green New Deal that aims at ambitious Green House Gas emission reduction targets supported by enacting Green Fiscal Reform and a Greening of the operation of the financial system can provide a solution to the biggest challenges facing the European Union. It can simultaneously help stimulate growth, create additional jobs, reduce GHG emissions and confer a competitive advantage to the EU.

This report, commissioned by the European Greens, surveys the state of the art research to show both that the benefits from a Green New Deal are real and that sufficient public and private sources of funds are available to unleash an ambitious program of Green Investments without any additional burden on the public exchequer in the European Union.

In addition, the report also highlights a series of policy proposals, many of which are new, that EU leaders can enact in order to successfully build a Green Financial System and fund the Green New Deal.

We would like to thank Philippe Lamberts, co-president of the European Green Party , for having taken the initiative to commission this report which is aimed at both demonstrating the feasibility of the Green New Deal and generating practical policy proposals. These show how the Green New Deal can be implemented by the European Union and by its Member States.

We would also like to thank all those involved in the writing of this report which includes the co-authors Sony Kapoor, Linda Oksnes and Ryan Hogarth and Marilyne Beaumont who helped with some additional research. We are also grateful to Greg Ford, Emily McCaffrey and Jessica Townsend for the editing support they provided.

On behalf of the Re-Define Team

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Executive Summary

The Green New Deal, a proposal to try and meet ambitious Green House Gas Reduction targets through a large scale Green Investment Program has been part of the political rhetoric in the European Union since the on-going financial crisis hit the European Union. However, as things stand now, it means different things to different people and is in danger of becoming just another buzzword with little tangible action having been taken in the EU.

This report defines what a Green New Deal will need to look like, estimates how much it would cost, highlights the positive impacts on growth and employment in the European Union, and demonstrates how sufficient private and public sources of funding could be effectively mobilized in support of such a deal.

The Green New Deal will need to aim for a 30% reduction in EU GHG emissions by 2020 and a 50% reduction by 2030 and will need to reinforce the EU's commitment to the 20% energy efficiency target for 2020. This would help save a significant amount of the nearly 3% of EU GDP that the EU spends on fossil fuel imports every year as well as ease energy security concerns and reduce the uncertainty associated with volatile energy prices.

The ambitious green investment program associated with the GND is likely to require green investments of close to 2% of EU GDP annually, a level that is easily achievable and will help provide a much needed economic stimulus to a moribund EU economy and could generate as many as 6 million additional green jobs. Many of the investments that need to be made will generate positive rates of return with the profit potential for energy efficiency related investments being particularly high.

The GND funding needs of around Euro 300 billion per annum will come from a mix of consumers purchasing green goods or making efficiency related investments, private financial investors or existing businesses using their balance sheet or from taxpayers in the form of public support. By far the largest component of this will be funded by the private sector making commercially profitable investments. At $64 trillion, $46 trillion and $27 trillion the stock of financial assets in the EU, credit in the EU and Long-Term financial assets world-wide respectively, there is an ample stock of financial wealth to be able to fund the Green New Deal. Sovereign wealth funds in particular seem to be very well placed to contribute to the financing of the Green New Deal in Europe.

A very strong economic case exists for the EU to significantly scale up green investments, even before the impact of climate change is taken into account. In the face of high, volatile and rising fuel prices as well the future expected higher price for GHG emissions, European Policy Makers and businesses need to consider the levelised lifetime costs of various energy generation technologies and not just the fixed costs which are lower for fossil fuel based power sources.

Once this lifetime cost is accounted for and the risk reduction arising from a diversification of energy generation technologies is factored in using a mean-variance approach, the EU will inevitably come to the same economically sensible conclusion as California, that most, if not all, new power generation plants constructed in the EU need to be green. California has now planned for a third of

all energy generation in the state to be green by 2020, a target we recommend the EU should also follow.

No matter how strong the rational economic case for green investments may be, the fact of the matter is that many financial and non-financial obstacles come in the way of green investments. In particular, the under-pricing of carbon, split incentives that afflict the energy sector, the unpredictability of the climate regime, the higher upfront fixed costs that characterize green investments and the small scale of many energy efficiency investments all act as barriers to the scaling up of green investments.

Simply put distortions inherent in the tax and financial systems the EU currently has means that the risks of dirty investments are underestimated and the profitability of and risks associated with green investments are exaggerated. That is why, EU policy makers need to enact changes that ensure that these distortions are addressed and that the fiscal and financial systems in the EU are made green friendly.

The under-pricing of GHG emissions needs to be addressed first. An emissions price of at least Euro 30 per tonne of CO_2 is needed and will come about once the emissions reduction targets are tightened. We also recommend the introduction of an EU-wide CO_2 tax of Euro 20 on the nearly 50% emissions not covered by the EU Emissions Trading Scheme as well as the full auctioning of all allowances under the EU ETS from 2015. The issuance of an expected forward curve for GHG price and a forward schedule for rising carbon taxes would do much to stimulate green investments and reduce their perceived riskiness.

Accelerating the adoption of the revised Energy Tax Directive as well as adopting an EU-wide approach to Environmental Tax Reform that part allocates the additional revenue from direct and indirect carbon taxes to reducing social security contributions will help tilt the investment landscape away from dirty towards green investments and stimulate the creation of jobs. These steps are also likely to generate additional tax revenue that can help part repair the damaged fiscal balances of Member States.

Companies that are engaged in emissions intensive activities are heavily exposed to a number of risks that include the policy risk from an increase in the price of GHG emissions, the reputational risk from being branded 'dirty' and a serious and growing competitiveness risk from their products going the way of fur coats. That is why, an EU-wide stringent policy of GHG emission disclosure and climate risk evaluation will help ensure that companies take better cognizance of the significant risks they face and this will undoubtedly generate a strong incentive at the level of companies to green their businesses. EU-wide standardization of disclosures and accounting rules that facilitate the consideration of climate risks and savings that arise from energy efficiency investments would also provide a big boost to green investments.

Financial institutions and investors are also heavily exposed to climate risks through their investments. Introducing mandatory requirements for investors with a fiduciary role as well as institutions such as banks that operate on credit licenses to evaluate the carbon exposures of their investment and lending portfolios would be a very prudent policy that would also help divert hundreds of billions of Euros of investments from dirty investments towards green ones. In particular, introducing mandatory carbon price and fuel price stress tests would make investors

aware of the very high degree of carbon risks that most financial portfolios face and would act as a strong trigger to shift their money into more green investments.

Such disclosures and stress tests would also help highlight the very significant and growing investment opportunities in the green sector where early movers are likely to enjoy an advantage. Fossil fuel revenue funded sovereign wealth funds will also see the diversification and risk reduction potential that investments in the green sector in the EU offer them. Meanwhile, the EU should consider introducing climate risk, which is also a form of systemic risk, considerations into its capital requirement directives that govern how much capital banks and other credit institutions have to hold against their assets.

The short-termism inherent in modern finance that introduces a bias against green investments can be tackled by additional reforms such as the introduction of financial transaction taxes, changes to compensation practices, limiting turnover ratios for fiduciary investors, linking performance measurement to absolute benchmarks and the introduction of voting periods linked to the duration of holdings. These and many other sensible reforms that can be introduced as part of the on-going financial reform process in the European Union to build a green financial system.

The EU should take the lead, using its public finance institutions such as the European Investment Bank, in the promotion of green investment instruments such as green bonds, green mortgages, green indices, green securitization and green savings which have an enormous potential to connect savers with profitable green investments. A special program to fund Energy Service Companies that can help highly profitable but often ignored energy efficiency investments at the level of households would also be a big contribution towards promoting green investments.

The endemic problem of split incentives can be tackled by a number of policy measures such as adopting an EU version of the Top Runner energy efficiency program used in Japan, issuing new and increasingly tough energy efficiency standards for all white goods, new homes, vehicles and other energy intensive products. Aligning the incentives of utilities to those of their customers in increasing energy efficiency through the use of energy savings certificates and banning the consumption of energy inefficient goods for which cheap and efficient replacements already exist would also help tackle the problem of split incentives. The introduction of mandatory green mortgages or penalty stamp duties on the sale of energy inefficient houses would help stimulate more energy savings investments in home insulation.

Making it mandatory to prominently display the lifetime costs for all energy intensive goods along with the fixed costs would help skew consumer purchases in the direction of green goods.

While most of the investments are likely to come from private sources, some public investment support will definitely be needed. The revenues for this could be mobilized through a combination of green taxes/auction of emissions quotas, bank levies and financial transaction taxes and EU and Member State level policies designed to tackle tax flight. Together, these are likely to raise hundreds of billions of Euros of additional tax revenue for EU governments with a highly progressive incidence.

These revenues can then be split between supporting green investments, reducing employment taxes and addressing fiscal deficits.

The lack of appropriate financial instruments continues to thwart private investments and certain green investment bottlenecks require public support. Research and Development funding, which needs to be significantly expanded could be delivered increasingly in the form of contingent grants and innovation prizes and can deliver more bang for the buck if it is better co-ordinated at the European level.

The zone between the development of technologies which is often supported by public funds and its commercialization is risky and is also called the valley of death for the high rates of failures. The EU, where the venture capital funding market is not as well-developed as in the United States, could help green investments along by increasing the provision of direct public venture capital funding through the EIB and by helping stimulate more such funding through requirements on public pension funds to allocate a proportion of their portfolio to a fund under the aegis of the EIB.

Other forms of public support in the form of mezzanine funding, loan guarantees, risk-sharing and co-investments can help overcome many of the other green funding bottlenecks and hence stimulate the flow of lager sums of green investments. Adding to funding support through incubator services of the kind provided by the UK through the Carbon Trust can also help tremendously.

This approach needs to be accompanied by an EU-wide strategy to green public procurement that amounts to as much as 16% of EU GDP and can help significantly scale up and stimulate the production of green goods and services in the EU and bring down the costs of the same. This will not only save recurring fuel costs but can also help the EU gain a significant competitive advantage as the world-wide demand for green technologies grows.

Local authorities in particular have a significant role to play in the Green New Deal. A city-wide energy efficiency investment program in street lighting, public housing, public buildings and public transport and transform the local economy. Since many of these generate positive economic returns in the long-term, an ambitious public funding support program that will in most instances not need an element of subsidy can help unleash the Green New Deal.

It is recommended, given the important role that the European Investment Bank already plays in the financing of green investments in the EU, that it should be anointed as the EU equivalent of the UK's Green Investment Bank.

Changing billing policies and real estate tax policies to allow Energy Savings Companies that help finance energy efficiency investments in privately owned houses and office buildings to recover their investments directly through sharing benefits of financial savings through lower energy consumption will also provide a big boost to green investments at the level of local authorities.

An EU-wide plan to introduce consumer funded Feed-In-Tariffs that are adjust downward over time but in a predictable manner will have the dual benefit of stimulating more green energy generation and a downward adjustment in energy consumption.

While the overall economic case for the GND is very clear, it is imperative to also look at the distribution of the costs and benefits generated by the associated fiscal and financial reforms. By most considerations, the impact of the GND is likely to be highly progressive. The green fiscal reform program we advocate is loosely modelled on the successful environmental tax reforms enacted in Sweden, Germany and in British Columbia in Canada all of which have had a progressive impact.

While the move away from dirty industries will generate unemployment, the green investment program is expected to generate a much greater number of new green jobs across a whole range of skill levels. The energy efficiency program can help offer employment to over a million workers many of whom would have lost jobs in the construction sector. In particular, we suggest the setting up of an EU low carbon transition fund that focuses on retraining of workers and skill development for green jobs. This will help smooth the employment transition associated with the Green New Deal and will prevent structural unemployment from taking hold.

Another issue is the perceived risk of industry flight and the carbon leakage associated with it which critics of the GND say will result from a tightening of EU policies on GHG emissions. While the concerns are legitimate, there is growing evidence that the risks have been exaggerated. The industrial sectors at risk only have a small contribution to the GDP of the EU. Meanwhile other parts of the world are also enacting tougher climate policies so many companies will find it unwise to pay the large costs associated with relocation just to gain a temporary reduction in their GHG bills. In fact the EU is starting to lag behind emerging economies in terms of the efficiency of its industrial installations and could gain significant competitive advantages by tightening emission rules.

Moreover providing labour tax rebates funded by green tax revenue, providing support for increasing energy efficiency and in extreme cases using WTO –compatible Cross Border Tax Adjustments can help address any serious competitive problems that may arise.

1. The multiple crisis and the Green New Deal

The EU faces a multiple crisis

In the middle of 2011, the European Union finds itself in a difficult situation. It faces headwinds on multiple dimensions most of which would already pose significant challenges on their own. The multi-faceted nature of the crisis means that only a highly ambitious and multifaceted policy response is likely to work to get the EU out of the corner it finds itself in.

High unemployment, depressed investment and uncertain growth prospects

Europe is simultaneously facing financial, economic and fiscal headwinds. Unemployment, particularly in some of the troubled peripheral economies, remains very high and continuing financial and economic fragility and uncertainty has depressed investment levels. The unemployment rate in the EU is a high 9.5% with that in troubled economies such as Spain exceeding 20% as of early 2011[i]. These factors have also cast a shadow over growth particularly at a time when other major large economies such as the US and Japan are vulnerable. Growth in the EU plummeted to - 4.2% for 2009 with some countries hit much harder than that. Current and future growth prospects for the EU remain depressed and uncertain feeding back into a low confidence-low investment-low growth loop particularly in countries such as Greece which saw a 4.5% fall in GDP even in 2010.

A fragile financial sector and a fiscal squeeze

At the same time that this real demand side of the economy is weak, the financial supply of funds for private and public investments is highly constrained[ii]. The financial sector has yet to recover from the deepest financial crisis in a generation and credit supply is squeezed with some of the peripheral economies facing significant reductions in the availability of credit. Moreover, the financial sector has become especially risk averse to the trio of growth generating SME, infrastructure and green investments[iii]. Fiscal austerity and consolidation hold sway across the union so public investment levels, including in these three sectors, are also depressed and are unlikely to recover anytime soon. Fiscal deficits in the EU averaged 6.4% in 2010[iv] and all EU governments are committed to programs of austerity with government spending set to contract significantly particularly in the peripheral economies.

Rising inequality, hurting poor and fraught politics

Inequality levels in the EU were rising in the run up to the crisis and the crisis driven high levels of unemployment, tax rises and cuts to public services are likely to hit blue collar workers especially hard. This is resulting in widespread social unrest across the EU but particularly in the peripheral economies where the effects are the most severe. The parallel development is the rise of an anti EU, anti-solidarity populist sentiment as seen most drastically in the richer northern economies of Germany, the Netherlands and Finland. What is common between the two sides of these political developments is a rising Euro scepticism that threatens to severely disrupt the functioning of the Union.

The unsustainability of the current economic structure

The world at large, including the EU, remains on an unsustainable path that leads to climate disaster resulting from excessive Green House Gas (GHG) related global warming. There is widespread consensus that unless GHG emissions in the EU (and elsewhere) are cut drastically, climate change will be irreversible and will extract a very high human and economic cost. The international targets for reducing GHG emissions agreed at the Copenhagen summit in 2009 are insufficient and according to a recent study will likely lead to an unacceptable three degree rise in temperature by 2100 [1].

A rise of this magnitude is associated not just with significant falls in crop yields and water availability but also with a substantial rise in the number and severity of natural disasters such as floods and droughts. There is also a near universal agreement that taking acting to limit GHG emissions now rather than later will be far more economically efficient. In addition to the problem of GHG emissions and climate change, there are also other broader issues of pollution and damage to the Eco system. For example, GHG emissions from fossil fuels are also often accompanied by particulate emissions and vehicle exhausts have significant quantities of nitrogen oxide, another pollutant. UNEP estimates that more than 60% of natural ecosystems in the world have been seriously depleted [109].

The high and volatile price of fossil fuel imports

Much of our legacy power, energy and transport infrastructure has been constructed at a time when the price of fossil (dirty) fuels oil, gas and coal was significantly lower than levels that have prevailed recently. A permanent demand shock in the form of the rise of fast growing emerging economies has shifted the price of fossil fuels to a higher level and recent years have also seen a drastic rise in the price volatility of fossil fuels [111]. The on-going political developments in North Africa and the Middle East have once again induced significant increases in the price and volatility of fossil fuels. This has a large and negative impact on the economy of the European Union because it needs to import a majority of its fuel.

Energy insecurity and the question of ethics

Beyond the economic perspective, the EU's heavy dependence on imported oil and gas also raises questions about the security of its energy supply. In particular, the EU is dependent on imports from a relatively few countries many of which are not known to be shining examples of human rights and good governance. This raises both the question of the possible interruption of energy supplies and its large potential economic cost as well as ethical questions about how far EU money flows to noxious regimes and how the EU faces serious constraints on its foreign policy so as to avoid provoking major oil and gas exporting countries.

The Green New Deal as a response to this crisis

This multifaceted crisis undoubtedly needs an ambitious and multidimensional response. It has been suggested that a Green New Deal (GND) that mobilizes large scale private and public investments to green the EU economy may be such a response that simultaneously provides an economic stimulus, creates new employment, tackles impending climate change and puts the EU economy on a path of sustainability.

While this Green New Deal has become a buzzword, many people have used it, in many different contexts to refer to a variety of objectives, often without a clear understanding of what it might entail. Before any more detailed discussion of how it might work or how this program might be financed (the object of this report), the GND must be defined.

Box 1: The Green New Deal

The Green New Deal was launched as a solution to the twin challenges posed by the economy and the climate. It has been argued that the economic crisis offers an unprecedented opportunity for governments to invest in a low carbon future. Inspired by Roosevelt's New Deal to rebuild the US economy and reform its financial system through the Great Depression of the 1930s, the idea of a Green New Deal goes further. It is about achieving global prosperity without threatening the opportunities and livelihood of future generations.

At its core is the idea that by tackling climate change we can protect the sustainability of our ecosystem and achieve long-term economic growth. Governments, by encouraging investments in low carbon technologies, can stimulate green job creation to tackle the unemployment problem and help steer Europe along a sustainable growth

Re-Define builds on this definition by considering the Green New Deal in terms of the following core objectives:

- Tackling Climate Change by meeting ambitious targets for reducing GHG emissions in the EU
- Without jeopardizing economic growth and where possible stimulating 'green growth'
- While creating new employment opportunities in the form of 'green jobs'
- With a progressive incidence of policies so the burden fall most on those who can afford it
- While recognizing the political constraints imposed by not having a Global Climate Deal
- Whilst not worsening, and where possible improving, fragile fiscal accounts of EU states

The urgent need to tackle climate change

There is near universal agreement that the rapid and accelerating accumulation of man-made Green House Gases (GHGs) driven by fossil fuel consumption and deforestation needs to be tackled urgently. Global warming is already underway and if allowed to run unchecked could trigger sudden catastrophic climate change. Climate change is associated not just with significant falls in crop yields and water availability but also with a substantial rise in the number and severity of natural disasters such as floods and droughts. The need to tackle climate change is becoming ever more urgent as ice packs melt, sea temperatures rise and rainfall patterns change.

As the rises in temperature and the effects of climate change turn out to be worse than what has been forecast even recently, this urgency cannot be overstated. That is why this paper recommends that the EU follows an ambitious GHG reduction program entailing at least a 30% reduction in emissions (with reference to 1990 levels) by 2020 with more ambitious reductions subsequently. The EU should also follow the example set by the UK recently to have longer term carbon budgets to improve policy certainty. The UK has just committed itself to a 2023-2027 carbon budget that commits to a reduction of 50% on UK GHG emissions (on 1990 levels) by 2027 and we suggest that the EU should also adopt this ambitious target[v].

Whilst trying to stimulate green growth

The EU has been hit relatively hard by the economic crisis and our growth prospects remain highly uncertain. The OECD has suggested that under a 'business as usual' scenario, EU growth prospects over the next decade will be half of the pre-crisis levels, a disturbing scenario[vi]. It is in searching for sources of growth that one must look back to the investment and mobilization program driven by United States' role in the Second World War. This was a key factor in pulling the US out of economic doldrums and turning it into the most dynamic economy in the World. While we are not recommending that the EU go to war, we are indeed saying that a large investment program targeted towards tackling climate change in the EU could indeed help stimulate the economy and start a virtuous cycle of green investment and green growth.

The Stern Review[2] made the point that 'investing' today to move the economy onto a low-carbon footing or mitigation financing would be expensive, but far less so than would dealing with the economic consequences of the level of climate change resulting from 'business as usual'. There is thus a strong economic case for acting now by frontloading investments otherwise the costs involved will increase on a year-by-year basis at the same time as increasing the risk of a systemic breakdown in climate patterns.

Frontloading investments in renewable energy, green infrastructure and energy efficiency measures will both allow the EU to tackle climate change effectively and help provide a much needed economic stimulus that can set us on the path of green growth. It has been estimated that the GND can increase the growth rate of the European economy by up to 0.6% of GDP per year [108].

While creating new employment in the form of green jobs

Workers have been hit the hardest by the financial crisis with unemployment in the EU having more than doubled in the crisis. A key focus of the Green New Deal thus needs to be to ensure that new jobs are created as a result of the new investments that will be undertaken to put Europe on to a low carbon trajectory. Jobs are likely to be created in a broad range of existing industries including vehicle manufacturing, construction, and lighting, heating and cooling equipment. Many new jobs will also be needed in the area of research and development and engineering.

While it is true that the GND is likely to lead to a loss of jobs in the 'dirty' sectors of the economy that are energy and fuel intensive, many of those displaced should be able to find jobs in the renewable energy and carbon efficiency sectors. This means that structural impediments such as the lack of proper training and other frictions will need to be addressed and that sufficient funds must be allocated to retrain workers and provide for adequate protection of workers who are not able to retrain. It has been estimated that the GND investment program will create up to 6 million additional jobs [108].

With a progressive incidence of policies

While the crisis had affected the middle classes as well as the wealthy in the EU, the brunt of the economic hardship has fallen on lower income groups. The new-fangled enthusiasm for fiscal austerity throughout the EU is likely to affect the lower income groups who most depend on public services and welfare most severely. It is also widely believed that the costs of climate change, in the form of higher food prices, for example, will affect the poor disproportionately.

This means that every effort should be made by governments pursuing the GND to make the net effect of GND fiscal, financial and regulatory policies as progressive as possible. The financial burden should fall most on those most able to afford it and the benefits flowing from the GND should, to the extent possible, be targeted towards the poorest sections of society. This would help at least partly offset the trend towards greater inequality in the EU and alleviate the problems faced in particular by those at the bottom of the income strata as a result of the financial and economic crisis.

It is helpful then that while green jobs are expected to be created across a whole range of economic sectors, the greatest number will be in the construction sector which should help the poorest sections of society.

While recognizing the political constraints of not having a Global Climate Deal

In an ideal world, the global scientific consensus on climate change would by now have led to a binding global agreement on tackling GHG emissions. Unfortunately, the Copenhagen climate summit in December 2009 and the Cancun summit a year later failed to deliver any agreement on carbon mitigation policies such as cap-and-trade or a carbon tax.

This means that there is no global price on carbon emissions, that internationally the 'dirty' sector continues to look more attractive than green investment and that public revenues from direct or indirect taxation of GHG emissions are too small to finance large scale green investments.

In the absence of global agreement, there is little choice but to finance and implement Green New Deal policies at national or regional level. This paper therefore focuses on fiscal, regulatory and financial sector policies that the EU could adopt on its own. Importantly, analysis has shown that the growth and employment benefits of the GND are available even in the absence of a global agreement [108].

Whilst not worsening, and where possible trying to improve, fragile fiscal accounts of EU states

The EU in general and the Eurozone in particular is facing a serious fiscal retrenchment as the daily Eurozone crisis headlines in the newspapers clearly highlight. Greece's debt is expected to exceed 150% of GDP in 2011, Ireland's fiscal deficit for 2010 was 32% and Portugal has become the latest country to request for financial assistance from the EU and the IMF.

It is not only these countries that are in austerity. Most other EU states are also engaged in some form of spending cuts and tax increases. Finding public money for green investment is very hard if not impossible at this time, especially when even basic provision of healthcare and education services is also being cut. Green expenditure is often wrongly seen as a 'luxury' item to be funded in good times only.

While the bulk of green investments by volume will come from the private sector, public investment is a critical catalyst. Public money is crucial in galvanizing follow-on investment from the private sector, for example in R&D, risk-sharing or co-investments in projects that provide marginal return at the current carbon price or seem too risky from a purely financial perspective.

The fiscal constraints mean that these public funds will need to come through additional public revenue. Additional carbon or environmental taxes and the auctioning of a greater proportion of

emission allowances under the European Emissions Trading Scheme (ETS) should be the first post of call and provides a significant potential for additional revenue. The discussion on the taxation of the financial sector is also promising in terms of revenue potential. Tackling tax flight, which costs EU governments hundreds of billions of Euros, would also generate significant revenues. Cracking down on tax avoidance has a highly progressive incidence and is politically popular in these austere times.

What the Green New Deal will entail

At a minimum, the Green New Deal will need to have a multi-faceted program that involves

- changes to the tax system
- a greening of the financial system
- changes to the behaviour of economic actors and
- targeted public and private green investments

This will need to be backed by

- high level political leadership
- an involvement of governments at the level of the EU, Member States and Local Authorities
- tangible actions by consumers and businesses and
- confidence enhancing Green expectation management in the EU

Such a multi-dimensional could help simultaneously address Europe's economic, financial and fiscal malaise at the same time as shifting the EU to a path of a sustainable green economy that addresses Europe's growth, unemployment and productivity woes.

This Green New Deal would target ambitious GHG reduction targets through a combination of large scale public and private investments in energy efficiency and renewable energy that will provide an economic stimulus creating employment, delivering growth and increasing productivity through the cost savings and the development of new technologies. These will be financed by a combination of public revenues generated by green taxes, taxes on the financial sector and tackling tax evasion as well as savings from lower fossil fuel imports and private investments stimulated by regulatory reform to build a green-friendly financial system.

In order to successfully execute this program, the EU, Member States and Local Governments would all need to act to remove various friction and information costs that currently penalize green investments. This will also need to be accompanied by a program for

- managing public and business expectations for a green future
- changing consumer and business behaviour and
- increasing the awareness of investment and climate risks arising from continuing 'dirty investments'

The Green New Deal will also deliver a much higher degree of energy security by reducing our dependence on imported fossil fuels and will free the EU to exercise a more principle based foreign policy and stop our fossil fuel purchases from funding noxious regimes.

The EU's approach

The EU's flagship climate related policy is the so called EU 20/20/20 targets[vii] that aim at reducing the EU's GHG emissions by 20% increasing the share of renewable energy production to 20% and increasing energy efficiency by 20% all by the year 2020. As things stand now, the EU is on track to meet the first two of these targets but will only end up increasing energy efficiency by 10% instead of the targeted 20%[viii].

The EU also has a longer term target of reducing its emissions by between 80% and 95% by the year 2050 as laid out in its roadmap for 2050[ix].

This report suggests that the EU should target at least a 30% reduction in emissions by the year 2020 and aim to meet or exceed the 20% efficiency target it had set itself under the EU 20/20/20 and match the UK by having a target of 50% emissions reductions by 2027 or latest by 2030. Moreover, we believe that the EU should seek to meet these targets unilaterally and not as currently envisaged conditional on a global agreement.

The investment program and savings associated with such a program will deliver significant economic benefits to the EU. The financing, as we will show in the report, is available and may even be easier to come by if the EU moves unilaterally towards these targets. Moreover, the scaling up and learning by doing created by such a program has a strong potential to trigger significant green innovation in the EU that can help create a serious competitive advantage in a world where the Green sectors of increasing energy efficiency and generating renewable power will become increasingly more important [108].

Combined with the decrease in the bill for fuel imports, green exports generated by the EU can help build up a favourable current account balance that will be particularly useful for peripheral economies such as Greece, Ireland, Portugal and Spain that are currently suffering from unsustainable current account deficits and a lack of competitiveness.

Summary

The EU faces a multiple crisis of

- high unemployment, depressed investment and uncertain growth prospects
- a fragile financial sector and a fiscal squeeze
- rising inequality, hurting poor and fraught politics
- the unsustainability of the current economic structure
- the high and volatile price of fossil fuel imports
- energy insecurity and engagement with dubious regimes

As a response to this multiple crisis, an ambitious a set of actions are necessary. They fall under the umbrella of a Green New Deal and include

- tackling Climate Change by meeting ambitious targets for reducing GHG emissions in the EU
- without jeopardizing economic growth and where possible stimulating 'green growth'
- while creating new employment opportunities in the form of 'green jobs'
- with a progressive incidence of policies so the burden falls mostly on those who can afford it

- while recognizing the political constraints imposed by not having a Global Climate Deal
- whilst not worsening, and where possible improving, the fragile fiscal accounts of EU states

At a minimum, the Green New Deal will need to have a multi-faceted program that involves

- changes to the tax system
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- targeted public and private green investments

This will need to be backed by

- high level political leadership
- an involvement of governments at the level of the EU, Member States and Local Authorities
- tangible actions by consumers and businesses and
- confidence enhancing Green expectation management in the EU

The EU's approach consists of a EU 20/20/20 program and a EU 2050 roadmap that seek to

- achieve s 20% emissions reduction
- a 20% share of renewables in EU energy markets
- a 20% improvement in energy efficiency in the EU
- and reduce GHG emissions by between 80% and 95% by 2050

We suggest that the EU needs to have a much more ambitious approach that requires

- a 30% reduction by 2020
- a 50% reduction by 2027 or 2030 rather than the 40% by 2030 under the EU 2050 roadmap

2. Current state of play and investment needs for the GND

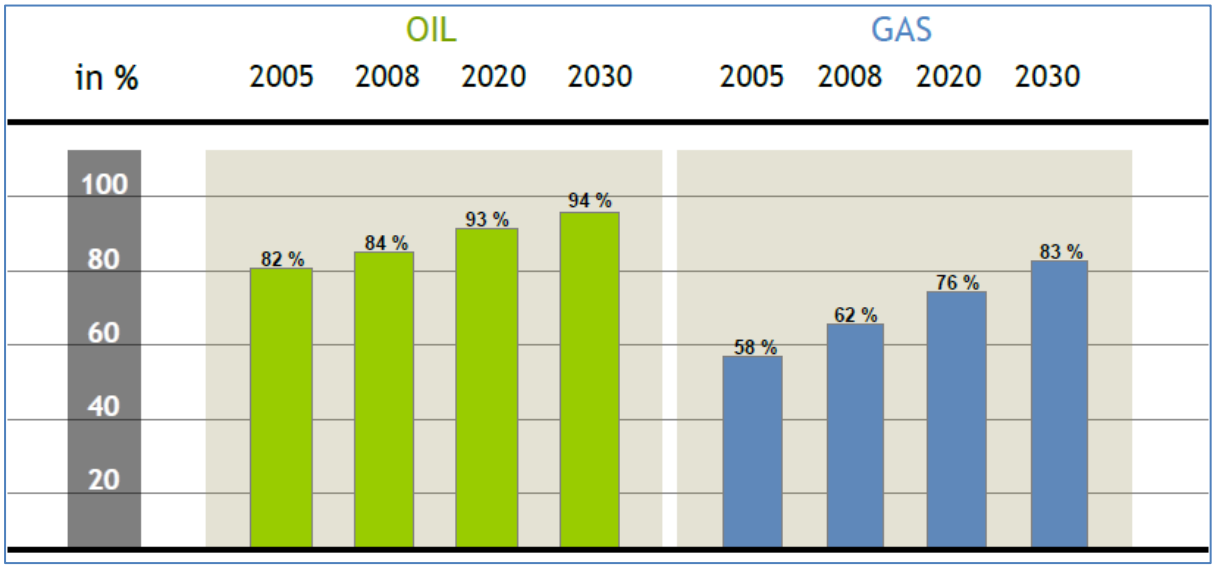
The EU is highly dependent on fossil fuels which are the largest sources of emissions

The European Union is one of the largest emitters of GHG gases and one of the largest consumers of energy in the world. Fossil fuels represent more than 80% of the EU's energy mix and under a business as usual scenario in the absence of embarking on an ambitious GND, are still expected to represent 70% of the mix in 2030 [120].

The use of energy in the EU is responsible for 79% of all GHG emissions with agriculture and industrial process both bringing up the balance. That is why any effort to reduce emissions under the GND must focus necessarily on the energy sector.

As pointed out in the previous Chapter, the EU imports most of its fossil fuel consumption. This also makes it the largest importer of fossil fuels and this dependence is only set to rise as can be seen in the figure below.

Figure1: Percentage of fossil fuel imports under a business as usual scenario



Source: European Commission [120]

The EU has paid between Euro 300 billion and Euro 350 billion annually to import these fuels over the past few years and the fossil fuel price rise between 2007 and 2008 and again between 2009 and 2010 alone cost the EU more than 0.5% of its GDP. Banks Goldman Sachs and Morgan Stanley have predicted that the price of crude is likely to average between $120/barrel and $140/barrel between now and 2014, which would significantly add to the EU's import burden. Most of the EU's imports of oil and gas come from OPEC countries, Russia and Norway.

The combination of the

- high (and rising) cost of importing fossil fuels – 2% to 3% of GDP annually
- the high and increasing volatility of fossil fuel prices
- the concentrated dependence on a small number of countries for imports

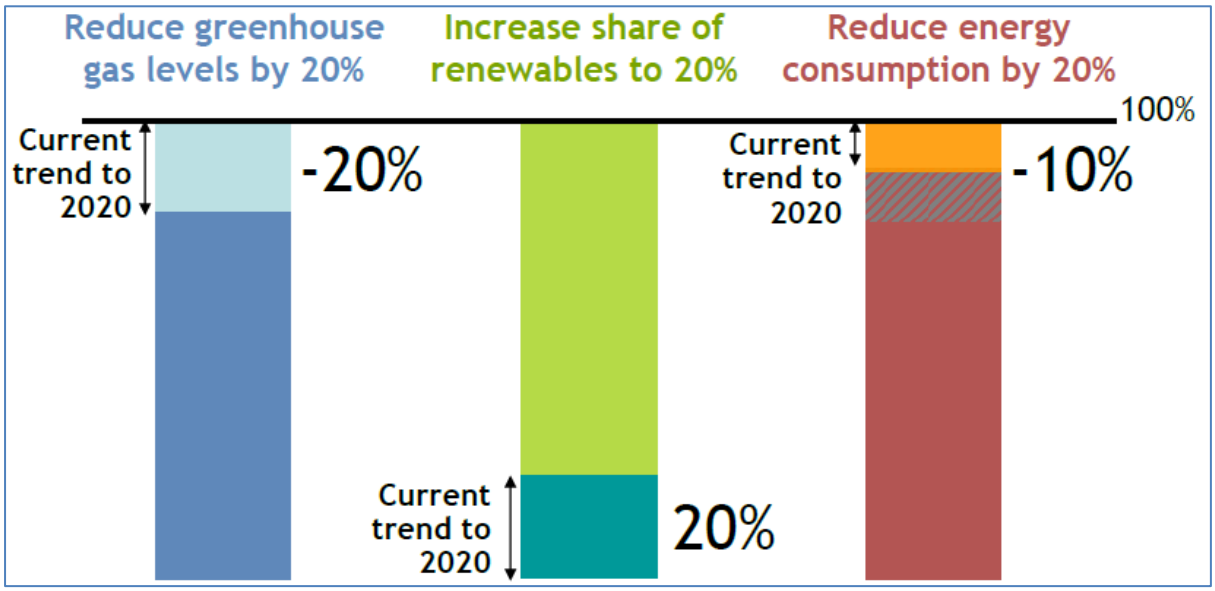
- and the very large contribution of these fuels to GHG emissions

mean that the EU has a very strong incentive to reduce its dependence on fossil fuels through investments in green energy.

The European Union Plan

The EU has adopted a policy of targeting a 20% reduction in emissions, increasing the share of renewables in electricity production to 20% and reducing energy consumption by 20% through efficiency measures by the year 2020. These 20-20-20 targets as they are often called have not been very ambitious. Despite this, the EU is set to fail to reach to reach all of them in the absence of a new approach such as the Green New Deal.

Figure 2: The EU is not on track with all of the 20-20-20 targets



Source: European Commission [120]

The EU's lack of progress on the efficiency targets is particularly disturbing as reducing energy consumption through efficiency improvements is a win-win policy that can deliver the double dividend of GHG reduction and cost savings/economic growth. In the words of Steven Chu, America's energy secretary, some of the energy efficiency measures are not just the 'low hanging fruit' in terms of their contribution to GHG reductions but are actually 'dollar bills lying on the ground' [118].

Achieving the target 20% demand reduction through efficiency enhancing measures can cut the EU's energy bill by Euro 200 billion per year in 2020 translating into an annual household saving of Euro 1,000, create up to 2 million jobs and deliver significant GHG reductions [120].

The European Commission has also published a roadmap highlighting its plans for achieving a low carbon economy and this envisages emissions reductions of 25% by 2020, 40% by 2030, 60% by 2050 and 80%-95% by 2050 [121]. It has been suggested that if the EU were able to achieve the 20% efficiency improvement envisaged in the 20-20-20 plan, it could deliver a GHG reduction of 25%.

Work done by the German Ministry of Environment shows that the EU should target an emissions reduction of at least 30% by 2020 and that this could be achieved as part of the Green New Deal discussed in the last chapter. This would deliver GHG reductions, GDP growth and job creation [108].

How much would it cost?

It is notoriously hard to make accurate estimates for achieving targeted reductions in GHG emissions because of the large uncertainties involved. Nevertheless a number of estimates exist and examining these gives at least some idea of the order of magnitude of resources and additional investments required.

The amounts of additional investments needed to meet the less ambitious shorter-term targets under the 20-20-20 plan amount to around Euro 100 billion a year till 2020 [120]. However, this does not include the investment needs for increasing energy efficiency.

The European Commission has estimated that in order to meet its roadmap targets, of 40% reduction by 2030 and 80%-95% by 2050 there would need to be a sustained increase in public and private investment to the tune of about Euro 270 billion annually. In terms of levels of investment, this would mean that the EU needs an additional dedicated green investment of about 1.5% GDP annually that will add to the overall investment levels in the economy which are stagnating at around 19% of GDP [121].

The German sponsored 'A new growth path for Europe' report foresees a need for investment levels to increase further to 22% of GDP in order for the more ambitious 30% GHG reduction target to be achieved by 2020 [108].

Barclays Capital and Accenture estimate that the EU's transition to a low carbon economy may need up to 2% of GDP in annual investment. They have divided the capital required into Euro 591 billion in development capital and Euro 2,300 billion in procurement capital between now and 2020. They calculate that this would bring about annual cost savings of up to Euro 200 billion and reduce EU emissions substantially [114].The Green Investment Bank Commission in the UK has estimated that the UK needs GBP 550 billion of investment to hits its green targets for 2020 and that GBP 40-50 billion is required annually till 2030[69].

At a global level, the Stern report [1] suggests that additional investments amounting to 1% of global GDP are appropriate. UNEP [108] estimates that the annual financing need to green the global economy, on the basis of several studies it surveyed, to be between $1.05 and $2.59 trillion per annum. It suggests that the intermediate sector based estimate of $1.3 trillion is less than a tenth of the annual global capital formation that is close to 20% of global GDP so can be easily financed within existing financial resource constraints.

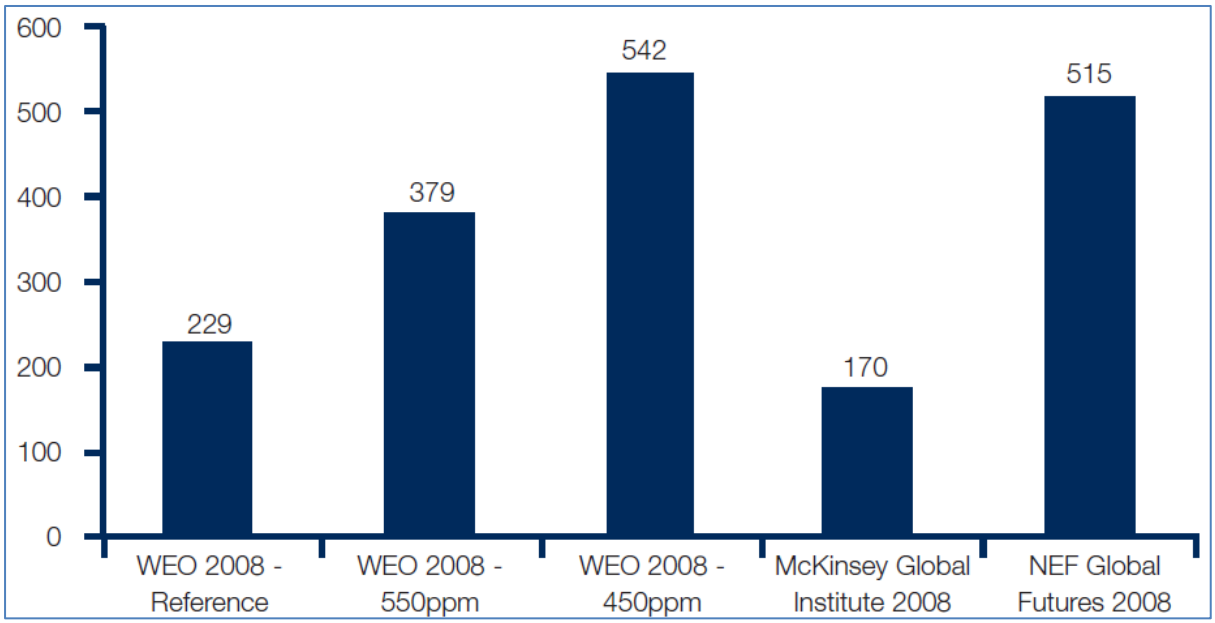
The IEA estimates that it requires investments of US$ 46 trillion higher than what is required in the baseline scenario, or approximately US$ 750 billion per year from 2010 to 2030 and US$ 1.6 trillion per year from 2030 to 2050 to halve worldwide energy-related CO_2 emissions by 2050.

Bloomberg New Energy Finance has calculated that clean energy investment needs to rise to US$ 500 billion per year by 2020 to restrict global warming to less than 2°C [127]. McKinsey estimates that the total annual cost to society of putting the world on a sustainable path would be Euro 500

billion to Euro 1,100 billion in 2030 or 0.6 to 1.4 per cent of GDP in that year. The figure below summarizes some of the estimates of annual green energy investment needs made by different organizations.

At this point it is also worth recollecting that the total subsidies paid to support fossil fuels world-wide amounted to more than USD 312 billion in 2009 in comparison to USD 57 billion in support of renewables [8]. This represents a substantial scope for shifting the investment landscape away from dirty investments and towards green investments.

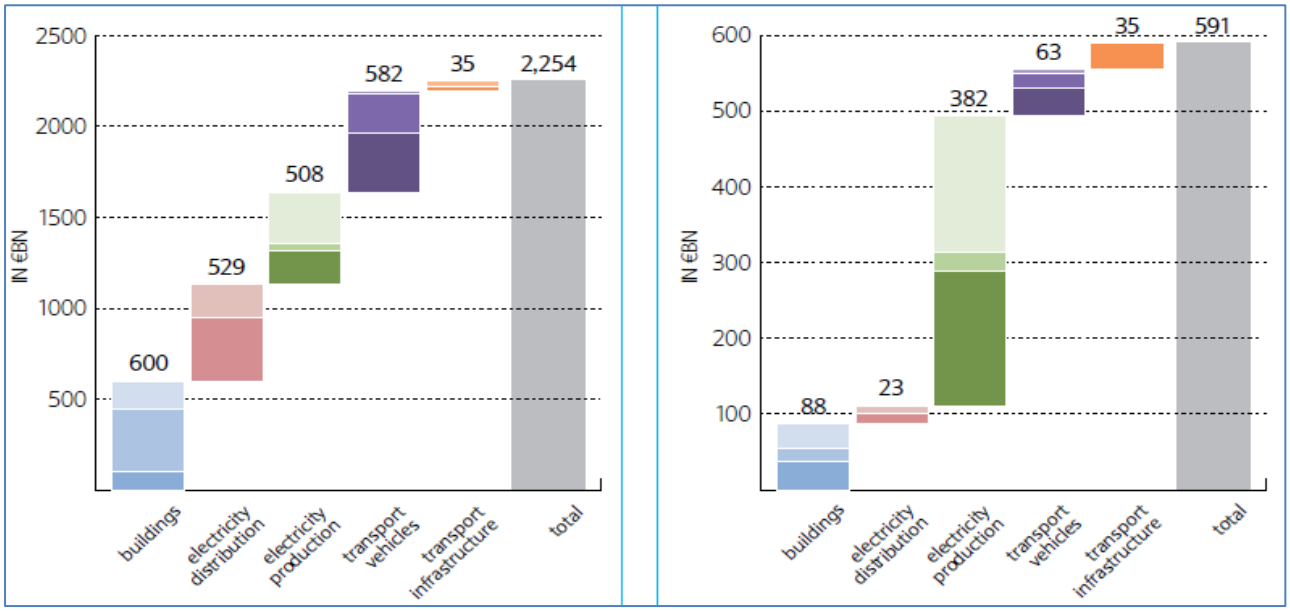
Figure 3: Estimated clean energy investment needed annually until 2030 ($ billion)



Source: World Economic Forum [124]

On the whole, most EU and global estimates of additional global investments fall within the 1%-2% of GDP range so we will use this as a guideline. In the EU, this will amount to Euro 125 billion – Euro 250 billion of investments annually particularly in the short to medium term time horizon that this report concentrates on. The following figure gives one estimates of the breakdown of the EU funding requirements across the type of capital required i.e. for development or procurement and also across the main sectors that the capital would need to be allocated to.

Figure 4: Estimates of cumulative procurement (left) and development capital for the EU (2010-20)



Source: Accenture and Barclays Capital [114]

The need for firm public policy action and resources for investments

Both the 2020 plan and the roadmap to 2050 are expected to deliver net economic benefits to the EU economy. The 2020 plan is expected to save the EU as much as Euro 200 billion annually on energy bills and the roadmap is expected to deliver savings of between Euro 175 billion and Euro 300 billion annually over the next 40 years. In both cases, the savings are likely to exceed the extra costs of additional investments. Additional benefits such as the reduction in mortality from lower air pollution are expected to be as high as Euro 38 billion annually by 2050[121].

However, unless firm public policy action is taken, even investments that deliver net economic benefits are not likely to be undertaken. The biggest reasons for this are

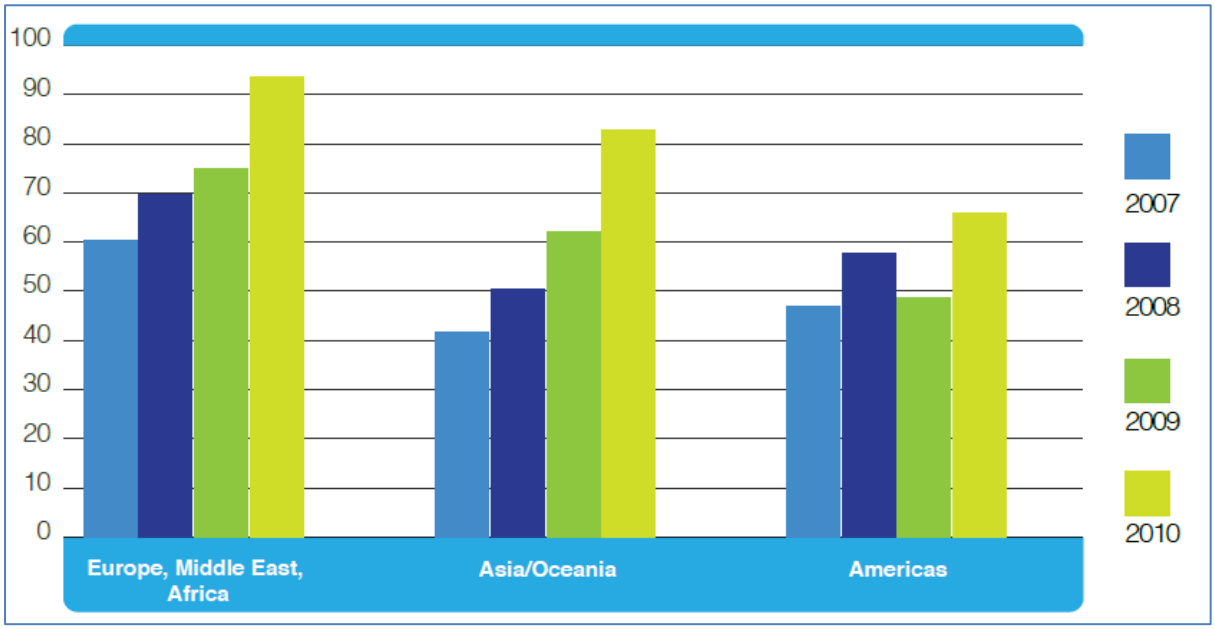
- the benefits of any green investments are likely to accrue through time whereas the costs are likely to be concentrated upfront
- the benefits of green investments in terms of savings in energy costs may accrue to different economic actors than those who make the investments in the first place
- many of the positive externalities such as the benefits of enhanced energy security and of GHG emission reduction are not monetized and cannot be fully captured

For the rest of the paper we use the range of Euro 125 billion-250 billion of green investments needed in the EU annually in the run up to 2020 as the benchmark. It is important here to remember that some of these investments

- are already happening
- will be financed by simply diverting resources from dirty to green investments
- may need additional new resources

Below we look at all three of these categories.

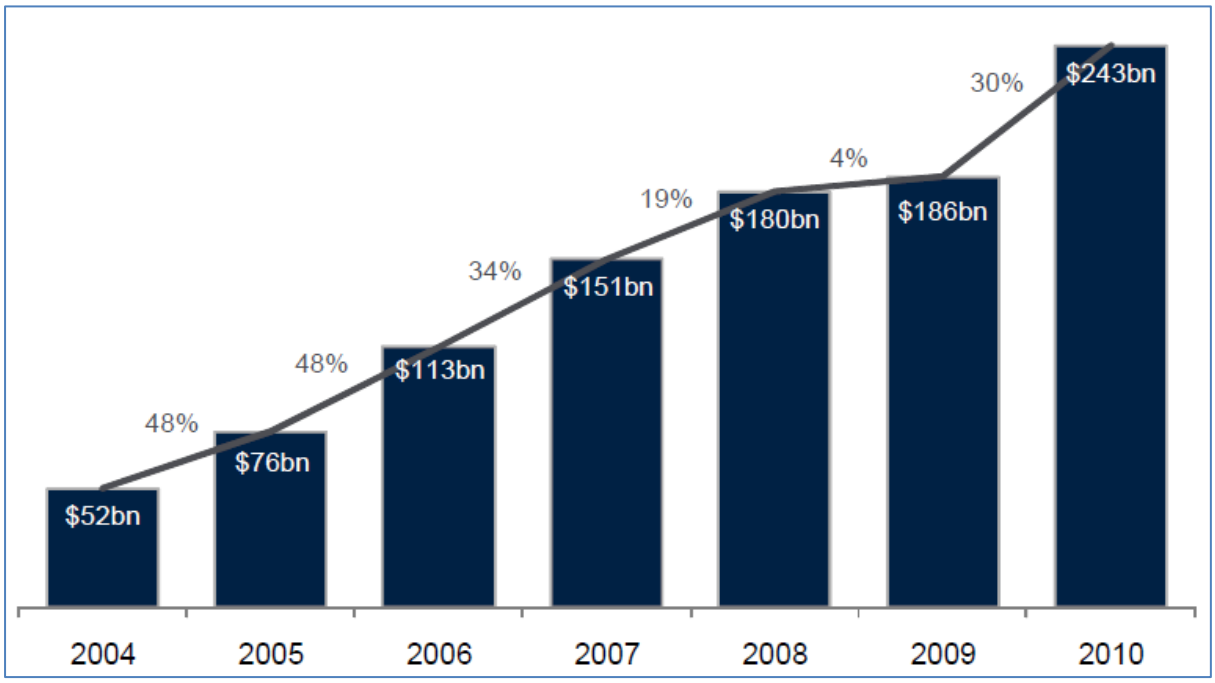
Figure 5: Total Investment in Clean Energy by Region (2007-2010 in $ billion)



Source: Pew Charitable Trusts [110]

As is clear from the chart above, a substantial amount of green investment is already happening in the main regions around the world and the European region has a slight but shrinking lead. In 2010, the European region attracted $94.4 billion of financing for clean energy projects of which the majority – more than $80 billion was invested in the EU. At a country level, China attracts the biggest green investment having invested $54.4 billion into green energy in 2010. China is also the world's largest producer of wind turbines and solar panels.

Figure 6: Global total new investment in clean energy (2004-2010)



Source: World Economic Forum [123]

As the chart above clearly shows, global investment in green energy is on a long term rising trend though the current levels and the annual increase may be insufficient to limit harmful change. On current levels, the global funding gap for green energy against the WEO (440 ppm) benchmark and the NEF Global Futures scenario highlighted in a figure earlier in the chapter is between $250 billion and $300 billion annually.

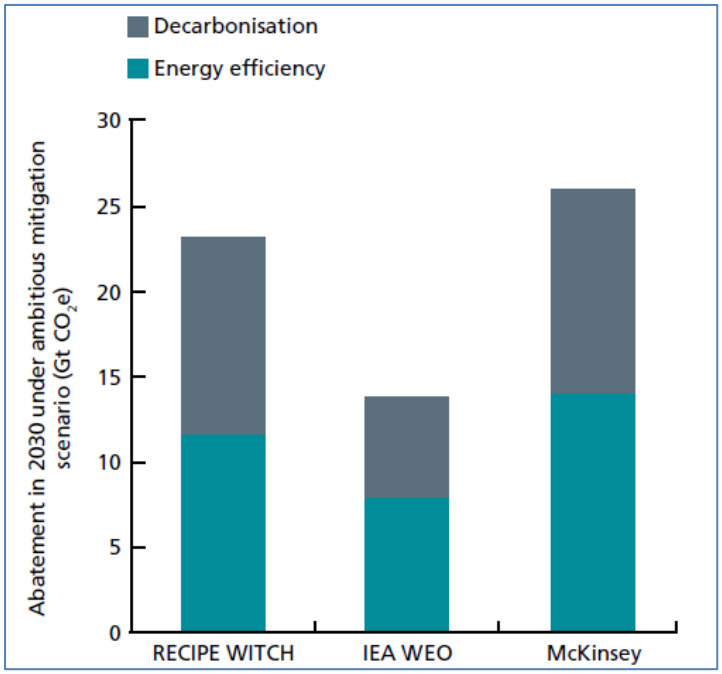
In the EU, the funding gap for green energy is between Euro 40 billion (for the 20-20 target excluding energy efficiency) and Euro 250 billion (Accenture and Barclays capital) with other estimates falling somewhere in between.

While the discussion in this chapter has focussed mostly on the investment flows for the supply side of the equation namely the production of more green energy, the demand side involving an increase in the efficiency of energy use is almost equally important from the perspective of tackling climate change.

The energy efficiency investment gap

In fact, increases in energy efficiency are expected to have a much more positive economic impact on the EU economy compared to equivalent reductions achieved through a shift to greener sources of energy. This is because many of the investments in energy efficiency, as we will see later in this report, generate a substantial rate of return on investment so generate economic savings that more than pay for the initial cost of the investments. It is increases in energy efficiency which are expected to deliver the nearly Euro 200 billion of savings the European Commission has suggested is possible in its energy strategy [120]. Looking at global numbers for investments it is possible to estimate that additional annual investments in efficiency measures in the EU would need to be close to Euro 50 billion annually till 2020.

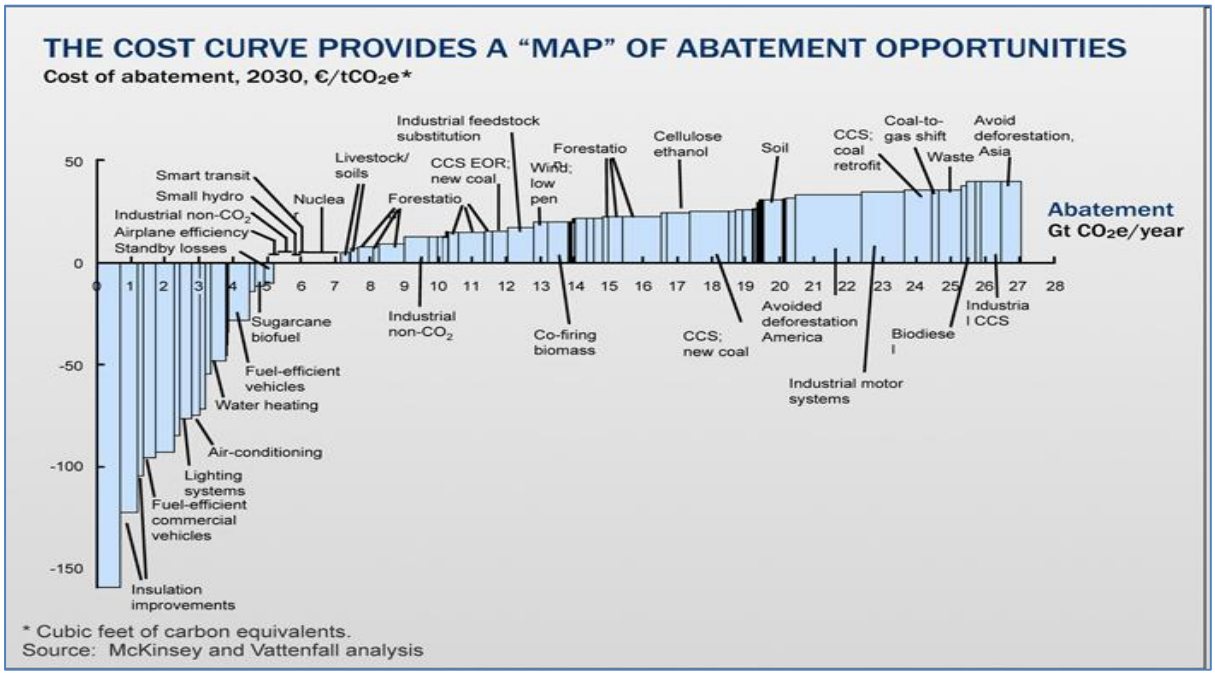
Figure 7: Mitigation potential of energy efficiency measures



Source: Mercer [115]

In the Unites States a report by national academies has found that "Many building efficiency technologies represent attractive investment opportunities with a payback period of two to three years" [118]. McKinsey has identified energy efficiency investments that will help reduce energy use by 20%-24% of end use by 2020 through $170 billion of investments annually [112]. It shows that this would deliver $900 billion in annual energy savings by 2020, and have an IRR of 17% at $50/ bbl oil. At the current price of oil of $112/ bbl (May 2011), the scope for emissions reductions through efficiency increasing measures as well as the potential profitability of these measures are both substantially higher. The following figure shows how substantial the profitable opportunities for reducing carbon emissions are.

Figure 8: The cost curve for reductions in carbon emissions



Source: McKinsey Global Institute [112]

A mid-estimate for the EU of funds necessary to meet efficiency commitments and target reaching a 20% emissions reduction target by 2020 points to a current funding gap of between Euro 150 billion and Euro 200 billion annually, which is achievable within the realm of the availability of public and private sector funds. The funding gap under the 30% emissions reduction target scenario envisaged for the Green New Deal is estimated to be Euro 100 billion or so higher.

While the challenges the EU faces to close the funding gap for the production of green energy are surmountable, significant barriers exist in the funding of energy efficiency investments as highlighted clearly by the fact that the EU has fallen far behind on its EU 20-20-20 energy efficiency target despite being on track to meet the green energy target. In later Chapters we will explore some of these barriers and how these could be overcome.

Sources of funds

We have now established how much additional investment the GND is expected to require. Funding for investments in green sources of energy, greener goods as well as energy efficiency can eventually

come from only two main sources, the private and the public sectors. However it is useful to look at the next level of detail. For example investments in energy efficiency may be financed by

- households from their own incomes such as through the purchase of more efficient bulbs
- businesses through their balance sheets such as through investing in more efficient industrial processes
- governments through tax revenue at the national, regional and local level such as in increasing the energy efficiency of public buildings
- any of these economic actors through borrowing from banks or markets specifically for the purpose of making these efficiency enhancing investments
- specialist energy efficiency companies that use their balance sheets for making efficiency enhancing investments and earn their income through accessing some or all of the savings that accrue from such investments

Similarly, investments in green energy production can be financed partly or wholly by

- conventional energy producers through their balance sheets
- households and businesses from their own resources when such investments are limited to micro-generation
- specialist green energy producers through market and bank funding
- public funds from local, regional or national governments

A significant proportion of the investments are likely to generate a positive net present value, so do not need public subsidies, in particular once the many non-financial barriers, discussed in subsequent, Chapters are dismantled. At least some more marginal investments or those where the barriers that exist cannot be removed successfully may need public support. New technologies as well as maturing technologies may also require some injections of public funds in particular in the transition from the development to the commercialization phase.

Summary

The EU is highly dependent on imports of fossil fuels on which it spends between 2% to 3% of GDP every year or close to Euro 300 billion. These imported fossil fuels are also by far the largest source of GHG emissions. Hence there is a very strong motivation for the EU to drastically cut its dependence on these by embarking on a Green New Deal.

The EU has a 20/20/20 plan that envisages an improvement in energy efficiency and a growth in the share of energy coming from renewables and is expected to require additional investments of Euro 100 billion annually. The EU also has a longer term 'roadmap' that commits it to a 40%, 60% and 80% reduction in GHG emissions by 2030/40/50 respectively and will need investments to the tune of Euro 270 billion annually or about 1.5% of GDP. It is useful to look at other estimates of the costs and investment needs.

- A report from Barclays and Accenture breaks down the funds required into Euro 591 billion in development capital and Euro 2,300 billion in procurement capital between now and 2020, and their overall estimate is a higher 2% of GDP.

- The Stern report suggests that additional investments amounting to 1% of global GDP are appropriate globally.
- UNEP estimates that the annual financing need to green the global economy to be between $1.05 and $2.59 trillion per annum.
- The IEA envisages the need for US$ 750 billion per year from 2010 to 2030 and US$ 1.6 trillion per year from 2030 to 2050 to halve worldwide energy-related CO_2 emissions by 2050.
- Bloomberg New Energy Finance has calculated that clean energy investment needs to rise to US$ 500 billion per year by 2020 and
- McKinsey sees a need for Euro 500 billion to Euro 1,100 billion in 2030 or 0.6 to 1.4 per cent of GDP in that year.
- Most EU and global estimates of additional global investments fall within the 1%-2% of GDP range.

However, unless firm public policy action is taken, even investments that deliver net economic benefits are not likely to be undertaken. The biggest reasons for this are

- the benefits of any green investments are likely to accrue through time whereas the costs are likely to be concentrated upfront
- the benefits of green investments in terms of savings in energy costs may accrue to different economic actors than those who make the investments in the first place
- many of the positive externalities such as the benefits of enhanced energy security and of GHG emission reduction are not monetized and cannot be fully captured

The biggest savings lie in energy efficiency related investments on which the EU is lagging behind. McKinsey has identified energy efficiency investments that will help reduce energy use by 20%-24% of end use by 2020 through $170 billion of investments annually. It shows that this would deliver $900 billion in annual energy savings by 2020, and have a return of 17% at $50/ bbl.

The funds would eventually come from consumers purchasing green goods or making efficiency related investments, private financial investors or existing businesses using their balance sheet or from taxpayers in the form of public support. Of the total funds, the largest component will be overwhelmingly from the private sector with some support from the public sector needed for marginal investments and new technologies.

3. The private funding universe

As discussed in the previous Chapter, the EU faces an annual funding gap of between Euro 150 billion and Euro 250 billion for meeting the EU 20-20-20 targets and between Euro 250 billion and Euro 350 billion for meeting the more ambitious 30% emissions reduction scenario we are advocating as part of the Green New Deal.

The vast majority of financing for this will need to come from the private sector though the public sector will need to play a supportive role. That is why any discussion of the scope and size of green investments needs to take into account the availability of private investment funds. This chapter looks at the universe of such funds and examines whether the amount and kind of investments envisaged under the Green New Deal in the EU can be realistically financed by the private sector.

The relevant aspects of funds we need to look at are the

- amounts
- instruments
- institutions

The size and type of global financial assets

Any sizeable investments in green energy and energy efficiency will need to be financed mostly through financial assets such as equities, debt and deposits. That is why it is relevant to examine the total stock of such assets in order to determine whether the scale of investments being envisaged is indeed achievable.

The stock of financial assets in the world peaked in 2007 at $196 trillion before falling to $178 trillion in 2008 as a result of the crisis. Partly because this is a conservative benchmark and partly because the availability of more recent comprehensive datasets is patchy, we use the 2008 figure as our benchmark. The table below highlights the decomposition of these assets across different assets classes.

Table 1: Stock of Global financial assets in 2008

Financial assets	Eurozone	UK	US	Global
$ Trillion (2008)				
Equity securities	5	2.8	11.5	34
Private debt securities	16	0.8	22.5	51
Government debt securities	8	1.4	7.7	32
Deposits	13	7	12.6	61
Total	42	12	54.9	178

Source: McKinsey Global Institute [16]

Even though this report focuses primarily on the Green New Deal for Europe, we believe that the relevant parameters to look at are the size, scope and operation of the global investment pools. Large sums of money are invested across borders and while some of these flows shrunk significantly

as a result of the crisis they are beginning to recover to pre-crisis levels again. So at least in theory, the total pool of global financial assets is potentially available to fund green investments in the EU. The total pool of $178 trillion of financial assets seems to be large compared even to the highest estimates of annual funding needs for the European GND of less than $500 billion (Euro 350 billion).

In reality, investors have a strong home bias i.e. are much more likely to finance investments in their geographic area than they are to finance investments in other countries or continents. So it also makes sense to look at the size of the financial assets available in the EU. As the table shows, the Euro area and the UK together account for more than a third of all global financial assets coming in at $64 trillion.

It is important to point out that the nature of credit (debt) delivery for investments is different on both sides of the Atlantic. In the United States, the financial markets are more developed than in the EU and a significant proportion of the credit in the US is channelled through market instruments such as bonds and securitization. In the EU, banks remain the most dominant channel for credit provision, accounting for 46% of credit compared to 20% of the outstanding credit in the US [16].

Since the availability of credit is crucial for all investments including those in green energy production and energy efficiency, it is useful to look at the following table which highlights the size and the nature of the delivery of credit in the EU.

Table 2: Credit in the European Union in 2008

Outstanding Credit	Eurozone	UK
$ Trillion (2008)		
Banks Loans	16.1	4.5
Other Financial Institutions Loans	3.3	1.4
Loans from other sectors	2.3	
Corporate Bonds and Commercial Paper	1.8	0.5
Financial Institution Bonds	5.7	1.6
Government Bonds	6.1	0.9
Securitization market	0.9	0.9
Total	36.2	9.8

Source: McKinsey Global Institute [16]

As is clear from this table, bank loans are the biggest source of credit for investments in the EU with corporate bonds coming a very distant second and securitization markets being smaller still. This means that any realistic funding of the green financing gap in the EU will necessarily need to involve banks though as we will see later in this report an expansion of the securitization and bond markets through the increasing use of 'green securitizations' and 'green bonds' can also make a substantial contribution.

Another observation is that the overall size of the credit markets in the EU seems to be sufficient to be able to fund the size of green investments needed in particular when adjustments are made for the facts that at least some of the green funding will come from

- a diversion of funds from planned dirty investments

- and from the savings achieved by highly profitable energy efficiency measures

The institutional investor landscape

While the size of the pools of assets held by investors as well as their decomposition according to geography and types of financial assets is important, the institutional landscape is by far the biggest determinant of the nature of investments made by these investors. In particular, the differentiation of the types of financial assets held, the average lifetime of investments as well as the norms for the allocation of funds in accordance with specific criteria are all very highly dependent on the type of institutional investor.

The following tables give a rough breakdown of the holdings of financial assets across the main categories of institutional investors.

Table 3: Assets under the management of different types of institutional investors

Institutional Investors	Amt Under Management
$ Trillion (2009)	
Pension funds	29.5
Mutual Funds	23
Insurance funds	20
Sovereign wealth funds	3.8
Private equity	2.6
Hedge funds	1.6
Total	80.5

Source: International Financial Statistics London Research

The World Economic Forum estimates that in 2009, investor groups that include life insurers, pension funds, endowments, foundations, family offices, High Net Worth Individuals (HNWIs), and retail funds controlled $65 trillion in assets [113]. While this number is different from the total in the table above, the difference can easily be explained because the definitions the two sources use are different.

The following table shows the size of the possible sources of long term capital that is very important for all infrastructure investments including those that drive green energy production. The size of this pool is smaller than the two numbers discussed so far because institutional investors such as defined contribution pension funds as well as retail mutual funds have short investment horizons so are not considered to be true providers of long term finance.

Table 4: Assets under the management of long term investors in 2009

Type of Long Term Investor	Assets Under Management
$ trillion	
Family Offices	1.2
Foundations/Endowments	1.3
Sovereign Wealth Funds	3.1
Defined Benefits Pension Funds	11
Life Insurers	11
Total	**27.6**

Source: World Economic Forum [113]

There will be more detailed discussions of these long term investors later in the paper but first we look at one particular class of these investors, Sovereign Wealth Funds in somewhat more detail. The table below shows the breakdown of the sizes of various SWFs as of 2009 and the total of $3.8 billion is somewhat different from the total in the table above because of definitional issues. It has been estimated that the likely median value of these SWF's by 2013 is likely to be around $4.3 trillion with the possibility of a higher $5.8 trillion value that is more compatible with a scenario of high oil prices that seems to be unfolding presently [125].

Table 5: Assets held by Sovereign Wealth Funds in 2009

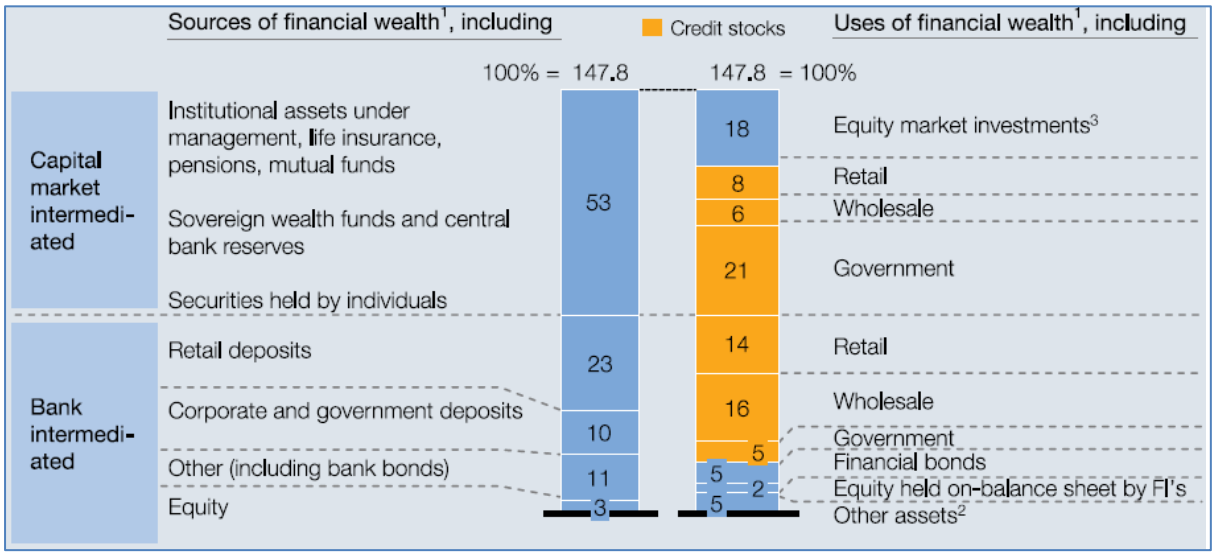
Sovereign Wealth Fund	Assets
$ bn 2009	
Abu Dhabi Investment Authority	627
Norwegian Pension Fund-Global	445
SAMA Foreign Holdings	431
SAFE Investment Company	347
China Investment Corporation	289
Government of Singapore Invest. Corporation	248
Kuwait Investment Authority	203
National Wealth fund	168
National Social Security Fund	147
Hong Kong Monetary Authority Invest. Portfolio	140
Temasek Holdings	122
Libyan Investment Authority	70
Qatar Investment Authority	65
Australian Future Fund	49
Revenue Regulation Fund	47
Others	402
Total	**3,800**

Source: Sovereign Wealth Funds 2010 IFSL Maslakovic M.

Perhaps the best overview of the original sources of funds, the institutions they are channelled through and the financial instruments that they eventually fund can be obtained from the graph below which summaries this information. The total stock of assets at 147.8 trillion in 2009 is once

again different from the numbers discussed above mainly because of a difference in methodology and definitions.

Figure 9: Sources and uses of financial wealth in 2009 ($ trillion and %)



Source: World Economic Forum [126]

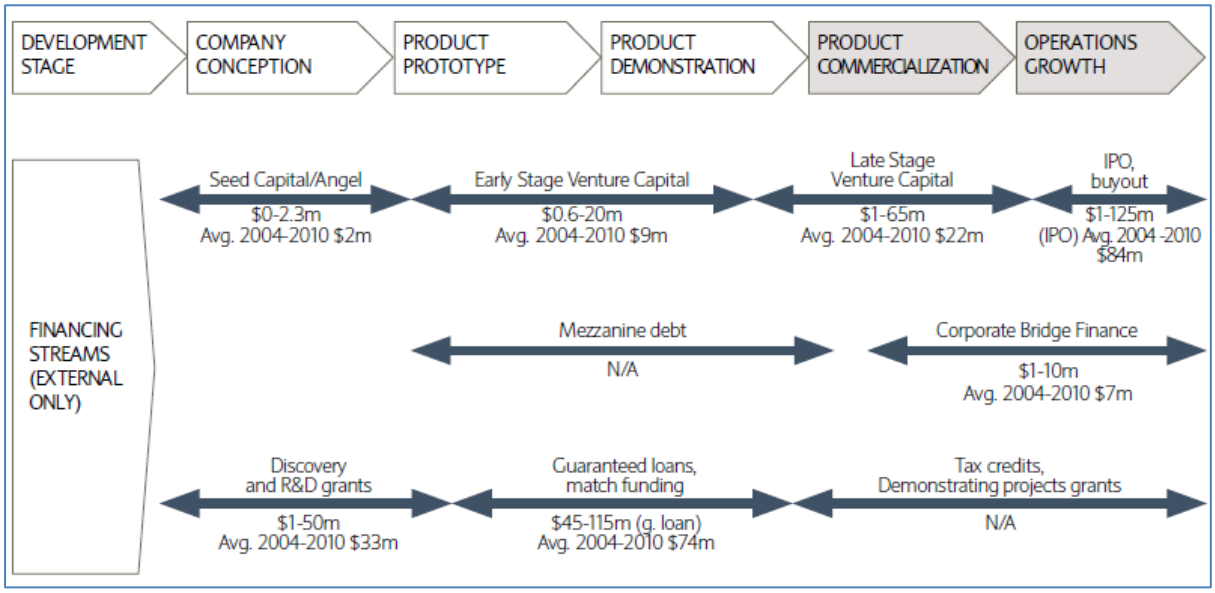
The types of financing required

It is useful to split the requirements for green financing into two categories 1) development capital and 2) procurement capital [114]. Development capital is associated with financing the research, production and commercialization operations of companies developing Low Carbon Technologies (LCT). Procurement capital, on the other hand, is the capital needed for the purchase and installation of these Low Carbon Technologies.

An easy way to understand this important distinction is through an example where the operations of a new wind turbine manufacturer working to improve turbine technologies will be financed through development capital but the purchase and installation of the firm's turbines, once they are commercialized, by utilities will be financed by what is called procurement capital. An even simpler way of thinking about this to think of development capital as the capital needed by the sellers of LCTs and the procurement capital as the money that is needed by the users or the buyers of LCTs.

Early stage development capital can come from both public and private sources with later stage capital (once the commercialization phase of technology is reached) will come primarily from the private sector. Government R&D grants, guarantees, demonstration grants and tax credits are the most common form of public support. Financing also comes from the private sector from angel investors and venture capitalists in particular. It is also often the case that development capital can be provided internally - for example a traditional energy utility trying to diversify and benefit from the green energy boom could finance the in-house development of LCTs.

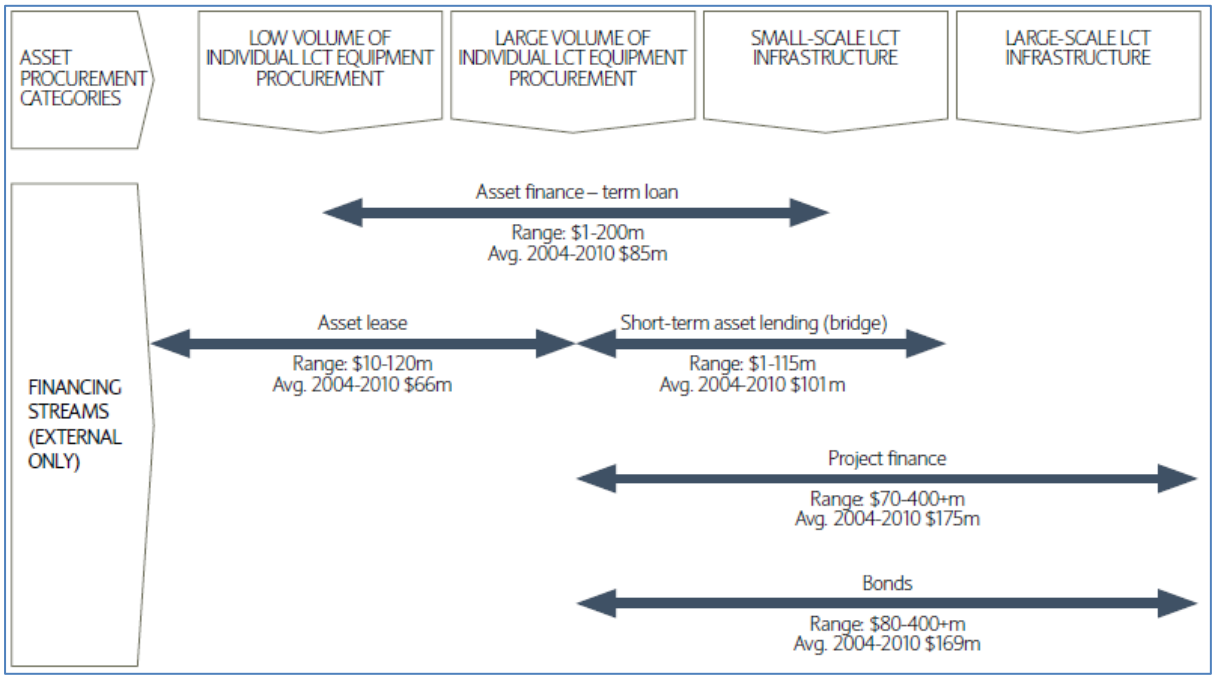
Figure 10: Early stage development funding: sources and size



Source: Accenture and Barclays Capital [114]

Procurement capital transactions include the very small such as a household's purchase of low energy incandescent lamps to the large such as the purchase of wind turbines. Many of the smaller transactions are financed by the balance sheets whereas pools of small investments or large investments often need external project finance. For example the purchase of the energy efficient lamps are often funded by households or companies from internal sources. The installation of smart meters though individually small can be bunched together as by British Gas which plans to introduce two million of them in the UK between 2010 and 2012 and will require external project finance as will the acquisition of wind turbines for a wind farm.

Figure 11: Procurement funding: Sources and Size



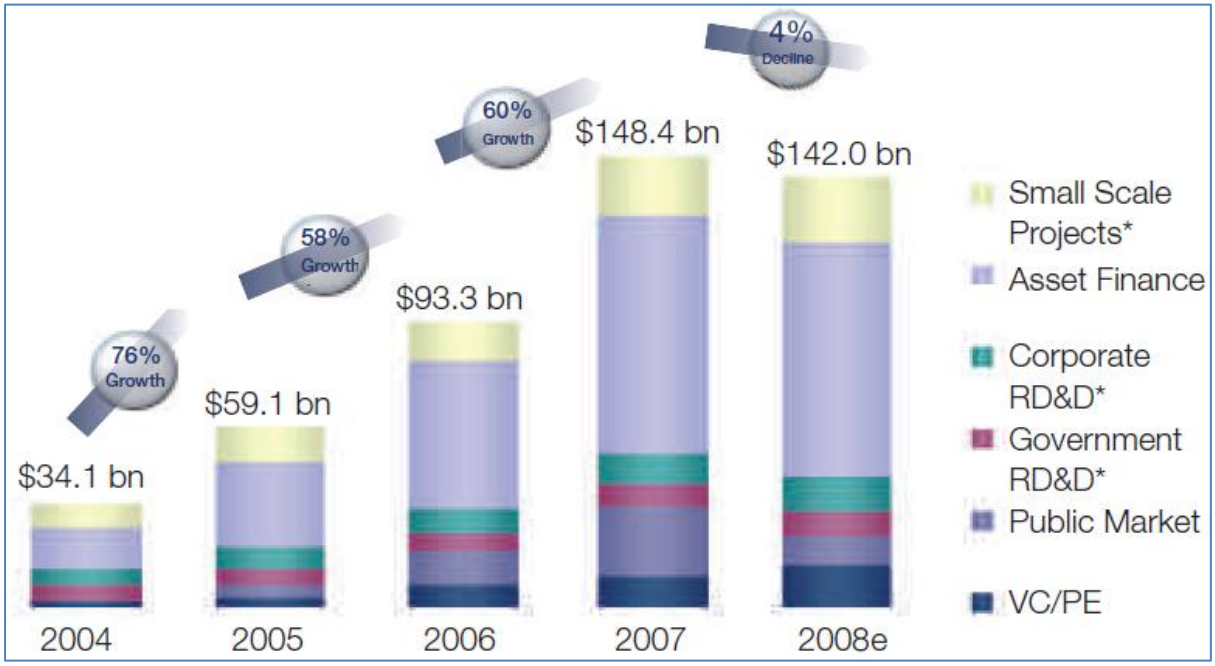
Source: Accenture and Barclays Capital [114]

It is quite clear from the discussions above that the overall supply of the universe of funds while necessary is not by itself sufficient to ensure that green investments get adequately funded. The availability of the right kinds of financial instruments from a diverse set of public and private institutions is equally important. The absence of adequate early stage venture capital funding, for example, can seriously harm the prospects for a successful execution of the Green New Deal no matter how much credit and public equity financing there may be available.

To be successful, the Green New Deal requires a well-functioning financial landscape that provides an appropriately diverse set of funding opportunities across different sizes and financial instruments at different stages of the development and the deployment of Low Carbon Technologies.

The figure below gives a rough breakdown of the kinds of green financing that had taken place till 2008. More recent figures are hard to come by but anecdotal evidence suggests that the mix of the financing channels remains relatively stable.

Figure 12: Green financing channels

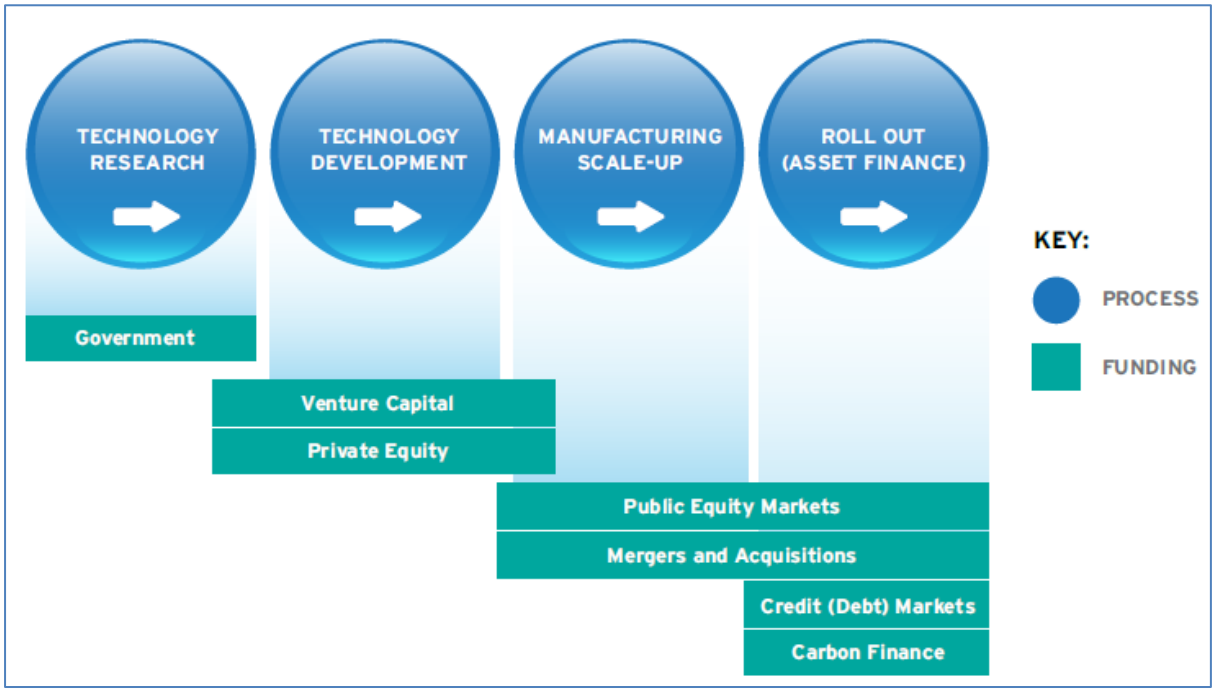


Source: World Economic Forum and New Energy Finance [124]

The diversity of funding sources needed and their relative size becomes much clearer in the set of figures below which contain estimates of the expected distribution of green funding in Europe in the run up to 2020.

It is also useful to look at the various stages of the development and the commercialization process to see what sources of funds are most appropriate at what stage as the following figure shows.

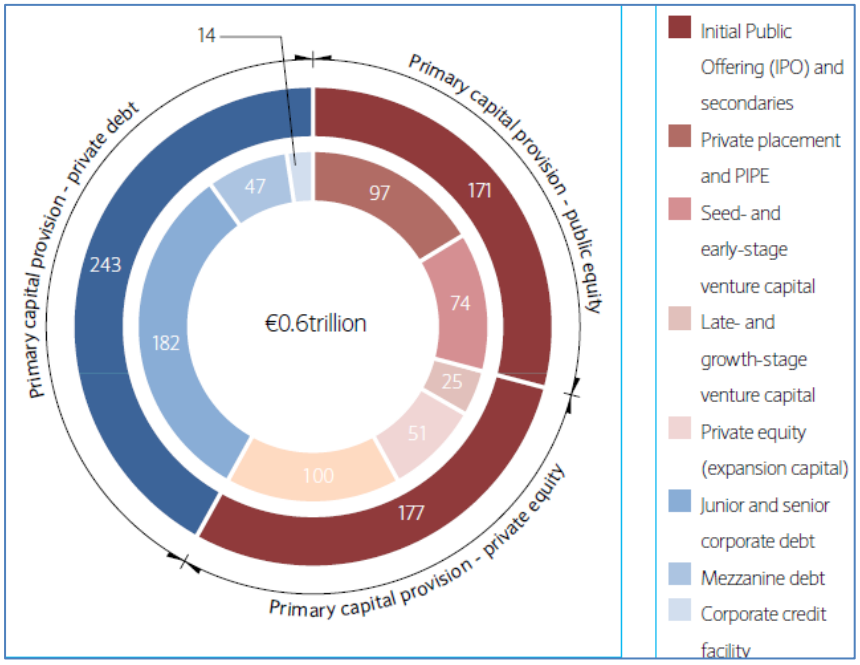
Figure 13: Stages in the development and financing of green energy



Source: Bloomberg New Energy Finance

As the following figure shows, development capital in the EU is expected to come from a near three way split between public sources of equity, private sources of equity including through venture capital and debt markets.

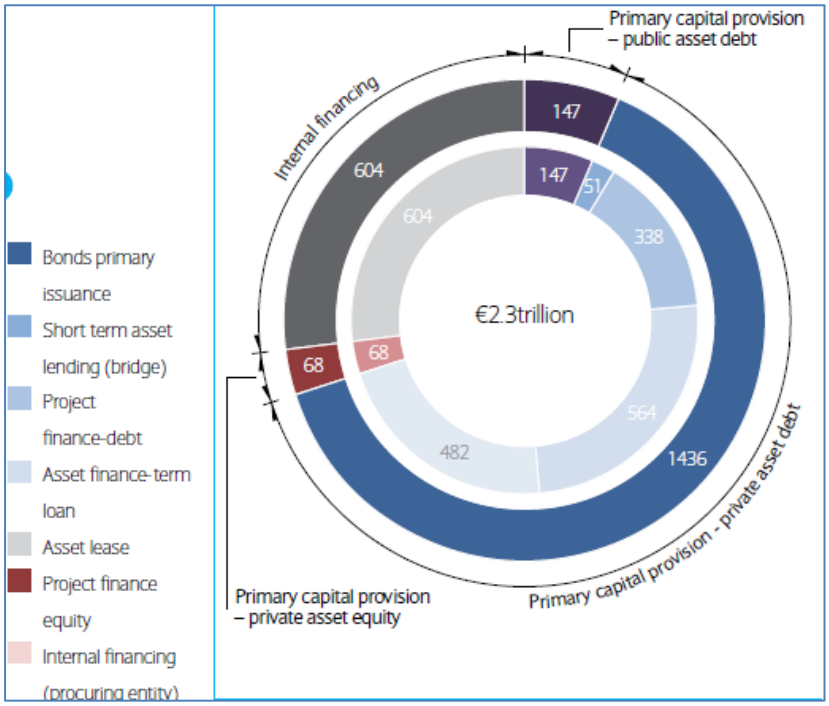
Figure 14: Expected distributions of the sources of green development capital in the EU (2010-20)



Source: Accenture and Barclays Capital [114]

The structure of funding for procurement capital (see figure below) will be different with two thirds of funding coming in the form of debt finance and a third funded by balance sheets or internal funds.

Figure 15: Expected distributions of the sources of green procurement capital in the EU (2010-20)



Source: Accenture and Barclays Capital [114]

The real pool of long term capital

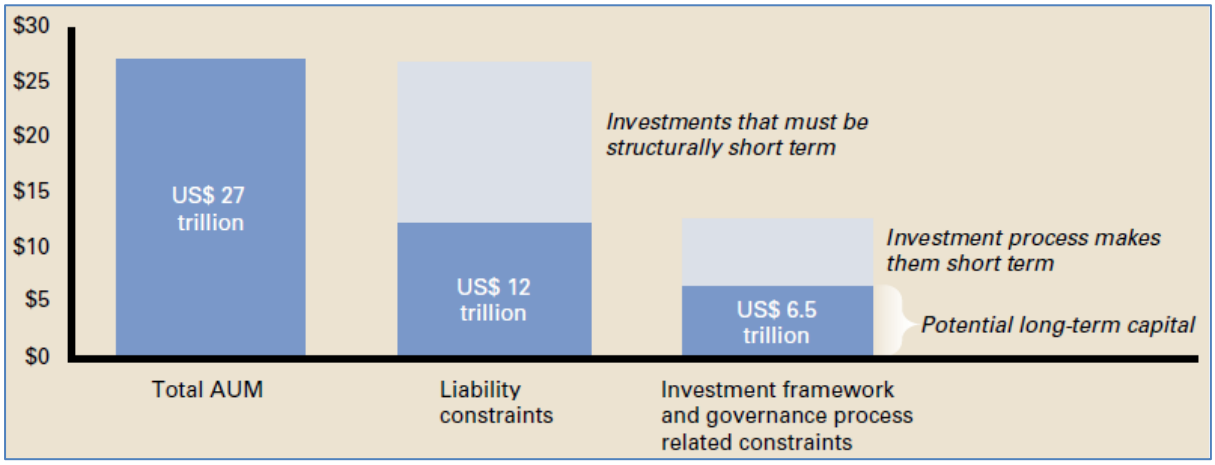
It is hard to find any policy maker who is not for more long term financing. However, only very few understand the drivers of such investments. Two things need to be made very clear at the outset. First that long term investment is particularly important for green financing and second that the pool of such investments may have declined with the crisis.

Long term (LT) investors are those that buy assets with a view to hold them for an indefinite (or long) period of time and the capability to do so. They are less concerned with short term fluctuations in price and are more concerned with long term growth and income. Done right, long term investment can not only deliver superior returns to the investors but can also allow companies to behave more strategically and deliver benefits to society. Green investing that often involves large upfront costs and has long payback periods but generates significant cash flows and benefits society is one example of such a win-win trade.

Pension funds, insurance firms and sovereign wealth funds are some of the best known long term investors and the overall size of these and other smaller investors is discussed at length in the previous chapter. It is important to note that not all of the $27.6 billion of funds controlled by these institutions can be ploughed into long term investments. The limits are defined by a number of constraints that include [113]

- liability profile – an institutions commitments to paying out funds
- investment philosophy – whether those running the institutions believe in LT investing
- risk appetite – whether the institution is willing to take specific LT risks
- compensation structures – if managers are paid for ST performance they will not invest for the long term

Figure 16: The real potential for long term investing



Source: World Economic Forum [113]

As the table above shows, the real pool of long term funds is much smaller than the headline number. The crisis has had a negative impact on this pool through three channels

- investors have become more risk averse as a result of the crisis
- having experienced liquidity problems during the crisis they have started keeping more of their assets in liquid investments
- some of the regulatory reforms being enacted may force LT investors to have a shorter investment horizon

However, a number of policy measures such as changes to compensation structures, tweaks to regulatory reforms and making available emergency liquidity for funds that fall short can help significantly increase the pool of true long term capital.

Moreover, not all green investments need true long term capital. Many, particularly those that increase energy efficiency, have much shorter payback periods so can be funded by a much larger pool of assets. Also, measures such as the increasing use of securitization and indices for pooling together portfolios of green investments can help make liquid markets that allow investors with short term horizons to be able to fund long term investments in aggregate.

All things considered, the green financing gap that currently exists can be funded by the existing pool of private financial resources though as we will see in subsequent sections this may need some changes to incentive strictures and regulations as well as the completion of markets in terms of the introduction or expansion of suitable financial instruments.

Summary

Policy makers often state that the green funding gap the EU faces will mostly be funded by the private sector. In order to evaluate how likely this is, we need to look at the size and type of the pool of funds that may help close this gap. The relevant parameters here are the size of funds, their institutional make-up and the nature of financial instruments they invest in.

The total stock of financial assets in the world is $178 trillion which is substantial even for the top end estimates of the annual funding needs for the GND in Europe of $500 billion. Because investors

continue to have a home bias, the first port of call for investments is the funds in the EU which amount to about a third of the total or $64 trillion The amount of credit in the EU is $46 trillion of which bank loans are the biggest part. GND funding will also come from a diversion of funds that would have gone into dirty investments and from savings arising from energy efficiency measures.

While the size of the pool of assets is important, the institutional structure of the holdings determines how long they are invested for and the criteria for these investments. The three largest categories of institutional investors are pension funds, insurance firms and mutual funds with smaller categories such as sovereign wealth funds still being important. Altogether these hold roughly $65 trillion in assets.

The most important category within this is those which potentially have a long term investment horizon and these funds amount to $27.6 trillion. Sovereign wealth funds, many of which are funded by dirty industries such as oil and gas are particularly interesting for funding the GND. They amount to about $4 trillion and may grow to $6 trillion by 2013. They mostly have very long investment horizons.

In terms of the need for green capital, it is useful to split the demand side into capital needed for development (for research and development and the commercialization of companies developing low carbon technologies) and procurement (for the purchase and installation of these technologies). It has been estimated that the EU will need about Euro 600 billion of the former and Euro 2.3 trillion of the latter by 2020.

The instruments needed to provide funds for these differ with a three way split between public sources of equity, private sources of equity and debt markets for development capital and a two third one third split between debt finance and balance sheet finance for procurement capital. Importantly, there is a logical gradation in the sources of funds in the development cycle with government funding, venture capital and private equity important at the initial stages and public equity and debt markets dominating as the technology matures and is scaled up.

It is important to note that not all of the $27.6 trillion of 'long-term finance' is actually available for LT investments. Between the need to hold some liquid investments, short-term managerial incentive structures, increased risk aversion as a result of the crisis and regulatory developments the real pool of LT funds has been estimated to be only about $6.5 trillion.

This may not appear to be much, but only some GND investments needs very LT capital. A second mitigating factor is that through the developments of green securitization, green indices and green bonds discussed later in this report, medium term oriented funds can be a source of long term funds.

All things considered, the size, depth, institutional structure and instruments of the private financial asset landscape seem sufficient to be able to fund the GND in Europe, in particular once the suitable regulatory reforms and market developments discussed later in this report are implemented.

4. The economic case for green investments for the EU

This report has dealt with the need for a Green New Deal, how much it may cost to finance the investments needed under this and the availability of the pool of private financial assets that would need to finance the lion's share of these. This Chapter builds the economic case for why many of these investments are likely to be attractive for both investors and as well as society.

In order to achieve green targets three mains steps are needed

- a rapid increase in the supply of energy coming from renewable sources
- a rapid increase in the efficiency of the use of energy and
- a behavioural reduction in the demand for energy

While some progress has been made on all three fronts, it is nowhere near enough. A number of obstacles, some policy related, some financial, some structural and some purely behavioural are holding back progress on moving towards a green economy. A prerequisite to making any form of corrective policy suggestions is to identify and analyse what distinguish green investments from dirty ones.

One of the main differences, which lies at the heart of many of the obstacles faced by green investments, is the cost/return profile. Dirty investments, such as

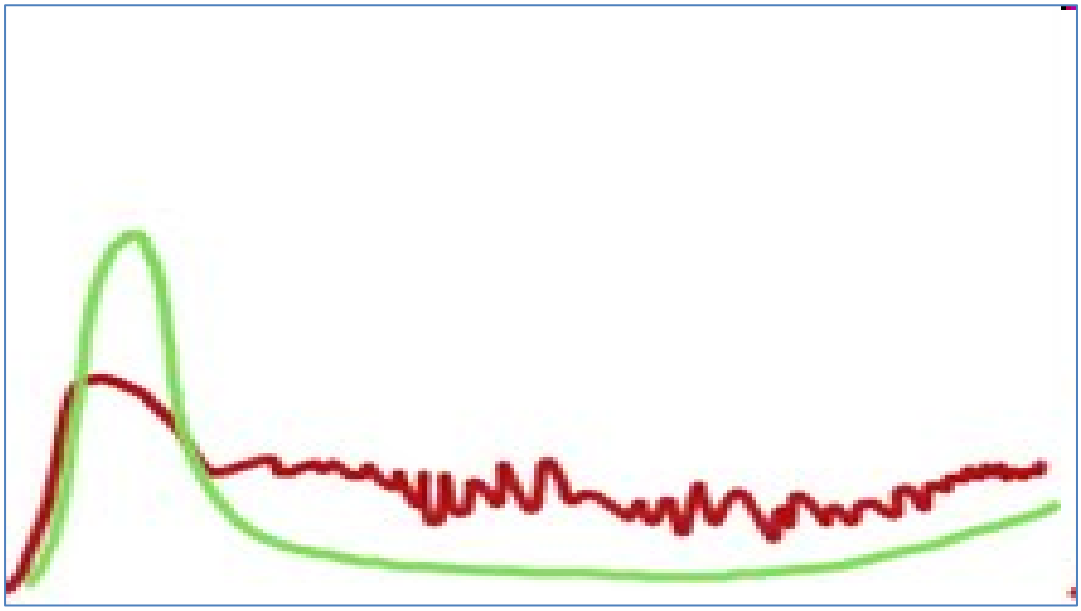
- building a gas turbine generator
- the purchase of a fuel-guzzling SUV
- the construction of a house with poor insulation etc.

all have one thing in common which is that they have a lower upfront fixed capital cost but higher operating expenses than equivalent green investments. This is captured by the picture below which shows that green investments such as

- building a wind turbine
- the purchase of a fuel efficient hybrid car and
- the construction of a well-insulated house

all entail a higher upfront cost compared to equivalent dirty investments. This, as we can see from the figure below, is counterbalanced by the fact that dirty investments that often involve a need to continue to purchase fossil fuels have a much higher operating cost. Green investments, on the other hand, only have minor variable costs to do with the maintenance of assets but do not need to buy fuel.

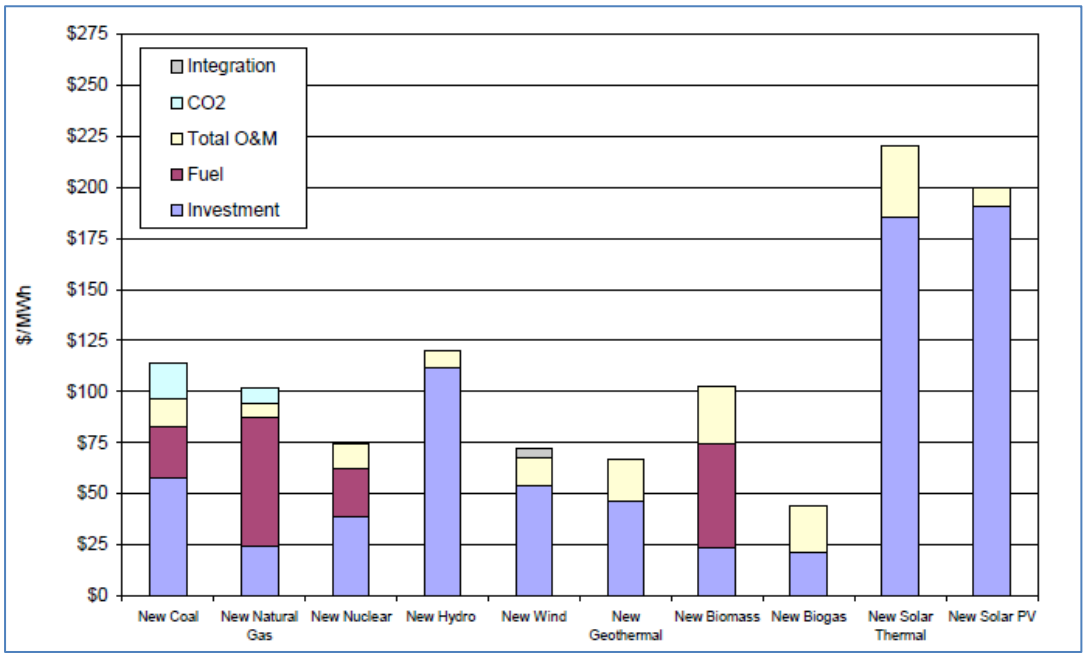
Figure 17: Cost structures of green (in green) and dirty (in red) investments over time



Source: Authors

Dirty investments such as gas turbines, coal fired generators, fuel guzzling motor vehicles and energy inefficient houses all are exposed (to a much greater degree) to the vagaries of fossil fuel prices that have high (and by many measures increasing) volatility. Clean investments, on the other hand, have near zero (as in the case of wind turbines and solar power generators) or much lower operating costs.

Figure 18: Proportion of fixed and variable costs in different sources of energy

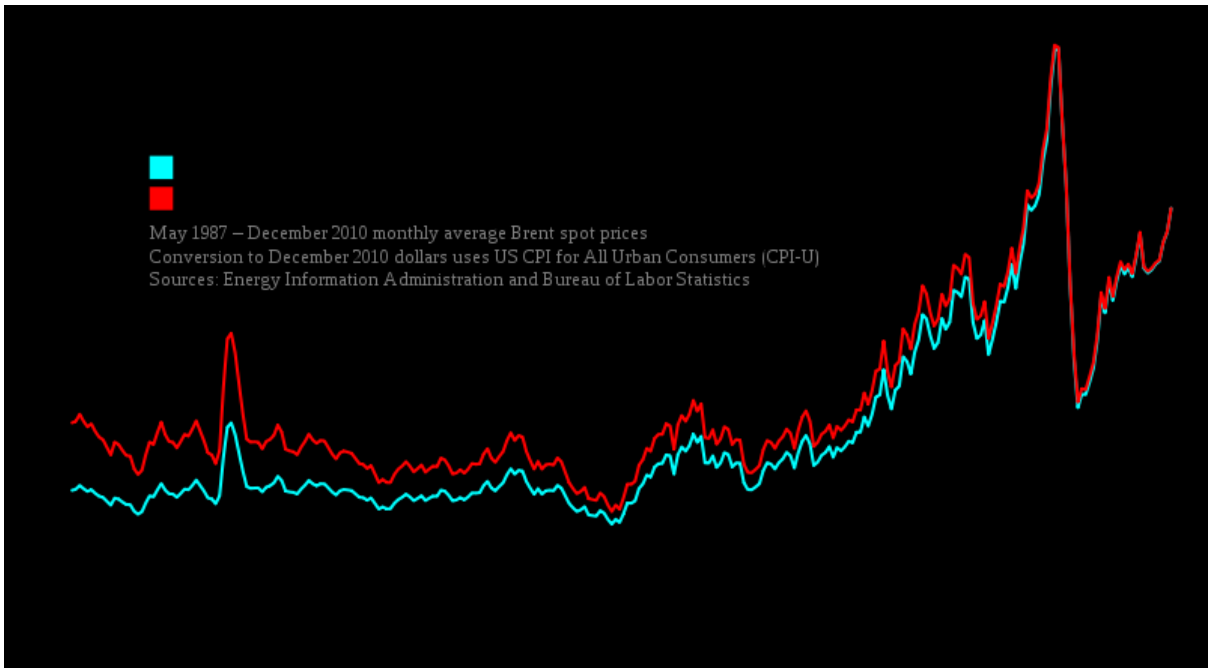


Source: Bates White LLC [116]

Everyone would agree that comparing different sources of energy on their initial fixed costs (blue columns in the figure above) is not sensible. By this measure, natural gas turbines are the cheapest.

However when we use other measures that include the costs of fuel and carbon emissions, wind power is significantly cheaper. This is the case even before the volatility of fuel prices is taken into account. Once the secular rising trend in fossil fuel costs and the very high (and possibly) increasing volatility of these costs are taken into the account, the case for green over dirty investments becomes even stronger.

Figure 19: The rise in the level and volatility of oil prices between 1987 and 2010



However, when energy producers are allowed to pass on the full costs of the fuel to their customers as many are, they have a much stronger incentive to look merely at the initial fixed cost of investments not the full costs of the energy generated. This is one of the many structural problems that penalizes green investment and rewards dirty investment and needs to be tackled by targeted policy measures.

Figure 18, which breaks down the fixed and variable costs dates back to 2006, since which time

- the carbon price in the EU is higher than the $ 20 assumed here
- fossil fuel prices are significantly higher
- and the cost of hardware of wind and solar power has come down substantially as technology has improved.

This means that the relative costs of clean investments such as wind and solar compared to dirty investments are now much lower.

A mean variance approach to energy planning

Looking at the figure on cost structures above after the initial cost hump of the construction of the power generator, the difference in the operating cost of the green and dirty investment is very stark. Green power from renewables can basically provide fixed cost power where the price is determined by a

- known repayment schedule of the initial fixed cost of investment
- known operating and maintenance cost and
- known profit margin

In contrast, dirty power generation can never provide fixed cost power. While the repayment schedule of the initial fixed cost of investment and the profit margin are both knowable, the very substantial cost of fossil fuel inputs is not. The fluctuations in the price of gas turbine generated power that has been experienced in California and the United Kingdom, for example, where the price of power has varied over a whole order of magnitude illustrates this point.

In another section, we examine the relative price of green and dirty power but a very important point needs to be made first.

Even if the price of green power is greater than the expected price of dirty power, it still makes sense, from an economic efficiency perspective, to have a substantial role for green power in the power generation mix.

An obvious question to answer here would be to justify this assertion. For this we turn to finance. Now imagine that you faced the following four choices

1) receive Euro 100 with certainty
2) receive either Euro 80 or Euro 120 with a 50% chance each
3) receive Euro 40 or Euro 60 with a 50% chance each
4) receive Euro 90 with certainty

Which choice would you make? Now option 1 and 2 both have an expected value of Euro 100 but option 2 carries more risk. You would obviously choose option 1 over 2 because it delivers the same return for less risk. Now look at options 2 and 3. Here you would obviously choose option 2 over option 3 because it delivers a higher return for the same risk.

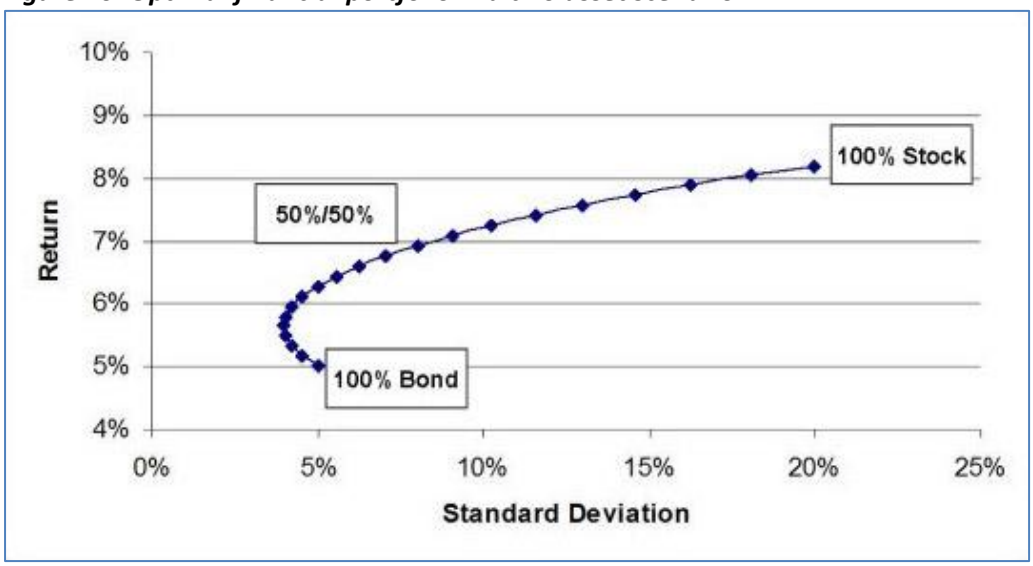
How does one choose between options 2 and 4? The answer is no longer simple and will vary across individuals. Highly risk-averse individuals will prefer to accept the Euro 90 with certainty offered by option 4 rather than be faced with a 50% chance of receiving Euro 80 under option 2 even though the expected value of that choice is higher. Other less risk-averse individuals would go for option 2 instead of option 4 because the expected value of Euro 100 is higher.

This option set is representative of the kind of choices that confront us in fields as diverse as finance and energy planning.

In finance, bonds are characterized by a lower volatility of return and a lower expected value of return, while stocks typically have a higher expected return but with higher volatility. As we have seen above, clean and dirty sources of energy also have similar characteristics.

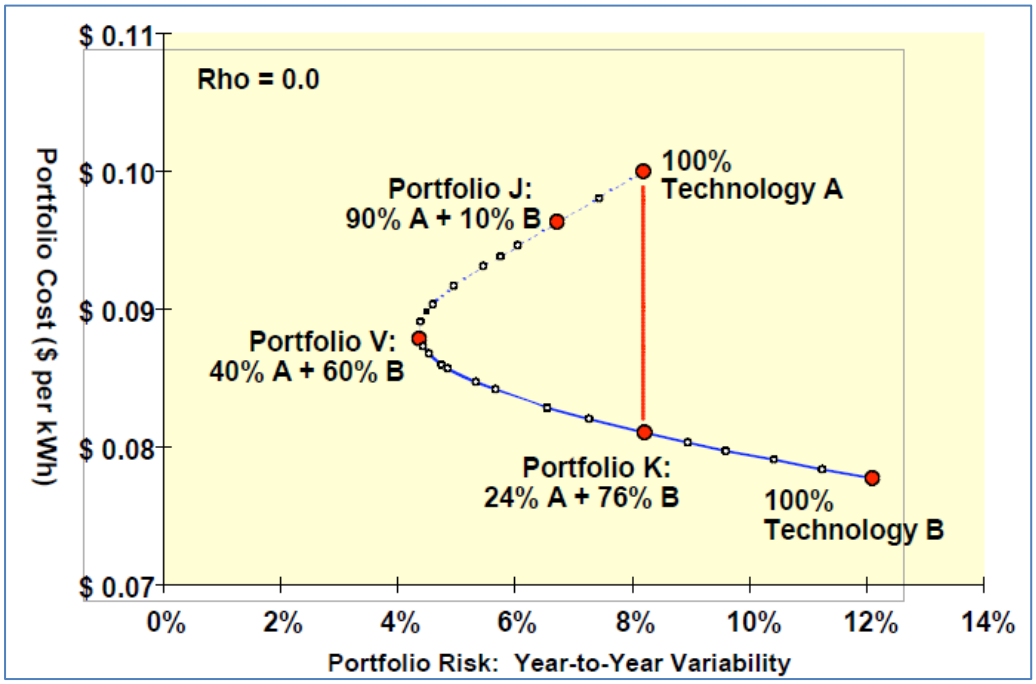
Somewhat counter intuitively, adding low risk bonds yielding 4 per cent to a riskier stock portfolio yielding 8 per cent increases rather than reduces the expected return of the resulting portfolio that contains both risky stocks and less risky bonds. This is clear from the graph below.

Figure 20: Optimal financial portfolio in a two asset scenario



Similarly, adding low variable cost (less risky) higher fixed cost (lower return) green energy generation to the fossil fuel dominated generation mix we have at present lowers expected portfolio cost, adjusted for risk, even if its stand-alone cost is higher than the remaining portfolio components.

Figure 21: Portfolio of new clean technology A and existing dirty technology B



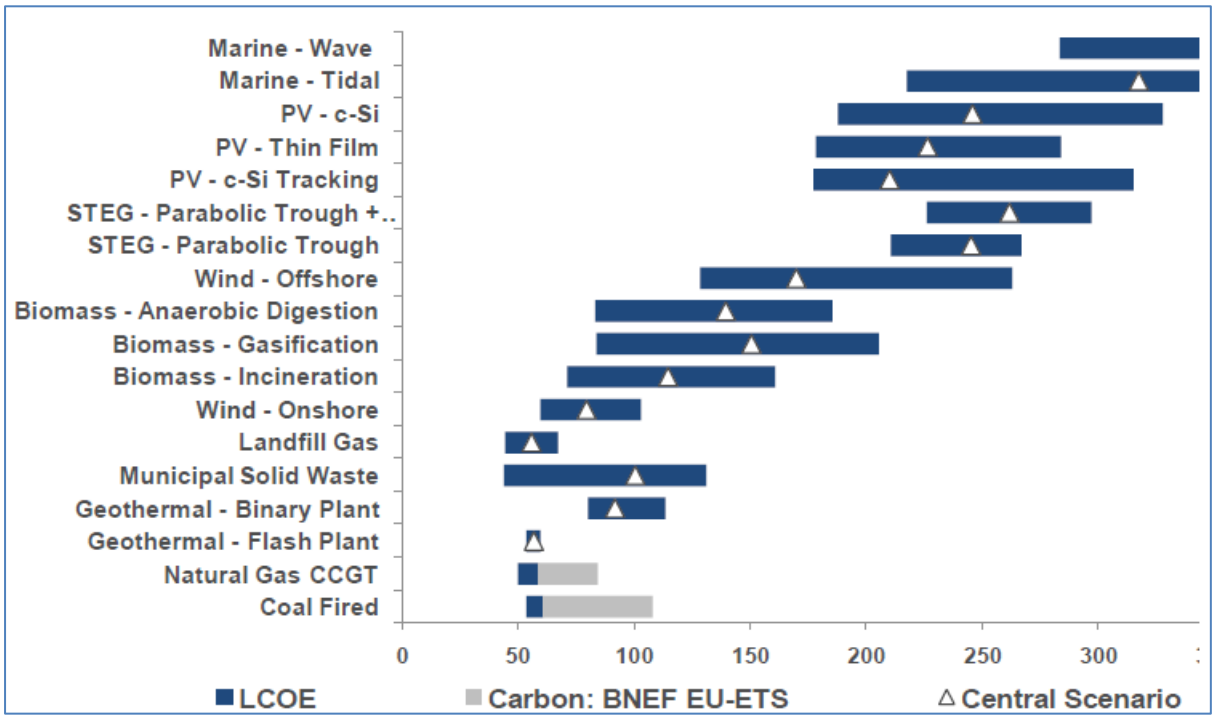
A study of California in 2006 concluded that at the then prevailing costs (Figure 19 in this Chapter), an optimized portfolio of California power supply by 2020 would contain at least 33% renewables [116]. From an operational perspective it means that practically all new energy investment should be in the form of clean energy. The estimate, if made now under updated costs of fuel and emissions would suggest an even higher proportion of renewables.

This has profound implications for all regions including the EU. Almost all new power investment in the medium term should take the form of renewables. A policy suggestion that flows naturally from this, but which might be controversial, would be that dirty power investments should be quantitatively restricted, if not outright forbidden, over and above any penalty that arises from the price of carbon.

Figure 22 below shows the levelised costs of energy as of the end of 2010. "Levelised cost represents the present value of the total cost of building and operating a generating plant over an assumed financial life and duty cycle, converted to equal annual payments and expressed in terms of real dollars to remove the impact of inflation. Levelised cost reflects overnight capital cost, fuel cost, fixed and variable O&M cost, financing costs, and an assumed utilization rate for each plant type[x]." This represents a much fairer comparison of the relative costs of various sources of energy than just looking at the fixed costs of investment which is much more of a standard practice. All new power investments should be based on these levelised costs rather than fixed cost criteria alone and this would drive much more investment into green energy particularly in an environment of

- high price volatility
- high and rising fuel prices
- rising costs of emissions

Figure 22: Levelised costs of various sources of energy $/MWh



Source: Bloomberg New Energy Finance [127]/ LCOE: Levelised Cost of Energy Model

The analysis in this Chapter clearly demonstrates that there should be a very strong role for public policy in decisions on new investments in energy as left to their own devices utility firms will make choices that are economically and environmentally very bad for the EU and also have little impact on reducing our dependence on imports of fossil fuels.

It also shows that using levelised cost estimates, discount rates that take into account the negative effects of high price volatility and using a mean-variance portfolio optimization approach for the energy mix in the EU will drive much more investments in the direction of green energy than is currently the case. This is central to a successful execution of the Green New Deal.

In fact California has just embarked on a very ambitious green venture when its legislature passed a law in April 2011 requiring that a third of all its energy comes from renewable energy sources by 2020. The new law has set the most ambitious targets of all US states and also imposes a much tighter definition of renewables by excluding hydropower.

Their use of the diversification and the fixed/variable costs arguments developed in this Chapter are obvious in the statement of the state senator who sponsored the bill

"People were so determined to save a fraction of a penny in the short term that they ended up paying billions of dollars in the long term. When you have all your energy eggs in one basket, you're at risk. Events around the world have served to remind California of the value of a diverse portfolio and greater energy independence[xi]." The European Union would be well advised to follow California's example if not go further.

The large potential economic costs of not being able to tackle climate change, which have not been discussed here, serve only to strengthen the case for green investments.

Summary

The economics of green investments are fundamentally different from those of dirty investments. Typically, green investments have significantly higher fixed capital costs that are frontloaded. Dirty investments have lower fixed costs but high variable costs owing to cost of fuel which forms the largest component of lifetime costs of the generation of energy from fossil fuels.

This means that green sources of power are capable of providing a near fixed cost supply of energy that dirty sources are incapable of. In particular in an environment where

- fuel prices are high
- fuel prices are rising
- fuel prices have high volatility
- and the price of carbon emissions is rising

the relative economic advantage of green investments over dirty sources of power rises sharply.

Comparing the initial fixed costs for making investments in power generation, as many utility companies that can pass on the variable costs of fossil fuels through to customers do, severely penalizes even green investments that may be economically cheaper once lifetime costs are accounted for. Of course the benefits they bring in terms of helping reduce GHG emissions are a significant additional source of advantage to society.

The use of levelised costs that compensate, at least partly, for higher lifetime operating costs helps reduce some of the economic distortion in energy planning decisions.

Even when the levelised costs of green energy may be higher than those of dirty energy, it may make pure economic sense for future investments in energy generation to be skewed heavily in favour of green investments. This is the logical conclusion from a mean variance analysis of the costs structures of various means of energy production. Such an analysis allows us to compare not just the costs inherent in different sources of energy but also the impact of different levels of volatility. Since the price volatility of green investments is much lower, the use of such an analysis further skews the economic case in favour of green investments.

In fact, at present levels of costs, and volatility and taking into account the current power generation mix in Europe it makes sense for almost all new investments in energy generation to be directed towards green investments. The use of such an approach and analysis has led California to conclude that it needs to set a target of one third of all energy generation in the state to be green by 2020, by far the most ambitious green target in the US and EU.

Applying levelised costs and a mean variance analysis would no doubt drive EU policy makers to the same conclusion. This economic case for green energy investments is only bolstered by a further tightening of GHG emission standards and a rise in carbon taxation anticipated in the near future. Once the downside economic risk from impending climate change is factored in the case for green investments receives a further boost.

5. The economic case for green investments for investors

It is clear from the discussion in the previous Chapter that the economy-wide economic case for green investments is very strong. Positive as this may be, it is not enough to guarantee that the investments anticipated under the Green New Deal would get funded. For this to happen there is a need to demonstrate that investors also have a positive economic case. Ethical investment funds, that may be a source of funds for economically marginal but socially beneficial investments, are simply not large enough to fund he green new deal. So an economic case for mainstream investors needs to be made.

Climate risks

Climate risks are particularly important to institutional investors. Many of the assets on their portfolios would be negatively impacted by the effect of climate change for example through the increased incidence of floods and droughts. Changes to policies pertaining to tackling climate change such as a decision to increase carbon taxes or limit emissions trading quotas would also affect many of their investments in utilities and energy intensive industries.

Yet another risk is reputational where companies that are part of the portfolio of such investors could find their products boycotted or their reputation damaged if they are known to be laggards in taking action against climate change. Another risk is that of changes in consumer behaviour. As US carmakers that were selling fuel guzzling cars found out to their detriment in the mid-2000s, customers can be fickle with their choices and companies that do not focus on producing energy efficient products or cutting their own energy consumption are putting themselves on the wrong side of trends in customer behaviour and regulatory action.

Such investors usually hold universal portfolios i.e. are exposed to most of the major asset classes and a significant proportion of them have long investment horizons. This means that they have a strong motivation to be concerned about externalities across both time and space. Actions such as excessive carbon emissions by some of the companies they are invested in that can have negative implications for some of their other investments either in the present or in the future will impact their bottom line. Hence, such externalities which are one of the main drivers of underinvestment in green sectors are at least partially internalized by longer term investors. This implies that they can potentially be champions of such green investing.

Because excessive emissions will have a significant impact on the returns they can expect from their investments and from their portfolios as a whole, they have a strong incentive encourage polluting companies to act in a way that is better aligned with successfully tackling climate change.

Climate opportunities

In fact talking about climate risks alone is inappropriate. It is equally pertinent to talk about climate opportunity wherein the expected growth in green investments, the on-going development of new promising green technologies and the large scale development of energy efficient products are all very promising investment opportunities where medium to long term investors have a competitive advantage.

They could, for example, persuade the companies they invest in to make energy efficient investments and choose to invest in firms developing promising new low carbon technologies (LCTs). Long term investors in particular are perfectly placed to take advantage of illiquid investments, investments under-priced by markets and investments driven by secular trends such as the need to tackle climate change. Green investments tick all three of these criteria.

Grantham LSE/Vivid Economics has estimated that the cost of carbon could be $110/tC02e to $220/tC02e by 2030 across a number of mitigation scenarios that they have modelled and at this level the economics of many industries, not just particular companies, can completely change thus having a substantial positive or negative impact on the portfolios of investors.

In a comprehensive study, the consultancy Mercer has estimated that a typical portfolio seeking a 7% return could manage the risk of climate change by ensuring around 40% of assets are held in climate-sensitive assets. They also suggest that investors

- need to introduce a climate risk assessment into on-going strategic reviews
- increase asset allocation to climate-sensitive assets as a climate "hedge"
- use sustainability themed indices in passive portfolios
- encourage fund managers to proactively consider and manage climate risks
- and engage with companies to request improved disclosure on climate risks [115]

The importance of this discussion and the potential from a shift in thinking towards accounting for climate risk can be gauged from the statements by important long term investors such as the Environment Finance and Pension Fund Management

- "We think that all pension funds will need to adopt a climate change-proofed financial investment strategy in the future"

and the Norwegian Sovereign Wealth Fund

- "Climate change is a global risk factor that all long-term investors should take into account when formulating investment strategy" [115]

Mercer has further estimated that

- new investment flows into green investment will range between $180 billion and $260 billion
- the negative impact of climate change will be between $70 billion and $180 billion
- and that the additional costs of emissions will range between $130 billion and $400 billion

annually between now and 2030. This range of impacts is very significant and cannot be ignored by any serious investor.

That is why, we believe that it makes economic sense for there to be a significant increase in the allocation of assets to green investments by both true long term investors as well as other investors and that the explicit factoring in of climate risks and climate opportunities in investment decisions will be one of the biggest drivers of funding for green investments.

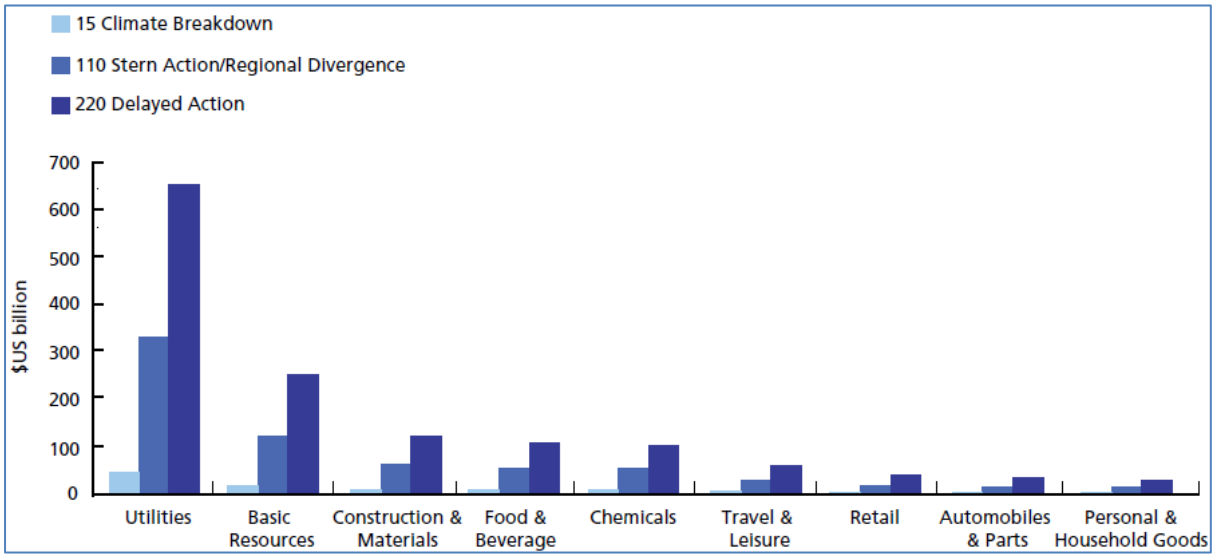
Sovereign wealth funds and green investments

Fossil fuel funded sovereign wealth funds are a particularly promising source of funding for green investments. They are heavily exposed to dirty industries as the new money flows come from the sale of oil and gas so they have a massive downside risk in actions being taken to mitigate climate change. That is why it makes sense for them to diversify their risks by actively investing in industries that will benefit from the policy measures taken to tackle climate change and new LCTs that are being developed with zeal.

Till date, many such as the Norwegian sovereign wealth fund remain far too heavily exposed to the oil and gas industry in their investment portfolio though the Norwegians have set up a small pilot facility of $2.5 billion as part of the sovereign wealth fund to actively seek investments in renewable energy, clean technology and climate sensitive sectors. However, they and the other fossil fuel based funds need to go much further for effective diversification of risk.

The figure below highlights some of the sectors most exposed to climate change risks.

Figure 23: Cost of carbon adjustment by sectors under various mitigation scenarios



Source: Mercer [115]

Many institutional investors have suffered seriously in this present crisis as result of not having sufficiently understood and managed the various risks facing their portfolios. The risks posed by climate change are another form of risk that is poorly understood and hence mismanaged. They need to recognize that policy driven changes to the future price of carbon, changes to the demand for products along the dirty to green spectrum and physical risks to various parts of their investments posed by climate change all pose serious long-term risks to their portfolios that can significantly alter the risk / reward mix.

Summary

No matter how strong an economic case there may be for green investment at the economy-wide level such investments will not materialize unless an economic case exists for investors to divert funds from dirty to green investments. Ethical funds that may fund marginal green investments are simply not large enough to meet the needs of the Green New Deal.

Institutional investors, many of which have universal portfolios (are exposed to most asset classes) face significant climate risks. Not only are their investments physically threatened by climate change but they are also heavily exposed to the policy responses such as an increase in the price of GHG emissions that the EU may impose to help tackle climate change. They may also face legal risks for not fulfilling their fiduciary duty as well as serious reputational risks where the GHG intensive investments in their portfolios invite boycotts and competitiveness risks where products and services that are energy intensive may simply go out of fashion.

The flipside of these climate risks where large investment opportunities exist in the green sector. This is likely to attract hundreds of billions of dollars in additional annual investments over the next few decades and institutional investors which are nimble would be able to make substantial returns from exploiting these green opportunities. In particular green companies that are well-placed to benefit from rising costs of emissions and an increasing awareness of green issues can offer good investments opportunities.

As discussed in an earlier Chapter, there is also a substantial need for financing the procurement of green assets for which long-term investors are particularly well-suited.

Mercer has estimated that a typical portfolio seeking a 7% return could manage the risk of climate change and capitalize on climate opportunity by ensuring around 40% of assets are held in climate-sensitive assets. They also suggest that investors

- need to introduce a climate risk assessment into on-going strategic reviews
- increase asset allocation to climate-sensitive assets as a climate “hedge”
- use sustainability themed indices in passive portfolios
- encourage fund managers to proactively consider and manage climate risks
- and engage with companies to request improved disclosure on climate risks

The economic case for fossil fuel sovereign wealth funds to make long-term green investments is particularly powerful because of the diversification potential of such investments.

It seems that the economic case for green investments is not only powerful at an economy-wide level but also for institutional investors in general and long-term investors and sovereign wealth funds in particular.

6. Barriers to green investments

Europe needs a Green New Deal in order to stimulate the economy, create jobs and tackle climate change. This report has discussed how much this would cost and shown that the stock of financial assets potentially available is large enough to be able to provide the adequate amount of funds needed though additional support may also be required from the public sector.

There is, as discussed in a previous Chapter, a robust economy-wide economic case for green investments. This is boosted when energy planning decisions are made on the basis of levelised costs. The economic case is made even stronger when one applies a mean variance approach that accounts for not just the average costs but also takes into account the price volatility of fossil fuels.

The report has also discussed how a there is also a strong economic case for green investments institutional investors, in particular long term investors such as sovereign wealth funds.

Once energy security considerations and more importantly tackling climate change are added into the mix the socio-economic case for green investments becomes overwhelming.

However, despite reasonable funding costs, a strong economic case based on economic fundamentals and an availability of a sufficient aggregate level of funds it is clear that not enough green investments are taking place.

It is clear from the discussion so far that

- a substantial amount of green investments are needed if we are to have any hope of fighting climate change or successfully executing the Green New Deal
- the overall pool of private savings and financial assets that exists is large enough to be able to meet these additional needs
- there is a possible need for but also a substantial scope of additional public revenues to support this private investment
- despite all of this there continues to be a very significant gap between the green investments needed and the amounts of investments currently being made
- there is an urgent need to fill this gap

Hence the focus of this Chapter is to identify and explore the factors that lie behind the fact that far too few investments in green energy and in energy efficiency are actually taking place, the so called green gap. This green gap must be plugged.

Even when all the financing measures are in place, physical barriers such as limited access to grid connections can limit the march of green energy [20]. While these are important, this paper will focus on financial, behavioural and information hurdles and friction costs. This Chapter will highlight these hurdles and subsequent chapters will focus on policy suggestions on how best to overcome these hurdles so as to get an effective implementation of the Green New Deal.

Here it is important to point out that there is a difference between those green investments/green consumption patterns that will impose an additional financial cost even when policy and practice distortions that unfairly penalize being green are removed and those that are financially profitable

under the right conditions. For the former negative net present value investments and consumption patterns the additional funds would need to come from somewhere. The two obvious sources here are public money driven by the non-financial goals of tackling climate change and improving energy security and premiums paid by groups of conscientious consumers.

The second group of green investments and green consumption is net present value positive so does not need a public subsidy. Here investments can be self-financing in the long run and consumers can simply shift consumption patterns from dirty to green products without incurring a financial penalty. However, while many of these investments and purchases are profitable the fact that being green often entails higher upfront costs and the sheer scale of investments required means that there may be a need for some form of public support to kick start the Green New Deal.

This Chapter deals primarily with the second much larger group of 'positive net present value' investments. The first smaller group of interventions needing subsides is dealt with in a later Chapter.

Financial hurdles

The corollary of there being too little green investment is that there is far too much dirty investment since the overall energy requirements of the EU are being met. This is driven by the fact that under

- current regulations
- market practices
- financial incentives
- and risk perceptions

the supposed risk/return trade-off seems to overwhelmingly favour dirty investments over green. In short, despite that fact that green investments are overwhelmingly preferable from a societal perspective, the odds in the real world are stacked against them. In this section we identify the factors behind this and in subsequent Chapters make policy suggestions on how best to tilt the financial landscape away from dirty towards green investments.

In order do this we have four main factors to play with

- the return on green investments (we would want to increase this)
- the perceived risk of green investments (we need to reduce this)
- the return on dirty investments (we would like this to fall)
- the perceived risk of dirty investments (we want market actors to factor in higher risks)

Carbon is under-priced and the price is volatile and uncertain

Greenhouse gas emissions drive climate change which is overwhelmingly harmful. However those responsible for the emissions are not made to bear the cost but inflict it on the rest of the world. This spatial externality is not the only one that GHG emitters impose on society. The average carbon molecule stays in the atmosphere for around 200 years or so and it is the stock of GHG gases that drives global warming. Those emitting GHG gases now are also inflicting a cost on future generations so they also impose an inter-temporal externality.

As long as these emitters do not have to bear the full costs of their actions, they will continue to have an incentive to emit far too many GHGs and profit from the economic upside associated with this. At a very fundamental level, we are not seeing enough green investments because those making dirty investments continue to enjoy a free ride. At low carbon prices, it is often more profitable for economic actors to continue to make use of legacy dirty energy infrastructure and even to install more coal-fired plants than to make new green investments. It is then also not very attractive to make economising changes to energy use patterns or to make efficiency enhancing investments.

Investments in low-carbon technologies are socially beneficial. As we have seen in previous chapters they also often make good economic sense. But as long as carbon emissions remain under-priced, the private rate of return on green investments will continue to be lower than the social return putting it at a disadvantage to the rate of return on dirty investments. As a result, more investment than is socially optimal is allocated towards carbon intensive activities, while low-carbon activities struggle to raise capital.

Programs such as the European Union's Emissions Trading Scheme (ETS) have belatedly put a price on GHG emissions but there is universal agreement that at current low levels this does not reflect the full cost of the externalities. Another problem is that the price is too volatile to send a reliable price signal. Carbon was traded in the EU-ETS for Euro 20–25 per tonne for most of 2008, dropped to Euro 8 in February 2009 and is currently trading around Euro 17 per tonne[xii]. The volatility and the price collapse can be clearly seen in the figure below.

Figure 24: EU ETS Price evolution and the 2009 price collapse

Source: Government of Scotland[xiii]

The collapse of the carbon price in the wake of the financial crisis, combined with weak results from international climate discussions, threatens to undermine confidence in the EU-ETS and endangers future investments in low-carbon technologies. Recent security breaches in the trading platform

that exposed millions of euros of fraudulent transactions have further undermined confidence in the EU ETS[xiv].

Jeff Chapman, Chief Executive of the Carbon Capture and Storage Association, explains: "The problem is that investors can't bank on a future value of carbon. It is impossible to take a project proposal to a bank based on a future price because we have seen the price collapse once before, and it is now doing it again."[xv][21]

The expected price of carbon is important in predicting the profitability of low carbon technologies. Point Carbon estimated that under the two different reduction scenarios it considered carbon prices will differ substantially: Euro 20-40/tonne CO by 2016 in the former, and Euro 30-60/tonne CO_2 in the latter [23]. This difference could be a decisive factor in determining whether or not a low-carbon project will go through.

Perhaps the biggest problem comes from the fact that a lack of political vision and policy clarity means that the future expected price of carbon is highly uncertain an environment in which future price expectations are excessively anchored by the prevailing price that is far too low. Even if an economic actor expects a high future price for emissions, the great uncertainty surrounding future price developments means that mobilizing funds based on such assumptions will not be possible. Under such circumstances, far too many new investments are being made in the dirty sector locking us in to a path of higher carbon emissions for decades to come. In the language of an earlier chapter the levelised cost of dirty energy, that at least in theory contains future price of carbon, is lower than it would be in an environment of greater certainty.

Solutions: Increase the price of carbon, make it more certain and reduce price volatility

The risks of dirty investments are under-priced

Under current practices there is a general under-pricing of risks associated with dirty investments. This works through several channels.

Even though the prices for GHG emissions are relatively low at present, the fact of the matter is that they are expected to increase significantly in the future. Even if one believes that our leaders are unlikely to be able to negotiate a successful global climate deal soon, there is real possibility that they might come through in the end. Even in the absence of a global agreement regional action such as in the EU is likely to get tougher. Under some scenarios of mitigation action, carbon price is expected to be as high as Euro 60-100/tonne of Carbon Dioxide.

At these levels the economics of dirty investments in coal fired power plants and even in gas turbines start to break down. However, despite this real possibility investors and lenders continue to evaluate dirty power investments using projections for carbon prices that are extrapolations of the current low price. This leads to a serious under-estimation of price risk for dirty projects and means that far too much dirty investment than is financially sensible goes through.

While the example deals with power plants it can be extrapolated to other investment decisions such as the purchase of a car or other energy intensive white goods. Because consumers almost always use the present price of petrol as a benchmark they do not account for the possibility of fuel

price rises at the time of their purchase and thus end up buying less fuel efficient cars than what might be financially sensible.

Another risk that is often not accounted for is the risk of an outright ban on certain polluting technologies. Investments being made in certain GHG intensive plants or products may face a drastic loss in the near future if such technologies are shut down, a plausible though somewhat unlikely scenario. Such risks are significant enough to be considered into cost benefit considerations but are often simply ignored.

A third risk that dirty investments that directly or indirectly use fossil fuels face is the possibility (independent of GHG pricing) of fuel price rises in the future. As we have seen in a previous chapter the price of oil has seen a rising trend. Once again, economic decision makers often do not account for this risk in their decisions and hence end up under-pricing the true risk of dirty investments. Unlike fossil fuels, renewables will see a decline not a rise in future costs.

A fourth risk, which is also evident from the graph of the evolution of oil prices in an earlier chapter is that of the high volatility of fossil fuel prices. All other things being equal, volatility has an economic cost. Current market practices seldom account for this so the under-pricing of the risks of dirty investments has multiple dimensions to it. In contrast, the prices of renewables, because they have no fuel costs, are less volatile.

Solution: Make investors and consumers take into account the likelihood of future higher carbon prices and high and volatile prices of fossil fuels.

The perceived risks of green investments are high

Currently green investments have a high perceived risk for several reasons:

- many low-carbon technologies are in an early phase of development, which tend to increase the perceived risk
- many green investments involve high upfront costs so the payback period is longer than that of many dirty investments
- the profitability of green projects depends on regional and international climate policy, which can change

All these factors restrict access to funding and increase the cost of funding green technologies and projects. The high private risks stand in sharp contrast to the social value of investing in low carbon technologies.

Many new technologies find it hard to attract private capital at affordable terms at several stages of the technology cycle with early phases often facing the steepest hurdles. While some of the early development stages of green projects are funded by public grants, demonstration and deployment of technologies is capital intensive and even though the potential revenue may be high, the risk associated with future revenue streams is still too high to attract a critical mass of funding in the private market. This pre-commercial phase is called 'the valley of death,' referring to the sudden financial gap a new technology faces once grant funding dries up and is a significant problem in the EU.

This gap is particularly prominent in the absence of well-developed venture capital, which provides capital to new technologies in the early stages of development before they can attract commercial bank financing. The gap increased during the financial crisis as investors fled the early stage investment arena depriving nascent green companies of a crucial source of equity capital [22].

The second risk is that some projects, such as building renewable energy systems and low carbon infrastructure, require high upfront investments but it may take time before the project is able to generate substantial revenues. This higher upfront capital cost nature of green energy was analysed in detail in a previous chapter. The high capital needs of the investments and long time horizon increases the perceived risk for the investor.

A third risk is to do with technological uncertainty. This has two parts: one that robustness of new technologies has not been tested fully so the new wind turbines or solar panels may not last as long as they are expected to and second that at the current pace of development, any technology one invests in has a danger of being superseded by new developments and becoming obsolete.

A fourth problem is due to the lack of a long data series on the performance of green technologies. The economics of coal fired plants and the expected cash flows are well-understood. This is not the case for green investments. Since lenders and investors are heavy users of historical performance time series, the absence of these means that they attach a higher risk premium to green investments.

This higher risk premium is especially harmful to green investments since green projects have higher up-front costs but low or no fuel costs, making them more sensitive to higher interest costs. “As opposed to natural gas generation, where the bulk of the lifetime cost is embedded in the variable fuel costs, capex-heavy (capital expenditure) generation is very dependent on the price of financing.” [124]

Finally, the lack of a consistent and predictable policy framework also undermines investor confidence. In a 2010 survey of corporations and project developers the majority of respondents indicated that regulatory stability and availability of public funding was a major driver for future green investments [22]. For example, faced with a fiscal crisis the Spanish government has

- slashed the generous subsidies it offered on solar power
- reduced the money paid for purchasing solar power
- capped the amount of subsidized power and
- reduced feed in tariffs which together amounted to a drastic shift in policy

This mean that installed capacity for solar power actually shrank in 2010 [127].

Solution: There is a need for more public support especially at early stages of green technology, more appropriate financial instruments, greater policy certainty, more demonstration projects to establish viability, a need for more funds for upfront investments and a preference for lower interest rates.

Investors do not account for climate risk

Climate change is going to change the conditions in which businesses are operating: the price of GHG emissions will increase sooner or later increasing the cost of polluting behavior, growing

awareness among consumers will drive demand for climate-friendly products, and the physical consequences of climate change will pose new challenges to business operation across the world. Despite the far-reaching impact that climate change will have on businesses' future value, and on the value of the financial institutions investing in them, climate risk has yet to be completely incorporated into asset managers' investment models. Until climate risk becomes a natural part of risk-return calculation, green investments will appear less favorable and will attract less finance than is economically optimal.

Climate risk refers to both the impact that climate change itself might have on a business's physical assets, such as reduced agricultural productivity caused by a climate-related disaster, as well as the impact that increased climate regulation might have on a business's operations, such as reduced demand for petroleum caused by a higher price on carbon. It also includes changes to consumption and behavioural patterns that may result from a growing awareness of climate change issues that may drive consumers to shun products that impinge negatively on global warming.

Climate risk is multidimensional in nature but signs are that investors are not taking these dimensions into account while making new investments and in the management of their portfolios. Interest in climate risk management has been growing steadily in recent years but financial institutions have yet to fully incorporate climate risk into their investment decisions.

Even out of the few investors who are already taking account of climate risks in their due diligence and investment decisions, none are able to consider all aspects of climate risk, reducing appetite for green investments. As is often the case, uncertainty favours the status quo. This is changing, as we saw in the previous chapter on long-term investments, but only at a very slow pace.

Some of the main types of climate risks we have mentioned in passing earlier that investors need to be cognizant of, but are currently under-pricing are:

- **Physical risk:** The physical consequences of climate changes, such as increased extreme weather events, floods and loss of biological diversity pose risks not only to the property and investment portfolios controlled by financial institutions, but on the economic system as a whole. Physical impacts can increase debt defaults and reduce equity values. For example, the heat wave in summer 2003 in Europe created water shortages, which shut down 14 nuclear plants at electricity producer EDF, causing a US$300 million loss [74].
- **Regulatory risk:** Although political leaders have been unable to agree on binding emissions targets and a global price on carbon, policymakers are already introducing carbon prices at the regional level. Higher prices on GHG emissions will pose a risk for institutions with heavy exposure to carbon intensive industries. For example, if the price of carbon allowances in the European carbon market rises to Euro 55, the cost of primary aluminium production will rise by 11 per cent [70]. Financial firms that invest in businesses with low climate performance are at risk of increased default rates and lower equity returns.
- **Climate litigation:** Failure to manage adverse environmental or social impacts may be seen as a failure to fulfil legal, fiduciary or agency responsibilities and could place firms at risk of climate-related lawsuits. For example, institutional investment consultants and asset managers can be sued for negligence if they to fail to consider environmental, social and

corporate governance issues [71]. In the United States in particular, the number of climate-related lawsuits filed in has grown steadily over recent years.

- **Reputational risk:** Consumers and investors are increasingly concerned with social and environmental impacts of economic activities and may punish firms that do not live up to their standards. If a financial institution is reputed to be 'dirty' it may face difficulties in attracting funding. For example, in 2008 the Rainforest Action Network (RAN) published a report on the climate exposure of seven leading Canadian banks, encouraging many clients to move their deposits to "greener" banks [72]. In 2009, campaign groups including the World Development Movement took the UK Treasury to court for failing to stop the state-owned Royal Bank of Scotland[xvi] (which they dubbed "Oil Bank of Scotland") from investing in Arctic drilling activities [73].
- **Competitiveness risk:** Usually driven by the other types of risk, this refers to the risk of losing market share either because a firm is more carbon intensive than its competitors due to new carbon regulations or because consumers prefer cleaner goods. The auto industry provides a good example. The EU is debating a set of proposals aiming at hold driving emissions at an average 120g CO_2/passenger km in 2012. Companies that have developed low emission vehicles have a competitive edge, while companies supplying high polluting vehicles, and their investors, risk losing market share. Just as fur became unfashionable, changing levels of awareness and consumer concerns mean that carbon intensive products may suddenly lose their markets. This is a very serious business risk.

Climate risk awareness is increasing among investors and asset managers. Most asset managers are considering some forms of climate risk, but fail to take the whole range of risks into account. In a survey of asset managers conducted by CERES, 71 percent responded that they did not conduct a comprehensive assessment of climate risks as part of their due diligence process. Asset managers that offer green investment products are more likely to assess climate risks – 67 percent compared to 20 percent for those not offering green investments products – but climate risk analysis was not necessarily included in their due diligence for non-green investments.

Regulatory and litigation risk was more frequently given weight in asset manager's investment procedure than other types of risk – 66 per cent compared to 33 per cent who consider physical risks to companies from climate change. Fifty per cent reported that they considered climate related competitiveness risk. However, only a few asset managers reported that they include climate risks and opportunities throughout their investment analyses, i.e. in due diligence, investment decision, and portfolio valuation.

Research conducted by Innovest Strategic Value Advisors found the environmental risks facing highest-risk companies were 30 times greater than those facing the lowest-risk ones. Those most exposed were in energy intensive sectors such as electricity utilities, automobiles, metals, mining, and construction. An analysis by Carbon Trust found that up to 65 per cent of the value of aluminum or automobile company could be at risk if it is poorly positioned to respond to market and regulatory changes [75].

Solution: There is a need to make institutional investors and credit institutions report, measure and manage all aspects of climate risk to which they are exposed through their investment and credit portfolios.

Short-termism in finance discourages green investment

Everyone agrees that the price of carbon (or equivalent penalty for GHG emissions) is likely to rise sharply in the medium term. Yet financial and business actors continue to behave as though they did not believe this would be the case. Even now, businesses are continuing to make 'dirty' investments ignoring the fact that were carbon price to increase to the expected level these would no longer be profitable.

More disturbingly, there is growing evidence that financial markets, which are supposed to send signals to the real economy that encourage long term productive and profitable investments, are doing the exact opposite. Banks as well as capital markets continue to provide cheap finance, for example, for coal fired power plants. Financial markets continue to reward energy intensive companies that are currently profitable but exposed to serious downside risk from higher carbon prices in the long term. Short term profitability is being rewarded often at the cost of long term profits and sustainability.

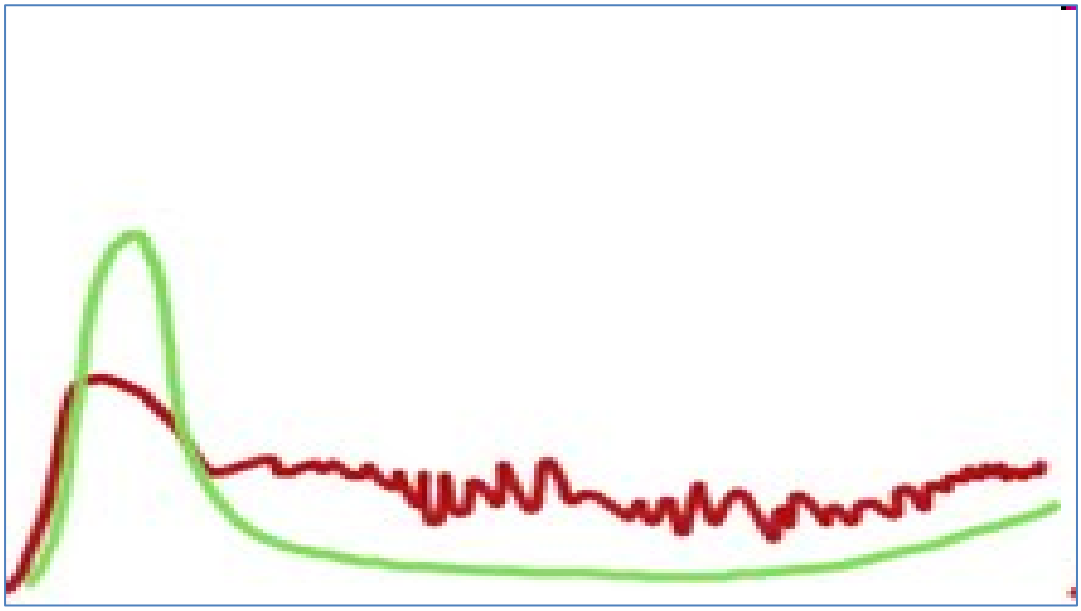
A survey of 421 financial executives found that "firms are willing to sacrifice economic value in order to meet a short-run earnings target…78% of the surveyed executives would give up economic value in exchange for smooth earnings."[128] Excessive short termism in financial markets and corporate management is directly translating into lost green investments. For utilities and energy companies this means less investment in green energy and for other non-energy businesses if often translates into much less investment in energy efficiency than would otherwise be the case.

Company executives are loath to disappoint analyst expectations of quarterly (or annual) profits and a study of the companies listed on the DJIA index showed that more than 60% of the time company earnings come in just above consensus forecasts, delivering the predictable share bounce[3]. This level of forecast hugging is clearly impossible in the complex world we live in and is evidence of earnings manipulation.

The short term focus of financial markets rewards projects with short payback periods and automatically penalizes projects with a longer payback horizon. This means that green projects which, as the figure below shows, have higher upfront costs are under-financed by the financial markets.

Other drivers of short-termism in the market are the facts that performance is often measured over the short term, portfolios are increasingly marked to market and that the market preferred choice as a measure of risk is the short term volatility of prices. Benchmarking the performance of funds to indices also means that it is risky to make investments that are very different from the market average so if the other investment managers are not making green investments it is hard for any fund manager to do so.

Figure 25: Cost structures of green (in green) and dirty (in red) investments over time



Source: Authors

As discussed in the chapter on the economic case for investors, the compensation structures of fund managers which are linked to annual profits mean that trillions of dollars of funds that are potentially available for long-term investments are instead invested for maximising short term profits. This is a grave loss for society and implies that green infrastructure projects that are best funded by long term capital remain underfunded. The average tenure of the chief investment officer for public pension funds is less than four years with more junior staff having even shorter tenures [113].

Such short term perspectives mean that many fund managers ignore the set of serious climate risks discussed in the previous section. This under-pricing of dirty investment risk also penalizes green investments. The same short term perspectives also mean that the promising long term developments in LCTs and other green investment opportunities are ignored and that companies that are well set to benefit from more stringent GHG restrictions and shifts in consumer behaviour are not rewarded by investors.

It's not just the incentive structures of fund managers and corporate decision makers that are short term but also increasingly their trading practices. Mutual funds, for example, now turn over an average of 72% of their portfolios every year which means the kind of buy and hold investments that were critical to financing infrastructure in the past are increasingly scarce.

Solution: Embed a longer term perspective in finance in corporate management

Access to capital, financial instruments and accounting issues

One of the biggest problems facing the scale up of green investments is the absence of sufficient financing for

- green energy production projects
- green infrastructure projects

- green consumption and purchases and
- energy efficiency investments.

This is attributable to a large degree to the risk/return discussion earlier in this Chapter. However, even when profits are there for the taking, many green investments do not materialize. This problem can be traced missing markets and missing financial instruments.

The greater upfront costs of green purchases and energy efficiency investments mean that they are sometimes at the mercy of availability of credit which is often a problem for a number of households.

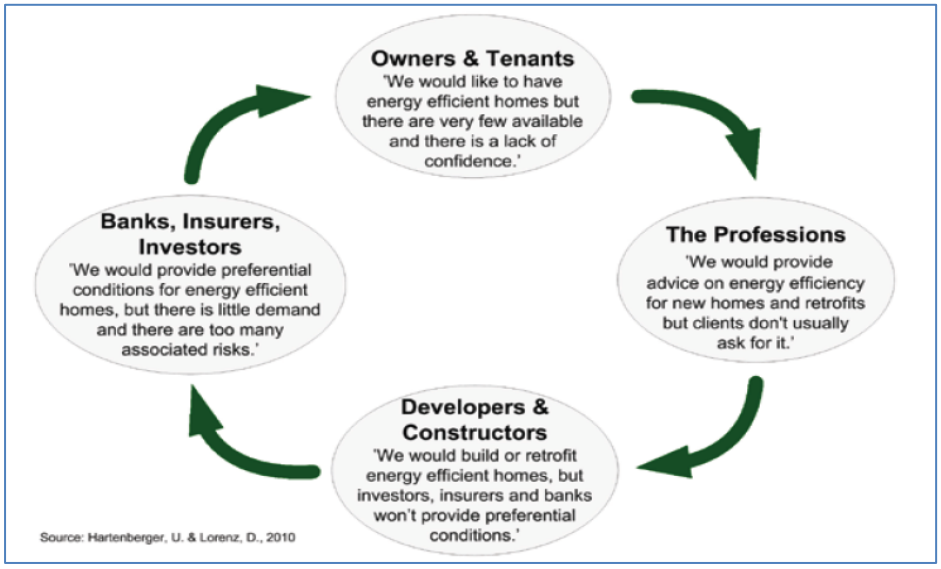
Another problem faced by energy efficiency related investments is accounting related as they not consistently valued today and therefore cannot be accounted for in the way typical investments would be. Moreover, energy efficiency is not viewed as a core business requirement and, therefore, companies do not want it on their balance sheets. This further complicates financing and accounting for them, creating additional barriers.

Solution: Encourage the private sector to complete markets and where gaps still exist provide public support with appropriate financial instruments and credit. There is also a need to develop appropriate measures of accounting.

Behavioural hurdles

Despite the fact that much of economic theory assumes the existence of the 'rational man' the reality is that in making real life decisions there are a number of circumstances under which economic agents do not behave rationally. Another problem that presents a behavioural hurdle to green finance is when the incentives of those making decisions are biased against green investments. This is a subset of the well-known 'principal agent' or the 'split incentive' problem in economics. A third problem arises when a lack of interest or a lack of information affect behaviour in a way that undermines green investments.

Figure 26: Some problems confronting green investments



Source: RICS [129]

Split Incentives

There are a number of problems of split incentives where those economic actors making decisions on the production of energy or its use are not the same economic actors having to pay for the cost of fuel or associated GHG emissions. Manufacturers of energy intensive products such as cars and durable white goods, for example, often do not have very strong incentives to make low energy intensity products because it is their customers who shoulder a higher bill for fuels and GHG emissions. And low energy efficiency products are often cheaper so are easier to sell in greater volumes.

As discussed earlier power companies that are allowed to pass on the fluctuating costs of fuels to their customers have little incentive to invest in low carbon technologies that may have a higher capital cost. For them it is cheaper to build gas turbines which have a much lower capital cost and then pass on the high variable costs of fuel to their customers[xvii]. This happens on a large scale in Europe.

Another problem with split incentives and utility companies is that as long as they get paid more to sell more gas (for heating) or power that is exactly what they will try and do. They have little incentive to help their clients reduce energy consumption by helping them invest in energy saving measures.

Similarly, builders who develop homes and offices for sales do not have a strong incentive for investing in making the building more energy intensive since the energy bills would be not be paid by the builders themselves but instead by those who buy the buildings. Those owners who buy to let also do not have the incentives to make energy saving investments in better insulation or more energy efficient installations as the energy bills are paid by those who rent. Since buildings are often rented for somewhat limited periods of time, it is not in the interest of those who rent them to make such investments either because the costs will fall entirely on them but part of the benefits will also accrue to the owners and future tenants.

This is seriously problematic as buildings represent 40% of the energy use in the EU and the USA (only a part of this is insulation related). Also, because buildings easily last 50-100 years, once a poorly designed or insulated building has been built, it inflicts additional emissions on society for a long period of time.

Split incentives can also be problematic within businesses. The responsibility for capital and operating budgets often lies with different individuals or teams in the accounting and budgeting processes. Green energy or energy efficiency projects that require upfront capital may remain unfunded by those driving the capital budgeting decisions, even if they help improve the operating bottom line by saving costs.

Solution: Better align the incentives of builders, utility firms, energy producers, manufacturers of energy intensive goods and decision makers within firms to green actions.

Consumer discount rates and savings aversion

Economic theory assumes that opportunities for making profits are used. However in real life consumers and other economic actors often act in ways that run contrary to this idea. Consumers

seldom behave in accordance with a cost benefit analysis. This means that they often make choices that, in the context of this paper, run contrary to what would both be profitable and green. They often choose white goods such as energy inefficient washing machines and refrigerators that have a lower upfront cost but a lifetime cost of operation that is much higher. Similarly, too many people still buy gas guzzling cars even when more fuel efficient alternatives are available.

Research has shown that only 27% of consumers are willing to consider making energy efficient investments which have a payback period of more than two years [112]. This implies they are discounting savings they will make at an annual discount rate of about 50% which is completely irrational given that most individuals in the OECD countries are able to borrow at rates of 5% or less. Many of these same individuals would be very happy to have opportunities to put money into investments that generate returns of 10% but they pass up much more profitable opportunities to save money.

Research has shown that people treat one euro of spending differently from one euro of saving and this irrational bias part explains why energy efficiency measures can truly deliver the 'dollar bills lying on the ground' since so many profit making opportunities are passed up. Understanding the difference in initial cost is easy for consumers, but understanding the potential future savings is much more difficult.

McKinsey estimates that there are substantial profitable opportunities[xviii], for example in buying more fuel efficient vehicles, that can help reduce emissions but these are not taken up because but the payback periods are too long for most customers.

Solution: Enact policies that help consumers make profitable green choices on purchases of energy intensive appliances and cars and make profitable investments that increase the efficiency of their energy use.

Energy efficiency is not 'front of mind'

For many economic actors, energy may or may not be a significant cost so saving on energy through efficiency measures is not 'front of mind'.

For a typical business not in an energy-intensive industry energy costs represent only between 1% and 1.5% of total costs. This is too small and does not often get much attention from the business and hence goes 'under the radar screen'. This is also too low to justify the capital investments on a traditional business case in particular when there are more important priorities. "For corporations, efficiency investments must have a high enough rate of return to compete with other potential uses for capital – they must be "investment grade"" [118].

Energy efficiency is also invisible. Individuals and corporations tend to invest in assets they can touch or see so energy efficiency often gets overlooked [112].

Let us take another aspect of decision making. Goods and appliances bought and investments made often have some primary drivers. For example, cars may be bought on the basis of their size, speed, cost, brand, comfort. They are seldom bought for their fuel efficiency alone and it seldom ranks more than third or fourth in the decision criteria if it is considered at all. Economic actors may value more efficient products, services and assets, all else being the same but other factors are seldom all

the same. The attribute of energy efficiency is seldom a primary consideration. "Buildings, automobiles and appliances serve their own purposes – efficiency is not the need they are designed to meet" [112].

No matter how high a return on investment certain forms of energy savings generate, if the total amounts of savings are small – say a tiny fraction of a household's expenditure – then they are often ignored. Businesses too can be similarly apathetic to small savings.

It does not help that savings, particularly from efficiency investments are hard to see and measure so even if people and businesses cared about them they would be more reluctant to pay extra upfront costs for benefits that may be less than visible and hard to measure.

Solution: Enact policies that can make energy considerations 'front of mind' and more prominent in decision making by economic agents or otherwise 'nudge' them in the direction of green choices.

Information barriers

When surveyed, many individuals indicate a strong desire to invest their money in green projects and purchase green products but often they do not have the right information to do so. A McKinsey survey, for example, shows that 56% of consumers are motivated to make green decisions but are unsure how to do so. Even when options are available, such as 'green offsets' while booking flights, it is difficult to authenticate the effectiveness of the offsets being purchased. Pension funds and ethical fund managers are also put off by the high threshold efforts required to make green investments and verify their authenticity.

The problem is not just a lack of information, but also a lack of comparable information. Several entities have attempted to address the information shortage by developing green standards, and socially responsible and ethical investment indices. One problem is defining precisely what is green. Another problem is that methodologies for assessing climate change impacts vary. It is therefore difficult to be a green investor and several have expressed frustrations over the fragmented landscape they are confronted with.

The problem of a lack of 'green information' also applies equally to other relevant decision-makers. For example, consumers make purchasing decisions on household goods and appliances and cars without full information about the lifecycle costs of these products. The initial purchase price is unambiguous and clear so has a far greater impact that any possible associated costs such as those of the product's lifetime consumption of fuel and electricity which may be far higher. The lack of clear information on total costs skews investment decisions in favour of dirty products.

While the disclosure of energy efficiency performance is important and has become increasingly common and more standardized across the EU, this information is often too abstract for many consumers who still get far too heavily influenced by the upfront purchase price of products.

A general lack of standardized, comparable and good quality information on green investment opportunities, green products, green consumption and green technologies are all obstacles that reduce the overall allocation of funds to the green sector.

Solution: Help increase the amount of information on 'green performance' that is available to customers as well as investors. It would also be imperative to make it standardized for easy comparability and easy to understand and interpret.

Friction costs

Even when information is available, a number of green decisions face serious friction costs. The most important amongst these is the problem of disaggregated decisions that afflicts both households and the industry as well as investors. For example, many energy efficiency opportunities do not involve one large investment with a substantial return but consist instead of large numbers of small actions that add up to significant energy savings. In a household this may involve changing over to energy efficient bulbs, putting in motion sensitive switches and efforts to minimize the use of 'vampire' power. Cost-effectively implementing these diffuse opportunities is a challenge because of the transaction costs involved.

Industries face the same problems as households where a number of small distinct measures such as improving insulation, reducing the heating temperature in workspaces, putting in place more energy efficient devices etc. add up to significant aggregate savings but face friction costs by virtue of being too small and too many to deserve attention from a business where the main line of work does not relate to the green sector and where the contribution of energy consumption to the input costs is rather small.

Investors face the same problem of disaggregation in terms of investment opportunities. As we have discussed before, many energy efficiency investments can deliver very significant returns on investments. These often face obstacles, for instance in the case of household investments in better home insulation, of significant upfront costs. For investors seeking high return opportunities these provide good possibilities. The problem is that each household investment is small – only about Euro 5,000-10,000 - and the effort needed to identify, verify and arrange for a loan or equity transfer to enable cash poor household to make such an investment entails significant friction costs.

Large corporate banks for example, are unlikely to invest their time and energy on conducting due diligence for investments lower than US$ 100 million as the returns compared to competing investments would be small.

Another problem is that investors seeking exposure to the green sector mostly would not like to take concentrated risk on any particular company or particular technology. Since green investments are still rather small, it is easy to get excessively exposed to particular companies or technologies.

These friction costs that arise from the 'disaggregation' inherent in many green investment and green behaviour decisions penalize being green.

Solution: Put in place policy measures as well as financial instruments and support measures that can help overcome the friction costs such as disaggregation that otherwise inhibit green investments.

Summary

A number of financial and non-financial barriers inhibit green investment and green consumption in the EU. Some forms of green behaviour remain fundamentally uneconomic and these can only be

brought about through a public subsidy, at least in the short term. However, the vast majority of green investments and green consumptions are not just beneficial for society but also generate a positive net present value once the barriers discussed in this Chapter are tackled. Some of the barriers we have highlighted here are

- carbon is under-priced
- the risks associated with the dirty investments are underestimated
- the perception of risks associated with green investments is exaggerated
- investors and firms both fail to seriously account for multidimensional climate risks that can have a very serious impact on their bottom-line in the near future
- short-termism inherent in modern finance penalizes green investments

Even when the economics of green behaviour may look sound from the perspective of the investor or the consumer misaligned incentives and psychological barriers may subdue green investments and green consumption. For example

- green investments also suffer from a problem of split incentives where those making decisions will not have to pay the full costs of dirty investments
- irrationality causes consumers and investors to pass up highly profitable green opportunities
- energy efficiency investments and opportunities are often not 'front of mind' so are ignored
- there is a lack of appropriate financial instruments and suitable accounting frameworks that further inhibits green investment

Information on green goods and green investment opportunities is not readily available and gathering such information is effort intensive which also penalize being green.

- a lack of comparable and standardized information on the 'greenness' of products and investment opportunities seriously inhibits green behaviour

Finally the nature of green investments which are spread across many different technologies, across small to modestly sized projects and across individual households such as in the case of opportunities to do with better home insulation means that there are serious aggregation problems for investors. The effort involved in seeking out and investing in such disaggregated investments mean that many profitable opportunities are passed up. This also happens at a micro level when households and businesses ignore small things such as using efficient bulbs that can help, when aggregated, to increase the efficiency of energy.

Tackling the obstacles discussed in this chapter is essential to stimulating and successfully executing the Green New Deal in Europe.

7. Putting an appropriate Price on GHG Emissions

While the many obstacles and frictions discussed in the previous chapter are important it is clear that the single biggest reason for why we do not see more widespread green investments and green consumption is that the current price of carbon does not reflect the externality that GHG emissions impose on the rest of society through global warming and climate change. That is why any discussions on policy measures for increasing green investments and consumption have to begin with increasing the cost of GHG emissions. Penalizing these emissions is the most important measure in making low-carbon activities competitive and in aligning social and private costs.

In addition to changing incentives structures, these measures can generate significant revenues for the public sector for example through a carbon tax and these in turn can be used by governments to subsidize the green sector or support green investments in other ways. If the level of these taxes is high enough this can generate general revenues that can help reduce some of the fiscal stress being faced by EU governments at this point.

The two main mechanisms for penalizing the cause of global warming are taxes on GHG emissions, and quantitative restrictions such as through a cap and trade scheme. These help skew the landscape away from dirty towards green behaviour by making dirty investments and consumption relatively more expensive. A future expectation of higher carbon penalties is also important for increasing the risks of dirty investments.

An important point to be noted here is that a predictable and less volatile price on carbon would be much more effective than a less predictable and more volatile one even at the same level.

Increasing the current and expected future price of GHG emissions

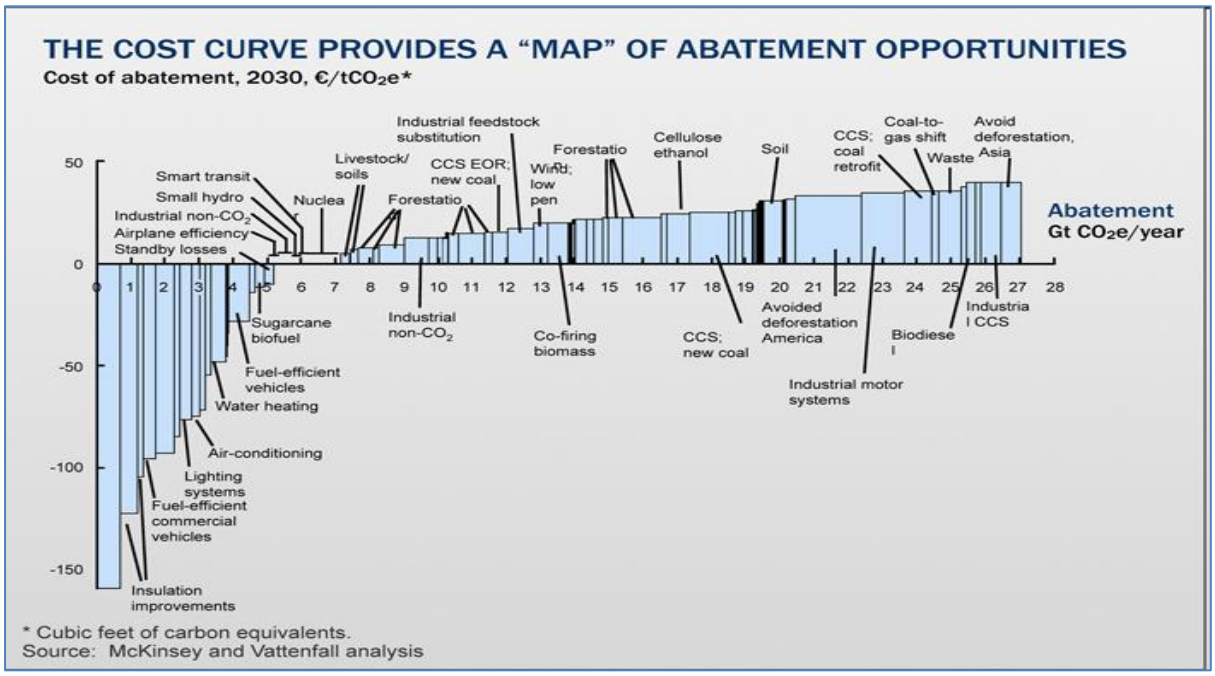
In theory, the optimal price on carbon equals the marginal social cost of GHG emissions. This approach is difficult to apply in practice for two reasons. First, measuring the social cost of GHG emissions is extremely challenging. There exist a range of measures, but the figures vary and are sensitive to the assumptions made for the calculation, in particular the choice of discounting rates.

Second, although the estimates provide a picture of the social cost today, they may not be the same tomorrow. The social cost of GHG emissions are increasing rapidly with the concentration of carbon in the atmosphere. Given the risk posed by climate change many policy makers across the world have adopted a precautionary approach and agreed to try limit any temperature rise to 2 degree Celsius. This in turn will require a very drastic reduction in emissions so the choice of carbon price has to be set so that it gives incentives to reduce GHG emissions in line with this stringent requirement.

This may require a price on GHG emissions of at least 30 euro/ tonne CO_2 equivalent over the next decade [25, 26]. Since new sources of dirty energy production such as coal fired plants have a long life, it is essential to frontload green investment as much as possible so a carbon price over 100 /tonne CO_2 may be needed by 2030 to provide incentives for a wholesale shift from fossil-fuels to renewables in energy production. The following graph illustrates the costs of CO_2 equivalent

emissions at which various current technologies for reducing GHG emissions become commercially viable.

Figure 27: The cost curve for reductions in carbon emissions



Source: McKinsey Global Institute [112]

Many carbon abatement technologies become profitable in the range 30-70 euro per tonne CO_2 (50-100 USD). For still nascent green technologies in the upper end of the cost spectrum such as carbon capture and storage (CCS) to be competitive the price estimate is from 70 to 90 euro/tonne CO_2 , while for offshore wind the price is estimated to be over 35 euro/tonne CO_2[26].

Since many of dirty as well as green investments, for example in the production of energy, last for several decades what is relevant is not just the current price of emissions also the evolution of this price over the life time of the investment. A CO_2 price of Euro 30/tonne may make a coal fired plant look more profitable than a wind turbine but if over its 30 year life the price increases substantially and averages Euro 70/tonne the relative profitability may reverse.

As we have discussed in the previous section, uncertainty around the future evolution of carbon prices is one of the biggest reasons for depressing green investments and green consumption. This happens because

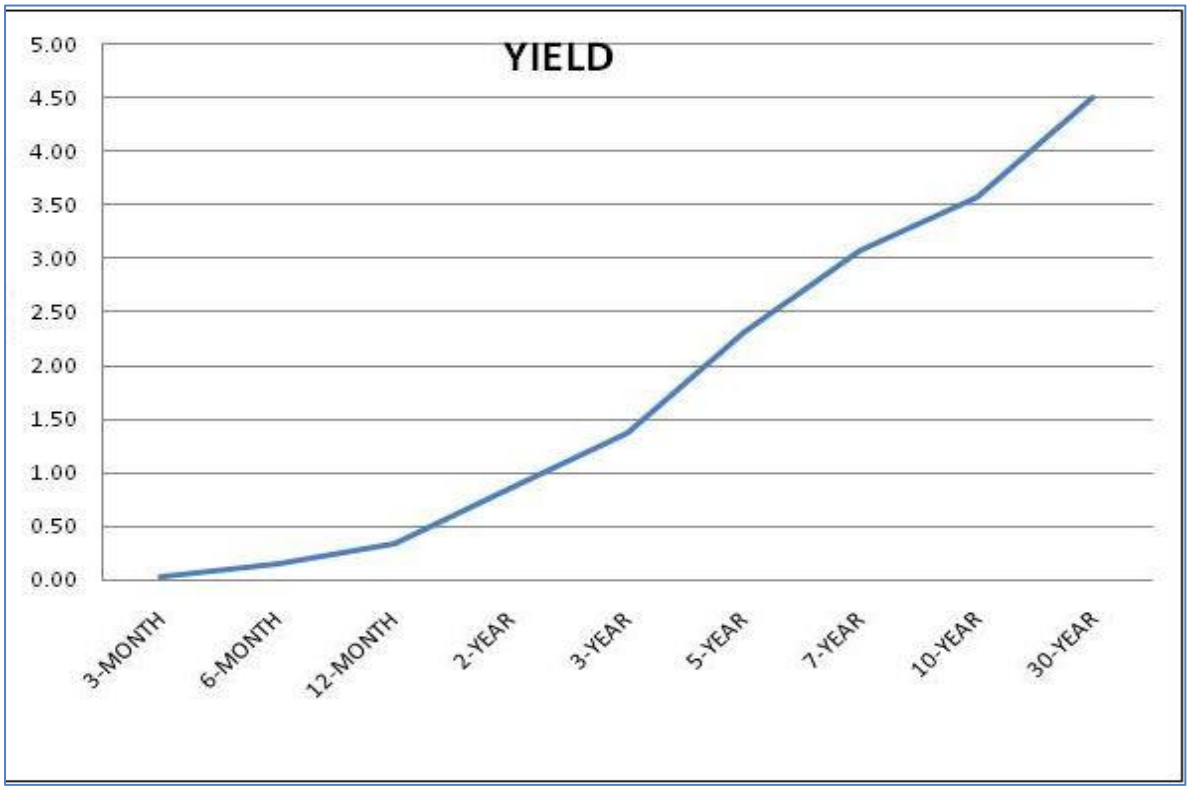
- the current price of emissions is too low and
- in the face of uncertainty this current price is often used as a benchmark to extrapolate future prices of carbon

This means that both investors and consumers substantially underestimate the lifetime price of GHG emissions in their decisions.

In addition to policies that increase the price of carbon, there is also a need for policies that allow for the formation of firmer expectations of the evolution of future carbon prices. For example, it has been suggested that EU policymakers should try form expectations of a future price for carbon that

use the management of the expectation of interest rates by central banks as a template [108]. The following graph, which shows a standard yield curve for interest rates, could provide a template for EU policy makers to create a forward curve for carbon prices.

Figure 28: A yield curve for interest rates that may serve as a template for a carbon price curve



Source: Bondsquak[xix]

Carbon Taxation and Cap and Trade

GHG emission reduction can be achieved by two means, putting a direct price on emissions such as through imposing a carbon tax or by putting a firm cap on the amount of emissions that are allowed. In the first case, the price determines the quantity of emissions and in the second the cost of staying under the cap will determine the implicit price. The capping mechanism is coupled with an ability to trade emissions rights which allows those who can reduce emissions at the lowest possible price to set the price as others facing more expensive abatement choices can pay these economic actors to reduce emissions on their behalf.

Carbon taxes are often more visible, more predictable and generate more public revenue compared to a cap and trade scheme for an equivalent amount of emissions reduced while the latter is supposed to deliver a greater certainty on the actual reduction in emissions and can achieve the same targets at a lower overall cost. The debate as to which of the two policy options is superior continues to rage with most economists favouring a carbon tax.

However, because of a number of factors such as the fact that extra payments made under an emissions trading scheme are less visible, the cap and trade mechanism being seen as more 'market friendly' and the negative reaction that the word 'tax' elicits in a significant proportion of the electorate, policy makers in the EU, have chosen to use the cap and trade mechanism to put a price

on carbon. That having been said, numerous examples also exist of carbon taxes, particularly at national levels in the EU, so it is useful to consider both options in making policy suggestions on improving the green investment and the green consumption landscape.

Carbon Taxation

Imposing taxes on the emissions of GHGs would help reduce their volume through an effect on both the supply and the demand side of the energy equation. For example, by making utilities pay a high price for emissions associated with the production of energy from sources such as coal or gas, a GHG tax would help change the energy production mix towards more green sources such as wind turbines. This will happen as the relative price of every Giga Watt Hour of power produced from dirty sources rises relative to the price of power produced from wind turbines or solar panels. In a competitive landscape, consumers too will start demanding more of the now relatively cheaper and greener kind of power. Another positive impact would be that the addition of a carbon tax to the price of dirty power would reduce its overall consumption and stimulate investments in efficiency.

Similarly, putting a price on emissions from the use of fuels such as petrol will provide consumers with incentives to buy more fuel efficient cars and to drive less. Those price signals would be passed on to the manufacturing industry to develop fuel efficient technology, and to city planners to build better integrated cities. In turn, this will increase the expected relative return on green investments. Pricing emissions is therefore one of the most powerful tools to drive a shift from 'dirty' to green investments.

Unfortunately, policies that make things more expensive are usually unpopular and therefore hard to implement. A common policy substitute is therefore to subsidise environmentally friendly alternatives such as renewable energy technology or public transport. However, unlike taxation which helps reduce both the size and the type of demand for energy, subsidies may perversely increase the overall demand for energy while changing the energy mix. Demand management is an essential aspect of a transition to a low-carbon economy. Additionally, subsidies cost money and therefore reduce opportunities for other green public investment schemes. Subsidies are also very hard to justify at a time such as now when austerity measures care cutting down public expenditure levels. A tax, on the other hand, would raise much needed revenue.

Cap and Trade

Under a cap and trade scheme the total level of GHG emissions allowed is capped by fiat. Governments then issue or auction a limited quota of 'permits to pollute' which are allowed to trade in a market so the private sector can reduce emissions in the most economically efficient way. The system incentivises industry to cut emissions when abatement costs are lower than the market price of quotas. Since businesses can trade permits within carbon markets, firms with low abatement costs will sell their permits to firms facing higher abatement costs and would thus be willing to pay more for them. This flexibility lowers the cost of a given GHG emissions reduction. The quota price is supposed to reflect the cost of reducing GHG emission down to the amount given by the total quota allocation. Unlike a tax on carbon emissions, cap-and-trade schemes does not provide incentives to reduce GHG emissions beyond the quota limit as the abatement cost falls.

Improving the EU Emissions Trading Scheme

The EU's Emissions Trading Scheme (ETS), which was launched in 2005, now covers almost half of the emissions (46%) of the total 3.9 billion tonnes CO_2 emissions in Europe and around 40% of the total GHG emissions[xx]. It works by targeting more than 10,000 high emitting installations in the energy and industrial sector that are concentrated sources of GHG emissions and obliging them to return emissions allowances to governments that are equivalent to their emissions for the year. They can get these allowances from their national governments under national allowances plans or purchase them in the open market from other installations that have managed to reduce their emissions below what is required of them under the EU targets so have excess allowances. A shortfall in allowances invites a fine from the European Commission. The number of allowances is reduced over time so that total emissions fall. In 2020 emissions will be 21% lower than in 2005.

The EU ETS currently covers CO_2 emissions from installations such as power stations, combustion plants, oil refineries and iron and steel works, as well as factories making cement, glass, lime, bricks, ceramics, pulp, paper and board[xxi]. In 2012 this will be expanded to include aviation and from 2013 some sectors such as petrochemicals, ammonia and aluminium that are currently exempt will also be covered.

A number of lessons have been learnt from the two first phases of the operation of the ETS which can help improve the operation of the cap and trade scheme in the longer term in time for the third phase of the ETS that begins in 2103. Broadly, the lessons include the need to

- expand the sectors included
- expand the list of green-house gases included to more than just CO_2
- tackling the over allocation of permits
- increasing the share of auctioned permits
- ensuring the integrity of the system
- try reduce some of the excessive volatility observed

Box 2: Suggested Reforms of the EU ETS

The European Commission has proposed revising the ETS with the changes coming into effect from 2013. Under these, a greater number of sectors and gases will be covered and the allocation will be done at the European rather than a national level. A much larger share of quotas will be auctioned from 2013 and the free allocation procedure will be harmonised.

The Commission plans to raise the proportion of emission quotas allocated by auction to at least 50% (around 1 billion tonne CO_2 equivalent) by 2013 – a move which is expected to raise electricity prices by 10-15%. Auctioning will first be introduced in 2013 for sectors not exposed to competition and phased in gradually towards 2020 for other sectors. The power sector will be required to buy 100% of its quotas, while other sectors will continue to receive 80% for free, decreasing annually to 30% in 2020 and reaching full auction in 2027. The transition to allocation by auction will not only increase government revenue from the cap and trade system but is also expected to deliver non-revenue benefits. Unlike the free allocation system, allocation by auction creates immediate incentives to invest in low carbon technology because it involves upfront payments.

The industry has voiced opposition to auctions and it is important to make sure that exemptions from auctions are kept to a minimum to avoid undermining the efficiency of the cap-and-trade system. If the EU is unable to come to a binding international agreement to reduce emissions in unison with other major economies, it should explore other options to preserve European competitiveness that do not involve watering down the EU ETS.

For the expected structure of the ETS regime, most forecasts of the price of CO_2 equivalent in 2020 lie between 30 and 40 Euros. Point Carbon, the carbon news and analysis provider, predicts the price on European emission allowances (EUA) to be 25-50 euro in 2016, assuming a 20% emission reduction, and 35-65 at a 30% reduction. The weighted price forecast has been adjusted in the wake of the financial crisis down to 37 euro. At the time of writing, the price of EUAs remains around 17 Euro per tonne CO_2. Deutsche Bank predicted the price of EUAs would rise to €30 by 2020. If the European Commission imposes tighter restrictions on the use of carbon credits from industrial gas projects (HFC and N20 destruction) the forecast increases to a significantly higher Euro 37 per tonne.

A critical factor limiting the effectiveness of the EU-ETS is the risk that the price of the EU allowances (EUA) might fall below a critical level, and no longer incentivise low carbon investments. In fact the recent fall in the carbon price, in the wake of the financial crisis, led many to question the scheme's reliability in providing a stable price signal to spur low carbon investments.

There are several ways to address this. A carbon tax supplement would provide a floor to the price of GHG emissions, giving investors more predictability in the development of future carbon prices and less risk of a price fall –crucial factors in their investment decisions. A tax could be set at a minimum level irrespective of EUA price. It would drive down the price of quotas although the total price on carbon would remain high as it would include both tax and quota costs. Alternatively the tax could come into play only if the quota price fell below a floor level. This would not affect the quota market except in extreme cases.

Another approach is to introduce a price floor in the auction of quotas, backed by a commitment to withdraw quotas if the market does not clear above the minimum price. This would insure investors against a price drop under a certain level in the same way as a put option for futures contracts.

The tax or auction price floor would work as an insurance mechanism against a sudden fall in the price of carbon to create investor confidence and strengthen the longer term incentive to invest in low carbon technologies. Another suggestion, as discussed earlier in this report, would be to issue guidance for future price developments in the EUA market backed up by some policy tools such as the ability to vary quotas or impose additional carbon taxes so as to limit the price fluctuations outside of the guidance range.

Increasing carbon taxation in Europe

While carbon taxes and cap and trade schemes are often seen to be substitutes there nevertheless are situations when combining the two can be effective. Carbon taxes should complement the EU-ETS to serve three purposes

- to internalize the external costs of emissions from sectors not included in the ETS

- to act as a safeguard against a sudden drop in the price of carbon for sectors covered by the ETS
- and to raise revenues for the Green New Deal

Despite the EU's adoption of a cap and trade scheme, the European Commission had long favoured the idea of a carbon tax. As early as the 1990s, a carbon/energy tax had been proposed at the EU level but failed due to intensive lobbying by some industrial groups and opposition to EU tax harmonization.

Box 3: The Carbon Tax as a Pigouvian Tax

The traditional purpose of levying taxes is to generate revenue for public expenditure, and the distortionary effect of taxation on the market is ultimately viewed as negative. The debate over how to use the revenues is secondary. However, a carbon tax is a prime example of Pigouvian taxes that aim to impose costs on activities which have a negative impact on society.

Theoretically, a Pigouvian tax should equal the social cost of an activity such as pollution that is damaging to society. The primary purpose of such a tax then is to limit undesirable activities by, for example, dis-incentivizing GHG emissions. The revenue that is generated is a secondary goal and often there is a strong case for ring-fencing the proceeds towards tackling the damage done by the harmful activity in question. So a carbon tax will not only limit emissions but will also generate revenue at least a part of which should be invested towards financing the Green New Deal.

In the absence of an EU-wide carbon tax, several countries such as Denmark, Finland, Germany, Italy, the Netherlands, Slovenia and Sweden, went ahead and adopted carbon taxes unilaterally. Despite this first step, however, none of these countries have introduced a uniform carbon tax for fuels in all sectors, a step that would help to curb carbon emissions in the most effective and least distortionary way.

Sweden and Finland were the first two countries to implement a Pigouvian-like carbon tax on fossil fuels in 1990 and 1991 respectively. In 2002, for example, Finland levied a carbon tax of 75 Euros per tonne of carbon (equivalent to 20 Euros per tonne of CO_2 emissions) [28] and Sweden 70 Euros per tonne of carbon[29]. Following suit, the Netherlands, Slovenia, Germany and the UK have since implemented carbon-based taxes of their own.

The experience from countries that introduced such taxes shows that taxing carbon is successful not only in reducing GHG emissions and spurring development of competitive low carbon technologies, but also in bringing positive social and economic effects. For example, energy and carbon taxation have played a pivotal role in reducing Sweden's dependence on fossil fuel and switching to biomass use in the district heating system. From 1990 to 2002, Swedish biomass use increased by nearly 50%.[30]. Fossil fuel taxes in place in Sweden and Finland since the 1970s were so effective that in each country biomass became less expensive than coal in the 1990s, although the exemption of certain industries meant benefits were more limited than they might have been.

Norway has had a similar experience. The CO_2 tax it introduced in the 1990s was the most important instrument in reducing GHG emissions in the Norwegian petroleum and transport sectors. The low level of CO_2 emissions per barrel of oil produced can be attributed to this tax, which induced

improvements in technology and emission reducing measures[31]. The tax has also led to a switch from fossil fuels to electricity in households and increased the use of public transportation[32]. However, the estimated overall impact on GHG emission is limited as the tax varies across sectors. The tax has, however, been quite effective within sectors with a high intensity of carbon [32].

Combining carbon tax with technical and financial support can be effective in improving firms' energy savings. For example, in Denmark revenues from carbon tax have been made available to co-finance and provide technical support for energy efficiency and technology upgrades. Firms can lower their energy tax bill by entering a voluntary agreement which includes an independent audit of the firm's energy practices and recommendations for improvements. Evidence suggests that the voluntary program has had a positive impact on firms' energy savings[33].

While European countries continue to have a mixed record on the use of carbon taxes, some other regions have gone much further. In 2008 the Canadian province of British Columbia introduced a tax reform that included the implementation of one of the broadest and most comprehensive carbon taxes in the world. The fossil fuels included in the tax base account for about 75 per cent of British Columbia's current GHG emissions.

The current tax rate is Canadian Dollar 20 per tonne of CO_2 equivalent emissions (14.7 Euros) but is set to increase by CA $5 per tonne each year over to $30 per tonne (22 Euros) in July 2012 [34]. Although the current rate may not be high enough to have a very substantial impact on GHG emissions, it is expected to bite more as it increases over time. Moreover the predictability of future higher taxes means that investors can already include their impact on investment plans. The carbon tax has been phased in gradually and has been combined with cuts in income and corporate taxes, which helped the tax to gain popularity. Moreover, the income tax cuts enabled by the carbon tax have helped British Columbia. to remain attractive for international investments[35].

The Dutch have introduced a green tax on cars that has a dual objective of cutting carbon emissions and reducing traffic-jams. For each kilometre driven, drivers will pay a minimum of 0.03 Euros, with higher charges imposed during rush-hour, on transit in congested roads, and on heavy polluting vehicles such as trucks and bigger cars[xxii].

Another initiative of note is French President Sarkozy's failed plan to introduce a carbon tax on domestic energy and road fuels in France. The proposal hit a roadblock after the March 2010 regional elections when President Sarkozy announced that he would no longer pursue a carbon tax, because it could impact negatively on the competitiveness of French industry unless there was a Europe-wide agreement. This example is revealing of the highly politicised debate over carbon taxation and its effects on competitiveness.

To overcome the concern of competitiveness, it is important for Europe to try levy a carbon tax in unison. To this end, the European Council and European Commission could play a leading role by incorporating a carbon tax into the Energy Taxation Directive.

Box 4: The EU Energy Tax Directive

In an attempt to harmonize the taxation rules across Europe and address concerns about distorted competition an EU-wide minimum tax level on energy products was introduced in 2003. The 2003 Energy Taxation Directive (ETD) widened the scope of the EU's minimum rate system, previously limited to mineral oils, to cover all energy products including coal, natural gas and electricity.

The Directive dictates minimum levels of environmental taxation in Europe. It sets minimum levies on consumption of fuels such as petrol, coal, and natural gas. The minimum rates differ depending on use, and are based on metric units of weight or volume consumed. However, this creates no incentives to switch from carbon intensive to low carbon energy sources. In fact, the lower energy content of renewable fuels is not taken into account and taxation based on weight or volume may actually create a bias towards more energy intensive sources.

In the current form of the ETD, minimum levels of taxation vary substantially according to the product concerned since the energy content of products is not adjusted for. Hence, some products are favoured over others with the most favourable treatment paradoxically being reserved for coal. The price signal inherent in the minimum levels of taxation is not properly related to the need to combat climate change as the levels of tax are not directly related to GHG emissions.

Another major problem with the current forms of the ETD is in its tax treatment of renewable fuels which still relies on rules developed at a time when these fuels were niche alternatives without major market significance. They are taxed based on volume and on the rate applicable to the fossil fuel product they replace. Because their lower energy content is not taken into account, renewable fuels may end up bearing a higher burden of taxation than competing fossil fuels.

A significant overhaul of the ETD is under consideration at the EU. The EU wants to revise the current energy tax regime by replacing the single energy based tax with a fuel tax that will be split into two components, energy and carbon. This would, for example, increase levies on carbon-intensive coal and reduce the tax burden on low-carbon bioethanol. If accepted, this proposal would be phased in between 2013 and 2020 and may result in a 5 fold increase in taxes on coal to Euro 0.15 gigajoule of energy[xxiii].

Table 6: Minimum levies as stipulated by the Energy Taxation Directive

Category	**Motor fuels**	**Reduced Rate**	**Heating fuels and electricity**	
In Euros			*Non-business*	*Business*
Leaded petrol	421/1000 litres	-	-	-
Unleaded petrol	359/1000 litres	-	-	-
Gas oil	330/1000 litres	21/1000 litres	21/1000 litres	21/1000 litres
Heavy oil	-	-	15/tonne	15/tonne
Kerosene	330/1000 litres	21/1000 litres	0	0
LPG	125/tonne	41/tonne	0	0
Natural gas	2.6/GJ	0.3/GJ	0.30/GJ	0.15/GJ
Coal & coke	-	-	0.30/GJ	0.15/GJ
Electricity	-	-	1.00/MWh	0.50/MWh

Source: European Commission

While the existence of environmental taxes has had some impact, it is clearly not enough. The EU's energy dependency has grown and the implicit tax rate on energy has fallen. Furthermore, the ratio of environmental to labour taxes has decreased indicating that a general shift from labour taxes to environmental taxes, a crucial element policy that can help achieve the targets of the Green New Deal, has not been achieved.

The overall level of environmental taxation in the EU remains low and there is a scope for increasing both environmental taxes and shifting the tax from fossil fuels to GHG emissions in Europe. Environmental taxes account for only 6.1% of tax revenues in Europe, almost Euro 300 billion in green tax revenues in 2008, of which 72% were from energy levies, 23% from transport levies, and only 5% from levies on resource extraction and pollution such as carbon emissions[36]. Carbon-based environmental taxes, that are sensitive to the contribution to global warming, amount to only Euro 25 billion per year in tax revenues[37].

The EU's Sustainable Development Strategy recommends that Member States "consider further steps to shift taxation from labour to resource and energy consumption and/or pollution." However, lobbying has ensured that the levels of taxation not only do not consistently reflect the carbon content of the fuels, but are also in many cases incompatible with the competitive positions of various energy products.

As part of the pending reform of its 2003 Energy Tax Directive the European Commission has put forward a proposal for an EU-wide carbon tax, set at a base level of Euro 20 per tonne of carbon[xxiv]. It has been proposed that the tax should be phased in between 2013 and 2018 but this has met opposition from several Member States [45]. Some have been influenced by their domestic automobile lobbies and others buffeted by the financial crisis are concerned about the impact the tax may have on their fragile economies. In actual fact though, green taxation is one of the best candidates for countries to examine as the fiscal strain tightens its grip and countries look for new ways to raise revenue[xxv].

A lesson learned from British Columbia is that a carbon tax can earn popularity and be introduced without hurting an area's attractiveness to international investments when combined with other tax cuts.

Another attractive feature of a broad-based carbon tax is that it can help provide economic incentives to reduce the more than 50% of Europe's GHG emissions that are not currently included in the Emissions Trading Scheme. A carbon tax could target these exempt emissions and be gradually scaled up over time. This could be done as part of the pending revisions of the Energy Taxation Directive (ETD) aimed at aligning the ETD with the EU's commitments on GHG reductions [42].

In order to address the shortcomings of the current ETD (see Box) the new proposal calls for a distinction to be made between carbon-related taxation and other forms of environmental taxation. The distinction, effective in 2013, would require Member States to levy new carbon taxes, while continuing to tax consumption of fuels for other purposes. As outlined in the next table, the tax base of the latter would change from metric units of weight or volume of consumption, to the energy content of consumed fuel measured by the unit Gigajoule. This would undoubtedly encourage more energy efficiency, a crucial part of the policies needed to tackle global warming, on which the EU is lagging behind its own pledges for the year 2020. In an effort to steer consumer

behaviour towards energy efficient products, the proposal would also give favourable rates to cleaner burning fuels, and would exempt bio fuels from the carbon tax altogether.

Table 7: Proposal for modified taxation of energy products under the ETD

Category	Motor fuels		Reduced for specific uses		Heating fuels and electricity		
	CO2-related	Consumption	CO2-relat	Consumption	CO2-related	Consumption	
						Non-business	Business
Petrol	€30/tCO2	€8.9/GJ	-	-	-	-	-
Gas oil	€30/tCO2	€7.6/GJ	€10/tCO2	€0.15/GJ	€10/tCO2	€0.30/GJ	€0.15/GJ
Heavy oil	€30/tCO2	€6.8/GJ	-	-	€10/tCO2	€0.30/GJ	€0.15/GJ
Kerosene	€30/tCO2	€8.2/GJ	€10/tCO2	€0.15/GJ	€10/tCO2	€0.30/GJ	€0.15/GJ
LPG	€30/tCO2	€1/GJ	€10/tCO2	€0.15/GJ	€10/tCO2	€0.30/GJ	€0.15/GJ
Natural gas	€30/tCO2	€1/GJ	€10/tCO2	€0.15/GJ	€10/tCO2	€0.30/GJ	€0.15/GJ
Coal & coke	-	-	-	-	€10/tCO2	€0.30/GJ	€0.15/GJ
Electricity	-	-	-	-	-	€1.00/MWh	€0.50/MWh
Biofuels[2]	Exempt	€1/GJ	-	-	-	-	-

Source: European Commission

The experiences from existing carbon taxes in several countries could be used to further develop a pan-European approach, as all Member States stand to gain from a harmonized green tax system in the EU. Introducing such taxes would increase economic efficiency to a large extent, whilst having a positive environmental effect and raising substantial revenue. Using some of these revenues to reduce employment related taxes can help play a significant role in the financing the Green New Deal and the jobs promised by its proponents.

Summary

While a number of barriers inhibit more green investment, by far the most important one is that GHG emissions are under-priced compared to the negative externalities they impose on society. Excessive emissions can be tackled either through a price penalty such as a carbon tax or a quantitative restriction as envisaged by a cap on GHG emissions that is often accompanied by a trading mechanism.

The first issue that needs to be addressed is what price of carbon do policy makers need to target. Here different suggestions for what is needed range from Euro 30 per tonne of CO_2 equivalent to Euro 100. Almost all estimates suggest that the current price of around Euro 17 is too low. Many LCTs become viable at prices of Euro 30 – Euro 70 so a medium term target in that range seems suitable. The main variable driving the price is the stringency of the cap. Under our suggested scenario of a 30% GHG reduction target for 2020, the price of emissions is expected to be at the higher end of the mid-range discussed above.

The expected future price and the volatility are both as important as the current levels. Here policy makers could help significantly reduce volatility by managing future price expectations for GHG emission price through a future carbon tax schedule of the kind used by British Columbia or through a guidance level for the EU emissions trading scheme price accompanied by policy tools to take corrective action.

Most economists prefer a carbon tax to cap and trade but for political economy reasons the EU has adopted a cap and trade mechanism. However, it only covers around 50% of the emissions and is in serious need of reforms. The EU has proposed an expansion of the scope of the ETS to include aviation, a greater degree of auctioning of allowances that can raise revenue for governments and some other much needed changes that must be implemented as soon as possible.

The European Commission has also proposed a carbon tax of Euro 20 per tonne of CO_2 equivalent in particular to cover exempt sectors but there continues to be heavy lobbying against this.

There are several ways of combining carbon tax and cap and trade regimes including using the tax as a floor mechanism for cap and trade. Policy makers could also use options of withdrawing emissions allowances from the markets in case trading price breaches a lower limit. In any case, a combination of carbon taxes and a cap and trade scheme is superior to the present dependence on the Emissions trading scheme alone.

That having been said, carbon taxes of one kind or another have indeed been widely adopted in a number of countries in the EU, particularly in Scandinavia. These, while not optimally designed to reduce carbon emissions have nonetheless managed to do so significantly. The levels of tax used have been close to Euro 20 per tonne of CO_2 equivalent. Other countries such as Germany and the province of British Columbia in Canada have also adopted carbon taxation and have used the revenue to reduce the burden of income taxes which has both encouraged employment and stimulated competitiveness and has been popular. The present Energy Taxation Directive that does specifies minimum taxes for fossil fuels but does not link them to their GHG emissions is also up for reform and will split the tax into two components one of which will be linked to GHG emissions.

The EU needs to go further with the tightening of the Emissions trading scheme, the introduction of an EU-wide carbon tax (and reform of the Energy Taxation Directive) and general environmental tax reform that shifts some of the burden of taxation from labour on to GHG gas emissions. These can help accelerate the Green New Deal and fulfil its multiple goals of tackling climate change, creating jobs and stimulating growth in the EU economy.

8. Removing barriers to becoming Green

As discussed extensively in Chapter 6, a number of risk, price, psychological, information, finance and friction related barriers act as a damper on green investments and green consumption. In Chapter 7 we considered how important the use of cap and trade mechanisms and carbon taxes is in tackling GHG emissions. This Chapter makes some further suggestions on that. It then recommends further public policy measures that can help overcome the various barriers faced by green investments and green consumption.

Energy planning and infrastructure

The European Union and Member States need to take a more active role in decisions that affect the energy mix in the European Union. For energy planning, the authorities should use the mean variance techniques discussed in previous chapters as well as make decisions on the basis of the need for higher energy security by attaching a monetary tag to energy insecurity and continuing dependence on imports.

Decisions on energy production and energy infrastructure should be taken on the basis of overall social costs and benefits rather than pure private ones as is currently the practice. Where current prices, for example of GHG emissions, do not reflect full social costs appropriate shadow prices that internalize externalities but also account for the higher volatility of fossil fuel prices as well the risks arising from an excessive dependence on energy imports should be used for planning purposes and in granting authorizations for new energy projects.

Top down support is needed for large scale projects such as improving energy transmission through cross border connectivity and the use of smart grids, putting in place better public transport in city plans and installing green infrastructure such as charging points for electricity vehicles where the appropriate levels of governments should provide logistical and where necessary financial support.

Tackling the low and uncertain price of carbon

The European Union should unilaterally switch to a 30% GHG reduction by 2020 target rather than wait for a global agreement on the subject which may or may not come. By doing this, it would create a sense of urgency that, as we have discussed earlier in the report, can help unleash new green investments and innovations that in turn can provide the faltering EU economy with a new engine for growth and job creation.

This new 30% target would tighten issuance of emissions allowances under the ETS, the EU's cap and trade scheme, thereby increasing the price of carbon as the supply of the allowances falls. We expect that the price of CO_2 will rise beyond Euro 30/tonne which will help skew the risk/return landscape in favour of green sources of power.

In order to reduce the volatility of CO_2 prices, the EU should also introduce a minimum price of Euro 20/ tonne with the provision that it will withdraw allowances from the market any time the price falls below this level. This will help introduce more predictability in the price of carbon and remove the risk of a price collapse of the kind that happened in the aftermath of the financial crisis. As

discussed in Chapter 6, the European Union can also use a minimum across the board CO_2 tax as an alternative to a price floor.

Further certainty in the field of green investments can be introduced if the European Commission issued an official version of a CO_2 forward pricing curve. This could provide an anchor for market participants and help significantly reduce the risk premiums that uncertainties on carbon prices impose on green investments. The curve could contain a guidance range rather than a single prediction and the credibility of the curve would be enhanced if the Commission were to commit to counter significant deviations from its band with policy interventions in the form of a withdrawal of GHG emission allowances and other policy tools in order to counter temporary price spikes or price crashes.

We also recommend that the European Union should follow a quicker path to a 100% auctioning of emissions allowances than currently planned. This rule should apply by 2015, with marginal exemptions of a maximum of 50% allowed only up to 2020 for certain highly sensitive sectors. This would bring in a substantial amount of additional public revenue which we recommend should be divided between

- allocation to leveraging private sector green investments
- supporting green R&D
- supporting adaptation efforts in developing countries and
- reducing social security contributions in order to stimulate job creation

For fiscally stressed countries such as Greece, some of the revenue can be used to help repay part of the outstanding debt.

We also recommend that EU governments not only adopt that new Energy Tax Directive put forward by the Commission but also that they go further by releasing a carbon tax schedule that charts a course for carbon taxes to rise from the suggested Euro 20/ tonne of CO_2 now to Euro 30/tonne by 2018 and Euro 40/tonne by 2025. The tax rate schedule can serve as an anchor for the cap and trade price and the use of a minimum tax that applies as a floor to the sectors of the economy that are part of the ETS can make the two regimes even more complementary. As a principle, the CO_2 tax should be broad-based and apply to as many of the 50% of GHG emissions not covered by the EU ETS as possible.

We suggest that the expected significant revenues from the CO_2 tax be used in a manner similar to what we have suggested for the revenues from the auctioning of GHG emissions allowances.

These steps would not only help reduce investments in dirty technologies and favour those in greener ones but they would also have a similar impact on consumption patterns especially if the broad-based CO_2 tax is introduced alongside reforms to the EU ETS. These may also help stimulate much greater interest and investments in energy efficiency and energy savings, the targets on which the EU is lagging behind on.

Increase the understanding and perception of risks inherent in dirty investments

As discussed extensively in Chapter 6, one of the reasons why dirty investments such as in coal fired power plants are still being financed is because the investors are significantly under-pricing the risks inherent in such investments.

Having the forward pricing curves for carbon taxes and the EU ETS as suggested in the previous section would help mitigate some of this risk myopia which comes from investors extrapolating the current low prices of carbon to the future. The forward curves would provide a much higher and more robust benchmark that is likely to make many dirty investment projects uneconomic. In case a range of forward prices is provided for the EU ETS, the upper ranges of future expected emissions prices would become the relevant 'risk parameter' in the evaluation of dirty projects that could help skew the financing landscape against such projects even further.

However, there are limits to how far such a forward curve can cause investors and financiers to change their behaviour. Often, the banks and investors involved in financing dirty investments will not make use of complete risk information available to them partly because this is effort intensive, partly because of familiarity with known technologies and partly because of sheer inertia or distorted incentive structures.

Box 5: Introducing Carbon Stress Tests

Banks and other financial institutions across the world are tested for their exposure to economic and financial stress. The purpose is to make sure that they are sufficiently resilient to survive an economic deterioration. While these stress tests have simulated all kinds of rare economic events, they have failed to test for another threat to a financial institutions' economic value - that of sharp increases in the price of carbon.

Like other stress tests applied to financial institutions, a 'carbon stress test' should evaluate financial institutions' exposure to different carbon prices, which assume different climate policies, technological developments and climate developments. The only difference would be that, unlike many financial and economic events, climate changes are already anticipated. That is why we believe the European regulatory authorities should introduce mandatory carbon stress tests for financial institutions.

These carbon stress tests should apply both

- at the point of making new financing commitments to energy intensive or carbon exposed industries
- and to the whole outstanding credit portfolio for banks and credit institutions and the investment portfolio for investors as part of their fiduciary and risk management obligations

Under such a stress test, banks and investment funds would be asked to take into consideration the expected future price of CO_2 emissions as specified by the EU ETS and Carbon Tax forward curves discussed above over the lifetime of new projects they are planning to finance. In the absence of such standard forward curves, the parties will need to use market expectations but supplement these with a scenario based stress test that examines what happens to the value of their investments if the price of CO_2 emissions increases to say Euro 30, Euro 50, Euro 70 and Euro 100.

These carbon stress tests will

- increase the awareness of carbon price risks amongst investors and banks and this change in risk perception is likely to direct their decisions away from dirty investments
- generate valuable information on the sensitivity of investments and the loan portfolio to increases in carbon price that would be useful not just for the management of the institution but also its regulators as well as other stakeholders. A mandatory requirement to disclose information pertaining to the sensitivity of the bottom line to carbon prices can also help promote better decision making for savers trying to choose between various banks or pension funds. This will go beyond just those who want to make 'green investments' to also include those who believe that banks and funds with a high negative sensitivity to carbon price are unsafe investments
- help promote the idea of positive carbon exposure or carbon neutrality for companies such as manufacturers of wind turbines who stand to benefit from rising prices of emissions. This could lead to a pressure on banks and institutional investors to increasingly seek such green investments or at least make their portfolios carbon neutral so that rises in carbon prices have a minimal impact on portfolio returns

A concept of fuel price stress tests, that checks the economic viability of investments against scenarios of high future prices of fossil fuels such as oil, gas and coal should also be incorporated into portfolio management and risk disclosure regimes for banks and institutional investors.

Stress tests and sensitivity analysis for carbon and fuels prices should be a mandatory part of the financing assessment of all energy intensive projects in the EU. A regular disclosure of these exposures as they pertain to the underlying portfolios should also be made mandatory. This should also be made mandatory at a company level at the time of listing on stock exchanges in the EU an issue discussed more in detail in a subsequent section.

Reducing the perceived riskiness of green investments

The profitability of green investments increases with the price of carbon. Any reduction in the uncertainty of the future price of carbon and any policy measures that act as a floor under the price of GHG emissions will reduce the perceived riskiness of green investments. Hence, the measures suggested in the section above on increasing the perceived riskiness of dirty investments will have a very positive impact on reducing green investment risk.

Other measures that increase the predictability of green support policies such as Feed in Tariffs are also very important in helping reduce the riskiness of green investments. In particular sharp policy reversals of the kind seen in Spain in the wake of the financial crisis should be avoided as they can not only burn existing investors but also undermine confidence in future policy announcements by governments.

Building publicly supported demonstration projects, co-financing, risk-sharing and insurance from public institutions such as the European Investment Bank all help reduce the riskiness of green investments.

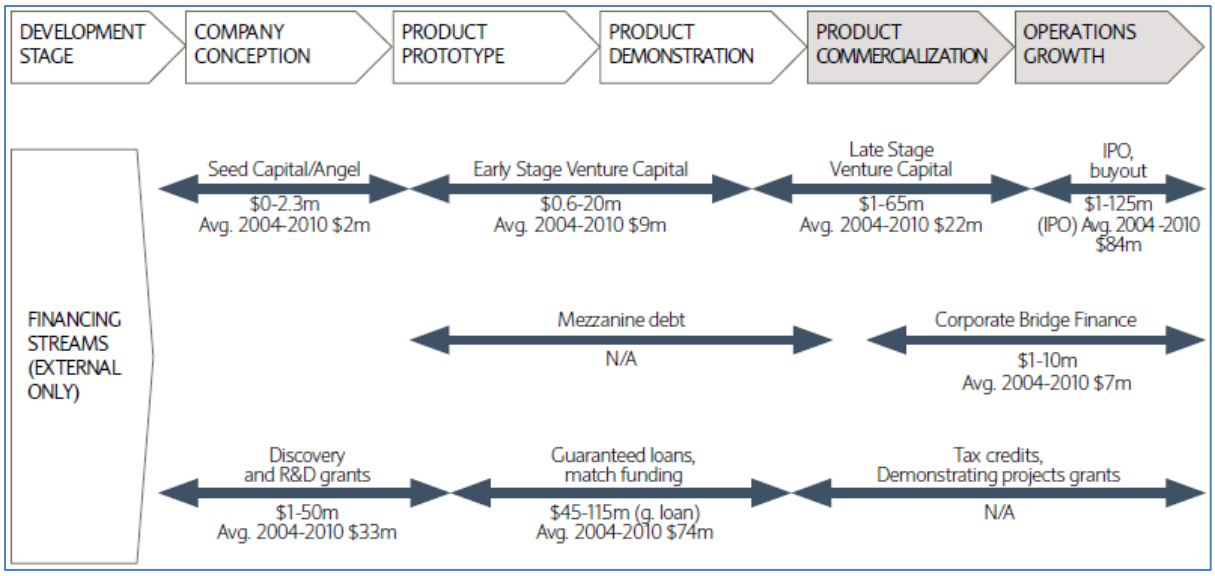
Standardized expected performance curves issued by European or national scientific standards committees or equivalent bodies for new technologies can be helpful in reducing the perception of

technological risks by providing unbiased neutral estimates of the performance of unfamiliar technologies.

A problem relating to green investments is the combination of high upfront costs and high discount rates driven by the perception of high risk. In general a lower interest rate environment is more helpful to green investments as it reduces the discount rate so makes green investment look relatively more attractive. This is, of course, under the control of the ECB but fiscal authorities can help by running policies that allow the ECB to keep low interest rates. A more direct way of influencing the discount rate is for EU governments as well as the EIB to use lower discount rates for their own green investments and to disclose these to the markets so they can serve as an 'anchor' for what the markets use as a baseline discount rate.

Another reason for the higher perceived riskiness of green investments is the gaps that exist in financial markets. Early financiers of green investments face the risk that they would lose money as green projects fail to attract the next stage of financing as they scale up. The so called 'valley of death' the phase between venture capital and commercialization of technologies is particularly dangerous. Encouragement provided to both the EU public and private sectors to complete markets for green finance by providing financial products that match the requirement of the various stages of the growth of green investments would be a very useful contribution in reducing the riskiness of green investments and helping unlock more green funds. The typical requirement for the type of financial instruments needed at various stages of green projects is highlighted in the figure below.

Figure 29: Type of financing requirement at various stages of green projects



Source: Accenture and Barclays Capital [114]

Here public sector support may be needed, particularly at the stage of development capital including in R&D as well as venture capital investments. Public support in the 'valley of death' phase is also particularly crucial. At later stages insurance and risk sharing instruments may be required as well as longer term financial instruments to help fund asset purchases.

Taking account of climate risks

Impending climate change and policy actions undertaken to thwart more drastic deterioration in global climate will undoubtedly change the conditions in which businesses are operating. These are expected to impact the

- physical environment (i.e. through changes to weather patterns and sea levels)
- the price environment through changes to the future price of carbon emissions and fossil fuels
- the consumer landscape (through a growing tendency to prefer green products)
- and the legal landscape for example through the possibility of climate related legal actions

Clearly taking stock of climate related risks that have been broadly classified into the

- physical
- litigation
- competitiveness
- reputational
- and regulatory

categories that have been discussed in some detail in Chapter 6 of this report is essential not just for businesses but also for investors who invest in them and banks who lend to them.

Beyond financial institutions, evaluating the impact of the multidimensional nature of climate risks on their bottom-line should be part of every company's strategy and the reporting of how such risks effect the profitability of companies should be made mandatory under company reporting standards.

The steps discussed above will mean that both companies as well as those that invest in them and lend to them will become far more aware of all aspects of climate risks being forced to consider them regulatory requirements or strategic imperatives. This should perceptibly shift the investment landscape as well as the product portfolios of corporations away from dirty towards green.

The EU can play a role in facilitating climate risk management in a number of ways. These include

- making it mandatory to disclose carbon emissions and exposure to carbon risk
- collecting data for public use
- and supporting the development of standardized tools for climate risk assessment

Each of these initiatives will be discussed in more detail below.

Mandatory tracking and disclosure of carbon exposures and risks

A mandatory disclosure of relevant carbon data that would allow for an assessment of a company's carbon exposure will be very useful as it will

- enable businesses to better manage their climate risk exposure and help identify the most effective emission reductions measures

- allow investors and financial institutions to differentiate between companies in their investment portfolio regarding carbon footprint and climate risk exposure
- prove useful in carbon tax collection

The Investor Statement on Climate Change Report 2009 [76] found that the lack of high quality and comparable disclosure of companies' climate change policies was a primary reason why many investors did not integrate the impact of climate change into their investment strategies. Financial institutions cannot effectively manage climate risk without the necessary information on the climate exposure of the companies in which they are investing.

In response to increasing concerns about risks, as well as forgone opportunities, a growing number of investors are calling for companies to report the information needed to assess their climate exposure. To overcome the information hurdle several initiatives have been taken. Some of these initiatives are summarized in the Box below.

Box 6: Examples of private initiatives on carbon disclosure

The Carbon Disclosure Project (CDP) represented in 2010 a total of 534 institutional investors across the world holding $64 trillion in assets under management encouraging companies to report their GHG emission and their strategies to reduce these. It holds the largest database of corporate climate information in the world[xxvi].

The Global Framework for Climate Risk Disclosure from 2006 is encouraging standardized climate risk disclosure and provides guidance on how firms should report information on financial risk related to climate changes to their investors.

The World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) launched in 1998 the Greenhouse Gas Protocol Initiative to develop internationally accepted greenhouse gas (GHG) accounting and reporting standards for companies[xxvii].

The US Security Exchange Commission (SEC) has issued a 2010 guidance on how to disclose business and legal developments related to climate change.

The United States Environmental Protection Agency's interactive energy management tool[xxviii] allows real estate investors to track the energy and water performance of their buildings portfolio. The data is based on the Commercial Building Energy Consumption Survey (CBECS), which is conducted once every four years. Such interactive tools for assessment of carbon exposure for different assets would be useful to investors in other sectors as well.

For carbon disclosure to become widely applied and comparable, companies must adopt standardised accounting and reporting standards. Two tools used internationally include the ISO (International Standardization Organisation) and The GHG Protocol's Corporate Accounting and Reporting Standard, which was initiated by the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI). The two tools are consistent and complementary. Both are compatible with the EU-ETS and have been endorsed by the Carbon Disclosure Project (see below).

A major challenge in creating an accounting methodology for GHG emissions is to identify the boundaries in which indirect emissions will be included in each company's GHG inventory. With the establishment of the EU-ETS came new demand for data on the direct GHG emissions produced by businesses. However, many companies' largest source of emissions is related to their energy consumption, transport, and investment decisions. Direct emissions refer to those from sources that are owned or controlled by the company. Indirect emissions include all other emissions that are relevant to a company's exposure to climate risk or that can be influenced by the company's decisions, such as those in its supply chain. There is significant scope for double counting, or failing to count emissions. The GHG Protocol provides three operational categories:

- **Scope 1** – GHG emissions directly owned or controlled by the company
- **Scope 2** – GHG emissions related to the consumption of electricity
- **Scope 3** – GHG emissions that are not directly under the company's control, but are deemed relevant, such as those in the supply chain or minor equity stakes

The box below discusses an important investor led initiative.

Box 7: The Global Framework for Climate Risk Disclosure

The Global Framework for Climate Risk Disclosure was initiated in 2006 by a group of leading institutional investors, including several large pension funds, to promote standardised climate risk disclosure methods. The purpose of the Global Framework for Climate Risk Disclosure is to enable investors to reduce the climate risk exposure in their portfolio.

The Framework provides guidance to companies on how to report the financial risks posed by climate change. The key elements include the following: 1) Measures of historical, current, and projected greenhouse gas emissions 2) Strategic analyses of climate risk and emissions management 3) Assessment of physical and regulatory risk related to climate changes

Data on companies' current and future direct and indirect GHG emissions are the first port of call assessing the impact of increased regulations on their operations. However, a firms' climate risk exposure will be affected not only by their GHG emissions, but also by their ability to innovate and adjust to changing conditions. Therefore, accounting for GHG emissions is only a part of the Global Framework for Climate Risk Disclosure. It also involves analysing how a company deals with current and future climate exposure, the actions it is taking or planning to take in order to minimize its carbon footprint, and the company's corporate governance. The latter refers to the awareness of climate risk among the board members, whether the company offers proxy voting for climate relevant issues, and whether the company has an incentive system in place to encourage employees to work towards its climate objectives.

Corporate climate risk disclosure is a prerequisite for financial institutions to manage their climate risk. The data made available through the Carbon Disclosure Project is already used frequently by investors. However, the disclosure is neither consistent nor universal. Therefore, to facilitate and incentivise well-informed investment decisions, the EU should require stringent disclosure of a company's environmental performance record as a condition of being listed. This should apply both to new and existing listings on stock exchanges. Furthermore, it should make inclusion of climate risk mandatory in annual reports and shareholders financial statements. Since some of Europe's large

companies are not publicly listed, mandatory disclosure should also apply to privately held companies over a certain size threshold. Such a proportionality principle for reporting information is common in financial accounting.

To make such requirements possible, the EU should institutionalise a consistent framework for GHG emission accounting. Gathering information on GHG emissions is time consuming and costly. A balance must be struck between the desire to have all relevant information and the cost of gathering data. Mandatory requirements should at least include Scope 1 and Scope 2 emissions, and standardised guidelines should determine the relevant Scope 3 emissions to be included by different sectors. In particular, we recommend that companies above a particular size or those listed on a public exchange should be obliged to report emissions under all three categories with emissions in Scope 3 becoming more standardized and being reported in line with financial liabilities and exposures.

Getting financial institutions to track and disclose climate risks

Considering the central role that financial institutions must play in the transition to a low carbon economy, the EU should mandate that they report the climate risk associated with their investment portfolio. Financial institutions have a particular responsibility when they manage other investors' assets – individuals' savings and investments in funds. World Resources Institute (WRI) [79] provides guidance to financial institutions on compiling GHG inventories set forth by the Greenhouse Gas Protocol Initiative. An appropriate approach would be for a financial institution to account for GHG emissions according to its share of a company's total enterprise value, including equity and debt.

Many financial institutions make thousands of small investments a year or even a day. Not all are relevant, and it would be too costly to include all of them in a GHG inventory, although computerization of investment decisions reduces the time and cost associated with analysing GHG emissions data. The aim is to get just enough information for sound climate risk management. Creating a threshold for which investments to include can be complicated.

Box 8: Institutional investors, climate risk and green opportunities

The most significant decision made by institutional investors in terms of the effect on returns is to do with the strategic allocation of assets (SAA) that drives as much as 90% of the difference in returns observed across assets. So they need to have an active policy of accounting for climate risk and climate opportunity in these strategic decisions. While standard approaches to SAA rely heavily on historical quantitative analysis, much of the investment risk around climate change requires the addition of qualitative, forward-looking inputs since historic precedent is not an effective indicator of future performance.

The best way to manage the portfolio risk associated with climate change, while retaining similar returns, is to increase exposure to those assets that have a higher positive sensitivity to climate change and reduce exposure to assets that will be negatively impacted by the rising prices of carbon or the physical impacts of climate change. In fact companies with higher carbon footprints may have higher regulatory, physical, litigation competitive and reputational risks.

A more detailed discussion can be found in WRI (2009) [79]. The threshold could be related to the size of investment, to the percentage of the investment relative to the institution's total assets, or to the time frame that the financial institution holds the investment. However, the disclosure standard should be careful not to create unnecessary bias against long-term relative to short-term investments.

There is no standard or widely embraced method to assess and manage climate risks. The development and implementation of these new practices could be costly for a single institution, particularly small lenders and investors. Therefore, public institutions could play an important role in reducing friction by supporting the development of assessment methodologies adapted to low carbon initiatives.

Box 9: Measurement and Disclosure of Climate Risks

The Equator Principles were initiated by a number of private banks to encourage inclusion of social and environmental sustainability in project financing. The principles commit signatory banks to follow the environmental and social guidelines (Performance Standards) of the International Finance Corporation (IFC) of the World Bank Group. Actions are taken to provide clearer guidelines on climate risk management[xxix].

The US National Association of Insurance Commissioners adopted in 2009 a mandatory requirement that insurance companies over a certain size should disclose their expected financial risk from climate changes and their management of those risks.

Some private banks and development banks – including the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD) – are leading the way by developing procedures for assessing the climate risk related to their own activities. These banks should team up with other larger institutional investors to develop a common methodology for risk assessment.

Many financial institutions are considering some types of climate risks in their investment strategies, but few have a comprehensive approach that includes longer-term risk factors. As observed in the financial crisis, banks' internal risk management often failed to account for the multifaceted nature of risk, in particular systemic economic or tail risks. Some climate risks are systemic in nature, both in the sense that investment decisions collectively can have global climate implications and because most financial institutions could be affected both directly and through their assets by the effects of new climate regulations or physical climate change.

For example if the price of carbon increases, how will companies and their financial backers be affected, either directly through their own GHG emissions or indirectly through the price of inputs such as electricity consumption? The winners would be companies that have switched to low carbon solutions beforehand and investors who have reduced their portfolio's exposure to carbon intensive industries.

This approach of making it mandatory for financial institutions to consider and reveal data on climate exposures will allow for the development of a responsible finance market as well as shift the behavior of financial institutions away from risky climate behavior towards green actions. Fiduciary investors in particular, such as pension funds should make the evaluation of the broad categories of

climate risks a mandatory part of their due diligence and portfolio allocation process. These risk evaluations should also be required of regulated credit institutions such as banks.

Though an increasing number of financial institutions claim to be incorporating the impact of climate risk in their business strategy, few monitor the climate impact of their investments, which are a large source of climate risk. In the 2010 Carbon Disclosure Report [78] just two companies (around one per cent) reported climate risk associated with their investments. Only Citigroup, which included emissions associated with project finance to thermal power plants, reported emissions of any significance.

Carbon stress tests for banks would be easier to administer if climate risk were incorporated in bank capital rules. Under Basel III rules on capital adequacy, bank assets will be risk weighted according to their credit default risk, market risk, operational risk and counter-party risk. Adding climate risk to this list, subject to agreeing an assessment methodology, would provide a ready source of data for conducting carbon stress tests and ensure that the prudential risk to banks from climate developments is factored into the bank lending system. This could be done under the Capital Requirement Directive of the European Union.

Assessing the prudential risk of climate change in this way would make banks more resilient to climate related shocks while discouraging the activities that contribute most to climate risk by increasing their cost of capital.

While some climate risks are present now, the risk is only going to increase in future. It is therefore crucial to make sure that financial institutions can withstand the long-term challenges. Given that many financial institutions encourage short-term investment strategies, several climate risks may fall outside their assessment models. By creating awareness of the systematic and long-run risk factors, a carbon stress test might encourage more long-term financial behavior.

A carbon stress test could help financial institutions with their climate risk management and create better awareness of climate risk factors.

A tax break according to the share of green assets in a bank's balance sheet could further incentivise banks to reduce the climate impact of their investment activities. For example, the European Commission's proposed bank levy proposal could have green exemptions.

Financial institutions committed to addressing climate risk will find themselves in an advantageous position. Climate risk disclosure will incentivize financial institutions to manage their climate risk, and will enable savers and investors to trust financial institutions with better climate profiles. This should go beyond the stress tests we have discussed in a previous section in this chapter.

Addressing short termism in finance

A number of incentive and structural problems in the modern financial system mean that it is far too short term oriented. Since Green investments often have high upfront costs, they are disproportionately penalized by the excessive short termism of finance. Though it would be impossible to eliminate this inherent short term bias there are a number of policy measures that can be put in place to help mitigate some of the worst aspects of this bias. Some of these are discussed below

- the imposition of financial transaction taxes can reduce the incentive for fund managers to churn their portfolios (trade excessively) in an effort to justify higher fees. The excessive costs of transaction taxes should exceed any additional fees gained by churning so the holding period of stocks should increase reducing the short term bias of finance somewhat. Such taxes will also alter the economics of the ultra-short term high frequency trading and lead to an average increase in the holding period of securities in financial markets.
- changing compensation structures for corporations as well as for financial institutions and banks so that 1) bonuses are limited as a percentage of base salary and 2) so that bonuses in the form of any share options or cash vest over a period of at least ten years. This can help reduce the incentives to pump up profitability in the short term at the cost of long term profits, which is endemic both in the corporate as well as the financial sector.
- changing the benchmark for compensation of fund managers from a relative benchmark where too many of them have an incentive to copy what everyone else is doing to also include an absolute performance benchmark measured over a number of years. Since too many investors continue to make dirty investments even more far sighted fund managers may be driven to make similar dirty investments so as to not underperform with respect to the benchmark. That is why it may be a good idea to link compensation at least partially to absolute performance rather than to relative performance. It may also be interesting to explore if performance can be 'risk adjusted' for exposure to carbon risks.
- changing the way that risk and performance is measured in particular for long term investors. As things stand now, most long term investors evaluate risk in the same way as those with shorter term horizons by using the standard deviation of the price movements of securities over short horizons. We recommend that long term investors move to different measures of risk that are more compatible with their investment horizons since short term fluctuations in asset prices often cancel out. Similarly the performance of these funds should not be evaluated over a quarter but on a longer term multi-year horizon.
- contemplating a move away from pure marked to market accounting towards a marked to funding accounting for long term investors where they can choose to ignore short term fluctuations in the markets for assets that they have the long term funding available to hold for longer periods of time[xxx]
- limiting turnover ratios for fiduciary investments such as pension funds so as to engender a longer term perspective by increasing the holding period for investments is also an idea that is worth exploring
- another idea that could help reduce excessive short-termism in finance could be to link voting right to a minimum holding period for shares

Putting in place these measures would not just tilt the investment landscape in favour of green investments but importantly would also favour infrastructure investments and investments in SME's over the speculative investments that currently tend to crowd out these real economy value generating investments[xxxi].

Accounting standards for measurement and disclosure

Because the fundamental structure of green investments is different from those of dirty investments, the way they are captured by modern day accounting standards may not be adequate,

in particular because they may come across as more expensive than dirty investments that are less capital expenditure heavy.

There is an even more serious problem with investments that pertain to energy efficiency which do not generate cash flows in the way that traditional investments do but free up cash through savings. There is a lack of adequate accounting standards to put these 'investments' on a level field with more traditional investments so companies may underinvest in such energy efficiency measures compared to a situation where their true benefits could be adequately measured.

There is a strong case for the development of some new 'green accounting standards' in order to fill the gaps observed in the accounting landscape.

Tackling split incentives

Split incentives arise when those who have to pay for energy and those that make decisions on the sources of this energy and the efficiency of its use are different. They are a serious barrier to more green investments. Manufacturers of energy intensive products, house builders, electricity producers and utility companies all face these split incentives.

Under such circumstances, when the price of fuel or carbon does not have a direct impact on those making decisions on energy intensity or the power mix the best policy measures to help achieve green outcomes are

- issuing standards on energy efficiency for white goods, vehicles and newly built houses and on energy mix and efficiency enhancing measures for electricity companies and utilities
- better aligning the incentives to these decision makers with green outcomes

Europe should replicate the Japanese Top Runner program[xxxii] where best in class energy performance automatically becomes a binding standard with a time lag so manufacturers of goods and vehicles are constantly having to improve their energy efficiency.

Another approach to improving efficiency standards is to simply ban some high energy consumption items. This would be good policy if

- a low energy replacement is easily and cheaply available
- behavioural inefficiencies mean that in the absence of such a ban consumers would continue to buy low efficiency products and
- if this means that there will be substantial savings for consumers

The EU ban on the use of incandescent bulbs fulfilled such a condition. It is estimated that this would save EU households more than Euro 30 over the life time of each bulb[xxxiii]. An equivalent action by the United States which has set very high efficiency standards for bulbs is expected to save the economy $ 13 billion a year. We suggest that the EU conduct an audit of all power hungry household goods and appliances and using the logic we have discussed above issue bans or very high performance standards that should be phased in over the next few years.

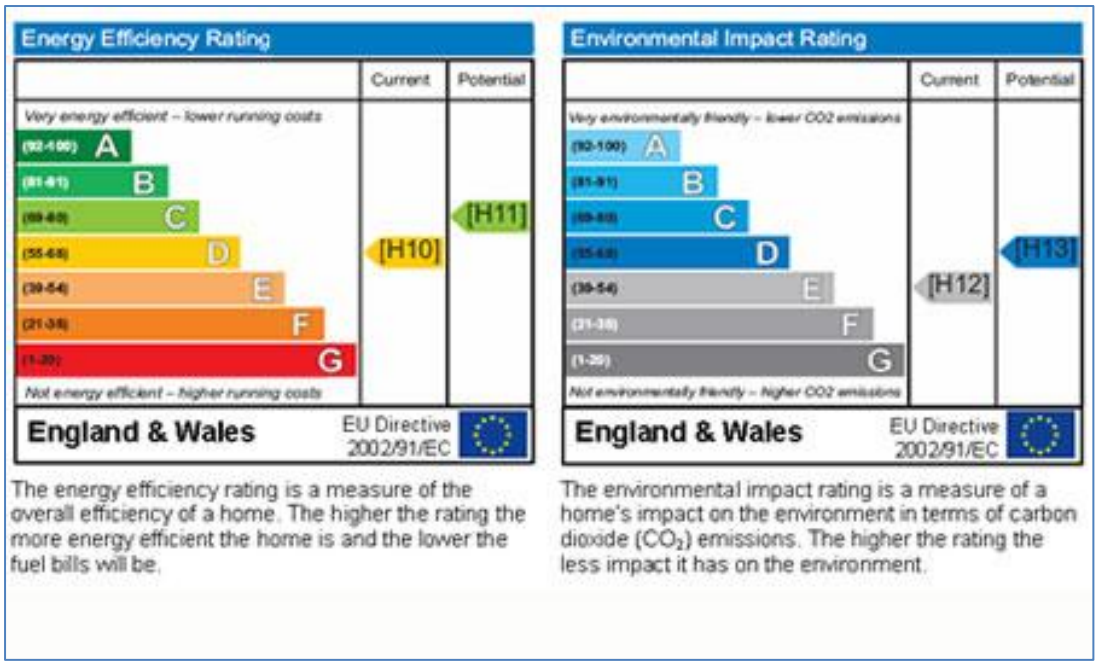
Strict building codes for houses in order to ensure high quality insulation and energy efficiency can help overcome the split incentives in the housing industry. However, since most the housing stock is old and new constructions are rather limited in number this would not be enough. A possible way of

tackling this problem would be to mandate energy certification of houses that are being sold and to charge penal rates of mortgages or higher housing stamp duties for those houses that do not meet the minimum insulation standards. Rather than using this stick approach, a carrot approach that provided for the issuance of home insulation loans on top of conventional mortgages with a proviso that the new insulation has to be verified within six months may work even better.

European rules requiring energy evaluation of new buildings or buildings being sold that aim at making energy costs a quantifiable factor in commercial property evaluation have recently come into play. These require an issuance of energy performance certificates of buildings based on life cycle costs[xxxiv]. However, it is not clear yet whether an awareness of energy efficiency and life cycle costs will actually translate into green behaviour.

The benefits of green buildings are obvious as is clear from the example of Adobe systems that reduced its building energy consumption by close to 40% after retrofitting its buildings in San Jose and generated a return on investment of 115% [118]. The figure below illustrates what the energy performance and accompanying environment impact certificates for buildings look like.

Figure 30: Energy Performance Certificates and Environment Impact Certificates



Source: Green Life Solutions[xxxv]

For utilities, regulators should mandate a program that requires a steady improvement of the efficiency of energy users so utilities have an incentive to help customers with the latest technology on water heaters and energy saving devices rather than having the perverse incentive to letting their customers stay locked in with legacy technology that maximises their energy utilization. "In 2009 three Australian states – New South Wales, Victoria and South Australia – started energy savings certificate programmes aimed at promoting energy efficiency and concurrently reducing GHG emissions. These programmes require utilities to collect a specified number of certificates by providing their customers with efficiency products and services, such as home audits, energy efficient appliances and other home improvements."[118]

For energy producers, requirements such as the need to 1) produce a minimum and increasing proportion of their energy from renewable sources 2) earn or purchase a minimum amount of renewable energy production certificates would help reduce some of the problems with split incentives. Other innovations such as making energy producers share the costs of rising fuel prices rather than being able to pass on all fuel price increases to customers and promoting the concept of fixed price energy contracts would also help. "As long as utilities [energy producers] are able to earn more – even after any penalties or fines – for selling more gas or electricity – they will have little real incentive to help their clients reduce energy demand… this is a problem that can, and must, be solved by a combination of changes to utility regulatory frameworks" [118].

Tackling behavioural and financing barriers for energy efficiency

A major problem that inhibits green behaviour is that people do not attach the same value to a Euro saved as to a Euro that is earned even though the two are economically equivalent. At least some of this is due to a lack of proper upfront information on the amount of savings. This can be addressed by mandating the need for a life cycle price labelling of energy intensive products as well as vehicles. These should be standardized across the EU and should use average life time, average use and average fuel/electricity price numbers for labelling the full (operating plus initial purchase) costs for energy intensive purchases. Another 'stressed' estimate for higher energy prices indicating the risks of GHG emissions and fuel price rises in the future should also be clearly labelled.

People are hesitant to commit to energy efficiency investments with payback periods of more than two years and often also ignore smaller investments such as in energy efficient lighting that have even shorter payback periods. Developing innovative financing and billing practices that allow Energy Service Companies (ESCOs) to offer to make energy savings investments such as in home insulation and by changing electric fittings so that home owner 'effort' is minimized would help overcome at least some of the behavioural barriers. These ESCOs can then be compensated through innovative billing practices such as by being able to directly access a share of the savings on electricity and heating bills. Using property tax assessments to repay loans is another interesting idea. This will remove yet another obstacle associated with the effort to pay that thwarts more green behaviour.

Making ready financing available can remove a significant obstacle to energy savings particularly for low income households. These are a particularly suitable environment for investment – they are most likely to live in energy inefficient housing and least able to afford improvements even when efficiency investment has the potential to pay off manifold. The United States has some interesting non-profit initiatives such as the Green Light New Orleans program that have a dual aim of reducing energy costs for low income households and tackling climate change by using donations to make energy efficient investments[xxxvi].

It is not necessary for private operators to carry out the financing of energy efficiency investments. In fact they can be rolled out in whole municipalities. An attractive way of doing this is for a municipality to borrow and invest in large scale renewable energy or energy efficiency improvements for homes. This can be done through the use of 'Property Assesses Clean Energy' bonds or PACE bonds[xxxvii] where repayments are made through a surcharge on property taxes over time. Another area where municipalities can play an important role is in the greening of the public lighting system, for example. BANOBRAS, a Mexican development bank has launched a program to

provide credit to municipalities to replace inefficient public lighting with the repayment coming from the cost savings[xxxviii].

Green indices to make it easier to make green investments

Much of institutional investment nowadays takes place in the form of 'index investment' wherein certain organizations group a portfolio of equities or bonds together based on certain criteria such as market capitalization and weights such as share of market capitalization to make indices such as the S&P 500 or the FTSE 100.

Investing in these indices rather than just in individual bonds or equities brings about three main benefits for investors

- the investments that constitute the index meet some minimum criteria that are important to investors. This could be minimum size, or exposure to a particular sector or geographic area etc. so investors have some form of quality assurance on their investments
- index investments provide a cheap and easy way of diversifying risk across a number of smaller individual investments that would otherwise have very high transaction and effort costs
- index investments can be a good mechanism to connect smaller companies and investments needs to large pools of institutional and retail investments

This means that the concept of indices can easily be carried over to the green sector of the economy particularly to overcome some of the information and friction costs that currently inhibit green investments. Also, it could significantly expand the possible pool of green investments by attracting those passive institutional investors that invest primarily through indices.

Green indices would identify and pool companies with solid environmental performance or in the green energy generation sector or on the basis of other 'green' criteria. They can provide both a benchmark for green performance of companies in general, as well as a benchmark for the financial performance of low carbon companies. Green indices help reduce friction costs by screening companies according to a set of sustainability criteria and by identifying economically viable investment opportunities in a specific sector. At the same time they offer an opportunity for diversified exposure to the green sector of the economy.

Thus green indices can offer

- diversification potential
- quality control
- screening on the basis of a number of green criteria
- aggregation of small green investments into large investment opportunities

In response to growing demand, a range of ethical and socially responsible investment indices have been created. Standard & Poor's, FTSE, and Deutsche Bank all now provide environmental and low-carbon indices. However these products remain marginal in their appeal.

There are three main categories of green indices

- conventional indices that give companies weights according to their climate exposure
- 'thematic indices' that track the economic performance of companies within a defined category or sector such as clean energy or low carbon infrastructure. Thematic indices highlight opportunities that often fall outside the scope of conventional indices
- 'best-in-class indices' track the economic performance of companies that score highest according to a set of environmental and social governance (ESG) criteria

These different types of green indices are attractive for different investors with different priorities, risk appetites and expectations of economic and environmental performance.

While sustainability criteria have traditionally been associated with negative screening, there is a belated recognition that green investment can be good business. In fact, green indices tend to perform well. While the number of green indices has been proliferating in recent years, they are of variable quality. In order to be a useful tool for environmentally minded investors, green indices must be credible at screening for environmental risk and transparent about their selection criteria.

A much cited barrier is the lack of a widely accepted standard on sustainability and assessment methods. This applies in particular to green indices based on multifaceted selection criteria. The problem is also linked to the lack of comparable data. Without a widely accepted benchmark for what qualifies as "green" and "climate friendly" it is hard to assess the environmental integrity of different indices.

As carbon disclosure increases and improves, the quality of green indices will improve with it. In the meantime, public institutions can play an important role in promoting sound green indices by lending their experience and credibility in assessing companies' environmental impact, abatement effort, and environmental risk management. For example, by collaborating with Standard & Poor's, the World Bank's S&P/IFCI Carbon Efficient Index is expected to mobilise more than USD 1 billion for carbon-efficient companies. However, the index is limited to emerging markets [80].

The European Commission together with the EIB could initiate an index targeted at low-carbon investments across all European companies. Moreover, the Commission could develop green investment guidelines, setting the standard once and for all on what is characterised as green. This would help address a lot of the doubts around the quality of indices.

Green Bonds

While any bonds floated for the purpose of a green investment could be referred to as green bonds, historically the term has referred to bonds mobilized by financial institutions such as the European Investment Bank and the World Bank to mobilize funds for making dedicated green investments.

Green bonds were pioneered by the EIB in 2007. They are particularly relevant for low carbon investments due to their capacity to attract institutional investors such as pension funds, mutual funds, sovereign wealth funds, and insurance companies that have inherently long-term investment horizons and large allocations to fixed income. Thus far, green bonds have been issued by the EIB, the World Bank, the US Treasury, and most recently, the European Bank for Reconstruction and Development (EBRD). The UK Treasury has also considered issuance of such bonds to raise funds for green infrastructure.

The experience of the above institutions provides meaningful lessons for the widespread adoption of green bonds. It highlights the importance of establishing standardised criteria for project eligibility; having minimum financial characteristics such as size, rating and structure; and applying rigorous governance and due diligence project finance to aid index providers in putting green bonds on a fixed income 'Green Index'. Such characteristics will encourage investors who make use of indices to manage their assets to introduce green bonds into their portfolios [82].

Although World Bank Green Bonds were originally envisioned to be a simple and high-grade product in order to easily mobilise resources from large institutional investments, green bonds may also be transformed into more customized instruments that are attractive to investors with different risk appetites – i.e. those looking for high grade products with credit-enhancements and other investors in search of higher yielding prospects with greater credit risk.

A multiplicity of novel designs have been put forth, including calls for the World Bank and the UN to issue bonds with IMF guarantees; proposals that see the involvement of credit rating agencies; proposals to link carbon offsets from the REDD mechanism (Reduced Emissions from Deforestation and Degradation) to green securities; index-linked carbon bonds, in which the interest on a government-issued bond is linked to the government delivering on its environmental commitments; and 'carbon war bonds,' modelled after the long-term bonds created by governments to fund war efforts in World War II.

Figure 31: Some examples of existing green bonds

	World Bank	EIB	Breeze	CREB (2009)
Rating	AAA	AAA	BB-CCC	AAA-BBB
Currencies	Many	EUR	EUR	USD
Amount outstanding (£)	700m	750m	800m	1,500m
Return	Fixed	Fixed and equity linked	Fixed	Fixed
Use of funds	Broad adaptation and mitigation projects	Renewable energy and efficiency projects	Wind turbine projects	Renewable energy projects

Source: The Sterling Bond Market and Low Carbon or Green Bonds

We strongly recommend that the EIB expand its offerings of green bonds substantially both for its own funding of green projects as well as in partnership with private institutions so as to expand the pool of private fixed income funding dedicated to green projects in Europe.

Another important category of green bonds can be used to finance the procurement of green assets discussed earlier in the report. One such category of asset backed bonds is the so called 'Breeze' series of bonds that have been issued by a company called CRC Breeze finance and are backed (secured) by the assets of several wind farms in Germany. At this point there are seven issues of these bonds outstanding worth about Euro 900 million in total [69].

The use of such green asset backed bonds to finance the procurement of green assets is very promising.

Green securitization

Securitization which involves the pooling of smallish bonds and loans into a special purpose vehicle and then the issuing of securities as claims on this special purpose vehicle has got a lot of bad press in the present crisis. However, we must not allow this to taint what can be a very useful financial technique to help mobilize market based funding for a group of disaggregated small investments.

The technique is particularly useful for what we have earlier called the problem of disaggregated investments. Many green investments, particularly those in energy efficiency measures and in local generation, are quite small compared to the 'normal' market size for transactions. As we learnt earlier in the report, it is hard to mobilize funding for these because of the high degree of effort involved and the associated costs. Banks, for example, often do not find it easy to lend for such a disaggregated set of investments.

Green securitization, wherein pools of small green investments, for example in household insulation measures or rooftop solar panels, could be funded through the use of securities issued on a special purpose vehicle through which such investments are challenged would be a very good way of addressing many of the frictions observed in the market for green investments.

In order to address the stigma attached to securitization and to develop standards on how such securitizations should work, we believe that the European Investment Bank should take the lead in organizing benchmark deals so as to help develop this market.

We believe that the scope for using green securitizations to mobilize investments in energy efficiency measures in particular is very large and mostly unexploited.

Green savings

Green savings funds and bank accounts, are designed to attract private money to green causes. The targets for these are those individuals and institutions that are green aware and who either do not want their money to be on-lent to dirty projects or who believe that the green sector offers good opportunities for financial gain.

Green funds and savings accounts have not achieved the same status as green bonds. Despite many banks offering green saving alternatives, they are not widely used yet. This may change with increased disclosure of climate risk, or if the terms become more favourable. If clients were made more aware of the carbon footprint of the investments made with their savings deposits, many might prefer to trust another bank with their money. Switching banks can have a striking impact on the carbon footprint of one's deposit account. For example, a study commissioned by the Rainforest Action Network (RAN) [72] on Canada's largest banks found that by moving CAD 10,000 from the bank with the highest carbon footprint in Canada to a climate friendly bank, an individual could reduce the GHG emissions related to their savings account by an amount equivalent to not driving a small car for five months. This rather staggering figure was a result of the carbon intensive banks financing of petroleum companies. To encourage individuals to switch banks, RAN has created a webpage that demonstrates the amount of GHG emissions related to different bank's fossil fuel investments.

Tax incentives can also be used to encourage individuals to put their money into a green bank account. Not only do such government initiatives make participation financially attractive, they boost confidence in green products. For example, the Netherlands has given green investments and savings a favourable tax status. Individuals, who save or invest green, benefit from a 2.5 per cent tax credit and a government-certificate system ensures that they are getting green value for their money.

The scheme has grown steadily since it was introduced and raised new capital for green projects. The green fund boasts a 1/40 leverage rate: every euro of public funds spent on the scheme generates a private investment of 40 euros [83]. A similar green saving account system has been proposed in the UK. Given the widespread popularity in the UK of the individual saving accounts (ISA), which give account holders a tax benefit, 'green ISAs' could be a promising route to attract new private investments.

Not only do such systems spur individual involvement, they also encourage banks to increase their portfolio of green products. Tax incentives could be instrumental during the transition, increased as green banking moves beyond a niche market and reduced as the market becomes self-sustaining[xxxix].

We recommend public encouragement for a widespread use of such green savings accounts combined with a regulatory effort to ensure that minimum standards are met.

Summary

A number of barriers some psychological, some technological and some financial thwart more green investments. However, most of these are surmountable through a mix of public policy, information and public education.

Energy planning in the EU

It is crucial for the EU, Member State governments as well as local authorities to change their approach to energy planning in the EU. In arriving at the optimal energy generation mix, a number of factors needs to be considered and internalized in the decision making process. These are

- the present and future expected costs of GHG emissions
- the present and future expected price of fossil fuels
- the volatility of fossil fuel prices
- the annual cost to the EU of fossil fuel imports
- the energy insecurity associated with fossil fuel imports and dependence on a small number of countries some with dubious human right records and unpredictable regimes
- the impact of GHG emissions from energy production on climate change
- the EU's present and future commitments to GHG emission targets

In light of these, it is important for decision makers to

- use a mean variance approach to energy planning
- use lifetime levelised costs to compare energy production options against each other
- take into account the future price of GHG emissions including under stressed scenarios
- account for the possibility of high fuel prices including under stressed scenarios

- account for the stock of GHG emissions from the power plant not just the annual flow

We believe that this will mean that almost all new energy generation in the EU is likely to be from green sources.

Tackling the low and uncertain price of carbon

We recommend that the EU should unilaterally adapt a 30% GHG reduction by 2020 target which will generate the impetus for the GND. This will likely drive the price of GHG emissions above Euro 30 which is essential for providing price support for green investments. In addition we recommend and EU wide adoption of a minimum Euro 20 green tax on the sources of emissions that are not presently covered by the EU ETS.

The EU should also issue an official version of its expected GHG forward price curve which should preferably be supported, at least on the minimum price, either by a carbon tax or by a commitment to withdraw emissions quotas. Policymakers should also move to a full auctioning of quota allowances by 2015. Furthermore the EU needs to adopt the revised Energy Tax Directive that has been put forward by the European Commission and go further by releasing a forward schedule for an increasing carbon tax.

The revenues from the auctioning and the carbon tax can then be distributed between reductions in social security contributions, support of green investments and deficit reduction.

Increasing the perception of the risks of dirty investments

While having a forward curve for expected GHG emissions prices and an expected increasing schedule for the introduction of carbon prices will already increase the awareness of the risks and the costs of dirty investments amongst investors and consumers, it may not be enough to change their behaviour.

That is why we also recommend the introduction of mandatory carbon stress tests for all financial institutions in the EU. Credit institutions such as banks, fiduciary institutions such as pension funds and other financial institutions such as mutual funds should all have to subject their existing portfolios as well as new investments to carbon stress tests wherein they measure and publish the effects of future higher prices of emissions on their investments.

This is likely to generate valuable information and sensitivity analysis that is interesting and useful for policymakers, investors, depositors as well as the financial institutions themselves. It will significantly enhance the awareness and discussion of risks arising from exposure to GHG intensive investments and is likely to result in significant behavioural changes.

Reducing the perceived riskiness of green investments

Because green investments are a relatively new category of investments, investors continue to associate them with high riskiness. Public sector supported demonstration projects for new technologies, the issuance of public performance curves and where needed financial support in the form of risk sharing, insurance and feed in tariffs can all work to significantly reduce the risks associated with green investments.

Another useful contribution towards reducing the high discount rates associated with dirty investments can come from the use and public disclosure of low discount rates by public institutions such as the European Investment Bank as they may provide an anchor to the private sector.

Taking account of climate risks

Several types of risks arise either directly from climate change, or indirectly through the policy actions undertaken to fight climate change or through a general change in perception and tastes driven by the on-going public debate on global warming.

Some of these risks are

- physical associated with a direct negative impact of climate change
- litigation to do with contribution to global warming
- competitiveness associated with a change in the tastes of customers and the development of more desirable green products
- reputational to with contribution to climate change and an irresponsible attitude to the discussion
- and regulatory arising from changes to the price of carbon or quantitative restrictions put in place to tackle climate change

The first step for companies and those who invest in them to manage such risks is an increase in the awareness and information that is needed to tackle such risks.

The EU can play a role in facilitating climate risk management in a number of ways. These include

- making it mandatory to disclose carbon emissions and exposure to carbon risk
- collecting data for public use
- and supporting the development of standardized tools for climate risk assessment

Putting in place a mandatory regime for the disclosure of relevant data would

- enable businesses to better manage their climate risk exposure and help identify the most effective emission reductions measures
- allow investors and financial institutions to differentiate between companies in their investment portfolio regarding carbon footprint and climate risk exposure
- prove useful in carbon tax collection

In response to increasing concerns about risks, as well as forgone opportunities, a growing number of investors are calling for companies to report the information needed to assess their climate exposure.

A major challenge in creating an accounting methodology for GHG emissions is to identify the boundaries in which indirect emissions will be included in each company's GHG inventory. Corporate climate risk disclosure is a prerequisite for financial institutions to manage their climate risk. However, the disclosure is neither consistent nor universal. Therefore, to facilitate and incentivise well-informed investment decisions, the EU should require stringent disclosure of a company's environmental performance record as a condition of being listed. This should apply both

to new and existing listings on stock exchanges. Furthermore, it should make inclusion of climate risk mandatory in annual reports and shareholders financial statements.

To make such requirements possible, the EU should institutionalise a consistent framework for GHG emission accounting.

Getting financial institutions to disclose, measure and tackle the climate risk faced by them

Considering the central role that financial institutions must play in the transition to a low carbon economy, the EU should mandate that they report the climate risk associated with their investment portfolio. Financial institutions have a particular responsibility when they manage other investors' assets – individuals' savings and investments in funds.

Some private banks and development banks – including the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD) – are leading the way by developing procedures for assessing the climate risk related to their own activities. These banks should team up with other larger institutional investors to develop a common methodology for risk assessment.

This approach of making it mandatory for financial institutions to consider and reveal data on climate exposures will allow for the development of a responsible finance market as well as shift the behavior of financial institutions away from risky climate behavior towards green actions. Fiduciary investors in particular, such as pension funds should make the evaluation of the broad categories of climate risks a mandatory part of their due diligence and portfolio allocation process. These risk evaluations should also be required of regulated credit institutions such as banks.

A carbon stress test could help financial institutions with their climate risk management and create better awareness of climate risk factors.

A tax break according to the share of green assets in a bank's balance sheet could further incentivise banks to reduce the climate impact of their investment activities. For example, the European Commission's proposed bank levy proposal could have green exemptions.

Financial institutions committed to addressing climate risk will find themselves in an advantageous position. Climate risk disclosure will incentivize financial institutions to manage their climate risk, and will enable savers and investors to trust financial institutions with better climate profiles. This should go beyond the stress tests we have discussed in a previous section in this chapter.

Addressing short-termism in finance

Green investments, which often have high upfront costs, are disproportionately penalized by the excessive short termism of finance. That is why it is imperative to address the excessive short termism of modern financial systems. A number of policy measures are possible, many of which will have significant benefits over and beyond reducing the barriers facing green investments. Some of these are

- the imposition of financial transaction taxes
- reducing the short-termism of compensation structures by introducing bonus caps and ten year vestment periods for performance related pay

- changing the structure of performance measurement from relative to also include an absolute element
- contemplating a move away from pure marked to market accounting towards a marked to funding accounting
- limiting turnover ratios for fiduciary investors
- changing the m easurement of risk used by long term investors
- linking votes to holding periods for investments

Accounting standards for measurement and disclosure

No matter what the economic profitability of green investments may be, if this does not reflect properly in the accounts of companies then GHG reducing investments will be penalized. Unfortunately current accounting frameworks do not allow for a favourable treatment of savings arising from efficiency investments. Another problem arises when decisions need to be made on allocating funds towards energy efficiency related investments.

Similarly there are other accounting standards that could be changed to make them more conducive to green investments.

Tackling split incentives

The problem of split incentives where those paying for energy use are not the same ones making decisions on the production of energy intensive goods or the nature of energy generation is one of the most serious barriers in the way of the execution of the Green New Deal. Manufacturers of energy intensive products, house builders, electricity producers and utility companies all face these split incentives. Some ways of addressing this problem through public policy are through

- issuing standards on energy efficiency for white goods, vehicles and newly built houses and on energy mix and efficiency enhancing measures for electricity companies and utilities
- copying the Top Runner energy efficiency program that has been very successful in Japan
- banning high energy consumption goods for which easy and cheap energy efficient replacements are readily available
- imposing higher transaction taxes or mortgage penalties on low energy efficiency buildings every time there is a sale or bundling additional finance for improving the efficiency of buildings with traditional mortgages with a verification process that such investments are indeed made
- making utilities adhere to a strict energy efficiency increasing schedule in partnership with their customers either through the use of energy savings certificates or through other means

Tackling behavioural and financing barriers for energy efficiency

Many investments in energy efficiency do not materialize despite having a positive rate of return. This is partly because of a lack of appropriate financing options and partly due to behavioural idiosyncrasies such as not treating one Euro of savings as equivalent to a Euro earned. Mandating a lifetime cost labelling of all white goods, cars and other energy intensive consumer goods may help people see a higher value in savings.

There is a very large potential for tackling missing financial instruments through the use of Energy Service Companies and flexible property taxes and billing practices that allow for such firms to share the savings with customers would be very helpful in triggering investments in home efficiency measures. Where needed, efforts also need to be made to ease the availability of credit to ESCOs.

The financing of energy efficiency projects by local authorities such as municipalities is another highly promising area of development where efficiency measures can be aggregated over a community. The measures can be financed either through loans from public or development banks or through special bonds floated for the purpose. These can then be repaid by mobilizing some of the funds saved due to lower energy consumption through smart billing or assessments on property taxes.

Green indices

Most institutional investment nowadays is index based which means that having dedicated green indices can help attract significant additional amounts of investments into the green sector. Specifically indices can

- help ensure that the entities that constitute the index meet some minimum criteria that are important to investors
- help provide a cheap and easy way of diversifying risk across a number of smaller individual investments that would otherwise have very high transaction and effort costs
- be a good mechanism to connect smaller companies and investments needs to large pools of institutional and retail investments

In general green indices can offer

- diversification potential
- quality control
- screening on the basis of a number of green criteria
- aggregation of small green investments into large investment opportunities

Green indices can be conventional weighing companies according to their market capitalization or be focussed thematically say on green energy generators or could be based on a best in class assumption of green performance.

As carbon disclosure increases and improves, the quality of green indices will improve with it. In the meantime, public institutions can play an important role in promoting sound green indices by lending their experience and credibility in assessing companies' environmental impact, abatement effort, and environmental risk management. The European Commission together with the EIB could initiate an index targeted at low-carbon investments across all European companies.

Green bonds

Historically the term has referred to bonds mobilized by financial institutions such as the European Investment Bank and the World Bank to mobilize funds for making dedicated green investments. Green bonds were pioneered by the EIB in 2007.

It is important to establish standardised criteria for project eligibility; having minimum financial characteristics such as size, rating and structure; and applying rigorous governance and due diligence project finance to aid index providers in putting green bonds on a fixed income 'Green Index'.

We strongly recommend that the EIB expand its offerings of green bonds substantially both for its own funding of green projects as well as in partnership with private institutions so as to expand the pool of private fixed income funding dedicated to green projects in Europe. Another important category of green bonds can be used to finance the procurement of green assets.

Green securitization

Securitization can be a very useful financial technique to help mobilize market based funding for a group of disaggregated small investments. Many green investments, particularly those in energy efficiency measures and in local generation, are quite small compared to the 'normal' market size for transactions so green securitization provides a perfect technique to help mobilize funds for these.

In order to address the stigma attached to securitization and to develop standards on how such securitizations should work, we believe that the European Investment Bank should take the lead in organizing benchmark deals so as to help develop this market.

Green savings

Green savings funds and bank accounts, are designed to attract private money to green causes and while they have not attracted too much attention yet, making clients more aware of the carbon footprint of the investments made with their savings deposits, might make them more likely to switch accounts.

Tax incentives can also be used to encourage individuals to put their money into a green bank account. Not only do such government initiatives make participation financially attractive, they boost confidence in green products. We recommend public encouragement for a widespread use of such green savings accounts combined with a regulatory effort to ensure that minimum standards are met.

9. Other sources of public revenue

The discussion so far has focussed on the essential elements of a Green New Deal, its funding needs, the potential sources of finance from the private sector and the policies that can help facilitate the flow of these funds. It has also become clear that at certain stages of the green investment cycle some form of public support may be needed. In this chapter we explore the revenue potential of some sources of public funds that may help mobilize any public funds needed in a progressive manner that is consistent with the objectives of the GND. In particular, we look at carbon taxation and auctioning of GHG emissions allowances, at taxation of the financial sector and at means to reduce the evasion and avoidance of taxes.

We are still in the midst of the biggest financial and economic crisis for a generation and this has led to a significant deterioration in both public and private finances. It may not be an exaggeration to say that the fiscal stress associated with the crisis was a factor in undermining a potential climate deal in Copenhagen and may continue to hamper agreements between developing and developed countries in forthcoming discussions on burden sharing. More to the topic of this report, problems with public finances have limited government support to green investment. In some countries such as Spain, fiscal stress has actually led to a roll back of support for the GND.

Hence, in order to mobilize funds for any public support that may be needed, it is crucial to discuss the potential for sources of additional public revenue. Ideally such sources would have a highly progressive incidence, make green investments more attractive and have a minimal impact on growth. The three possible sources of additional revenue discussed in this chapter fulfil most of these criteria.

Green revenue potential

The use of a cap and trade scheme and the taxation of carbon discussed in an earlier Chapter not only have a strong effect in terms of changing incentives for green behaviour but can also help generate substantial amounts of additional tax revenue. This 'double dividend' is very attractive even though under the green tax reform program discussed earlier at least part of the revenue ought to be allocated to reduce regressive and employment inhibiting taxes.

For example, the allocation of EU-ETS allowances potentially offers a very large source of public revenue if the allowances are sold (auctioned) rather than given away as has been the usual practice so far. In the first two phases of the EU-ETS, 2005-2007 and 2008-2013, Member States' opportunity to auction quotas was limited to 5% and 10% of the total respectively. The actual use of auctioning was even less. Even in phase two, only a few countries reserved a share of the quotas for auctioning: Germany (9%), the UK (7%), the Netherlands (4%) and Lithuania (3%). Nonetheless, in 2009 Germany raised about Euro 230 million from such auctions, which it allocated for development expenditure.

According to the European Commission, assuming that by 2020 half of the total EU-ETS allowances were auctioned at a price of Euro 30, the total annual revenues could amount to more than Euro 25 billion[xl] annually [131]. Most forecasts assume a carbon price between Euro 30 and 40 by 2020. If 80-90% of the quotas were auctioned in 2016, at Point Carbon's EU-quota price estimate of 37

euro/t for 2016, an even more substantial Euro 50 to 60 billion in revenues could be raised every year. At a price of 50 euro per tonne CO_2, public revenues could be as much as Euro 70-80 billion. The amount generated is strongly dependent on the number of quotas allocated and the price development in the EU-ETS market.

A very significant revenue potential also exists in the form of a possible EU-wide carbon tax. As discussed in a previous Chapter, a carbon tax would be an appropriate complement to the EU ETS in particular if levied on the almost 50% of the total GHG emissions that are not covered by the ETS. The European Commission has put forward a proposal for an EU-wide carbon tax[xli], set at a base level of Euro 20 per tonne of CO_2 though as of the writing of this report the fate of this proposal hangs in balance [xlii][45].

Applied at this rate to the 2.9 billion tonnes of carbon not included in the EU-ETS, the tax would yield approximately Euro 58 billion annually, not taking into account the impact it would have on the volume of emissions. However, the base rate should be set at least Euro 30 per tonne of carbon, the rate that the Stern Review estimated to be the aggregate social costs of carbon emissions and which is the lower threshold necessary to trigger low carbon investments at a sufficient scale [2]. At this rate the revenue in the EU would be Euro 87 billion.

Many member states already have CO_2 taxes in place. The current tax rates are Euro 12/tonne of CO_2 in Denmark, Euro 36.5 in Sweden and Euro 20 in Finland[xliii]. These generate a significant amount of tax revenue, 0.3% of GDP in Denmark, 0.81% in Sweden and 0.29% in Finland [131]. The UK, Netherlands, Germany and Ireland have also put in place green tax reforms where taxes on carbon-based fuels serve a similar role to that of more traditional carbon taxes in Scandinavia.

In 2004, the then French President Jacques Chirac commissioned a report on innovative sources of financing that brought the concept of international taxation to centre stage[xliv]. The report suggested a tax on international shipping that at present remains untaxed. Shipping taxation can be used to correct for two environmental externalities, pollutants that lead to acid rain and climate change, and pollutants to the marine environment and shorelines. The report estimated that a 10 % tax on bunker fuel, the mainstay fossil fuel used in shipping, would yield about $1 billion if applied worldwide. It also suggested that in order to internalize the full environmental externalities of GHG emissions from shipping the tax would need to be levied at a 150 % rate. At this rate it would yield an estimated $20 billion of revenue every year.

Because shipping is the most economical transport option for large loads, this taxation would likely not impact the volumes carried very significantly, and because the industry is characterized by intense competition, the costs would likely be shared across the shippers and their customers which would moderate the impact on freight rates.

Taken together the volume of additional green public revenue from carbon taxation, the auctioning of emissions and proposed international green taxes such as those on shipping easily exceeds Euro 100 billion a year in the EU and could amount to much more.

Putting a direct or an indirect tax on Carbon through the mechanisms discussed can significantly change the investment and consumption landscape away from dirty towards green behaviour and help generate substantial additional revenues. We agree with the European Commission's proposals

that at least 50% of the revenue from these sources should be allocated to green expenditures in the form of supporting R & D and helping leverage much larger amounts of green investment from the private sector in the EU. The balance, we believe, should be shared between meeting the EU's international commitments to developing countries under the UN climate negotiations and helping stimulate employment through reductions in employment taxes.

Revenue from financial sector taxation

No matter what form the crisis has taken now the fact remains that it originated in the financial sector. The sector needed trillions of Euros of direct and indirect government support with the European Commission having approved more than Euro 3.7 trillion of member state support measures in 2009 (of which only a small fraction was direct support). The combined effect of direct financial costs, the recession-induced fall in tax revenues and the need for fiscal stimulus led to a near 7% of GDP deterioration of Member State fiscal deficits and debt stock levels will end up nearly 30% of GDP higher as a result of the financial crisis.

It has also become clear in the discussions following the crisis that the financial sector is under-taxed relative to real sectors of the economy so a discussion on additional financial sector taxation has been a regular companion to efforts to reform financial regulation in the EU. Countries such as the UK, Sweden and Germany have already introduced some new financial sector taxes and many others are set to follow. The European Council of December 2009 asked for the consideration of a "full range of options including insurance-fees, resolution funds, contingent capital arrangements and a global financial transaction levy".

Since distortions in the financial sector have played a significant role in hampering green investments, a strong case can be made to allocate at least part of the proceeds of any additional financial sector taxation towards tackling climate change in the EU.

The first post crisis financial sector tax to be levied in the EU was an annual levy on part of the balance sheet of banks. Such a levy has not (yet) been agreed at the European level though an increasing number of countries are implementing it at the national level. It has been estimated that if the Swedish model of the levy, at a rate of 0.036%, is applied at the EU-wide level then it would yield Euro 13 billion annually. At the much higher rate of 0.15% that has been proposed (but not implemented) in the US, this would increase to more than Euro 50 billion (without any exemptions).

Such a levy, especially if the structure is reformed, can also have a beneficial side effect in terms of reducing excessive risk taking by the financial sector. One of the biggest triggers as well as source of amplification for the financial crisis was an increasing reliance by banks on cheaper short term funding. This worked well as long as the economy appeared to be booming but as in the past the sources of short term finance dried up at the first sign of trouble. That is why it is very important for systemic stability to discourage over-reliance on this short term funding.

Re-Define has suggested that a 'double dividend' in the form of substantial revenues as well as lower system risk could be delivered by modifying the bank levy regime to impose a differentiated tax rate linked to the duration of liabilities on bank balance sheets. Our calculations show that this could generate between $75 billion and $110 billion world-wide on an annual basis, of which nearly a third would be generated in the European Union.

Table 8: Financial Sector Taxation

	Financial Transaction Tax	Bank Levies
What is Taxed	The sale and purchase of financial securities	Non deposit based funding for financial institutons
Size of Tax Base	Very Very Large > $3500 trillion	Large > $100 trillion
Rate of Tax	Very very low (from 0.005% upwards)	Very low (from 0.15% upwards)
Spatial Variability	Significantly different accross diferent financial markets and instruments	Different according to funding type and country
Temporal Variability	Can be adjusted to prevent asset market overheating	Should be increased in booms
Initial Incidence of Tax	Primarily Hedge Funds and Investment Banks and some Asset Managers	Commerical Banks and Investment Banks
Impact on Behaviour	Less Short Termism, Less Churning, More Simplicity, Less OTC	Less Maturity Mismatch so Lower Systemic Risk
Use as a Prudential Tool	Tax Complexity and Opacity and Change Rate of Overheating Markets	Change Rate with Increasing Systemic Risk
Tax Base	$3,850 trillion	$100 trillion
Asset or Liabilities	Asset Side	Liability Side
Revenue Estimates	$200 bn - $300bn	$75bn - $110bn
Scope of Coverage	Shadow banking system, banking system and asset managers	Credit Institutions
Final Expected Incidence	Mosty Hedge Fund and Investment Bank Employees and Clients	Mostly Commercial Bank Employees and Customers

Source: Re-Define[xlv]

The discussion in previous Chapter has highlighted how short-termism prevalent in the financial sector can undermine green financing. One of the policy recommendations has been sense to introduce a financial transaction tax that can help tackle some of this excessive short termism. This will deliver a 'double dividend' in terms of not just helping engender more green friendly investments through lengthening investment horizons but also delivering substantial revenue of as much as Euro 80 billion in the EU part of which can be allocated to climate financing for developing countries.

Re-Define has made a strong case for introducing a differentiated financial transaction tax regime which extends this 'double dividend' into 'multiple dividends' by delivering on other public policy goals. Under this scheme, financial transaction taxes can also help reduce tax evasion by generating transaction level data and help tackle systemic risk through policy makers having the right to vary tax rates counter-cyclically[xlvi].

As the table above shows, bank levies and transaction taxes are complementary initiatives that target different segments of the financial system to tackle excessive short termism and mitigate the build-up of systemic risk. We strongly recommend that the EU should implement both of these.

Tackling Tax flight

Tax systems lie right at the heart of modern states and form the backbone of the social contract between citizens and their governments. That is why tax evasion and avoidance can be so pernicious not just in terms the negative impacts on government finances, but also on the social fabric of a country.

Good tax policy and related good governance was primarily a domestic affair in the past; but that is no longer the case. Changes to the international economy, such as:

- growing cross-border trade and financial flows
- increasing complexity of multinational corporation operations and international production networks
- the liberalization of capital and current accounts, and

- the growth of 'tax havens' jurisdictions which legislate specifically to help economic actors avoid regulatory and tax obligations in other jurisdictions

have significantly increased the opportunities for economic actors to legally and illegally reduce their tax payments.

This internationalisation of economic activity has not been accompanied by the internationalization of tax governance or even significant progress on cross-border co-operation on tax matters. This has allowed economic actors to use international economic linkages to escape paying taxes – tax flight. This tax flight reduces public revenues, weakens the social contract and undermines good governance. That is why EU Member States need to pursue a fiscal policy that seeks to minimise tax flight.

Estimates of undeclared wealth held offshore typically exceed $10 trillion of which around 30% or more is likely to belong to EU Member States. The annual tax flight from the EU runs into the hundreds of billions of Euros. Additional tax revenues from both reducing this tax flight as well as repatriating some of the money held offshore can easily generate much needed additional annual tax revenues for EU Member States facing difficult fiscal situations. The need for this additional revenue both to repair the hole left by the financial crisis in public finances as well as to address the urgent challenge of climate change was never more urgent.

Facing severe revenue shortfalls EU Member states have been taking action against tax flight. These have included actions as diverse as the purchase of stolen tax haven account data by the German secret service, to a tax amnesty by Italy to raids of Swiss banks by the French authorities to the UK striking deals on withholding taxes and amnesties with Liechtenstein and Switzerland. The Financial Times has reported that thus far "Germany has collected €4bn from offshore evaders; France, €1bn; Italy, €5bn. The UK has collected an extra €600m and expects this to rise to at least £6bn by 2015"[xlvii].

Re-Define believes that if the one-off national level measures taken by Member States so far were replicated and co-ordinated at the European level, they would yield a one-time boost of Euro 100 billion of additional tax revenue in addition to having beneficial impact on annual revenue collection[xlviii]. Below we discuss a number of other measures that EU authorities and Member States can take in order to help improve the collection of tax revenues.

Box 10: Tax havens

Tax havens, economies that specialize in offering low taxes and secrecy, typically earn their keep not from taxes but from levying an annual fee on each of the shell companies, trusts, foundations or personal bank accounts they host. Typically, this annual fee is only of the order of a few hundred dollars. This means that a Cayman Island shell structure, which could be used to avoid millions of dollars of taxes in other onshore economies, would typically bring in only a few hundred or a few thousand dollars of revenue to the Cayman Island government. **Re-Define** has estimated that tax havens typically earn less than 1% of the tax loss that their existence imposes on onshore economies[xlix]. The negative externality posed by havens is thus huge, and their existence is highly inefficient from the perspective of overall tax revenue in the world.

In a perfect world, the zero/low tax rates offered by tax havens would not pose a very serious threat. Tax regimes around the world operate primarily on the basis of source and residence principles wherein states can tax incomes generated within their borders or incomes attributable to their residents. Tax haven operations are often shell operations that usually perform no economic activity, so the real income is always generated in an onshore economy and could in theory be taxed there even when it is reported as the income of a tax haven resident entity. Likewise the assets belonging to offshore bank accounts, trusts and foundations come from an onshore source and should be taxable there. This would be the case were it not for the fact that tax havens also offer secrecy in combination with low tax rates. This means that governments are often not able to attribute such income and assets to their residents or to a source within their territory. That is why tackling secrecy is central to the question of tackling tax havens.

Championing the creation of a global tax organization

Despite the massive internationalization of commercial activity, the world of taxation lacks a truly international body and a cohesive regime but works instead through a network of bilateral Double Tax Agreements and Tax Information Exchange Agreements (TIEAs). These lay out principles for sharing tax revenues and exchanging information between the two respective jurisdictions. With 192 countries in the world, there is a need for more than 18,000 bilateral tax treaties to cover all nations. Of these less than 4,000 are in place yet. A multilateral tax system akin to the World Trade Organization – an International Tax Organization – would be a far more efficient way of organizing global fiscal affairs. This is a worthy goal that the European Union should champion.

Absent such a global level agreement, the EU, as the largest economy in the world, still has the wherewithal to act to establish new rules of the game. But it can only do so by acting in concert as one EU rather than a motley collection of disparate Member States pushing their own agendas.

Negotiating stronger bilateral TIEAs at a pan European level

Tax havens are reluctant to undermine their secrecy, so have typically been hesitant to enter into bilateral tax treaties. When they did so, it was only because up until recently the text of such agreements did little to pierce this secrecy. Typically, only information that the havens kept could be shared, so they kept few records of beneficial owners of bank accounts and legal entities registered in their territories. Even where the records existed, the havens were under no obligation to share them and did so only on the basis of specific requests from treaty partners. These requests typically have a very high burden of proof in terms of the specificity of the information, so, in a manner of speaking, requesting partners 'already need to have the information that they request'. That is why there were fewer than ten episodes of information exchange annually under most of these TIEAs.

Some of this has changed under pressure from bodies such as the OECD, and more recently the G-20, and tax havens are now required to maintain proper records of beneficial ownership. They are also increasingly under increasing pressure to negotiate more TIEAs. However, there is little change to the mechanism for the exchange of information which has not been automated, and so remains ad hoc and highly ineffective. Urgent progress is needed on

- the negotiation of more TIEAs
- improving the sharing of tax relevant information

It makes little sense for Member States to negotiate separate tax treaties with haven countries as has been the case. In fact, bilateral deals with tax havens can be negotiated on a multilateral basis so the European Commission should negotiate TIEAs for Member States. The OECD 'Model TIEA' provides for such a multilateral option. In the absence of a pan EU directive, the Member States will have to separately pass the required legislation at the country level once such an agreement has been struck.

Such a mechanism has been used effectively by the Nordic Council since 2006, where TIEAs are negotiated jointly and signed separately. This not only strengthens the bargaining hand of the onshore economies but is also far more efficient and moves the world in the direction of a truly multilateral tax regime. The European Commission should initiate a parallel process for introducing a directive that allows the European Union to strike fully multilateral tax treaties with other countries on behalf of all the Member States.

Reviving a truly multilateral approach with automatic exchange of information

Despite the 'multilateral' option discussed above, the model TIEA being used bears little resemblance to the truly multilateral Council of Europe/OECD Convention of 1988. This convention provides for true multilateralism as well as the automatic exchange of information - the two tools necessary for an effective international tax regime.

The European Commission and the Parliament should initiate a process of fully adopting the Council of Europe/OECD Convention of 1988 on Mutual Cooperation in Tax Matters across all Member States. The European Union should intensively push for the adoption of the same by other OECD countries and tax havens in particular. Technical assistance from the EU should be made available where required, especially to developing countries and tax havens. Alternatively, upgrading the UN Committee of Tax Experts to a full statutory international tax body and locating a truly multilateral treaty under the aegis of the UN would be an even more inclusive option.

Expanding the scope of the EU Savings Tax Directive

The EU Savings Tax Directive (EUSTD) broke new ground for being both multilateral in nature and requiring an automatic exchange of information. Its effectiveness has, however, been severely hampered by its limited geographic and transactional scope since it applies only to the EU and some satellite territories, and covers only the interest income on personal savings. The extent of its limitation is clear from the following example:

Say an EU citizen transfers $1,000,000 of unreported and hence untaxed income to his account in Switzerland. Most savings accounts pay an interest of around 1% so the annual interest income would equal $10,000. The withholding tax on this would be around 30% or $3,000 part of which will be transferred to the member state.

However, there is no withholding tax on capital gains or income relating to equity, derivatives and other forms of investments which in recent (pre-crisis) years have sometimes been generating 10% - 20% annual return. Much more important, the tax due on the original $1,000,000, of between $300,000 and $500,000 in most European countries has simply not been paid. So the EUSTD captures $3,000 but misses out the $500,000. Moreover, the account holder could simply avoid even

this miniscule tax simply by transferring their account to a non EU STD jurisdiction or by setting up a legal structure in the form of a corporation, trust or foundation.

There is consequently an urgent need for the EU to push hard for a strict revision and expansion of the scope of the EU STD. The EU STD, suitably extended, could serve as yet another template for a truly multilateral system complete with automatic exchange of information. The new EU STD should also contain a provision for sharing tax relevant information with or collect revenue on behalf of developing countries - the Least Developed Group of countries in particular on a non-reciprocal basis to help tackle capital flight and corruption.

Introducing country by country reporting and a consolidated pan EU Tax base

Since tax flight is facilitated primarily by a lack of information for onshore tax authorities, any steps that improve the information available could provide a substantial boost to the efforts to reduce tax losses. If a country by country reporting provision is made mandatory for corporations, this would generate significant new and relevant information for tax authorities. If, for example, they find that a multinational corporation is reporting 50% of its world-wide profits in a low tax jurisdiction with less than 1% of total employees, their suspicions would be aroused and they would be able to take follow up action to minimise tax flight.

The EU is already in a lead position world-wide on taking up the issue of country by country reporting but could and should go much further. Requiring EU based MNCs to institute the standard while slowly expanding its reach through the International Accounting Standards Board would benefit both the EU as well as it developing country partners. Parallel moves to institute an EU wide Comprehensive Consolidated Corporate Tax Base, which have now been endorsed in the Euro Plus pact agreed by most Member States at the European Council in March 2011, would help stem the destructive tax competition amongst Member States that has been on the rise and would help boost tax revenues overall.

Tackling the mis-pricing of trade transactions

The mis-pricing of trade transactions is perhaps the most important channel for tax flight. In a world where supply chains are becoming ever more complex and the percentage of cross border service transactions are increasing, it has become ever easier for MNCs and other commercial actors to use internal and external mis-pricing of these transactions to shift profits to low tax jurisdictions and tax havens. The EU, which has a customs union, should act immediately to apply an intelligent mis-pricing detection filter to its international trade transactions to help tackle this large channel of abuse. This filter would be useful for detecting illicit financial flows both out of and into the union. Where relevant, the information generated should also be shared with developing countries.

Learning from successful country level strategies

The European Union could do much to apply lessons learnt from country level initiatives against tax flight. The US program of qualified intermediaries, which obliges bank and other fiduciaries to share tax relevant information on US citizens, could easily be replicated at the EU level. The fact that this has not happened yet is indicative of how much less effective fractious Member States are acting alone than when they act together as the European Union. Some other unilateral measures that should be considered for replication at the EU level are:

- Adopting a financial transaction tax which increases the risk of detection (This generated information that helped substantially reduce domestic and cross-border tax evasion in Brazil). A penalty rate for transactions with tax havens would be effective.
- Adopting special reporting requirements and fewer exemptions for investments and financial flows to and from 'tax havens' (Argentina and Spain)
- Requiring accounting firms to register tax shelters before selling them (USA and UK)
- Initiating a cross-functional program of the kind that exists in Australia (Project Wickenby – which is a task force that comprises the tax office, crime commission, security and investment commission and a number of other relevant governmental bodies and helps tackle tax flight)
- Aiming for legal rulings (as done in the UK and Ireland) which would require banks to report customers with undeclared offshore bank accounts.
- Tax amnesties of the kind being offered by Italy and the UK and offering rewards for information from tax havens as Germany has done unilaterally are other somewhat less orthodox options to consider.

Revenue estimates

Re-Define has estimated that implementing just the EU level measures discussed above (not those for which a global agreement is needed) can potentially boost EU annual tax collection by between Euro 200 billion and Euro 400 billion[l], in addition to delivering a large one time boost to tax revenue. We recommend that any additional one-off tax revenues be shared between reducing the burden of public debt particularly in highly indebted EU Member States and allocating capital in support of green investments, for example by endowing the equivalent of the planned UK Green Investment Bank.

Summary

Public support of some kind is necessary in order to help facilitate operationalization of the Green New Deal. The serious fiscal stress that EU member states are facing at this time because of the financial crisis has hurt their ability to provide this public support with countries such as Spain having actually reduced support to the green sector.

Three attractive possibilities for additional tax revenues can help mitigate some of the problems caused by the fiscal stress. Imposing more direct or indirect taxes on carbon is a very promising policy option in particular because it can also simultaneously make the incentive landscape more green friendly. Since the financial sector has been responsible for the crisis and has benefited enormously from taxpayer subsidy and not paid its fair share of taxes in the past, imposing new forms of taxes on this sector is both fair and can deliver significant revenues as well as help improve its functioning. Since tax systems lie at the heart of the social contract in modern welfare states, rampant tax evasion and avoidance can gnaw away at the fabric of the state itself. Tackling tax flight will not only help preserve the fabric of the state but can also deliver very significant additional revenues.

The planned switch to the auctioning of GHG allowances under the EU ETS can bring a substantial amount of additional revenue that ranges from Euro 25 billion to a much more substantial Euro 80 billion annually depending on various assumptions for the percentage of allowances auctioned and the prevailing price of GHG emissions. An additional carbon tax on the emissions not included under the ETS could yield between Euro 58 billion and Euro 87 billion annually. While the EU level tax does not exist yet, Member States that have implemented such taxes already generate significant revenues with Sweden, for example, reporting a 0.8% GDP revenue.

Enacting EU-wide bank levies of the kind that countries such as Sweden have implemented will raise Euro 13 billion while implementing these at a higher rate could bring in as much as Euro 50 billion. Modifying the structure of such a bank levy (with the same revenue target) could have the additional impact of significantly reducing the riskiness of bank balance sheets. Similarly, enacting an additional and complementary financial transaction tax regime in the EU could mobilize as much as Euro 80 billion annually and simultaneously reduce excessive short-termism in the financial sector and help reduce systemic risk.

Tax flight can be pernicious for society and globalization has meant that the opportunities for minimising tax payments by exploiting links to the international economy have grown significantly. EU economies lose hundreds of billions of Euros in tax revenue every year. In response to fiscal stress many Member States have acted unilaterally to help reduce tax flight but replicating these measures EU wide could deliver as much as Euro 100 billion of a one-time tax bonanza and reduce annual evasion.

Sensible steps such as switching to EU-coordinated negotiations of bilateral tax exchange information agreements, a much overdue reform of the EU Savings Tax Directive, EU-wide steps to systematically tackle the mis-pricing of trade transactions, an adoption of country by country reporting standards for all MNCs operating in the EU and an acceleration of the adoption of a consolidated corporate tax base can all help tremendously. Learning lessons from other successful efforts to reduce tax flight such as the US qualified intermediary program or the Australian cross-departmental task force and applying them at the level of the EU will also help reduce tax flight.

Altogether the suggested measures on new taxation and tackling tax flight can help mobilize hundreds of billions of Euros of additional revenue for EU Member States which can then be split between the goals of supporting the GND and paying off excessive levels of public debt.

10. Public Support to Leverage Private Investments

This report has clarified that 1) there is a strong economic case for the Green New Deal 2) there is a sufficient stock of private funds in order to be able to meet the investments needed to successfully execute a GND and 3) that there is a significant potential for additional public revenues to support the GND, if needed. As discussed in earlier sections, certain interventions that are necessary for the GND such as R & D are need some form of public subsidies. Others, such as investments in unproven technologies or early commercialization attempts may also require some form of public support because of the high risks involved. Still others such as investments in efficiency may not materialize even when profitable in the absence of public interventions.

Public financial support can come in many forms some of which are

- grants
- subsidies
- tax credits
- feed-in-tariffs
- risk sharing
- insurance
- co-financing

Because most forms of public support only involve partial funding, even small amounts of public money can help mobilize significant amounts of private capital. Another distinction that needs to be made is the difference between the volume of public funds or guarantees and the cost to the public exchequer. Here again, the volume of public support would be a multiple of the actual costs to taxpayers since the vast majority of public funds invested in the GND will be made on a commercial or semi-commercial basis and will be paid back.

A study commissioned by the UN Framework Convention on Climate Change [9] posited that nearly 90% of the funds required to meet the climate challenge must come from the private sector though public funds can play an important role in leveraging private investments.

The cost of capital for renewable projects remains higher than for conventional technologies depending on the stage of the technological development. That is why, in order to create an investment environment with an acceptable level of risk-adjusted return, governments may need to use public financing mechanisms (PFMs). In addition to public expenditure, PFMs, such as feed-in tariffs, R&D grants, and publically backed loan guarantees, can potentially mobilize substantial private investment into green activities. Research suggests that well-designed PFMs can halve the cost of funding for low carbon projects, and leverage between USD 3 and 15 of private sector investment for every public USD 1 spent [58]. PFMs address several of the investment hurdles discussed earlier by:

- lowering the risk to private investors through risk sharing facilities
- lowering the capital cost for low carbon companies and projects
- pooling small scale investments

- supporting large scale investments such as in energy infrastructure
- spurring the development of a private risk capital market
- supporting demonstration projects and application of new technologies to build a track record
- demonstrating political commitments to bolster confidence in low carbon investments
- creating learning effects and improved knowledge about the risk profiles of low carbon investments, hence reducing the debt service requirements and required return on equity for future projects.

Despite their appeal, designing PFMs is a delicate matter. Interventions to seed technological "…transitions cannot be micromanaged and are, at best, guided indirectly through policies and initiatives that enhance the adaptive capacity" of the economy [54]. Policies must be predictable and long-term to bolster the confidence of the private sector, yet at the same time nimble and adaptable to changing conditions.

Policies that 'pick winners' from overly immature or poor quality technologies can have perverse impacts by either locking-in inefficient technologies at the expense of more desirable ones, or by causing consumers to lose interest. An often used example is that of US President Jimmy Carter's enthusiasm for renewable technology in the 1970s, which with hindsight seems to have been premature for the technology of the day.

"The country's physical landscape was littered with images of broken down wind and solar farms, and its business landscape was haunted by memories of bankrupt American renewable energy manufacturers… Thus, renewables were paradoxically a victim of their own success: public favour quickly turned to either apathy or resistance once the high expectations for renewable energy failed to materialize" [55]

The lesson to be learned is not to abandon public financial support but to use the right combination of PFMs. Different policies and investment tools are appropriate at different stages in the development of a technology. The technological development path depicted in the figure below is a useful guide to the various stages for public intervention.

Low carbon technologies differ in capital costs, level of maturity, and risk profile. Direct governmental support is most important at the initial stage of development. The further along the development continuum a technology has advanced, the more private capital can be leveraged with public investment until the market is saturated and full privatised. Thus, a mix of financial mechanisms is needed to close the finance gap and manage the risk of low carbon technologies at different levels of maturity. The table below shows a range of different PFMs that can be used to support development and adaption of low carbon technologies.

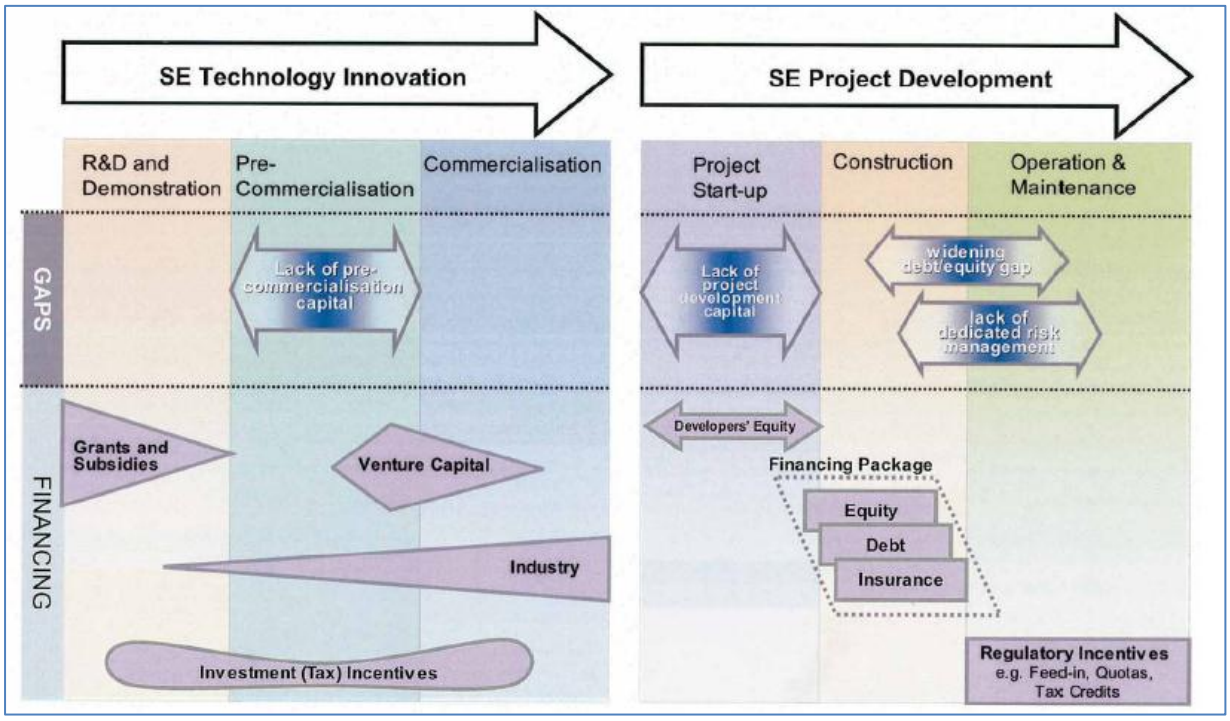
Table 9: Forms of public support mechanisms

R&D	Demonstration	Deployment
•R&D grants •Contingent grants	•Contigent grants •Soft loans •Convertible loans •Public backed loan guarantees •Public/private venture capital •Mezzanine finance •Technical assistance	•Loans •Public backed loan guarantees •Public/private venture capital •Mezzanine finance •Pooling and securitisation of project loans •Low cost loans to SMEs •Public procurement mechanisms

Source: Accenture and Barclays Capital [114]

In order to deploy green technologies successfully, hurdles must be addressed along the whole development cycle. Linking R&D with market deployment can be effective in accelerating technological progress and attracting private investors. While some public support is available for innovation and early stage financing, many technologies encounter difficulties raising funds in the demonstration and deployment phases as early grants run out.

Figure 32: Stages of public support



Source: UNEP SEFI [57]

This pre-commercialisation phase involves capital-intensive activities such as large-scale demonstration and repeated testing of commercial viability. The roll-out of a new technology requires larger investment than initial R&D activities. At the same time the risk profile remains too high for many traditional investors and funding is dependent on public support. Early stage grants

may need to be followed up by public loans, equity and guarantees to attract private investors at the later stages. Providing clear price signals, such as through a feed-in tariff system, is likely to reinforce the effect.

Supporting Research & Development

The invention and application of new technologies is critical for developing a low carbon economy. Early on in the research phase, public grants need to be directed towards labs and testing facilities necessary for the invention of new technologies. However, despite a universal acknowledgement of the need for more R&D, global research funding of renewable energy, both public and private, has trended downwards in real terms since the 1970s. This trend is attributable to the liberalisation of energy sectors, which shifted incentives towards short-term gains rather than long-term investments.

Due to the high public share of investment at the R&D stage in the technological lifecycle, a substantial increase in public spending is necessary. The Stern Review [2] estimated that global public R&D funding needed double from USD 10 billion to USD 20 billion per year. Europe, which is particularly challenged with a low share of private R&D financing, needs to increase its public R&D investments by as much as three to four times to develop technologies needed for the transition to a low carbon economy. Fortunately, well-designed PFMs can reduce public costs substantially.

Contingent grants

To support applied R&D and pre-commercial development of technologies, grants can be replaced with contingent grants, which are 'loaned' without interest or repayment requirements until technologies become commercially viable. Successful repayment of the grants can be recycled into the scheme, releasing more funding to new low carbon activities. Failed technological ventures do not generate repayment obligations.

Public private partnerships

Public-private partnerships can also be effective in encouraging private investments. For example, the UK Energy Technologies Institute[li] (ETI) was launched as a public-private partnership in 2006 when the British government declared it would match any private investment creating the potential for a GBP 1 billion R&D low carbon research institute [56].

Innovation prizes to promote R&D

Another effective and increasingly popular means of promoting innovation is through prizes. For example, the X Prize Foundation is a non-profit grant-making organisation whose mission is "to create radical breakthroughs for the benefit of humanity thereby inspiring the formation of new industries, jobs and the revitalization of markets that are currently stuck." Inspired by the 1919 innovation competition that awarded $ 25,000 to the first person to achieve a nonstop flight between New York and Paris, X Prizes have been awarded to inventions of private reusable space-crafts, human genome sequencing, and automobiles that get 100 miles to the gallon. In the words of Peter Diamandis, CEO of the X Prize Foundation, the benefits of innovation competitions is that they can "change what people believe to be possible."

Innovation prizes leverage not only the private investment and technical expertise of the competition winners, but also of numerous other participants. Such collaborations towards a common goal can be extremely effective in producing ground-breaking discoveries.

Government funded innovation prizes can be an effective means to promote publicly desirable green inventions by bringing competition to areas of research and development that would otherwise be unprofitable. Competitions could even be held for inventions that seem unlikely or impossible. Critics argue that such competitions attract far-fetched and economically unviable solutions that would be costly or impossible to commercialize. However, some of these problems could be avoided with carefully designed terms of the competition.

The prize would only have to be awarded if an inventor is successful according to the prize's criteria. Because the prize money would be much less than the amount the government would otherwise spend to develop the same technology through public means, it is a no-lose strategy, and could result in unexpected gains. Despite the obvious potential, innovation prizes do not provide predictable results and cannot replace other PFMs.

European Coordination in R&D

Most research activities are undertaken at the national level, so there is a scope for both increased pan-European research and coordination of existing national activities. Many member states have research programmes with similar objectives that seek to develop the same technologies. A coordination of these programmes will lower costs and provide substantial learning benefits. Furthermore, through pooling research funding, coordination can help fund more expensive projects.

Several options exist for coordination to promote high quality research and increase information dissemination. A virtual research platform for knowledge sharing across Europe would substantially increase the accessibility of climate research for academics, practitioners, policy makers and the general public, by lowering the time it takes to search for, and disseminate, recent findings. The US has recently initiated the creation of 46 Energy Frontier Research Centres, from which researchers across the US compete for funding. The US and China have also recently initiated a joint Clean Energy Research Centre. Europe must take similar initiatives.

The establishment of the European Energy Research Alliance (EERA) is one initiative to increase cooperation across Europe. However, its core areas are limited to specific technologies, such as bio energy, nuclear, and CCS technologies. The scope should be broadened to cover other types of low-carbon technologies. Given the importance of reforming Europe's energy system, cooperation should also be encouraged in the development of smart energy infrastructure and competitive renewable energy sources.

Offering a portfolio of financial instruments to aid demonstration and deployment

As noted above, many technologies that receive initial R&D funding encounter difficulties raising the more substantial funds needed for later phases of testing and commercial roll-out. The risk profile remains too high for many traditional investors.

PFMs that address investors' perceived risk are therefore most effective at this deployment stage. Public loans and loan guarantees, mezzanine finance and public equity financing can attract interested private investors such as venture capitalists and private equity funds. Such PFMs are expected to have a medium to high leverage ratio (unlocking 6-15 times the amount of public investment in private funds according to UNEP), and put relatively little strain on public budgets.

Publicly backed loan guarantees can attract debt finance and long term capital into riskier projects and ease access to loans for SMEs by lowering their default risk. Banks, which are traditionally reluctant to lend for unproven technologies, can be persuaded to enter at an earlier stage of development. Different types of public risk capital, such as equity and mezzanine finance, can mobilize private equity capital into green companies and projects, but can also lower the risk for private debt financing by providing some insurance against losses.

Setting up publicly funded pilot projects, or partnering with private investors to set up projects with demonstration potential, can further remove some of the uncertainty associated with new and untested technologies. Pilot projects will enable innovations and technologies to show economic and technological viability to attract private investors.

Table 10: Some forms of PFMs suitable for development financing

Instrument	Description	Targeting	Leverage potential	Example
R&D and innovation to demonstration				
Contingent grants	Loans provided at concessional rates/loan without payment requirements before the technology/project is commercial viable. Provide funding for early stage technologies.	High technology risk and positive externalities	Low to medium	UK Carbon Trust's R&D Open Call Scheme
Soft and convertible loans	Offer short-term interest deferral periods and payback grace periods. Convertible to equity. Provide finance for firms and technologies in a pre-commercial stage when revenues are insufficuent to service debt. Provide funding for early stage technologies.	High technology risk and positive externalities		Connecticut Clean Energy Fund (CCEF)
Loan softening programmes	Provide financial support for financial instiuttions to enter new markets.	Limited knowledge with a new markets		
Innovation prizes	Encourage innovations. Providing financing to winning technologies.		Medium to high	
Grants for technical assistance	Funds aimed at providing business and market capabilities. Help innovations enter the market and attract investors.	Lack of commerzial experience	High	

Sources: Various

In order to meet the investment need at different stages of technological development the EU needs to make sure that there is an appropriate mix of public financial products available to help attract private capital at all stages of the green technological development process. The UK's proposed Green Investment Bank, for example, has been proposed with these needs in mind. We recommend

that rather than setting up a pan-EU dedicated bank for the GND, the EU should expand the European Investment Bank's role in green financing.

Table 11: Some forms of PFMs suitable for interim and later stage financing

Instrument	Description	Targeting	Leverage potential	Example
Demonstration and deployment, company start-up				
Publicly backed loan guarantees	Guarantees are most effective at addressing banker perceptions of risk by taking on part of the default risk from the private investor. Improve access to capital in particular for energy efficiency and large renewable projects. Particulary useful until a bank has gained experience to evaluate the risk.	High perceived risk	Low to high depending on the guarantee structure	the Chinese IFC loan guarantee scheme, the French FOGIME
Mezzanine finance	Groups together qualities of different financial structures somewhere between the high risk / high upside pure equity position and the lower risk / fixed returns senior debt position. Typically consist of convertible equity or subordinated debt. Preferred shares can be combined with subordinated debt and the option to later be bought out. Help start ups bridge the debt-equity gap.	High perceived risk and limited debt finance	Medium to high	French FIDEME
Public venture capital	Specialized to finance start-ups and early stage technologies associated with high risk against high returns. Encourage the development of a private risk capital market by teaming uo with private venture investors.	High perceived risk	Medium to high	CEGT (Centre for Energy & Greenhouse Technologies) in Australia, The California Clean Energy Fund (CalCEF)
Pooling and securitization of project finance	Supporting a secondary market in commercial banks' project finance can encourage lending to larger projects by enabling banks to transfer and share the financing of the project.	Long-term and large capital requirements		
Green public procurement	Public procurement could provide a sizeable niche market for new green technologies. Feed-in tariffs guarantee long-term procurement of the energy at a fixed-rate.			

Sources: Various

Improving the venture capital markets in the EU

A well-developed market for risk capital can ease the financing gap for technologies in the crucial phase between R&D and commercialisation. The main source of equity for early stage technologies is venture capital. Venture capital investors specialise in making high-risk investments against a high internal rate of return in companies and projects that other investors deem too risky. Venture capital is particularly important in financing innovation in small and medium companies and broadening the take-up of new technologies in the market. Although venture capital only constitutes a small share of total private funding in low carbon technologies (1.5 % of global energy funding in 2008) [58], it plays a vital role in catalyzing market growth. Most venture capital investments occur at the early commercialisation stage. However, well-designed PFMs could attract venture capital to enter at the pre-seed phase (between demonstration and deployment).

In comparison to Europe, North America has a more developed venture capital market, making it easier for low-carbon industries to access funding at an early stage of development. Venture capital funds in the US tend be more willing to enter at an early stage compared to their more conservative European counterparts [5]. The European Venture Capital and Private Equity Association (EVCA) has been calling on European governments to increase public support for clean-tech funds and to take demand-push measures, such as green public procurement and feed-in tariffs[59].

The North American venture capital sector is relatively highly capitalised by public pension funds. The State of California has even mandated that public pension funds invest in low carbon technologies. Such requirements could further develop the European venture capital market, which currently remains limited, and dominated by the UK. In 2008 only EUR 233 million, 0.2 % of total investments in clean energy, was directed towards venture capital [58]. Public investors and those with fiduciary responsibilities should be mandated to increase their exposure to this sector which can deliver high profitability as well as diversification benefits.

Public venture capital

Venture capital generally requires a high rate of return and a clear exit strategy, factors that can limit appetite for green investment projects. Public venture capital programmes can galvanise private risk capital, and help the European venture capital market to evolve. According to the Green Investment Bank Commission (2010), public venture capital funds can leverage private investments an average of 5 to 7 times by sharing the risk and bolstering the confidence of investors. For example, Carbon Trust's venture capital activities have attracted £10 in private capital for each public £1 invested.

Often it is the case that a venture capital investor is only interested in covering a share of the capital needed for a project. Thus, a low carbon initiative may only go through if it is able to attract a number of different investors. When the market is less developed, this represents a serious barrier. Public venture capital programmes can also play a vital role in coordinating private investors. However, as yet such public venture capital programmes exist only in a few European countries. The gaps could be plugged either by an increasing the role of EU institutions such as the EIB in venture capital or through encouraging national level initiatives.

Provision of public support for large investments

For large-scale projects with high upfront costs and a long delay before reaching operation, access to long term funding is critical. Although large-scale green projects can generally attract loans based on an expected revenue stream, given the size of the investment required and the high risk involved in new technologies, it is often not feasible to raise funds at an affordable rate and sufficient scale from private sources.

Publically backed loan guarantees could overcome this problem by reducing the risk. However, loan guarantees are not commonly used in the case of large projects in Europe and other OECD countries. A facility that pools different sources of private funding can realize sufficient amount of investment and spread the risk over a number of investors. An increasing use of green bonds and green securitization with elements of public insurance, if necessary, is a promising way to approach the funding of large scale green investment projects such as smart grids.

Aiding small scale projects

Small and medium enterprises (SME) play a key role in the development and distribution of low carbon technologies. In fact these companies are responsible for a majority of clean tech innovations[38] but investors are often reluctant to finance small start-up firms. Start-ups have no track record, often lack collateral and are perceived as risky. Moreover, financial institutions often require higher risk premiums when lending to individuals and small firms.

One example of a successful joint public private initiative is the French mezzanine fund Fideme, launched by the French environment agency ADEME and the French commercial bank Natixis, which addresses the debt-equity gap for start-ups in the renewable energy sector. Mezzanine funds can make long term investments but rank ahead of common equity in seniority, reducing their risk. Alone, small-scale projects find it difficult to attract institutional investors due to lack of scale and uncertain returns. Governments can encourage larger institutional investors to invest in small projects by encouraging the pooling of projects to provide scale and more reliable returns. A dedicated pan EU fund under the auspices of the EIB would be a useful initiative.

Public support to encourage investments in energy efficiency measures

Reducing the perceived risk of energy efficiency projects

According to the IEA (2010), the perceived risk associated with energy efficiency projects is higher than the factual risk. The main reasons for this misconception are the uncertainty surrounding expected energy savings, the small size of individual projects, limited knowledge of their technical nature and no standardized method to measure and verify energy savings.

Financial institutions are often reluctant to provide capital to risky and small-scale energy efficiency measures. Public guarantee schemes provided to banks' lending to energy efficiency projects can help increase the availability of affordable funding through risk sharing. One example is the Chinese IFC loan guarantee scheme. By guaranteeing up to 75 % of the loans from Chinese banks, the guarantee scheme developed a pipeline of energy efficiency projects worth over $ 650 million. It has been such a success, that it has been expanded [60].

Energy Service Companies (ESCO) can play a vital role in promoting energy efficiency improvements in households and firms. ESCOs offer a range of services related to the implementation of energy efficient technologies. They provide capital to households and firms to implement energy saving measures, in effect taking over the risk, and they share the earnings from future energy savings. However, although future energy savings are expected to provide profits, ESCOs themselves are dependent on external financing to cover their high upfront costs. Because of the risk involved, many ESCOs find it hard to attract sufficient funding.

The European Investment Bank (EIB) could address this critical funding gap by further expanding its loans, guarantees and technical assistance programmes such as ELENA (see Box below) for renewable energy and efficiency projects. The EIB lent a total of Euro 79 billion in 2009[lii], of which Euro 17 billion was lent to projects to tackle climate change.

Moreover, the EIB could have a coordinating role by facilitating knowledge sharing in financing energy efficiency solutions across Europe. A major hurdle is the lack of a common method for

verification of energy savings and standardized contracts between ESCOs and their clients. There exist over 30 such standards in the EU alone. The EU should take action to develop a harmonized framework. This will increase the awareness and confidence in the market for energy efficiency services.

Another hurdle is the lack of awareness over firms' own energy saving potential and the concept of ESCOs. Giving energy utilities the responsibility to save energy in households can be effective in realising energy efficiency measures. Energy efficiency obligations are legal obligations imposed on energy utilities, such as electricity and gas companies, to realise energy efficiency measures and have been introduced in several European countries, such as Italy and the UK.

Most energy efficiency measures are expected to be profitable though many barriers exist. Public efforts should therefore focus on removing information hurdles; reduce the risks of such investments and in helping ESCO's mobilize funds.

The need to go beyond just providing financial support

Researchers and academics often lack the business knowhow to attract investors and bring good ideas to the market. To address this issue, several PFMs combine funding with business support to technology providers. Business incubators, which offer a portfolio of business services aimed at guiding innovators through the commercialisation process, are a particularly interesting model. Advice is provided to SMEs, research organisations, individuals, etc., on how to raise funding and financial support. Such programmes have proven successful in paving the way for more private investments.

For example, the UK Carbon Trust Incubator Programme assists low carbon companies to refine their business plans and address issues concerning investors. Since it was introduced in 2003, the Carbon Trust has helped 90 companies to raise approximately GBP 86 million in private funding [61]. Such programmes should be initiated in other European countries. They could be coordinated by the European Investment Fund[liii], which already provides financial support to small and medium enterprises.

Green Public Procurement

Often a technology at the deployment phase will still need public assistance to become competitive in the general market. At first, it will only appeal to a niche market made up of customers that are ignored by existing market leaders – for example, those that were willing to move first to put solar panels on their roofs. Niche markets are crucial for the successful deployment of green technologies and should be strategically developed and fostered. Green public procurement, which mandates that state agencies purchase green products or abide by greener technological standards for procurement, is a particularly promising form of public support.

According to the European Commission [62], public procurement accounts for an estimated 16% of the EU's GDP: "The number of vehicles purchased by public bodies has been estimated at 100 000 cars, 100 000 vans, 30 000 lorries and 15 000 buses each year in the EU-15 alone." If state agencies would collectively procure more efficient vehicles, it would send a clear price signal to manufacturers and the rest of the market. In this manner green public procurement could provide a

sizeable niche market for new green technologies, give critical scale for cost reduction and provide and an effective means to demonstrate their effectiveness to broader society.

Renewable Energy Procurement Mechanisms

The most important factor thus far in dictating private investment in renewable energy technology at the deployment phase have been policy mechanisms that guarantee procurement of the energy produced. Unquestionably, feed-in tariffs have proven to be the most successful of these policy mechanisms. Feed-in tariffs provide a secure investment environment for clean energy generators by guaranteeing long-term procurement of the energy at a fixed-rate, typically for 10 to 20 years. They are currently championed by twelve American states, China, Germany and Spain – first, second, third and fifth in renewable energy world rankings [63] and according to Deutsche Bank are responsible for 75% of global solar photovoltaic power deployment and almost half of global wind deployment. The strategy has worked as long as the tariffs are priced high enough and not expected to change. There are significant credibility risks that can arise from having to deviate from a pre-announced schedule for FITs.

Feed in Tariffs are often set higher than the market price for electricity from dirty sources so have an additional cost. The size of the long-term costs of funding feed-in tariffs, and the responsibility for bearing them has not been discussed properly in public policy debates. In Spain these costs are borne by taxpayers. By Royal Decree, the public Comisión Nacional de la Energía (CNE) pays utilities to provide the feed-in tariff to generators. Rates originally ranged from 7.32 eurocents per kWh over 20 years for wind energy, to as high as 34 eurocents per kWh for solar.

Catalysed by the high rates, the Spanish solar market grew a record 2.66 GW in 2008 alone [64]. New Energy Finance estimated that the price tag to the Spanish taxpayers from 2008 to 2030 would have been Euro 53 billion – an enormous burden on the national budget of the last major economy to emerge from the recession, and an estimated Euro 39.9 billion higher than the price for energy from other non-renewable sources of power [65]. In response, the Spanish government cut feed-in tariff levels by up to 45% in the summer of 2010. While the FITs were excessively generous and the cuts were necessary, such changes to policy do create insecurity in the renewables industry. This can dissuade private investment. In addition to having to account for the public cost of taxpayer funded FITs, another problem is that such a structure does not encourage a reduction in the demand of energy since consumers do not pay the full costs.

That is why Germany has a different structure for FITs so the burden to pay the feed-in tariff falls not on the taxpayer, but on the consumer. The German government has mandated that utilities purchase renewable energy from producers. Rather than creating a large off-balance sheet liability for the government, the costs of the feed-in tariff scheme are tagged on to the electricity bills of consumers in a cost-sharing manner. The scheme is expected to boost the price of electricity by an estimated 1.1 eurocent per kWh from 2008 to 2030 resulting in a lifelong cost of Euro 120 billion [65] payable by consumers. The unit costs at 5.39 eurocents per kWh for wind power, and 5.953 eurocents per kWh for solar power are lower than those in Spain. The added cost of energy should incentivise energy conservation, a crucial function in the transition to a green economy that would not achieved if costs were borne by the taxpayer.

Critics of feed-in tariffs argue that price controls prevent competition, necessary to generate downward pressure on prices. An alternative is a quota-and-trade system, exemplified by the UK's Renewable Obligation Certificate (ROC) scheme. Under this scheme, utilities are required to source a specified percentage of their energy portfolio from renewable sources. If the supplier is unable to meet its quota, it can trade for certificates from other suppliers that have exceeded their own. Those that fail to meet their quota despite the option of trading for ROCs are penalised. In theory, the quota-and-trade creates a semi-protected market for clean energy that should direct investment towards the most cost-effective sources. And, like the German feed-in tariff model, costs are passed on to the end-user to promote demand management.

However, the UK ROC scheme has been a failure by most accounts. Although competition between many players would theoretically place a downward pressure on prices, the UK electricity market is dominated by only five or six major players, all of which have a vested interest to keep the price of ROCs high as a crash would undermine their profits [66]. In 2007, average prices paid to renewable electricity generators in the UK were 10.6 eurocents per kWh, even higher than the feed-in tariffs paid in Spain.

Some, including the European electricity representative organisation, Eurelectric, have called for a pan-European quota-and-trade system [66]. Such a scheme, it is thought, would overcome the lack of competition in single countries, and direct investments in renewables to more productive sources. These sources would likely be in windier countries such as the UK and Denmark, rather than Germany, which currently dominates the European market [63].

Others point to the fact that even with high prices and favourable windy conditions; the UK ROC scheme has only catalysed a fraction of the renewable energy of Germany and Spain. In 2009, the portion of UK's energy supply from renewable energy hovered at 2 %, a far cry from its goal of 15 % by 2020. Moreover, quota-and-trade systems disadvantage local ownership of renewable energy technology. Almost half of Germany's wind power is procured from local farmers through feed-in tariffs.

With the implementation of a pan-European quota-and-trade system, at least some of this investment would presumably be lost rather than transferred to more cost-effective sites in other countries. Such a scheme may ultimately result in a net loss in investment [66]. Furthermore, quota-and-trade schemes have generally priced electricity from different technologies at the same rate. As a result, investment is directed towards the most efficient renewable energy technologies (such as wind), but the development of other technologies is hampered and countries are put in danger of becoming "locked-in" to technologies that in the long run may not be optimal.

In April 2010, the UK introduced a 'Clean Energy Cash Back' programme – a form of feed-in-tariffs. The programme is meant to supplement the ROC scheme by allowing small businesses and homeowners to install small-scale renewable energy technology such as solar panels or wind turbines to receive an income three times the wholesale rate for any excess electricity they generate and feed-in to the national grid. The income is capped at GBP 1,000 per household per year and will be financed by taxpayers. The government predicts that a 2.5 kW solar PV system could save a household GBP 140 on their electricity bill, and earn it up to GBP 900 in extra income. The Clean Energy Cash Back programme is expected to boost micro-electricity generation in the UK, where the

ROC scheme has thus far failed. It will be an interesting experiment to determine the merits of a feed-in tariff scheme in combination with tradable certificates.

The UK's about-face is indicative that different procurement mechanisms favour different types of investors and have different effectiveness in under different circumstances. While a quota-and-trade system may ultimately be a more cost-effective means of promoting corporate investments in big projects like offshore wind, it does little for the local investor who wishes to install solar panels on the roof or a wind turbine on the farm. Quota-and-trade is too complex and the transaction costs are too high for small scale and local investors to take advantage of it. Also, as the experience of the UK has shown, it does not work very effectively in markets dominated by a few large players and can risk locking a country into a particular technology.

The revolutionary transformation of energy sector necessary to the New Green Deal requires an all-hands-on-deck approach that thus far has only been catalysed through feed-in tariffs. Therefore, in order to promote demand management as well as renewable energy, we recommend that each European nation implement a German-model feed-in tariff, in which it is mandated that utilities purchase the renewable energy from the producer and tag it onto the cost of electricity.

Closing the funding gap – the need for an EU-wide Green Funding Facility

While the potential for private and public investments in support of the GND is large, it is clear that present levels of investment falls short of the scale needed across a broad range of areas. Although many initiatives at the national and European level provide green public funding, there is a need for the PFMs to be both scaled up and better coordinated. In order to address the green funding gap, Europe should take a holistic approach by setting up a green investment facility with the capacity to meet the depth and range of Europe's green investment challenges.

The European Investment Bank (EIB) is a natural candidate setting up such a facility. It was established to support EU policy objectives and is already involved in funding several European low-carbon strategies. It is the world's largest public lending institution and has expertise in providing a range of financial products, including long-term loans, mezzanine loans, venture capital, and loan guarantees, as well as technical assistance. It is strongly backed by Member States and has a AAA rating. Such credentials give the EIB good access to international capital markets which will be useful in delivering the critical mass of funding needed.

The first step should be to assess and lower the carbon footprint of the EIB's current investment portfolio. In particular, the EIB must green its energy lending activities, which have been criticised for supporting fossil fuel projects. In the past, renewable energy has constituted only a small share of the energy portfolio. However, EIB loans for renewable energy projects have increased substantially since 2005, from 43 % to 70 % of the Bank's current total power generation portfolio. EIB lending to renewable energy project totalled Euro 4.2 billion in 2009, four times more than in earlier years [67]. Although promising, this support is not enough, and there is a need to both scale up lending for renewable energy, and entirely phase out support for conventional energy sources. To enhance the EIB's support for the green economy, the EU should initiate a thorough analysis of the green financial gaps, many of which have been identified throughout this paper.

The EIB already has expertise in investing in programmes that support the fight against climate change, such as energy efficiency and sustainable transport systems in cities, demonstration of new clean technologies, and sustainable trans-European infrastructure (see box). To plug the remaining investment gap, the green investments must be better coordinated with new tools to encourage private green investments. The green investment bank, as proposed by the UK, might provide a useful template for setting up a dedicated green funding facility at the EIB. A more detailed discussion of different possibilities can be found in [68] and the [69]. Based on these discussions, some useful tasks for the EIB's new green facility would be the following:

- improving access to long-term funding for the EU's infrastructure and energy systems through either direct loans or loan guarantees
- working with capital markets to help investors fund larger infrastructure and renewable energy through, for example, green bonds and debt securities. This is particularly important for projects that require large amounts of funding and allows investors to spread their risk
- mobilize funding for small and medium sized energy service companies (ESCOs) across Europe by providing guarantees. For example, the International Finance Corporation (IFC) has had great success by providing guarantees to local lenders that back energy efficiency projects. The result has been increased funding and decreased risk perception. The EIB can also serve as a bridge between investors and ESCO
- link investors with green projects and companies by offering investors green products with a sufficient degree of diversification, for example by issuing energy efficiency or green infrastructure bonds that are used to fund a portfolio of projects
- coordinate green public support and create a fund of funds to increase the capacity of other green funds across Europe
- improve access to risk capital by creating a joint public-private risk capital fund, such as the French mezzanine fund Fideme
- initiate and coordinate the development of consistent assessment methodology, and collecting and disseminating information on climate risk to help the assessment of green investments.

The EIB can play a useful role in bridging the green investment gap by encouraging private sector investments either by providing credit guarantees or co-investing with private sector investors in green projects. The EIB is very well positioned to link institutional investors with green investment opportunities. Most of the EIB's green activities can be self-funded if backed by pubic guarantees. Given the EIB's credit worthiness it has the ability to bridge the gap between international capital markets and green projects in order to deliver the critical mass of funding required in the transition to a low carbon economy.

Box 11: Some EIB initiatives

The European Clean Transport Facility (ECTF) provides direct lending, co-financing, intermediated financing and guarantees for syndicated loans to co-finance research, development and innovation in the areas of emissions reduction and energy efficiency in the European transport industry. The facility has a total budget of EUR 4 billion annually[liv].

The Risk-Sharing Finance Facility (RSFF) provides support to activities in the fields of research, technological development, demonstration and innovation. The facility offers access to debt financing for private companies or public institutions with a higher-than-average risk profile.

The Joint European Support for Sustainable Investment in City Areas (JESSICA) assists the allocation of EU Structural Funds to urban regeneration. The target is to increase investments in sustainable cities.

The European Local Energy Assistance (ELENA) programme offers technical assistance targeted at accelerating the implementation of energy efficiency and renewable energy projects developed by municipalities, regions and other local authorities. The Commission offers grants to cover technical assistance expenses under ELENA.

The European Public-private partnership Expertise Centre (EPEC) strengthens the organisational capacity of the public sector to engage in PPP transactions

The Joint Assistance to Support Projects in European Regions (JASPERS) prepares projects supported by EU Structural and Cohesion Funds

Other European initiatives

The Marguerite Fund[lv] provides equity and quasi equity investments in renewable energy and infrastructure projects, with a particular focus on the development of trans-European transport networks. The Fund has a target size of EUR 1.5 billion with over EUR 700 million already committed, and is to be invested within four years. The Fund has long-term investment horizons (20 years) and intends to team up with other long term credit institutions to establish a Debt Co-Financing Initiative of up to EUR 5 billion.

Summary

While the vast majority of funds needed for a successful Green New Deal will come from the private sector, there are 'green bottlenecks' which will need to be overcome through public support in some form. These bottlenecks can take the form of a fundamental lack of profitability, the presence of friction costs and the lack of appropriate financial instruments. The public support can take a number of forms of such as tax credits, subsidies, feed-in-tariffs, insurance and co-financing etc.

In most instances, public support is only partial or comes in the form of a guarantee so even small amounts of public funds can attract significant amounts of private funds. Another distinction that is important is the one between the amount of public support offered and the actual cost to the taxpayer. Even when large amounts of public funds may be made available, the actual cost to the taxpayer may be relatively small because many of the funds are paid back and the inherent subsidy is small.

On average, under prevailing prices of carbon, the cost of capital for renewable projects remains higher than that for conventional technologies and this is the biggest driver of the need for public financing mechanisms. Appropriate PFM tools can halve the cost of capital for green projects and attract 3 to 15 Euros of private investment for every Euro in public support. PFMs address several of the investment hurdles discussed earlier by:

- lowering the risk to private investors through risk sharing facilities
- lowering the capital cost for low carbon companies and projects
- pooling small scale investments
- supporting large scale investments such as in energy infrastructure
- spurring the development of a private risk capital market
- supporting demonstration projects and new technologies to build a track record
- demonstrating political commitments to bolster confidence in low carbon investments
- creating learning effects and improved knowledge about risk profiles of green projects

Despite their promise there are a number of pitfalls associated with PFMs. Some are

- the risk of locking in a particular technology
- the provision of excessive subsidies
- distortion of private markets

However, appropriately designed PFM tools that are customized according to the stage of intervention can help achieve maximum impact at minimum cost. Different technologies may also need different forms of PFMs since low carbon technologies differ in capital costs, level of maturity, and risk profile. In order to deploy green technologies successfully, hurdles must be addressed along the whole development cycle.

Despite that fact that the importance of invention and application of new technologies for the GND is widely recognized, the funding of R&D remains inadequate. This is partly attributable to the liberalisation of energy sectors, which shifted incentives towards short-term gains rather than long-term investments. The shortfall needs to be made up through public support and it has been estimated that the EU needs to increase its public funding of green R&D by as much as three to four times.

In order to make the most efficient use of scarce public resources we suggest that the EU should focus on offering contingent grants, where grants needs to be paid back if the research achieves commercial success and public private initiatives based on the Energy Technologies Institute model used in the UK which supports the demonstration of clean power projects and is funded jointly by energy firms and the UK government.

Another effective and increasingly popular means of promoting innovation is through prizes. Innovation prizes leverage not only the private investment and technical expertise of the competition winners, but also of numerous other participants. A better European co-ordination of green research that includes the use of a virtual platform could also help make public support more effective. The scope of the European Energy Research Alliance (EERA) should be broadened to include a greater variety of technologies.

Offering a range of financial instruments such as loan guarantees, mezzanine finance, public venture capital etc. at various stages between research and commercialization can help translate R&D efforts into deployable commercial technologies.

One of the most problematic funding gaps lies in the zone between research and development and the commercial deployment of technologies. Here the technological development has become

ineligible for grant support but is not yet well developed enough to attract traditional commercial funding. Venture capital can plug some of the gap here particularly in early stage development but European venture capital markets are underdeveloped so public entities such as the EIB can play a supportive role through providing public venture capital support.

Such support can both leverage additional private venture capital as well as play a co-ordinating role. A promising source of additional venture capital funds is through encouraging public pension funds as well as other institutional investors such as sovereign wealth funds to co-invest in green venture capital. However providing financial support may not be enough as those who develop technology often lack entrepreneurial skills. Business incubator support, of the kind provided by the Carbon Trust in the UK, could be provided by the European Investment Fund at the European level.

A number of green projects are either very large scale (such as cross border transmission networks) or small scale (such as investments in better home insulation) so lie outside the market convention size. This makes it more difficult to finance them and public intervention can help. For large scale projects, the use of green bonds supported by public insurance, if needed, can help unlock significant private resources. For smaller scale energy efficiency projects as well as green SME financing, the pooling and securitization of small investments by a public entity such as the EIB or another dedicated public fund can be very effective.

Energy service companies (ESCO's) play a very crucial role supporting micro level energy efficiency investments that can collectively play a significant role in helping reduce GHG emissions. In addition, such investments often generate high financial returns and have a very positive economic impact. However, ESCO's are dependent on external financing and often encounter problems mobilizing funds at a reasonable cost. Here public support in the form of loan guarantees and technical support can help unlock the promising potential of small scale energy efficiency investments.

A unification of fragmented European standards on the verification of energy savings, a legal imposition of energy efficiency obligations on utility firms and a better provision of information would all prove very useful.

While these bottom-up initiatives are important there is also need for additional top down interventions. At 16% of GDP, the EU's annual public procurement budget is very large and a deliberate policy of greening this procurement policy can help give a significant boost to what could otherwise end up being just niche green initiatives. In particular, public procurement does not suffer from the same distorted incentives that the private sector does so it is possible to look at lifetime costs of investments that will demonstrate large savings in the operating costs of the transport fleet, for example. Green procurement also sends favourable signals to the market in addition to helping in the deployment and scale up of green technologies.

While public procurement is significant, the vast majority of purchase decisions that relate to energy consumption are made privately. In order to encourage 'green energy procurement' by the private sector a number of countries have experimented with a variety of schemes. The three main types are consumer funded feed-in-tariffs used in Germany, taxpayer-funded feed-in-tariffs used in Spain and the renewable obligations certificates tried in the UK. Of these, the German experiment has proven to be the most useful partly because it encourages both the development of a diversity of

technologies and because it also generates incentives for reducing consumption. We recommend that an EU-wide program of consumer financed feed-in-tariffs should be rolled out.

Finally, it is important to acknowledge that there may be scale and efficiency benefits from having a one stop shop or a co-ordinating body for all the disparate public financing mechanisms discussed so far. The UK is in the process of setting up a Green Investment Bank to fulfil such a role. At the European level, the European Investment bank is already one of the leading providers of green financing through main lending facility as well as special programs such as ELENA for energy efficiency and JESSICA for urban regeneration etc. It is also the largest issuer of green bonds. That is why we recommend that the EIB should be formally handed the role of the European green bank. For this to work, it would not only need to expand existing facilities and add new products and funding lines but it will also need to phase out most forms of lending to the dirty energy sector.

11. The economic and distributive impact of the GND

The EU has been hit relatively hard by the economic crisis. Unemployment surged from around 7% to over 10%, and serious questions are being raised regarding Europe's future economic prospects. Given these fragile economic circumstances, legitimate concerns exist regarding the economic and distributional impacts of policies to combat climate change. In particular, there are concerns that climate policies will require large public spending that will add to already excessive sovereign debts, that too many jobs will be lost in carbon intensive industries, and that carbon taxes and emissions trading will result in higher household heating and transport costs. An area of particular concern is that such impacts could be disproportionately burdensome for low-income households.

Unquestionably, transforming Europe into a low carbon economy will involve both costs and benefits. However, a key message of the Green New Deal is that it is possible to combine ambitious environmental targets with economic growth and job creation. The Green New Deal will create new green jobs, reduce spending on energy and increase energy security, and provide European industries with a competitive advantage in the growing international low carbon technology market. By acting aggressively to mitigate and adapt to climate change, Europe could avert serious risks and emerge from the transition more competitive and resilient than those regions that are slow to act.

The need for early action

Although estimates of the cost of tackling climate change vary widely, one message is clear: the cost of mitigating climate change today will be far less than the cost of addressing the pernicious effects of climate change in the future.

Both the Stern Review [2] and McKinsey [84] have estimated that the annual cost of tackling climate change will be around 1% of global GDP. To put this number in perspective, the aggregate defence budgets of 68 countries in the world currently amounts to more than 2.5% of GDP [85]. Failing to take action and tackle climate change could produce annual economic losses of up to 7% of global GDP, and up to 20% when non-market impacts, such as decreased life quality from deterioration of health and loss of biodiversity, are included. After the financial crisis McKinsey (2010) [86] revised its estimates, which shows that the net economic cost of stabilization will actually be negative. The main reason for this is that higher projected energy prices have raised the expected benefits from energy efficiency measures.

However, it should be noted that the above estimated mitigation costs assume the adoption of the most cost-effective policy options on a global scale. The costs will be somewhat higher for Europe. Moreover, unilateral implementation on a regional level is likely to increase costs and raises concerns about industry competitiveness and carbon leakage. Nonetheless, the costs are still manageable, and they could be outweighed by the benefits of gaining an 'early mover' competitive advantage. Furthermore, with appropriate policies, many of the problems associated with unilateral implementation could be overcome.

Competitiveness, Industry Flight and Carbon Leakage

A major disincentive for countries to implement carbon-reducing fiscal measures and regulations is fears over industry flight. If a country takes unilateral action to make polluting more expensive for firms, an incentive is created for firms to relocate to countries with less stringent regulations, known as 'pollution havens.' Not only is industry flight damaging to the competitiveness of a domestic economy, the pollution reduced by the imposed taxes or regulation is offset by an increase in pollution in other countries. In the case of carbon emissions, this phenomenon is called 'carbon leakage.'

The European Commission has published a list of 164 manufacturing sectors that can be risk of carbon leakage as a consequence of the EU's carbon market policies. Thus far, the policy to deal with carbon leakage has been to provide exemptions from the ETS or a free allocation of EUAs. Dröge and Cooper (2010) [87] argue that while the list of sectors at risk of carbon leakage constitutes a good starting point the ETS exemption covers many sectors that would otherwise experience limited or no cost impact.

Empirical evidence suggests that the risk of carbon leakage remains limited and the fear over industry flight is overstated. According to the Carbon Trust, the environmental impact of the EU ETS Phase III targets up to 2020 without any free allocation of allowances is expected to drive less than 2% of EUs emissions abroad. Leakage from direct emission costs is likely to be of concern only to some high-polluting sectors with lower transport costs, such as steel, cement, aluminium, paper and pulp, chemical subsectors and refineries [87, 88]. An econometric model created by Demailly & Quirion (2008) [89] has found that the impact of the ETS on carbon leakage from the iron and steel industry is marginal. Furthermore, losses in energy intensive industries will likely be compensated by gains in other manufacturing sectors [90].

Nonetheless, as regulation tightens and the price of carbon rises, industry flight might become more of an issue. As with all regulation, there will be winners and losers. In designing policies, attention should be drawn to the exact impact of carbon taxes on individual industries. For many industries, the benefits of local production, such as lower transport costs, outweigh the costs imposed by environmental taxes so industry flight would be minimal. This is particularly true for utilities.

Carbon leakage does not pose a serious threat to the growth prospects and overall competiveness of the EU as a whole. The total economic value-added of potential exposed sectors is unlikely to exceed 1% of EU GDP [88]. However, the losses from climate policies will be unequally distributed across European countries and will be a serious concern for sectors and regions affected. The specific impacts will be highly dependent on the specific choice of policy design.

As discussed earlier, European countries have provided tax exemptions and free allocation of EUAs to vulnerable sectors in order to prevent industry flight. However, extending tax breaks and subsidising the most polluting industries with free quotas is counterproductive. Our broader aim is to dis-incentivize investment in more polluting sectors and encourage development of green solutions. While tax breaks and free emission allowances are an easy way to protect certain sectors from increased costs, they may not be the best way to preserve the European Union's competitiveness. Exemptions for certain sectors tend to shift the burden of reducing GHG emission from these sectors to other parts of the economy.

Europe has no natural cost advantage in several of the sectors at risk of carbon leakage, such as aluminium and steel [91], and it may not be wise to subsidise such polluting production. It is a myth that European energy intensive industries are clean. Many manufacturing plants are powered by coal and are falling behind players in other markets in terms of energy efficiency. In fact new plants, for example in Brazil, Kazakhstan or China, tend to be more energy efficient than old EU production processes [92]. As stated in Carbon Trust (2010)[91]: "If an aluminum smelter powered by a brown coal-based station closes in favour of a hydro-based plant abroad, that is an entirely appropriate and natural consequence of tackling CO_2emissions".

Other approaches exist for dealing with carbon leakage and improving Europe's competitiveness that are more appropriate than tax exemptions and allocation of free allowances. Some of these include the following:

- Use green tax revenues to fund reductions in labour and income taxes. Such 'environmental tax reforms' have successfully increased competitiveness in, for example, Sweden, Denmark, Germany, and the province of British Columbia, Canada
- Provide financial support to European industry for improving energy efficiency
- Consider imposing WTO compatible penalties on 'dirty' imports

Each of these measures will be briefly discussed in later sections. A more detailed discussion on how to reduce carbon leakage in different sectors is in Dröge and Cooper (2010) [87] and Carbon Trust (2010) [91]. Ultimately, the appropriate approach will differ from sector to the sector.

The benefits of a decarbonised economy

The previous section discussed the possible negative impacts of tackling climate change on EU industries. However, the vast majority of studies and surveys we have looked at clearly highlight that the positive impact on European Competitiveness from tackling climate change decisively will far exceed any negative effects.

In fact, European industries are falling behind in terms of energy efficiency compared to players in other markets. The world's best performing steel plant is in Korea, the world's most energy efficient cement plant in Brazil, and the world's most advanced primary aluminum plant is in Dubai [92]. More disturbingly, China has now overtaken the EU in terms of production of solar panels and wind turbines and its companies are competing with EU firms not just internationally but also in the EU. The EU cannot afford to be left behind in the green transition that is coming to the world economy. There are several reasons to expect that Europe's growth prospects would improve by taking unilateral steps to transitioning to a low-carbon economy.

First, many potentially profitable low-carbon investments are yet to be realised. In particular, many energy efficiency projects are expected to have a positive internal rate of return because of substantially lower energy costs[lvi]. Second the economy would benefit from less exposure to volatile fossil fuel prices. The European Commission has estimated that in the near future, the EU may have to import up to 70% of its total energy consumption and 90% of its oil consumption if no additional measures are taken. Decarbonisation of the European economy will lead to lower total energy cost, the savings from which could be as high EUR 350 billion per year by 2050, or EUR 1500 per year per household [93].

Were Europe to take a leading role in clean technology, it could generate EUR 25 billion in increased exports, adding 0.04% to annual growth [93]. In Germany, for example, the output from the clean technology sector rose by 27% between 2005 and 2007, and it now employs almost 1.8 million workers [94]. The UK, already a leading exporter of environmental goods, has the potential to double its exports over the coming years thanks to Europe's early leadership in tackling climate change [95]. The EU currently has a global market share of 22% of the low-carbon goods and services sector, but the rest of the world is catching up and as in the case of China's export of renewable energy technology, overtaking us. To remain in the forefront the EU must substantially increase its investments in a low carbon future.

Finally, many of the necessary changes will likely cost less than predicted. To illustrate this point, after the Montreal Protocol on Substances that Deplete the Ozone Layer went into force, new policy frameworks induced firms to change business practices and think in new ways. The changes catalysed a boom in technological innovation and the cost of cutting chlorofluorocarbons turned out to be almost 90% lower than expected. The success of the Montreal Protocol exemplifies what can be achieved when government policies send the right signals to businesses. The Green New Deal should emulate this success to put Europe back on an economically and environmentally sustainable trajectory of growth and prosperity.

The promise of green job creation

The Green New Deal will involve a reallocation of workers from carbon intensive industries to the renewable energy sector and firms applying carbon efficient technologies. However, the net impact on employment from transforming Europe into a low carbon economy is likely to be overwhelmingly positive. It has been estimated that the Green New Deal will create more than 6 million new jobs [108].

Jobs will be created in a broad range of industries including renewable energy and energy efficient construction and manufacturing. A number of studies suggest that environmental industries are likely to be a fast growing sector of the economies of many European countries, and will make a substantial contribution to their national income [96, 97]. However, jobs in carbon intensive industries will be lost. In particular, jobs in Europe's coal industry will be substantially reduced. Numbers from ILO suggest that cutting current coal production by two thirds will lead to 295,000 fewer coal workers in Europe. Firms that fail to adapt to new climate policies may have to reduce employment or close entirely.

Encouraging green investments and public support in low-carbon activities is critical to ensure that more jobs are created than lost. Investments in renewable and energy efficiency activities can potentially create more jobs than similar investments in conventional energy sectors. According to calculations done by the Centre for American progress (2008) [98] every USD 100 spent on green stimuli results in more jobs created compared to the same amount of money spent on the oil industry. The reason is that renewable energy sectors tend to be comparably more labour intensive.

Around 3 million more green jobs could be created if the EU achieves its 20% renewable energy and energy efficiency targets. This figure includes 1.42 million in renewable energy [99], 1 million in energy efficiency measures [100], and approximately 775,000 from investments in transmission

infrastructure [101]. This could be doubled to 6 million if Europe follows the more ambitious targets under the Green New Deal proposed in this paper [108].

Energy efficiency programmes, in particular, have a significant potential to spur job creation across skill levels. Green technologies ready for commercial use will require a range of unskilled, semi-skilled and highly trained employees. The development of new technologies will require a substantial numbers of skilled workers in the areas of research and development and engineering.

In contrast to conventional energy production, energy efficiency and renewable energy industries are local in nature and are more likely to be populated by small and medium sized firms, which generate the bulk of employment in the EU. Wind power is the largest green industry in Europe in terms of electricity generated and employment, but the solar sector is assumed to have the largest growth potential. The table below gives an overview of potential job creation in a selection of green sectors. The figures should be regarded as estimates.

Table 12: Green job potential in the EU

Sector	**Current employment**	**Additional jobs**
Renewable energy	1.38 million	1.42 million more jobs could be created. Of these, 410,000 would be the result of additional policies aimed at achieving the renewable energy to 20% of the energy-mix **[99]**
Wind Power	154,000 (direct and indirect jobs in 2007)	EUR6 billion in investments could create 250 000 jobs (European Commission)
		According to the EWEA employment could reach 329,000 in 2020 and 377,000 in 2030, giving 175,000 and 223,000 more jobs respectively
Solar Power	100,000 for solar PV (Heinrich Boll 2009)	600,000 more jobs by 2020 and 1.3 million by 2030 in solar PV and probably higher if other solar technologies are included [102]
Energy efficiency		1 million more jobs could be created from reducing energy consumption by 20% [100]
Smart Grid		775,000 jobs could be created from realizing all investments needed in EU's transmission infrastructure [101]

Source: Various (see table)

A low carbon transition fund to prevent structural unemployment

Although the development of new green technology will open up new jobs opportunities, the labour stock will not necessarily be equipped to fill them. It is likely that workers made redundant during the transition to a low-carbon economy may not have the skill sets required, for example, to develop and operate new low-carbon technologies.

Complicating the matter further is the fact that jobs lost and jobs created will be unevenly distributed across regions, increasing demand for labour in some regions, while increasing unemployment in others. Some countries, such as Germany, have had substantial growth in wind and solar power over the last decade, and are already experiencing a shortage of qualified labour. If the potential mis-match of skills is not addressed, the transition to a low carbon economy may give raise to structural unemployment.

Education and well-designed training programmes for green jobs will alleviate the cost of the green transition. To this end, the Environmental Bureau (EEB) and the Platform of European Social NGOs (Social Platform) have called on EU leaders to launch a low-carbon transition fund to build training programmes for new green jobs. Such a fund could offset some of the regional imbalances by lifting the burden off countries experiencing relatively larger transition costs from climate policies.

Environmental tax reforms to mitigate the social and economic impacts of the GND

It is possible that by raising fuel costs, policies to price carbon would have a negative impact on the poor. A substantially higher tax burden for carbon-intensive industries would lead to higher household heating, food, and transport bills, which could be disproportionately burdensome for low-income families. However, it is possible to design such policies in a way that removes potential regressive effects.

Nations that have previously levied carbon taxes have overcome these distributional issues through what is known as 'environmental tax reform' (ETR). Rather than treat a carbon tax as an entirely new source of revenue, ETR shifts the tax burden from levies on labour to levies on energy, transport, pollution, and resource extraction.

In order to compensate businesses and households for higher costs, measures are taken to recycle the revenue and return it to tax payers through a combination of the following policies:

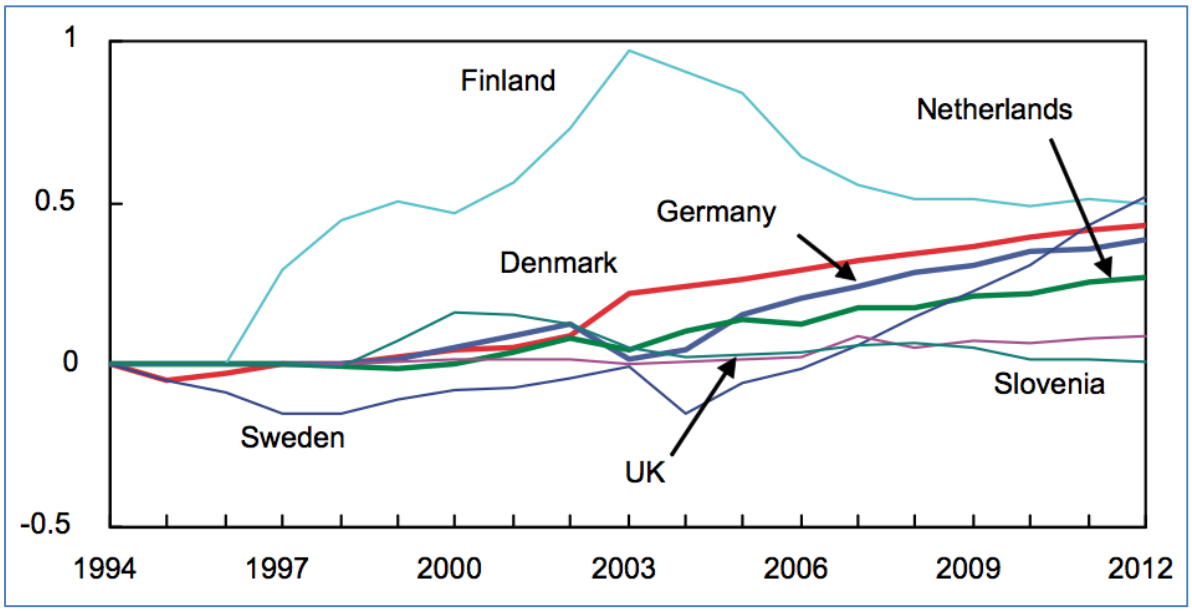
- Reducing social security contributions for employees
- Reducing employers' social security contributions to reduce the cost of hiring
- Transferring a lump sum directly to those parts of society that do not pay social security contributions (e.g. pensioners and students) [37]
- Introducing tax exemptions on a minimum amount of kilojoules used in households
- Supporting energy efficiency measures in low income households

The overall impact of ETR has been positive, as demonstrated by a comprehensive European modeling exercise called COMETR[lvii]. The project compared the economic impacts of ETRs in seven European countries – Finland, Denmark, Germany, the Netherlands, UK, Sweden, and Slovenia – to what would have occurred without the ETR. As expected, the carbon levies resulted in reduced energy demand and emissions. The reduction in energy demand was generally in the region of 4 percent, while the reduction in emissions was slightly larger because use of carbon-intensive fuels was reduced most [103]. As explained by the Green Fiscal Commission (2010) [103]:

"In Sweden, the effects take slightly longer to come through, as the very large increase in household electricity taxes depresses real incomes in the short run. Finland has a short-term boost to GDP from

the effects of the taxes on fuel demand, because a reduction in the demand for imported fuel improves the country's trade balance."

Figure 33: The effect of Environmental Tax Reform on GDP



Source: COMETR [103]

The figure shows the percentage difference between the actual GDP of countries that implemented ETR, and what the COMETR modeled showed would have occurred in the absence of ETR [103].

Germany's Environmental Tax Reform

An evaluation of Germany's 1999 ETR commissioned by the German Federal Environmental Agency found that reductions in social security contributions and an increase in energy efficiency contributed to the creation of 250,000 jobs in the first three years, primarily in energy-saving technology and labour intensive sectors. By 2003, Germany's environmental tax had resulted in a 2.4% decrease in carbon emissions, i.e. 20 million tonnes of CO_2, and it was predicted that by 2010, emissions would be cut by 24 million tonnes of CO_2 yearly [104]. As discussed in the next section, the ETR implemented by the Canadian province of British Columbia in 2008 has also been progressive.

British Columbia's Environmental Tax Reform

Although set at a lower rate than some carbon taxes in Europe, the carbon tax introduced in 2008 by the Canadian province of British Columbia is the most comprehensive ETR to date. It has the broadest tax base, does not provide exemptions for highly polluting industries just to preserve competitiveness, and it uses revenue recycling measures to ensure that the tax is progressive rather than regressive.

The tax rate was initially set at a rate of CAD 10 per tonne (EUR 7.80) of carbon equivalent GHG emissions, and is set to increase to CAD 30 (EUR 23.39) per tonne by 2012. From 2008-2012, it will yield an estimated CAD 1.85 billion (EUR 1.44 billion), which will be returned to taxpayers through the following recycling mechanisms:

- a reduction in personal income taxes by 5 per cent on the first CAD 70 thousand (EUR 54.6 thousand) of income;
- a reduction in corporate and small business income tax rate by two per cent to 10 per cent and 2.5 per cent respectively; and
- a Climate Action Tax Credit, in which CAD 100 (EUR 77.97) per adult and CAD 30 (EUR 23.39) per child is transferred to low income families quarterly.

To ensure transparency, each year's annual budget reports the amount of revenue collected from the carbon tax and the amount returned to taxpayers through revenue recycling measures. The amount returned is necessarily based on projections from the previous year, so any discrepancies between the amount raised and the amount returned is worked into the following budget through additional tax reductions. Table X outlines the BC government's plan to ensure revenue neutrality between 2008 and 2012.

It is widely believed that British Columbia's ETR is progressive. Individuals pay for the tax primarily through higher transportation and heating costs. However, for low-income households these costs are more than offset through income tax cuts and low-income climate action tax credits. The table below demonstrates how these benefits exceed the costs for many typical family types.

Table 13: Net effect of the ETR on two types of families in British Columbia

	Tax (Benefit)	
	2008*	2009
Double earner family of four with $60,000/year income		
– Van – 10 L/100km fuel efficiency driving 20,000 km/year	24	60
– Natural gas heat and hot water	21	53
– Personal income tax reduction	(45)	(118)
Net impact	0	(5)
Senior couple with $30,000/year income		
– Gas guzzler – 12 L/100km fuel efficiency driving 7,000 km/year	10	25
– Oil furnace using 2000 litres of heating oil per year	28	70
– Personal income tax reduction (Climate Action Tax Credit)	(100)	(205)
Net impact	(62)	(110)

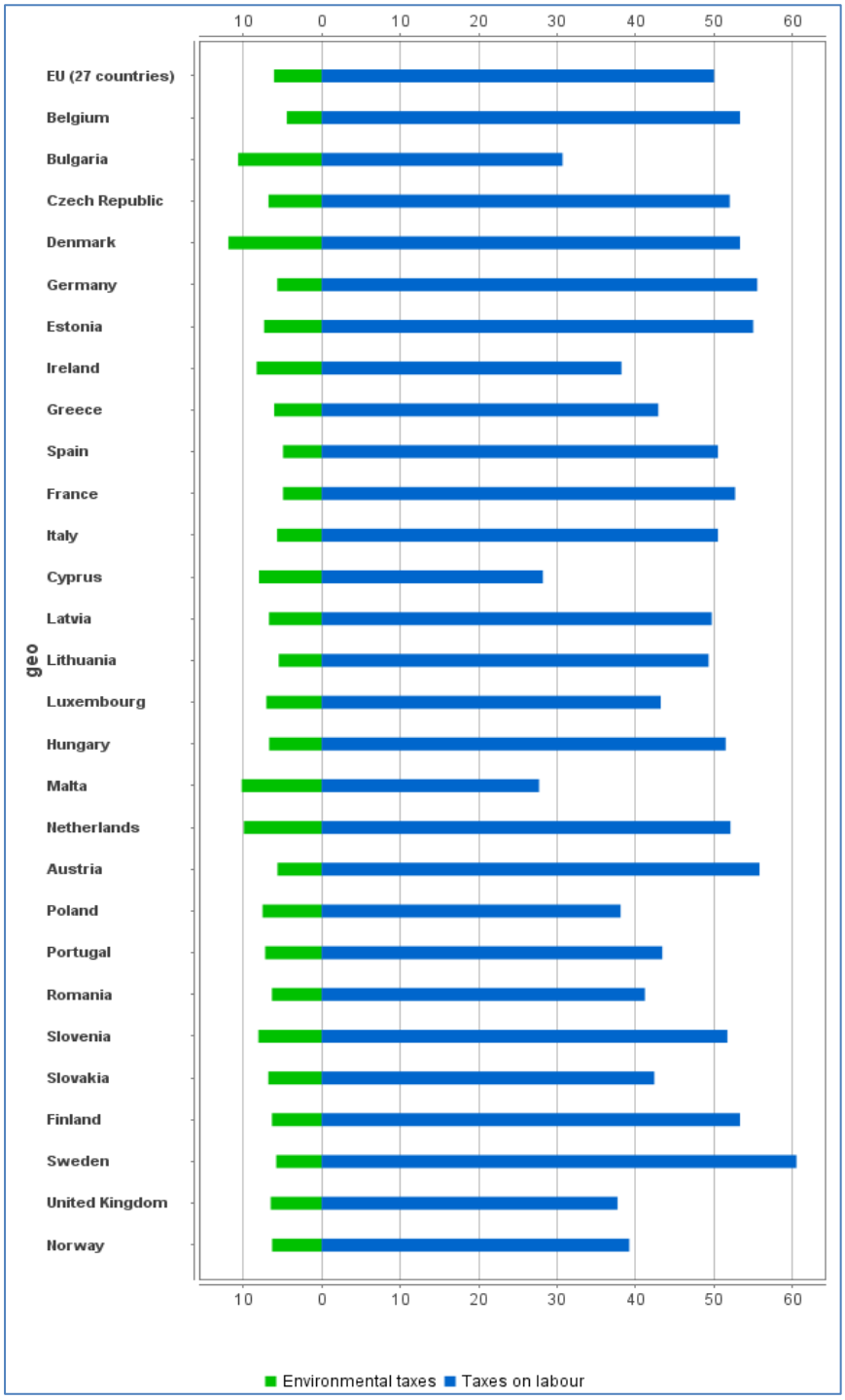
*July 1, to December 31, 2008

Source: British Columbia Budget

Europe should make a shift towards green taxation

There is significant room for further environmental taxes to be offset with reduced labour taxes. As demonstrated in the figure below, 50% of tax revenue in EU countries is derived from labour taxes. Only 6.1% derives from environmental taxes. Such a big asymmetry between the two is counterproductive, because labour taxes disincentivize employment. Shifting the burden towards pollution and resource extraction would increase labour demand and have positive effects on the competitiveness of labour intensive sectors while stimulating green investments at the same time.

Figure 34: Percent of Tax Revenue from Environmental Taxes vs. Labour Taxes in Europe in 2008



Source: Eurostat

To ensure that European carbon tax is progressive, we recommend that it fulfill the following principles[lviii]:

- A substantial portion of the carbon tax revenue should be recycled through reductions on labour taxes and social security contributions of households and employers
- Where possible, business tax cuts should be targeted to promote employment, for example, by reducing employers' social security contributions to reduce the cost of hiring

- Ideally, the revenue should be recycled with income tax cuts rather than transfers of lump sums of cash. For one, administrative costs from cash transfers are much higher. Second, unlike the fiscal signals from income tax cuts that promote employment, the fiscal signals from cash transfers are delayed, and thus not as strong
- Rather than transferring a lump sum to protect low income households, it would be more effective to either support energy efficiency initiatives of low income households, or to provide progressive tax exemptions, for example on a minimum amount of kilojoules used per household. Cash transfers should only be used as a last resort, such as for those that do not pay social security contributions (ie. pensioners and students), and should be in the form of refundable tax credits that the recipient could opt to carry over to the following years income tax
- The tax rate should start low and increase gradually according to a pre-specified schedule to enable individuals and businesses to adjust. The BC rate increases at CAD 5 per year (EUR 3.90)
- Future rates should be announced well in advance to allow for planning. Known future rates are as important as current rates in changing consumer and producer behaviour
- The tax should cover the broadest proportion of emissions sources possible. Exemptions should only be considered for the purposes of protecting low income households (for example, exempting a minimum amount of kilojoules used per household), and integrating the tax with other climate policies such as the EU ETS
- Exemptions should not be made for the purposes of protecting the competitiveness of domestic industries that are exposed to foreign trade. Instead, carbon border tax adjustments should be used to protect these industries as discussed in the following section

Cross-border measures to preserve industry competitiveness

We have demonstrated how revenues from carbon taxation and the auctioning of EUAs can be used to create positive economic and distributional effects. However, differing environmental policies across countries create an uneven playing field for industries competing in an international market. While ETR and similar measures can be used to counter the disadvantage from the majority of sectors experiencing a modest cost impact, there are a few domestic industries that could experience a substantial cost disadvantage from a higher price on GHG emissions. International regulatory harmonization is the preferable approach to dealing with an uneven playing field as explained in the following section. However, this does not seem realistic in the short to medium term. Alternatively, to adjust for the cost differentials imposed by ETS, the EU could consider imposing WTO compatible border tax adjustments. While a controversial and complex matter, border tax adjustments can be useful to reduce the competitive disadvantage for certain sectors.

International tax and regulatory harmonisation

Some argue that tax and regulatory competition between nations is useful as it puts a downward pressure on tax levels and bureaucratic expenditure. While we disagree with that in general, in particular cases such as when taxes are intended to correct externalities that occur across national borders, such as transnational pollution, competition between national tax regimes creates perverse incentives and can be very harmful. Nations will under-tax and under-regulate industry in order to attract investment, which externalises the costs of pollution.

It is therefore ideal for environmental taxation to be coordinated internationally. There are two ways in which uniform taxation can be achieved: harmonisation of domestic environmental tax regimes or an international tax regime. International taxation at a global level would require unparalleled international cooperation. National governments would need to relinquish a portion of their exclusive sovereign right to taxation to an overarching government institution. Crucially, this institution would need to be checked through democratic lines of accountability. At the global level, such an institution does not exist. For this reason, harmonisation of domestic environmental taxes is a more appropriate goal in the near term.

At the European level, however, there exists an overarching and democratically accountable government. Europe has already taken the lead in establishing an international mandatory carbon market, and it should continue to lead by pioneering international taxation to finance the Green New Deal.

Carbon Border Tax Adjustments

Carbon border tax adjustments (CBTA) offer a tool to protect the competitiveness of domestic industries without watering down regulation. CBTA involves taxing imports based on their carbon impact to ensure that carbon-taxed domestic products remain competitive at home, and/or rebating the carbon taxes paid on products being exported to ensure that they are competitive abroad. These two mechanisms can be used in combination or separately.

As an instrument of trade protection, CBTA has become a heavily debated issue in both the EU and the US. In Europe, French President Sarkozy and German Chancellor Angela Merkel have led the call for tax adjustments at the EU's borders in order to protect industries and jobs in high polluting sectors such as steel and chemical from cheaper imports. Thus far, no country has gone through with such regulations.

Given the high levels of information concerning GHG emissions in production needed to implement CBTAs fairly, CBTAs are only suitable for products with relatively simple production processes. Imports of clinker and cement are such a sector (Carbon Trust 2010). Increased information about firms' carbon footprint and international carbon disclosure will ease the implementation of CBTAs.

Were CBTAs to be implemented, they would be strictly regulated by the General Agreement on Tariffs and Trade (GATT). Different rules apply to border rebates and to border taxes. A revision in the GATT in the Uruguay Round permits rebates for taxes on goods that are either physically incorporated into the exported product or consumed during production. Rebates on direct taxes such as income taxes are not permissible. It is likely that taxes on fuels (which are consumed during production) would be found compliant with GATT, but taxes on carbon emissions and other forms of pollution (as "dis-incorporated material outputs") would be incompliant [107].

The National Treatment principle found in Article III of GATT requires imported goods to be treated no less favourably than "like" domestic products. As mentioned above, taxing imports in a non-discriminatory manner based on their carbon content would be incredibly problematic due to the difficulties in measuring carbon emissions from foreign resource extraction, production, and transportation. A likely permissible solution would involve taxing imported products with the assumption that they were produced in the most efficient manner possible using a benchmark of the

best available technology (BAT). Of course, this is a weak solution, because it would not discriminate against more polluting methods of production [107].

A distinction must be made between border adjustments for cap-and-trade systems and fiscal measures like carbon taxes. Although both could result in carbon leakage, the GATT only allows border adjustments to be made for taxes, not regulations. Cap-and-trade systems fall into the latter category. Thus, WTO dispute settlement mechanisms might not permit border taxes and rebates to adjust for price impacts of cap-and-trade systems. A more appropriate policy would be to require emission permits purchases for imports and provide output-indexed emissions allowances for exports [107].

Finally, even if CBTA were ruled discriminatory by the WTO dispute settlement mechanism, it might still be permitted under Article XX, the general exceptions clause. CBTA would be permissible if it is proven to fit any of the three following exceptions: (b) necessary to protect human, animal, or plant life or health; … (d) necessary to secure compliance with laws or regulations which are not inconsistent with the provisions of [GATT]; …and (g) relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption." Despite this potential, CBTA has yet to be tested in World Trade Organization (WTO) dispute settlement mechanisms.

Beyond enabling the EU to implement more stringent environmental regulation and taxation on heavily polluting industries, CBTA may have positive knock-on effects by inducing foreign nations to sign a climate agreement and implement carbon-reducing policies of their own in order to avoid border adjustments. Alternatively, CBTA could stimulate trade wars with foreign nations leading to widespread protectionism. For this reason, care should be taken to comply with the rules of the General Agreement on Tariffs and Trade (GATT).

We are not recommending the use of CBTAs since we believe that the benefits of the GND will outweigh any costs and that it will provide a significant competitive boost to the EU economy.

Summary

While we have shown that there is a strong economic case for pursuing an ambitious Green New Deal, the distribution of the costs and benefits is equally important as the overall size of these costs and benefits. In particular because lower income groups have been hit disproportionately by the crisis and because their capacity to absorb additional costs is limited the Green New Deal needs to have a broadly progressive incidence.

While looking at the progressivity of tackling climate change it is important to keep two additional facts in mind. One, that the costs of tacking climate change now are modest but will increase sharply the longer we wait and two that climate change and global warming are expected to have a very regressive footprint.

Not only will acting sooner be cheaper and more progressive but it is also likely to generate competitive advantages for the European Union.

Despite an overall acceptance of these arguments there are legitimate concerns surrounding the possibility of industrial flight and associated carbon leakage with the European Commission having

compiled a list of 164 manufacturing sectors that could be at risk. However, empirical studies have shown that the discussion is overblown and that under the EU ETS with no free allocation of allowances less than 2% of EU emissions are at risk of being driven abroad.

Nevertheless, the risk will be higher for the tighter GHG targets we have proposed in this report and policies should be designed with as much information on cost structures as possible. For many industries, such as utilities, the transport costs increase from moving abroad would exceed any possible benefits in carbon prices. Even if the EU moves faster than other regions in the world, it is only a matter of time before they too tighten GHG regulations so any cost reduction from industry flight is likely to be only temporary.

The current strategy of exempting industries from the ETS and carbon taxes is counterproductive, especially since the gross value added of affected industries is likely to be less than 1% of EU GDP though the costs and effects will be unevenly distributed. Our broader aim is to dis-incentivize investment in more polluting sectors and encourage development of green solutions.

Europe has no natural cost advantage in several of the sectors at risk of carbon leakage, such as aluminium and steel so it may not be wise to subsidise such polluting production. It is a myth that European energy intensive industries are clean. Besides, other approaches such as using green tax revenue to reduce labour taxes, providing support for improving energy efficiency and considering WTO compatible restrictions on dirty imports may be more effective overall. Another factor is that if the success of the Montreal protocol is anything to go by, becoming green may be much less expensive than estimated as the pace of technological change picks up.

In fact the EU is lagging behind emerging economies in energy efficiency and this may turn out to be a serious competitive disadvantage as export markets for green technologies and efficiency enhancing tools grow manifold. By taking a lead in being green the EU could generate additional exports and enhance growth as has been demonstrated by the positive impact of green policies in Germany on gross value added and employment.

Given the seriousness of the EU's current unemployment problem, the fact that the GND is expected to generate a significant number of additional jobs takes on extra significance. While jobs will be created in green industries and services across a whole range of skill needs, jobs will also be destroyed in the dirty industries so policies that support the retraining of workers are very important. We recommend that a low carbon transition fund should be set up with the aim of re-skilling workers and preventing structural unemployment.

Energy efficiency related jobs in the construction sector can help re-employ nearly a million of out of work low skilled construction workers who are suffering from the collapse of construction bubbles in many EU countries. Policies suggested in this paper are expected to generate an additional 6 million jobs in the EU by 2020.

Another very promising policy tool is the use of environmental tax reform wherein carbon taxes replace more regressive taxes such as social security contributions and income taxes that apply to low income households that also act as a damper to job creation. Green tax revenue could be recycled through

- Reducing social security contributions for employees

- Reducing employers' social security contributions to reduce the cost of hiring
- Transferring a lump sum directly to those parts of society that do not pay social security contributions (e.g. pensioners and students)
- Introducing tax exemptions on a minimum amount of kilojoules used in households
- Supporting energy efficiency measures in low income households

The overall impact of such policies in countries including Finland, Germany, the Netherlands, UK, and Sweden has been positive having reduced emissions, created jobs and increased GDP. That is why we recommend an EU –wide approach to Environmental tax reform that can go hand in hand with the tightening of the ETS and the introduction of an EU-wide carbon tax recommended in this report.

There are also interesting possibilities for international co-ordination in some form of green taxation such as taxes on bunker fuels though the political space for broader international agreements on carbon taxes probably does not exist at this point.

Where serious concerns on competitiveness continue to haunt EU policy-makers, it is possible to use WTO-compatible Carbon Border Tax Adjustments as we have discussed in this chapter though we do not recommend their use.

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