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GREEN GROWTH:

Policies for Transition Towards Low Carbon Economies

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Abstract: For the next fifty years and beyond, the world faces twin challenges:

-Enhancing economic opportunities and living standards for a growing global population;

-Addressing the environmental threats that, if left largely unaddressed, could undermine our abilities for longer term economic growth and development and the ability to reduce poverty.

For twenty years the world community has attempted to face up to these challenges, notably global warming by a “top down” international negotiation process under the auspices of the UN Framework Convention on Climate Change (UNFCCC). The paper discusses why this process has failed so far.

To get out of this impasse, a “bottom up” policy framework for green growth based on national preferences, possibilities and policies should be considered and is discussed in some detail.

However, while green growth may enhance the transition towards low-carbon economies in the short – and medium term, it is argued that a “Global Green Deal” with regional and global rules of the game is needed to reduce the risk for unsustainable development in the longer term.

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1 Executive Summary

Two questions are posed to policy makers, civil servants and researchers in this policy note:

- How may a strategy of national green growth policies help us out of the present impasse regarding a transition towards low-carbon economies?
- Even if successful, is it likely that a “Global Green Deal” containing stronger international cooperation and global rules of the game is necessary within a decade or so in order to make future long-term economic development sustainable?

In the twentieth century the world population increased four times over, economic output twenty-two times and fossil fuel consumption fourteen times. During the first decade of the twenty-first century, world population continued to grow, surpassing 7 billion persons in 2011, and so did greenhouse gas (GHG) emissions. By 2050 world population is expected to be 9 billion. Global greenhouse gas (GHG) emissions continue to increase, and in 2010 global energy-related carbon dioxide (CO₂) emissions reached an all-time high of 30.6 gigatonnes (Gt) despite the recent economic crisis. Without more ambitious policies than those in force today, GHG emissions may increase by another 50 per cent by 2050.

Thus for the next fifty years and beyond the world faces twin challenges:

- Expanding opportunities for the global population;
- Addressing the environmental threats that, if left unaddressed, could undermine our abilities for economic growth and development in order to reduce poverty for a growing global population.

For the last twenty years the world community has attempted to face up to these challenges, notably the challenge of climate change, by international negotiations encompassing some 190 countries under the auspices of the UN Framework Convention on Climate Change (UNFCCC) adopted in Rio in 1992. So far this process has yielded few results, and we are currently left with yet another uncertain roadmap to 2015 for a possible global agreement by 2020. In section 4 of this paper I discuss why this “top down” approach has failed, and despite that most analyses show that the risks associated with future climate changes are high, and that the economic costs of a cost-efficient global climate agreement are relatively modest. While the UN negotiations continue, hopefully in different ways with better results, a difficult situation forces one to think anew regarding approaches and strategies that may contribute to get us out of this impasse.

A “bottom up” policy strategy to enhance the transition towards low-carbon economies - Green Growth - is based on national policies that are realistic and politically doable fostering growth and development, while assuring that natural assets continue to provide resources and environmental services on which our well-being relies. Section 5 sets out the content of a policy framework for green growth, and in section 6 innovation for green growth is elaborated on.

Whether one looks for ambitious GHG mitigation policies in particular or policies for green growth in general, such policies will result in accelerated economic- and social changes- a topic relatively little discussed in the economic literature. Yet it is argued in section 7 of this paper that resistance to structural changes from the potential losers – as exemplified by the fossil-based electricity – and transport sectors – is a major reason why not more has been achieved in the almost twenty years since the Rio conference. These political economy aspects are discussed, as are policy measures to overcome them.

Green growth policies based on national circumstances, economic possibilities and political preferences is one concrete policy alternative to get us on to the path of low-carbon growth well before 2020. The US and EU economies will recover, and this is an opportunity that could be seized for green growth investments and policies.

In the Norwegian National Budget for 2012, a goal of a carbon neutral Norwegian economy in 2050 is set forth. The government's White Paper on Long Term Perspectives, expected to be presented to the Parliament in early 2013 could contain a Green Growth Strategy for Norway consistent with this long term goal.

But most economic analyses show that a "Global Green Deal" may be necessary in the longer term in order to be able to combine the ongoing global growth in population and GDP with containing the resulting environmental pressures. Such a deal containing enhanced international cooperation and regional and global rules of the game should include:

- Developing and linking emission trading systems (ETS) in order to secure stable and well-functioning markets for carbon;
- Provide a strong commitment to pricing carbon across all sectors and regions in order to trigger follow-up investments by the private sector and strengthen incentives to invest in technologies and processes that lock in low-carbon production and green growth;
- Supporting clean technology markets;
- Reduce subsidies of energy – and carbon use which presently are very large, especially in a number of developing countries.

G-20 countries account for roughly two thirds of world's population and three quarters of global gross national product, energy consumption and GHG emissions. It is hoped that this group of countries, supported by EU and EEA countries, will see it in their long term interest to strike such a global deal for green growth as the world economy recovers.

2 Introduction

There has been a large amount of research and analyses over the last twenty years regarding how to face up to the challenges of future climate changes and its economic, environmental and social consequences. Since the Stern Report came out some five years ago, research into the economics of climate change and green growth has accelerated. Most economic model based analyses conclude that the economic costs of strong mitigation policies are rather small measured as loss of Gross Domestic Product (GDP) over the longer term, and that the risks of doing little – i.e. continuing largely on a high carbon growth path – are quite high. Some economists, e.g. Nicolas Stern et. al., goes further and argue that a high carbon growth path is not sustainable, and will over time eventually lead to lower GDP than if we now started the transition towards low carbon economies: "And eventually the immense risks from unmanaged climate change would probably derail high-carbon growth across the world". Romani, Stern and Zengelis in "The Basic Economics of Low-Carbon Growth in the UK", Policy Brief (2011).

Nevertheless, and not surprisingly, almost twenty years after the Rio Conference in 1992, the seventeenth Conference of the Parties (COP 17) under the UN Framework Convention on Climate Change (UNFCCC) in Durban gave very few results. A main conclusion is an uncertain roadmap for further negotiations to 2015 with the aim of binding global climate measures by 2020. Earlier roadmaps have failed, for example the 2007 Bali roadmap that aimed at a global deal at COP 15 in Copenhagen in 2009.

After briefly reviewing economic paradigms for growth and development in section 2, I argue in section 3 that the “top down” approach to the challenge of climate change that has been followed for the last twenty years, notably the above mentioned UN negotiation process, may not succeed in coming years either, and for many reasons. And since the Durban road map has 2020 as its time horizon, one should now in any event look for supplementary or alternative strategies for enhancing the transition towards low carbon economies during the present decade.

One such strategy is “a bottom up” approach defined as Green Growth. As reviewed in section 5 and 11 (Annex), many of the policy instruments within such a framework are well known. Thus key issues are how to get stronger national policy implementation before 2020 through such a policy framework in order to enhance development to reduce poverty while avoiding irreversible damages to the environment and ease the transition towards low-carbon economies. A necessary, but not sufficient condition for green growth is enhanced green innovation, briefly discussed in section 6.

The transition of developed, emerging and developing economies from high to low carbon economies is all about structural changes with winners and losers. Thus political economy aspects are important, some of which are discussed in section 7.

Green growth policies requires good coordination of a number of different policies which in most countries are the responsibility of a number of ministries, and institutional inertia may be one reason why reasonably coherent and comprehensive strategies for the transition towards low-carbon economies are slow to emerge. This challenge is briefly discussed in section 8.

Section 9 concludes.

3 Paradigms for Economic Growth and Development

Historically, economic growth has been closely tied to increasing consumption levels as well as increasing loads on the environment. While neoclassical growth theory of the 1950s and 1960s included no limits on natural resources, questions were raised in the 1970s whether economic growth as measured by Gross Domestic Product (GDP) should come to an end and be replaced with a “steady-state” economy operating within limits to growth set by the natural environment. However, stopping growth altogether has gained little political support, and during the 1980s one started to explore the possibilities of a “de-coupling” of economic growth from negative environmental consequences. Such possibilities could according to the World Commission on Environment and Development (1987) combine longer term environmental sustainability with the need for further economic growth in order to reduce poverty in developing countries.

Within such a paradigm, which recently has been labeled Green Growth, it is argued that continued growth in Gross Domestic Product (GDP) may be compatible with avoiding an environmental disaster, the critical factors being technological progress, economic structural changes and good policies over the longer term. A recent example of this rather optimistic way of thinking is given in OECDs publication: *Towards Green Growth. Green Growth Strategy Synthesis Report* (2011a). Here it is stated that. “A green growth strategy is centered on mutually reinforcing aspects of economic and environmental policies. It takes into account the full value of natural capital as a factor of production and its role in growth. It focuses on cost-effective ways of attenuating environmental pressures to affect a transition towards new patterns of growth that will avoid crossing critical local, regional and global environmental thresholds”, *ibid*, page 6. I.e., good national policies may save us from crossing “critical environmental thresholds” over the longer term.

Note that this approach does not start with a top down political objective of limiting temperature increases to 2 degrees Celsius by 2050 through a global climate agreement, and then constructing policies so that global greenhouse gas emissions, GHGs, are reduced substantially for the next forty years. Rather it starts with what may be more realistic national policies, given economic circumstances and political economy considerations, i.e. a bottom up approach.

Thus, for those who still believe that an ambitious global, cost-efficient and binding international agreement on climate change is achievable in the short term, a green growth strategy is a second best approach to policies. However, a second best policy approach that can be implemented is better than a first best approach that cannot.

There is also another possible starting point when analyzing the future interactions between the global economy and planetary limitations, but one that I will not pursue further in this policy note. This is, as mentioned above, the perspective of “The Limits to Growth” school of thought, which posits that the central challenge is the delay in practical decision making. This delay secures that substitutes come on line too late to avoid a temporary dip in the material standard of living. Under circumstances where the US and parts of Europe presently are faced with little growth, high unemployment and financial crises, a no-growth or de-growth approach is probably a political non-starter – as in the 1970s - and thus not a realistic alternative strategy for economic- and climate policies in the years to come. Nevertheless, this approach could be pursued through further empirical research in order to explore the consequences for the economy and the environment of continuing present growth processes. Which approach is the best is, in the final analysis, an empirical question as well as a political one, and cannot be determined a priori.

4 The Climate Challenge. A Top Down Approach to Policies

After The Rio Conference in 1992, global warming gained prominence as one of the most important future threats to economic development and human welfare. Since then numerous economic/empirical models have been developed to simulate future interactions between economic developments and emissions of greenhouse gases (GHGs) under alternative assumptions.

In the following I will briefly illustrate this way of “top down” analysis with two alternative scenarios recently presented by The OECD (2011c) using their OECD ENV Linkages Model.

It is beyond the scope of this Policy Note to go further into the considerable uncertainty of the results of such model based projections and analyses, how technological change should be modeled, and how the results should be interpreted in the context of possible catastrophic global warming. For recent and detailed discussions of these questions in the literature, the reader is referred to Weitzman (2009), Nordhaus (2011) and Ackerman and Stanton (2011).

Two Scenarios to 2050 and 2100.

Scenario 1. Business as usual, BAU

This scenario assumes no new climate mitigation policies over and above those already in place.

Under the OECD Outlook Baseline scenario, the global concentration of GHGs is expected to increase to approximately 685 parts per million (ppm) CO₂ equivalents (CO₂e) by mid-century and more than 1000 ppm CO₂e by 2100. The concentration of CO₂ alone is projected to be around 530 ppm in 2050 and 780 ppm in 2100. As a result, global mean temperatures are expected to increase, though there is still uncertainty surrounding the climate sensitivity. The OECD Environmental Outlook Baseline scenario suggests that these GHG concentration

levels would in the event lead to an increase in global mean temperature at the middle of the century of 2.0-2.8 degrees C, and 3.7-5.6 degrees C at the end of the century compared to pre-industrial times. According to research carried out by Meinshausen et. al (2009), if the world could stabilize greenhouse gas concentrations at 450 ppm CO₂e, the chance of keeping the global temperature increase under 2 degrees C would be between 40 and 60 per cent.

Scenario 2. A Binding Global Climate Agreement

The Outlook 450 Core scenario technically assumes an agreement that limits warming to the 2 degree political objective by 2050. This is assumed to be achieved in a cost-effective way through the global pricing of carbon and by other policy measures. To achieve the 450 ppm stabilization target, global emission reductions of 12 per cent will be needed by 2020 and 70 per cent by 2050 compared to the Baseline (for 2050 this means 52 per cent below 2005 levels, and 42 per cent below 1990 levels). Emissions would therefore have to decrease at an average rate of 1.7 per cent per year between 2010 and 2050, compared to an increase of 1.3 per cent projected under the baseline. The scenario technically assumes that carbon pricing is used to give incentives for mitigation efforts in all parts of the world economy. A relatively large portion of emission reductions could be achieved relatively cheaply and quickly by limiting emissions of non-CO₂ gases from industries (e.g. coal mining, oil and gas processing and shipping, acid production) and the agricultural sector (e.g. changing rice cultivation patterns and nutrient management); and improving waste handling (waste recycling and methan capture from landfills). Curbing global emissions beyond 2020 would require a rapidly increasing carbon price (according to the OECD calculations to USD 325/tCO₂e in 2050) to discourage intensive reliance on carbon-based energy sources. Only a strong and lasting carbon price signal will achieve the major transition required in carbon-intensive sectors, and those with large-scale infrastructure investments.

The economic costs would according to the OECD calculations be relatively modest. For instance, the level of world GDP is estimated to be 5.5 per cent lower in 2050 in the 450 ppm Core scenario than under the baseline scenario. These economic impacts reflect purely the cost of action, and not the net costs or benefits. This is in a context where world GDP is projected to rise by more than 250 per cent over the same period.

According to Victor: “Global Warming Gridlock. Creating More Effective Strategies for Protecting the Planet” (2011), the present approaches to international climate negotiations, as simulated technically in scenario 2 above, will be very hard to put into practice. He argues that when the global warming issue became visible on the radar screens of government that were most keen to act, they reached for the wrong toolbox. They chose strategies based on the history of international environmental law that were prone to gridlock when applied to the challenge of global warming.

As governments tried to tighten the screws on emissions, the diplomatic problems increased. Inflexible targets and timetables were poorly matched to the commitments that governments could credibly honor. The involvement of such a large number of countries in the UN negotiation process with diverse and conflicting interests resulted in diplomatic chaos. Yet in the aftermath of the Copenhagen meeting (COP 15), which so far is the high water mark of chaos, alternative ideas have, according to Victor, not gained traction. The lack of results from COP 17 confirms this view.

One should thus shift the focus of climate negotiations away from abstract promises that are hard for governments to honor except for in speeches at international environmental conferences, such as targets and timetables, towards promises to implement national policies that are more credible and realistic from a political economy point of view – e.g. policies to enhance green growth.

Ministries of Environment have conducted global negotiations under the auspices of the UN since 1992. For reasons given above, so far relatively little has been achieved. There are legal obligations to reach targets by 2012 by a small fifth of global GHG emissions through the Kyoto Protocol – notably because China and the US are not part of this agreement.. But there is not any agreement beyond 2012 other than a road map for further negotiations. The political system in the US seems unable deliver a consensus on climate policies for a long time to come, part of the reason being that the US economy presently is characterized by weak growth, and high levels of debt and unemployment. A number of European economies have even deeper economic problems in the wake of the global financial crisis in 2008. GDP in China and India and other emerging economies may, on the other hand, grow by two digit numbers for another decade. This is good for poverty alleviation, but will contribute to increasing global energy use and GHG gas emissions – despite their present five-year national plans for energy saving and green growth more generally.

So despite the relatively low economic cost and the option of a reasonably cost-effective global climate agreement, my educated guess is that the UN negotiations will not lead to a global agreement in the near future.

Thus the time has therefore come to seriously consider alternative or supplementary strategies for economic – energy, and environmental policies.

5 A Policy Framework for Green Growth. A Bottom Up Approach

In the twentieth century the world population increased 4 times over, economic output increased 22 times and fossil fuel consumption 14 times. During 2011 world population passed 7 billion. The resilience of a wide range of environmental systems is now being tested by the requirements of a rapidly growing global population and increasing levels of economic activity. This means, in addition to the challenges of climate change and the loss of biodiversity, meeting the energy and food needs of 9 billion people in 2050. Water supplies are coming under increasing pressure and, without new policy action, a further 1 billion people are expected to live in severe water-stressed areas by 2030.

Thus for the twenty-first century, the world faces twin challenges: expanding opportunities for a growing global population; and addressing environmental pressures that, if left unaddressed, could undermine longer term growth and development. It is about fostering growth and development while ensuring that natural assets continue to provide resources and environmental services on which our well-being relies. It is also about enhancing investment and green innovation which will underpin sustained growth and give rise to new economic opportunities. It may also be argued that the recovery in coming years from the present economic difficulties in parts of Europe and the US will present an opportunity to accelerate the transition towards low-carbon economies.

The OECD states that:”Green growth is not a replacement for sustainable development, but should rather be considered a subset of it. It is narrower in scope, entailing an operational policy agenda that can help achieve concrete, measurable progress at the interface between the economy and the environment. It focuses on fostering the necessary conditions for innovation, investment and competition that can give rise to new sources of economic growth – consistent with resilient ecosystems”, *ibid.*, Box 1, page 7.

Green growth has the potential to address economic and environmental challenges and open up new sources of growth through the following channels:

- **Productivity.** Incentives for greater efficiency in the use of resources and natural assets, enhancing productivity, reducing waste and energy consumption and making resources available to highest value use;
- **Innovation.** Opportunities for innovation, spurred by policies and framework conditions that allow for new ways of addressing environmental problems in general, and the climate challenge in particular;
- **New markets.** Creation of new markets by stimulating demand for green technologies, goods and services, creating potential for new job opportunities;
- **Confidence.** Boosting investor confidence through greater predictability and stability around how governments are going to deal with environmental issues;
- **Stability.** More balanced macroeconomic conditions, reduced resource price volatility and supporting fiscal conditions through, reviewing the composition and composition and efficiency of public spending and increasing revenues through the pricing of pollution and carbon.

It may also reduce the risks of negative shocks to growth from:

- **Resource bottlenecks** which make investment more costly, such as the need for capital-intensive infrastructure when water supplies become scarce or their quality decreases. In this regard, the loss of natural capital or the damage from climate change can exceed the gains generated by economic activity, undermining the ability to sustain future growth;
- **Imbalances in natural systems** raise the risk of more profound, abrupt, highly damaging, and potentially irreversible effects – as has happened to some fish stocks and as could happen with damage to biodiversity under unabated climate change. Attempts to identify potential thresholds suggest that in some cases – climate change, global nitrogen cycles and biodiversity loss – these have already been exceeded.

Implementing a green growth strategy will involve a mix of instruments which may vary from country to country. Included are fiscal and regulatory settings such as tax and competition policies. Enhanced innovation policies that place a premium on the inventiveness that is needed to use natural capital more sparingly, save energy and stimulate low carbon technologies are important. And policy instruments like green taxes, emission trading systems (ETS) and regulations that target efficient use of natural resources and making pollution – including GHG emissions – more expensive are needed. The annex (section 11) to this Policy Note presents an overview of policy options to overcome constraints to green growth. See also Moe (2010) and OECD (2011).

Policies for greening growth will differ across countries, according to local environmental and economic conditions, institutional settings and stages of development. However, in all cases a strategy for green growth need to:

- **Integrate the national resource base** into the same dynamics and decisions that drive growth;
- **Develop ways of creating economic payoffs** which more fully reflect the value of the natural resource base of the economy and the negative externalities of GHG emissions;
- **Focus more strongly and in a more coherent and coordinated way** on mutually reinforcing aspects of economic and climate policies.

This includes changing payoffs through:

- Pricing pollution and natural resource use through mechanisms such as taxes and tradable permits, and through other measures to combat climate change.
- Remove perverse subsidies which encourage GHG emissions and over-extraction of resource use while being a drain on the public purse.
- Ensure that regulatory standards focus on outcomes.

Changing payoffs in the economy is only part of the solution. Policy will also need to address inertia, the risks of technology lock-in, and the roles of innovation, infrastructure and institutions enabling change:

- Innovation. Strengthened innovation for green growth and enhanced diffusion of new technologies are important elements in a green growth strategy which is elaborated on in section 6 below.
- Infrastructure investment programs in sectors such as water, energy, and transport. Well-planned programs can help drive growth- and development, reduce water and the emission of GHGs and help deploy next generation technologies.
- Institutional and government capacity to implement a green policy reform is an essential condition to greening growth. Governments need to integrate green growth and climate policy objectives into broader policymaking, development planning and poverty reduction strategies as further discussed in section 8 below.

6 Fostering Innovation for Green Growth

In a publication from The International Energy Agency (IEA): “Energy Technology Perspectives: Scenarios and Strategies to 2050” (IEA 2010), it is argued that current energy trends run counter to ambitious long term climate objectives. If present developments continue, the so called Baseline Scenario, energy-related CO₂-emissions are projected to double from 2007 to 2050.

In the so called BLUE Map Scenario, energy-related CO₂-emissions are – on the other hand – projected to be reduced by 50 per cent in the same period. However, for this latter scenario to be realized, the IEA projects investment requirements for the whole period up to year 2050 to be some USD 316 trillion. Over the the past three years, actual annual investments in low-carbon energy technologies averaged approximately USD 165 billion. Implementing the BLUE Map Scenario, will according to this publication require investments to reach approximately USD 750 billion per year by 2030, and rise to over 1,6 trillion USD per year from 2030 to 2050. It is not clear how much of these considerable sums that – in the event – would have to be financed by the public purse.

Business is the driver of innovation, including green innovation. However, government action is essential to shape the environment for green innovation. Several well-known market failures provide the rationale for policy actions to foster green innovation:

- The first are the negative externalities associated with environmental damages – including GHG-emissions. If firms and households do not have to pay for these environmental and other damages or costs, there will be little incentive to invest in green innovation;
- Second, there are important market failures specific to the markets for innovation, notably the difficulty for firms to fully appropriate the returns from their investments, which typically results in under-investments in innovation;

- Third, the markets for green innovation is affected by specific barriers, notably the prevalence of dominant designs, technologies and systems in energy – and transport markets. These can create entry barriers for new technologies and competition due to, for example, the high fixed costs of developing new infrastructure.

A number of policy areas are particularly important as part of a broad strategy to enhance green growth:

- Boosting green innovation requires clear and stable market prices, e.g. energy – and carbon prices at higher and more stable levels than presently. While this is a rather fundamental condition for accelerating green growth in general and green innovation in particular, it is a necessary but not sufficient condition as other policies to strengthen green innovation are needed as well:
- Public investment in basic and long-term research;
- A third set of important policy actions to drive green innovation are interventions to overcome specific market failures associated with green innovation, notably those linked to the dominance of existing technologies and incumbent firms. Thus there is need for support for private investment in innovation, notably R and D, support for general-purpose technologies, stimulation of the growth of new entrepreneurial firms, and the facilitation of the transition to green growth in small – and medium-sized enterprises, SMES.

Policies to foster green innovation should not only focus on the creation and supply of new technologies and innovation, but also on the diffusion and take-up of green innovation in the market place, including policies to:

- Foster diffusion;
- Strengthen markets for green innovation;
- Change consumer behavior.

For more details, see OECD: *Fostering Innovation for Green Growth*, (2011b).

7 Green Growth and Structural Changes. Some Political Economy Aspects

Industrial restructuring and structural economic and social changes are intrinsic elements in economic development processes. Enhancing green growth means that one wants policies that in many ways accelerate already ongoing structural changes.

In recent decades these restructuring processes within and between countries have become more pronounced through globalization and the emergence of rapidly growing economies like Brazil, China and India - implying a changing division of labor with the slower growing OECD countries.

Pushing for green growth would lead to intensified reallocation of resources within and across broad economic sectors. With the aid of their ENV Linkages model the OECD analyzed the potential economic restructuring on a global and regional basis of ambitious climate policies.

The results reported in OECD: *A Framework for the Green growth Strategy* (2010) show that that for a majority of developed countries, achieving ambitious cuts in GHG-emissions would lead to a substantial increase in the extent of sectoral structural changes compared to a scenario with continued high-carbon growth. For example such structural sectoral resource shifts of labor and capital would be twice as large in the European Union/EFTA countries and Canada, and nearly three times as large in the US. In the case of developing or emerging

countries structural changes would be substantial in Brazil and China but not in India. Since these three emerging economies are growing rapidly, they would more easily absorb such structural changes than in the slower growing Europe and the US, with higher political resistance against structural change – notably in the US.

In general, the largest declines in sectoral economic shares of output are found in the fossil-based electricity – and a transport sector, which is not surprising considering that these represent two of the main sources of CO₂-emissions. The agricultural sector, a major emitter of methane, also loses importance in countries where they represent a significant sector of the economy. By comparison, the decline in the share of energy-intensive industries – the third major source of emissions – is relatively modest except in the Australia/New-Zealand region. In all cases, the sectors which gain the most by accelerating green growth are construction and services. Relatively small gains are observed in the OECD study for renewable energy sources.

Since there thus are winners and losers, and since the benefits of green growth mainly will go to future generations, political economy considerations are very important elements in designing and implementing of a policy framework for green growth. There is obviously resistance against change from the losing sectors, and these have often considerable political influence. To convince politicians, which in democratic countries have to be reelected at regular intervals, that green growth is a preferable and less risky future development path, one has to document the possibilities to create value added and employment in the winning sectors – and how to ease the transition towards low-carbon economies. A major and underestimated factor for the slow implementation of green growth policies in general – and climate policies in particular – is that those sectors, lobbyists and politicians that resist structural changes have won most of the battles so far.

A major concern, real or perceived, is the question of so called carbon leakage or international competitiveness. Global warming is caused by GHG emissions, and it does not matter where these take place. Efforts to reduce emissions, for example in a small and open economy like Norway, may be undermined or even completely sterilized by increasing activities and GHG emissions elsewhere.

Furthermore, model-based analysis has shown that although most countries would achieve benefits from taking domestic action against climate change, some would gain much less than others see Bosetti et.al. (2009). This concern is particularly strong among energy-intensive industries like chemicals, metal products, iron and steel, paper and non-metallic mineral industries like the cement industry.

The most common political economy measure used so far to counter the international competitiveness challenge has been to exempt trade-exposed, energy-intensive industries from the application of carbon taxes or emission trading systems. However, this is not a long term solution to a short term political economy problem. Analysis has shown that exempting energy-intensive industries from such policy instruments could raise the global cost of achieving a given emission-reduction target by as much as 50 per cent.

Another measure to meet political economy concerns has been the free allocation of permits, as in the EU-ETS and Norwegian-ETS systems. The main drawback over time of such exemptions is that the competitiveness concern is only addressed at the expense of incentives to reduce the production of carbon-intensive goods, and in addition governments forego significant revenues.

In the longer term it therefore seems clear that bilateral, regional or global agreements and rules of the game seem necessary to overcome the resistance to structural changes from the above mentioned industries, and in order to accelerate the transition towards low-carbon economies in a reasonable cost-efficient way.

8 Implementation. Effective Institutional Arrangements for Green Growth

Specific steps for enhancing institutional capacity to develop and implement green growth policies will depend on whether existing and regular national economic – and development planning processes may be used, or whether new ones have to be established. In all cases, the goal should be to integrate green growth into policy processes at the highest level, rather than create stand-alone policy documents or agencies. A more coordinated policy process will be needed.

Green growth policies include macro – and structural economic policies, energy – and environmental policies, transport – and infrastructure policies and innovation policies. In most countries the political responsibilities for these policies are divided between Ministries of Finance – and Economy and a number of line ministries. Ministries of Environment are relatively young compared to most other ministries, and their position is still often rather weak. For example, most policy instruments to combat climate change are the formal responsibilities of other ministries.

There is no “one size fits all” solution to institutional inertia to develop and implement green growth policies. In this Policy Note I will limit myself to illustrations of two cases where economic – and planning policies to a considerable extent presently are coordinated centrally within one agency.

In China the Planning Commission has a strong position and wide responsibilities – including climate change policies. They prepare five-year plans, the most recent one being Chinas 12th Five-Year Plan which was approved in March 2011 at the annual meeting of the National People`s Congress (NPC).

This plan places high priority on both climate change and other environmental – and energy issues. Binding targets for a range of these issues include:

- Farmland reserves;
- Decrease in water consumption per unit of value added industrial output;
- Increase of non- fossil fuel usage in primary energy consumption;
- Decrease in energy consumption per unit of GDP;
- Decrease in CO₂ emissions per unit of GDP.

To reach these targets without sacrificing economic growth, the Chinese government is emphasizing a more sustainable development trajectory over the next five years. Thus the government sets a slower 7 per cent annual GDP growth as an aspirational target for quality and the sustainability of economic growth.

Norway, which has a long central planning tradition going back to the late 1940s, abandoned formal plans as recently as 2005 as the last Long Term Plan (Langtidsprogrammet) was presented to the Parliament in 2001. This has been replaced by a White Paper on Long Term Perspectives, the most recent one being presented to the Parliament in 2009. The next one from the present government is expected in early 2013.

The Norwegian Ministry of Finance has rather broad responsibilities including macro – and structural economic policies, budget – and tax policies and financial market policies. Furthermore, this ministry has been heavily involved in environmental – and climate polices for the last twenty years.

In a Norwegian Official Research Paper, NOU 1996:9 Green Taxes. Policies for a Better Environment and High Employment, The Green Tax Commission more than 15 years ago presented a blueprint for green growth. Their proposals included how to make tax systems greener, how environmental considerations on a regular yearly basis should be included in the yearly fiscal expenditure budgets, and how environmental considerations in general – and climate measures in particular - could be integrated into energy –, infrastructure - and other sector policies. If there is political will to establish a more systematic and comprehensive Norwegian green growth strategy, many of these proposals could be used as a point of departure.

The Norwegian National Budget, a yearly White Paper presented by the government to the Parliament on economic policies for the coming period, now contains statements on climate policies as one of ten main elements of economic policies. In The National Budget for 2012, White Paper no. 1 (2011-2012), there is also a chapter on sustainable development and life quality. Norway is the only OECD country where the Ministry of Finance coordinates work on sustainable development.

This White Paper enumerates a number of policy measures taken since 2007 which all would be important elements in a national green growth policy framework including:

- Norway has since 2008 participated fully in the EU ETS system. When process industries are included in this system from 2013, 80 per cent of Norwegian GHG emissions will have price on CO₂;
- CO₂ taxes were introduced in Norway in 1991, and domestic air traffic has had a CO₂ tax since 1999. From 2012 air traffic will be included in a separate EU ETS system, so that also international flights in and out of Norway will have a price on CO₂;
- For the period 2007-2012 around NOK 10 billion has been spent by the Central Government on CCC-projects and research on renewable energy. A new fund for diffusion of green technologies has a budget frame of NOK 500 million for the period 2011-2013;
- Government appropriations for low-carbon transport such as train development and other collective transport have been increased significantly.

For more details, see the National Budget for 2012, Box 3.8, page 97.

Even if the institutional and formal conditions exist for establishing a coherent and fairly comprehensive green growth strategy in Norway, in reality there is presently insufficient coordination of policies – notably regarding transport – innovation and energy - environmental policies. Without reintroducing formal four-year plans, which during the 1980s and 1990s had less and less de facto influence on actual policies, the next White paper on Long Term Perspectives – due early in 2013 – could review and analyze in a more consistent and comprehensive manner than presently the most important challenges and policy elements in a long term Green Growth Strategy for the Norwegian economy to become carbon neutral by 2050.

9 Conclusions

In the longer term we face the following twin challenges:

- Expanding the opportunities for a growing global population and reducing poverty in developing countries;
- Addressing energy - and environmental pressures – notably climate change – that, if left unaddressed, would undermine economic growth and development in the longer term.

Absolute decoupling is defined as the ability to combine a growing GDP while negative environmental impacts are kept stable or declining. For example, growth in GDP is combined with declining use of energy and decreasing GHG emissions. Relative decoupling is defined as growing energy use and increasing GHG emissions, but they grow less than GDP so that GDP per unit of energy declines.

Over recent decades, OECD countries have been able to achieve an absolute decoupling between GDP growth and emissions of certain acidifying substances such as SO_x and NO_x. However, OECD countries were only able to achieve relative decoupling between GDP growth and energy use and GHG-emissions which have continued to rise absolutely during the last decade. Indeed, in many areas environmental pressures have continued to rise as economies grow still largely on relatively high-carbon path.

Almost twenty years of international negotiations under the auspices of the UN Framework Convention has so far achieved little, and the Durban (COP 17) road map envisages at best legally binding policy measures by 2020. Thus one has to look for alternative ways to enhance the transition towards low-carbon growth.

At the same time, the US and a number of European countries still struggle economically and financially in the aftermath of the 2008 global financial crisis. In these countries budgets are cut in the short run in order to achieve sustainable public finances and levels of debt in the longer term.

A green growth strategy, being a bottom up approach based on the actual different national circumstances, economic abilities and political preferences, may therefore be a more realistic and doable policy framework to get us out of the present impasse. The EU economies and the US will recover, and then there will be opportunities for policies to enhance green growth during the recovery period. Chinas present 5-year plan starting in 2012 may be said to be a plan for green growth, and the Norwegian government could present a green growth blueprint for the Norwegian economy to become carbon neutral in 2050 in the forthcoming White Paper on Long Term Perspectives.

Although not discussed in this paper, stronger efforts to adapt to global warming and a number of negative environmental consequences should be an important element in all national plans and policy strategies for the medium – and longer term.

While policies to pursue green growth based on national economic prospects and preferences may be the most realistic approach for many countries during a probable economic recovery in the near – and medium term , it is unlikely that relative decoupling of future GDP growth from energy use, GHG emissions and other harmful environmental consequences will be sufficient conditions for the global economy to avoid crossing critical local, regional and global environmental thresholds in the longer term. In other words, policies for green growth may be the most practical political-economy framework to move us in the right direction, but most economic analyses show that a “Global Green New Deal” may be necessary in the longer term to combine ongoing global growth in population and GDP with containing the

resulting environmental pressures. Such a deal containing enhanced international cooperation and regional and global rules of the game should include:

- Developing and linking emission trading systems (ETS) in order to secure stable and well- functioning markets for carbon;
- Provide a strong commitment to pricing carbon across all sectors and regions in order to trigger follow-up investments by the private sector and strengthen incentives to invest in technologies and processes that lock in low-carbon production;
- Supporting clean technology markets;
- Reduce subsidies of energy- and carbon use which presently are very large, especially in a number of developing countries.

G-20 countries account for roughly two thirds of world`s population and three quarters of global gross national product, energy consumption and GHG emissions. It is hoped that this group, supported by EU and EEA countries, will see it in their long term interest to strike such a global deal for low-carbon growth as the world economy recovers.

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11 Annex . Possible Policies to Address Green Growth Constraints.

A range of policy options are available to address constraints to green growth. These are summarized in Table 1. These options will vary according to levels of economic development, institutional capacity, the economic situation and the possibilities for investing in green growth in coming years, and national political preferences and objectives.

Policy initiatives should, in general, be designed on the basis of the following criteria:

- Cost-effectiveness;
- Adoption and compliance incentives;
- Ability to cope with uncertainty and provide clear and credible signals to investors.

Key issues in improving the policy framework for green growth include:

- Are key domestic economic-, fiscal and sectoral policies (especially in the transport, energy, agriculture, trade, investment and development assistance domains) subject to a systematic review of their harmful and beneficial environmental consequences?
- Are opportunities for improved co-ordination between environmental, sectoral and economic policies periodically explored, at both the national and sub-national levels?
- Could existing national planning- and policy processes be used to more systematically and comprehensively present consistent national blueprints for green growth and the longer term transition towards low-carbon economies?

| Green growth constraints | Policy options |
|---|--|
| Inadequate infrastructure | <ul style="list-style-type: none"> • Taxes • Tariffs • Transfers • Public-private partnerships |
| Low human and social capital and poor institutional quality | <ul style="list-style-type: none"> • Taxes • Subsidy reform/removal |
| Incomplete property rights, subsidies | <ul style="list-style-type: none"> • Review and reform or remove |
| Regulatory uncertainty | <ul style="list-style-type: none"> • Set targets • Create independent governance systems |
| Information externalities and split incentives | <ul style="list-style-type: none"> • Labelling • Voluntary approaches • Subsidies • Technology and performance standards |
| Environmental externalities | <ul style="list-style-type: none"> • Taxes • Tradable permits • Subsidies |
| Low returns on R&D | <ul style="list-style-type: none"> • R&D subsidies and tax incentives • Focus on general-purpose technologies |
| Network effects | <ul style="list-style-type: none"> • Strengthen competition in network industries • Subsidies or loan guarantees for new network projects |
| Barriers to competition | <ul style="list-style-type: none"> • Reform regulation • Reduce government monopoly |

Table 1. Possible policies to address green growth constraints