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**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN  
PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL  
COMMITTEE AND THE COMMITTEE OF THE REGIONS**

**Analysis of options to move beyond 20% greenhouse gas emission reductions and  
assessing the risk of carbon leakage**

**Background information and analysis**

**Part I**

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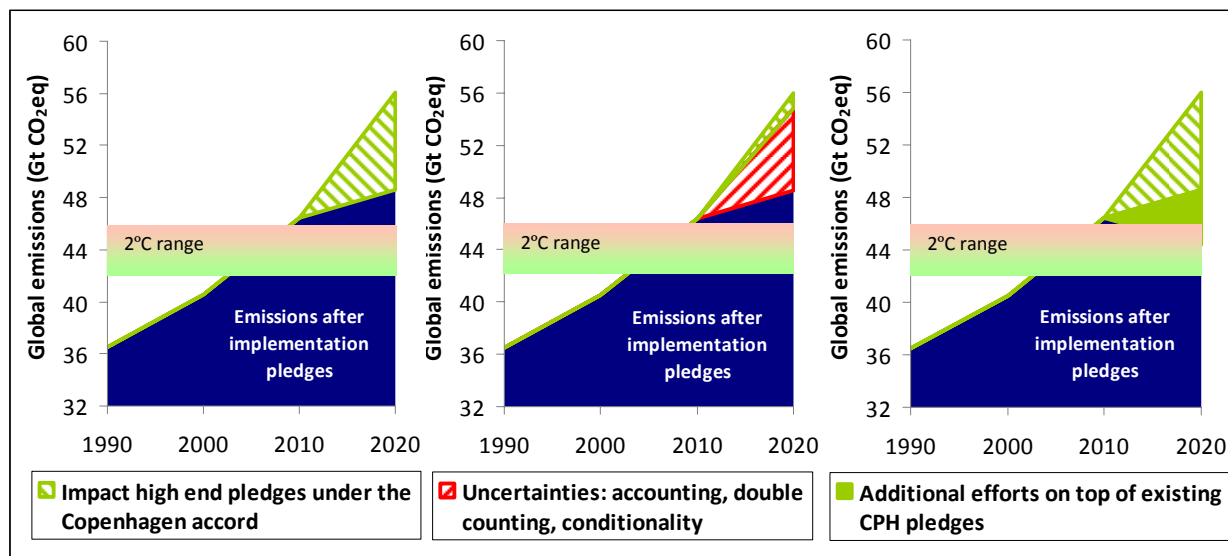
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## 1. THE COPENHAGEN ACCORD AND THE 2° CELSIUS TARGET

Provided that all high end pledges put forward by countries under the Copenhagen Accord would be fully implemented, the world could bridge a major part of the required efforts by 2020 in order to keep average global temperature increase below 2°C (see left graph in Figure 1). In this highly optimistic case, global peaking would be possible and, given sufficient efforts by all, could even come sooner than many expected.

**Figure 1: Three perspectives on the Copenhagen outcome**



Source : MNP

However, the Copenhagen Accord does not yet give certainty that these reduced emission levels will be actually accomplished. Most high end targets are conditional on others taking similar action, on a legally binding international agreement or on the need for further international financial or technical support making their degree of implementation uncertain. Furthermore possible double counting of targets and pledges through the carbon market and the issues related to surplus Assigned Amount Units and LULUCF accounting could further weaken the ambition level.

Adding all these uncertainties up would result in a much bleaker picture with emissions almost back to business as usual (see middle graph, Figure 1). This underlines the importance for the international negotiations to enlist the high developed country pledges and to register developing country actions through a formal decision, including transparent and robust methods to account for these.

Furthermore, negotiations need to explore how actions and targets could be increased beyond those at present on the table. Developed countries should explore how to increase their targets to be consistent with the required overall reduction of 25 to 40% below 1990 by 2020. Together with a further increase of developing countries pledges that should match at least a 15% deviation from baseline, only this would result in reductions compatible with a 2°C objective (see right graph, Figure 1).

Opportunities for this exist. For instance, proposed actions to address deforestation will not lead to a halving of gross deforestation by 2020. Many actions will require swift support, demonstrating the need for a rapidly operational registry to effectively mobilise support. Also international aviation and maritime transport should contribute through a global instrument. In addition, a number of countries are ready to take firm action to reap domestic co-benefits but do not want to commit to the same action internationally.

## **2. AN ASSESSMENT OF THE MERITS AND DRAWBACKS OF ALTERNATIVE LEGAL FORMS FOR AN INTERNATIONAL AGREEMENT**

An assessment of the merits and drawbacks of alternative legal forms for an international agreement for the period post-2012, including of a second commitment period under the Kyoto Protocol, concludes that an international legal framework which builds on the essential elements of the Kyoto Protocol should remain the EU's preferred outcome of the international negotiations. Although a second commitment period under the Kyoto Protocol should not be ruled out, there are a number of important issues, including the carry-over of surplus emission budgets and the accounting rules for land use, land-use change and forestry emissions from developed countries that must be addressed. Only this would enable the EU's participation in such a second commitment period, without it negatively affecting the integrity and ambition of EU legislation already in place. These practical concerns come in addition to the environmental imperative to ensure the participation of all key emitters in a future agreement in order to be able to deliver on the objective to remain below 2°C.

Importantly, the assessment also shows that the absence of an agreement on a second commitment period is not an obstacle for the continuation of the CDM. As both the Kyoto Protocol and its implementing decisions elaborating the CDM remain in force after 2012, the legal foundations for the CDM stay intact. Administrative and institutional support for the CDM is provided post-2012, as the instrument is self-funding through a charge on credits before they are issued to investors. Most importantly, the absence of internationally agreed developed country targets is unlikely to affect the demand for the CDM, as already today this demand is mostly driven through domestic legislation. Currently, transactions under the EU ETS account for more than 70 % of the total value of the international carbon market. The CDM accounts for most of the remainder, with the large majority of the demand coming from the EU. The EU climate and energy package has ensured the continued use of credits post-2012. Domestic emissions trading systems that are under development outside the EU also foresee the recognition of international credits.

## **3. ACCELERATED GREEN TECHNOLOGICAL CHANGE IN A WORLD OF GLOBAL COMPETITION**

There is now a widespread consensus that the development of climate friendly and resource-efficient policies and green low carbon technologies will be a major driver of growth. The following section first briefly describes the current situation of green jobs in Europe. This is followed by a description of Europe's position in the low carbon technology market. Then policy responses to the economic crisis and in particular the clean energy component of stimulus packages are analysed.

*Current situation of green jobs in Europe*

Numerous studies quantify and describe the trend in green job growth in Europe. The EU's eco-industry is estimated to be growing at a rate of 7 or 8% per annum<sup>1</sup>, which is considerably faster than in other sectors. It is also faster than past estimates of the growth of 2% only. Employment in the eco-industry reached 3.4 million in 2008. Eco-industry in this context was defined as: air pollution control, collection and treatment of waste and sewage, renewable energy and recycling. Ecorys (2009) outlines the manner in which the combination of environmental policy, regulation and public awareness have affected industries such as the automotive and transport sectors, energy intensive industries, electronics industry and the energy supply sector. The developments in these sectors have, in turn, been strong drivers for employment in eco-industry sub-sectors, notably the environmental technology, recycling and renewable energy subsectors<sup>2</sup>. The study GHK (2007) pays particular attention to the multiplier effects of environment related activities<sup>3</sup>. The employment multiplier describes the jobs directly and indirectly linked to the eco-industry as a ratio to those directly created in the eco-industry. The study finds multipliers of between 1.3 and 1.9 across the 27 Member States<sup>4</sup>. An overview of recent studies is given in the Employment in Europe 2009 report<sup>5</sup>.

### *Europe's position in green technology competition*

The global market for green technologies is estimated in a recent study at a volume of €1400 billion in 2007. Energy efficiency and environmentally friendly power generation and storage contribute about half of this volume and are projected to more than double by 2020, reaching a volume of €1645 billion by 2020<sup>6</sup>.

Investment in sustainable energy has multiplied in the last decade. According to UNEP/NEF (2009), global annual new investment (public and private) in renewable energy and energy efficiency grew from \$7.1 billion in 2002 to \$118.9 billion in 2008. Investments within Europe (around \$50 billion) and North America (\$30 billion) continue to make up the bulk of sustainable energy investment, comprising two-thirds of global investment in 2008. However, new investments in particular in China have grown rapidly, reaching \$15.6 billion in 2008<sup>7</sup>.

These industries are rapidly becoming globalised business sectors with industrial players competing at a world scale, while exploiting local and regional competitive opportunities to

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<sup>1</sup> Ecorys (2009) Study on the competitiveness of the EU eco-industry [http://ec.europa.eu/enterprise/newsroom/cf/document.cfm?action=display&doc\\_id=5416&userservice\\_id=1&request.id=0](http://ec.europa.eu/enterprise/newsroom/cf/document.cfm?action=display&doc_id=5416&userservice_id=1&request.id=0)

<sup>2</sup> Ecorys (2009) [http://ec.europa.eu/enterprise/newsroom/cf/document.cfm?action=display&doc\\_id=5416&userservice\\_id=1&request.id=0](http://ec.europa.eu/enterprise/newsroom/cf/document.cfm?action=display&doc_id=5416&userservice_id=1&request.id=0)

<sup>3</sup> GHK (2007) Links between the environment, economy and jobs [http://ec.europa.eu/environment/enveco/industry\\_employment/pdf/ghk\\_study\\_wider\\_links\\_summary.pdf](http://ec.europa.eu/environment/enveco/industry_employment/pdf/ghk_study_wider_links_summary.pdf)

<sup>4</sup> The spread of multipliers was not related to the GDP of the member states, but rather to the structure of the national economy. Multipliers were higher where environmental activities require inputs from a wide range of sectors.

<sup>5</sup> European Commission, Directorate-General for Employment, Social Affairs and Equal Opportunities: Employment in Europe 2009, in particular chapter 3; <http://ec.europa.eu/social/main.jsp?langId=en&catId=113&newsId=642&furtherNews=yes>

<sup>6</sup> Federal Ministry for the Environment, Nature Conservation and Nuclear Safety: GreenTech made in Germany 2.0, 2009. [http://www.bmu.de/files/pdfs/allgemein/application/pdf/greentech2009\\_en.pdf](http://www.bmu.de/files/pdfs/allgemein/application/pdf/greentech2009_en.pdf)

<sup>7</sup> United Nations Environment Programme/ New Economy Finance, Global Trends in Sustainable Energy Investment 2009. Analysis of Trends and Issues in the Financing of Renewable Energy and Energy Efficiency.

build-up their R&D and manufacturing capacity. Moreover, studies indicate that in particular photovoltaics are relatively labour-intensive. For e.g. Renner (2008) finds an average employment over life of 7 to 11 jobs per megawatt of average PV capacity compared to 1 to 3 jobs for other energy technologies<sup>8</sup> While these offers opportunities for increasing green jobs everywhere in the world, countries are competing to attract a high share of new investment and green jobs in these growth sectors. Developing and maintaining knowledge and know-how in such new lead markets internally is a precondition for continued export successes even if product life cycles also apply for these markets<sup>9</sup>.

While the EU has taken a head start, it will need to step up efforts to retain its leadership. The adoption of the Renewable Energy Directive with the mandatory 20% target, the provision of a carbon price signal through the ETS, and the European Strategic Energy Technology Plan (SET-Plan) show Europe's determination to do so. But since this decision, conditions have changed, and so has competition. From the policy side, increased R&D support, the development of smart grids, upgrading transmission systems, and overall attractive investment conditions are essential pre-conditions to succeed in the coming decade.

#### *An automotive sector in transition*

While being an established industry for decades, the automotive sector is equally undergoing rapid change. More than 2.2 million people are employed directly in the manufacture of motor vehicles and components in Europe. In the future, its success will be determined by its ability to lead technological developments towards fuel efficient and low carbon cars, while at the same time providing affordable access to mobility for European citizens and companies in the light of increasing risks of oil price hikes. Here as well, the EU has taken a regulatory head-start in order to reduce CO<sub>2</sub> emissions of new cars to 130g/km by 2015 and 95g/km by 2020. In 2008, already 17% of all new cars sold in the EU emitted less than 120g/km, and for some Member States the market share of such cars was already above 25%.

The first plug-in hybrids appear on the market and many producers announce such models for the next years. Several countries in the EU, including Spain, Denmark, Portugal and France, are taking initiatives to facilitate the introduction of electric vehicles on their market. A gradual increase of hybrid and electric vehicles could have profound consequences for the competitive situation of automotive producers and the related supply chain. This poses a particular opportunity for Europe with its 500 million consumers, provided it can respond more quickly than its competitors to the profound challenges in terms of standardisation, provision of infrastructure, increased low-carbon electricity generation and the right incentives for early deployment, as well as in R&D for key enabling technologies such as batteries, where other regions in the world are leading.

#### *Efficiency remains the first choice for saving energy and reducing CO<sub>2</sub> emissions.*

While old incandescent light bulbs are being phased out, reducing greenhouse gas (GHG) emissions by 15 million tonnes by 2020, new technologies are emerging that are much more efficient and environmentally sound than "conventional" energy saving lamps. A set of efficiency requirements for a wide range of products have been adopted through the Eco-

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<sup>8</sup> Michael Renner. Green Jobs. Towards sustainable work in a low carbon world. January 2008

<sup>9</sup> See also the Lead Market Initiative for Europe and related analyses, <http://ec.europa.eu/enterprise/policies/innovation/policy/lead-market-initiative/>

design Directive. In preparation of the review of the CCS Directive, the Commission is undertaking a study on the costs of CO<sub>2</sub> emissions performance standards for power stations. Throughout Europe, Governments are tightening performance standards for buildings and citizens have become much more responsive to apply energy-savings measures in their homes than they were 10 years ago. Among others, this is a result of the introduction of specific legislation following the requirements of the Energy Performance of Buildings Directive (EPBD), increased consumer awareness, better information about the energy performance of products for example due to labelling, and declining prices for energy efficient products because of economies of scale. The recast EPBD will provide additional impetus to improve the energy performance of buildings. Still, much remains to be done to reach the objective to 20% energy savings by 2020. Green public procurement should play a greater role. Refurbishing the existing building stock towards the needs of the 21<sup>st</sup> century will remain the major challenge, but one that can bring substantial employment benefits in the construction sector and which will reduce the energy cost of EU citizens.

#### *Carbon capture and storage demonstration coming up*

On carbon capture and storage, the EU has taken important steps forward through the adoption of a single legal framework for the safe geological storage of CO<sub>2</sub> and by putting in place financial support schemes for the first demonstration projects, through the European Energy Programme for Recovery<sup>10</sup> and the planned allocation of parts of the 300 million EU Allowances set aside from the New Entrants' Reserve of the EU Emission Trading Scheme (ETS)<sup>11</sup>. A range of companies are now preparing demonstration projects throughout the EU, so as to promote public acceptability and to enable commercial viability as early as 2020. For this to happen, it will be essential for the EU ETS to provide a sufficient long term carbon price signal. This would allow coal to remain a secure energy source in the EU's energy mix.

#### *Green stimulus packages as response to the economic crisis*

The current crisis has spurred governments to kick-start efforts towards a greener economy through their economic recovery packages. The stimulus measures put in place include public investments in green infrastructure, including public transport, low-carbon energy production, smart electricity grids, clean energy related R&D and ecosystem-based approaches to maintain or restore natural carbon sinks and stores, with the aim to combine short term economic signals, job creation, and long term sustainable growth.

In addition to national programmes, the EU is spending, as part of the European Economic Recovery Plan €4 billion on energy infrastructure projects, off-shore wind electricity generation and demonstration of carbon capture and storage. In addition, €1.5 billion were freed up in the Community budget for three technology development initiatives, two of them focusing on clean technologies for cars and construction, adding to the other EU cooperative research projects conducive to a low-carbon society funded so far under the 7<sup>th</sup> RTD Framework Programme<sup>12</sup>.

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<sup>10</sup> COM(2009)35 of 28.01.2009

<sup>11</sup> Article 10a(8) of Directive 2003/87/EC. The EU Allowances are also to be used to support the demonstration of innovative renewable energy technologies.

<sup>12</sup> The share is calculated on the basis of data available from projects flowing from the calls in 2007 and 2008 attributed to climate change. For more information see <http://www.fp7-4-sd.eu>



Moreover, 300 million allowances, representing at current ETS carbon prices at least another € billion, have been earmarked in the EU ETS for supporting demonstration activities in innovative renewable technologies and carbon capture and storage. Finally, EU Heads of State and Government have declared that, as of 2013, at least half of the revenues from auctioning carbon allowances will be used to tackle climate change and adapt to its effects, which should lead to further necessary advances in innovation, technology deployment and emission reductions. There is no overall estimate for the green share or volume of all recovery programmes available<sup>13</sup>. A study by UNEP/NEF estimates the combined stimulus programmes related to sustainable energy from five major EU countries and at EU level at \$26 billion in total<sup>14</sup>.

### **Stimulus packages, low carbon growth and job creation outside the EU**

Many stimulus packages around the world contain important green elements. There are several comparative analyses which converge on the overall picture but vary considerably with regard to the numbers estimated<sup>15</sup>. According to UNEP/NEF, seven of the major non-EU economies included significantly higher stimulus measures for sustainable energy of in total \$157 billion in their economic stimulus plans announced in 2008 and 2009, 85% of which are to be spent between 2009 and 2011. These energy-related green stimuli account for around 6% of the total recovery packages announced – but the countries vary significantly in the clarity of their measures.

The American Recovery and Re-investment Act with an estimated total volume of \$787 billion contains according to UNEP around \$68 billion for clean energy investment, including smart grids, energy efficiency in buildings, local and State level renewable energy and energy efficiency efforts, and R&D on energy storage<sup>16</sup>, and in addition significant investment for carbon capture and storage (CCS). The US Council of Economic Advisors estimates the clean energy investment volume including railways, vehicles and fuel technologies to be \$90 billion, including also clean-energy related tax credit costs, and estimates on this basis based on macroeconomic modelling that cumulatively 720.000 job-years will be created or saved until end of 2012, of which around two thirds are direct clean energy jobs<sup>17</sup>.

All analyses converge that the Republic of Korea dedicates the highest share of its stimulus package to green growth measures, sometimes estimated as going beyond 80%. Also according to UNEP South Korea's package devotes with 20% the highest share of all major economies to sustainable energy. Late 2009, it presented a five year green growth investment programme to spend an additional \$60 billion over five years to cut carbon dependency. The

<sup>13</sup> For a detailed comparative analysis see European Commission, DG Environment NON-PAPER "GREEN ELEMENTS FROM MEMBER STATES' RECOVERY PLANS" and Annexes, [http://ec.europa.eu/environment/integration/recovery\\_plan.htm](http://ec.europa.eu/environment/integration/recovery_plan.htm)

<sup>14</sup> UNEP/NEF, Global Trends in Sustainable Energy Investment 2009.

<sup>15</sup> See e.g. Nick Robins, Robert Clover, Charanjit Singh: A Climate for Recovery, The colour of stimulus goes green, HSBC, February 2009; UNEP/NEF, Global Trends in Sustainable Energy Investment 2009; OECD: Green Growth : Overcoming the Crisis and Beyond, 2009.

<sup>16</sup> UNEP/NEF, Global Trends in Sustainable Energy Investment 2009.

<sup>17</sup> EXECUTIVE OFFICE OF THE PRESIDENT, COUNCIL OF ECONOMIC ADVISERS: THE ECONOMIC IMPACT OF THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009 SECOND QUARTERLY REPORT, JANUARY 13, 2010

<sup>18</sup> Edward Barbier.: How is the Global Green Deal Going. Nature 464, 832-833, April 2010.

Government forecasts the creation of up to 1.5 to 1.8 million jobs by 2020<sup>18</sup>.

China's stimulus package includes the largest green investment programme in absolute terms. A considerable part of the \$586 billion package relates to green investments, mainly in rail transport, grid improvements, energy efficiency, and waste and waste water treatment, sometimes estimated to reach 40%. The clean energy part is estimated by UNEP (2009) to be approximately \$67 billion.

However, green stimulus packages will only be effective if the supply of green-collar professionals with adequate green skills matches the demand. There will be need for both re-skilling and up-skilling, and education and trainings systems have to adapt to this challenges. The Commission has already developed some initiatives in this field, notably the initiative New Skills for New Jobs<sup>19</sup> that aims to facilitate better anticipation of skills need in the EU. Further to that, the importance of skills is also reflected in Europe 2020 strategy flagship initiative *An Agenda for new skills and jobs*.

### *Conclusion*

The analysis shows both the current leading role of Europe in green technology competition and the threats to the European potential for leadership in this domain, due to the dynamics of technological competition and to worldwide policy responses to the economic crisis. Well designed climate policy, including a sufficiently high and predictable carbon price, could contribute to foster technological change, innovation in green activities and green growth<sup>20</sup>. Increased R&D support, the development of smart grids, upgrading energy transmission systems, and overall attractive investment conditions are also important pre-conditions to succeed in the coming decade both on the world markets and in the transition to a low carbon economy.

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<sup>19</sup> See <http://ec.europa.eu/social/main.jsp?catId=822&langId=en>.

<sup>20</sup> For a recent overview see e.g. Philippe Aghion, David Hemous, Reinhilde Veugelers: No Green Growth Without Innovation. Bruegel Policy Brief, 23 November 2009