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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

A Roadmap for moving to a competitive low carbon economy in 2050

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1. EUROPE'S KEY CHALLENGES

The EU provides its Member States with a long-term framework for dealing with the issue of sustainability and the cross-border effects of phenomena that cannot be dealt with at the national level alone. Climate change has long been recognised as one such long-term shaping factor where coherent EU action is needed, both inside the EU and internationally.

The Commission recently proposed the Europe 2020 flagship initiative for a resource-efficient Europe[1] and within this framework it is now putting forward a series of long-term policy plans in areas such as transport, energy and climate change. This Communication sets out key elements that should shape the EU's climate action helping the EU become a competitive low carbon economy by 2050. The approach is based on the view that innovative solutions are required to mobilise investments in energy, transport, industry and information and communication technologies, and that more focus is needed on energy efficiency policies.

The Europe 2020 Strategy for smart, sustainable and inclusive growth includes five headline targets that set out where the EU should be in 2020. One of them relates to climate and energy: Member States have committed themselves to reducing greenhouse gas emissions (GHG) by 20%, increasing the share of renewables in the EU's energy mix to 20%, and achieving the 20% energy efficiency target by 2020. The EU is currently on track to meet two of those targets, but will not meet its energy efficiency target unless further efforts are made[2]. Hence, the priority remains to achieve all the targets already set for 2020.

In order to keep climate change below 2ºC, the European Council reconfirmed in February 2011 the EU objective of reducing greenhouse gas emissions by 80-95% by 2050 compared to 1990, in the context of necessary reductions according to the Intergovernmental Panel on Climate Change by developed countries as a group[3]. This is in line with the position endorsed by world leaders in the Copenhagen and the Cancun Agreements. These agreements include the commitment to deliver long-term low carbon development strategies. Some Member States have already made steps in this direction, or are in the process of doing so, including setting emission reduction objectives for 2050.

Together with the White Paper on Transport and the Energy Efficiency Plan, this Communication is a key deliverable under the Resource Efficiency Flagship. It presents a Roadmap for possible action up to 2050 which could enable the EU to deliver greenhouse gas reductions in line with the 80 to 95% target agreed. It outlines milestones which would show whether the EU is on course for reaching its target, policy challenges, investment needs and opportunities in different sectors, bearing in mind that the 80 to 95% reduction objective in the EU will largely need to be met internally.

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1 COM(2011) 21, see: http://ec.europa.eu/resource-efficient-europe

2 Energy Efficiency Plan - COM(2011) 109.

3 Taking into account necessary efforts from developing countries, this will allow a global reduction of 50% in emissions by 2050.

2. MILESTONES TO 2050

The transition towards a competitive low carbon economy means that the EU should prepare for reductions in its *domestic* emissions by 80% by 2050 compared to 1990[4]. The Commission has carried out an extensive modelling analysis with several possible scenarios showing how this could be done, as explained in the box below.

This analysis of different scenarios shows that domestic emission reductions of the order of 40% and 60% below 1990 levels would be the cost-effective pathway by 2030 and 2040, respectively. In this context, it also shows reductions of 25% in 2020. This is illustrated in Figure 1. Such a pathway would result in annual reductions compared to 1990 of roughly 1% in the first decade until 2020, 1.5% in the second decade from 2020 until 2030, and 2 % in the last two decades until 2050. The effort would become greater over time as a wider set of cost-effective technologies becomes available.

Modelling approach for the 2050 roadmap

The results and findings presented in this Communication are based on a comprehensive global and EU modelling and scenario analysis on how the EU could shift towards a low-carbon economy by 2050 against the backdrop of continued global population growth, rising global GDP and varying global trends in terms of climate action, energy and technological developments.

A set of global projections were used to look at global impacts of climate action, how it relates to the energy sector, agriculture and deforestation. Furthermore, impacts on the EU's competitive sectors were projected to assess the possible risks of ambitious actions in the context of fragmented global action on climate.

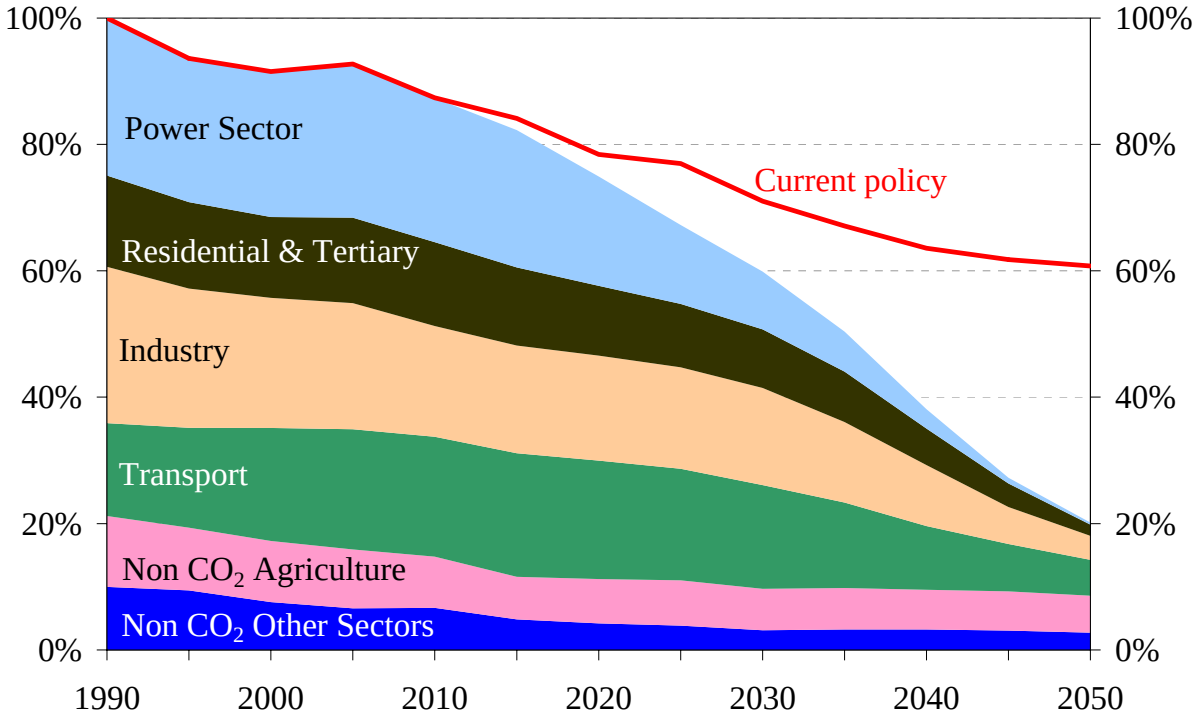
Detailed EU projections were made within a wide set of potential future scenarios, focussing on the sensitivity regarding assumptions on global fossil fuel price developments and rate of technological innovation to analyse the sectoral contribution, including from agriculture and other land uses. While there are always uncertainties relating to long term projections, results have been made more robust by developing a wide set of scenarios with different assumptions.

Future modelling improvements could consider better representation of the impacts of climate change itself, as well as energy storage and smart grid solutions for distributed generation.

Figure 1 illustrates the pathway towards an 80% reduction by 2050, shown in 5 year steps. The upper "reference" projection shows how domestic greenhouse gas emissions would develop under current policies. A scenario consistent with an 80% domestic reduction then shows how overall and sectoral emissions could evolve, if additional policies are put in place, taking into account technological options available over time.

[4] Domestic meaning real internal reductions of EU emissions and not offsetting through the carbon market.

Figure 1: EU GHG emissions towards an 80% domestic reduction (100% =1990)



Emissions, including international aviation, were estimated to be 16% below 1990 levels in 2009. With full implementation of current policies, the EU is on track to achieve a 20% domestic reduction in 2020 below 1990 levels, and 30% in 2030. However, with current policies, only half of the 20% energy efficiency target would be met by 2020.

If the EU delivers on its current policies, including its commitment to reach 20% renewables, and achieve 20% energy efficiency by 2020, this would enable the EU to outperform the current 20% emission reduction target and achieve a 25% reduction by 2020. This would require the full implementation of the Energy Efficiency Plan[5] presented together with this Communication, which identifies measures which would be necessary to deliver the energy efficiency target. The amount of currently allowed offsets would not be affected.[6]

The analysis also shows that a less ambitious pathway could lock in carbon intensive investments, resulting in higher carbon prices later on and significantly higher overall costs over the entire period. In addition, R&D, demonstration and early deployment of technologies, such as various forms of low carbon energy sources, carbon capture and storage, smart grids and hybrid and electric vehicle technology, are of paramount importance to ensure their cost-effective and large-scale penetration later on. Full implementation of the Strategic Energy Technology plan, requiring an additional investment in R&D and demonstration of € 50 billion over the next 10 years, is indispensable. Auctioning revenue and cohesion policy are financing options that Member States should exploit. In addition, increasing resource efficiency through, for instance, waste recycling, better waste management and behavioural

5 Energy Efficiency Plan - COM(2011) 109.

6 As agreed by the emissions trading Directive 2003/87/EC (as amended by Directive 2009/29/EC) and the effort-sharing Decision (Decision 406/2009/EC).

change, as well as enhancing the resilience of ecosystems, can play an important role. Also, continued effort to strengthen research on climate mitigation and adaptation technologies will be required.

3. LOW CARBON INNOVATION: A SECTORAL PERSPECTIVE

The Commission's analysis has also explored pathways for key sectors. This analysis looked at a range of scenarios assuming different rates of technological innovation and different fossil fuel prices. They produced largely convergent results with respect to the magnitude of reductions needed in each sector in 2030 and 2050 as indicated by the ranges presented in Table 1. The development of sectoral policy options will have to go into greater depth on costs, trade-offs, and uncertainties.

Table 1: Sectoral reductions

GHG reductions compared to 1990	2005	2030	2050
Total	-7%	-40 to -44%	-79 to -82%
Sectors			
Power (CO_2)	-7%	-54 to -68%	-93 to -99%
Industry (CO_2)	-20%	-34 to -40%	-83 to -87%
Transport (incl. CO2 aviation, excl. maritime)	+30%	+20 to -9%	-54 to -67%
Residential and services (CO_2)	-12%	-37 to -53%	-88 to-91%
Agriculture (non-CO_2)	-20%	-36 to -37%	-42 to -49%
Other non-CO_2 emissions	-30%	-72 to -73%	-70 to -78%

A secure, competitive and fully decarbonised power sector

Electricity will play a central role in the low carbon economy. The analysis shows that it can almost totally eliminate CO_2 emissions by 2050, and offers the prospect of partially replacing fossil fuels in transport and heating. Although electricity will increasingly be used in these 2 sectors, electricity consumption overall would only have to continue to increase at historic growth rates, thanks to continuous improvements in efficiency.

The share of low carbon technologies in the electricity mix is estimated to increase from around 45% today to around 60% in 2020, including through meeting the renewable energy target, to 75 to 80% in 2030, and nearly 100% in 2050. As a result, and without prejudging Member States' preferences for an energy mix which reflects their specific national circumstances, the EU electricity system could become more diverse and secure.

A wide range of existing technologies will need to be widely deployed, including more advanced technologies, such as photovoltaics, that will continue to become cheaper and thus more competitive over time.

Energy specific scenarios and the means of achieving such decarbonisation, while ensuring energy security and competitiveness, will be examined in the Energy 2050 Roadmap. This will build on the established EU energy policy and the EU 2020 Strategy.

The EU ETS will be critical in driving a wide range of low carbon technologies into the market, so that the power sector itself can adapt its investment and operational strategies to changing energy prices and technology. For the ETS to play this role on the identified

pathway to 2050, both a sufficient carbon price signal and long-term predictability are necessary. In this respect, appropriate measures need to be considered, including revisiting the agreed linear reduction of the ETS cap[7]. Other tools, such as energy taxation and technological support may also be appropriate to ensure that the power sector plays its full part.

Given that the central role of electricity in the low carbon economy requires significant use of renewables, many of which have variable output, considerable investments in networks are required to ensure continuity of supply at all times[8]. Investment in smart grids is a key enabler for a low carbon electricity system, notably facilitating demand-side efficiency, larger shares of renewables and distributed generation and enabling electrification of transport. For grid investments, benefits do not always accrue to the grid operator, but to society at large (with co-benefits for consumers, producers, and society at large: a more reliable network, energy security and reduced emissions). In this context, future work should consider how the policy framework can foster these investments at EU, national and local level and incentivise demand-side management.

Sustainable mobility through fuel efficiency, electrification and getting prices right

Technological innovation can help the transition to a more efficient and sustainable European transport system by acting on 3 main factors: vehicle efficiency through new engines, materials and design; cleaner energy use through new fuels and propulsion systems; better use of networks and safer and more secure operation through information and communication systems. The White Paper on Transport will provide a comprehensive and combined set of measures to increase the sustainability of the transport system.

Up until 2025, the main driver for reversing the trend of increasing greenhouse gas emissions in this sector is likely to remain improved fuel efficiency. Emissions from road, rail and inland waterways could in fact be brought back to below 1990 levels in 2030, in combination with measures such as pricing schemes to tackle congestion and air pollution, infrastructure charging, intelligent city planning and improving public transport, whilst securing affordable mobility. Improved efficiency and better demand-side management, fostered through CO_2 standards and smart taxation systems, should also advance the development of hybrid engine technologies and facilitate the gradual transition towards large-scale penetration of cleaner vehicles in all transport modes, including plug-in hybrids and electric vehicles (powered by batteries or fuel cells) at a later stage.

The synergies with other sustainability objectives such as the reduction of oil dependence, the competitiveness of Europe's automotive industry as well as health benefits, especially improved air quality in cities, make a compelling case for the EU to step up its efforts to accelerate the development and early deployment of electrification, and in general, of alternative fuels and propulsion methods, for the whole transport system. In this respect, it is not surprising to see also automotive industries in the US, Japan, Korea and China increasing their investments in battery technology, electric vehicles and fuel cells.

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[7] Directive 2003/87/EC as amended by Directive 2009/29/EC foresees a linear reduction of the cap of 1.74 percentage points per year. This reduction is legally enshrined in the ETS and continues after 2020.

[8] See also Communication "Energy infrastructure priorities for 2020 and beyond – A blueprint for an integrated European energy network" - COM(2010) 677.

Sustainable biofuels could be used as an alternative fuel especially in aviation and heavy duty trucks, with strong growth in these sectors after 2030. In case electrification would not be deployed on a large-scale, biofuels and other alternative fuels would need to play a greater role to achieve the same level of emissions reduction in the transport sector. For biofuels this could lead, directly or indirectly, to a decrease of the net greenhouse gas benefits and increased pressure on bio-diversity, water management and the environment in general. This reinforces the need to advance in 2nd and 3rd generation biofuels and to proceed with the ongoing work on indirect land use change and sustainability.

The built environment

The built environment provides low-cost and short-term opportunities to reduce emissions, first and foremost through improvement of the energy performance of buildings. The Commission's analysis shows that emissions in this area could be reduced by around 90% by 2050, a larger than average contribution over the long-term. This underlines the importance of achieving the objective of the recast Directive on energy performance of buildings[9] that new buildings built from 2021 onwards will have to be nearly zero-energy buildings. This process has already started, with many Member States implementing stricter energy performance standards for buildings. On 4 February 2011 the European Council, taking account of the EU headline target, decided that from 2012 onwards all Member States should include energy efficiency standards in public procurement for relevant public buildings and services. By the end of 2011, the Commission will present a Communication on "Sustainable Construction" setting out a strategy on how to boost the competitiveness of this sector while improving its environmental and climate performance.

Efforts will need to be strengthened significantly over time. Today, new buildings should be designed as intelligent low- or zero-energy buildings. The extra cost of this can be recovered through fuel savings. A greater challenge, however, is the refurbishment of the existing building stock, and in particular how to finance the necessary investments. Some Member States are already pro-actively using structural funds. The analysis projects that over the next decade investments in energy-saving building components and equipment will need to be increased by up to € 200 billion. Several Member States have already implemented smart financing schemes, such as preferential interest rates for leveraging private sector investments in the most efficient building solutions. Other private financing models must be explored.

As in the transport sector, shifting energy consumption towards low carbon electricity (including heat pumps and storage heaters) and renewable energy (e.g. solar heating, biogas, biomass), also provided through district heating systems, would help to protect consumers against rising fossil fuel prices and bring significant health benefits.

Industrial sectors, including energy intensive industries

The Commission's analysis shows that GHG emissions in the industrial sector could be reduced by 83 to 87% in 2050. The application of more advanced resource and energy efficient industrial processes and equipment, increased recycling, as well as abatement technologies for non-CO_2 emissions (e.g. nitrous oxide and methane), could make a major contribution by allowing the energy intensive sectors to reduce emissions by half or more. As

[9] Directive 2010/31/EU.

solutions are sector-specific, the Commission sees a need to develop specific Roadmaps in cooperation with the sectors concerned.

In addition to the application of more advanced industrial processes and equipment, carbon capture and storage would also need to be deployed on a broad scale after 2035, notably to capture industrial process emissions (e.g. in the cement and steel sector). This would entail an annual investment of more than € 10 billion. In a world of global climate action, this would not raise competitiveness concerns. But if the EU's main competitors would not engage in a similar manner, the EU would need to consider how to further address the risks of carbon leakage due to these additional costs.

As the EU develops its climate policy framework, there will be a need to continue to monitor and analyse the impacts of these measures on the competitiveness of energy-intensive industries in relation to efforts by third countries, and to consider appropriate measures where necessary. The Commission's analysis confirms earlier findings that the current measures provide adequate safe-guards in the current context and notes the findings on options for addressing carbon leakage as set out in the Communication of May 2010, including on the inclusion of imports into the ETS[10]. The extent to which the existing, adequate safeguards are sufficient will continue to be kept under close review in relation to efforts by third countries. The Commission remains vigilant in order to maintain a strong industrial base in the EU. The Commission will continue to update the list of sectors at risk of carbon leakage as foreseen in the EU ETS Directive[11]. Clearly, the best protection against the risk of carbon leakage would be effective global action.

Raising land use productivity sustainably

The Commission's analysis shows that by 2050 the agriculture sector can reduce non-CO_2 emissions by between 42 and 49% compared to 1990. The sector has already achieved a significant reduction. More reductions are feasible in the next two decades. Agricultural policies should focus on options such as further sustainable efficiency gains, efficient fertiliser use, bio-gasification of organic manure, improved manure management, better fodder, local diversification and commercialisation of production and improved livestock productivity, as well as maximising the benefits of extensive farming.

Improved agricultural and forestry practices can increase the capacity of the sector to preserve and sequester carbon in soils and forests. This can be achieved, for instance, through targeted measures to maintain grasslands, restore wetlands and peat lands, low- or zero-tillage, to reduce erosion and allow for the development of forests. Agricultural and forestry are also providing the resources for bio-energy and industrial feedstocks, and this contribution is bound to increase further.

The above elements will be further addressed in the Common Agriculture Policy legislative proposals for 2013, of which the positive impacts have not yet been taken into account in the analysis, as well as the forthcoming Bio-economy Communication[12].

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10 COM(2010) 265.

11 Article 10a (13) of Directive 2003/87/EC as amended by Directive 2009/29/EC.

12 Commission Work Programme 2011, European Strategy and Action plan towards a sustainable bio-based economy by 2020.

After 2030, the rate of emission reductions in the agricultural sector could slow down, in part because of increased agricultural production due to the growing global population. However, it is important to note that, by 2050, agriculture is projected to represent a third of total EU emissions, tripling its share compared to today. Its importance in terms of climate policy is, therefore, set to increase: if it does not achieve the projected emissions reductions, other sectors would need to reduce even more, which would come at a high cost. The farming sector is also potentially at some risk of carbon leakage, so changes in production and trade patterns should not in the longer-term undermine global reduction of emissions.

The analysis also considers implications for the agricultural and forestry sector in a global perspective. In 2050, the world will have to feed around 9 billion people. At the same time, tropical forests will have to be preserved as an essential component of tackling climate change and preserving world biodiversity. In addition, mitigation efforts are expected to increase demand for bio-energy alongside existing and increasing demand for feed for animals, timber, paper production and bio-industries. The dual challenges of global food security and action on climate change need to be pursued together. In order to cope with these increased land use requirements in the EU and on a global scale sustainable increases in the productivity delivered by diverse agricultural and forestry systems (both intensive and extensive) will need to continue at rapid pace, not least in developing countries. Any negative impacts on other resources (e.g. water, soil and biodiversity) will need careful management. Accelerating climate change could endanger these productivity improvements in a world of insufficient action on climate change.

This also underscores the need to consider all land uses in a holistic manner and address Land Use, Land Use Change and Forestry (LULUCF) in EU climate policy. The Commission is preparing an initiative on this issue later this year. In addition, paper and wood products should be reused and recycled more to reduce pressure on land use.

The analysis took account of global trends towards a greater share of animal products in nutrition. Reversing existing trends of food waste and re-orienting consumption towards less carbon intensive food would be desirable.

4. INVESTING IN A LOW CARBON FUTURE

A major increase in capital investments

Various forms of low carbon energy sources, their supporting systems and infrastructure, including smart grids, passive housing, carbon capture and storage, advanced industrial processes and electrification of transport (including energy storage technologies) are key components which are starting to form the backbone of efficient, low carbon energy and transport systems after 2020. This will require major and sustained investment: on average over the coming 40 years, the increase in public and private investment is calculated to amount to around € 270 billion annually. This represents an additional investment of around 1.5% of EU GDP per annum on top of the overall current investment representing 19% of GDP in 2009[13]. It would take us back to the investment levels before the economic crisis. Investments today will determine the future competitiveness of economies. In this context, it is interesting to note the much larger shares of GDP allocated to investments in China (48%),

[13] Eurostat, National accounts.

India (35%), and Korea (26%) in 2009[14], showing emerging economies' need to build up infrastructure but also the potential in leapfrogging towards a competitive, low carbon economy.

Unlocking the investment potential of the private sector and individual consumers presents a major challenge. While most of this extra investment would be paid back over time through lower energy bills and increased productivity, markets tend to discount future benefits, and disregard long-term risks. A key question is, therefore, how policy can create the framework conditions for such investments to happen, including through new financing models.

In the implementation of the 20% energy efficiency target, the Commission will have to monitor the impact of new measures on the ETS in order to maintain the incentives in the ETS rewarding low carbon investments and preparing the ETS sectors for the innovations needed in the future. In this respect, appropriate measures need to be considered, including recalibrating the ETS by setting aside a corresponding number of allowances from the part to be auctioned during the period 2013 to 2020 should a corresponding political decision be taken. This would also ensure that the contribution to the energy efficiency target would be made in a cost efficient manner in both, the ETS and non-ETS sectors.

Additional public private financing mechanisms are key in order to overcome initial financing risks and cash flow barriers. Public finance through innovative financing instruments, such as revolving funds, preferential interest rates, guarantee schemes, risk-sharing facilities and blending mechanisms can mobilise and steer the required private finance, including for SMEs and consumers. In this way, limited public finance can leverage a multitude of private sector investments[15]. The European Investment Bank, the European Bank for Reconstruction and Development, as well as dedicated funding in the next Multi-Annual Financial Framework should play a role in providing additional financing for energy efficient and low carbon technologies.

Increasing domestic investments provide a major opportunity for increased productivity, added value and output from a wide range of EU manufacturing industries (e.g. automotive, power generation, industrial and grid equipment, energy–efficient building materials and the construction sector), which are key industries for the creation of future growth and jobs.

Beyond the reductions in greenhouse gas emissions, which are the key benefits of the shift to the low carbon economy, this transition will bring a number of other essential benefits.

Reducing Europe's energy bill and its dependency on fossil fuel imports

Taken over the whole 40-year period, it is estimated that energy efficiency and the switch to domestically produced low carbon energy sources will reduce the EU's average fuel costs by between € 175 billion and € 320 billion per year. The actual cost saving depends on the extent to which global action on climate change is undertaken. In a scenario of global climate action, less fossils fuel would need to be imported into the EU and the cost of what would still be imported would decline.

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14 World Bank, Indicators.

15 If it constitutes State aid, public funding should be in line with State aid compatibility rules.

If the rest of the world does not take coordinated action, however, a major benefit of EU action would be to protect the economy against high fossil fuel prices. The analysis, as well as the IEA World Energy Outlook 2010, clearly demonstrates that fossil fuel prices are indeed projected to be significantly higher in case of limited global action. This is not only a long-term issue. Even following the recession in the Western world, oil prices are about twice as high as in 2005. The IEA estimated that the EU has seen its import bill rise by $ 70 billion from 2009 to 2010, and that further rises in the foreseeable future are probable. As we experienced in the '70s and early '80s, oil price shocks can lead to inflation, increasing trade deficits, reduced competitiveness and rising unemployment.

In 2050, the EU's total primary energy consumption could be about 30% below 2005 levels. More domestic energy resources would be used, in particular renewables. Imports of oil and gas would decline by half compared to today, reducing the negative impacts of potential oil and gas price shocks significantly. Without action the oil and gas import bill could instead double compared to today, a difference of € 400 billion or more per annum by 2050, the equivalent of 3% of today's GDP[16].

New jobs

Investing early in the low carbon economy would stimulate a gradual structural change in the economy and can create in net terms new jobs both in the short- and the medium-term. Renewable energy has a strong track record in job creation. In just 5 years, the renewable industry increased its work force from 230 000 to 550 000. Also for the construction sector low carbon investment offers large short-term job opportunities. With some 15 million employees in the EU, it was particularly hard hit by the economic crisis. Its recovery could get a significant boost through a major effort to accelerate the renovation and building of energy efficient houses. The Energy Efficiency Plan confirms the large job creation potential from promoting investments in more efficient equipment.

In the longer-term, the creation and preservation of jobs will depend on the EU's ability to lead in terms of the development of new low carbon technologies through increased education, training, programmes to foster acceptability of new technologies, R&D and entrepreneurship, as well as favourable economic framework conditions for investments. In this context, the Commission has repeatedly emphasized the positive employment benefits if revenues from the auctioning of ETS allowances and CO_2 taxation are used to reduce labour costs, with the potential to increase total employment by up to 1.5 million jobs by 2020.

As industry takes advantage of the economic opportunities provided by the low carbon economy, the need to ensure a skilled work force, especially in the construction sectors, technical professions, engineering and research, becomes more pressing. This will require targeted vocational training of the existing work force towards "green-collar" job opportunities, addressing emerging skills bottlenecks and fostering these skills in education systems. The Commission is currently working on assessing the employment effects of greening the economy, for instance through the implementation of the Agenda for New Skills and Jobs.

Improving air quality and health

[16] The level of reductions in the bill for fossil fuel imports depend on future fossil fuel price developments and diversification of supply sources.

Action to reduce GHG emissions would importantly complement existing and planned air quality measures resulting in significantly reduced air pollution. Electrification of transport, and the expansion of public transport, could strikingly improve air quality in Europe's cities. The combined effect of GHG reductions and air quality measures would bring about more than 65% lower levels of air pollution in 2030 compared to 2005. In 2030, annual costs of controlling traditional air pollutants could be more than € 10 billion lower, and in 2050 close to € 50 billion could be saved every year. These developments would also reduce mortality, with benefits estimated up to € 17 billion per year in 2030, and up to € 38 billion in 2050. Moreover, public health would be improved, with a reduction in health care costs and damage to ecosystems, crops, materials and buildings. These gains will be important also in the light of the comprehensive review of the EU Air Quality Policy, foreseen for 2013 at the latest, where the aim is to maximise co-benefits with climate policy and minimise negative trade-offs.

5. THE INTERNATIONAL DIMENSION

The EU with little more than 10% of global emissions will not be able to tackle climate change on its own. Progress internationally is the only way to solve the problem of climate change, and the EU must continue to engage its partners. By formulating and implementing ambitious domestic climate change policies for more than a decade, the EU has brought many other countries on board. The situation today is fundamentally different than at the end of 2008 when the EU unilaterally adopted its Climate and Energy Package. At COP15 in Copenhagen, world leaders agreed that global average temperature should not rise more than 2°C. Today, countries representing more than 80% of global emissions have pledged domestic targets under the Copenhagen Accord and the Cancun agreements. For some countries, delivering on these pledges will require stronger action than currently envisaged.

This concrete action, sometimes more ambitious than what countries would be ready to commit to internationally, is driven to a significant extent also by other domestic agendas: to accelerate innovation, increase energy security and competitiveness in key growth sectors and reduce air pollution. A number of Europe's key partners from around the world, such as China, Brazil and Korea, are addressing these issues, first through stimulus programmes, and now more and more through concrete action plans to promote the "low carbon economy". Standstill would mean losing ground in major manufacturing sectors for Europe.

In the coming years, implementing these pledges will be a key step in globalising climate change policies. The EU should use this opportunity to strengthen its cooperation with its international partners, including to work towards a gradual development of global carbon markets to support efforts of developed and developing countries to implement low-emission development strategies, and ensure that all climate financing contributes to "climate proof" development opportunities.

However, swift implementation of the pledges made since Copenhagen would only achieve part of the reductions needed. A recent report by UNEP estimated that their full implementation would reach 60% of the required emission reductions until 2020. If no firm global action is taken against climate change, temperatures might increase by more than 2°C already by 2050, and more than 4ºC by 2100. In order to avoid this scenario, science indicates that by 2050 global greenhouse gas emissions need to be reduced by at least 50% compared to 1990. With the preparation of this Roadmap, the EU is taking a new initiative to stimulate

international negotiations in the run-up to Durban. In this way, the Roadmap is an integral part of a wider strategy to deliver on the objective to keep the global average temperature increase below 2ºC compared to pre-industrial levels. When cooperating with its partners, the EU should take a comprehensive approach intensifying bilateral and multilateral engagements on the broad range of aspects across sectors that touch upon climate policy.

6. CONCLUSIONS

The Commission's detailed analysis of cost-effective ways of reducing greenhouse gas emissions by 2050 has produced a number of important findings.

In order to be in line with the 80 to 95% overall GHG reduction objective by 2050, the Roadmap indicates that a cost effective and gradual transition would require a 40% domestic reduction of greenhouse gas emissions compared to 1990 as a milestone for 2030, and 80% for 2050. Building on what has already been achieved, the EU needs to start working now on appropriate strategies to move in this direction, and all Member States should soon develop national low carbon Roadmaps if not already done. The Commission is prepared to provide some of the necessary tools and policies.

Second, the analysis also shows that with existing policies, the EU will achieve the goal of a 20% GHG reduction domestically by 2020. If the revised Energy Efficiency Plan would be fully and effectively implemented meeting the 20% energy efficiency target, this would enable the EU to outperform the current 20% emission reduction target and achieve 25% reductions. This Communication does not suggest to set new 2020 targets, nor does it affect the EU's offer in the international negotiations to take on a 30% reduction target for 2020, if the conditions are right. This discussion continues based on the Commission Communication from 26 May 2010[17].

Third, as well as reducing the threat of dangerous climate change as part of ambitious global action, deep reductions in the EU's emissions have the potential to deliver benefits in the form of savings on fossil fuel imports and improvements in air quality and public health.

Fourth, the Roadmap gives ranges for emissions reductions for 2030 and 2050 for key sectors. To realise these milestones as cost-effectively as possible, and to maximise benefits for EU manufacturing industries, the implementation of the Strategic Energy Technology Plan is of crucial importance. Considering the important labour market implications, the New Skills and Jobs Agenda will need to support the transition process.

The Commission intends to use the Roadmap as a basis for developing sector specific policy initiatives and Roadmaps, such as the 2050 Energy Roadmap and the upcoming White Paper on Transport. The Commission will initiate the appropriate sectoral dialogues. The Commission will continue to ensure that the EU ETS remains a key instrument to drive low carbon investments in a cost-efficient manner. It will also remain attentive to the risk of carbon leakage in order to ensure a level-playing field for industry.

As part of the development of the next Multi-Annual Financial Framework, it will also examine how EU funding can support instruments and investments that are necessary to

[17] COM(2010) 265.

promote the transition to a low carbon economy, taking into account the specificities of sectors, countries and regions.

The Commission invites the other European institutions, Member States, candidate countries as well as potential candidates, and stakeholders to take this Roadmap into account in the further development of EU, national and regional policies for achieving the low carbon economy by 2050. Internationally, the Commission will present the 2050 Roadmap to its global partners in order to stimulate international negotiations working towards global action, and will foster cooperation with countries in the EU's neighbourhood on measures to promote a resilient low carbon economy.