ANNEX 4

THE OUTLOOK TO 2020 AND BEYOND TO 2050

1) The OECD Environmental Outlook to 2050[1]

By 2050, the Earth's population is expected to increase from 7 billion to over 9 billion. Coupled with expected higher living standards, global GDP is expected to quadruple, with growing demand for energy and natural resources. To feed a growing population with changing dietary preferences, agricultural land is projected to expand globally in the next two decades to match the increase in food demand. Without new policies, global energy demand is projected to increase by 80%, and the energy mix would remain virtually unchanged from today's with fossil energy still supplying 85%.[2] Without new green growth policies, continued degradation and erosion of natural environmental capital are expected to 2050, with the risk of irreversible changes that could endanger two centuries of rising living standards. The costs and consequences of inaction are significant, both in economic and human terms. The OECD Environmental Outlook to 2050 suggests that without more ambitious policies, by 2050:

- More **disruptive climate change** is likely to be locked in, with global GHG emissions projected to increase by 50%. Atmospheric concentrations could reach almost 685 ppm by 2050, resulting in the global average temperature increase of 3 to 6 degree Celsius by the end of the century[3].

- **Biodiversity loss** is projected to continue globally. The main pressures are land-use change and management (e.g. agriculture, urban sprawl), commercial forestry, infrastructure development, human encroachment and fragmentation of natural habitats, as well as pollution and climate change.

- **Global water demand** is projected to increase by some 55%, due to growing demand from manufacturing (+400%), thermal electricity generation (+140%) and domestic use (+130%). These pressures could imply water shortages that would hinder the growth of many economic activities.

[1] Environmental Outlook to 2050 (OECD, Paris, 2012)

[2] Other studies (such as IEA Technology Perspectives 2012) confirm this possible trend from business as usual, bringing the world on a path to 6 degree C global warming. Taking account of possible policy action currently under way, other IEA scenarios show a world, in which due to implementing some new policies and current climate pledges, climate change could be limited to 4 degrees. (IEA Energy Technology Perspectives, Pathways to a Clean Energy System, Paris 2012); The IEA 450 Scenario presented in the World Energy Outlook 2011, sets out an energy pathway consistent with the goal of limiting the global increase in temperature to 2°C by limiting concentration of greenhouse gases in the atmosphere to around 450 parts per million of CO2.

[3] The Intergovernmental Panel on Climate Change's Fourth Assessment Report (IPCC AR4) concluded in 2007 that based on available information, the equilibrium climate sensitivity (temperature increase as a result of a doubling of GHG concentrations) is likely to be in the range 2°C to 4.5°C, with a best estimate value of about 3°C. Values which are substantially higher than 4.5°C cannot be ruled out, but are unlikely. See also the Impact Assessment of the Roadmap for moving towards a low carbon economy (SEC(2011)288)

- The **health impacts** of urban air pollution will continue to worsen. Because of their ageing and highly urbanised populations, OECD countries are likely to have one of the highest premature death rates linked to ground-level ozone. The burden of disease related to exposure to hazardous chemicals falls more heavily in non-OECD countries.

The Environmental Outlook also highlights the linkages between different environmental issues, and the risk of passing irreversible "tipping points" (e.g. species loss, climate change, groundwater depletion, land and soil degradation).

The OECD's Green Growth Strategy provides a framework for the best policy mix.

(i) make pollution more costly than greener alternatives (with environmental taxes, emissions trading schemes to put a price on pollution),

(ii) better price the true value of natural assets and ecosystem services (e.g. water pricing, payments for ecosystem services),

(iii) devise proactive and effective regulations (e.g. standards for energy efficiency, to safeguard human health or environmental integrity);

(iv) remove environmentally harmful subsidies (e.g. to fossil fuels);

(v) encourage green innovation

(vi) ensure policy frameworks that incentivise green investments.

Ensuring policy coherence across sectors lies at the heart of a greener growth path. The Outlook also highlights the green growth potential from tackling these environmental challenges, including poverty alleviation, fiscal consolidation and job creation. Impact assessments can be a useful tool towards achieving policy coherence.

The *OECD Environmental Outlook to 2050* also makes a clear conclusion: if we do not take policy action to address the key environmental challenges, the costs of inaction to the economy and human wellbeing of over-use of natural resources, pollution and waste will be significant. Early action, that is well designed is often the optimal solution.

2) Looking back – the OECD's analysis of the period covered by the 6EAP

In 2001, Environment Ministers adopted the 'OECD Environmental Strategy for the First Decade of the 21st Century'. The fundamental objective was to maintain ecosystem integrity, particularly climate, biodiversity and water. Four other objectives were also established:

- decoupling environmental pressures from economic growth;
- improving information for decision-making;
- enhancing the interface of social and environmental policies;
- improving global environmental governance and cooperation.

The OECD reports that the objectives of the Strategy have not been fully achieved. In particular, we risk crossing environmental thresholds. However, there have been areas of progress:

- Advances in the scientific and economic understanding of climate change, biodiversity, and other key elements of global change science;
- Participation of a better informed citizenry in environmental policy;
- Use of more cost-effective policy instruments;

- Initiatives by cities and other sub-national levels of government;
- The beginnings of an international carbon market;
- An increase in the share of official development assistance allocated to the environment, particularly to support implementation of the Rio Conventions;
- Strengthened environmental governance in areas such as the marine environment and chemicals.

Factors holding back progress are identified as:

- Prices do not sufficiently internalise environmental costs; and some subsidies create perverse incentives for environmentally harmful activities. For example, natural assets are consistently undervalued in conventional economic analysis and decision making. As a result, there is a gap between private returns from economic activity and the overall benefits that accrue to society.
- Policy ambition and implementation - there is wide variation among, and sometimes within, countries. Convergence with "top-runners" would help, but not be enough.

The scale of many environmental pressures are seen as outstripping the gains that current policies have achieved in terms of more efficient resource use and reduced pollution generation. Current economic structures, and the associated patterns of production and consumption, are reinforcing the dominance of existing technologies, infrastructure and related institutions. These are formidable barriers to the transition to a low-carbon, more resource-efficient economy. Overcoming this inertia will require substantial innovation, not just in technologies but also in the social and institutional relations in which they are embedded.

3) The EU perspective on global environmental challenges to 2050

The Commission commissioned modelling to complement the OECD Environmental Outlook, and to examine in more depth trends particularly of concern to the EU. The study[4] provides a global, model-based analysis of five distinct, vitally important resource themes: (i) *Energy*, particularly with regard to scarcity associated with fossil fuels and their key role in climate change; (ii) *land* for agriculture/forestry and terrestrial biodiversity; (iii) *phosphorus*, especially with regard to its irreplaceable role in agricultural production; (iv) *fresh water* with attention to water stress in primary catchment areas; and (v) *fish stocks*.

Looking a few decades ahead, there is ample justification for increasing global concerns in the areas included in the resource efficiency initiative. The model projections suggest, for example, that in the absence of additional targeted policies:

- Global annual energy demand would increase by almost 80% between 2010 and 2050, with 90% of the demand growth in developing and emerging countries. The share of fossil fuels in the total energy demand is projected to remain large (close to 80%). Targets for greenhouse gas emissions would be a long way from being met.
- Increase in agricultural productivity will lag behind increase in food demand, resulting in further expansion in land use for agricultural production in developing countries, notably in Africa and especially up to 2030. This would lead to substantial loss of nature and biodiversity and associated ecosystem services.

[4] EU Resource efficiency perspectives in a global context, PBL, 2012

- Global annual use of phosphorus fertilisers will increase by 40% up to 2050. Although immediate scarcity of phosphorus in physical terms is unlikely, extraction of this irreplaceable non-renewable resource will concentrate more and more in northern Africa.
- The number of people living in areas affected by severe water stress is projected to increase to 3.9 billion by 2050 (from 1.6 billion in 2000). Most of this increase will take place in South Asia.
- Commercially attractive fish stocks will continue to decline with some functional groups (of similar size and with similar feeding and habitat characteristics) approaching depletion.

With ambitious global efforts, in line with the EU and global objective to limit dangerous climate change to 2° C, the assessment finds that, there is substantial potential to improve efficiency in the use of these resources, a result which is also confirmed by a number of other studies and assessments:

- The increase in global annual energy use between 2010 and 2050 could be limited to less than 25%. For greenhouse gas emissions, this would halve the gap between the situation of unchanged policy and the 450 ppm CO2 eq mitigation scenario[5]
- Net global agricultural expansion between 2010 and 2050 may be halted, with expansion in Africa reduced by half, by improving the efficiency of agricultural production, consumption and food supply chains. Most industrialised countries and emerging economies would see a net reduction in their agricultural areas, after 2020.
- The global increase, up to 2050, in the use of phosphorus fertilisers from primary sources could be limited to 11%; mainly by making better use of manure and by recycling phosphorus from human excreta. Additional phosphorus savings could be achieved by improving animal feed and by banning the use of phosphorus in detergents.
- Globally, water efficiency, in all sectors combined, could be improved by 25%.
- Fish stocks may recover and marine biodiversity may improve, thus, sustaining higher catches in the long term, following a temporary reduction in fishing efforts.

Although these potential improvements are substantial, complementary measures will be needed to curb negative trends. To accomplish biodiversity goals, for example, in addition to halting the expansion of agricultural land, other pressures, such as from fragmentation and nitrogen compounds, also need to be addressed. The situation regarding fresh water appears to be most alarming. The efficiency gains will not be sufficient to offset the effects of strong population growth in water stressed river basins. As a consequence, some 3.7 billion people will still be living in areas affected by severe water stress by 2050.

The potentials for ambitious improvements that would lead to a more efficient use of the five resources in focus are interrelated, and the analysis revealed many synergies. However, there are also some trade-offs, such as additional amounts of water and fertilisers needed to sustain

[5] For a detailed analysis of global emission scenarios see the Impact Assessment of the Roadmap for moving towards a low carbon economy (SEC(2011)288, in particular section 5.1). Also according to recent IEA work, energy developments compatible with achieving the 2 degrees objective are also possible, thereby implying a great deal of energy savings, technology improvements and fuel switching. World energy demand growth could be kept at some 35% to 2050 and the share of fossil fuels could be reduced below 50%, while using clean and efficient technologies including CCS (IEA Energy Technology Perspectives, Pathways to a Clean Energy System, Paris 2012).

improved crop productivity, and the consequences of reduced deforestation when agricultural expansion is reduced.

As part of this workstream, analysis was also undertaken to illuminate the relationships between the EU and other world regions, from a global, long-term and integral point of view[6]. Its focus is on environment-related issues whereby actions within the EU, or the fact that no actions are being taken, are expected to have significant consequences elsewhere in the world, or where the EU needs global partners to effectively address a problem. One issue study explores future scarcities of natural resources, using phosphate and fish as examples, and two studies explore various aspects of biomass use for energy. Of these last studies, one concerns a longer time scale and the other is tailored to current and near-term policies. The studies show clearly that resource efficiency cannot be considered in an EU context alone, as the EU will be affected by global trends.

Starting from the European Council's objective to reduce EU GHG emissions by 80-95% compared to 1990 by 2050, in the context of necessary reductions by developed countries as a group, the Commission has evaluated the energy and climate effects of such global action with several scenarios as part of the Roadmap for moving to a competitive low carbon economy in 2050 and of the Energy Roadmap 2050. Achievement of 80% domestic GHG emission reduction in the context of global action is shown to be technically and economically feasible without entailing additional costs compared to current trends that are characterised by increasing fossil fuel prices and a great deal of modernisation investment that is necessary in any case. Energy consumption can be reduced in the EU by a third by 2050, which would ensure reaching the GHG objective if it is supplemented with a mix of low carbon technologies, including very high shares of renewable energy sources.[7]

[6] Global integrated assessment to support EU future environment policies, PBL, 2012

[7] See SEC(2011)288 and Energy Roadmap 2050, Impact Assessment and Scenario Analysis, December 2011