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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

Innovation for a sustainable Future - The Eco-innovation Action Plan (Eco-AP)

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EXECUTIVE SUMMARY

Using resources more productively is crucial for environmental protection and competitiveness, but progress is slower than it should be. Eco-innovation will help to improve resource productivity, especially in the long term, with all the positive effects this will bring. But we need to design coherent and effective eco-innovation policies.

Specific reasons for the slow uptake of eco-innovation are:

- on the supply side: (1) Inadequate levels of research on eco-innovation, (2) Need for coordination of research programs, (3) Weak linkages between research and market, (4) Inadequate skills base;
- on the demand side: (5) Market prices do not adequately reflect environmental costs, (6) Demand side measures are too weak, (7) Lack of appropriate and credible information on the performance of new environmental technologies;
- on both sides: (8) Governance problems related to EU eco-innovation support, (9) Difficulty in accessing finance, (10) Difficulty in providing finance;
- and for the global dimension: (11) Unfavourable global conditions for eco-innovation, (12) Unused potential for eco-innovation in developed and developing countries, (13) Indigenous eco-innovation capability amongst developing countries is scarce.

The Innovation Union Flagship Initiative is setting the future framework for EU innovation policy. But problem analysis suggests the need for a dedicated eco-innovation policy initiative. The Action Plan will build upon the Innovation Union in respect of the "environmental" dimension of innovation. As such its role is where general innovation policies are insufficient to promote eco-innovation. An eco-innovation policy should – while respecting the limitations of Community competence and in cooperation with the Member States - pursue overall strategic objectives:

> **Increasing the rate of eco-innovation and its uptake in Europe and in so doing deliver efficient solutions for environmental problems, boost the resource efficiency of Europe and its competitiveness.**

With this strategic objective and operational objectives in mind, five policy options have been identified. Four of them specifically target the problems outlined above. However, one of them - Option 1 where there is no Environmental Technologies Action Plan (ETAP) - is the baseline scenario where existing EU policies linked to eco-innovation are implemented but there is no specific comprehensive policy on maximising eco-innovation.

Option 2 - Continuation of the ETAP – consists of measures in four main areas (research, markets, global action and, lastly, governance and coordination) in line with the communication of 2004. It continues the nine priority actions of ETAP, and includes some measures on governance and coordination.

Option 3 – Taking forward the Europe 2020 Flagships - Would involve doing what is promised in the context of the Europe 2020 Flagships (i.e. Innovation Union, Industrial Policy, New Skills and Resource Efficiency) for the area of the environment, in particular the review of environmental policy in terms of its eco-innovation potential and inclusion of eco-innovation aspects into the Innovation Partnerships. This option stems in particular from lessons learnt with the implementation of ETAP and environmental policy for eco-innovation,

and from the need to adapt and react to the recent changes that have occurred in the political and economic context surrounding eco-innovation.

Option 4 – SME-targeted actions – Would include actions to support SMEs in becoming active developers and users of eco-innovation as well as open eco-innovative SMEs to global trade opportunities for green goods and services. It is characterized by increased ambition, expanded scope of intervention to also include non-technological innovation, a real focus on global dimension and increased attention to networking. It builds upon the ETAP lessons learnt and issues identified in the problem definition section.

Option 5 – A wide eco-innovation policy - Responds to the call for policies that create the economic conditions to reduce demand for natural resources and thus stimulate appropriate eco-innovations. This would include working on price signals and boosting demand for green products and greener production technologies through public procurement, clear labelling of green products, and waste prevention and recycling.

This impact assessment considers the various aspects of these options, the urgency of a focused and improved eco-innovation policy, and the feasibility of reasonably rapid implementation. It concludes that Option 3 in combination with Option 4 seems to have a better balance than the other options and responds best to the strategic and operational objectives. Option 5 could serve as a long-term vision for achieving a radical transition to a more resource-efficient, competitive and sustainable economy.

1. BACKGROUND

The Europe 2020 Flagship Initiative "Innovation Union"[1] (IU) announces an Eco-innovation Action Plan (EcoAP) to focus on specific bottlenecks, challenges and opportunities for achieving environmental objectives through eco-innovation. The IU also announced that EcoAP will promote eco-innovation in technologies, business processes and organizational change to address the challenges of resource[2] scarcity, air, water and soil pollution, water efficiency and also provide growth and jobs. The Action Plan will build upon the Innovation Union in respect of the "environmental" dimension of innovation. As such its role is where general innovation policies are insufficient to promote eco-innovation. It will take forward existing experiences in promoting the development and uptake of eco-innovation, in particular the Environmental Technologies Action Plan[3] (ETAP). The ETAP was adopted by the Commission in 2004 to cover a wide range of activities promoting the development and use of environmental technologies in the EU and globally.

EcoAP will also help to deliver the objectives set out in the Europe 2020 Flagship Initiative on "A resource-efficient Europe"[4], that established resource efficiency as the guiding principle for EU policies on energy, transport, climate change, industry, commodities, agriculture, fisheries, biodiversity and regional development. The Flagship creates a framework for policies to support the shift towards a resource-efficient and low-carbon economy. Eco-innovation is one way of improving the resource efficiency of the economy.

Definitions[5]:
Eco-Innovation is any form of innovation resulting in or aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment, enhancing resilience to environmental pressures, or achieving a more efficient and responsible use of natural resources.

2. PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

Considerable effort went into consultation of stakeholders. The public at large has been consulted. Extensive use has also been made of the existing ETAP communication channels. The main elements of this consultation exercise include:

- open stakeholder consultation
- consultation of the regular ETAP High Level Working Group (HLWG) with the Member States, mostly representatives of Ministries of Environment and Economy.
- targeted consultations (Member States and representatives from research, business, financial, non-governmental organisations) on the impact assessment.
- bi-annual ETAP Forums on Eco-innovation, attended by 1,010 participants, 30% of them from the private sector, which made targeted recommendations[6].
- Within the European Commission, an Impact Assessment Steering Group (IASG) met repeatedly allowing different Services to input.

1 COM (2010) 546 final, Europe 2020 Flagship Initiative "Innovation Union"
2 Resources include raw materials such as fuels, minerals and metals but also food, soil, water, air, biomass and ecosystems.
3 COM (2004) 38 final, Communication from the Commission to the Council and the European Parliament, Stimulating technologies for sustainable development: An Environmental Technologies Acton Plan for the European Union
4 COM(2011) 21, "A resource-efficient Europe"
5 For a list of all definitions relevant to this report please refer to Annex I.
6 Forum recommendations are to be found at: http://ec.europa.eu/environment/etap/events/ecoinnovation_en.html

- Eurobarometer survey[7] on the "Attitudes of European entrepreneurs towards eco-innovation"

2.1 Consultations[8] – Main conclusions

Overall, Member States felt the ETAP had been successful in mobilizing stakeholders and the Commission in supporting eco-innovation. There is broad support to take forward the framework, but key areas where stakeholders wanted change were:

- the need to cover not just traditional environmental technologies but also eco-innovation (innovations in processes, systems and services) more widely.
- the need to better target SMEs was highlighted as a clear priority[9].
- the need to make better use of public funding to attract and leverage private investors, in particular venture capital funds.
- a renewed focus on export promotion activities and networking of eco-innovative European SMEs.
- The role of the Eco-AP within the new Innovation Union (IU) framework.

There was consensus on the need to define better the goal of intervention: the focus on resource efficiency was widely supported. However, there were remarks that this should not be considered an "all-inclusive" goal, as it could leave out other environmental priorities (e.g.: clean air). The need to concentrate on non-energy areas was highlighted, to avoid overlap with energy-specific EU policy initiatives. Priority sectors such as water, waste, recycling, and more sustainable materials were proposed.

The focus on business, and in particular SMEs, was questioned by some academics who would have liked to extend the scope more explicitly to consumers, particularly with regards to the theme of more environmental awareness. The EU Sustainable Consumption and Production Action Plan and other initiatives deal with policies related to consumers.

The need for demand side policies for eco-innovation was prioritised, particularly by MSs, underlining their potential as in the case of Green Public Procurement.

Calls were made for a better division between strategic and operational objective as well as more clarity on the timing of different actions.

MSs, business and financial stakeholders noted the need to support the development of skills for green and greener jobs as shortages and skills mismatches are becoming problematic, particularly for SMEs.

The need to mobilise financial resources with specific incentives for eco-innovative businesses was widely supported by business and financial community. The ETAP Forum "Financing eco-innovators"[10] concluded that more flexible and favourable risk-sharing conditions are needed to stimulate access to finance in this specific and sometimes 'disadvantaged' investment area, especially in sectors such as waste and recycling and water. The need to provide better support to businesses was raised leading to focusing on actions related to SMEs, training and financing needs.

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7 Flash Eurobarometer 315: "The attitudes of European entrepreneurs towards eco-innovation"
8 For a list and minutes of all consultation meetings see: http://etap.pracsis.be/etap/Minutes%20-%20Consultation%20meetings.pdf
9 See Bilbao Declaration "Fostering eco-innovation in SMEs", June 2010
10 For details see: http://ec.europa.eu/environment/ecoinnovation2010/2nd_forum/

There were some concerns amongst the MSs over eco-innovation governance in particular with regards to widening the group of stakeholders to include the business community. There was, however, general support to relying more on business and expert advice. The table below summarises the feedback received from the various groups of stakeholders[11].

	MS representatives HLWG	Financial/Business /Academic community	IASG
General issues			
Coordination with Innovation Union	**+/-**	+/-	**+/-**
Need to reinforce ETAP	**+**	+	
From env. tech to wider eco-innovation		+	
Definition of eco-innovation and more sectoral focus (e.g.: exclusion of ener	**+**	+/-	**+**
SME focus		+/-	
Demand policies		+	
Need to reinforce global actions		**+/-**	
Strategic and Operational actions		**-**	**-**
Clarity regarding timing of actions		**-**	
Evidence in the IA			**+/-**
Main actions			
Action on Green skills	**++**	**++**	
Ad hoc funding for eco-innovation		**++**	
Business models		**+**	
ETV pilot	**+**		
GPP of eco-innovation		**++**	
Support to eco-industry		**+/-**	
Global actions		**+**	
Reinforcing eco-innovation governance	**+/-**	**+**	
Gathering of info on eco-innovation (also at global level)		**+**	
Policy learning and roadmaps		**+**	
Tax on natural resources		**+/-**	
Ambitious "green" procurement standards			
Legally binding framework for labelling			
Phasing out of worst performing products			
Waste prevention and recycling standards along value chain			
Cardif process (integration of env policies in others)		**+**	

++	**Very positive feedback**
+	**Positive feedback**
+/-	**Contrasting feedback**
-	**Negative feedback**
--	**Very negative feedback**
	No specific feedback

While the possibility to introduce a tax on natural resources was regarded as attractive by some stakeholders, concerns were raised regarding the feasibility and political 'sensitivity' of such actions. These comments have been taken into account in the analysis of the impacts and in the long time horizon foreseen for the action.

More focussed and in-depth cooperation was requested by stakeholders in terms of global actions as compared to ETAP. This has been taken into account in the development of the options and of specific actions with relevant partners such as UNEP and OECD.

The Eurobarometer survey shows that eco-innovation is part of the business responses to the resource scarcity challenge. The survey also identified the key barriers and drivers to eco-innovation development and uptake.

2.2 View of the Impact Assessment Board

11 In some cases no specific feedback was received and that is why the table is not comprehensive in terms of actions of the different options. For the sake of brevity only contrasting feedback (+/-), negative feedback (-) and very positive feedback (++) is commented below as the rest is quite self explanatory.

This Impact Assessment (IA) is re-submitted to take account of the opinions presented by the Impact Assessment Board in its opinion of December 2010. In particular a more focused problem definition has been inserted, and specific objectives as well as their hierarchy have been proposed. The IA details the particular drivers for eco-innovation and analyses how these drivers are tackled by the current EU and national policies. The report has expanded on the number of options it evaluates, linking them to the problem drivers and providing a clear baseline scenario. In the analysis of impacts of options much greater care has been taken to specify expected costs and benefits of the proposals.

3. PROBLEM DEFINITION

Eco-innovation is one way of improving environmental protection and of improving the resource efficiency of the economy and so contributing to competitiveness (see Annex II).

3.1 The problem – insufficient eco-innovation

Delivering on environmental objectives requires change in the way we use, re-use and manage materials, and resources at large. This change can be made by developing new technological and non-technological solutions, new approaches to the way we run business or the way we consume and use goods and services. However, the current rate of change is sub-optimal, and there is the potential to increase eco-innovation in a way that boosts resource productivity, competitiveness and helps to safeguard the environment.

At the same time implementation of EU environmental legislation is incoherent across the Member States. In the period 2003 – 2009 (the latest available data) the European Commission has launched app. 500 environmental infringement cases annually[12]. Increased development and uptake of eco-innovation will also help in the better implementation of the environmental acquis throughout the European Union.

Achieving a safe and healthy global natural environment necessitates significant involvement of partners outside the EU. However, eco-innovations and environmental technologies are currently developed, for the most part, in developed countries, and they are not being diffused in the world economy at sufficient speed and scale.

3.2 The eco-innovation policy landscape

Eco-innovation is a broad concept that is related to many policies. Although environmental policies are the main driver for eco-innovation development and uptake other ongoing policies in innovation, energy, cohesion also help shape the eco-innovation landscape.

Environmental policies

EU Environmental legislation and policy plays a central role in motivating[13] eco-innovation and have created new markets, incentivising business to innovate towards best and more efficient solutions. The **Sustainable Consumption and Production Action Plan (SCP-AP)** outlines an integrated approach to sustainable production and consumption patterns, primarily

12 See for details: http://ec.europa.eu/environment/legal/law/statistics.htm

13 Belin, J, Horbach, J & Oltra, V, 2009, Determinants and specificities of eco-innovations – An econometric analysis for France and Germany based on the Community Innovation Survey, Article submitted to the EAEPE Conference, Amsterdam, November 6-8, 2009

via regulatory and support measures aimed at enhancing the energy and environmental performance of products and encouraging their uptake by consumers.

As means to better coordinate and ensure consistency of eco-innovation policy the European Commission launched the **Environmental Technologies Action Plan** as a complement to the regulatory approaches. The Plan aims to integrate EC objectives in terms of EU competitiveness, economic growth, employment and the environment into research, investment and purchasing decisions, concerning environmental technologies. As such the Plan promotes research, development and deployment, mobilizes funds, helps to drive demand and to remove barriers to market developments for environmental technologies, and eco-innovation in general.

For a detailed description of the lessons learnt of ETAP and environmental policy for eco-innovation see chapter 3.3 and Annex IV.

Financial Support

CIP supports eco-innovation activities in SMEs, primarily, under the Entrepreneurship and Innovation operational programme (EIP). It allocates €433 million (out of EIP's total budget of over €2.0 billion). EIP facilitates the commercialisation of innovative production processes, products or services and new management and business practices seeking to reduce environmental impacts and to promote an efficient and responsible use of resources and encouraging the competitiveness of European enterprises. EIP-eco-innovation addresses almost the entire range of sectors/areas with the exception of renewables and energy efficiency covered by the Intelligent Energy Europe sub-programme of EIP.

Eco-innovation and environmental technologies are part of the Environment Policy and Governance component of **LIFE+**. In 2009, projects related to innovation, in general, including the development of innovative policy ideas, technologies and processes amounted to about €21 million.

With regard to Cohesion Policy sustainable development and environmental protection are among the overarching policy aims with about 30% of the total available funding over 2007-13 directly and indirectly invested in those areas. The ERDF regulation[14] explicitly mentions priorities related to environmental technologies. Over the period 2000 – 2006 the ERDF allocated €25.5 and the Cohesion Fund €15.8 billion to environment-related interventions and €1.4 billion has been spent on environmentally friendly technologies (three quarters of this in support of SMEs). An assessment of the Regional Programmes for Innovative Actions (RPIA)[15] highlights some examples related to environmental technologies. However there is little evidence[16] that it has been used to develop or diffuse eco-innovative technologies at a larger scale. Between 2007-2013 the Structural Funds (SF) allocations to the promotion of environmentally friendly products and production processes in SMEs increased to €2.4 billion. This shows a significant absolute increase in comparison to the previous period.

Over the last two programming periods support for investments in e.g. energy efficiency (notably housing sector), clean technologies and environmental services increased. However in certain cases, depending on the split of the Operational Programmes at national and/or

14 Regulation (EC) No 1080/2006, OJ L 210
15 Technopolis, October 2010, Policy lessons from experimentation with regional programmes of innovative actions
16 Technopolis, 2006, Strategic Evaluation on Innovation and the knowledge based economy in relation to the Structural and Cohesion Funds, for the programming period 2007-2013

regional level the related SF investments can be fragmented, as environment and innovation are sometimes dealt with via separate operational programmes. A recent Communication[17] on 'Regional Policy contributing to sustainable growth in Europe 2020' underlines eco-innovations as a key investment area and encourages the Member States and regions to make further use of the SF to boost eco-innovations. In addition the development of 'Smart Specialisation Strategies'[18] at regional level and the launch of the 'smart specialisation platform' will help the regions and their authorities to address the cross-sectoral nature of eco-innovation and the need for an overarching strategy. Data on eco-innovation are not really available: the available analysis of SF effects did not explicitly focus on eco-innovations or environmental innovations but analyse innovation-related effects or environmental effects, and as such provide limited evidence related to eco-innovation.

Although subsequent EU reforms of the **Common Agricultural Policy (CAP)** reflect a growing commitment to environmental issues, the principal focus has been on land use / management and the diffusion of good practice. The longer-term goals of CAP reflect the Lisbon and Gothenburg discourse on innovation and sustainability. However the complexity of the CAP, the need to manage its financial reform and ensure food supply within a global market place while promoting cohesion amongst rural communities are not likely to allow a dedicated attention to eco-innovation in this area. Agricultural policy might thus be overlooking an important challenge or opportunity for doing more to support eco-innovation.

Research and innovation policy

Within RTDI policy innovation is a core issue. In FP6 €1.4 billion was spent on environmental technologies and eco-innovations. Most of it in the NMP thematic priority (Nanotechnology, multifunctional knowledge-based materials; new production processes and devices; and integration of technologies for industrial applications) and priority 6: sustainable development, global change and ecosystems. Within FP7 app. €10 billion has been allocated to environmental technologies. Furthermore, in the context of both FP 6 and 7 a number of ERA-NETs and ETPs were established, many of them related to environmental technologies (Hydrogen and fuel cells, Water supply and sanitation, Steel, Chemistry, Construction etc.). Both FP6 and FP7 show a 'greening' of sub-themes after 2004, the starting year of ETAP, and it is explicitly mentioned as driver for some of the sub-themes.

Energy

Energy is well covered by other policies, apart from ETV. The political importance attributed to climate change mitigation and adaptation efforts have focused efforts on technological areas, like renewables and energy efficiency, which directly contribute to the reduction of green house gases. The Climate Change and Energy Package sets targets for renewable energy and energy efficiency and provided the framework for targeted initiatives.

The SET-Plan, launched in 2007, is a policy initiative linked to the current ETAP. The overall purpose of the SET-Plan "is to focus, strengthen and give coherence to the overall effort in Europe, with the objective of **accelerating innovation in cutting edge European low carbon technologies"**. This will be achieved through joint strategic planning, European Industrial Initiatives and an increase in financial resources and international cooperation.

17 COM(2011) 17 final and SEC(2011) 92 final
18 COM(2010) 553, Communication from the Commission, "Regional Policy contributing to smart growth in Europe 2020"

A follow up communication[19] addressees the need for additional public/private funding (€50bn by 2020) for low carbon technologies to cover basic and applied research, demonstration and market take up. The initiative includes technology 'roadmaps' for key low carbon technologies: wind, solar, electricity grids, bioenergy, carbon capture and storage (CCS) and sustainable nuclear fission. The communication also proposed to reinforce financial instruments (RSFF, GIF, Marguerite Fund) to support large demonstrations and replication projects in the identified areas.

The SET-Plan will have a direct impact on eco-innovation rates, however limited only to the energy sector. The focused SET-Plan will not provide a coordinating aspect and overview over the wide eco-innovation field and risks missing out on the opportunities provided by emerging "non- energy" technologies. ETAP would thus complement the SET-Plan. There is also a potential for synergies for example with regard to the financial instruments providing funding to the uptake of eco-innovation.

In practice, energy is thus well covered by other policies. The exception would be ETV, a focus area for ETAP, not covered by other energy-related policies. Accordingly, there seems to be little value-added in covering energy, so excluding energy from any eco-innovation policy initiative (ie Options 3 to 5) provides the best value added.

3.2.1 Emerging policy landscape for eco-innovation – Europe 2020 Flagships

Any future eco-innovation initiative must take account of the new policy framework set by the Europe 2020 Flagship Initiatives "Innovation Union", "A resource-efficient Europe", "Industrial policy for a globalized Era"[20] and "Agenda for new skills and jobs"[21].

The "Innovation Union" sets the future framework for innovation policy in the EU. Any new eco-innovation initiative needs to build on the "Innovation Union" and take it forward in a way that specifically supports eco-innovation. At times, this is explicit such as creating European Innovation Partnerships (IPs) to address specific societal challenges or the review of environmental legislation with regards to their eco-innovation potential. A long–term vision for the direction of the green transition is provided in the "Resource Efficient Europe" to increase certainty for investment and eco-innovation.

Additionally the Industrial Policy Flagship explicitly states that the EcoAP will put in place the tools to identify the deployment requirements for key environmental technologies, enhance coordination and cooperation between the EU and Member States and generate awareness of the potential of new technologies. The New Skills and Jobs Flagship calls for an Eco-innovation Action Plan to support competences for sustainable development, and promote appropriate skills development and tackle skills mismatches.

3.3 Implementing eco-innovation policies – Lessons learnt

The first attempt at a systemic approach to eco-innovation policy was the **Environmental Technologies Action Plan** (ETAP) launched in 2004[22]. Its aim was to harness the potential of

19 COM (2009) 519, Investing in the development of low carbon technologies (SET-Plan)
20 COM (2010) 614 Communication from the Commission: "An integrated industrial policy for the industrial era"
21 COM (2010) 682 Communication from the Commission: "An agenda for new skills and jobs"
22 COM (2004) 38 final, Communication from the Commission, Stimulating technologies for sustainable development: An Environmental Technologies Acton Plan for the European Union

environmental technologies to better protect the environment and contribute to competitiveness and growth. It was the first attempt at coordinating heterogeneous policies and mobilizing stakeholders. It has been reviewed once and two progress reports have been issued[23], and also two reviews of the ETAP National Roadmaps have been conducted.[24]

The key lessons for promoting eco-innovation are (see Annex IV for detailed analysis):

- Eco-innovation will not emerge without an innovation-friendly environmental policy.
- Eco-innovation is also conditioned by the wider framework conditions, outside the realm of environmental policy. A case for integrated policy approaches can be made[25].
- Need to consider unintended negative environmental consequences (e.g. growing crops to produce biofuels can lead to deforestation and increase greenhouse gas emissions).
- Need to focus on demand-side actions to ensure uptake and EU-wide technology spillovers. Benefits only materialize when the eco-innovation is taken up and delivers.
- The ETAP report of 2007 specified priority sectors (sustainable construction, waste & recycling, food & drink), and this resulted in a more coordinated approach as seen in the launch of Lead Markets in sustainable construction and waste & recycling.
- EU Member States devote a lot of attention to the creation and development of new, eco-innovative firms and ventures. National strategies to support eco-innovation provide opportunities to coordinate policy dialogue. In Europe, ETAP has been a vehicle to systematize and reorganize existing measures. In particular in the New Member States ETAP helped launch policy debates on eco-innovation.

The ETAP-specific experiences related to eco-innovation policy are described below, organized according to ETAP intervention areas.

3.3.1 Getting from research to markets

ETAP has been successful in influencing the research priorities in the Framework Programmes (FPs) and supporting infrastructure (European Technology Platforms (ETPs), Joint Technology Initiatives (JTIs)). However research efforts could still be better coordinated and are not always aligned with emerging environmental and market needs.

3.3.2 Improving market conditions

ETAP was successful in mobilising public and private sources of funding to accelerate the market uptake of eco-innovative technologies. The main results are:

- the creation of the new **Competitiveness and Innovation Programme**, with specific support actions for eco-innovation and an indicative budget of €433 million (2007-2013) including participation in venture capital (VC) investment funds and support of **market replication** and pilot projects;
- the revision of the **environmental State Aid guidelines**, with a specific 10% bonus on the maximum aid intensity for eco-innovation investments;
- the agreement on a target for **Green Public Procurement** (GPP) of 50% of general public procurement as from 2010, and development of related tools.

23 CEC 2005, Report on the implementation of the Environmental Technologies Action Plan in 2004, COM(2005) 16 final; CEC 2007, Report on the Environmental Technologies Action Plan (2005-2006), COM(2007) 162 final; Ecorys 2009, The implementation of the Environmental Technologies Action Plan, Rotterdam

24 CEC 2007, Commission Staff Working Document Accompanying Report of the Environmental Technologies Action Plan (2005-2006) {COM(2007) 162 final}; WIFO 2009, Assessment of ETAP roadmaps with regard to their eco-innovation potential, Vienna

25 European Commission, Directorate-General Environment (2007), "Designing environmental policy to be innovation friendly"

With respect to mobilizing EU financing, ETAP was not so successful in ensuring a greater role for cohesion policy in eco-innovation development and uptake. Experience shows that the design of future EU financial instruments for eco-innovation should be better linked to policy objectives, national instruments and market needs. Finally, ETAP shows that if financial instrument for eco-innovation are to have an impact they must be part of a package of financial and non-financial measures designed to address a specific policy objective.

The 2007 ETAP report points to the role of innovation initiatives in emerging sectors, where established communication channels do not exist (see Lead Market for bio-based products[26]).

Finally, the lack of uniform implementation in the MSs of the environmental acquis creates an uncertain business environment. A stable policy framework with greater harmonization or co-ordination, together with simplification of complex national regulations would help.

3.3.3 Acting globally

ETAP has not been successful in putting eco-innovation on the international agenda. Progress in removing trade tariffs for environmental goods and services was slow due to the delays in the general WTO trade negotiations. However, international cooperation on the 'green economy' creates new opportunities.

ETAP experiences show that a "one-size-fits all" solution does not work. Entrepreneurs in the EU face different challenges and opportunities from those in developing and rapidly industrialized countries. Finally, for technology transfer[27] (TT) to happen, indigenous eco-innovation capabilities need to be developed to facilitate the adoption, adaptation and development of technologies that fit the specific conditions of recipient countries.

3.3.4 Governance of ETAP

The ETAP High Level Working Group and the ETAP National Roadmaps are the main EU instruments for stimulating eco-innovation policies at the EU and MS level. However the lack of a clear leadership role for ETAP meant that the impact was sometimes incoherent. A high level of MS engagement was achieved, but insufficient networking (ie weak links across policy areas, actors and sectors) was the key obstacle to a coherent approach.

Considerable experience has been accumulated through the ETAP National Roadmaps. However, the voluntary nature of the Roadmaps, their retrospective nature and the lack of appropriate follow-up, risks an uneven impact of ETAP across the Member States. This is further aggravated by the lack of qualitative information on the status, design, target and budget of eco-innovation instruments to further assess their potential impact.

3.4 Underlying drivers of the problem

The drivers affecting eco-innovation uptake in the EU can be grouped into four classes. Some of these drivers are specific to eco-innovation, but many are not. The current policy measures take account of this specificity, but in some cases a targeted policy response is needed.

26 SEC (2009) 1198, Commission Staff Working Document, "Lead Market Initiative for Europe – Mid-term progress report"
27 See Berlin ETAP Forum (April 2nd – 3rd, 2011): http://ec.europa.eu/environment/ecoinnovation2009/1st_forum

3.4.1 Research leading to eco-innovation and to market applications

- **Inadequate level of research on eco-innovation** – *Not specific for eco-innovation, but more severe than in other policy areas.* Companies do not by themselves invest enough in innovative solutions to reduce pollution or the resource intensity of their activities. Available financing and support is inadequate especially for SMEs.

  The current policy response is adequate. European funding for environmental technologies increased from €1.4 billion in the 6th Framework Programme for Research and Technological Development (FP6) to €10 billion in the 7th FP. As such, policy is already tackling the problem of lack of research.

- **Need for better coordination of research programmes** – *Generic innovation issue.* National research efforts do not reflect national strengths and often overlap preventing the achievement critical mass and smart specialization at a European level.

  The current policy response is adequate. An ERA-Net on eco-innovation (part of FP7) has been launched, as a first attempt to coordinate MS eco-innovation research activities. Commission is promoting joint programming. Furthermore IPs, granted they take account of eco-innovation, will coordinate research efforts in key areas.

- **Weak linkages between research and market** – *Not specific for eco-innovation, but more severe than in other policy areas*. Particularly true for environmental technology transfer and early-stage financing to turn research results into market applications.

  Environmental innovations evolve with the social, legal and economic settings. They mutually influence each other and therefore successful transfer to the market depends on the path of its development. Increasing returns to adoption exist, (i.e. economies of scale and scope, etc.) lead to 'lock-in' of incumbent technologies, preventing the take up of less environmentally harmful alternatives. Industrial economies are locked-in to carbon intensive fossil fuel based energy systems, which consequently lock-out the development of new, more sustainable technologies[28] that are yet to benefit from economies scale and scope. Coordinating policies[29] must overcome these lock-ins.

  The current policy response is inadequate. The IPs will address these issues in the targeted, high-potential areas, going further than the existing Lead Market Initiative[30] (LMI). For eco-innovation to benefit they should be integrated into this approach.

- **Inadequate "skills" base** – *Not specific for eco-innovation, but more severe than in other policy areas.* Specific skills and knowledge is required for greening industries. However, skills gaps and mismatches for green and greener jobs are expected to worsen unless tackled[31].

  The current policy response is inadequate. The New Skills, New Jobs initiative will focus on skills anticipation and provision, but it calls upon an EcoAP to support

28 Unruh, G C (2000), 'Understanding carbon lock in', Energy Policy 28, 817-830; Unruh, G C (2002), 'Escaping carbon lock in', Energy Policy 30, 317-325

29 Foxon (2002). Technological and institutional 'lock-in' as a barrier to sustainable innovation. ICCEPT working paper. Available at http://www.iccept.ic.ac.uk/public.html

30 COM (2007) 860, Communication from the Commission, "A Lead Market Initiative for Europe"

31 CEDEFOP (2010), "Skills for green jobs"

appropriate skills development. The value added of EcoAP will be to indicate priority sectors and facilitate policy learning between MS.

3.4.2 Market demand for eco-innovation

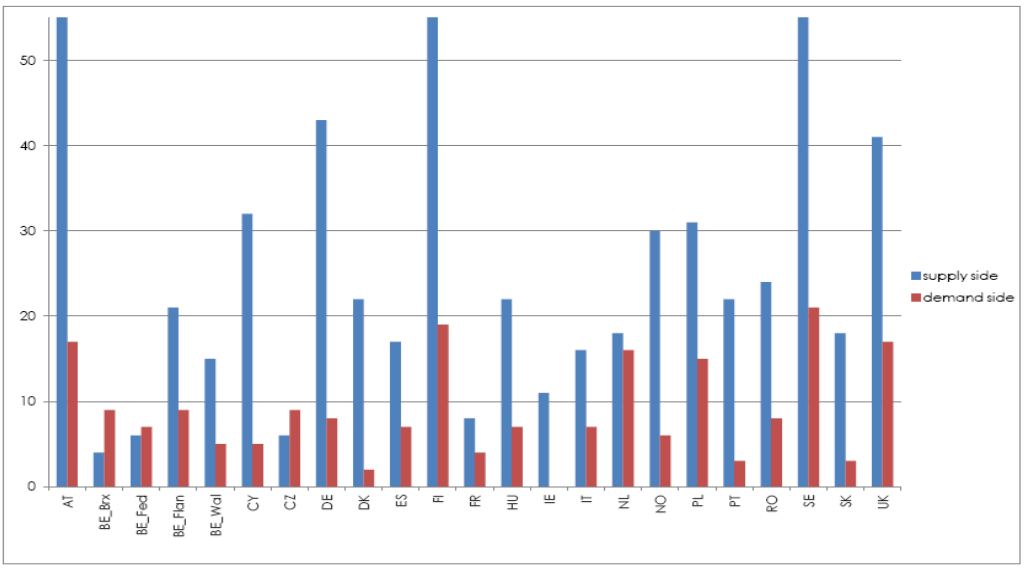
- **Market prices do not adequately reflect environmental costs** – *Eco-innovation specific.* Failure to price environmental externalities - or providing environmentally harmful subsidies - puts eco-innovation at a disadvantage with cheaper, but more polluting and less efficient technologies. For instance the Hungarian ETAP Roadmap[32] states that the economy is "…characterised by poor energy efficiency… resulting in reduced competitiveness due to the higher specific costs [of eco-innovations] … also strengthened by the fact that market prices do not take into account environmental externalities, or do so but at an insignificant level, the actors … are not environment-conscious and resources are wastefully used in both material and energy terms…".

  The current policy response is adequate. The issue is dealt within individual environmental policies and under the aegis of the Resource Efficiency Roadmap.

- **Demand side measures are weak** – *Not specific for eco-innovation, but more severe than in other policy areas.* Current EU and Member State innovation policies and instruments seem biased towards supply-side innovation policies[33]. The analysis[34] of policy measures listed in the ETAP roadmaps shows (see Figure 1) that Member States rarely design and implement demand side policies for eco-innovation. Also private sector expect governments to create markets for environmentally better performing products and solutions, for instance through green public procurement[35].

Figure 1: Balance of policy instrument across ETAP countries

32 See: http://ec.europa.eu/environment/etap/policy/pdfs/roadmaps/hu_en.pdf
33 OECD (2008), "National approaches for promoting eco-innovation: Policy issues"
34 "Assessment of ETAP roadmaps with regard to their eco-innovation potential" http://ec.europa.eu/environment/etap/files/env-map_projektt2_finalreport_maindocument_final_030910.pdf
35 Innovative environmental growth markets from a company perspective, Research project on behalf of the Federal Environment Agency by Roland Berger Strategy Consultants, 2007



Source: OECD (2008), "National approaches for promoting eco-innovation: Policy issues"

The current policy response is inadequate. Public policy must compensate for the disadvantage eco-innovations face in the market (failure to price the env. externality). On the policy side the SCP AP will drive the change. The EcoAP will launch demonstration projects showing the value added of procurement of green products and services. Also the IP approach must be exploited towards this objective.

- **Lack of appropriate and credible information on the performance of new environmental technologies –** *Not specific for eco-innovation, but more severe than in other policy areas.* The performance data from tests of emerging eco-innovation and demonstration plants are not always sufficiently robust for the market and do not adequately address the information needs of technology purchasers. Improving the quality and reliability of performance data on innovative environmental technologies, and the information on their environmental and health effects, would significantly facilitate market access.

  This may be illustrated by the specific case of measurement instruments. Three associations of industrial users of measurement instruments (Evaluation International in the UK, EXERA in France and WIB in the Netherlands) regularly undertake comparative tests and evaluation of measurement, control and monitoring systems. They published joint statistics based on 107 evaluations performed in five years, in which they stressed that, for 80% of evaluated systems, adequate documentation was not available for users. In 39% of cases, the technologies were not complying with announced specifications under normal conditions of use, this proportion rising to 74% under influence conditions.

  The current policy response is inadequate. Environmental Technology Verification is one way of increasing the market credibility of new technologies. An initial phase, on an experimental basis, should enable the testing and evaluation of the concept in near-real conditions.

3.4.3. The interplay between supply and demand

- **Governance problems related to EU innovation support** – *Not specific for eco-*

innovation, but more severe than in other policy areas. The policy mix for eco-innovation support ranges from environmental legislation and the "knowledge triangle" (research, education and innovation) to policy areas such as state aid, procurement, intellectual property rights and employment. The policy mix also depends on co-ordination at national, regional and local levels. Eco-innovation however has not been a main objective of either environmental or innovation policy, while it could contribute to objectives of both policies. Further changes[36] in the range of EU instruments and policies used to support eco-innovation seems necessary, notably to promote coherence between instruments, critical mass and to complement or extend them to cover also demand-led innovation measures.

The current policy response is inadequate. The measures to improve governance between areas and national, regional and local levels is currently one of the strengths of ETAP, and will not be properly tackled by the Europe 2020 flagships.

- **Difficulty in accessing finance** - *Not specific for eco-innovation, but more severe than in other policy areas.* Access to financial resources is one of the major difficulties for firms[37], the main barriers are:
  - Competency issues related to the small size of companies, such as lack of the organizational capacity to support research and commercialisation, lack of resources to protect IPRs, and lack of business skills;
  - Over-reliance on the public sector for financing;
  - Industry-specific issues including: divergent goals between eco-innovators and investors, limited knowledge of the eco-innovation market due to its rapid growth and embryonic development, and lack of cooperation within the industry.

Case-study: LODOred[38]
WASTEred is a project financed under CIP eco-innovation market replication grant programme. The consortium lead by BIOAZUL, a Spanish enterprise, develops and markets its own eco-innovative product LODOred (Sludge Reducer for Wastewater Treatment Plants) offering a 15%-40% reduction of the surplus sludge generated in wastewater treatment. Potential markets are the municipal and industrial treatment plants. The consortium was faced with many market barriers. For example reluctance of plant owners towards innovative solutions as well as the misconception that wastewater and sludge treatment is considered as a cost rather than an opportunity for increasing efficiency (and profits). Those hurdles have not allowed them to access "normal" financing at market conditions but they had to recur to European financing. The replication of the project in Europe is advancing and the achievement of 30% market share in the targeted markets is well on track.

- **Difficulty in providing finance** - *Not specific for eco-innovation, but more severe than in other policy areas.* Investors are showing an increasing interest in green investment,[39] but there are still barriers to investment in eco-innovation, namely:
  - the longer profitability horizons, the higher amounts needed, and hence the higher risks compared to investing in other sectors;
  - problems understanding the projects presented by eco-innovative start-ups, which makes it hard to evaluate their potential and risks;

36 OECD(2009), Eco-innovation in industry, enabling green growth, Paris, 2009.
37 Henzelmann, T, Mehner, S, & Zelt, T, 2007, Umweltpolitische Innovations- und Wachstumsmärkte aus Sicht der Unternehmen (Innovative environmental growth markets from a company perspective), Berlin
38 http://images.itt.camcom.it/f/Materialeconvegni/65/653_ITTUCCP_1542011.pdf
39 Deloitte (2009): 2009 Global Trends in Venture Capital Report

- the legislation and regulations governing eco-innovation are complicated, so investors need a high degree of specialization;
- finally, some investors argue, there is a real need to develop the managerial and business skills of entrepreneurs since business plans are often not good.

Case-study: SOT Biotech GmbH[40]
SOT has developed a proprietary industrial scale fully integrated microalgae production process which is more efficient and less capital intensive than existing alternatives. The company is currently financed with venture capital money as well as with grants. Although the company would have been interested in debt financing in the start-up financing round, commercial banks have declined to participate as it was too risky in their opinion. Have seen the potential of such technology those same banks are currently rather interested to act as financiers in such a promising company.

In the case of providing and accessing finance the current policy response is inadequate. Whilst the IU will provide support, there will be scope for additional action reflecting the eco-innovation specific problems and the need for targeted actions. Also the networking and support of investors and financiers specific for eco-innovation needs attention.

3.4.4 The global uptake of eco-innovations

- **Unfavourable global conditions for eco-innovation** - *Not specific for eco-innovation, but more severe than in other policy areas.* The perceived view is that there has been limited progress in the internationalisation of European eco-innovation, partly because of lack of demand in potential partner countries and emphasis on low-carbon technologies. Secondly since environmental goods and services are part of the Doha Trade Round the opening up of global markets has been stalled.

- **Unused potential for eco-innovation in developed and developing countries** – *Not specific for eco-innovation, but more severe than in other policy areas.* Eco-innovators face different set of opportunities and challenges when entering markets in developing countries to those in rapidly industrializing. Secondly a pure "competitiveness" approach to trade in eco-innovations is not always appropriate when looking for solution to global environmental challenges. For instance certain technologies that are specific to the needs of developing countries are not being developed at all, because the developing countries lack the innovation capacity to do so, while the developed countries lack incentives to develop such 'neglected' technologies in the first place.

- **Indigenous eco-innovation capability amongst developing countries is scarce** - *Not specific for eco-innovation, but more severe than in other policy areas.* Developing countries often lack the capacity to absorb eco-innovation and the capabilities to adopt and disseminate environmental technologies. Moreover, the governance systems to manage eco-innovation are often weak.[41] Research shows that "softer" approaches

40 http://ec.europa.eu/environment/ecoinnovation2010/2nd_forum/presentations_en.htm

41 Popp, D. (2009) Policies for the Development and Transfer of Eco-Innovations: lessons from the literature. OECD Global Forum on Environment on eco-innovation.

(like training or the transfer of "tacit knowledge") are crucial for effective eco-innovation uptake[42].

In the case of global uptake of eco-innovation the current policy response is inadequate. This problem will be partially addressed by EU trade policy[43]. However, there is a gap to be tackled by the EcoAP in the form of multilateral cooperation.

Case-study: Drying process of cash crops (coffee, tea, rice) [44]
The production and the export by developing countries of cash crops is considerable in terms of volume. The drying process of cash crops contributes considerably to the carbon footprint of the consumer products (coffee, tea, rice). It is clear that the economical, social and environmental impact of using appropriate drying technology for cash crops is high and often underestimated. The use of solar dryers allows addressing environmental concerns and simultaneously being profitable. Barriers to higher uptake include the need for capacity-building (therefore partnership at international level and technology transfer) and ad hoc financial support to accommodate the lack of information and of initial investment capital. Brazil, India, Sri Lanka and Viet Nam are potential candidates for technology transfer.

3.5 Are eco-innovation specific policy interventions at the EU level still needed?

Current policies and actions, such as those in the "Innovation Union" or "Resource Efficient Europe" will promote eco-innovation. However, there are gaps or issues specific to eco-innovation, where EcoAP can provide value-added over and above the Europe 2020 Flagships. Looking at the problem drivers these are:

- Weak linkages between research and market
- Inadequate “skills” base
- Demand side policy measures are weak
- Lack of appropriate and credible information on the performance of new environmental technologies
- Governance problems related to EU innovation support
- Problems related to environmental acquis
- Difficulties in accessing and providing finance
- Unfavourable global conditions for eco-innovation

To sum up, whilst the Europe 2020 Flagships will help tackle the problems related to eco-innovation, there is scope for additional policies targeted on the specific bottlenecks and market failures that exist for eco-innovation. A targeted eco-innovation policy would complement and build on the Innovation Union and other policies in two ways:

1. Taking forward some elements of the Innovation Union such as the screening of the regulatory framework for eco-innovation.
2. Putting in place eco-innovation measures that target specific environmental drivers that would only be partially responded to by the more generic actions set out in the Europe 2020 Flagships.

42 Ockwell (2009) Scoping Note on the difficulties developing countries face in accessing markets for eco-innovation. Final report for the OECD Environment Directorate.
43 COM (2010) 612, "Trade, growth and world affairs. Trade policy as a core component of the EU's 2020 strategy"
44 "Technology Transfer for reducing the carbon footprint. The example of cleaner technologies for food processing". Cassia Maria Lie Ugaya (Brazil) and Bernard Mazijn (Belgium)

3.6 Who is affected, in what ways, and to what extent?

The slow pace of eco-innovation adoption means lost benefits for a range of stakeholders. The most obvious loss is slower growth in production and commercial activities for eco-industries. For a description of Europe's eco-industry turnover, composition, employment and its future potential see Annex III.

There is widespread consensus that increasing eco-industry activities can spur the creation of 'green jobs' and help outweigh the job losses in other industrial sectors[45]. Global wind power employment projections, 2010 – 2050 by Global Wind Energy Outlook[46] estimate a potential of 2.1 – 2.8 million jobs. EPIA and Greenpeace project that by 2030, 6.3 million jobs47 could be created in solar energy generation. The European Renewable Energy Council argues that by increasing the share of renewable energy in Europe to 20% by 2020, there is a potential for the creation of more than 2 million jobs.[48]

Moving towards cleaner and more energy- and resource-efficient products and processes should give all European industry - not just the eco-industries - a competitive advantage[49]. Finally, eco-innovation is also good for the environment, allowing environmental objectives to be more ambitious and / or achieved at lower cost.

3.7 Does the EU have the right to act? The EU added-value

Eco-innovation is at the crossroads of articles 173 and 191 of the Lisbon Treaty, and so is a shared responsibility between MS and EU. In the field of innovation the EU coordinates, supports and supplements the innovation policies of the Member States, but cannot replace them. The need for a coordinated policy approach able to address eco-innovation failures and to create favourable conditions requires intervention at the EU level and cannot be achieved by individual EU Member States alone.

EU level innovation policy action is also necessary to respond to the increasing geographic complexity of innovation that requires increasing cooperation with innovation actors outside the territory of an individual Member State. Therefore the European added value of an eco-innovation initiative is evident.

4. OBJECTIVES

The problem analysis has underlined that improving Europe's eco-innovation performance must be tackled from both the supply and the demand side in an integrated approach. The objectives below focus on the problem drivers left unaddressed or where the measures in IU or other policy initiatives need to be taken forward (as specified in chapter 3.5) and so where there is potential to add value.

45 ILO (2010), "Green jobs: Towards decent work in a sustainable, low carbon world"
46 Greenpeace and Global Wind Energy Council (GWEC), Global Wind Energy Outlook, 2006
47 EPIA and Greenpeace International, "Solar generation: Solar electricity for over one billion people and two billion jobs by 2020, 2006. These projections are under an "Advanced" scenario positing additional support and dynamic growth.
48 Renner, M., M. Ghani-Eneland, and A. Chawla, 2009, Low-Carbon Jobs for Europe: Current Opportunities and Future Prospects, June 2009, World Wide Fund for Nature, Brussels
49. OECD, 2010, Greening Jobs and Skills: labour market implications of addressing climate change, Local Employment and Economic Development Programme Working Paper

4.1 General objectives

EcoAP will contribute to attaining the objectives of the Europe 2020 Strategy and in particular the "Innovation Union". It will accelerate the development and uptake of eco-innovation by tackling eco-innovation specific barriers, with an overall objective of:

- Increasing the rate of eco-innovation and its uptake in Europe and in so doing deliver efficient solutions for environmental problems, and boost the resource efficiency of Europe and its competitiveness.

4.2 Specific and operational objectives

Specific objective 1: to apply the principles of the Innovation Union Initiative to eco-innovation. This will be done through the following operational objectives:

- Putting in place an eco-innovation friendly environmental regulatory framework
- Integrate eco-innovation concerns into relevant policies and initiative, in particular in the innovation policy field
- The European Commission will in 2012 make proposals for better targeting of EU funds on eco-innovation as part of the next EU financial perspectives.

Specific objective 2: to promote eco-innovation in Europe. This will be done through the following operational objectives:

- Strengthen eco-innovation capacities of SMEs through increased networking and the spread of best practice (2011 onwards)
- Increase the market credibility and investment readiness of emerging eco-innovations (2011 onwards).

Specific objective 3: to improve global markets for eco-innovation. This will be done through the following operational objectives:

- Open up global markets to eco-innovation
- Improve global capacities for eco-innovation, in particular in developing countries

5. POLICY OPTIONS

Option 1 is a baseline option whereby EU policies that already exist or are under development are implemented but there are no additional policies on eco-innovation. It provides the baseline against which the other options are compared. Option 2 is the simple continuation of ETAP. Option 3 looks at a basket of actions to take forward the Europe 2020 Flagships. Option 4 looks at a number of SME eco-innovation specific actions, while Option 5 sets out more wide ranging regulatory intervention in support of eco-innovation.

5.1 Option 1: Discontinuation of ETAP (no specific EU action)

Under this option, several instruments and policy directions will continue, at least for a limited period – but the focus on eco-innovation may be limited or abandoned. In particular, eco-innovation would be taken forward through:

- the Europe 2020 flagships, including the Innovation Union, Industrial Policy for a Globalized Era, A Resource-Efficient Europe and the Agenda for New Skills and Jobs,

- environment policy will continue to create markets and set incentives for eco-innovation,
- funding for innovation from CIP and LIFE+.

Although during stakeholder consultations both positive and negative opinions about ETAP were voiced, the discontinuation of ETAP was never deemed to be beneficial.

5.2 Option 2: Continuation of ETAP

The current Action Plan consists of 29 actions, including 9 priority actions (PA) (see Figure). The option would see a continuation of the current four main domains. Firstly, promoting "green" research while attracting private and public investment. Secondly, tackling the unfavourable conditions faced by eco-innovators in the market (by facilitating access to finance). Thirdly, promotion of environmental technologies abroad. Finally, governance and networking of stakeholders (public institutions, enterprises, researchers, financial institutions, etc.) to increase the knowledge base for eco-innovation. Continuation of ETAP would have a strong focus on technology (excluding social and organisational eco-innovation), and a "light" governance (through the HLWG).

Figure 2: Actions under the ETAP option

A1	Increasing and focusing research, demonstration and dissemination. Improving co-ordination of relevant programmes
A2	Establishing technology platforms
A3	Establishing European Networks for technology testing, performance verification and standardisation
A4	Developing and agreeing on performance targets for key products, processes and services
A5	Mobilising financial instruments to share the risk of investing in environmental technologies
A6	Encouraging systematic internalisation of costs through market-based instruments
A7	Encouraging procurement of environmental technologies
A8	Raising business and consumer awareness
A9	Supporting eco-technologies in developing countries, and promoting foreign investment

All stakeholders, including the Member States, have shown continuing support for ETAP. It was stressed that any continuation of ETAP should take stock of the lessons learned and reflect the latest policy developments in order to reinforce the ETAP approach.

5.3 Option 3: Taking forward the Europe 2020 Flagships

Option 3 would involve doing what is promised in the context of the Europe 2020 for the area of eco-innovation, in particular the review of environmental legislation, inclusion of eco-innovation aspects in the Innovation Partnerships or supporting the development of skills for green and greener jobs. Whilst there is a commitment to these actions already, this option would provide firm ownership for them, and put them in the context of an EcoAP that has clear governance and so ensure a clear follow-up.

In addition Option 3 builds on ETAP lessons learnt, by expanding from green technologies to eco-innovation. The improved governance framework responds to the identified ETAP gaps. This is evident in the emphasis on policy learning between the MS as well as transformation of the Roadmaps from summaries of (past) national actions towards pro-active, forward looking documents (i.e. ensuring a coherent impact of the measures across the EU).

During the consultation stakeholders stressed the need for the Action Plan to link and complement associated Europe 2020 Flagships (in particular Innovation Union and Resource Efficiency).

Action 1: Screening the environmental regulatory framework for eco-innovation

ETAP has shown that eco-innovation will not emerge without an eco-innovation friendly environmental policy. Forthcoming initiatives will thus be designed so that they drive and support eco-innovation. This means that future proposals and policy reviews will consider the following assessment criteria[50]: a) promote innovation for achieving best the defined environmental objectives, b) avoid technology lock-in and stimulate competition, c) remove barriers to research and development activities, d) facilitate the emergence of commercially viable new products or practices, e) accelerate the uptake of eco-innovation.

The screening will be carried out by the European Commission with the help of stakeholders, based on guidance to be developed with the HLWG. It will begin with the revised Waste Framework Directive, the 2012 Water Blueprint, the 2013 clean air legislation review, the reviews of the Thematic Strategies under the 6th Environmental Action Programme.

Action 2: Partnerships for eco-innovation

The Commission has launched a pilot Innovation Partnership (IP) on active and healthy ageing, with the expectation of more to follow (in particular Partnerships for water-efficiency or secondary raw materials). The partnership approach will bring together the right stakeholders along the value chain, identifying bottlenecks and applying the right instruments. Eco-innovation is conditioned by wider framework conditions and EcoAP will support the integration of eco-innovation considerations into new IPs as they are developed and where it has something to offer.

EcoAP will also build the foundations for IPs in areas more directly related to eco-innovation: sectors like methane from bio-waste, eco-system services for flood and droughts protection or green chemicals have the potential to become new Partnership areas. EcoAP, through the Eco-innovation Observatory[51] (EIO), will provide support in the form of market intelligence on emerging eco-innovation sectors, opportunities and mobilizing stakeholders. Also, pilot schemes will be implemented to bundle public and private procurement for promoting eco-innovation in emerging partnership areas. Tender specifications and documents will be developed for wider public and private sector use.

Action 3: Mobilising financial resources, both public and private, for investment in eco-innovation

Finance for innovation comes mainly from the LIFE programme, the Competitiveness and Innovation Framework Programme (CIP), and cohesion policy. These efforts are not sufficient to support green SMEs. Faster pace of eco-innovation and market penetration is hampered by the lack of risk finance and support for demonstration. Only 15%-20% of applications for eco-innovation demonstration have been supported under CIP programme. Financiers tend to use the same investment rationale for eco-innovative enterprises as for

50 Criteria based on: EC, DG Environment, 2007 "Designing environmental policy to be innovation friendly"; OECD, 2011, "Better policies to support eco-innovation"

51 A DG Environment funded network monitoring eco-innovation trends and opportunities and gathering market intelligence on key green sectors. The network is funded through the CIP program and operational till end 2012. For details see: http://www.eco-innovation.eu/

investments in "traditional" sectors (i.e. same expected return, same level of accepted risk) and the social and environmental challenges do not play a role in investment decisions[52].

As part of the next EU financial perspectives the Commission will consider whether to propose:

- Reinforced and focused support for eco-innovation demonstration projects in SMEs
- Risk capital support for eco-innovation in SMEs including equity and loan financing schemes with flexible risk sharing and guarantee schemes for mobilising private finance
- Technical assistance for SMEs and financial sector in developing bankable projects, for appraising their bankability and for implementing projects benefitting from risk financing.

Representatives of business and financial community have debated[53] the issue of eco-innovation financing in the context of the 9th ETAP Forum in 2010. Its specificity was recognised and there was support regarding the above mentioned proposals. Also the HLWG has supported the approach and in particular the need to reinforce financial support to SMEs.

Action 4: Developing standards and performance targets for key products, processes and services to reduce their environmental footprint

The Commission and the Member States will work together with European and international standardisation bodies to ensure that new and revised standards are performance-related and better accommodate environmental technologies and eco-innovation. Industrial stakeholders will be mobilised to work on standardization and to drive the process of introducing the new standards to the market. As part of the review of the Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan in 2012, it will be assessed whether it is possible to expand the scope of the Eco-design directive to non-energy related products.

Action 5: Developing new skills for new jobs in environmental goods and services industry

The "New skills for new jobs" initiative will promote the set of skills needed for the transition to a low carbon and resource efficient economy. A European Sector Council on skills for green and greener jobs could build on this by facilitating the exchange of information between Member States on skills profiles, training programmes and emerging skills gaps and skills mismatches related to occupational needs for the growing demand of energy efficient economy. Skills and employment strategies will be developed for promising areas, i.e. bio-energy skills roadmaps and the construction of zero-carbon homes. This Sector Council on skills for green and greener jobs would have to be closely associated to the upcoming EU Skills Panorama which will collect forecast and foresight information from Member States and international organisations on future skills needs, supply and mismatch possibly having a 'green' dimension.

Action 6: Governance of eco-innovation policy

This action would strengthen the governance of the Action Plan, both at a national and EU level. The Eco-innovation National Roadmaps would track and highlight upcoming eco-innovation policy initiatives in the Member States. The HLWG would become the focal point for eco-innovation policy development at the EU level and the venue for peer reviews and

52 EIM & Oxford Research for DG Environment (2011), Financing eco-innovation
53 For Forum conclusions see: http://ec.europa.eu/environment/ecoinnovation2010/2nd_forum/index_en.htm

policy exchange between the Member States. Pilots would be launched[54] to prepare the ground for implementation of the most promising policy practice in other MS. The Eco-innovation Forum would be used for regular consultation of stakeholders on the available policy options, mobilization and networking of eco-innovators.

Following on from ETAP lessons learnt, the new governance structure will help set the agenda for eco-innovation outside the environmental domain. As eco-innovation is conditioned by wider framework conditions the Action Plan and the HLWG, will act as agenda setters for eco-innovation integrating it into other policies through regular contacts and exchanges between relevant Commission services and Member States.

During the consultations there were concerns, especially from the Member States, about the participation of business entities as permanent members of the new governance structure. As a result this action excludes private members from the HLWG, but foresees extensive and regular consultations in the framework of the new governance structure.

5.4 Option 4: SME-targeted actions

In order to seize the emerging opportunities SMEs must become active developers and users of eco-innovation[55]. This option focuses on the eco-innovation needs of SMEs, expanded scope of intervention from environmental technologies to also include non-technical eco-innovation, a real focus on the global dimension and increased attention to networking. The actions are in two broad areas: additional actions specific to eco-innovation and going beyond the Europe 2020 flagships and global actions.

Considering the significant impact of SMEs on the environment Option 4 aims to facilitate the development and uptake of eco-innovation within this sector. SMEs face specific barriers hindering the adoption of eco-innovations and specific measures should be developed to promote their adoption by SMEs56.

The stakeholder consultation showed wide support for focusing efforts on SMEs. Some stakeholders (particularly the academic representatives) objected to the exclusion of consumers from the planned policy initiative. This was justified by the need to avoid overlaps with other initiatives, such as the SCP-AP.

Action 1: Targeted eco-innovation support for SMEs through enterprise and business networks

The Enterprise Europe Network[57] offers support and advice to businesses across Europe and other participating countries. In order to improve investment readiness for eco-innovative SMEs and help them devise and implement eco-innovative solutions for their businesses, further SME support should be mobilized.

54 Policy pilots are part of the work programme of the DG Environment funded network "Instruments and policies for eco-innovation" and part of the ProInno Europe. The network is operational till end 2013.
55 The 8th ETAP Forum Declaration, June 2010, "Fostering eco-innovation in SMEs"
56 JRC IPTS, 2007, "Promoting environmental technologies in SMEs: Barriers and measures"
57 For details see: http://www.enterprise-europe-network.ec.europa.eu/index_en.htm

- The European Commission, in cooperation with the Enterprise Europe Network, will expand the activities of the "Environmental Assistants for SMEs". The scheme will enhance and consolidate ecological approaches in SMEs and provide the SMEs with the necessary skills and awareness to stimulate eco-innovation.
- The Action Plan will work towards the establishment in 2012 of a European network of eco-innovation financiers by providing advice and knowledge-building on eco-efficient technologies, green procurement, green business models and services, business plan preparation and connecting entrepreneurs with finance providers.

Action 2: Environmental Technology Verification initiative, to test an EU ETV pilot programme and evaluate its potential in facilitating market access for innovative environmental technologies

The Environmental Technology Verification initiative (ETV) – involving Member States and participants on a voluntary basis – aims to generate independent and highly credible information about new environmental technologies. It will do this by verifying that performance claims by technology developers and vendors are accurate, complete, fair and based on reliable test results. The objective of ETV is three-fold:

- To help developers and vendors, especially SMEs, provide objective and reliable evidence on the performance of new eco-technologies they are bringing to the market, in order to convince investors and potential customers about the merits of the technologies;
- To support technology purchasers (public or private), who need to base their buying decisions on sound information, widely recognised as scientifically valid and acceptable as proof of evidence in tendering and purchasing procedures;
- To facilitate the implementation of public policies and regulations by providing citizens, regulators and decision-makers with solid information on the level of performance achievable by new eco-technologies ready for the market.

The ETV pilot programme will be implemented by Verification Bodies, which are existing independent organisations specifically accredited for this purpose by the existing national accreditation bodies. As of May 2011, seven Member States have volunteered to try out ETV through the pilot programme and the three initial technology areas selected are: water treatment and monitoring; energy technologies; waste, materials and resources.

The results of the ETV pilot programme will be evaluated after two to three years of actual operation. On the basis of this evaluation and a study on the market potential of ETV now underway, the Commission will draw conclusions on the potential of ETV in Europe and on the best way to realise it. Choices could range from discontinuing the initiative to transferring its implementation to private actors, or proposing a legislative instrument, if there is clear evidence of its potential added value as an EU-wide measure.

To facilitate the launch of the ETV pilot programme, a call for proposals will be launched in 2011 under the EU Competitiveness and Innovation Programme (CIP) with a budget of €1 million[58]. Amounts of €1 million are also programmed under CIP for ETV in 2012 and 2013, subject to the approval procedure of annual work programmes for these years. The grants awarded should enable accredited Verification Bodies to implement the ETV pilot programme

58 2011 Work Programme for CIP – Entrepreneurship and Innovation sub-Programme – adopted on 18 January 2011 by Commission Decision C(2011) 91.

efficiently, to facilitate access for SMEs and to report to the Commission in view of the future evaluation of the pilot programme.

The Member States, through the HLWG, have followed from the start and provided input to the development of the ETV initiative. There is wide agreement on the role that such initiative can play to help the uptake of environmental technologies. Member States having volunteered to participate in the ETV pilot programme are now part of the ETV Steering Group (generally the same representatives participate in the HLWG and ETV Steering Group meetings) and contribute actively to the preparation and setting-up of the pilot programme.

Action 3: Setting up Eco-innovation Partnerships with major partner countries and regions

The European Commission will step up its efforts to work with other countries and to ensure the development and dissemination of environmental technologies. In particular:

- Green technologies and eco-innovation will be included in relevant regional initiatives with third countries. Examples that will be built on will include the EU-China Sustainable Trade Task Force and the EU-China IPR2 project. In particular practical and concrete co-operation initiatives between Brazil, US, China, India and the EU will be developed in the field of eco-innovation with a clear focus on networking between and innovative venture capital funding schemes for SMEs.
- Benchmarking and harmonisation of the eco-design requirements of products in key emerging markets. The approach of the SWITCH Asia programme will be expanded to other developing countries, particularly in Africa and Latin America.

Action 4: Promotion of environmental technologies in developing countries

This will be done through global networks in partnership with UNEP and using the EU and UN technology centres, to support capacity-building, demonstration projects and financing for resource-efficiency projects in developing countries. In cooperation with the OECD the EcoAP will investigate the incentives for the development and diffusion of "mature" environmental technologies. Furthermore, the European Commission will support UNEP in expanding its work on the Green Economy Initiative by participating in knowledge sharing and providing advisory services. It will also take stock of past international activities for eco-innovation and investigate directions for future global cooperation. In particular in 2011 the European Commission will present the Communication on Rio+20 on global policies towards green economy including policies and measures to promote eco-innovation.

The need to reinforce the international dimension of ETAP was a strong messages coming from the consultations. Particularly, the need to avoid setting up new structures for this purpose, but rather building upon existing initiatives and international organisations was raised. This resulted in propositions for Actions 3 and Action 4.

5.5 Option 5: Wide EU eco-innovation policy

This option consists of actions that can be implemented in addition to (and not only instead of) the other options. It is characterised by a higher level of ambition, more regulatory approach and a more long-term view. However, it is also of a 'general principles' nature, rather than of the operational bent of options 3 and 4. Reflecting this, the measures involved in delivering this option would be the responsibility of a wide range of levels of government and a wide range of actors.

Action 1: Promoting a faster shift of the burden of taxation to resources: this would involve more systematic use of taxes and other market-based instruments to reflect the true environmental benefits of eco-innovation. Currently, only one out of every fifteen Euros of government revenue comes from environment taxes (although Denmark, at one-in-eight shows they can be used more widely) and this share has even declined slightly in recent years.

Stakeholders stressed the "courage" and controversies that the implementation of this action would require a from the Member States. Due to thus the action was deemed problematic.

Action 2: Introduction of ambitious standards for green public procurement: more focused and stringent demand-side policies (e.g. public procurement standards and targets on resource efficiency and environmental performance) aimed at fostering eco-innovation. This will be assessed as part of the review of public procurement policies scheduled for the beginning of 2012.

Action 3: Introducing a legally binding framework for labelling of all manufactured goods: building on the successful examples of labelling eg for electrical appliances, to fully inform purchasers and ensure informed competition by providing information on the environmental impacts of goods.

Action 4: Introducing waste prevention and recycling standards along the whole value chain: Implementing this principle will accelerate the eco-innovation rate by making the production of non-recyclable products more costly.

6. ANALYSIS OF THE IMPACTS

Many of the actions foreseen under EcoAP are indirect and, especially for the more strategic actions, impacts cannot be quantitatively assessed. Whenever possible, attempts to quantify effects are made, but given the complex relation between policy actions, final impacts, associated problems of attribution and additionality (as well as lack of evidence in some cases) it can be difficult to quantify effects[59].

6.1 Option 1: Discontinuation of ETAP (no EU specific action on eco-innovation)

This option assumes the termination of ETAP. Ongoing policies in innovation, environment and other areas continue without specific inputs from the eco-innovation point of view. Chapter 3.2 describes the impact of current policies on eco-innovation. See Annex VII for a detailed description of additional ETAP contributions.

Additionally it is worth nothing that with the suspension of ETAP current activities on the definition of an EU framework for the **verification of environmental technologies**, developed under the ETV pilot programme and associated research and pilot activities, would no longer be supported at EU level. National programmes would probably be developed and tested in those Member States most interested in the approach, potentially resulting in divergent programmes without mutual recognition and with practically no impact on the promotion of green technologies outside national markets. International co-operation would likely lead to an international standard on ETV procedures, but without involvement at EU level. There is a risk that EU policy and industry characteristics would not be taken into

59 See Annex VIII – XI for a detailed analysis of the actions

account. The overall impact would be missed opportunities for the marketing of EU environmental technologies both within the EU and on international markets.

Also in terms of financial support to eco-innovation, although it is expected to continue in the next financial perspective, the discontinuation of ETAP would probably result in less focussed financial support due to a lack of a deep understanding of the European eco-innovation system, which is one of the priorities of ETAP.

Overall, the rate of eco-innovation and the degree of policy integration of eco-innovation would fall as compared to the existing situation. This option is the baseline against which other options are compared.

6.2 Option 2: Continuation of ETAP

6.2.1. Impact of actions

The ETAP option consists of 9 PAs. Impacts of each action are assessed in this section.

Action 1. Increase and focus research, demonstration and dissemination. Improve co-ordination of relevant programmes (strategic)

Increased R&D demonstration and dissemination, and better coordination of eco-innovation R&D programs results in increased funding for research[60]. This action will continue to have a positive impact on the eco-innovation system by steering networks and collaboration among various stakeholders, addressing market failures (through attracting more funding for R&D and commercialisation), solving organizational problems, capacity building in firms and steering a more favourable regulatory framework.

The activities under PA1 had a stronger focus on energy technologies and carbon emission reduction, and somewhat weaker emphasis on wider problems of resource efficiency and even less focus on other nature protection problems. The EU value added seems to be quite high and evaluations show the main effect to be organising international networks and adding additional funding to national sources[61]. Due to the specific agenda setting processes for each programme the role of ETAP has been limited.

Action 2. Establishing European Technology Platforms (ETP) (operational)

Technology Platforms are a direct and concrete contribution of ETAP towards promotion of environmental technologies. The contribution of ETPs to addressing system failures and increasing competitiveness is positive, especially by mobilizing funds and building dialog between research community, authorities and business community, and this should continue[62]. EU added value is evident and there is scope for launching additional and focussed ETPs, but the influence of ETAP on ETPs has been limited and indirect.

Action 3. Establishing European Networks of technology testing, performance verification and standardisation (operational)

60 Ecorys (2009). The implementation of the Environmental Technologies Action Plan. Draft final report. August 2009
61 Technopolis 2008, Evaluation of FP5 and FP6 research in the sub-priority Global Change and Ecosystems; Technopolis 2009, Evalluation of Non Nuclear Energy research activities in FP5 and FP6
62 Ecorys (2009). The implementation of the Environmental Technologies Action Plan. Draft final report. August 2009

Environmental technology testing and verification can play a role in addressing systemic market failures (e.g.: lack of sound information and trust in environmental technologies). EU added value and impacts on competitiveness are considered to be positive. This has been shown through a number of research and pilot actions, at EU and MS levels. A summary of these actions and market and cost estimates is available in Annex VI.

Based on the preparatory actions developed under ETAP, seven Member States have formally volunteered to participate in an ETV pilot programme, co-ordinated by the Commission services on an experimental basis and testing the ETV approach in three technology fields: (1) water treatment and monitoring, (2) energy technologies, (3) materials, waste and resources.

Based on the results of the ETV pilot programme and on a market study commissioned in parallel, a thorough evaluation and assessment will be undertaken in 2-3 years time, after which the Commission will decide on the appropriate way forward for ETV. No options are excluded at this stage.

By facilitating the provision of scientifically-sound information on technology performance, an EU ETV scheme could potentially have a positive impact extending beyond simply support for market access. It would also send out a signal that the development of innovative technologies, and competition between technological solutions, must be built on proven performance rather than regulatory obligations and cost considerations alone.

Action 4. Develop and agree on performance targets for key products, processes and services (strategic)

Due to legislative constraints and the difficulty to deal with a broad set of industries, products and processes[63], ETAP has not been successful in developing standards for products and processes. ETAP would find it even more difficult to play a leading role in the development of performance targets for resource use. Literature on their effectiveness and impacts is scarce though standards and targets for energy savings show a positive environmental effect (e.g.: Japan's Top Runner scheme), implying potential for performance targets for eco-efficiency. The need for EU coordination is evident as positive environmental and competitiveness impacts depend on uniform application throughout the EU and globally[64].

Action 5. Mobilising financial instruments to share the risks of investing in environmental technologies (strategic)

The CIP and the Environment and Governance component of LIFE+ are the key EU instruments supporting the transition of eco-innovations from research to market. With regards to CIP it is yet impossible to assess the impact on eco-innovation[65] (specifically on resource savings). **However it is argued that its continuation under the influence of ETAP will bring positive impacts.** The additionality of the EU in these actions is high. Eco-innovation is a key pillar of the CIP. The role of ETAP has been significant, without it specific funding "windows" for eco-innovation could dissappear.

63 Problems that can be encountered are the entrance of alternative products that are not taken up in the standard, shortening of the economic lifetime of products, as well as difficulties to set the standards due to difficulties in defining targeted industries.
64 Popp 2006, International innovation and diffusion of air pollution control technologies: the effects of NOx and SO2 regulation in the US, Japan and Germany.
65 GHK & Technopolis 2009. Interim evaluation of the Entrepreneurship and Innovation Programme (EIP).

Action 6. Review State Aid Guidelines and review of environmentally harmful subsidies (strategic)

The impacts of improving the demand for eco-innovation of these actions are hard to assess. Since the amount of money involved is large, potential effects on the market uptake of (eco-) innovations can be considered large. This measure did not have a specific focus on resource efficiency, but impacts on resource savings, biodiversity, water and energy are considerable. The additionality of EU action is evident: subsidies are largest in sectors with a strong EU role (e.g.: fisheries or agriculture), and in areas where MS are responsible for subsidies then the EU has a strong controlling role present due to the 'single market' perspective.

Action 7. Green public procurement (strategic)

Public procurement of goods and services amounts to 17% of EU GDP[66] and could have a significant contribution to[67,68] eco-innovation, including by creating markets for resource-efficient products and services. The effect on competitiveness is evident. Buying 'green' has led to an average decrease in costs of 1%, when the life cycle costing is taken into account. EU added value and additionality of EU action is significant.

Action 8. Raise business and consumer awareness, and provision of targeted training (operational)

This action has had a major and positive role[69]. It embeds a powerful networking aspect with (indirect) benefits to the European eco-innovation system. Impacts of this action on environmental protection and competitiveness are positive. The additionality of EU action is intermediate, and the EU added value is clear. Its continuation, without being more clear and defined, will remain beneficial for networking, but without concrete feedback into eco-innovation policy.

Action 9. Promoting responsible investments and use of environmental technologies in developing countries and countries in economic transition (strategic)

Investment in environmental technologies, especially in developing countries, has the potential for positive impacts on innovation, environmental protection (e.g.: resource savings) and competitiveness. The EU could have added value in stimulating S&T agreements[70], stimulating technology transfer through institutions such as Global Energy Efficiency and Renewable Fund (GEEREF) and by strengthening facilities such as the Global Environment Facility (GEF). Continuation of this action along past lines is likely to bring modest positive results as it is too dependent on the discussions for liberalizing global trade.

6.2.2 Overall impact of option

66 Schmidt-Bleek, F. (2010): Innovation for a sustainable future. Paper prepared for the Stakeholders Consultation on Eco-AP, 11 February, 2010 in Bruxelles. Carnoules
67 Öko-institut & ICLEI, 2007. Costs and Benefits of Green Public Procurement in Europe.
68 2007, PricewaterhouseCoopers, Significant, Ecofys, Collection of statistical information on Greeen Public Procurement in the EU.
69 Ecorys (2009). The implementation of the Environmental Technologies Action Plan. Draft final report. August 2009
70 Technopolis / Manchester Institute of Innovation Research 2009, Drivers of international collaboration in research, Luxembourg, European Commission

The impacts ETAP are indirect: ETAP is not a distinct programme with a budget. It is an umbrella pulling together different intervention instruments and influencing the direction and size of other, often broader and non-environment specific programmes and schemes.

The continuation of ETAP will lead to continued attention for environmental technologies and will have positive effects on innovation in the area of environmental technologies, competitiveness of the eco-industry (and related employment) and positive impacts on the environment and on health. Direct administrative burden, as ETAP actions are voluntary and reporting requirements minimal, would be limited and mainly consists of human resources to carry out the actions. As ETAP operates since 2004 both the Member States and the Commission are efficient at carrying out the actions in the ETAP Framework.

Option 2 covers most of the specific objectives, however, the adequacy of response is relatively low notably due to the scope being limited to environmental technologies, failure to refocus action in line with the lessons learnt and not corresponding to the new political landscape.

6.3 Option 3: Taking forward the Europe 2020 flagships

6.3.1 Impact of actions

Action 1: Screening the environmental regulatory framework for eco-innovation (strategic)

Many of the enabling conditions for innovation are the same ones as for eco-innovation. However, the rate and pattern of eco-innovation is influenced by the environmental policy framework. A study[71] on eco-innovation in the French and German industry concluded that government regulation plays a central role in motivating eco-innovation. Policy corrects for market failures and helps address the eco-innovation specific barriers. The perceived importance of regulations for eco-innovation is high and overwhelmingly positive[72]. Various empirical studies[73,74] confirmed that complying with environmental regulation was one of the key motivations to innovate among eco-innovation companies.

Impacts are indirect and hard to assess. The costs of undertaking the screening will be minimal, as it will be done within the context of already planned reviews. The benefits will come from increased innovation because public policies play a key role in determining framework conditions for eco-innovations, which in the past are seen as not innovation friendly. Whilst it is clear that to some extent the existing reviews would have covered this issue, with explicit guidance a clear political focus, it should be much better covered. Improved innovation should make environmental policy more effective, more efficient or both. For instance the REACH[75] regulation directs research and development efforts and sets the pace of technological change. It lists substances of very high concern (SVHC) for which substitution is required when safer alternative substances or technologies become technically

71 Belin, J, Horbach, J & Oltra, V, 2009, Determinants and specificities of eco-innovations – An econometric analysis for France and Germany based on the Community Innovation Survey, Article submitted to the EAEPE Conference, Amsterdam, November 6-8, 2009.
72 ZEW (2007) Analysis of regulatory and policy issues influencing sectoral innovation patterns, Sector report eco-innovation, Interim paper
73 ZEW (2001) The Impact of Clean Production on Employment in Europe – An Analysis using Surveys and Case Studies (IMPRESS),
74 Rehfeld K.M., Rennings K., Ziegler A. (2006) Integrated Product Policy and Environmental Product Innovations - An Empirical Analysis
75 Regulation (EC) No 1907/2006 of the European Parliament and the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

and economically feasible. This active search for alternatives stimulate R&D activities towards delivering competing and safer substitutes, thus in turn replacing SVHCs.

Overall impacts for this action will vary between and within sectors and countries, depending on the policy initiative being assessed. The additionality of EU action is large.

Action 2: Partnerships for eco-innovation (strategic)

Eco-innovation is a too broad field to be covered by a single partnership, but the IP approach would benefit from integration of eco-innovation considerations into existing and upcoming IPs. The action would also investigate the potential for Innovation Partnerships in sectors relevant for eco-innovation. ETAP Fora on Eco-innovation have identified strong market potential and stakeholder commitment, in particular for water efficiency, bio-gas for bio-waste and eco-system services for draughts. IPs are characterized by greater levels of policy coordination and underpinned by a high level of stakeholder commitment. The Eco-innovation Action Plan can assess the market potential for an emerging Partnership sector, its maturity, key drivers and barriers. The High Level Working Group will coordinate Member State policies governing these sectors and ensure Member State buy-in. The pilot procurement schemes would signal market demand in the (eco-) IP areas.

The EU added value and additionality is considerable. The direct costs of action will be relatively small as it will build on existing fora to create and harness stakeholder commitment. The pilot schemes[76] would bundle private and public demand for green goods or services thus enlarging the market (and thus certainty) for technology developers. The procurement pilot would cost app. 600.000 Euro per product group/ service type. Financing is available through the support measures under the CIP eco-innovation strand. The analytical work for the IPs would be carried out through the EIO which is operational and funded through the CIP.

Action 3: Mobilising financial instruments, both public and private, for investments in eco-innovation (strategic)

The impact of this Action is similar to PA5 of option 2. The focus on further integration of eco-innovation in future EU programmes in partnership with the EIB Group or other international financial intermediaries has relatively identical mechanisms of impacts as those described in the ETAP option – but if Eco-AP succeeds in mobilising additional resources and better adapting financial instruments to existing gaps in eco-innovation financing, the impacts would be stronger from all points of view. Based on the information available it is not possible to have quantitative estimates of additional funds needed to stimulate eco-innovation uptake, anyhow evidence shows that in the eco-innovation area there is a clear dominance of energy as opposed to non-energy related investments (e.g.: water, waste etc.).

Action 4: Developing standards and performance targets for key products, processes and services to reduce their environmental footprint (strategic)

76 As described in: COWI A/S for DG Environment, 2009, "Bridging the valley of death: Public support for commercialization of eco-innovation"

Standardisation can enable the uptake of eco-innovation and facilitate their dissemination in the Single Market and access to global markets. It is expected[77] that standards and performance targets can make an important contribution to 'sustainable industrial policy', improving the energy and resource efficiency of products, processes and services and the competitiveness of European industry. Broadening the scope of the Eco-design Directive (EuP)[78] to non-energy related products would have a positive impact on resource efficiency (that could be a priority for this widening process) and lead to additional impacts considering that the EuP now only addresses energy use of products, which only accounts for about one-third of the environmental impacts of products[79]. The impacts of this action will be discussed in the Impact Assessment accompanying the review of the Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan.

Action 5: Developing new skills for new jobs in environmental goods and services industry (strategic)

Managing the transition to a green economy means anticipating change, and identifying the skills that will be required. There is already a mismatch between current skills and the future skills needed and this is a threat to green growth. For example, according to several national trade unions, a shortage of skilled people exists to implement the Directive on Energy Performance of Buildings. To better prepare the current and future workforce, this action includes action at sectoral level, for example through a focus on 'skills for green and greener jobs' in the upcoming EU-level sectoral Councils for skills and employment. A specific section on skills for green and greener jobs will also be introduced in the EU Skills Panorama, to be launched by the end of 2012, which will collect from Member States and international organisations information on skills needs, supply and mismatch in the short and medium-term. The role of an Eco-AP contribution can be very important although impacts very limited and indirect.

The costs and benefits of a European Sector Council on skills for green and greener jobs are unclear at this stage. Preparatory work will investigate how such a mechanism should be designed, and how it can concretely complement the “New skills for new jobs” initiative. In the first stages, the costs will be rather minor, as the exploratory work will be undertaken through the HLWG, which has expressed[80] a desire for this action.

Action 6: Governance of eco-innovation policy

Regularly updated Eco-innovation National Roadmaps can represent a significant body of knowledge and have positive, even if indirect impacts (through policy learning), on the innovation system and the competitiveness. These would be voluntary, and only undertaken if Member States saw value-added in them: the Commission would provide guidance to ensure their usefulness. In particular the Eco-innovation Roadmaps would provide information as to future planned actions and being regularly updated would allow mapping the efforts and impacts of the Member State actions ensuring a coherent impact throughout the EU. Bi-annual Fora on eco-innovation will be organized on issues of key importance for eco-innovation. The event will be used for regular consultation of stakeholders on the available policy options, mobilization and networking of eco-innovators.

77 COM(2008) 133 final Towards an increased contribution from standardisation to innovation in Europe
78 Directive 2005/32/EC of the European Parliament and of the Council establishing a framework for the setting of ecodesign requirements for energy-using products (OJ L 101, 22.7.2005, p. 29).
79 Staff Working Paper SEC(2008) 2110 Impact assessment for recast of Directive 2005/32/EC,
80 See conclusion to the 2010 ETAP Forum in Bilbao: http://ec.europa.eu/environment/ecoinnovation2010/1st_forum/pdf/declaration.pdf

6.3.2 Overall impact of option

The shift from environmental technologies to eco-innovation, as announced in the EcoAP, will contribute to a competitive advantage for industry across sectors and can lead to positive environmental, economic and employment impacts. A German study found that improving resource efficiency by 20% would boost economic growth by 1% and could create up to 1 million new jobs in Germany alone[81]. Improving resource efficiency will also help combat climate change and boost economic growth. Furthermore an EcoAP with a strong focus on resource efficiency would be strongly consistent with the strategy set out by the Europe 2020 initiative. As for social impacts, in addition to the expected positive impacts on health (i.e.: less environmental impacts generated by more sustainable solutions) positive impacts are expected in terms of employment.

Administrative burden may increase marginally, for example if voluntary Roadmaps are provided.

Option 3 provides a comprehensive policy response to specific objectives and complements well the Innovation Union initiative. The adequacy of response is high.

6.3.2.1 Subsidiarity, additionality, European value added – Eco-innovation Action Plan

This option is compatible with the principles of subsidiarity and proportionality. The initiative falls within the scope of competences of the EU under its environmental and innovation policies. It is also compatible with the EU's 2020 strategy for growth, placing emphasis on innovation, sustainable growth, competitiveness and resource efficiency.

The additionality of this option is the highest compared to the other options. EU-level interventions are either key or significant. The additionality of increased coordination of national eco-innovation policies is high. Accumulation of EU-wide expertise and networking, in particular when assessing new areas for IPs will contribute to improved eco-innovation in the Member States and the competitive position of the relevant sectors.

Also the proposed governance structure will allow better management and targeting of eco-innovation policies and through support networks will facilitate peer reviews of policy.

6.3.2.2 Downsides, administrative impact and reality check – Eco-innovation Action Plan

Public spending

- Effects under this option would also include the conclusions listed under option 1

Employment

A number of actions would generate new job opportunities by alleviating current bottlenecks.

Administrative burden

81 See before for reference to the study.

Looking at the actions of the Eco-AP, one could highlight a number of initiatives where added consideration for administrative burdens might be necessary. These would include:

- Develop and agree on standards and performance targets for key products, processes and services. Although standardisation on products generally function to a satisfactory level, standards development in the areas of environment and services are possibly less well developed. In addition, the research and design of standards need both time, and extensive input by relevant stakeholders.
- Encourage Procurement of environmental technologies and eco-innovations. Developments have been made in GPP under ETAP, the shear size of the GPP scheme – encompassing 15 to 20% of final consumption – would most likely mean continued administrative burdens in Member State public authorities, and on businesses and organisations bidding for contracts.
- Administrative burden may increase, in particular with regards to the greater involvement of Member States in setting the agenda for eco-innovation (through the voluntary National Roadmaps).

6.4 Option 4: SME-targeted actions

6.4.1 Impact of actions

Action 1: Targeted eco-innovation support for SMEs through enterprise and business networks

The support to eco-industries through the Enterprise Europe Network primarily aims at increasing network activities focussed on capacity building and communication. It aims to exploit key drivers for eco-innovation[82], i.e. good business partners and access to technology support services. Although impacts are indirect they are expected to have positive effects on innovation, environment as well as competitiveness. This action will particularly favour eco-innovative companies within the eco-industries, where networking and support structures are only emerging. The EU can play an important role in this type of networking, which is already financed through the CIP.

Additionally, a dedicated network of financiers would be beneficial to mobilise them, accelerate investment and finance for eco-innovation. As SMEs, also eco-innovators, largely rely on bank credit to finance their development the network would he instrumental in decreasing risk aversion of banks towards the sector and spread best practice for the evaluation of such investment prepositions[83]. The financing for this network would come from the CIP "eco-innovation strand" with an indicative budget of 2 million Euro.

Action 2: Environmental Technology Verification initiative, to test an EU ETV pilot programme and evaluate its potential in facilitating market access for innovative environmental technologies

The assessment of the continuation of the action under ETAP related to ETV (Option 2, Action 3) is also valid here. See Annex VI for more details on the assessment of this action.

Based on the results of the ETV pilot programme and on a market study commissioned in parallel, a thorough evaluation and assessment will be undertaken in 2-3 years time, after

82 As highlighted in the Flash Eurobarometer 315 on the "Attitudes of European entrepreneurs to eco-innovation"
83 EIM & Oxford Research for DG Environment, 2011, "Financing eco-innovation"

which the Commission will decide on the appropriate way forward for ETV. No options are excluded at this stage.

If successful, the ETV approach could also be applied to other technological fields where the EU has a (potential) competitive advantage, within or beyond the field of environmental technologies, possibly integrating other aspects than environment, for example in the health and social fields. As long as these aspects can be quantified and verified through testing, they could be accommodated. This would lead to new types of technical information, alongside technical standards and labelling, for the benefit of technology developers and purchasers and policy-makers. Better-informed choices will be more cost-beneficial. Any wider application of ETV would however to be specifically assessed.

Action 3: Setting up Eco-innovation Partnerships with major partner countries and regions

In this case different sub-actions are envisaged (i.e.: trade liberalisation, harmonisation of the eco-design requirements, bilateral cooperation with third and partner countries also at regional level). Similarly to the previous initiative impacts might be very positive but implementation and complexity represents a challenge to overall impact of this action. Costs will be minimal, as this will be done through or building upon existing structures, and the role will be primarily one of guidance.

Action 4: Promotion of environmental technologies in developing countries

Different sub-actions are envisaged (i.e.: use of Enterprise Europe Network to favour eco-innovative SMEs in export, support to the expansion of UNEP National Cleaner Production Centres, EU-public-private partnerships for environmental technology demonstrations in majors markets). The costs for the Commission will be around €4 million over 3 years. With the right and favourable global conditions for eco-innovations the potential for resource savings within and outside the EU is considerable, but previous implementation of similar efforts has been challenging (action 9 of the ETAP scenario, option 1) and subject to budget availability.

6.4.2 Overall impact of option

The Option will adequately target the needs of eco-innovative SMEs by highlighting networking and better preparing them for exploiting the available market opportunities (by, for instance, increasing their market readiness).

Option 4 provides a policy response targeting well the needs of eco-innovative SMEs. The adequacy of response is high.

6.4.2.1 Subsidiarity, additionality, European value added – Eco-innovation Action Plan

The initiative falls within the scope of competences of the EU under its environmental and innovation policies. It exploits EU added value in facilitating an EU wide level playing field, creation of trade ties and provision of SME support services.

This option although not tackling directly the framework conditions for eco-innovation responds well to the eco-innovation specific needs of the SMEs. Value of EU-level intervention is thus significant.

6.4.2.2 Downsides, administrative impact and reality check – Eco-innovation Action Plan

Public spending

- Effects under this option would also include the conclusions listed under option 1

Employment

A number of actions would generate new job opportunities by alleviating current bottlenecks.

Administrative burden

Additional administrative costs are likely to be small, and would relate to the increased networking both within the EU and globally.

6.5 Option 5: Wide EU eco-innovation policy

Option 5 includes strategic and long term actions off-setting the framework conditions for resource efficient eco-innovation.

6.5.1 Impact of actions

Action 1: Promotion of a faster shift of the burden of taxation to resources (strategic)

Taxation, and better pricing, can influence technological change[84]. In the case of energy efficiency, more energy-efficient solutions (and emissions reduction) were generated by modifications of energy prices[85]. Similar impact can be expected for natural resources consumption[86]. Impact on competitiveness is expected to be positive, but an element of uncertainty is represented by potential mismatch between EU and non EU countries. EU added value would be provided by the influencing and coordinating role of the Commission. Long-term, measurable social, economic and environmental impacts are expected.

Action 2: Introduction of ambitious standards for green public procurement (strategic)

This action exploits the potential of public procurement to favour resource-efficiency top-runners (this is the main difference versus similar GPP actions described previously). This would enhance the role of eco-innovation in driving the transition towards green growth. Economic, social and environmental impacts could be reinforced by periodically revising the criteria for public procurement to reflect innovation and development of markets.

Action 3: Introduction of a legally binding framework for labelling of all manufactured goods (strategic)

84 OECD (2009): Green Growth: Overcoming the crisis and beyond. Paris
85 OECD 2007: Impacts of environmental policy instruments on technological change. Paris
86 Bahn-Walkowiak, B. (2008): Resource taxation beyond energy and climate issues [Japan.]. In: Nikkei ecology, 2008, 2, p. 129

Labelling would extend public procurement criteria for resource efficiency to the private sector. EU added value would be provided by the European Union Eco-labelling Board (EUEB)[87] through negotiation and coordination. This would support demand for resource-efficient products and services, enlarging markets and improving competitiveness of eco-innovators. Long-term measurable social and environmental impacts are expected. However, there would also be very significant economic costs associated with any such action.

Action 4: Introduction of waste prevention and recycling standards along the value chain (strategic)

More regulation in favour of eco-design and eco-efficiency can reduce material requirement of production processes and products[88]. This would encourage eco-innovation related to the use of materials along the value chain. Evidence exists that stringent waste regulation has induced significant "cycles" of innovations[89]. Environmental and competitiveness impacts the expected, consequent increase in resource efficiency would lead to positive impacts.

6.5.2 Overall impact of option

Systemic eco-innovation requires coordinated action by research actors, economic stakeholders and political decision-makers. This option strives for establishing prices, which reflect environmental impacts. On the other hand, it improves market conditions for demand and the supply of eco-innovations. Option 5 addresses underlying drivers for high consumption of resources and energy and high levels of emissions and waste. **It takes a radical approach directed at root causes expanding beyond traditional environmental policy.** The necessity of the described actions have neither been contested in literature nor during the stakeholder consultation connected to this Impact Assessment.

The Option will carry significant long-term effects. Social impacts will be considerable: industry structure may change with related shifts in employment, effects on competition may be large (when EU is not taking possible trade effects into account).

6.5.2.1 Subsidiarity, additionality and European value added

The high additionality of Option 5 owes to the scale of the initiative and its expected effects. This option includes a good mix of measures, fiscal, regulatory and normative which complement each other and seek to enhance efficiency in different policy areas.

6.5.2.2 Downsides, administrative impact and reality check

Public spending

- Accelerated eco-innovation in the EU poses a threat to resource-inefficient and high-carbon EU industries. They will need to reinvest and develop new capacities. The downsides should be outweighed by new industries and new jobs, but additional support for structural adjustments may be needed.

87 http://ec.europa.eu/environment/ecolabel/index_en.htm
88 Bleischwitz, R., B. Bahn-Walkowiak, W. Irrek, Ph. Schepelmann, F. Schmidt-Bleek, S. Giljum, S. Lutter, L. Bohunovski, F. Hinterberger, E. Hawkins, M. Kuhndt, N. Pratt, et al. (2009): Eco-innovation - Putting the EU on the path to a resource and energy efficient economy. Wuppertal-Spezial 38. Wuppertal. Download: http://www.wupperinst.org/uploads/tx_wibeitrag/ws38.pdf
89 OECD (2010): Diverting Waste: The Role of Innovation (ENV/EPOC/WPNEP(2010)5). Paris

- Within a set EU budget, investing in eco-innovation might reduce funds for other important issues, from health to security. Consideration should be given to financially less intensive approaches (coordination, information, horizontal support)

Employment

This option will aid the transition of the employment structure – from traditional environmental jobs, to employment positions in new or growing eco-innovation sectors.

Administrative burden

An ambitious eco-innovation policy will add to the administrative burden of public authorities in Member States – specifically Actions 1 to 4 – but also European businesses – specifically Actions 3 and 4. Action 1 will need to accommodate for existing Member State fiscal policy.

7. COMPARING THE OPTIONS

7.1 Approach

The comparison of options is carried out according to the **adequacy** of policy options, **expected impacts,** and **the feasibility of implementation**.

- **Adequacy** indicates the extent to which a policy response will deliver specific objectives: i.e. its effectiveness.
- **Expected impacts** assess the likely impact of policy options on innovation, environment and competitiveness as well as overall EU value added: i.e. its efficiency.
- **Feasibility** expresses the likelihood of achieving the impacts within the existing organisational, governance and political constraints of the European Commission. It also considers the optimal timing for implementation to highlight practical challenges: i.e. its coherence.

Each criteria is scored as --- (very strong negative) to +++ (very strong positive) or N/A where there is no evidence or the impact is unclear. Scores are given in relation to the baseline scenario (no ETAP). Due to the diverse character of actions included in the policy options the overall scores at option-level are based on the scores on the action level, but are not simple arithmetic averages.

7.2 Findings

7.2.1. Overview

The figure below presents an overview of overall scores for policy options taking into account their expected wider impacts and the feasibility of their implementation.

Figure 3. Comparison of policy options against Option 1

Overall table and ranking criteria						
		Option 1*	Option 2	Option 3	Option 4	Option 5
Adequacy	Adequacy in terms of meeting specific objectives	N/A	medium	high	medium/ high	high**
Impact	Impact on innovation system	N/A	+	+++	++	++
	Impact on environment	N/A	+	++	++	+++
	Impact on competitiveness	N/A	+	++	+++	-/++ ***
	EU value added	N/A	++	+++	+++	+++
Feasibility	Contribution to the achievement of wider impacts	N/a	++	+++	++	+
	Timing of actions (mean)	N/A	< 2 years	< 2-5 years	< 2-5 years	> 5 years

* The exact degree of negative impacts of discontinuation of ETAP depends on other EU interventions that may subsititute ETAPactions
** Option 5 is assessed as highly adequate notably in the field of improving market conditions in a long term
*** Effects on competitiveness may be negative in the short term (e.g. resource taxes may hamper competitive position of resource-intensive industries)

7.2.2. Focus on adequacy of policy response

Taking into account the specific objectives, Option 5 offers the most **adequate policy response** when compared to policy options (notably in terms of improving market conditions). Option 3 & 4 are considered as second best. Option 3, focusing on exploiting the potential of environmental policy to support eco-innovation and policy learning between Member States creates appropriate framework conditions for eco-innovation. Option 4, targeting SMEs, responds better to the practical challenges faced by eco-innovators, by raising their credibility, focusing on networking and opening up global markets.

The adequacy of "Continuation of ETAP" has been considered average. First of all, Options 3, 4 and 5 have a broader scope of intervention addressing eco-innovation (with its non-technical and organisation issues). Option 3 offers a coherent approach to eco-innovation policy-making, fitting well with the new political realities and allows achieving the objectives through the emerging structures and measures. In particular it ensures integration of eco-innovation into the Innovation Partnerships, a key vehicle for the new innovation policy. Option 3 is also expected to better target financial resources to support the planned policy interventions and have a more coherent impact of eco-innovation across the EU. On the other hand Option 4 better responds to SME needs in terms of networking and opening up trade opportunities for eco-innovation.

7.2.3. Focus on expected impacts

The overall impact of the options on the functioning of innovation systems is positive, notably on framework conditions. However concrete impacts differ across options.

Once again Options 3, 4 and 5 improve on Option 1 and Option 2 in terms of impact on innovation system due to greater emphasis on minimising market failure (i.e. strengthened focus on financial instruments), further improvement of framework conditions and coordination of eco-innovation policies. Furthermore, due to a pervasive approach to eco-

innovation, options 3 & 5 can have a systemic impact on the innovation process placing resource productivity among the key determinants regardless of sector.

In terms of potential **impacts on the environment** Option 5 promises the greatest positive impact. The impact is however expected in the long term (effects on the resource tax are expected only in 10-15 years assuming immediate action). The impact of Option 3 is expected to be larger than Option 2 foremost due to the enlarged scope to eco-innovation and better fit to the new policy framework.

The report argues that resource productivity is positively correlated with competitive potential of economies. Option 3, with its focus on eco-innovation for resource productivity, is deemed to deliver a larger positive **impact on competitiveness** than Option 1. At the same time Option 4 will also have a positive impact ensuring integration of eco-innovation into SMEs, focus on creating new foreign markets and creation of business partnerships and improving investment readiness of eco-innovators. The actions with the financial community (Option 4) will help increase investment flowing to the sector.

Option 5 might have a net positive impact on competitiveness, but it more difficult to assess and is drawn out in time. In the short term taxation may have negative effects on competitiveness of resource-intensive industries, while unilateral EU action on standards or labelling may have significant costs.

In general, all options are characterised by high EU value added. No action has been classified as "unjustified" apart from Option 1. The discontinuation of ETAP is not justified if it is not to be substituted by comparable action ensuring continuous attention on eco-innovation.

7.2.4. Focus on feasibility

Feasibility assessment is a necessary "filter" to put the wider impacts of planned action in context and to understand the actual contribution of the assessed plan towards achieving the overall objectives. The contribution of assessed options to achieving the overall goals has been considered positive. Except for Option 3, the contribution has not been assessed as strong. The other options, just like the "old" ETAP, will not have a strong direct impact (or an exclusive "ownership") of the majority of actions. The instruments at the disposal of ETAP (ie inter-service consultations, communication tools, analytical activities) make it particularly well adapted to inform EU policies and communicate with stakeholders as well as gain a role in EU policy coordination. Option 3 builds upon the ETAP governance structure by providing eco-innovation policy with ownership of the review of framework conditions as well as ensures its key role in integrating eco-innovation into emerging policy approaches.

With this in mind, the contribution to achieving overall impacts is considered stronger for Options 3 and 4. In case of Option 3 these include notably expanding Innovation Partnerships to cover eco-innovation. In case of Option 5, the potential contribution is assessed as lower since several actions are beyond the (policy) reach of Commission, at least when considered in the short to medium term.

With regards to timing both Option 1 and Option 3 require an intense work in the coming two years. Option 3 offers more implementation flexibility in terms of timing as it includes several actions where optimal timing was deemed to 2-5 years. As expected, the most ambitious option requires more time to gain political support and to be ready for implementation, with impacts to be expected in 5 to 10 years

7.2.5. Recommendation

Considering the urgency for a focussed and improved eco-innovation policy initiative, as well as the feasibility of its implementation in a reasonable range of time, Option 3 appears to respond better to the new political environment. Option 4 on the other hand targets directly SME-specific problem drivers. After all SMEs are critical developers and users of eco-innovation. Option 5 represents a longer term vision to achieve a radical transition to a resource-efficient, competitive and sustainable economy. Thus **a combination of Option 3 & 4 is deemed to be most appropriate by shaping the policy agenda for eco-innovation in the medium term and responding directly to the eco-innovation needs of the SMEs.** Options 3 and 4 also combine well, complementing each other and there are no negative trade-offs between them. The combined actions respond best to the identified objectives and problem drivers as shown in Figure 4.

In addition combining Option 3 & 4 corresponds well to the arguments raised during the broad public consultation, for instance by focusing on SME needs, in terms of financing, training and networking (Option 4). The business sector and the Member States call for the need to act on the framework conditions for eco-innovation and design policies that stimulate demand in emerging eco-innovation sectors (Option 3). A reinforced governance structure (Option 3) with greater emphasis on policy learning, coordination, and agenda setting has received broad support both during the HLWG meetings and wider stakeholder consultations. Stakeholders have endorsed a targeted approach in relation to foreign partners for eco-innovation (Option 4) and acting through established networks and channels to avoid overlap (i.e. UNEP Cleaner Production Centres for global SME networking).

Figure 4: The link between objectives, problem drivers and actions (Option 3 & 4)

Specific Objective	Operational Objective	Driver targeted	Action
to apply the principles of the Innovation Union Initiative to eco-	Putting in place an eco-innovation friendly environmental regulatory framework	Problems related to environmental acquis	Option 3, action 1
		Governance problems related to EU innovation support	Option 3, action 6

innovation			
	Integrate eco-innovation concerns into relevant policies and initiative, in particular in the innovation policy field As above	Weak linkages between research and market	Option 3, action 2 Option 3, action 4
		Inadequate "skills" base	Option 3, action 5
	make proposals for better targeting of EU funds on eco-innovation as part of the next EU financial perspectives	Difficulties in accessing and providing finance	Option 3, action 3
to promote eco-innovation in Europe	Strengthen eco-innovation capacities of SMEs through increased networking and the spread of best practice	Demand side policy measures are weak	Option 4, action 1
	Increase the market credibility and investment readiness of emerging eco-innovations	Lack of appropriate and credible information on the performance of new environmental technologies	Option 4, action 2
to improve global markets for eco-innovation	Open up global markets to eco-innovation	Unfavourable global conditions for eco-innovation	Option 4, action 3
		Unused potential for eco-innovations in developed and developing countries	
	Improve global capacities for eco-innovation, in particular in developing countries	Unused potential for eco-innovations in developed and developing countries	Option 4, action 4
		Indigenous eco-innovation capability amongst developing countries is scarce	

8. MONITORING AND EVALUATION

8.1 Context

EcoAP, being a broad "policy framework", presents a challenge for monitoring and evaluation. Furthermore, the selection of indicators will need to recognise its enlarged scope. Therefore, especially evaluation of wider effects will rely on proxy indicators (due to the limited access or lack of suitable data) or qualitative assessments.

8.2 Organisation and scope of monitoring and evaluation process

The monitoring activity can be performed on two levels:
- reporting on activities performed by EcoAP, such as Eco-innovation fora, the HLWG, participation in inter-service consultations, specific studies ("internal reporting"), and
- collection of key monitoring indictors on the implementation of all EcoAP actions in collaboration with implanting bodies ("external reporting").

The evaluation activity will encompass:

- collection of quantitative and qualitative evidence of the progress towards achieving goals of all individual actions of Eco-AP (whenever possible, the evaluation of Eco-AP will rely on dedicated evaluations performed for individual actions);
- analysis results and effects of activities performed by Eco-AP team (attribution analysis of the value added of Eco-AP in achieving the goals).

In order to improve the quality of evaluation it is proposed that the EcoAP will be evaluated both internally and externally. The previous experience of ETAP showed difficulties in attributing effects to ETAP actions. An ongoing internal evaluation will gather useful evidence; it could have a form of preparing regular self-evaluation notes. Furthermore, they will become one of key documents to be used by external evaluators. In this regard the Eco-innovation Observatory will be highly useful, by gathering data on markets and trends.

8.3 Parameters and indicators

Particular attention will be given to selecting adequate, accessible and reliable indicators. Suggested performance indicators for each action are proposed in Annex XIV. To this end, the final selection of monitoring indicators as well as data collection process will be preformed in a close collaboration with the relevant Commission services as well as (if relevant) with the representatives of the MS. In both monitoring and evaluation activities, the particular emphasis will be given to monitoring and evaluation of the most important actions of EcoAP, the monitoring and evaluation will be performed for all proposed action.

Definitions

Competitiveness

Competitiveness is the collection of factors, policies and institutions which determine the level of productivity of a country and that determine the level of prosperity that can be attained by an economy[90]. It means a sustained rise in the standards of living of a nation or region and as low a level of involuntary unemployment as possible[91].

Eco-industry:

The eco-industry consists of activities which produce goods and services to measure, prevent, limit, minimize or correct environmental damage to water, air, and soil, as well as problems related to waste, noise and eco-systems. These include cleaner technologies, products and services, which reduce environmental risk and minimize pollution and resource use[92].

Eco-innovation

Eco-innovation is any form of innovation resulting in or aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment, enhancing resilience to environmental pressures, or achieving a more efficient and responsible use of natural resources. This is a broad definition, including both intended and unintended environmental effects from innovation as well as social and behavioural innovation[93].

Environmental technologies

An environmental technology is a technology that advances sustainable development by reducing risk, enhancing cost effectiveness, improving process efficiency, and creating products and processes that are environmentally beneficial or benign[94].

ERA-NET Scheme

The ERA-NET scheme, in the framework of FP7 funded activities, aims at developing and strengthening the coordination of national and regional research programmes through two specific actions:

- 'ERA-NET actions' - providing a framework for actors implementing public research programmes to coordinate their activities e.g. by developing joint activities or by mutually supporting joint calls for trans-national proposals.

- 'ERA-NET Plus actions'- providing, in a limited number of cases with high European added value, additional EU financial support to facilitate joint calls for proposals between national and/or regional programmes.

90 Definition by the World Economic Forum, Global Competitiveness report 2007.
91 European Commission, European Competitiveness report 2008
92 OECD/Eurostat (1999)
93 As defined in Community Guidelines On State Aid For Environmental Protection ((2008/C 82/01).
94 NSTC (1997), The road to sustainable development

Under the ERA-NET scheme, national and regional authorities identify research programmes they wish to coordinate or open up mutually. The participants in these actions are therefore programme 'owners' (typically ministries or regional authorities defining research programmes) or programme 'managers' (such as research councils or other research funding agencies managing research programmes).

European Technology Platforms

European Technology Platforms (ETPs) are a mechanism to bring together all interested stakeholders to build a long-term vision to develop and promote a specific technology or solve particular issues.

Green skill

There is no clear definition of what is meant by "green skills" or "skills for the green economy". The research is still ongoing and trying to clarify concepts. However, analysis shows that the green economy reinforces the trend towards a new skills paradigm where the importance of 'generic' skills is recognised to complement 'specific' skills. The analysis from European Centre for the Development of Vocational Training (CEDEFOP) on Skills for Green Jobs[95] shows that fundamental weakness in the EU's skills base could matter more to its capacity for green growth than shortages in specialist "green tech" know-how. A systematic deficit in technical skills related to science, technology, engineering and mathematics (STEM) was also identified.

Joint Technology Initiative

Joint Technology Initiatives (JTIs) are "public-private partnerships in key areas where research and technological development could contribute to Europe's wider competitiveness goals and where the traditional instruments of the Framework Programme (e.g. collaborative research) are not adequate"[96]. JTIs are to constitute an efficient implementation mechanism "enabling the necessary leadership and coordination to achieve the research objectives"[97].

Innovation

Scientific and technological innovation may be considered as the transformation of an idea into a new or improved product introduced on the market, into a new or improved operational process used I industry and commerce or into a new approach to a social service[98].

Market failure

Generally speaking a market failure implies an inefficient allocation of goods and services in a market. In relation to innovation this is due to the fact that market mechanisms are unable to secure long-term investments in innovation due to uncertainty, indivisibility and non-appropriability of innovation process99. Typically, a market failure manifests itself in an insufficient allocation of funding by enterprises for risky and innovative investments or information asymmetries, and hence the market failure approach leads to instruments that

95 "Skills for green jobs: A European synthesis report", CEDEFOP, 2010
96 CEC (2007) Joint Technology Initiatives: Background, State-of-Play and Main Features, Commission Staff Working Document, SEC(2007)692
97 CEC (2005) Report on European Technology Platforms and Joint Technology Initiatives: Fostering Public-Private R&D Partnerships to Boost Europe's Industrial Competitiveness, Commission Staff Working Document, SEC(2005)800
98 OECD (1993), Frascati Manual
99 Arrow 1962

allocate resources to firms (R&D grants or tax incentives) or provide them with information, e.g. on IPR, market opportunities, collaboration partners, etc. This is the so-called "supply side" innovation policy.

Proportionality

Article 5 (3) of the Treaty on European Union also stipulates "under the principle of proportionality, the content and form of Union action shall not exceed what is necessary to achieve the objectives of the Treaties".

Subsidiarity

Article 5 (3) of the Treaty on European Union further states that subsidiarity means in such case of shared competence that "the Union shall act only if and in so far as the objectives of the proposed action cannot be sufficiently achieved by the MS, either at central level or at regional and local level, but can rather, by reason of the scale or effects of the proposed action, be better achieved at Union level".

System failures

System failures are connected to "missing links" among the different elements of the innovation system (network, co-ordination, institutional, framework or regulatory, etc.) and not only to problems related to the market. They are now taken into account in innovation policy because even if the 'market' signals induce enterprises to invest in innovation, other factors such as financial rules and regulations or weak incentives for higher education institutes to develop collaborative research or graduate courses in partnership with industry may nevertheless prevent innovation performance from being improved. Innovation policy-makers have increasingly begun to adopt the language of 'national innovation systems' (OECD, 2003) theory that stresses that the flows of technology and information among people, enterprises and institutions are at the core of the innovation process.

Resource productivity/efficiency

Resource productivity describes the relation between economic outputs usually in monetary terms (Y – numerator) and a physical indicator (M – denominator) for material or resource input in physical terms. According to the OECD, the term 'resource productivity' is put in a welfare perspective. It sets the quantity of economic output in relation to the input of natural resources[100]. In other word it asks: How much welfare can be generated from resource use?

Resource use can be measured by means of material flow indicators of an economy-wide material flow analysis (EW-MFA). Different indicators can be used, such as Direct Material Input (DMI), Domestic Material Consumption (DMC), Total Material Requirement (TMR) or Total Material Consumption (TMC).

100 Wuppertal Institute (2007), the relation between resource productivity and competitiveness and OECD (2008) Recommendation of the Council on Resource Productivity. Meeting of the Environment Policy Committee (EPOC) at Ministerial Level. March/April 2008.

Table 1: Macro-indicators for material flows

Indicator	Formula	Subject
Total Material Requirement (TMR)	DMI + indirect flows	Domestic and imported resources including their ecological rucksacks, which are required for domestic production and consumption.
Total Material Consumption (TMC)	TMR – (exports + indirect flows of exports)	Domestic and imported resources including their ecological rucksacks, which are required for domestic consumption only (excluding exports).
Domestic Material Input (DMI)	domestic material used + imports	Domestic and imported resources without ecological rucksacks, which are used for domestic production and consumption.
Domestic Material Consumption (DMC)	DMI - exports	Domestic and imported resources without ecological rucksacks, which are used for domestic consumption only (excluding exports).

Eurostat uses the indicator "resource productivity" (GDP/DMC) as headline indicator for the policy area "sustainable consumption and production" (SCP) in the monitoring of the EU Sustainable Development Strategy[101]. Analogical the indicator for resource efficiency would be DMC/GDP.

101 Eurostat (2009): Sustainable Development in the European Union. 2009 monitoring report of the EU sustainable development strategy. Eurostat Statistical Books. Luxemburg

Apart from being a solution to environmental problems, eco-innovation covers a big market and is considered of strategic importance by many industries. Eco-innovation is found in all sectors and encompasses al kinds of different innovations, including technical innovations and non-technical innovations. As eco-innovation is not systematically monitored in national or EU statistics measurement is difficult.

The economic importance of eco-innovation can be illustrated by available figures on the market for environmental technology, though smaller than the total eco-innovation market. For a definition of eco-industries see Annex I.

The eco-industry is already one of Europe's biggest industrial sectors102. Its estimated annual turnover of 319 billion euro is about 2,5% of Europe's Gross Domestic Product (GDP). Currently app. 3.4 million people are directly employed in the EU eco-industry, which is about 1,5% of all Europeans in employment. The largest sub-sectors deal with waste management (30%), water supply (21%), wastewater management (13%) and recycled materials (13%). The eco-industry in Europe has in recent years grown by around 8% annually making it one of Europe's most dynamic sectors. Most recently, growth has been concentrated in resource management (esp. energy) where new technologies such as solar and wind energy have made remarkable progress. Approximately 600,000 additional jobs were created between 2004 and 2008. For a composition of basic information on the size, composition and turnover of eco-industries in the EU and globally see Annex III.

Current experience suggests that the primary focus of current eco-innovations tends to rest on technological developments and advancements. Nevertheless, a number of non-technological innovations, such as establishing separate environmental divisions or creating inter-sectoral or multi-stakeholder research networks, have spurred technological developments. Some industry leaders have even begun to explore systemic innovations that are changing the way their businesses fulfil consumer demands[103]. Here are opportunities for the EU to take the lead. An example is e.g. a copying machine manufacturer performing research on business-models that allow them to make a profit when they help their clients in reducing the number of photocopies and printouts (and thus reducing costs and environmental impacts) instead of their traditional focus on reducing the environmental impacts per photocopy.

In a study in 2008 the Wuppertal Institute tested the relationship between material productivity and competitiveness for the year 2000. Score values of the Global Competitiveness Report of the World Economic Forum were plotted against the values on resource productivity (DMI) of 2000 and applied in a correlation analysis. The Wuppertal Institute concluded, that the results delivered "good reasons to believe that there is a positive relationship between the resource productivity of economies (measured in GDP in PPP U.S. $ per kg DMC) and the score value[104] of the GCI[105]".

In order to further validate the conclusions a regression analyses for the years 2004 to 2007 was carried out similar to the analyses for the year 2000. More sophisticated time series

102 All figures on EU and worldmarkets from Ecorys et al., Study on the competitiveness of the EU eco-industry, Final Report – Part 1, Brussels, 2009 (Ecorys, 2009A)
103 OECD 2009, Policy Brief, Sustainable Manufacturing and Eco-innovation: Towards a Green Economy
104 We used the score values instead of ranking positions for the regression analyses. The score values provide us with information about the relative distance of the individual countries. For rank correlations, we would lose this information. For this reason we did not make regression analyses with the Business Competitiveness Index, as this index only existed as a ranking.
105 Bleischwitz et al. 2008, p. 39

analysis could not be performed due to the lack of corresponding time series. Therefore, it has been analysed whether the statistical correlation still exists with a larger number of countries and in every single year from 2004 to 2007.

It is still unclear whether high material productivity results in an improved competitiveness or if high competitiveness is a precondition for higher material productivity. Or maybe a third, not analysed variable, which is a driver for both the competitiveness and the resource productivity, is the explanatory variable. 4-year-data is still not sufficient to answer the causality by means of the Granger Causality Test. However, a visual analysis of scatter plots provides a first assumption about causality.

As seen from the scatter plots for each year, Malta is consistently an outlier, which results from the enormous material productivity of Malta. This seems to be caused by the lack of (depletion of) local raw materials. Therefore, all regressions were performed with Malta and once again without Malta. As expected, the coefficient of determination has improved when using the data without Malta.

Based on a visual analysis of the Fig 1 to 4, we can derive that in all analysed years, a positive relationship exists between material productivity and competitiveness (measured as the Global Competitiveness Index). However, the variance of material productivity in countries with high competitiveness is very high. If non-European OECD countries are included in the analyses (2004 and 2005), the results are in principle identical, but with a further spread of the countries in the top of the figures. The scatter plots (Fig. 1-4) show that a very high level of competitiveness could be associated with low material productivity. On the other hand, countries with low competitiveness are also characterized by low material productivity - with the exception of the outlier Malta. These results allow the interpretation that a high level of competitiveness is a precondition to achieve a high material productivity. However, other factors also determine whether economies have a higher or lower material productivity. Thus, for example the Scandinavian economies are still characterised by the use of their natural resource endowments (Norway: oil & gas, Sweden & Finland: mining and forestry, Denmark: animal biomass) compared to more service-oriented economies e.g. UK or Switzerland. In interpreting the causality of the relationship between competitiveness and material productivity there is need for further research and an improved database.

Fig: 1: Scatter plot material productivity and Global Competitiveness Index 2004

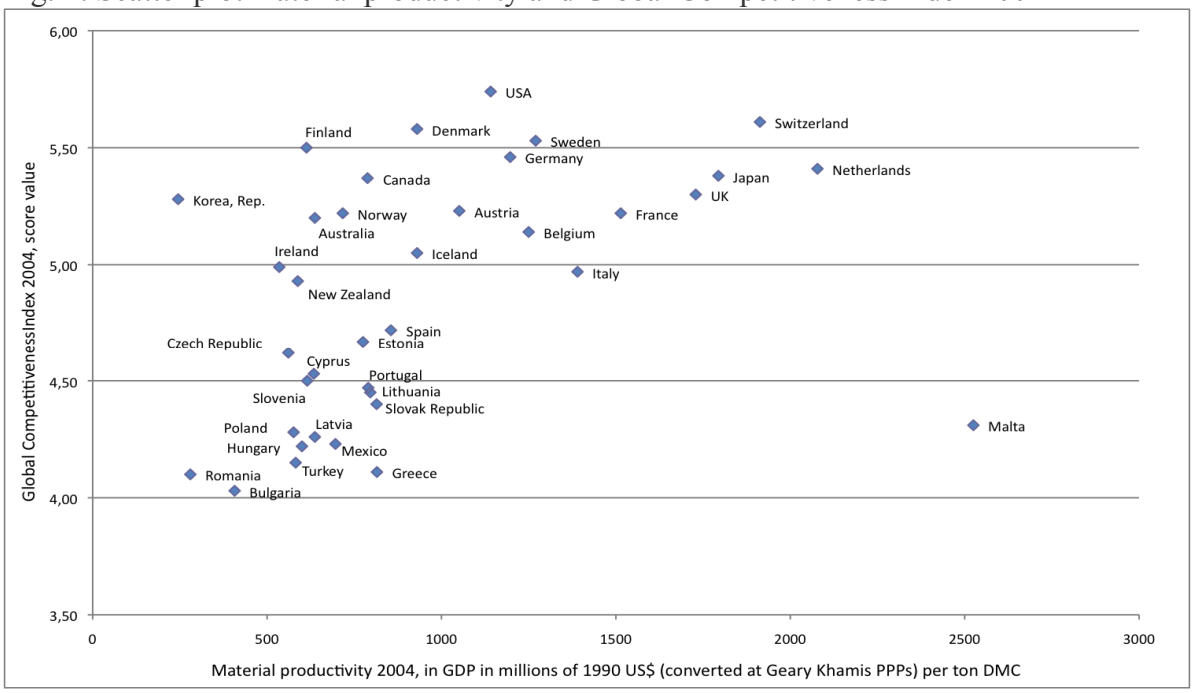


Fig: 2: Scatter plot material productivity and Global Competitiveness Index 2005

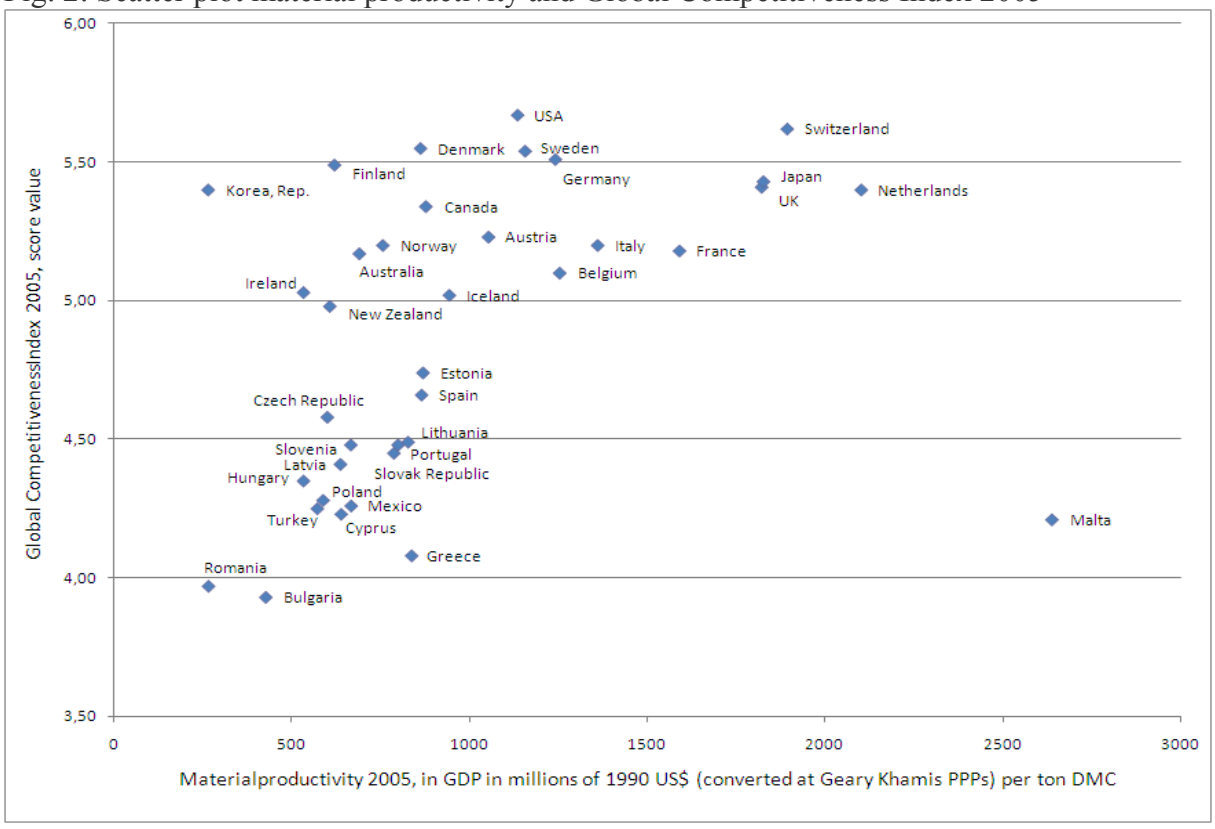


Fig: 3: Scatter plot material productivity and Global Competitiveness Index 2006

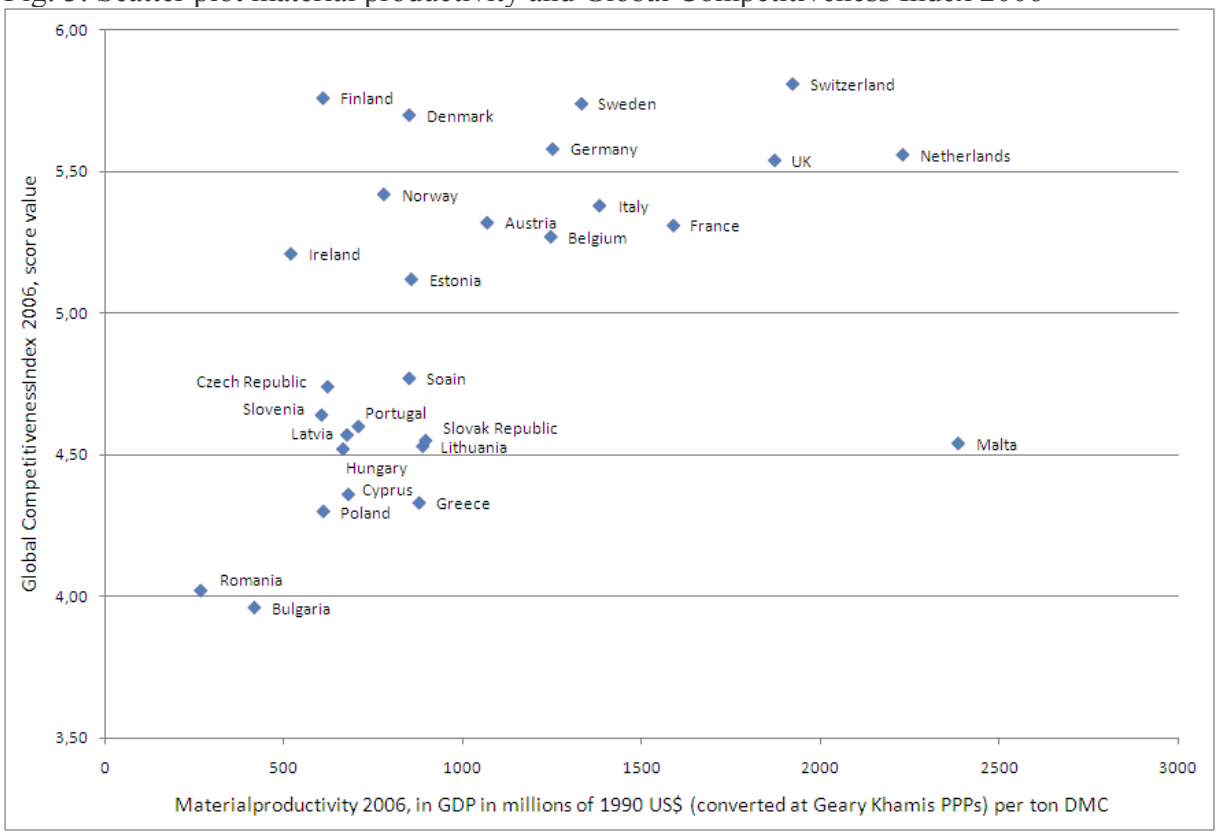
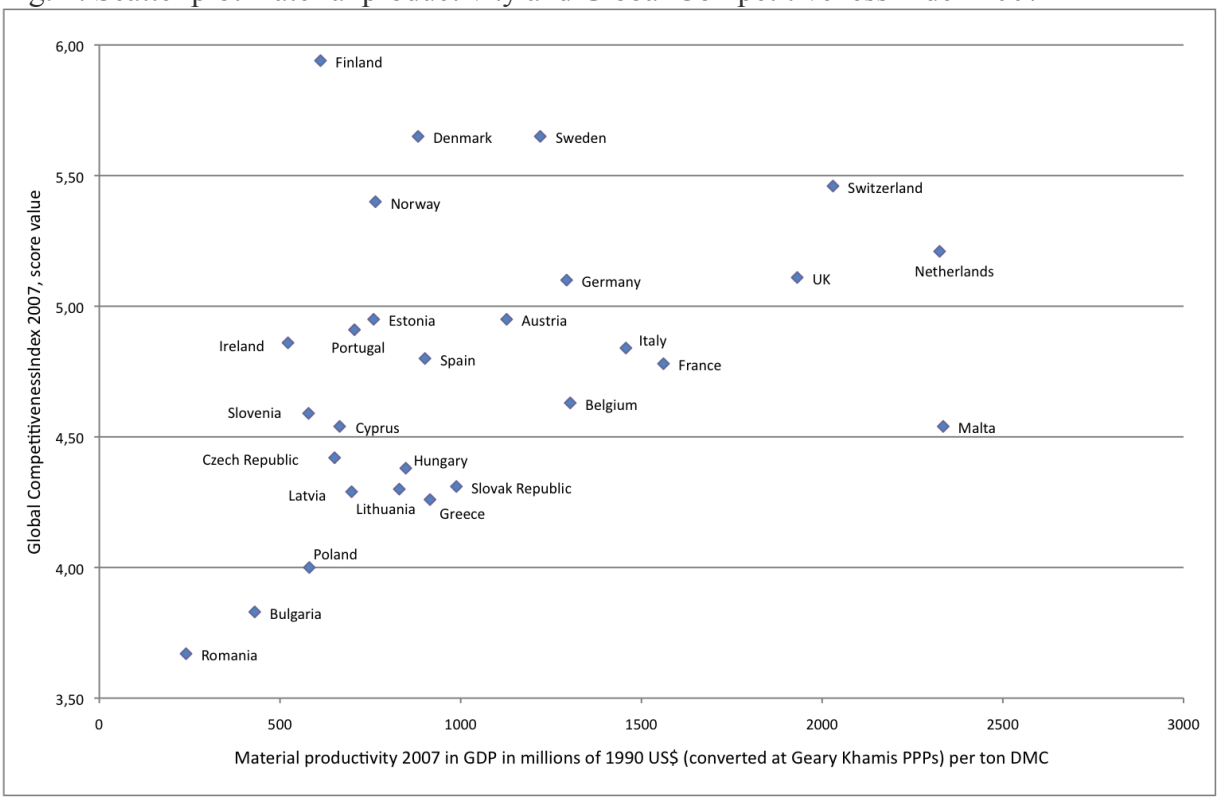


Fig: 4: Scatter plot material productivity and Global Competitiveness Index 2007



At first glance, the four different regressions from 2004 to 2007 show quite similar results. The coefficient of determination improved significantly when using the data without Malta

(from an average adjusted R2= 0,15 to an average adjusted R2= 0,35). Only in 2007, the difference between the regressions with and without Malta is not so pronounced (with Malta: adjusted R2= 0,10, without Malta: adjusted R2= 0,17). In all tested models, both the t-values and the F-values of the models were within the level of significance. However, some regressions suffer from a violation of the assumptions of OLS estimation, so these results are not statistically significant. Only the regressions for the year 2006, both the regressions with and without Malta, are statistically significant and normally distributed in their residuals.

Interpretation of results

Based on an analysis of the figures in Annex II we can derive that in all analysed years, a positive relationship exists between material productivity and competitiveness (measured by the Global Competitiveness Index). These results allow the interpretation that a high level of competitiveness is a precondition to achieve a high material productivity. Based on the present sample, we cannot conclude, however, that a high material productivity leads automatically to higher competitiveness. Thus it can be seen as a necessary, but not sufficient factor for high competitiveness.

Although the visual analyses of scatter plots point to a positive relationship between material productivity and competitiveness, the results of our regression analysis are not statistically significant in three of four years. One reason could be the large variance of material productivity in the countries with a high score value in the Global Competitiveness Index. Since the Global Competitiveness Index is combined by dozens of different indicators, a wide range of different parameters influences the Global Competitiveness Index. Based on the present sample, we cannot conclude, however, that a high material productivity leads automatically to higher competitiveness. Thus it can be seen as a necessary, but not sufficient factor for high competitiveness.

ANNEX III – THE ECO-INDUSTRIES – IN THE EU AND GLOBALLY

Defining eco-industries

The OECD and Eurostat define eco-industries as "those [identifiable] sectors within which the main – or a substantial part of – activities are undertaken with the primary purpose of the production of goods and services to measure, prevent, limit, minimize or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems"[106]. Based on this definition, a distinction can also be made between 'core' and 'non-core' or 'connected industries' based on the relevance of the industry's activity to the previously mentioned purpose. For example 'core' industries include sectors such as wastewater treatment and renewable energy sources. Connected industries on the other hand include sectors such as ICT, chemicals or automotive.

Most of the data on eco-industries and the eco-innovation market refer to the 'core' set of industries. These refer to the 36 activities listed by the OECD[107]. The table bellow presents these activities according to three different groups[108].

Pollution Management Group	Cleaner Technologies and Products Group	Resource Management Group
Equipment and materials for: o Air pollution control. o Wastewater management. o Solid waste management: – Hazardous waste collection, treatment and disposal; – Waste collection, treatment and disposal; – Waste recovery and recycling (excludes manufacture of new materials or products from waste and scrap). o Remediation and clean-up of soil, surface water and groundwater. o Noise and vibration abatement. o Environmental monitoring, analysis and assessment. o Other. **Provision of services for**: o Air pollution control. o Wastewater management. o Solid waste management: – Hazardous waste collection, treatment and disposal; – Waste collection, treatment and disposal; – Waste recovery and recycling (excludes manufacture of new materials or products from waste and scrap). o Remediation and clean-up of soil, surface water and groundwater.	o Cleaner/resource-efficient technologies and processes. o Cleaner/resource-efficient products.	o Indoor air pollution control. o Water supply. o Recycled materials (manufacture of new materials or products from waste or scrap, separately identified as recycled). o Renewable energy plant. o Heat/energy saving and management. o Sustainable agriculture and fisheries. o Sustainable forestry. o Natural risk management. o Eco-tourism. o Other (e.g. nature conservation, habitats and biodiversity).

106 ECORYS, 2009, Study on the competitiveness of the EU eco-industry, Study produced for the DG Enterprise and Industry, European Commission, Rotterdam.
107 Please refer to OECD "Environment Goods and Services Industry: Manual for Data Collection and Analysis"
108 The link between these activities and the NACE classification of industrial activities has not been completely developed. Eurostat has defined a 'core' industry group (NACE 25.12, 37, 41, 51.57 and 90).

o Noise and vibration abatement. o Environmental R&D. o Environmental contracting and engineering. o Analytical services, data collection, analysis and assessment. o Education, training, information. o Other.		

Source: OECD, 1999.

It must be kept in mind however that "eco-innovation occurs in the whole economy: any company adopting a good, service, production process management or business method with environmental benefit is an eco-innovator"[109].

General figures on the eco-industry in the EU

The eco-industry in the EU27 had a turnover of €232 billion in 2004 and €319 billion in 2008. In 2008, this equalled 2.5% of GDP with an annual growth rate of 8.3%[110].

The four largest sub-sectors account for roughly three-quarters of the total eco-industry with waste management (30%), followed by water supply (21%), wastewater management (13%), and recycled materials (13%). Recycled materials is the sector showing the highest growth rate among the four previously mentioned sub-sectors.

The New Member States display a very high percentage of eco-industry turnover in relation to GDP, reflecting the increasing role these industries have begun to play in their economies. In Bulgaria and Slovenia, eco-industry turnover represents 10.6% and 9.75% of GDP respectively, compared to 2.55% for EU27[111]. Eco-industries are an equally important economic sector across the European Union.

The following table shows the distribution of the total turnover of eco-industries in EU25 in 2004, both by sector (pollution management vs. resource management), and country.

Table 1 Total turnover in EU25, Pollution Management and Resource Management Expenditures by Country, 2004

Country	Total Turnover (€million)	% of EU-25	Pollution management (€million)	% of EU-25	Resource management (€million)	% of EU-25
Germany	66114	29%	44597	31%	21517	26%
France	45851	20%	28264	20%	17587	22%
UK	21224	9%	12103	8%	9121	11%
Italy	19269	8%	8946	6%	10323	13%
Netherlands	14039	6%	10953	8%	3086	4%
Austria	10091	4%	9092	6%	999	1%
Spain	9044	4%	6047	4%	2997	4%

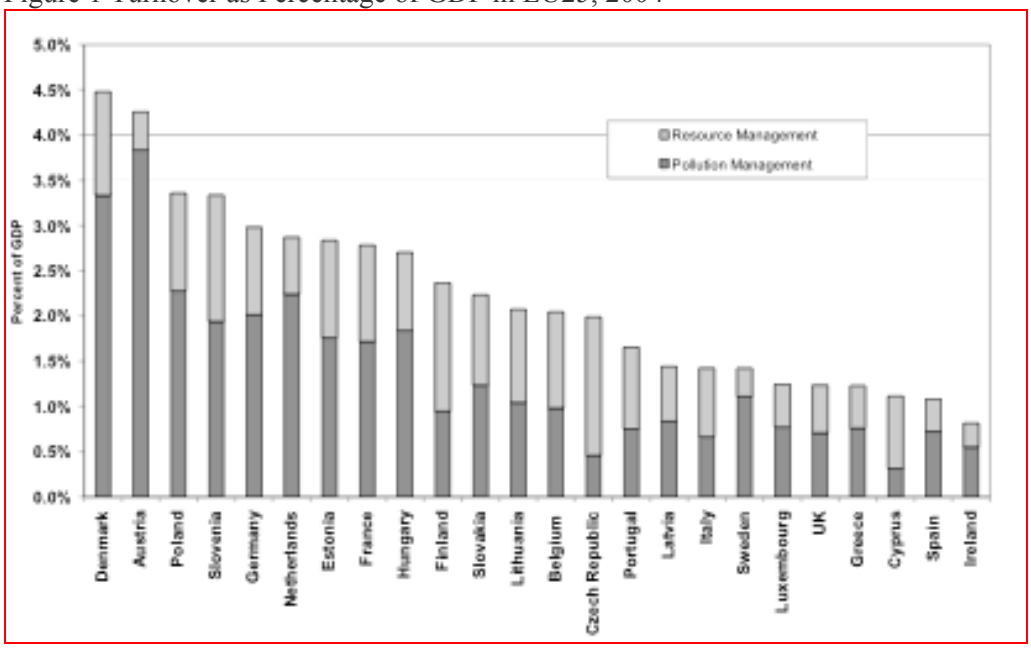
109 Kemp, R & Pearson, P, 2007, Final report MEI project about measuring eco-innovation, project carried out in the framework of FP6.
110 Most of the figures regarding turnover of eco-industries are calculated based on the Environmental Protection Expenditure used by Eurostat. This indicator is defined as, the money spent on all purposeful activities directly aimed at the prevention, reduction and elimination of pollution or nuisances resulting from the production processes or consumption of goods and services.
111 ECORYS, 2009, Study on the competitiveness of the EU eco-industry, Study produced for the DG Enterprise and Industry, European Commission, Rotterdam.

Denmark	8794	4%	6542	5%	2252	3%
Poland	6557	3%	4444	3%	2113	3%
Belgium	5806	3%	2785	2%	3021	4%
Sweden	3968	2%	3090	2%	878	1%
Finland	3543	2%	1414	1%	2129	3%
Portugal	2356	1%	1069	1%	1287	2%
Hungary	2193	1%	1493	1%	700	1%
Greece	2054	1%	1266	1%	788	1%
Czech Republic	1726	1%	399	0,28%	1327	2%
Ireland	1211	1%	818	0,56%	393	0,48%
Slovenia	872	0,38%	507	0,35%	365	0,45%
Slovakia	740	0,33%	409	0,28%	331	0,40%
Lithuania	371	0,16%	187	0,13%	184	0,22%
Luxembourg	319	0,14%	198	0,14%	121	0,15%
Estonia	256	0,11%	159	0,11%	97	0,12%
Latvia	159	0,07%	92	0,06%	67	0,08%
Cyprus	139	0,06%	39	0,03%	100	0,12%
Total	**226696**		**144913**		**81783**	

Source: EY, 2006.

As seen in the following figure, Denmark, Austria and Poland were the three countries with the largest eco-industry turnover as a percentage of GDP (2004).

Figure 1 Turnover as Percentage of GDP in EU25, 2004



Source: EY, 2006.

In terms of employment, the eco-industry in EU27 was estimated to employ 3.4 million in 2005, compared to 2.7 million in the car manufacturing industry and 3.4 in chemicals[112]. This represents 1.7% of total paid employment in Europe. The annual growth rate of employment in all subsectors between 2000 and 2008 is estimated at 6.98%, with recycled materials and renewable energy showing the strongest growth (10.5% and 16.3% respectively).

112 European Commission, 2007, Facts and Figures: the links between EU's economy and environment, Belgium.

Employment in the pollution management sector alone accounts for 2.35 million full time job equivalents. In Austria, employment in this sector represents 3% of the total workforce making it the country with the highest share in Europe. It is followed by Denmark, Estonia and Slovenia[113].

Eco-industry exports for the EU25 (2004) represented approximately €13 billion while imports rose to €11.1 billion. 57% of trade (both imports and exports) took place within the European Union, mainly between Germany, France and the UK. These countries are both the largest exporters and importers despite them being net exporters of eco-industry. Together, they represent approximately 55% of trade carried out by EU countries. The first exporter in Europe is Germany, exporting €4.8 billion in 2004. This is more than twice the amount of French (€1.5 billion) and nearly three times the amount of British exports (€1.5 billion)[114].

Size of eco-industry firms

The structural make-up of eco-industries varies strongly from one sector to another. The heterogeneous nature of the industry along with the strong lack of statistical information make it difficult to provide a precise overview regarding the exact number, type and size of companies in eco-industries. In spite of this, taking a closer look at a number of specific sectors allows to draw some general conclusions.

Firstly, concentration is a notable trend in the eco-industry in the EU, particularly in the waste management sector, soil remediation, wind power and renewable energy. The ECORYS study shows that approximately 10% of companies are responsible for almost 80% of the turnover. The particular drivers behind this concentration trend are intentions to increase their geographic coverage and along with it, increase business activities to build a critical mass allowing lessening the burden of costs linked to R&D[115].

With regards to firm size, firms tend to be larger and display a more international profile in long-standing eco-industry markets such as waste management and water supply. On the other hand, new regulation-driven markets116 such as the eco-construction sector and the renewable energy sector are characterised by a stronger presence of smaller firms. Their growing maturity as well as the ongoing economic downturn is likely to lead to the consolidation of the sectors. The following table summarises the key profiles of companies belonging to different eco-industry subsectors.

Sub-sector	Industry structure
Air pollution	Flue gas treatment: small and medium-sized e.g. LAB (France) and large international e.g. Lurgi (Germany), Alstom (France) Catalytic converters: Big groups e.g. Coming GmbH (Germany), Delphi (Luxembourg), Rhodia (France) and special medium-size e.g. Ibiden (Germany) and Johnson Matthey PLC (UK)
Waste management	EU15 has a mature market and EU (27-15) is developing. An oligopoly with the large actors accounting for 80% and the remaining 20% is for the local companies

113 Ibid.
114 EY, 2006, Eco-industry, its size, employment, perspectives and barriers to growth in an enlarged EU, a study for the European Commission, DG Environment
115 ECORYS, 2009, Study on the competitiveness of the EU eco-industry, Study produced for the DG Enterprise and Industry, European Commission, Rotterdam.
116 EY, 2006, Eco-industry, its size, employment, perspectives and barriers to growth in an enlarged EU, a study for the European Commission, DG Environment.

Soil & Groundwater	Two types: small specialized firms and construction companies
Wastewater management & Water supply	Wastewater management & water supply are often done by the same actors who are usually local small specialized companies who are often part of a few major actors e.g. Veolia (France), RWE (Germany), Thames Water (RWE) (UK)
Renewable Energy	o Hydropower: 90-100 small and large companies o Photovoltaic energy: 40-50 large companies o Geothermal: hundreds of small companies o Solar thermal energy: small sector dominated by SMEs o Wind power: a fast growing market all sort of actors
Others	o Public administration: each country has at least one department or ministry o Private environmental management: activities are part of total activities within a company
Biodiversity	Eco-tourism: plenty of national parks, eco-museums, etc…

Source: EY, 2006.

Despite eco-industries' overarching trend towards concentration, these sectors are characterised by the presence of an important number of small and medium enterprises (SME). Out of a micro-economic sample of firms from eco-industries, ECORYS found that 97% were SMEs[117], however accounting only for approximately half of total employment.

Eco-innovation financing in the EU

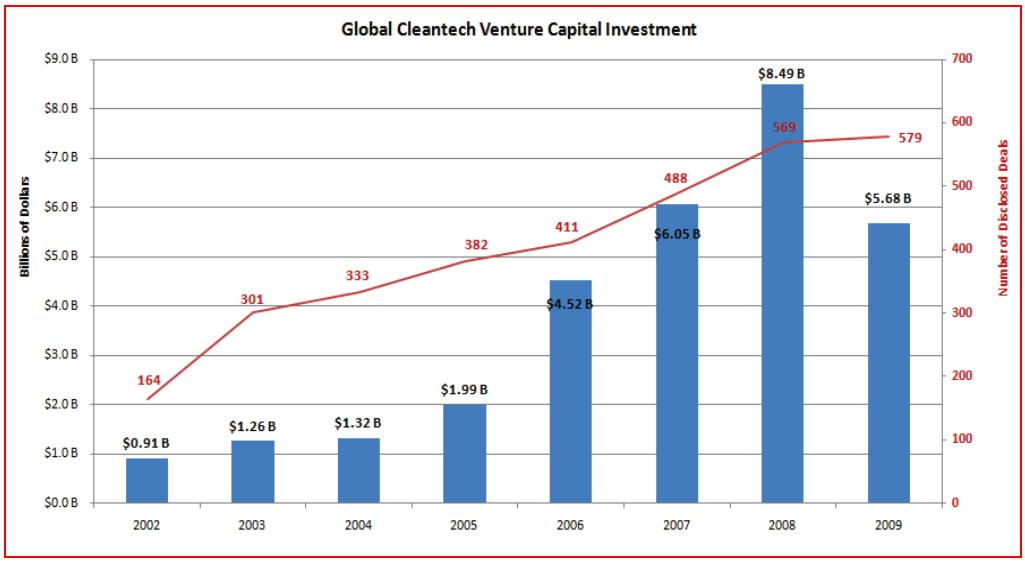
Indicators on the cleantech industry are often used to measure the eco-industry. The term cleantech is generally used to describe companies that produce technologies that are environmentally friendly. The emphasis is often on new or established technologies. Cleantech and eco-innovation are thus closely related. However, the focus of eco-innovation is broader than only technology and also encompasses for example process innovation.

Data on the venture capital (VC) market trends in the cleantech sector offer an insight on the current trends of the capital market for eco-innovation.

The total venture investments worldwide in 2009 amounted to about 29.6 billion dollars[118]. Investments in cleantech companies at that time represented nearly 11%. However, VC investments in cleantech declined in 2009 by 33%. Until 2008 the industry recorded six years of growth at an average annual rate of 45% and VC investments reaching 8.5 billion USD.

117 As defined by the European Union (1 to 250 employees).
118 Dow Jones Venture Source. Available at: www.venturesource.com

Figure 2 Global Cleantech Venture Capital Investments

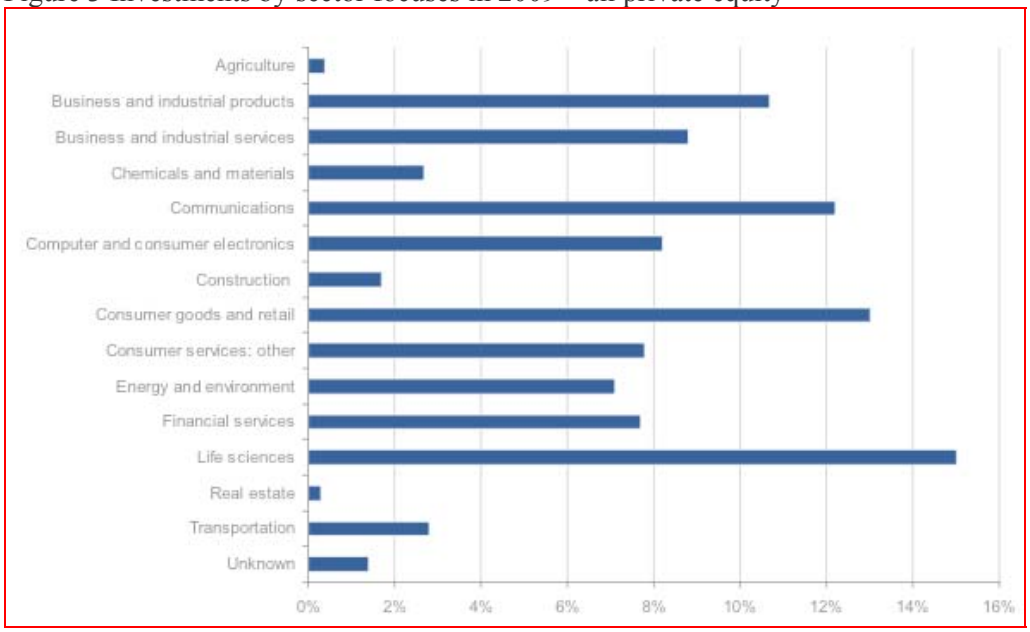


Source: Cleantech Group, 2009

The Cleantech Venture Capital report for 2010 shows the state of VC investments in European companies. According to the report, in Europe the VC capital market is significantly smaller than in North America (64% of VC funding raised in the US in 2009 compared to 28% in Europe and Israel). However in Europe, a larger share of the total investments goes to cleantech. In the EU as much as 39% of VC invested in cleantech while in the US it is estimated between 17-20%.

According to the European Private Equity & Venture Capital Association, all private equity investments in the energy and environmental sectors in Europe represent approximately 7% of all investments. This is comparable to investments carried out in the consumer services, and the financial services sectors.

Figure 3 Investments by sector focuses in 2009 – all private equity

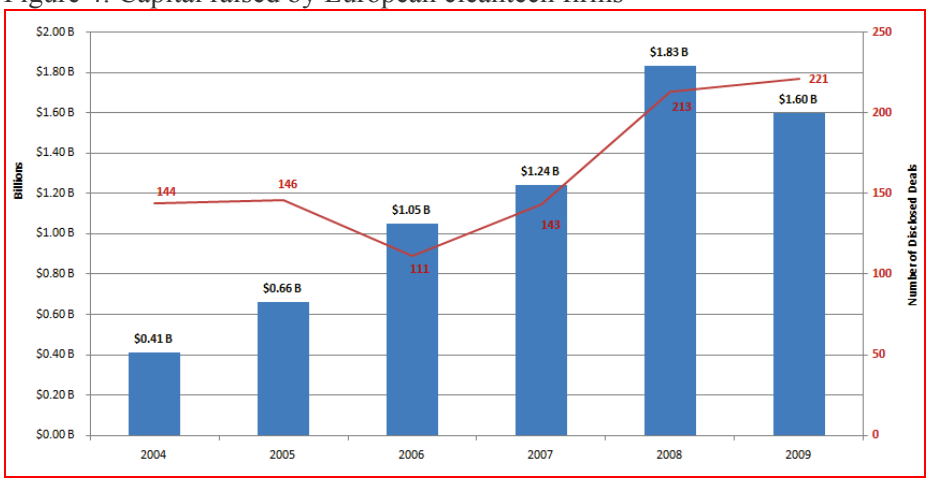


Source: EVCA/PEREP Analytics

Most of this funding goes to energy generation followed by energy efficiency. These two sectors alone make up 71% of the capital invested in the fourth quarter of 2009.

Moreover, VC capital investments in Europe have exploded over the last decade. In 2009, investments amounted to 1.6 billion dollars spread over 221, while in 2004 only 0.4 billion dollars were invested in 144 deals. The largest cleantech venture capital marked in Europe is found in the UK followed by Germany, Norway and France. By far the most VC in Europe is invested in energy generation followed by energy efficiency.

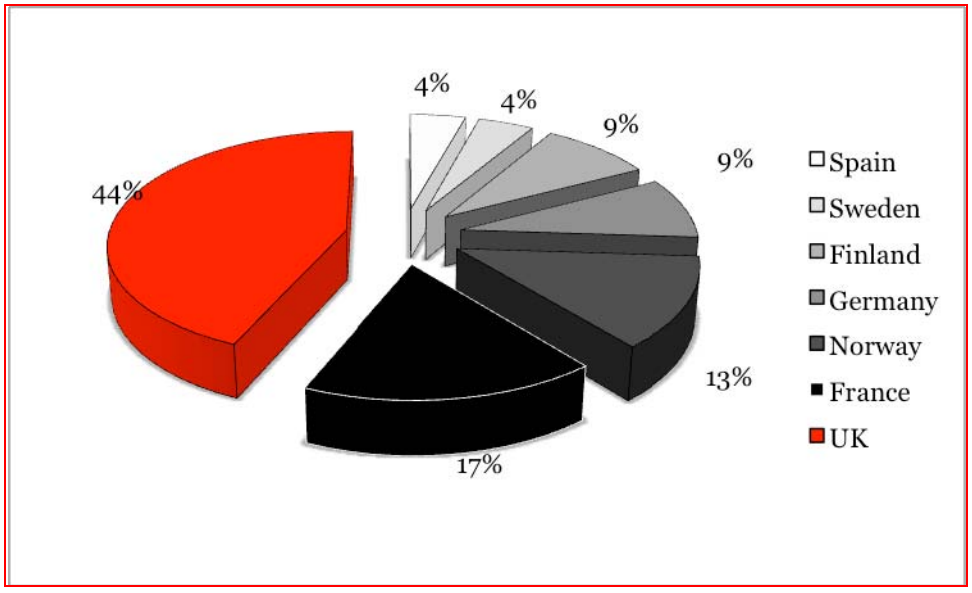
Figure 4: Capital raised by European cleantech firms



Source: Cleantech Group, 2010

During the first quarter of 2010, VC investments en Europe were distributed as follows among the top seven countries:

Figure 5: Distribution of VC investments among the top 7 European countries for the first quarter of 2010



Source: EY in Club Cleantech AFIC, 2010.

European market share and competitiveness

When it comes to European industrial competitiveness data[119] indicating world trade shares of potential environmental goods of OECD countries (1993 up to 2004) indicates that, internationally there are three strong OECD members – Germany, the USA and Japan (China is not an OECD country), with South Korea performing more average. Generally, the UK, Spain, Ireland, and Sweden are also considered to be competitive.

A 2007 Roland Berger analysis of the European environmental industry looked at market volumes and competitive positions – mainly Germany – in Europe. One of the study's key findings was that "environmental technology already represents an important economic factor"[120]. The report further estimated that overall market volume (2007) was €1 trillion globally, with energy efficient technologies playing a large part (€450bn). The average market share of European companies was above 30% – in waste management and recycling, power generation, sustainable mobility, energy efficiency, and sustainable water management. The European market share was lower – 10% – for material efficiency.

Global market shares in European hands fluctuate between the different fields of environmental technologies. For example, for automatic separation of materials and solar power stations, Europe accounts for more than 70% of the total market. And in synthetic biofuels, solar cooling systems and energy storage technology, European industry are leading in R&D, although there are no market shares to speak of, as there are not yet any established markets. On the other hand for hybrid vehicles, there are no European companies that currently have a product on the market. For the remaining markets, the share of European companies ranges from 20% to 80%.

On an aggregate level, the Roland Berger study concluded that the most competitive EU countries, in terms of innovation and market share, are Germany, Spain, Scandinavia, the Netherlands, Great Britain, France and Italy.

119 DG Research sponsored project (Measurement of competitiveness of eco-innovation)
120 Innovative environmental growth markets from a company perspective, Research Project on behalf of the Federal Environment Agency by Roland Berger Strategy Consultants, 2007

Table 1 World trade shares of potential environmental goods of OECD countries, 1993-2004

Land	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
GER	16,4	16,2	16,4	15,9	15,0	15,8	15,7	14,7	15,0	15,8	16,2	16,4
FRA	6,4	6,7	6,6	6,4	5,9	6,1	5,8	5,1	5,4	5,6	5,7	5,3
GBR	7,1	7,0	6,9	7,1	7,5	7,3	6,9	6,3	5,3	6,3	6,4	6,1
ITA	8,6	7,9	7,9	8,5	7,5	7,5	7,2	6,3	6,7	6,8	7,0	6,9
BEL	2,7	2,5	2,4	2,4	2,4	2,5	2,5	2,5	2,5	2,5	2,6	2,5
LUX							0,2	0,1	0,1	0,2	0,2	0,2
NED	4,4	3,7	3,6	3,4	3,2	3,0	2,9	2,7	2,6	2,6	2,9	2,8
DEN	1,9	1,9	1,9	1,8	1,7	1,7	1,7	1,5	1,7	1,8	1,7	1,6
IRL	0,4	0,4	0,4	0,4	0,4	0,5	0,4	0,4	0,5	0,4	0,5	0,5
GRE	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
ESP	1,9	1,9	2,0	2,1	2,2	2,2	2,2	2,1	2,2	2,3	2,4	2,3
POR	0,2	0,2	0,3	0,2	0,3	0,3	0,2	0,2	0,2	0,3	0,3	0,3
SWE	2,0	1,9	2,0	2,0	1,8	1,8	1,9	1,8	1,7	1,9	1,8	1,8
FIN	0,9	1,0	1,1	1,0	1,0	1,0	0,9	0,9	0,8	0,8	0,9	0,9
AUT	1,9	1,7	1,9	1,8	1,5	1,5	1,5	1,3	1,4	1,5	1,7	1,6
SUI	3,3	3,2	3,2	3,0	2,6	2,6	2,7	2,6	2,6	2,6	2,6	2,5
NOR	0,5	0,4	0,4	0,5	0,5	0,5	0,5	0,4	0,4	0,5	0,5	0,5
ISL	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
TUR	0,2	0,2	0,2	0,3	0,3	0,3	0,3	0,3	0,4	0,4	0,5	0,5
POL	0,4	0,4	0,5	0,5	0,5	0,6	0,6	0,6	0,7	0,8	1,0	1,1
CZE	0,4	0,4	0,4	0,6	0,6	0,7	0,7	0,7	0,8	0,9	1,0	1,1
HUN	0,3	0,3	0,3	0,3	0,3	0,4	0,4	0,4	0,6	0,7	0,7	0,8
SVK					0,2	0,2	0,1	0,1	0,2	0,2	0,2	0,2
CAN	2,1	2,2	2,2	2,5	2,7	2,9	3,0	3,1	3,3	3,2	2,7	2,5
USA	18,4	17,9	17,2	17,6	20,0	19,3	19,6	21,0	20,5	18,6	16,8	16,1
MEX	1,4	1,5	1,4	1,7	2,0	2,3	2,7	2,9	2,9	2,9	2,5	2,3
JPN	12,1	12,8	12,9	11,8	11,3	9,5	10,4	12,2	9,9	9,6	9,9	10,8
KOR		1,3	1,5	1,2	1,4	1,2	1,2	1,3	1,2	1,4	1,3	1,4
AUS	0,5	0,5	0,5	0,6	0,5	0,4	0,4	0,4	0,4	0,4	0,4	0,4
NZL	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1

*) Abfall, Wasser, Luft, Mess-, Steuer-, Regeltechnik, Güter zum Lärmschutz sowie Energie/Umwelt.
1) Anteil der Ausfuhren eines Landes an den Weltausfuhren in %.

Quelle: OECD, ITCS - International Trade By Commodity Statistics, Rev. 3 (versch. Jgge). - Berechnungen des NIW.

ANNEX IV – ENVIRONMENTAL POLICY AND ETAP FOR ECO-INNOVATION –LESSONS LEARNT

The EU Sustainable Development Strategy, launched in 2001, recognized the linkages between growth and sustainable development. This has been further reinforced by the Council[121], which recognized the potential of technologies to create synergies between economic growth and environmental protection. Eco-innovation is a natural junction of the pursuit towards sustainability, competitiveness and job creation. It merges technological, process and business innovation with environmental benefits.

The EU approach to eco-innovation has developed over time. The EU's environmental policy and legislation has evolved from promoting "end-of-pipe" solutions to setting environmental performance requirements and targets for products, industrial processes and resource use and moving further to address environmental management and consumer behavior. These policies and regulations have been and remain a main driver for eco-innovation.

Environmental policy supporting eco-innovation complements other EU policies supporting innovation, which do not have environmental outcomes as their main objective. In particular this refers to innovation and industrial policies, cohesion policy, research. As means to better coordinate and ensure consistency of eco-innovation policy in 2004 the European Commission launched the Environmental Technologies Action Plan (ETAP) as a complement to the EC regulatory approaches. As such the Plan promotes research, development and deployment, mobilizes funds, helps to drive demand and to remove barriers to market developments for environmental technologies, and eco-innovation in general.

The integration of environmental, competitiveness and employment aspects has received a further boost with the launch of the Europe 2020 strategy[122]. It aims to turn the EU into a smart, sustainable and inclusive economy by putting in place policies to secure economic development and social cohesion in circumstances where environmental challenges, including natural resource scarcity, are growing.

Environmental policy for eco-innovation

Evidence suggests that, by modifying relative incentive structures and production constraints, environmental regulation can act as a powerful stimulus to innovation and economic growth. The EU environmental policies have created new markets, incentivising business to innovate towards best and more efficient solutions. Eco-innovation provides thereby the key means to reconcile economic growth and environmental protection. The objective of this part is to give an overview of the key lessons learned with respect to eco-innovation support gathered through the development and design of EU environmental policy.

Literature[123] exists that looks at the contribution of specific environmental legislation with respect to its contribution to eco-innovation support. The points below summarize key lessons learnt regarding the relationship between environmental policy and eco-innovation:

- Eco-innovation will not emerge in the absence of innovation-conducive environmental policy. At its early stage eco-innovations tend to be more costly and uncompetitive vis-

121 In particular refer to European Council conclusions of: 22&23 March 2005, 23&24 March 2006, 8&9 March 2007, 13&14 March 2008
122 COM (2010) 2020 Communication from the Commission, Europe 2020: A strategy for smart, sustainable and inclusive growth
123 In particular refer to Ecorys (2009) "The implementation of the Environmental Technologies Action Plan" and European Parliament (2009) "Eco-innovation – Putting the EU on the path to a resource and energy efficiency economy"

à-vis conventional technologies or practices – so often lack a commercial rationale, particularly early in its life.

- Eco-innovation is not only dependent on environmental policy, but is also conditioned by the wider framework conditions as well as the corresponding innovation barriers. The measures necessary to overcoming these barriers fall often outside the domain of environmental policy, however their complementarity is such that a strong case for integrated policy approaches can be made[124].
- Due to increasing technological interdependency, successful technology development frequently requires corresponding advancements in various related technology areas. Support mechanisms must be put in place alongside environmental regulation in order to stimulate R&D activities. Environmental policy should create the right conditions for green innovations to emerge and flourish, without knowing exactly in advance what these innovations will look like. Stimulating diversity is essential.
- Due to this diversity it is crucial to eliminate regulatory bias towards established technologies, for instance in the form of technology-forcing standards and corresponding support mechanisms that "price out" alternative solutions. A better approach is to concentrate efforts on creating demands for green products and services by for instance pricing the environmental externality. Policymakers should leave individual products to emerge from the market[125].
- Diffusion of eco-innovation can be induced. The environmental benefit of eco-innovation will depend on the pace and level of diffusion. Policymakers can mobilize a broad array of instruments to induce eco-innovation diffusion. Empirical evidence[126] suggests that command and control instruments may be just as effective as market based instruments.

The Environmental Technologies Action Plan

The EU **Environmental Technologies Action Plan** (ETAP)[127] was launched to harness the potential of environmental technologies and eco-innovation to better protect the environment and, at the same time, contribute to competitiveness and growth. Since its inception ETAP has contributed to removing market barriers to the uptake of eco-innovation, to turning research results into business opportunities and to opening up global markets to eco-innovations.

The Plan contains 25 measures in three priority areas: Getting from research to market; Improving market conditions; Acting globally. These measures are to be implemented by the EC, national and regional authorities, industries and research organizations. A High Level Working Group composed of representatives from Member States and the EC services was set up in 2004 to facilitate the implementation of measures and cooperation among participants. Member States formalize their national transposition of strategies and action plans towards environmental technologies in the ETAP National Roadmaps. The ETAP is not a typical Action Plan, but rather an umbrella that brings together efforts and actions across policy areas with the aim to coordinate eco-innovation support at the EU and national level.

Two reports on ETAP implementation have been produced in 2005[128] and 2007[129].

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124 European Commission, Directorate-General Environment (2007), "Designing environmental policy to be innovation friendly"
125 McKinsey Global Institutue (2010), "How to compete and grow: A sector guide to policy"
126 Diaz-Rainey, I. (2009), Induced diffusion: Definition, review and suggestions for further research, Robert Schuman Center for Advanced Studies, European University Institute, Firenze
127 COM (2004) 38 final, Communication from the Commission to the Council and the European Parliament, Stimulating technologies for sustainable development: An Environmental Technologies Acton Plan for the European Union
128 COM (2005) 16 Report on the implementation of the Environmental Technologies Action Plan in 2004

Getting from Research to Markets

During the implementation of ETAP, the overall effort of research in environmental technologies has increased, both at EU and Member States levels. At EU level, a total of €1.4 billion has been mobilised for the development of environmental technologies through the 6th Framework-Programme (FP) and up to €10 billion under the 7th FP. The Member States have also stepped up their eco-innovation R&D efforts. The increase in R&D funding for eco-innovation may not be directly linked to ETAP, but it provides some insights on the growing importance of environmental technologies, which would not have been possible without a proper coordination of existing programmes, as provided by the ETAP framework.

Industry has been engaged in developing eco-innovation through Technology Platforms (ETPs), and new instruments were created to link research institutions, businesses and investors. Such instruments include the Risk-Sharing Finance Facility or new forms of Public-Private Partnerships (e.g. Joint-Technology Initiatives).

Research efforts however remain somewhat uncoordinated and do not always meet emerging environmental and market needs. Coordination of and synergy between programmes supporting eco-innovation in Europe should be reinforced to address barriers to market uptake of promising research results. The ERA-net on Eco-Innovation, launched in 2009, should be useful to pool Europe's national research and innovation programmes to promote eco-innovation and to create a networking platform for information exchange among Member States and beyond. Looking into the future more advanced governance structures for eco-innovation research should be explored to build on Member State-specific strengths and specialization, assure EU-wide coherence and commitment of critical mass of resources.

Improving market conditions

During ETAP implementation actions aimed at mobilising public and private sources of funding to accelerate the market uptake of eco-innovation have progressed. These include:

- The Competitiveness and Innovation Framework Programme supports actions for eco-innovation with an indicative budget of €433 million for 2007-2013 period. A number of risk capital funds investing into clean-tech companies have emerged, energizing the European venture capital market. The market replication projects offer direct funding for eco-innovative SMEs reducing the gap between research and market:
- An increasing number of projects funded through the LIFE+ programme deal with innovative management or business methods being introduced both by public entities and the private sector. Already app. 65% of projects funded under the objective LIFE+ Environment have an eco-innovation component;
- The revised environmental State Aid Guidelines, offer a specific 10% bonus on the maximum aid intensity on eco-innovation investments;
- The target for Green Public Procurement is 50% for the priority product groups and services as of 2010, and the necessary tools are being developed;

The eco-innovation focus of other EU funding programmes such as the Structural Funds has also been reinforced. Experience shows that LIFE+ and CIP provide funding for projects more directed at market-oriented demand. Structural Funds promote large-scale promotion of eco-innovation best practices at the regional level.

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129 COM (2007) 162 Report on the implementation of the Environmental Technologies Action Plan (2005 – 2006)

Despite progress difficulties in accessing risk capital remain. Procedures for eco-innovation funding instruments are complex. Furthermore, the regulatory barriers to the emergence of a European venture capital market seem to slow down and limit financing for eco-innovation, especially early-stage.

A main lesson from the 2007 ETAP report is the need to focus innovation initiatives on demand side actions. This has been taken up in the **Lead Market Initiative** (LMI), which created new networks and bilateral contacts across policy areas, actors and sectors, as well as across the Commission services. The implementation of Lead Markets mobilised for example public procurers, professional public procurement expertise centres, standardisation organisations and professional bodies. This approach has proved especially useful in emerging sectors, where established communication channels do not exist, as the case of the bio-based products shows. Secondly a sectoral approach to eco-innovation has proved particularly useful. Conditions that promote competitiveness differ across sectors and so therefore do the most effective potential regulations and policies.

Looking at the framework conditions, one of the major hurdles the eco-industries has to deal with (especially some of its sub- sectors such as air pollution control and recycling), is the absence of a well functioning single European market. For example, the Waste Framework Directive provides a sound framework to drive waste management practices in the EU. However, the lack of a uniform implementation and enforcement at the level of the Member States creates an uncertain and non-transparent business environment. A long-term stable policy framework with greater harmonization or co-ordination across the Member States, together with simplification of the often highly complex national regulations is therefore a crucial element for the future development of the sector.

Evidence points to the role market-based instruments (MBIs) can play to overcome the disadvantage environmental technologies face with respect to established technologies. The role of ETAP in this respect should be further enhanced for the establishment of new MBIs or for the review of existing ones. The information gathered through the Action Plan on the involved markets and actors, especially in the Member States, could be vital for a better design of new MBIs. Use of ETAPs framework and network should be made to monitor existing MBIs and to assess and provide evidence of their effectiveness.

The dialogue with stakeholders, including business and financial actors, was enhanced by the Forum on Eco-innovation. Together with other initiatives in the Member States this helped raise awareness and share strategies and tools for eco-innovation.

Looking into the future cohesion policy should make a greater contribution to eco-innovation development and uptake, in particular complementing existing regional capabilities through smart specialization. Secondly experience shows that the design of future EU financial instruments for eco-innovation should be better linked to policy objectives, national instruments and market needs.

Acting globally

ETAP has not been successful in putting eco-innovation on the international agenda. Progress in removing trade tariffs for environmental goods and services was slow due to the delays in the general WTO trade negotiations. There was some progress on the funding side, i.e. the Global Energy Efficiency and Renewable Energy Fund (GEEREF) and the EU Energy Facility. These instruments provide funding for energy and energy efficiency projects in developing countries. These initiatives however were initiated outside the ETAP framework.

However, perspectives are improving. The international cooperation on climate change creates new opportunities for cooperation on eco-innovation, related in particular to technology transfer. Additionally eco-innovation policies are now key elements of the green growth agenda and are part of bilateral environmental dialogues with external EU partners.

With respect to technology transfer (TT) ETAP experiences in the field show that a "one-size-fits all" solution has proved misguided. TT is industry and country specific. Also a high grade of industry specificity has been identified with respect to the barriers/ blockages, making technology transfer of green technologies particularly challenging.

ETAP has also shown that there is room for international cooperation in the field of public research. Joint investment in pre-competitive research, mapping of R&D needs, multilateral science and technology cooperation, common pools of knowledge can share costs and effectively and efficiently stimulate eco-innovation at a global scale: it potentially facilitates outreach, facilitates access to funding, contributes to technology transfer and capacity building. It might be useful to identify principles and best practice for further cooperation.

However TT efforts will not prove effective unless indigenous eco-innovation capabilities are developed. They are essential to facilitating both the diffusion of existing eco-innovation within developing countries, and sustainable economic development based on the adoption, adaptation and development of environmentally sound technologies that fit with the bespoke conditions faced by these countries. OECD analyses demonstrate that high technological capacity in the recipient country is a key factor in encouraging transfers.

Governance of eco-innovation

The ETAP High Level Working Group and the ETAP National Roadmaps have both emerged as the main EU instruments for stimulating eco-innovation policies. A high level of Member State engagement in the ETAP process has been achieved. Insufficient networking, weak links across policy areas, actors and sectors, both at the EU level and Member State level, remain the key obstacles to a coherent eco-innovation policy approach.

The challenge ahead is how to better coordinate national eco-innovation policy measures, and facilitate policy learning. A lot of experience has been accumulated through the ETAP National Roadmaps on the development and use of eco-innovation. The voluntary nature of the Roadmaps and the lack of appropriate follow-up risks an uneven impact of ETAP across the Member States. To benefit further from this experience there may be a need for:

- More systematic information on governance and responsibilities,
- More systemic information and instruments,
- Analytical work to identify lessons. Knowledge accumulated in the roadmaps can be used to identify good practice relating to: the roadmaps themselves, the role they can play; how eco-innovation policies can be governed; the combination of instruments; the design of specific instruments.

Eco-innovation policy in the Member States

The Environmental Technologies Action Plan has invited EU Member States to develop eco-innovation roadmaps to account for initiatives taken at national level to support eco-innovation. The analysis of the Roadmaps shows that countries differ in many respects with regards to governance aspects. This reflects the dual character of the ETAP roadmaps as an instrument of industrial policy embedded in the Lisbon agenda, and as an instrument to address environmental policy issues.

The Roadmaps have not spurred new policies, they have been a vehicle to gather and share information, to reorganize measures. For the new EU Member States, they have also been a way to initiate a policy dialogue on eco-innovation policies.

There balance of instruments reported in ETAP Roadmaps indicates a bias towards supply side instruments. Prevalence is given to R&D support, the support of networks and partnerships, demonstration and commercialization; among demand side measures, information services are most common.

The systemic review of ETAP Roadmaps indicates that environmental policy priorities are well reflected in eco-innovation priorities reflected in the Roadmaps. Nevertheless, there is a strong bias towards climate change mitigation and renewable energy generation. The review indicates that the choice of instruments to support eco-innovation is related to the innovation potential and the development state of a country. Finally the review suggests that countries with the most stringent, most flexible and most transparent environmental regulations rely more heavily on the supply side measures, whereas countries with less stringent environmental policy regimes and less developed financial markets, on average, on average, more frequently use information services, the provision of infrastructures, and regulations and standards to support eco-innovation.

ETAP lessons learned

The EU experience and the ETAP National Roadmaps, confirm that countries implement a variety of policies to stimulate eco-innovation. At the European level the key lessons learnt for eco-innovation policy include:

- The need to coordinate eco-innovation policies is evident. As implicit assumption made in much of innovation literature is that more innovation-related activities is always better than less. ETAP experience shows that this does not need to be the case. More eco-innovation does not necessarily lead to improved environmental performance. Eco-innovation can have unintended negative environmental consequences (e.g. growing crops to produce biofuels can lead to deforestation and increase greenhouse gas emissions).
- The most efficient policies to spur a green economy combine a portfolio of instruments, involving carbon pricing, R&D support for green innovations, removing non-market barriers to ease the substitution from dirty to green technologies, and subsidies to clean technology transfers to developing countries[130]. Typically, pricing the externality ought to be combined with long-term investments by governments and firms if technological change is too costly, too risky, too long term, or cannot be appropriated by firms.
- It is not clear whether and to what extent the internalization of costs through market-based instruments (MBIs) has taken place. MBIs have been put in place, on a

130 Acemoglu D., Ph. Aghion, L. Bursztyn, D. Hemous (2009), The environment and directed technological change, MIT/ Harvard/ NBER Working Paper

European and national level, but information as to their effects specifically with respect to environmental technologies is lacking[131].

- More qualitative information on the status and design of instruments would be needed to characterize them further and assess their potential impact on eco-innovation: additional information on target, budget would be useful as well.
- The objective of eco-innovation is not to spur new technologies, but to accelerate the improvement of environmental performance. The benefits of innovation for the environment only materialize when the innovation is taken up by users and delivers the expected performance. This emphasizes the need to focus on demand side actions for eco-innovation and better coordination of demand measures across the EU to ensure technology spill-overs.
- ETAP must become more focused on priority sectors linked to the growing environmental challenges. The current wide focus on green technologies has not been helpful in developing targeted and efficient sectoral policies.
- Solving persistent environmental problems needs the involvement of other sectors, but environmental policy will have to play a key role. Implementation will require better cooperation and negotiation with other sectors and with industry.

At the Member State level the key lessons learnt include:

- National strategies to support eco-innovation provide opportunities to coordinate a policy dialogue on this complex and multifaceted issue in a whole-of-government approach. In Europe, ETAP has been a vehicle to systematize and reorganize existing measures in the participating countries. In addition, it would be useful if Member States would report on policies that were successful and lessons that have been learned with the use of particular policies.
- EU Member States devote a lot of attention to the creation and development of new firms. In particular, a variety of initiatives are taken to encourage venture capital and direct it towards green tech and eco-innovation investments. New firms and new comers play a role in the development and deployment of eco-innovation. Data developed by the OECD on patent-based indicators for eco-innovation shows that green young firms are more inventive than non green young firms.

131 Ecorys (2009), The implementation of the Environmental Technologies Action Plan

Economic instruments

No adequate economic incentives or policies exist currently for creating a resource-efficient economy. "Adjusting the economic and fiscal framework is therefore the most fundamental and urgent policy prerequisite for moving toward sustainability"[132]. The central role of price signals for eco-innovation has been highlighted by numerous publications and most recently confirmed by OECD analysis[133]. For achieving the right price signal the development and introduction of environmental taxes is pivotal. In 2005 the weighted average of the revenue generated with environmental taxes in the EU-27 constitutes 2.6% of GDP. There are four categories environmental taxes used in the European Union[134]:

– Energy,
– Transport,
– Pollution and
– Resource taxes.

The overwhelming part of environmental taxes is usually generated by energy taxes, but this will not be sufficient to address other aspects of eco-innovation. For example, price signals for a sustainable use of natural resources are not well developed. Only 4.1% of the total of the environmental taxes are related to resources, for instance in the UK, Sweden, Italy and the Czech Republic[135]. The taxes can cause resource reducing and material substitution effects with positive effects on eco-innovation, e.g. in material extraction, processing and recycling. The extent to which this would have effects along the value chain would depend on the tax bases, levy forms, recipients and administrative procedures[136].

Consumption and Production Policies (SCP)

With the adoption a 10-Year Framework of Programs (10YWFP) on sustainable consumption and production, as called for by the WSSD Johannesburg Plan of Action the European Union supports global efforts for eco-innovation by

- assisting countries in their efforts to green their economies
- helping corporations develop greener business models
- encouraging consumers to adopt more sustainable lifestyles.

Within the SCP framework number of legislative measures could be taken in order to improve eco-innovation in the European Union by improving the interplay between eco-innovation supply of and demand as outlined in the problem defition.

132 Schmidt-Bleek, F. (2010): Innovation for a sustainable future. Paper prepared for the Stakeholders Consultation on Eco-AP, 11 February, 2010 in Bruxelles. Carnoules
133 OECD (2009): Green Growth: Overcoming the crisis and beyond. Paris
134 Eco-innovation - Putting the EU on the path to a resource and energy efficient economy. Wuppertal-Spezial 38. Wuppertal. Download: http://www.wupperinst.org/uploads/tx_wibeitrag/ws38.pdf
135 Eurostat (2007): Taxation trends in the European Union: Data for the EU Member States and Norway, Luxembourg
136 Bleischwitz, R., B. Bahn-Walkowiak, W. Irrek, Ph. Schepelmann, F. Schmidt-Bleek, S. Giljum, S. Lutter, L. Bohunovski, F. Hinterberger, E. Hawkins, M. Kuhndt, N. Pratt, et al. (2009): Eco-innovation - Putting the EU on the path to a resource and energy efficient economy. Wuppertal-Spezial 38. Wuppertal. Download: http://www.wupperinst.org/uploads/tx_wibeitrag/ws38.pdf

– Public procurement

Public procurement of goods and services amounts to 15% - 20% of final consumption[137]. A greening of public demand could be would create a powerful pull for eco-innovation, but as outlined in the problem definition the interest of procurement in eco-innovation is limited. For using the full potential of public procurement of the European Union the European Commission would introduce ambitious standards for public procurement reaching from EU institutions, over EU MS down to the regional authorities and municipalities. Beyond the already existing plans of the SCP Action Plan, which focuses primarily on energy-related aspects, more comprehensive eco-innovation standards for public procurement would include reference to best available technology (BAT) not only in relation to energy consumption, but to a number of different eco-innovation aspects including the resource efficiency along the life-cycle of procured goods.

– Clear labelling of green products

The use of labels exposing the energy-use of products positively influences consumer decision-making. Thus they have a direct impact on the demand and indirectly on the supply of energy-efficient products. Labelling of products for eco-innovation would have to go beyond the current energy-related labelling as required by the eco-design directive to include all aspects of resource consumption along the life cycle. Positive effects on supply of and demand for eco-innovation similar to the energy domain could be expected. In this context it would be desirable to reduce the multitude of existing eco-labels. For this purpose the European labelling would have to be based on the vision of greening products all over Europe in a joint and common approach. Such an approach would have to be supported by all governmental and non-governmental stakeholders issuing and using green product labels.

The European Union Eco-labelling Board (EUEB) could support this process by involving stakeholders and setting up joint working plans, key objectives and plans for joint action. This would also promote key objectives of the EU Eco Label Scheme including:

– Developing, publishing and promoting life-cycle criteria for eco-labelling;
– Raising the credibility of the award by effective administration and criteria,
– Encouraging manufacturers, retailers and service providers to apply for labels, to publicise their own participation in labelling schemes, and to promote the availability of eco-labelled products and information about them;
– Encouraging purchasers to buy labelled products and services;
– Improving consumer awareness and behaviour regarding optimal use of labelled products and services.
– Substitution of the worst performing products on the market

Based on the life-cycle analysis of products new instruments for selecting and banning of products (including imported goods) would have to be developed and introduced.

The combination of public procurement with stricter labelling would create an environment in which the demand-pull for well-performing products could grow. Especially during the absence of economic instruments these efforts could be undermined by "eco-dumping", because production with little care for the environment would in most cases still be cheaper than responsibly produced goods. Therefore, the European Union would have to protect producers with higher standards by actively discriminating against products and production

137 Schmidt-Bleek, F. (2010): Innovation for a sustainable future. Paper prepared for the Stakeholders Consultation on Eco-AP, 11 February, 2010 in Bruxelles. Carnoules

processes with negative environmental impacts. This would mean that the worst performing products would be phased-out of the market by enforcing gradually stricter standards. The effect on the supply side within and among trade partners outside of the EU could be amplified, if strict long-term targets would indicate the direction of eco-innovation and market discrimination.

– Waste prevention and recycling

Principles of waste prevention and recycling would have to be introduced along all stages of the value chain to foster eco-innovation not only in production and consumption but also during resource extraction and design phase. As outlined in the Thematic Strategy on the Prevention and Recycling of Waste, prevention and recycling of waste can depend very much on a successful Integrated Product Policy (IPP), which provides for the possibility of maintenance, repair, remanufacturing and dismantling of products during the use and end-of-life phase. This implies much more regulation in favour of eco-design, but also the development of new business models for the manufacturing industry, which encompass not only the selling of material goods, but also maintenance and end-of-life services. Such an approach would foster eco-innovation along the value chain from cradle to cradle. Numerous innovations in areas such as raw material extraction, material processing, selection and production of new materials, product design, use and end-of-life treatment could be expected[138].

138 Braungart, M., McDonough, W. (2009): Cradle to Cradle. Rethinking the way we make things. London: Random House

1. What is ETV? Main objective and rationale

ETV provides **independent verification of information on the performance of new eco-technologies**, so that worthwhile innovations can establish a market foot-hold. By providing that verification, risks for new purchasers are reduced, such that they can purchase the innovative technology with the confidence that it delivers as specified.

New eco-technologies do not have a track record of solid industrial references showing results obtained from the innovation being used under real conditions. Innovators typically base their performance claims on demonstration projects and test results, which may not be enough to convince technology buyers and investors to make informed choices. Since purchasers tend to favour the 'safe' option of well-proven technologies, rather than going for a new technology even though it might offer significantly improved performance, lower costs etc. Opportunities are missed and further investment is more difficult to obtain.

ETV addresses this market-access obstacle through a framework which provides for independent, qualified, third-party investigation of the technology performance. Providing that the innovation is indeed able to deliver as it promises, ETV delivers a Statement of Verification, showing that the **performance claims are based on complete, fair and reliable test data**. As a result:

- The technology developer can show reliable data proving the value of the innovative technology.

- Technology buyers and investors have reliable information on which to base their purchasing decisions and management of technological risk.

- Other stakeholders (including public policy-makers and regulators) have indications of the performance achievable by new technologies.

Verifying a technology under ETV is generally one step in the chain leading from research and development to marketing. ETV is appropriate:

- When the technology is ready for the market: no further major developments affecting the performance are planned; and

- When there is no technical standard or certification system available to prove the performance of the product, or where the innovative features of the new technology are not correctly (or adequately) reflected by the available standards.

When there is a demonstration project or testing process planned, ETV could be an integral part of it. Verification under ETV would then add only marginally to overall costs, while adding significantly to the value, in terms of eventual market credibility.

Under ETV, test data of good quality may be taken into account, to help save time and cost. The added value of ETV lies in the credibility and comparability of the *'Statement of Verification*', which is the result of a successful verification process.

ETV is intended for use in business-to-business relations. It can thus be distinguished from product certification, in that there is no control that a series of product conform to given

specifications; and from product labelling, since each ETV *Statement of Verification* is specific to one technology, i.e. there are no pre-defined criteria.

2. Development of ETV

The ETV initiative builds on a number of studies, as well as research and pilot projects, exploring the benefits, obstacles and testing verification protocols in specific technology fields139. In total, some 35 technologies have been verified during this preparatory phase. For example, the pilot project TRITECH, funded under the LIFE instrument in 2006-2009, tested an operational verification procedure in real conditions. It coverered 15 innovations in three technology areas - water, soil and energy - and produced a business plan for an EU ETV scheme.

Some EU Member States have already implemented ETV pilot projects: the Nordic Innovation Council project on Water Technology Verification Centres (NOWATECH)[140]; the Danish ETV Centre (DanETV) on 5 different technology areas[141]; and the VERA project on Verification of environmental technologies for agricultural production[142]. Some private initiatives have also provided inspiration for ETV, such as the programmes of evaluation for instruments run by associations of industrial users[143].

In 2007-2008, a proposal for a Regulation establishing an EU ETV scheme was prepared, to address the issues of access to markets by innovative environmental technologies. An Impact Assessment report concluded that a legislative instrument was the preferable option to achieve the necessary break-through. However, the Inter-service consultation failed to reach a reasonable consensus among Commission services, as a Regulation was considered disproportionate and the scheme as then proposed too burdensome and resource-intensive for the Commission. The evidence of potential uptake and on the added-value of the scheme was also questioned during the ISC.

Acknowledging the need for further evidence to make an informed decision on the need and structure of an ETV scheme, DG Environment engaged a new approach on ETV in 2009, combining a pilot programme without legislative instrument, on a purely voluntary basis for participating countries and organisations, and a detailed study on the potential market and demand for ETV in the EU.

3. Implementation of the ETV pilot programme

The ETV pilot programme has been designed progressively in 2009-2010, with interested Member States and stakeholders in a public-private partnership setting. The selection and monitoring of organisations implementing ETV as 'Verification Bodies' is done by national accreditation bodies, using the existing procedures applied for example to product certification. Relations between Verification Bodies, test bodies and technology developers follow normal commercial practice, while in addition, Verification Bodies are co-ordinated by thematic technical groups to ensure the consistency and comparability of ETV procedures and products.

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139 The results of all ETV research and pilot projects are accessible through the common website: http://www.eu-etv-strategy.eu/
140 See http://www.nordicinnovation.net/
141 See http://www.etv-denmark.com/danetv/
142 See http://www.ecoinnovation.dk/English/Topics/Verification_of_ecoefficient_agro_technologies/
143 See http://www.exera.com/, http://www.evaluation-international.com/ and http://www.wib.nl/

The verification of technologies submitted to ETV is performed by a **Verification Body**, acting as a one-stop shop for technology developers. This includes defining the technical parameters to be used in the verification process; and also assessing the quality of existing test data. When further tests are needed – e.g. when the Verification Body finds that the test data in support of the claims are not sufficiently robust – a **testing body** and/or an **analytical laboratory**[144] are designated by the technology manufacturer to carry out further tests / analyses.

Verification Bodies, testing bodies and analytical laboratories follow the provisions laid out in the ETV **General Verification Protocol** ('GVP'), which is in fact a set of general instructions for the verification of individual technologies. The GVP sets out the required qualifications of organisations implementing ETV procedures and the quality of test data acceptable under ETV. The GVP ensures that the procedures followed and the outcomes from the pilot programme will be of adequate quality and are both credible and reliable.

To facilitate the launch of the ETV pilot programme, a call for proposals will be launched in 2011 under the EU Competitiveness and Innovation Programme (CIP) with a budget of €1 million[145]. Amounts of €1 million are also programmed under CIP for ETV in 2012 and 2013, subject to the approval procedure of annual work programmes for these years. The 2011 call should be open to Verification Bodies accredited to implement ETV and it should enable Verification Bodies to:

- Participate actively in the setting-up of the ETV pre-programme by participating in relevant technical groups and implementing ETV procedures within their technical area;

- Set up and maintain a Quality Management System, thus ensuring a high level of quality and reliability for ETV procedures and products;

- Facilitate access to verification procedures under ETV for Small and Medium-sized Enterprises by providing specific technical assistance during ETV processes;

- Report on the implementation of ETV, on results and indicators to help the evaluation of the ETV pre-programme and to recommend any further steps.

4. Market assessment and cost estimates

The 4th Community Innovation Survey estimated the number of EU innovative companies at around 300 000. Of these, 107 000 introduce new products to the market each year, just under half of which are aimed at the industrial sector (excluding construction). The share of environmental investment of industry out of total investment can be estimated around 3%. If this share is applied to the number of innovations discussed above, it results in a total of **1350 environmental innovations being introduced by EU industry every year.** This figure should be considered as the potential maximum number of clients for ETV. As an innovation itself, and to explore realistically whether early indications of a market need for ETV are borne out in the medium-term, ETV will need time to prove its value and it is for that reason that the pilot programme was devised.

144 Analytical laboratories are distinguished from other test bodies when they carry out analytical work, for example to measure chemical compounds in water or air samples, because such activities follows highly standardised and quality-controlled procedures, independent from the products or processes at the origin of the analysed samples, whereas technology tests are by nature dependent on the technologies tested.
145 2011 Work Programme for CIP – Entrepreneurship and Innovation sub-Programme – adopted on 18 January 2011 by Commission Decision C(2011) 91.

The costs of verification under ETV can vary considerably depending on the technology concerned and the quality of existing data. The DanETV verification centre is a pilot ETV scheme, active in Denmark in 5 technology areas since 2009. Based on 21 verifications finalised in 2009-2010, the average cost for the testing and verification of technologies was €53,000[146], of which €28,000 was attributable to the verification procedures *per se*.

Feedback from public consultations and stakeholder workshops indicated that these costs may be an obstacle to participation, particularly in the case of small and medium-sized technology companies. In order to facilitate SME's access to the scheme, the fixed costs of the pilot programme are to be indirectly supported by the EU budget during an initial phase, the aim being to limit the average total contribution by participating Small and Medium-size Enterprises to no more than around €20 000.

To refine the ETV marketing and cost estimates, DG Environment commissioned a study on a 'detailed assessment of the market potential and demand for an EU ETV scheme', whose results are expected by mid-2011. The study will identify technology areas where ETV is expected to generate the greatest added value, exploring the business cases for ETV in a series of technological applications. It will provide solid estimates of the market potential for an ETV scheme, covering likely uptake by technology developers, validated estimates of the costs of verification under ETV, insights into the willingness of potential applicants to contribute financially and an assessment of the cost-effectiveness of an ETV scheme.

5. Conclusion

By providing objective comparability between technologies for purchasers, ETV should facilitate the emergence of an eco-innovation market place in the EU, boosting partnerships between technology developers and users. It should create confidence in the eco-innovations verified under ETV, promoting healthy competition – based on performance – between technologies and between test bodies. ETV should also facilitate the greening of public procurement: public purchasers are typically very careful and ETV will provide them with the kind of assurance that they need to make a purchase of a significantly better-performing innovative environmental technology.

The results of the ETV pilot programme will be evaluated by the Commission services after two to three years of actual operation. On the basis of this evaluation and the study on the market potential of ETV, the Commission will draw conclusions on the potential for ETV in Europe and on the best way to mobilise it. A range of options will be drawn up, based on the evidence available at the time. If there is clear evidence of its potential added value as an EU-wide measure, offering the scheme and its implementation to the private sector would likely be one option, and/or proposing a legislative instrument and/or a guidance document to underpin key objectives and requirements.

146 Costs for testing and verification ranged from €22,000 to €94,000.

In the main text implications and impacts of policies directly related to eco-innovation were discussed, here effects of the removal of specific ETAP actions are qualitatively assessed.

Getting research to markets

Since ETAP mainly supported and strengthened existing research areas, in this 'no-action' option the research focus will likely continue as it is currently. Funding and coordination activities by ERA-Net projects, FP7 and its successor will continue. It is however likely that less concerted effort will be put into attracting private and public investment for the development and demonstration of environmental technologies. Actions aimed at improving the eco-innovation process and to take inventions out of laboratories and onto the market will be taken (as part of the Innovation Union and the European Innovation Partnerships), but in a more scattered and uncoordinated way with no specific focus on eco-innovation. Furthermore, dialogue with stakeholders on specific issues relating to the development and deployment of eco-technologies won't be organized in a central manner, which could imply that important actors will not be involved in vision-building on the development of eco-innovations. Trends towards public-private partnerships, the establishment of technology platforms and an increase in attention for research and dissemination of eco-innovation indicate that in the case of the absence of an EU eco-innovation action plan, still actions will be taken on a smaller scale, for instance within and between the Member States. Finally, the EURODEMO, PROMOTE, Testnet and AIRTV initiatives have been promoted in support of ETAP to establish European networks of technology testing, but, according to national stakeholders, international cooperation initiatives mainly take place through established networks, so the absence of ETAP will possibly not be of great influence.

Improve market conditions

ETAP has tried to bridge gaps in this area in the past few years by financial stimulation measures and the development of regulation to improve market conditions. If ETAP disappears many of the achieved concerted actions towards mobilising financial instruments will continue, but it is questionable whether the instruments would still focus on eco-innovation. Stopping ETAP would be seen as a signal that eco-innovation is not a central theme of European policies. A discontinuation of ETAP for sure won't mean a disappearance of national instruments for eco-innovation, but surely the analysis of roadmaps has highlighted the coordinating and networking role that ETAP played with regard to those.

In the area of State Aid Guidelines ETAP has been successful in adapting the state aid framework to favour eco-innovations, but in the area of harmful subsidies only the analysis stage has been reached. Collectively reviewing harmful subsidies will be more difficult if this is coordinated and specifically targeted by an ETAP-like action plan. Raising business and consumer awareness by ETAP aimed at creating a network among interest groups and increase the current knowledge related to environmental technologies. A few activities took place, such as the European Forum on Eco-innovation. In this 'no-action option', these network and communication activities would likely decrease: there would be no website, no High Level Working Group, no ETAP forum nor newsletters. Training in the environmental domain supported by the Marie Curie and ESF funds will however likely continue even without the existence of ETAP (but was limited with ETAP anyway).

Acting globally

ETAP's activities in this field have been quite indirect (e.g: cooperation with international organisations) and limited in terms of budget, and therefore it is particularly hard to assess consequences of stopping such actions. It is anyhow assumed that the promotion of responsible investments will continue without an ETAP, maybe in a less focussed way (i.e.: environmental good and services in general rather than eco-innovative ones).

EXAMPLES OF ETAP CONTRIBUTION

- The integration of eco-innovation in CIP. The focus on eco-innovation was (at least partially) a result of the implementation of ETAP. To accomplish this, ETAP officials participated in a number of meetings on the design of CIP. This resulted amongst others in a fenced-off budget for eco-innovation for Venture Capital in CIP and the creation of the EACI instrument for pilot and market replication projects
- With regard to the State-Aid guidelines ETAP officials were integrated in a team that guided the implementation of the guidelines. The participation of ETAP supported the integration of eco-innovation in the guidelines. ETAP officials have participated by taking part in consultations, writing of and commenting on notes, etc.
- The attention for GPP already arose around 2003. Since 2005, ETAP was involved in a mixed group created of members of the working group and a group of DG Markt. The group was to discuss between MS and representatives that the word of procurement and the GPP. This is the meeting were the objective of 50% GPP was introduced.
- The signalling effect to the Framework Programmes. ETAP has drawn attention to the relevance of eco-innovation and by this mean influenced the Framework Programmes to pay attention to development towards more sustainable directions.
- Supporting the launch of the Environmental Technology Verification (ETV) legislative proposal and prototype scheme in 2010. The ETV has been set up by the EC in the Framework of ETAP.

Source: Interviews with Commission's officials, Technopolis Group 2010

Action 1. Increase and focus research, demonstration and dissemination. Improve co-ordination of relevant programmes

From FP6 to FP7 the funding devoted to environmental technologies increased from around EUR 1.4 bln to EUR 10 bln. Although this increase in funding cannot be attributed directly to ETAP, it indicates the growing importance of environmental technologies, which would not have been possible without a proper coordination of existing programmes. This signal, at least, some influence from ETAP.

Also many other instruments have been put in place to increase R&D, demonstration and dissemination activities and they help to reach a large number of different stakeholders. This ERA-NET aiming specifically at SME based innovations. A large contribution to the coordination of the MS' R&D programs has been expected from the ERA-NET network launched in 2009 under the FP7. Besides, a few other EU level programs and initiative can potentially be relevant to PA1 of ETAP such as Structural Funds or the European Institute of Innovation and Technology.

ETAP has also proved to be helpful in addressing market failures faced by early stage innovative projects. Addressing the funding problem was one of the focuses of the research to market component, and it seems that ETAP initiatives managed to some extent to either through mobilization of funding. ETAP influence on direction of funding in environmental technologies on national level varies from country to country from neutral to positive.

The activities under PA1 had a stronger focus on energy technologies and carbon emission reduction, and somewhat weaker emphasis on wider problems of resource efficiency issues and even less focus on other nature protection problems. With a specific focus of new ETAP on resource efficiency outside the renewable energies area there might be a shift in focus in research and therefore a shift in environmental impact. Since markets in this area are also less developed than renewable energy markets uptake of research results may be slower.

Action 2. Establishing ETPs

Establishing Technology Platforms can be considered as one of the direct and concrete contribution of ETAP. These mechanisms contribute to the objective to promote further investments in research and innovation and 36 platforms have been established since 2004.

The literature and the interviews point to a strong impact of ETPs in boosting R&D in specific technology areas. Additionally they provide a range of positive externalities such as positive contribution to other research programmes and helping to identify research infrastructures. Because of the importance of ETPs in setting right research and innovation policies, they have received extensive support of the national authorities. So called "Mirror Groups" represented by the state-nominated specialists facilitate cooperation and communication between ETPs, national activities and national stakeholders.

Action 3. Establishing European Networks of technology testing, performance verification and standardization

In order to be able to objectively validate the performance of environmental technologies, and improve the consumer confidence it was deemed necessary in ETAP to establish a special mechanism to address these issues related to environmental technologies verification and

testing. There have been a number of initiatives and pilot projects on this topic; these are RTD FP6 initiatives EURODEMO, PROMOTE, Test net, and AIRTV which involved a total of 47 organizations from 18 MS[147]. In this regards ETAP has put the bases for the establishment of a European Environmental Technology Verification System using the experience of US Environmental Protection Agency's Environmental Technology Verification. The results of the Ecorys survey of MS showed that international networks of standardisation seem to be fairly active and ETVs play some role in this. It is difficult to judge whether ETVs can have any impact in addressing capability, organizational and network failures, as this instrument targets first of all the product, rather then the process of innovation. In creating any environmental impact this instrument can have indirect positive effect on a large range of problems depending on the program/ technology type, its purpose, etc. For example EURODEMO programs explicitly targets technologies targeting soil remediation and ground water problems, and have a direct effect on soil and water pollution problems and indirect effect on resource or energy consumption.

Action 4. Develop and agree on performance targets for key products, processes and services

Performance targets hold a potential for eco-innovation because a certain requirement to products, processes or services can be set with regard to resource use. Literature on the effectiveness and impacts of performance targets with regard to resource use is scarce. Up until now evaluations of standards and targets aim at standards for energy savings. A benchmark for the effectiveness of performance standards is Japan's Top Runner scheme. Estimates show that the Top Runner scheme will have an effect of 16-25% of national energy savings. This shows the potential of performance targets for eco-efficiency. Standards on specific substances seem to have a positive effect on technological development and technology transfer[148].

According to the 2007 study of the JRC, performance targets could be defined as long-term objectives for the environmental performance of product, process or service and they should not be technology prescriptive. With regard to the type of performance targets, a survey[149] of the MS' officers showed that a variety of instruments are perceived to be effective, especially when aimed at market uptake. The softer types or instruments (i.e. voluntary agreements and awareness campaigns) are however perceived to be least effective. The EU can play a role, especially in coordinating and stimulation of the development of more forceful targets.

Action 5. Mobilising financial instruments to share the risks of investing in environmental technologies

Financial instruments aim to improve the capability of the industry to integrate eco-innovation. Eco-innovative companies face an alleged drawback in competitiveness compared to more traditional innovations. This competitive disadvantage is due to the fact that environmental costs are not taken up in market prices; eco-innovations are thus more costly and seen as more risky[150]. Therefore, general innovation barriers are applicable to eco-innovations. Generally, the literature suggests that there is a lack of capital investment

147 Interview Technopolis with commission officials, Environmental Technologies and Pollution Prevention, April 22, 2010 . and http://www.eu-etv-strategy.eu

148 Such as SO2 and NOx (Popp 2006, International innovation and diffusion of air pollution control technologies: the effects of NOx and SO2 regulation in the US, Japan and Germany) and NOx (Popp 2006, Exploring links between innovation and diffusion: adoption of NOx control technologies at US coal-fired power plants).

149 ECORYS evaluation of ETAP, see previous reference.

150 Literature suggests that if environmental costs are taken into account, eco-innovations are less costly on the longer term. However, individual companies are not the problem-owner of environmental costs.

flexibility due to low (initial) profit margins and a lack of resources in the start-up and the post start-up phase of SMEs. Instruments with a clear focus on this problem in eco-innovation related to ETAP are the instruments High Growth and Innovation SME Facility (GIF, with a fenced of window for participating in eco-innovation VC funds) and the "first application and market replication projects" in the CIP.

Within GIF the EIF participates in VC funds with a minority participation, which may induce commercial parties to participate as well. The VC funds then invest in companies in early and expansion stages. For cleantech early and expansion stage funds in total €228m is available for participation in the period 2007-2013. The applying funds for the eco-innovation are assessed on two cumulative criteria: (i) innovation and (ii) prevention or reduction of environmental impacts[151]. For the ex-post impacts, no specific assessment criteria exist to assess the eco-innovation as well as the environmental impacts of funded SMEs. Up until now, funds aiming at eco-innovation are typically larger than the conventional funds in GIF; moreover, there appears to be a large number of funds chasing the eco-innovation budget. There is a relatively high level of rejection because the quality threshold is not met in many applications. The availability of additional resources (apart from the EIF participation) is less important[152].

Increasing available budgets to participate in VC may increase effects to a certain extent, but when available budgets become too large, availability of capital might not be the problem but the availability of viable investment opportunities. It can well be that there is no lack of VC, but a shortage of economically viable ideas and inventions to invest in. This issue can only be increased by other measures both supply (generation of viable ideas and inventions) as well as demand side (dealing with the lock-in of conventional not green technologies and services, primarily "getting the prices right"). The effect of the eco-innovation GIF is therefore significant in relation to the purely commercial funding available. Effect on competitiveness for the firms involved is large, but it concerns only a limited number of (however high-growth potential) firms. This also limits the environmental impacts effect enhanced by the fact that not all companies are aiming at substantially improving resource efficiency either.

The "first application and market replication projects" programme in the CIP-EIP holds larger potential for resources savings. However, since the projects started in May 2009, it is too early to appraise the effects. Feedback gathered from the EACI shows that good results are expected with regard to eco-innovation, because the instrument is aimed at market introduction of eco-innovations specifically[153]. The beneficiaries of the instrument show a strong drive to bring eco-innovation to the markets. This makes this instrument of added value to the traditional R&D instruments, especially because 68% of surveyed industry associations perceive there are adequate opportunities for receiving RD&I funding for eco-innovations. Focus on the market penetration might thus be of added value to the innovativeness.

The potential for improvement of competitiveness is shown by the interest in the instrument. At the time of the deadline for the Call 2010, 287 proposals were submitted. This represents an increase of almost a half as compared to the 202 proposals submitted in the Call 2009, and more than a doubling compared to the 134 application received in 2008. The total funding requested in the 2009 call was more than €150m[154], an increase of almost 40% compared to

151 Guiding Paper for Investors on Eco-innovation in CIP Financial Instruments.
Surce: http://www.eif.europa.eu/ attachments/venture/resources/Paper-for-investors_on_Ecoinnovation_in_CIP_Financial_Instruments.pdf
152 Interviews Technopolis Group with EIF, April 2010
153 Interview with EACI, April 2010
154 This is about 0.05% of the estimated size of *eco-industry* in 2008 in the EU27. According to the Study on the Competitiveness of the EU the total size of eco-industry was €319bn (turnover)

the 2008 call. The manager of the facility pointed out that with relatively little activities to draw attention to the facility there was already more response from the field than budget was available[155]. It is expected that the instrument will have a positive impact on the ability of particularly SMEs to penetrate the market with innovation. Almost 70% of the participants are SMEs, 83% are from the private sector. Moreover, an expected impact is increased cooperation, 65% of the proposals are submitted by consortia where two thirds of these consortia involve participants from different countries. An expected impact of the instrument is an increase of the capability to innovate, and thus to growth. Here budgets may be a constraint. With present means the effect is expected to be modest to large.

A related programme also in the range of, indirect, influence of ETAP and linked to eco-innovation grants is the Environment and governance component of LIFE+. Grants are awarded on the basis of thematic priorities and so far waste and natural resources, climate change and water have represented around 71% of all funded projects. Differently from the CIP grants for eco-innovation the instrument is not specifically targeting SMEs, but significant results have been produced and are expected for the future. Ongoing projects foresee the "production" of a total 27 new technologies, 85 methodologies and approaches and 10 process and products in fields like climate change, waste and water.

The additionality of the EU in these actions is high.

Action 6 Review State Aid Guidelines and Review environmentally harmful subsidies

As a consequence of the State Aid review, since 2008 a 10% higher intensity is allowed for environmental state aid investment support when the investment results in a substantially improved asset compared to the existing state-of-the-art, the eco-innovation is leading to a large leap forward in terms of environmental benefits and when the innovative character of the project clearly involves higher risks compared to non-innovative projects. Further more various other forms of state aid are now allowed for environment related activities (e.g. early adaptation to future Community standards, waste management, renewable energies, energy saving, relocation of undertakings)[156]. The effect of this action has not been evaluated because of it is a recent development. Under this action in a new ETAP is suggested to evaluate the effects in due time (2012) and re-assess state guidelines in this respect.

The OECD concluded[157] that much of USD 400 billion subsidies[158] in the OECD can be potentially environmentally harmful, meaning that efficient State Aid implementation can give advantages to sound environmental practices. However, untangling and assessing the effects of subsidies on the environment is a complex task. A systematic approach, consisting of determining the effects of subsidy removal on the decisions of consumers and producers and identifying the linkages between those decisions and the environment, is required to ensure that appropriate policies are developed and the benefits of reform fully realised. The OECD proposes various subsidy reform strategies. Follow up action under a new ETAP would be implementation of these strategies at EU level and promotion of these strategies at MS level by assessing the harmful subsidies in each MS by an OMC type of process.

155 Interview with EACI , April 2010.
156 GHK: State Aid for Eco-innovation. Guidance on the application of the Bonus for Eco-innovation under the Environmental Guidelines for State Aid (2008)
157 OECD (2005). Environmentally harmful subsidies-Challenges for reform
158 Estimates per sector are USD 318 billion in agriculture, USD 6 billion in fisheries, 40 billion in EU road&rail transport, USD 20-30 billion to the energy sector and some 40-50 billion the manufacturing sector

Impacts of these combined actions are hard to assess. This measure did not have (nor will have) a specific focus on resources efficiency. However, in terms of resource savings biodiversity (e.g. in the case of fisheries, where biodiversity is a serious issue and subsidies compose 20% of landings), water and energy may be affected heavily, other resources less directly. Competitiveness effects will also be large but will be very different over sectors and countries, and for some (parts of) sectors and countries positive and for others negative.

Action 7. Green public procurement

Given the economic significance of public procurement of goods and services directing it towards green purchases would contribute to a greener economy considering that higher purchasing prices of green products are in many cases compensated for by lower operating costs, for instance due to lower energy consumption and increased resource efficiency[159]. A greening of public demand could thus be a powerful incentive to increase eco-innovation – especially when resource efficiency is taken into account. The effect of green public procurement (GPP) is twofold. As a direct effect, potentially 15-20% of the GDP may be spent on environmentally sustainable products and services. A secondary effect of green public procurement would be the stimulating effect on the development of resource-efficient products, because of creating markets for them (esp. when there is a dynamic system of determining what is 'green'). As an after-effect GPP can influence the private demand[160]. Effects may be significant. A 2008 study[161] on GPP shows that GPP has led to a CO2-emission reduction of 25% (for the procured items).

The effect on competitiveness is indicated in the financial impact of GPP. Buying 'green' has led to an average decrease in costs of 1%, when the life cycle costing is taken into account.

In GPP, the EU has shown to have a direct effect on its own procurement, and a coordinating effect on implementing procurement rules at MS level. Implementation of the 50% GPP threshold at MS level is a clear example of this. Additionality of EU is therefore significant and can be further increased (without significant extra budgetary needs) by increasing the threshold to for instance 100%, and to make GPP itself more ambitious, by introducing a threshold to the significance of how green the procurement is. This requires however more complicated assessment criteria.

Action 8. Raise business and consumer awareness, and provision of targeted training

Main activity is the ETAP forum (held twice every year). Participation was about 250 persons per forum, coming each time from at least 25 different countries (and 40 different countries in total), approximately 50% from industry and associations, 35% from public organisations and the remainder from academia. Potential impacts on the innovation system relate to the fact that stakeholders are made more aware of other relevant players and may find it easier and more effective to connect with them. ETAP has benefited from this activity, but would obtain higher importance and visibility to its goals if closer co-operation between the Commission and the relevant Member State officers for co-ordinating further activities could be established stronger links with national programmes strengthened.

159 Öko-institut & ICLEI, 2007. Costs and Benefits of Green Public Procurement in Europe.
160 Öko-institut & ICLEI, 2007. Costs and Benefits of Green Public Procurement in Europe.
161 2007, PricewaterhouseCoopers, Significant, Ecofys, Collection of statistical information on Greeen Public Procurement in the EU.

With respect to training eco-innovation is a training subject brought into other EU programmes like ESF and Marie Curie. There are however no figures available on the success of this under ETAP.

Impacts of this action on resource efficiency and competitiveness are very indirect. Attribution of any effects in these domains to this action is therefore very speculative. Adequate networks are however of great importance for well functioning markets, and as has been stated in the problem definition a clear network failure exist between research and industry communities as well as with public authorities, hampering market uptake of research results. The additionality of EU action is intermediate: there are many national networking initiatives, however in providing transnational dimension the added value of the EU is clear and needed, and the mixing of private and public sector is also of added value. The role of ETAP can be large, but should be stronger focusing on using and linking national networks than before. The role of ETAP in providing training of procurers is low, and will remain low when not more specifically targeted.

Action 9. Promoting responsible investments in and use of environmental technologies in developing countries and countries in economic transition

A study by McKinsey shows that capital investment of 150 billion euro can reduce demand for imported oil by 30-40 per cent and stabilise coal demand at current level[162]. The potential for improvement of competitiveness is also significant. Currently, developing countries are responsible for nearly all of the increase in emissions. In the end, the availability of more efficient technologies enables a country to achieve greater economic output from a given amount of energy[163]. 2/3rd of the energy efficiency investment opportunities lie in de developing countries[164], which could potentially give an impetus to both the local as well as the European economy. The potential for the use of recycling technologies, in particular for e-waste is huge, specifically taking into account the growing demand for rare metals[165]. Possible impacts of the uptake of recycling technologies for instance are the high collection rates, the recovery of valuable components, the recovery of material fractions, and job creation, which is a socio-economic impact[166]. At the moment China and South Africa are amongst the most promising countries for the introduction of sustainable e-waste recycling technologies.

The Global Energy Efficiency and Renewable Fund (GEEREF) launched in 2007 is operational. The European Commission will contribute €80 million over 4 years, starting with €15 million in 2007 providing equity finance to a broad mix of energy efficiency /renewable energy technologies in global public-private partnership supporting renewable energy and energy efficiency project developers and SMEs, mainly in ACP countries, Africa, Eastern Europe, Middle East and South America. Although not intended to pursue innovation but to implement tested environmental technologies the GEEREF had a budget of € 110 million for the 2007 – 2011 period and offers support for the development and transfer of environmentally sound technologies and know-how[167].

162 McKinsey 2009, China's green opportunity
163 Popp, D. (2009) Policies for the Development and Transfer of Eco-Innovations: lessons from the literature. OECD Global Forum on Environment on eco-innovation.
164 McKinsey Global Institute 2008, How the world should invest in energy efficiency
165 UNEP 2009: Recycling, from e-waste to resources.
166 UNEP 2009: Recycling, from e-waste to resources.
167 European Commission: "Mobilising public and private finance towards global access to climate-friendly, affordable and secure energy services" – COM(2006) 583 final. Announcement by European Environment Commissioner Stavros Dimas at the UN Climate Change Conference in Poznań, Poland, 2008.

Action 1. Screening of environmental regulatory framework for eco-innovation

EU environmental policies promote eco-innovation by setting environmental objectives for the economic operators to achieve, thus bringing predictability and certainty to the markets and establishing a level playing field. The Commission will pay particular attention on promoting eco-innovation when designing and revising environmental policy and legislation. More specifically, following actions will be taken:

- When developing implementing measures of the recently revised Waste Framework Directive and other waste legislation the Commission will:
    - promote eco-design in the implementation of the ELV (End of life vehicles), WEEE (Waste electrical and electronic equipment), RoHS (Restriction of hazardous substances), batteries and accumulators, and packaging directives;
    - mobilise Member States to promote eco-innovation in the preparation of national Waste Prevention Programmes with guidance and exchange of best practices for improving resource efficiency, reusability, recyclability and recoverability of products.
    - develop end-of-waste criteria under Art 6 of the Waste Framework Directive for copper, paper, glass, plastics, compost, and possibly other waste streams. These criteria will designed to support and drive innovative waste collection, separation and treatment technologies for high quality secondary materials;
    - develop minimum standards for waste treatment activities on the EU level pursuant to Art 27 of the Waste Framework Directive based on best available techniques and innovative solutions;
    - promote the full implementation of the EU waste legislation, such as the diversion targets of the Landfill Directive and the waste hierarchy of the Waste Framework Directive, also stimulating innovation in ecological and economic optimisation of waste management schemes.
- As part of the Fitness Tests the Commission will review the Water Policy (Water Framework Directive and complementary Directives, including Groundwater, Priority Substances, Flood, Urban Waste Water and Nitrates Directives and non-legislative instruments. Any policy, legislative and other barriers for cost-effective implementation and innovative ways of improving the implementation will be at the heart of the Fitness Test.
- The forthcoming review of air policies will identify urban areas in Europe that are faced with particular air quality challenges and chosen pilot areas will be part of the implementation of relevant Innovation Partnerships for testing innovative approaches for air pollution abatement.

EU policies with dual goals in economy and environment would be identified; and the bridges strengthened so that the aims will be obtained better and faster. Impacts of this action are indirect and hard to assess because the action in itself is very indirect while the effects should come from very specific changes in policies. The impacts are largely depending on the success of a set of actors. Influencing these actors is a role that can be taken up by the Eco-AP, similar to the often-indirect chain effect ETAP had (see discussion of Option 1). The effect however may be significant because public policies play a strong role in determining markets for eco-innovations. When not done properly effects may however also be negative for the environment, e.g. prescribing modular design for all products may be counterproductive when seen from a life cycle point of view (e.g. for some products it may be better to prescribe biodegradability than modularity). Impacts can vary greatly between

sectors and countries and within sectors and countries, depending on the policy initiatives tackled. The additionality of EU action is large because the EU has a leading role with MS in defining environmental policies. Possible role of ETAP is depending on ambition to really promote eco-innovation and the effort done to develop methods to assess policies systematically and use these methods to analyse (new and existing) policy initiatives. Administrative burden may be an issue here.

Action 2. Partnerships for eco-innovation

The Innovation Partnerships (IPs), as described in the Innovation Union, will mobilize all actors from the innovation chain towards addressing grand societal challenges. To simultaneously achieve positive economic, environmental and social outcomes there is a need to integrate environmental and sustainability aspects into all spheres of the economy and value creation and pursue a broad concept of eco-innovation. Eco-innovation is part of the solution to many of the societal challenges (cutting CO2 emissions and other sources of pollution or substituting scare raw materials). The European Innovation Partnerships, by pooling stakeholders and achieving critical mass of commitment are the right vehicle to mainstream eco-innovation into technological development, business models, supply chains, consumption patterns and policies outside the environmental realm.

Eco-innovation and the IPs can be mutually reinforcing. Environmental aspects are interlinked with the grand societal challenges, i.e. cleaner air objectives are a necessity for a healthy and active aging or for the smart cities of the future. Eco-innovation will provide innovative and efficient means to address these challenges, i.e. using floodplains to protect against floods or draughts and exploit eco-system towards these objectives.

The Eco-innovation Action Plan will identify eco-innovation areas and solutions to be transferred or integrated into Innovation Partnerships. This will be done through analytical and forecasting work by the Eco-innovation Observatory. The ETAP HLWG will coordinate Member State policies in the emerging areas, identify best practice and ensure Member State commitment. The ETAP Forum will mobilize stakeholders and discuss issues of key importance for the emergence of the sector.

The impacts of the addition of the two pilot schemes for the bundling of private and public procurement for green products and services would increase the scope of GPP. It could be a first step to open the way to private green procurement. Firstly it would increase the direct effect of purchasing green. Secondly, it would strengthen the role of eco-innovation in Innovation Partnership areas and show the potential of eco-innovation in non-environmental fields.

Action 3. Mobilizing financial resources, both public and private, for investment in eco-innovation

Increasing available budgets to participate in VC may increase effects to a certain extent, but when available budgets become too large, availability of capital might not be the problem but the availability of viable investment opportunities based purely on market criteria. Supply (generation of viable ideas and inventions) as well as demand side (dealing with the lock-in of conventional not green technologies and services, primarily “getting the prices right”) and demand side measures would need to accompany specific efforts related to marked based financial instruments.

The total amount of "leveraged" eco-innovation GIF funding is €528.5 Mln so far. The expected leverage is around 7,5 and under current CIP framework programme around €225 Mln are earmarked for eco-innovation. This means a total expected leveraged amount of €1,687 Mln over the framework period 2007/2013 or around €241 Mln annually. The

Cleantech Group reports[168] that about €1,5 was invested in cleantech in Europe (including Israel). With a rough calculation this would mean that current "leveraged" budget would cover around 17% of yearly cleantech investments (€241/€1,456). Based on the information available it is hard to say if this covers sufficiently financial needs in order to stimulate uptake of environmental technologies. Anyhow evidence shows that of the total 2009 VC cleantech investments non-energy technologies investments account for only €324m[169].

The difference between clean technology and eco-innovation, however, has to be kept in mind: the first only includes technological innovation with sustainable aims and not other, necessary forms, of eco-innovations.

The effect of the eco-innovation GIF seems significant in relation to the purely commercial funding available. Effect on competitiveness for the firms involved is large, but it concerns only a limited number of (however high-growth potential) firms. This also limits the environmental impacts effect enhanced by the fact that not all companies are aiming at substantially improving resource efficiency either.

The "first application and market replication projects" programme in the CIP-EIP holds larger potential for resources savings. The total funding requested in the 2010 call was more than €287m[170], an increase of more than 40% compared to the 2009 call.

CIP Market replication projects – Results 2008 - 2010

Call	**2008**	**2009**	**2010**
Proposals received	134	202	287
Yearly increase		+50%	+42%
Projects funded	43	47	40-50
Available budget	27m EUR	32m EUR	35m EUR

Source: Executive Agency for Competitiveness and Innovation

The manager of the facility pointed out that with relativly little activities to draw attention to the facility there was already more response from the field than budget was available[171]. The programme seems to be a rather small instrument when compared to the full potential of the eco-industry. Additional resources are needed to up-scale the impact of this instrument (or similar instruments) in order to support eco-innovations to overcome the first financing gap in the innovation chain (i.e. the phase of full-scale piloting).

The opportunity to enhance synergies, strenghten links and possibly combine this programme with the Environment and governance component of LIFE+ might bring additional positive impacts as well as efficiency in terms of administrative burden.

Moreover, additional instruments are needed to provide the industry (such as SMEs) with the financial resources to gear potential eco-innovations to the market (i.e. the market development phase). Instruments that help bridging the financing gap between VC and the phases where companies are able to source financing from banks are currently not covered with an instrument. Such an instrument aiming at SMEs is the SME Guarantee Facility (SMEG), which is part of the CIP. It targets start-up and growth of SMEs and investment in

168 Cleantech Group, Realdeals and TaylorWessing, 2009. The future of cleantech in Europe, Special Report 2009.
169 Cleantech Group, Realdeals and TaylorWessing, 2009. The future of cleantech in Europe, Special Report 2009.
170 This is about 0.1% of the estimated size of *eco-industry* in 2008 in the EU27. According to the Study on the Competitiveness of the EU the total size of eco-industry was €319bn (turnover)
171 Interview with EACI, 2010.

(all) innovation activities. SMEG provides counter- or co-guarantees to guarantee schemes, and direct guarantees to financial intermediaries, in order to increase the supply of debt finance to SMEs. SMEG appears not to be very appealing to actors that specifically aim at eco-innovation. Up until now, there is one financial intermediary fully engaged in eco-innovation. Moreover, there is one SMEG contract supporting an eco-innovation loan product. This is a guarantee agreement where application of eco-innovations is financed on the pull side. It is offered by Credit Cooperatif: it targets companies investing in eco-innovation. The Guarantee covers loans and leases for environment related investments. Eligible loans are for investments by SMEs active in environment protection, waste recycling, water management, renewable energy areas as well as SMEs producing environment protection goods. Investments into renewable energy capacities and eco-friendly equipment (clean vehicles and energy saving facilities) are also eligible. For the rest, there are no specific features on the guarantee for eco-innovations[172].

In order to ensure a large impact of financial instruments, an integrative approach could be taken into consideration[173]. An interesting aspect of this consideration would be the balance between push and pull facilities. The supply side of the financial instruments is currently covered by a risk sharing facility such as GIF. Demand side measures could be additionally interesting to overcome the valley of death for companies; loans or other debt oriented instruments could be used to help eco-innovators to overcome the "valley of death" and also by helping their cutomers finance their investments. Up until now, there is no instrument in place that addresses debt funding specifically for eco-innovation. For example, a german bank KFW has set up an instrument to support SMEs investing in acquiring ecoinnovations allowing for an interest reduction.

More generally more flexible and not necessarily marked based (but rather policy driven) financial instruments would have to be explored under this action.

The potential for improvement of competitiveness in this scenario is similar to that of the ETAP scenario – but with increased focus, the impacts are expected to be stronger.

Action 4. Develop standards and performance targets for key products, processes, services for reducing their environmental footprint

The Eco-design Directive (EuP)[174] now only addresses energy use of products, which only accounts for about one-third of the environmental impacts of products175. Broadening the scope to non-energy related products would thus have a positive impact on resource efficiency. The impact on competitiveness is expected to be marginal. Targets may foster the innovativeness of a sector as a whole, which could lead to increased competitive advantage over non-EU actors. However, when in other countries standards are not applied, conventional alternatives are likely to be just as competitive. The EU can play a pivotal role in broadening the scope of the Eco-design directive to non-energy related products especially in coordinating and stimulation of the development of more forceful targets. The Eco-design directive prevents disparate national legislations on the environmental performance of products from becoming obstacles to the intra-EU trade. EcoAP can play an important role in

172 Interview with EIF and ECFIN

173 For an example of such an integrative approach, see the example of Technology Canada for sustainable technologies: http://www.sdtc.ca/en/funding/index.htm

174 Directive 2005/32/EC of the European Parliament and of the Council establishing a framework for the setting of ecodesign requirements for energy-using products (OJ L 101, 22.7.2005, p. 29).

175 Staff Working Paper SEC(2008) 2110 Impact assessment for recast of Directive 2005/32/EC

problem signalling, drawing attention to the need of broadening the scope of the Eco-design directive and assistance in developing the broader focus.

Action 5. Developing new skills for new jobs in environmental goods and services industry

Firstly, the green industries and services sectors suffer from a skills gap. Secondly, skills profiles of more traditional occupations will have to be expanded to include green skills, for instance in the areas of assessing the environmental impacts of industry and business activities and daily actions to reduce them. The added value of the EU relies on its ability to put this relevant issue on the political agenda, to coordinate with and link to existing initiatives in order build information base needed as well as to promote good practices. The role of an Eco-AP initiating this can be very important, for instance by investigating how skills requirements are affected by EU environmental policies and what impact this has on systems of education and training across the Member States. A more formal system for exchange of information on training approaches and needs would also be very beneficial at this early stage. A clearing house role could be included in the remit of the HLWG, and it could then be investigated how to further take this on.

Direct effects on resource efficiency are limited (although for certain sectors (e.g. mining) implementation of existing skills from elsewhere may have impact). Direct effects on competitiveness may be larger. The main added value of the Eco-AP in this action lies in a signalling and communication effect. Several training initiatives already exist – the inclusion of the issues related to eco-innovation would lead to the largest effect with limited resources. Therefore, co-operation and alignment with existing initiatives is of great importance; the Agenda for New Skills and Jobs' initiative[176], the upcoming EU-level sectoral Councils for skills and employment, the EU Skills Panorama, as well as activities carried out by the European Centre for the Development of Vocational training are all important starting points.

Action 6. Governance of eco-innovation policy

The eco-innovation national roadmaps are the follow up of the ETAP national roadmaps. The regularly updated Eco-innovation National Roadmaps represent a significant body of knowledge on programmes, schemes, and examples of promising practice in the MS[177] and will specify framework conditions, national environmental policy approaches, funding schemes and partnerships for national eco-innovation support. The Roadmaps under ETAP have increased mutual learning between MS but have, in most countries, not initiated new actions: the Roadmaps were mainly a wrap-up of existing policy. Impacts were therefore low. The impacts of the Eco-innovation Roadmaps will only be larger when these Roadmaps will sparkle new policy thinking and policy-development in the MS. Effects will be very indirect, distributed and probably long term but may be large.

To reap the full benefits of the Action Plan active involvement of the MS is necessary. The Eco-innovation (ETAP) High Level Working Group has proved to be an important tool for networking, policy learning and coordination between the MS on policies in support of eco-innovation. A new coordinating structure must now take a more prominent role in driving the eco-innovation agenda in the EU to deliver growth opportunities and jobs to the European

176 A joint policy initiative carried out in cooperation between the European Commission and the EU Member States, New Skills for New Jobs aims to address some of these issues by supporting EU countries and regions in developing more effective ways to analyse and predict which skills will be required in tomorrow's labour markets and, with this knowledge, developing and adapting education and training so that the workers gain the skills required. http://ec.europa.eu/social/main.jsp?catId=568&langId=en.
177 ec.europa.eu/environment/etap/roadmaps_en.htm

economy and mobilizing stakeholders for this task. The role of the Working Group in delivering cross-sectoral policy recommendations and ensuring the business focus of the Action Plan will be strengthened. This action is more a structural action than a specific action with possible impacts. Most likely impact are good guidance of the whole Eco-AP and development and implementation of the National Roadmaps.

Targets and indicators are useful to translate a vision into concrete objectives setting levels of ambition, to mobilise different actors in implementing these objectives and to monitor the progress of policies and their impact. In this action also the feasibility and usefulness of an Eco-innovation Scoreboard to track, benchmark and review Member State and EU performance will be tested and an evaluation of the results of on-going monitoring initiatives, (i.e. the module on eco-innovation in the 5th Community Innovation Survey (CIS) or the patent-based indicators for eco-innovation) will be carried out. Although improving measurement has very indirect and long term effects the impact may be large (esp. on environment and competitiveness) since it can influence polis making heavily.

To reap the full benefits of the Action Plan active involvement of the MS is necessary. The Eco-innovation (ETAP) High Level Working Group has proved to be an important tool for networking, policy learning and coordination between the MS on policies in support of eco-innovation. A new coordinating structure must now take a more prominent role in driving the eco-innovation agenda in the EU to deliver growth opportunities and jobs to the European economy and mobilizing stakeholders for this task. The role of the Working Group in delivering cross-sectoral policy recommendations and ensuring the business focus of the Action Plan will be strengthened. This action is more a structural action than a specific action with possible impacts. Most likely impact are good guidance of the whole Eco-AP and development and implementation of the National Roadmaps.

Action 1. Targeted eco-innovation support for SMEs through enterprise and business networks

The support to eco-industries primarily aims at increasing network activities that strengthen other actions in the Eco-AP. Concrete issues are to establish a dialogue with the financial communities to support the evaluation of eco-innovation projects. The impacts of such an intervention are closely linked to the impact assessment of Action 5 in this section. The first goal of this action is to connect and align different stakeholders. Secondly, to generate impacts, these stakeholders should develop activities related to eco-innovation. The impact of these activities is largely depending on the ambitiousness of the eco-industry. Assessment criteria are needed to assess how ambitious eco-industries are. The ambitiousness of eco-innovations can have a wide variety; for this instrument it is crucial select the industries that foster innovation with the highest potential for resource efficiency. Therefore, it will be necessary to develop an assessment method that is able to assess how ambitious the potential of the eco-innovations are. This would enable all players involved to select the best projects with regard to eco-innovation. This can have a large impact on resource efficiency, if resource efficiency is taken up as a determinant for selection criterion, the projects with the largest impact on eco-innovation can be selected. Moreover, in evaluation processes, the best working projects can be selected.

The other actions in support to eco-industries would increase the awareness of eco-innovation in both companies (SMEs and larger companies) but also in for policy makers on regional, national and EU level. The impact of such an instrument is not easy to measure because the attribution to this instrument only would be hard. However, the expected impact would be prevention of scattering of the policies and a better uptake of eco-innovation by companies, especially SMEs.

The EU can play an important role in this type of networking. The added value is especially high for SMEs, because they tend to have a strong regional focus, while a large potential of learning on eco-innovation has an international dimension. Adoption of concepts can be an innovation in itself. Eco-AP can play an important role in the establishing dialogues and creation of forums.

Action 2. Environmental Technology Verification initiative, to test an EU ETV pilot programme and evaluate its potential in facilitating market access for innovative environmental technologies

New environmental technologies face difficulties in convincing the first customers and investors of their merits; their difficulty to be diffused to potential customers is a barrier to eco-innovative companies in coming up with new technologies, to users in tapping into new technological solutions and to policy-makers in achieving policy goals rapidly and cost-efficiently. EU-Environmental Technologies Verification (ETV) can help by providing independent and credible information on new environmental technologies, by verifying that performance claims put forward by technology developers and vendors are complete, fair and based on reliable test results. With regard to addressing systemic failures the impact of ETV can undoubtedly play a role in addressing framework failures, which in turn can improve marketability of the technology.

The EU ETV pilot programme is expected to show the principles and added value of the EU ETV scheme. It has been proposed that the pilot programme will be tested in a limited number of technology areas and based in volunteer MS. Among the recommendations highlighted in

the literature, simple and robust procedures, product and application in the focus of the system rather then technologies, ensuring verification of innovation and improvement, voluntary feature of the process, combination of verification with demonstration/reference projects, flexibility and complementary to existing labels, using technical standards (ISO, IEC, CEN, Cenelec) where available, avoid language and access barriers by national contact points [178, 179]. Additionally the international acceptance & harmonization on the EU level is pointed to be addressed.

Action 3. Eco-innovation Partnerships with major partner countries and regions

The ultimate effectiveness of the Eco-AP will very much depend on its level of influence on the global supply chain since the material and product flow is highly globalized. Moreover, the cost-effectiveness and impact of eco-innovation is much higher in developing and transition economies as compared to what could be achieved in the EU countries. However, the EU and its Member countries could have a critical role in shaping the global conditions for eco-innovation and thereby supporting the transition towards a green economy. In addition, this could lead to new market opportunities for the products and services from the MS countries[180].

The reduction or elimination of import tariffs and non-tariff barriers on environmental technologies has been part of the broader negotiations on the liberalisation of world trade in the World Trade Organisation's Doha Round for the past five years[181]. This measure would boost trade with eco-innovative products and technologies and would bring significant environmental benefits but has been delayed due to objections from developing countries. The liberalisation bears the risk for developing countries of being outdistanced by trade with highly competitive economies. The issue also applies to some economically weak EU MS[182]. In addition, scale effects associated with trade liberalisation, and structural effects such as the concentration of polluting and precarious industries in emerging and developing countries, are subverting the environmental benefits attained by improved efficiency[183]. In this respect, it has to be assured that the conditions strived for by the EU unfold win-win effects for developing, emerging countries and developed countries. Impact assessments (prospectively together with DG Trade) could support the investigation whether and in what way a policy mechanism is able to mobilise endogenous eco-innovation capabilities[184]. The debate of IPR protection in key emerging markets is an essential element in this context because a strong IPR regime will ensure revenues for innovators, but it may slow the diffusion of eco-innovation. International collaboration on this issue will be encouraged by projects such as the EU-China IPR2 project.

In response to the economic crisis 2008/2009 many countries have expanded their green investments within the scope of economic recovery packages[185]. The promotion of the harmonisation of the eco-design requirements and benchmarking can play a major role in this context. Here, the eco-design directive has a great potential to contribute to these efforts by defining and disseminating eco-design requirements. As eco-innovation can also be measured

178 "European perspectives and initiatives", presented by Elena Domínguez , EC DG Research, at the ETV Conference "Boosting Environmental Technologies by Verification", 15th September 2008

179 for example see "Recommendations for a EU Verification System' and '***E***nvironmental ***T***echnology ***V***erification: Whatand why?' by Dr. Thomas Track , DECHEMA e.V. presented at **ETV** Conference "Accelerating Eco-innovation through Environmental Technology Verification", 12-13 October 2009, available on http://www.eu-etv-strategy.eu/

180 Based on discussions held during the stakeholder workshop held on April 28. Brussels. By the UNEP representative.

181 ICTSD / GMF / iisd 2008, Liberalization of Trade in Environmental Goods for Climate Change Mitigation: The Sustainable Development Context; Switzerland.

182 EVCA 2009 , EVCA Special Paper on Central and Eastern Europe Statistics 2008

183 OECD 2008, Environment and Globalisation, Background Report for Ministers, Meeting of the Environment Policy Committee (EPOC) at Ministerial Level Environment and Global Competitiveness, 28-29 April 2008

184 Ockwell, David 2009, Scoping note on the difficulties developing countries face in accessing markets for eco-innovation

185 OECD 2009, Green Growth: Overcoming the Crisis and Beyond and UNEP 2009, A Global Green New Deal

indirectly from changes in resource efficiency and productivity[186], OECD endeavours to harmonise the measurement of material flows and resource productivity which are able to gain country benchmarks in material use and improvements[187].

The SWITCH Asia Programme for sustainable consumption and production with a fund of approx. €90 million for the period 2007-2010 will evolve large environmental and social benefits[188] in particular when expanded to other developing countries like Latin America. The Eastern Partnership (EaP) launched a new environmental flagship project with an EU funding of around €13 million in March 2010. The potency of networking effects depend on the the strength of cooperation among and between the countries within, for example, the Black Sea Synergy initiative (including the countries Romania, Bulgaria, Turkey, Georgia, Russia and Ukraine). A number of successful initiatives and programmes covering transatlantic cooperation activities between the EU and other countries have been established in research and technology which are relevant for innovation but do not explicitly cover eco-innovation yet[189]. An enhancement of the Transatlatlantic Economic Dialogue with the USA to eco-innovation (beyond biotechnology), like the S&T policy dialogue with the Environmental Protection Agency (EPA) or the EU-China Sustainable Trade Task Force, will give impetus to the other bilateral dialogues with Brazil, Canada, India, Russia and Japan. In addition, a closer connection of the G8 3R-iniative and Europe's efforts for eco-innovation can have exceptional influence[190] and thus support demand for eco-innovative products. Bilateral and regional cooperations expanded to eco-innovation will contribute to the effective use of resources, the improved environmental performance and the diffusion of cleaner technologies by providing improved conditions[191].

Action 4. Promotion of environmental technologies in developing countries

Under favourable global conditions for eco-innovations the potential for resource savings within and outside the EU is considerable. According to a McKinsey projection[192], two thirds of the energy efficiency investment opportunities lie in the developing countries and, if properly placed, could halve the projected growth in global energy demand until 2020 and deliver half of the emission abatement required to cap the long-term concentration of atmospheric greenhouse gases[193].

As described in action 9 of the ETAP scenario (option 1), promotion of environmental technologies in developing countries has the potential to both increase employment and economic growth in the EU, as well as promote sustainable development and resource efficiency on a global level. The eco-innovations developed in the developed world are however not always applicable in the developing countries and therefore an important element of promoting environmental technologies in developing countries is the ability to adapt proven technologies to local conditions. Expanding the network of the National Cleaner

186 Arundel and Kemp, 2009, Measuring eco-innovation, UNU-MERIT
187 OECD 2008, Measuring Material Flows and Resource Productivity, Volume I-III, Paris
188 UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production 2010, SWITCH Asia Projects Fact Sheets, http://www.switch-asia.eu/switch-projects/fact-sheets-of-projects.html
189 Horvat, M. and K.A. Harrap, 2009 Review of the Science and Technology Cooperation between the European Community and the United States of America 2003 – 2008, Brussels, European Commission, Directorate General for Research
190 Bahn-Walkowiak; Bleischwitz 2008, Resource efficiency - Japan and Europe at the forefront : synopsis of the project and conference results and outlook on a Japanese-German cooperation. - Dessau-Roßlau [u.a.] : Federal Environment Agency [u.a.]
191 OECD 2008, Environment and Globalisation, Background Report for Ministers, Meeting of the Environment Policy Committee (EPOC) at Ministerial Level Environment and Global Competitiveness, 28-29 April 2008
192 McKinsey 2009, China's green opportunity
193 McKinsey Global Institute 2008, How the world should invest in energy efficiency & McKinsey 2009, China's green opportunity

Production Centres to support capacity building can lead to increased awareness, understanding and ultimately, greater demand for Cleaner Production[194].

Furthermore, promoting and developing EU-public-private partnerships for the demonstration of key environmental and clean energy technologies in major markets has a strong economic and environmental potential, and it embeds a strong networking aspect. They could lead to reduction in technology risks and costs because of joint collection and dissemination of data for instance[195].

194 http://www.uncrd.or.jp/env/spc/docs/1st_3r_forum_presentation/Session5-1-3_UNIDO.pdfhttp://www.unep.fr/scp/cp/network/declaration.htm

195 Ockwell (2009) Scoping Note on the difficulties developing countries face in accessing markets for eco-innovation. Final report for the OECD Environment Directorate.

Action 1. Promotion of a faster shift of the burden of taxation to resources

"OECD analysis clearly shows that better pricing will be one of the best triggers for the development and diffusion of greener technologies"[196]. Taxation policies have an impact at least on the direction of technological change, but the direct causal link between tax policies and eco-innovation is not always clear[197]. Social, economic and ecological impacts depend very much on the tax base, levy forms, recipients and administrative procedures. Nevertheless, there is sufficient evidence that "changes in energy prices had strong impacts on invention, innovation and diffusion of more energy-efficient technologies which, in turn, has lowered emission levels as well"[198]. A similar impact may be assumed in other areas of natural resources consumption[199]. If the EU was able to generate a joint proposal on resources taxes, the tax revenue would be very small at the start with the dynamic element that would lead to a slow increase over the succeeding years. This would offer the opportunity of positive economic, social and environmental effects by gradually shifting the tax burden from labour to resources[200,201]. As we have experienced in the context of past attempts to introduce ecological taxation in the European Union, resistance from a number of stakeholders and EU MS would have to be overcome. Several rounds of discussion and impact assessments could be expected. Therefore, this action would have measurable social, economic or environmental impact on in the long term.

Action 2. Introduction of ambitious standards for green public procurement

The leverage would be higher the more levels of public procurement are involved (from the local to the European level). This could influence a demand equivalent to about 15-20% of final consumption. Current practice of green public procurement (GPP) among EU MS is very diverse[202]. Therefore, the Commission is engaged in a number of activities to raise awareness and diffusion of good practice[203,204, 205].

Social, economic and environmental impacts would very much depend on the Commission's ability to convince national, regional and local authorities to apply criteria for their procurement not only in relation to energy consumption, but to a number of different environmental impacts and resource efficiency along the life-cycle of procured goods. Further research on criteria for green public procurement in combination with assessments of economic, social and environmental impacts in different public demand sectors would have to be generated along the way. Once set in motion this action could have considerable effects on demand for and supply of eco-innovation. On the demand side criteria development for eco-innovation would improve. This would probably have an impact not only in the public domain, but could spread to corporate supply chain management as well. On the supply side

196 OECD (2009): Green Growth: Overcoming the crisis and beyond. Paris
197 OECD 2007: Impacts of environmental policy instruments on technological change. Paris
198 ibid
199 Bahn-Walkowiak, B. (2008): Resource taxation beyond energy and climate issues [Japan.]. In: Nikkei ecology, 2008, 2, p. 129
200 Kohlhaas, M. (2000): Ecological Tax Reform in Germany. From Theory to Policy. Economic Studies Program Series Volume 6, American Institute for Contemporary German Studies. Washington: The Hopkins University.
201 Goerres, A. (2006): The Tragic Paradox: Germany's very successful but not very popular Green Budget Reform. Lessons from seven years of courageous turnaround (1999 to 2005). Green Budget Paper 2006/12. Berlin: Green Budget Germany
202 Bouwer, M., de Jong, K., Jonk, M., Szuppinger, P., Lusser, H., Berman, T., Bersani, R., Nissinen, A., Parikka, K. (2005): Green Public Procurement in Europe. Status overview. Haarlem: Virage
203 EC (2004): Buying Green! A Handbook on Environmental Public Procurement. Brussels: European Commission
204 EC (2008): Green Public Procurement Training Toolkit. Construction Background Product Report. Brussels: European Commission
205 EC Communication (2008): On the functioning of public procurement markets in the EU: benefits from the application of EU directives and challenges for the future, COM(2008) 400/2

increased invention and innovation activities related to the refined procurement criteria could be expected as a reaction to changing preferences on the demand side.

Action 3. Introduction of a legally binding framework for labelling of all manufactured goods

The "public vanguard" should be followed private consumers. After the establishment of public procurement criteria related to different environmental impacts and resource efficiency along the life-cycle of procured goods similar criteria should be applied for private consumption of households. This would require a transfer of extended GPP criteria into a labelling system which is on the one hand easy to understand and on the other hand captures sufficiently environmental objectives of the European Union. The necessary negotiation process could be supported by the European Union Eco-labeling Board (EUEB)[206]. If the objectives of the EUEB would be adapted to the requirements of resource efficiency and if they would be successful, the process could eventually promote considerably the demand for resource-efficient products and services. It would thus increase the market and improve competitiveness of eco-innovative industries, which will be able to meet these criteria. Positive impacts beyond the European Unions are likely as producers outside the European Union would be interested in complying with EU standards. Impacts on the public standard setting in other regions of the world are also likely. Activities would primarily require research and development of labelling criteria in combination with stakeholder participation and negotiation processes related to all major areas of private consumption and production. Measurable social, economic and environmental impacts of this action are unlikely during the current Commission's term of office.

Action 4. Introduction of waste prevention and recycling standards along the value chain

An important step towards resource efficiency is the reduction of the demand for primary resources, by reducing the use of materials (dematerialization) and improving conditions to use secondary material as outlined in the Thematic Strategy for the Prevention and Recycling of Waste[207]. This can be achieved with more regulation in favour of eco-design and eco-efficient supply, which reduces material requirement of production processes and products[208]. Findings of the OECD working party on national environmental policies suggest that also in the waste sector regulation plays an important role in the promotion and diffusion of innovation[209]. Nevertheless, patent trends across the different waste streams have reached technological maturity in the 1990s, and are now in a phase of decline. New regulation and standards could encourage eco-innovation related to the use of materials along the value chain. For example, standards could promote innovation related to the use of less and/or different materials, durability of products, more maintenance services, product responsibility and recycling. The economic, social and environmental impact would be different depending on the material, the economic sector, and the different value-chains including the supplying industries[210,211]. The overall economic and employment effects will be positive as the capital

206 http://ec.europa.eu/environment/ecolabel/index_en.htm
207 COM (2005) 666
208 Bleischwitz, R., B. Bahn-Walkowiak, W. Irrek, Ph. Schepelmann, F. Schmidt-Bleek, S. Giljum, S. Lutter, L. Bohunovski, F. Hinterberger, E. Hawkins, M. Kuhndt, N. Pratt, et al. (2009): Eco-innovation - Putting the EU on the path to a resource and energy efficient economy. Wuppertal-Spezial 38. Wuppertal. Download: http://www.wupperinst.org/uploads/tx_wibeitrag/ws38.pdf
209 OECD (2010): Working Party on National Environmental Policies. Diverting Waste: The Role of Innovation. Paris
210 Braungart, M., McDonough, W. (2009): Cradle to Cradle. Rethinking the way we make things. London: Random House
211 UNEP, UNU 2009: Recycling – From E-Waste to Resources. Sustainable Innovation and Technology Transfer Industrial Sector Studies. Paris

required for the acquisition, the processing, recycling and waste disposal of material would be reduced[212]. The saved capital can stay in the European economy and can be used for innovation and consumption. Positive impacts on eco-innovation would increase, if the regulation would be supported by resource taxation[213]. It is likely that with increasing environmental pressure and resource scarcity the worldwide demand for the know-how and skills related to eco-design and product maintenance services would significantly increase. This can have positive effects on the European research, consultancy and service industry. The connected diffusion and market penetration would also improve resource efficiency in other parts of the world.

212 Bahn-Walkowiak, B.; R- Bleischwitz (2008): Resource efficiency - Japan and Europe at the forefront: synopsis of the project and conference results and outlook on a Japanese-German cooperation. - Dessau-Roßlau: German Federal Environment Agency

213 Bleischwitz, R., R. Bahn-Walkowiak (2007): Aggregates and construction markets in Europe : towards a sectoral action plan on sustainable resource management. In: Minerals & energy, 22 (2007), 3-4, p. 159-176

Option 2 ETAP

Assessment of Option 2 in terms of its response to specific objectives

General objective	Specific objective	Actions addressing the objective	Assessing potential contribution of actions to achieving the objectives				
			Adequacy of actions:	Contribution to the achievement of the objectives	Optimal timing of action	Order of impact	Estimated time of impact
			high, medium, low, N/A - no specific action	positive +, ++, +++ negative -, --, --- no evidence or evidence unclear - N/A	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years	1st order - action achieves impacts directly (operational); 2nd order - action achieves impacts indirectly(policy).	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years, > 15 years
Increasing the rate of eco-innovation and its uptake in Europe and in so doing deliver efficient solutions for environmental problems, and boost the resource efficiency of Europe and its competitiveness	**To apply the principles of the Innovation Union to eco-innovation**	PA1. Increasing and focusing research, demonstration and dissemination. Improving co-ordination of relevant programs PA2. Establishing technology platforms PA5. Mobilizing financial instruments to share the risk of investing in environmental technologies	Low	+	< 2-5 years	2nd order	2-5 and 5-10 years
	To promote eco-innovation in Europe	PA3. Establishing European Networks for technology testing, performance verification and standardization PA4. Developing and agreeing on performance targets for key products, processes and services PA6. Encouraging systematic internalization of costs through market-based instruments PA7. Encourage procurement of environmental technologies PA8. Raising business and consumer awareness	high	++	<2 and 2-5 years	1st and 2nd order	2-5 and 5-10 years
	To improve global markets for eco-innovation	PA9. Supporting eco-technologies in developing countries and promoting foreign investment	medium	++	<2	2nd order	2-5 years

Assessment of actions in option 2

Relevant actions	**Potential [W1]impact on innovation system**	**Potential environmental impact**	**Potential impact on competitive-ness**	**EU value added**					**Assessing potential contribution**		
	positive +,++,+++ negative -, --, --- no evidence or evidence unclear - N/A	positive +,++,+++ negative -, --, --- no evidence or evidence unclear - N/A	positive +,++,+++ negative -, --, --- no evidence or evidence unclear - N/A	unjustified - supplementary+ significant ++ leading +++					positive +, ++, +++ negative -, --, --- no evidence or evidence unclear - N/A	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years, > 15 years	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years, > 15 years
				Local/	Regional	National	EU	Global			
PA1. Increase and focus research, demonstration and dissemination. Improve co-ordination of relevant programmes	++	+	++	N/A	+	++	+++	+	++	2-5 years	5-10 years
PA2. Establish Technology Platforms	+++	+	+++	+	+	++	+++	++	+++	<2 years	2-5 years
PA3. Establishing European Networks of technology testing, performance verification and standardisation	++	+	+++	N/A	+	++	++	+	++	< 2 years	2-5 years
PA 4: Performance Targets	+	++	n/a	-	-	+++	+++	++	+	<2 years	5-10 years
PA 5: Financial Instruments	+++	+++	+++	+	++	+++	++	-	++	<2 years	5-10 years
PA6a: Review State Aid Guidelines	++	++	++	-	-	+	+++	-	+	<2 years	2 - 5 years
PA6b: Review environmentally harmful subsidies	++	+++	++	-	+	++	+++	-	+	<2 years	2 - 5 years
PA7: Encourage procurement of environmental technologies	++	++	+	+++	+++	+++	++	-	++	<2 years	2 - 5 years
PA8a: Raise business and consumer awareness	+	+	+	+	+++	+++	+	-	+++	<2 years	2 - 5 years
PA8b: Provision of targeted training	++	+	+	++	+++	+++	+	-	++	<2 years	2 - 5 years
PA9. Promoting responsible investments in and use of environmental technologies in developing countries	++	++	+	+	+	++	++	+++	++	<2 years	2-5 years

Option 3 Taking forward the Europe 2020 flagships

Assessment of Option 3 in terms of its response to specific objectives

General objective	Specific objective	Actions addressing the objective	Assessing potential contribution of actions to achieving the objectives				
			Adequacy of actions:	Contribution to the achievement of the objectives	Optimal timing of action	Order of impact	Estimated time of impact
			high, medium, low, N/A - no specific action	positive +, ++, +++ negative -, --, --- no evidence or evidence unclear - N/A	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years	1st order - action achieves impacts directly (operational); 2nd order - action achieves impacts indirectly(policy).	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years, > 15 years
Increasing the rate of eco-innovation and its uptake in Europe and in so doing deliver efficient solutions for environmental problems, and boost the resource efficiency of Europe and its competitiveness	**To apply the principles of the Innovation Union to eco-innovation**	A1. Screening the environmental regulatory framework for eco-innovation A2. Partnerships for eco-innovation A3. Developing new skills for new jobs in environmental goods and services industry	High	+++	< 2 years and 2-5 years	1st order	2-5 and 5-10 years
	To promote eco-innovation in Europe	A1. Screening the environmental regulatory framework for eco-innovation A2. Partnerships for eco-innovation A3. Mobilising financial resources, both public and private, for investment in eco-innovation A4. Developing standards and performance targets for key products, processes and services to reduce their environmental footprint A6. Governance of eco-innovation policy	High	+++	<2 years	1st and 2nd order	2-5 and 5-10 years
	To improve global markets for eco-innovation	A2. Partnerships for eco-innovation A4. Developing standards and performance targets for key products, processes and services to reduce their environmental footprint	Low	+	< 2 years and 2-5 years	2nd order	2-5 years

Assessment of actions in option 3

Relevant actions	**Potential impact on innovation system**	**Potential environmental impact**	**Potential impact on competitiveness**	**EU value added**					**Assessing potential contribution**		
	positive +,++,+++ negative -, --, --- no evidence or evidence unclear - N/A	positive +,++,+++ negative -, --, --- no evidence or evidence unclear - N/A	positive +, ++, +++ negative -, --, --- no evidence or evidence unclear - N/A	unjustified - supplementary+ significant ++ leading +++					positive +,++, +++ negative -, --, --- no evidence or evidence unclear - N/A	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years, > 15 years
				Local/ urban	Regional	National	EU	Global			
A1. Screening the environmental regulatory framework for eco-innovation	+++	+++	++	+	+	+++	+++	++	++	<2 years	2-5 years
A2. Partnerships for eco-innovation	+++	++	+++	N/A	+	++	+++	++	++	2- 5 years	5-10 years
A3. Mobilising financial resources, both public and private, for investment in eco-innovation	+++	+++	+++	+	++	+++	++	-	+++	<2 years	5-10 years
A4. Developing standards and performance targets for key products, processes and services to reduce their environmental footprint	+	++	n/a	-	-	+++	+++	++	+	2-5 years	5-10 years
A5. Developing new skills for new jobs in environmental goods and services industry	++	+	+	-	+	+++	+++	+	++	<2 years	2 - 5 years
A6. Governance of eco-innovation policy	+	n/a	+	++	++	+++	+++	+	+++	On-going	< 2 years

Option 4 SME-targeted actions

Assessment of Option 4 in terms of its response to specific objectives

General objective	Specific objective	Actions addressing the objective	Assessing potential contribution of actions to achieving the objectives				
			Adequacy of actions:	Contribution to the achievement of the objectives	Optimal timing of action	Order of impact	Estimated time of impact
			high, medium, low, N/A - no specific action	positive +, ++, +++ negative -, --, --- no evidence or evidence unclear - N/A	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years	1st order - action achieves impacts directly (operational); 2nd order - action achieves impacts indirectly(policy).	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years, > 15 years
Increasing the rate of eco-innovation and its uptake in Europe and in so doing deliver efficient solutions for environmental problems, and boost the resource efficiency of Europe and its competitiveness	**To apply the principles of the Innovation Union to eco-innovation**	A1. A1. Targeted eco-innovation support for SMEs through enterprise and business networks	Medium	++	< 2 years, 2- 5 years	2nd order impact	2 – 5 years, 5 – 10 years
	To promote eco-innovation in Europe	A1. Targeted eco-innovation support for SMEs through enterprise and business networks A2. Environmental Technology Verification initiative, to test an EU ETV pilot program and evaluate its potential in facilitating market access for innovative environmental technologies	High	+++	< 2 years	1st order impacts	2 – 5 years
	To improve global markets for eco-innovation	A3. Setting up Eco-innovation Partnerships with major partner countries and regions A4. Promotion of environmental technologies in developing countries	High	+++	< 2 years	1st and 2nd order impacts	2 – 5 years

Assessment of actions in Option 4

Relevant actions	**Potential impact on innovation system**	**Potential environmental impact**	**Potential impact on competitive-ness**	**EU value added**					**Assessing potential contribution**		
	positive +,++,+++ negative -, --, --- no evidence or evidence unclear - N/A	positive +,++,+++ negative -, --, --- no evidence or evidence unclear - N/A	positive +, ++, +++ negative -, --, --- no evidence or evidence unclear - N/A	unjustified - supplementary+ significant ++ leading +++					positive +,++, +++ negative -, --, --- no evidence or evidence unclear - N/A	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years, > 15 years
				Local/ urban	Regional	National	EU	Global			
A1. Targeted eco-innovation support for SMEs through enterprise and business networks	++	++	++	+	+++	+++	++	+	++	<2 years	2-5 years
A2. Environmental Technology Verification initiative, to test an EU ETV pilot programme and evaluate its potential in facilitating market access for innovative environmental technologies	++	++	++	+	+	++	+++	++	++	2-5 years	5-10 years
A3. Setting up Eco-innovation Partnerships with major partner countries and regions	++	n/a	+	+	+	+	+++	+++	+	< 2 years	2-5 years
A4. Promotion of environmental technologies in developing countries	++	+++	++	+	+	++	++	+++	+	<2 years	5-10 years

Option 5 – Wide eco-innovation policy

Assessment of Option 5 in terms of its response to specific objectives

General objective	**Specific objective**	**Actions addressing the objective**	**Assessing potential contribution of actions to achieving the objectives**				
			Adequacy of actions:	Contribution to the achievement of the objectives	Optimal timing of action	Order of impact	Estimated time of impact
			high, medium, low, N/A - no specific action	positive +, ++, +++ negative -, --, --- no evidence or evidence unclear - N/A	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years	1st order - action achieves impacts directly (operational); 2nd order - action achieves impacts indirectly(policy).	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years, > 15 years
Increasing the rate of eco-innovation and its uptake in Europe and in so doing deliver efficient solutions for environmental problems, and boost the resource efficiency of Europe and its competitiveness	**To apply the principles of the Innovation Union to eco-innovation**		N/A	N/A	N/A	N/A	N/A
	To promote eco-innovation in Europe	A1. Promoting a faster shift of the burden of taxation to resources A2. Introduction of ambitious standards for green public procurement A3. Introduction of legally binding framework for all manufactured goods A4. Introducing waste prevention and recycling standards along the whole value chain	High	+++	< 2 years and 2 – 5 years	1st and 2nd order impacts	5 – 10 years and 10 – 15 years
	To improve global markets for eco-innovation	A4. Introducing waste prevention and recycling standards along the whole value chain	Low	+	< 2 years and 2 – 5 years	2nd order impacts	5 – 10 years and 10 – 15 years

Assessment of actions in Option 5

Relevant actions	**Potential impact on innovation system**	**Potential environmental impact**	**Potential impact on competitiveness**	**EU value added**					**Assessing potential contribution**		
	positive +,++,+++ negative -, --, --- no evidence or evidence unclear - N/A	positive +,++,+++ negative -, --, --- no evidence or evidence unclear - N/A	positive +,++,+++ negative -, --, --- no evidence or evidence unclear - N/A	unjustified - supplementary+ significant ++ leading +++					positive +,++,+++ negative -,--,--- no evidence or evidence unclear - N/A	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years	< 2 years, 2 - 5 years, 5 - 10 years, 10-15 years, > 15 years
				Local/ urban	Regional	National	EU	Global			
A1. Promoting a faster shift of the burden of taxation to resources	+++	+++	+	-	-	++	+++	-	+	5 - 10	10 - 15
A2. Introduction of ambitious standards for green public procurement	++	++	+	++	++	++	+++	++	+	2 - 5	5 - 10
A3. Introduction of legally binding framework for all manufactured goods	++	++	++	-	-	++	+++	+	+	2 - 5	5 - 10
A4. Introducing waste prevention and recycling standards along the whole value chain	+++	++	++	-	-	++	+++	+	+++	<2	5 - 10

ANNEX XIII – SUGGESTED PARAMETERS USED FOR MEASURING CONTRIBUTION TOWARDS ACHIEVEMENT OF OBJECTIVES

Option 2:

Relevant action	Suggested parameter
PA1. Increasing and focusing research, demonstration and dissemination. Improving co-ordination of relevant programs	Number of initiatives/ networks/ programmes created on EU and national levels; Amount of funds attracted for R&D, demonstration, etc.; numbers of spinouts and new projects initiated
PA2. Establishing technology platforms	Number TPs, number of projects under the TPs; quantitative & qualitative:(influence on) creation a of national policies on promotion of certain environmental technology(ies)
PA3. Establishing European Networks for technology testing, performance verification and standardization	Certification / verification framework is established for certain environmental technologies/products on national EU level
PA4. Developing and agreeing on performance targets for key products, processes and services	Qualitative: influence of ETAP on the setting of the agenda and the development of standards
PA5. Mobilizing financial instruments to share the risk of investing in environmental technologies	Leveraging effect, combined with an assessment of the 'ambitiousness' of the eco-innovations
PA6. Encouraging systematic internalization of costs through market-based instruments	Assess the changes in StateAid guidelines: qualitative assessment of ETAP contribution
PA7. Encourage procurement of environmental technologies	Qualitative Assessment of influence of ETAP in agenda setting for GPP; combined with analysis of GPP levels
PA8. Raising business and consumer awareness	Qualitative Assessment of influence of ETAP on communication on eco-innovation
PA9. Supporting eco-technologies in developing countries and promoting foreign investment	Patents, FDI, partnerships, participation in FP of dev. countries

Option 3:

Relevant action	Suggested parameter
A1. Screening the environmental regulatory framework for eco-innovation	Qualitative assessment of the influencing effect of the action - combined with analysing the change towards more and better integration of eco-innovation
A2. Partnerships for eco-innovation	Number of initiatives/networks/ prorammes created on EU and national levels; scope of the activities this initiatives implement (advising, funding, providing space for between various research organizations, firms, investors)
A3. Mobilising financial resources, both public and private, for investment in eco-innovation	Qualitative assessment of the contribution of the action in integrating eco-innovation in schemes & leveraging effect, patent analysis, case studies of instruments
A4. Developing standards and performance targets for key products, processes and services to reduce their environmental footprint	Qualitative: influence of the action on the setting of the agenda and the development of standards
A5. Developing new skills for new jobs in environmental goods and services industry	Qualitative Assessment of influence of the action on the uptake of eco-innovation in courses
A6. Governance of eco-innovation policy	Number of national roadmaps approved; Number of good practices identified; number of good practices shared

Option 4:

Relevant action	Suggested parameter
A1. Targeted eco-innovation support for SMEs through enterprise and business networks	Network activities organised (forum, /meetings, etc.
A2. Environmental Technology Verification initiative, to test an EU ETV pilot programme and evaluate its potential in facilitating market access for innovative environmental technologies	Functioning ETV pilot for certain areas/technologies, clear indications on usefulness and added-value for marketing innovative environmental technologies
A3. Setting up Eco-innovation Partnerships with major partner countries and regions	Qualitative, increased 'green' trade, increased green investments, increased networking and int. cooperation
A4. Promotion of environmental technologies in developing countries	FDI, partnerships, patents, participation in FP, nr. Of NCP centers

Option 5:

Relevant action	Suggested parameter
A1. Promoting a faster shift of the burden of taxation to resources	Share of taxation coming from resource taxes
A2. Introduction of ambitious standards for green public procurement	GPP as part of Total Public Procurement/ GPP as part of GDP
A3. Introduction of legally binding framework for all manufactured goods	Quantitative
A4. Introducing waste prevention and recycling standards along the whole value chain	Qualitative