Study on the Competitiveness of the EU eco-industry

Within the Framework Contract of Sectoral Competitiveness Studies – ENTR/06/054

Final Report – Part 2

Client: Directorate-General Enterprise & Industry

Disclaimer: This report presents the vision of the consultants and is not necessarily in line with the analytical understanding or policy views of the European Commission.

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Preface

This report has been produced as part of the "Study on the Competitiveness of the EU eco-industry" commissioned by the European Commission Directorate General for Enterprise and Industry, within the context of the framework contract on Sector Competitiveness Studies (ENTR/06/054).

The report is published in two parts. The first part, which is covered in a separate document, provides the main results of the analysis for the EU eco-industries as a whole and cross-cutting policy issues, together with the Executive Summary. The second part, which is covered in this document, provides a review of particular eco-industries that have been perceived as core EU eco-industries for this study.

It has been quite a challenge finding appropriate quantitative information on the EU eco-industry. Various sources have been consulted and used bearing in mind their potential and limitations. The most important sources were Eurostat, OECD, and UN Comtrade. Beside literature on the subject, numerous interviews with stakeholders have been done providing valuable qualitative information. The relevant insights have been included in this report to the degree possible and in an independent manner. With respect to the micro economic analysis, substantial efforts have been done to establish representative stratified samples of companies. The help and feed-back of certain stakeholders for the sample composition has been greatly appreciated. Non-EU companies have been identified as well for a comparative analysis. Only the results from sub-sector samples that had a sufficient coverage have been included in this study.

The report has been written in 2009. This implies that much of the economic context was coloured by the economic crisis, the proportions of which became clear mid 2008. To the degree possible the research team took this into account. Especially through qualitative assessments and the interview reports the effects of the financial and economic crisis became apparent. Yet in terms of quantitative information, the crisis has not been reflected adequately, since most data, such as EU level sectoral indicators and harmonized company accounts, come with a substantial delay. Furthermore, at the final stage of the project, leading business indicators still did not show convincing evidence of a sustained recovery, leading to quite some uncertainty about the short to mid-term future economic outlook.

The analysis contained in the Report has been undertaken by a team of consultants from IDEA Consult and ECORYS Netherlands. Specific environmental technical expertise has been provided by a team of specialists from the Flemish Institute for Technological Research VITO. We would like to thank the numerous industry and company representatives who were willing to share their views on the subject. We are also grateful for the reflections of the Commission in the various phases of the project.

Dr. Valentijn Bilsen

Wednesday, 30th of September, 2009

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List of abbreviations

APC	Air Pollution Control
BRIC	Brazil, Russia, India and China
C2C	Cradle to Cradle
CAFE	Clean Air For Europe
CAPEX	Capital Expenditure
CIS	Community Innovation Survey
CO	Carbon monoxide
CSP	Concentrated Solar Power
CSS	Carbon Capture and Storage
EPE	Environmental Protection Expenditures
EEG	Erneuerbares Energien Gesetz - Germany's Renewable Energy Law
EMAS	Eco-Management Audit Scheme
ETS	Emission Trading System
FTE	Fulltime equivalent
GDP	Gross Domestic Product
GNG	Greenhouse Gases
IEA	International Energy Agency
MW	Megawatt
MWe	Megawatt Electrical
MWp	Megawatt Peak
O_3	Ozone
ODA	Official Development Assistance
O&M	Operation and Maintenance
OEM	Original Equipment Manufacturer
OPEX	Operating Expenditure
PM	Particulate Matter
PPP	Public Private Partnerships
PV	Photovoltaic
TFP	Total Factor Productivity
TGC	Tradable Green Certificate
UBA	Umweltbundesamt, the Federal Environment Agency of Germany
VOC	Volatile Organic Compounds
WBCSD	World Business Council for Sustainable Development

1 Introduction

Given the heterogeneity of the eco-industry, in this part of the draft final report the main sub-sectors of the European eco-industry are concisely documented. The main source for these sub-sector reports has been the interviews with the stakeholders. This information has been supplemented with other material where necessary. The following sub-sectors are presented:

Air pollution control,
Recycled materials / recycling,
Environmental technology providers,
Renewable energy, and
Eco-construction

The chapter outlook for each sub sector report is based on the common approach laid down in the Sectoral Competitiveness Studies Framework Contract which aims at obtaining an insight in the competitive position of various industries using the same methodology. Therefore we present the following subjects for each of the above mentioned sectors:

- Sector overview, providing an insight in the nature of the sector,
- Micro data: identifying the major players in the field,
- Competitiveness analysis, focussing on the major competitiveness issues of the sector,
- The sector and its supply chain, addressing the interrelation with other sectors of the economy, notably the upstream sectors and main customer sectors,.
- The regulatory and other framework conditions; documenting the economic and social environment in which the companies operate, such as regulations, labour market conditions, R&D and innovation, as well as more exogenous factors such as technological progress and the effects of globalisation,
- A dynamic SWOT analysis
- The last section concludes with an overview of potential policy issues and suggestions.

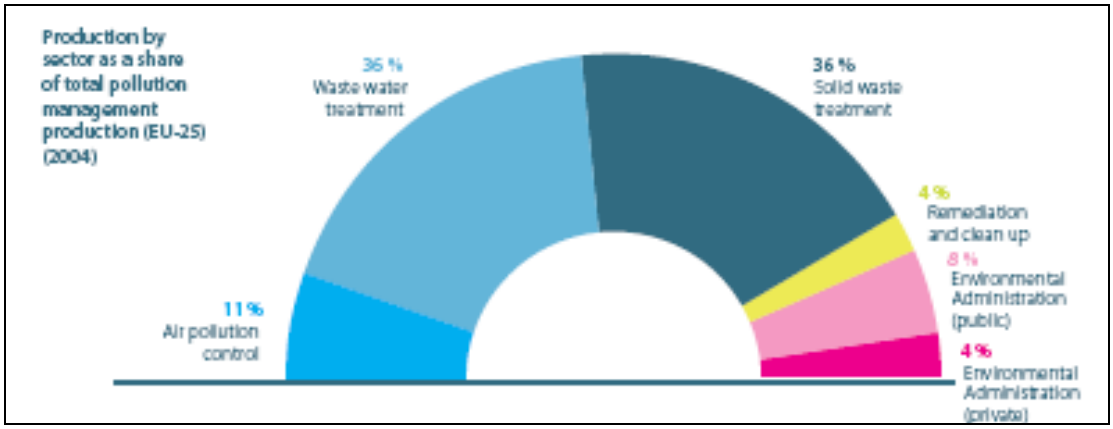
This report also contains the validated interview reports of the key stakeholders and various connected industries. The key stakeholders have been interviewed in an early stage of the project. The connected industries have been interviewed in a later phase.

2 Air pollution control

2.1 Sector overview

Air Pollution Control is part of the bigger sector of pollution management, which along with the resource management sector make up the two major sectors of the European eco-industry. Pollution management is the larger of the two sectors with an annual turnover of about €145 billion and is predominantly focussed on air, waste and wastewater treatment. Figure 2.1 illustrates that air pollution control accounts for 11% of total pollution management production.

Figure 2.1 Production by sector as a share of total pollution management production (EU-25)



Source: Ernst & Young, (2006)

The sector is geared towards combating air pollution in the form of fine particulates that cause health problems and are produced from industry, transport, power generation and many other factors. The six main categories of pollutants that the industry targets are: sulphur oxides, nitrogen oxides, ammonia, volatile organic compounds (VOCs), particulate matter and odours. The combination of NOx and VOCs also cause ozone formation at ground level (troposphere), which is bad for human health and is difficult to regulate as there are no emission standard levels for ozone.

Air pollution in the EU, notably from fine particulate matter and ground-level ozone, presently causes the premature death of almost 370,000 citizens every year and reduces average life expectancy by an average of 9 months. The human health damage that air pollution causes is estimated to cost the European economy between €427-€790 billion

per year[1]. Air pollution also has a significant environmental impact through the damage it causes to crops and ecosystems that support life, such as forests and fresh water bodies.

Improvements in air quality is mainly sought through legislation that focuses on source pollution and through policy designed for targeting diffuse pollution through air quality targets. Air quality target values of pollutants such as carbon monoxide (CO), ozone (O3) and particulate matter (PM) are similar in the EU and the United States, but standards for heavy-duty vehicles are tougher in the United States. The air pollution control sector includes companies that offer products, processes and services dedicated to the removal of pollutants from the air. The main activities covered include measuring, analyzing and monitoring pollutants present in the air or in flue gases and providing equipment for air pollution control and treatment.

The size of air pollution control industries in the EU is estimated to be €15.8 billion[2]; while air pollution control represents approximately 120,000 jobs in the EU-25[3]. The air pollution control (APC) market is already well-developed in some areas, for example in incinerator flue gas treatment, which is also expected to grow further in the new Member States. Power plants are also thought to provide stimulus to the APC market especially in the 10 new member states, while many European countries are obliged to reach targets set for industrial and chemical emissions, which will also strengthen the APC market. For example, it is estimated that approximately €5 billion will be spent by Italy alone in order to reach full compliance with air quality legal requirements[4].

The development of this sector at EU level and indeed to a large extent at a global level depends to a large extent on the consistency of public policy, the expected rate of decline of use of current technologies and the degree to which micro dust particle air pollution (a relatively new phenomenon) is tackled by the authorities in the immediate future.

Many investment decisions in the field of eco-industries are based on government induced targets and subsidies. Yet the inconsistency of the implementation at Member State level is becoming a problem. Investment and expenditure in clean air technology relies on clear signals from government regarding the policy they intend to follow in the medium to long term. With reference to the rate of use of current technologies it appears that a transition to low carbon sources of energy and renewable energy in particular will offset the need for clean air technologies that are geared towards filtering particles that originate from burning fossil fuels. It is for this reason that the solution for air pollution is increasingly being tackled in combination with climate change policy. The link between air pollution and climate change is important as air pollution affects the regional and global climate both directly and indirectly. Ozone in the lower layers of the atmosphere contributes to global warming even more than some greenhouse gases included in the Kyoto Protocol, and particulate matter in the atmosphere also has important climate impacts. However, although soot particles have a warming effect, other particles such as sulphates and nitrates may have a cooling effect. The current high levels of sulphates and

[1] http://europa.eu/rapid/pressReleasesAction
[2] Ernst and Young: Eco-industry, its size, employment, perspectives and barriers to growth in an enlarged EU (2006)
[3] Ibid
[4] Ibid

nitrates in fact mask the effects of climate change to some degree. Through cuts in sulphur and nitrogen emissions necessary to protect human health and the environment the climate impacts of the greenhouse gases may actually show more quickly. On the other hand, measures to cut so-called black carbon emissions, for example from diesel combustion, will have extra benefits, protecting both human health locally and also the climate regionally and worldwide.

2.2 Micro data

The number of firms focussing particularly on air pollution control that could be identified in the EU-27 was rather limited. Since no particular NACE sector covers this type of environmental activity, a search was done on the base of company descriptions in the Amadeus and Orbis databases, supplemented with web searches, membership lists of representative organisations and specialised literature. The EU sample consists of 73 companies. The producers of catalysts can be considered as an important and relatively well defined part of this sector. They are located in the automotive clusters, particularly in Germany. This is strongly reflected in the EU top 25 list, which is shown in the following table.

The EU top 25 companies in air pollution control, based on operating revenue of 2007

Air pollution control		
1	UMICORE AG & CO. KG	Germany
2	JOHNSON MATTHEY PLC	United Kingdom
3	BASF CATALYSTS GERMANY GMBH	Germany
4	NGK SPARK PLUG EUROPE GMBH	Germany
5	MAHLE FILTERSYSTEME GMBH	Germany
6	IBIDEN DEUTSCHLAND GMBH	Germany
7	EMITEC GESELLSCHAFT FÜR EMISSIONSTECHNOLOGIE MBH	Germany
8	AERZENER MASCHINENFABRIK GESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG.	Germany
9	BALCKE-DÜRR GMBH	Germany
10	DONALDSON GESELLSCHAFT MBH	Germany
11	AL-KO THERM GMBH MASCHINENFABRIK	Germany
12	TLT - TURBO GMBH	Germany
13	LECHLER GMBH	Germany
14	VENTILATORENFABRIK OELDE GMBH	Germany
15	BRÜCKNER TROCKENTECHNIK GMBH & CO. KG	Germany
16	PAUL WURTH UMWELTTECHNIK GMBH	Germany
17	LÜHR FILTER GMBH & CO. KG	Germany
18	KÖRTING HANNOVER AG	Germany
19	HANDTE UMWELTTECHNIK GMBH	Germany
20	LANGBEIN & ENGELBRACHT GMBH	Germany
21	LTG AKTIENGESELLSCHAFT	Germany
22	WEISS KESSEL-, ANLAGEN- UND MASCHINENBAU GMBH	Germany

Air pollution control		
23	STEULER ANLAGENBAU GMBH&CO KG	Germany
24	LUTRO LUFT- UND TROCKENTECHNIK GMBH	Germany
25	KREISEL GMBH & CO. KG	Germany

Source: Amadeus database

2.3 Competitiveness analysis

In this sector, US companies are strong competitors with EU companies, as their products are generally considered to be reliable and of high quality. However, US companies are often specialized in large-scale equipment, which are sometimes over-sized and expensive, while the European market mostly demands small-scale operations[5]. Japan is the other greatest competitor of Europe in the sector while China is considered both an opportunity and a threat. In the opinion of some stakeholders China innovates much faster than EU, which is despite many industrial accidents and often insufficient organisational capacity. In addition, and in terms of quality, the EU outperforms China, but there is a huge knowledge transfer effect, from which China will benefit in the future. China is and will continue to catch-up and potentially leapfrog Europe in this field. The air pollution control market is well-established in some North European countries, especially the incinerator flue gas treatment market. In Germany, Sweden and Switzerland, 90 % of waste is incinerated and regulation concerning emissions is very restrictive. France has about 100 incineration plants in operation, which is roughly equal to the total number of plants in other European countries and shows that France is the biggest player in Europe regarding incineration. The APC market is in a state of development in most European countries as regulation has recently targeted specific industrial and chemical atmospheric pollutants such as volatile organic compounds (VOCs) and CO2.

The key factors that determine relative competitiveness in the clean air sector is the ability to innovate (innovation capacity) as well as the use of high-technological solutions. Another key factor to compete in the market is the ability to provide small-scale solutions to clean air problems i.e. that supplying the large-scale manufacturing equipment for heavy industry is not as relevant for the European market where small-scale equipment is more in demand. In general, the driver for competition in this field is quality, and specifically quality for value, i.e. that when selecting technological alternatives, companies will do so on the basis that it is the best technology for a given price.

(Labour) productivity

On a general level, the labour productivity of the air-pollution control sector is closely related to the level of technology being used in the sector. High-tech equipment and processes help enhance labour productivity, while the smaller size of European clean-sector companies also contributes a positive effect as individuals employed have increased value-added. There is little quantitative information regarding labour productivity in the sector.

[5] Ibid

Productivity enhancement

The increased international scale of the European eco-industry in general and the clean air technologies sector in particular (e.g. EU-15 expansion to the current EU-27 Member States) enhances productivity, while at the same time cultural and institutional differences still hamper productivity within the European Union (although no exact figures can be given regarding productivity loss due to these factors).

Competition and business strategies

It is likely that legislation will induce only the minimal effort required by industry and that real innovations will come from business opportunities related to eco-production. If there is a potential for future profit, or a potential to avoid future loss, companies will invest in eco-industries as it is essentially a business/economic motivated process. It has become business motivated because of the increased involvement of various stakeholders such as the state through legislation and because of consumers groups through consumer behaviour patterns. However, there is a perverse incentive mechanism at work to some extent as high costs of innovation for the innovator are usually of several orders greater than the lower adaptation costs for the second-in- line.

In the US, the Clear skies Act and Clean Air Act focus on continued use of market based instruments, with the current emission trading scheme for greenhouse gases. Such schemes are favoured in Europe by industrial players. These stress that the future legislation should put Europe on a level-playing field with the US and other regions and note the importance of moving away from command and control legislation to voluntary agreements and market-based instruments. It is also suggested by industry that any legislation should be synchronised with business investment cycles and accompanied with more flexible deadlines.

Internationalisation

A January 2004 research paper commissioned by DG Enterprise compared the EU air pollution policies against that of major competitors, mainly the US and Japan. The research paper considered existing and future legislation and assessed their impact on industry competitiveness. The paper concluded current pollutants concentration limits as being homogeneous between Europe, the US and Japan although Europe is considered more efficient in reducing greenhouse gas emissions and acidifying pollutants. The US was found to fare better than Europe when it came to ozone precursors although, according to the European Environment Agency (EEA), emissions in the EU fell by 22 per cent between 1990 and 1998.

While emissions have fallen over recent years this is not considered to have been at the expense of competitiveness; air pollution regulations generally do not appear to have a major impact on competitiveness. When compared to the US and Japan, EU air pollution expenditure is similar at less than 0.5 per cent of industrial Gross Value Added (GVA). In addition, memoranda of understanding (MoUs) between EU-China and related funds (e.g. Asia Pro Eco) enhance internationalisation and therefore productivity of the eco-industry.

2.4 Eco-industry and the supply chain

Potential users of air pollution control equipment are both the private sector, mostly composed of medium and large industrial companies in the petroleum, chemical, cement, food processing, textile and tanning industries; and the public sector, which includes municipalities, hospitals and regional agencies with the function of monitoring air pollution and / or incinerating wastes. The demand for clean-air technology is closely linked with regulatory conditions on industrial sectors, which impose strict(er) standards and norms for emission values for various chemicals and particles.

Two types of barriers in the transfer of eco-industry solutions (goods and services) to the other industries can be perceived: a knowledge barrier and a technology barrier. The first one relates to the asymmetric information between supplier and potential client in the area of air pollution control possibilities. The second relates to differences in technological standards, and incompatibilities.

In order to improve the supplier-customer relations of the eco-industry with the rest of the industry, new and holistic approaches are required that include concepts such as chain management and cradle-to-cradle. It is expected that in the future the design, production and waste processes will be more integrated and will become and an integral part of corporate governance, thereby not simply relying on end-of-pipe-solutions, but moving more towards prevention. There are innovative and sustainable companies that have proven to be more competitive in the long-term. In a way they provide sustainable development examples to the rest of their industry.

2.5 Regulatory and other framework conditions

The purpose of this section is to identify and prioritise the key framework conditions that influence the clean air sector both in terms of its own development, and in terms of its inter linkages with other industries (especially manufacturing industries). The analysis is based around a screening of the sector in relation to the main regulatory and framework conditions[6;] the overall assessment is summarised in Table 2.1.

2.5.1 Regulatory conditions and standards

Regulation

Regulation remains the single most important driver of the air pollution control industry as compliance is often not considered a profit-making activity but something one must do in order to meet national regulation (usually stemming from EU directives). In general the EU sets relatively high air quality standards that have also been implemented in most EU-15 Member States. The long-term horizon of eco-regulation is also beneficial for the air pollution control industry, as planning and execution of procedures is easier and can be done more consistently for both governmental and industrial parties.

[6] This analysis is in accordance with the general framework for assessment of regulatory and framework conditions agreed as part of the Framework Contract of Sectoral Competitiveness Studies.

Recent studies sponsored by the European Union report that current international protocols and national legislation designed to reduce air pollution, actually need to go further to avoid more environmental damage from high ozone concentrations[7]. These reports also point out that better use of existing technology can also help reduce the harmful effects of emissions and bring ozone levels in most regions of the world into compliance with current standards. The European Environmental Bureau states that much has already been done to reduce air pollution in the industrialised parts of the world, particularly through use of improved technological standards, but some areas have lacked regulation, including air pollution from ships (in some parts of Europe becoming a major source for acid rains) and ground level ozone.

Standards

The implementation of European directives (listed below) supports the further development of the air pollution control sector given the major role that legislation plays in driving the clean air or air pollution control sector forwards. The Clean Air for Europe (CAFE) programme aims to establish a long-term, integrated strategy to tackle air pollution and to protect against effects on human health and the environment. Several directives have been introduced in order to limit and control the concentrations of pollutants in the air. These include:

- Directive 96/61/EC concerning Integrated Pollution Prevention and Control (IPPC), the main purpose of which is to reduce pollution by industry and from larger facilities,
- Air Quality Framework Directive 96/62/EC on ambient air quality assessment and management.

Other Directives specific to certain air pollutants:

- Directive 99/13/CE relating to VOC emissions,
- Directive 99/30/CE fixing limits for emissions of nitrogen and sulphur oxides (NOx, SOx), lead, particulate matter,
- Directive 2000/69/CE fixing limits for emissions of carbon monoxide (within 2005) and benzene (within 2010),
- Directive 2000/76/CE on waste incineration,
- Directive 2001/80/CE on emissions from combustion plants (SOx, NOx, and dust),
- Directive 2001/81/EC on national emission ceilings, which sets upper limits for each member State for the total emissions of SO2, NOx, VOCs and ammonia by 2010,
- Directive 2003/87/CE establishing a greenhouse gas emission trading scheme (EU ETS) within the European Community,
- Directive 2004/107/CE imposing emission limits for metals like arsenic, cadmium, nickel, and for poly-aromatic hydrocarbons (PAH) within 2012.

The provisions of the IPPC Directive allow for certain flexibility for Member States to set permit conditions and to apply the concept of best available technologies (BAT). The implementation of the IPPC Directive differs across the EU with the transposition of the IPPC permit system into national legislation: in France, Germany, the UK, and Luxemburg the existing pre-IPPC permit systems are similar to the IPPC permit system

[7] This is the conclusion of scientific studies done by European Commission (EC) scientists and the Atmospheric Composition Change the European Network of Excellence (ACCENT) network of research scientists, funded by the EU.

while in Italy, Spain and Poland the similarities are small. The reasons for differences are significant structural differences between national regulatory systems which reflect different historical experiences, different political priorities and different attitudes towards environmental protection.

The institutional context of individual Member States influences the regulatory conditions under which individual companies with IPPC installations operate. Differing conditions and requirements from site to site and from country to country may eventually give rise to competitive distortions (inequality view). These distortions may be relatively unimportant and qualify only as irregularities. They may also be only a transitory problem related to the current restructuring of the permit system in some countries.

There are few signs of negative effects on the competitiveness resulting from insufficient flexibility or lack of cooperation on behalf of authorities. In most countries, pre-application contacts and continuous interaction between operators and competent authorities is standard practice avoiding "surprises" for companies. Some standardisation and accreditation (ISO-14001, EMAS, etc.) is considered by some to be very beneficial for the sector as too many stand-alone norms can cause bureaucracy and inefficiencies, while a combination of overall (general) principles and tailor-made participatory solutions are far more cost-effective and flexible.

2.5.2 'Other' framework conditions

Knowledge and innovation

Knowledge and innovation are key framework conditions affecting the air pollution control sector. Innovation in the sector stems from good cooperation between principal research institutes (e.g. universities) and the business community and R&D departments of market players. Research and development are two separate stages, and in this sector principal research is typically done by the universities and developed further by companies. Participatory approaches like long term agreements, public private partnerships and combined governmental and industrial initiatives to combat air-pollution and to improve sustainability are all important factors stimulating research and development, while eco-industries active in the field of air pollution control would welcome support for their Research and Development (R&D) programmes.

Competition issues

The ability to innovate remains a key framework condition as competitive advantage is derived from quality and not necessarily from price alone, which allows room for investment in research and development. As stated earlier, competition in the sector is expected to get fiercer as growth is expected for energy-efficiency related activities (ESD, ETS, post-Kyoto) in the EU-27 and in the so-called BRIC-countries.

2.5.3 Exogenous conditions and trends

Technological change

Technological change is another important framework condition given the competitiveness of the air pollution control sector is partly based on the ability to

innovate using better technology. Moreover technological change can mean the ultimate redundancy of the need for clean-up in the first place. For example, the penetration of the electric car may crowd out the need for better catalytic converters and reduce demand in the associated supply chain for this product.

Socio-political developments

Both European and National politics exert an influence on the sector as public policy developments can induce further regulation or tightening of existing regulation, which increases demand in the sector. Corporate Social Responsibility (CSR) for example is in the interests of employees, citizens, clients and customers alike. Public relations exercises and government's building greener reputations require eco-industry services and activities. Policy framing is thus an extremely important factor that if carried out properly and with an element of stability will further encourage eco-industry goods/services, i.e. a balanced mix of "carrots" and "sticks" will stimulate initiatives and compliance simultaneously. For example, often new investments in air pollution control, mostly in the new member states, are hindered by the inability to finance these projects. Incentives such as subsidies or 0% loans could help implement such projects which are not always a priority in infrastructure development or environmental protection policies and programmes.

Global competition

As mentioned previously, the EU eco-industry is based on smaller scale operations than its Japanese or U.S. counterparts and thus it would seem reasonable to suggest that benefits of scale are yet to be attained in this specific sector. Larger markets like US and Japan have more likely benefited from this process already and thus the EU challenge is to integrate the air pollution control market to also attain these benefits. This is especially relevant for smaller Member States.

2.5.4 Screening of importance of framework conditions

Table 2.1 provides an overview of the relevance of the different regulatory and other framework conditions for the development and competitiveness of the air pollution control sector, as well as for its inter linkages with other industries.

Table 2.1 Air pollution control Sector: screening of framework conditions

Regulatory & 'other' framework conditions			Relevance	
Heading	**Item**	**Issues**	**Sector-level**	**Eco-industry interaction with other sectors**
Regulatory conditions	National regulatory measures	Transposition of European legislation into national law is heterogeneous across MS	♦♦♦	♦♦♦
	EU regulatory measures	New legislation required for micro dust – can be a major driver for the APC industry in the medium to long term.	♦♦♦	♦♦♦

	Completion of internal market legislation	Difficulties due to national cultural and technical barriers	♦	♦
	Industry and professional regulations and standards		♦♦	♦♦
'Other' framework conditions	Knowledge: R&D, innovation and product/service development	Partnership building is key to better R&D, application and product development.	♦♦♦	♦♦♦
	Labour force, knowledge and skills	Required skills often missing from labour force.	♦	♦
	Openness of international markets (trade and investment)		♦	♦
	Structural change		0	0
	Competition policy issues	Innovation capacity is important as competition will get stringer	0	0
Exogenous conditions	Technological change	Only important if technology renders eco-goods redundant	♦♦	♦♦
	Socio-political change	Policy consistency and pressure to maintain green culture extremely important to continued development of the industry.	♦♦♦	♦♦♦
	Global competition	Growth of China is both an opportunity and a threat	♦♦	♦♦

Legend: 0: Not relevant
♦: Relevant
♦♦: Important
♦♦♦: Very important

2.6 Dynamic SWOT results

The next table provides an overview of the dynamic SWOT results for the air pollution control sector from the competitiveness point of view and with respect to the inter linkages with other industries.

Table 2.2 SWOT results for the air pollution control sector

Strengths	Weaknesses
• **Regulatory environment**: clean air technology is becoming part of the solution to reduce GHG and tackle climate change; • **Consumer awareness**: citizens are becoming	• **Policy environment**: Clean air policy is not yet integrated with climate change policies, although this is beginning to happen; further changes can be expected

increasingly aware about the impact of air quality on public health and the need to improve air quality • **Technological advancements**: EU manufacturers are able to provide "world - beating" installations, and tailor-made solutions • Europe is considered more efficient in reducing greenhouse gas emissions and acidifying pollutants than the U.S. and Japan • Corporate social responsibility reinforces the drive for cleaner production methods.	• Different degrees of **implementation** of EU directives within the various EU countries • **Capital**: finding enough capital is especially hard for SMEs • **Labour market** : the lack of skilled work force is an important issue as it will take time to educate the work force and for the learning by doing to pay off • Demand is "minimum-required to-achieve-norm": investment in clean-air technology is limited to the bare minimum required to conform with legislation • No economies of scale apparent in the EU clean-air technology sector so far
Opportunities	**Threats**
• **Policy-making:** harmonization of national implementation • **Increased global demand**: this may come about as climate policies integrated with clean-air policy becomes more concrete • **Innovation**: further cooperation between research institutes (e.g. universities) and the business community and R&D departments of market players • Potential for growth through Europe's leadership on **carbon capture storage (CCS**) technologies. Pilots for CCS are already big business.	• **Labour skills**: knowledge transfer and skill development are important to stay ahead of non-EU countries, • Long-term **technological change**: process integrated pollution prevention techniques reduce the need for specific clean-air technology; • **Strong international competition** is likely to intensify, • **Lack of political will** to tackle air quality issues may have adverse effects on the sector.

Although one may clearly perceive competitive strengths of the European air pollution control industry vis-à-vis its global competitors, most notably the ability to provide tailor made high quality solutions, a number of weaknesses can be identified that may potentially undermine the competitiveness of the sector in the longer term. In particular addressing the lack of a skilled work is important in order to further validate the industry's potential. In terms of regulatory environment the various regulations are in place. Yet the differences in the national implementation hinder the operation towards an EU-wide internal market, inhibiting potential scale effects.

The harmonization of the national implementation schemes of the various directives that are relevant for the air pollution control industry is therefore expected to generate substantial opportunities of scale and scope. This is important in light of the expectation that globally clean-air policy will be more integrated with climate policies generating new opportunities. To exploit these it is however important that the necessary labour skills are in place.

2.7 Overview of potential policy issues

The purpose of this section is to identify and prioritise potential areas for European policy initiatives that could have an important impact on the air pollution control sector's own development and on its interaction with other industries (especially manufacturing industries). To begin with, the possible arguments (justification) for potential policy intervention from an economic standpoint are examined. After this, the analysis is based around a screening of the sector in relation to existing industrial policy initiatives; the overall assessment is summarised in Table 2.3.

2.7.1 Key arguments for policy intervention

Externalities

The major driver of the industry has been the drawing up of regulation to set limits on emissions from industrial processes and setting air quality targets. The fundamental argument here is that the health, environmental and ecological damages caused by air pollutants are externalities that need to be addressed. Thus, the key argument for policy intervention is already being applied. The scientific arguments currently being made for protecting the public from the latest-discovered particles that cause damages in the form of micro dust is likely to grow and is another reason for policy intervention, which will also drive new development of the sector itself.

Market structure, conduct, market power

The benefits associated with developing a larger, integrated European single market rather than the patchwork of markets that currently describe this sector is one possible reason for policy intervention. Making sure standards are harmonized and that companies can compete on a more even playing field will require further regulatory action on a European level.

Information asymmetries and regulation

Technical barriers exist, but so do implicit barriers such as insufficient transfers of knowledge, which often prevent manufacturing sectors' from acquiring the eco-industry goods/services that it needs to meet standards and regulations.

2.7.2 Screening against policy initiatives

Table 2.3 provides an initial screening of the air pollution control sector against existing and potential EU horizontal 'industrial' policy initiatives[8]. This attempts to identify those policy initiatives that, if introduced or extended, could be of most relevance for the air pollution control sector, in particular in terms of raising performance (e.g. productivity improvements) and/or creating opportunities for sector development.

Table 2.3 Air pollution control sector: screening of policy initiatives

EU Policy areas	Relevance

[8] Based on the Mid-term Review of Industrial Policy, COM(2007) 374.

Heading	Initiatives	Issues	Sector-level	Eco-industry interaction with other sectors
Trade	Trade policy		♦	♦
	Proper functioning of the internal market		♦	♦
Better regulation	Public procurement	Stable policy required in terms of green public procurement	♦♦	♦♦
	Competition policy		♦	♦
	Better regulation and simplification	Standardisation could be beneficial to sector as reduces bureaucracy	♦♦♦	♦♦♦
	Internal standards	Important as a driver of the sector	♦♦♦	♦♦♦
Knowledge and skills	Research and development	Key to long-term competitiveness	♦♦♦	♦♦♦
	Intellectual property rights		♦♦	♦♦
	Innovation policy		♦♦	♦♦
	Employment, qualifications, skills / Flexicurity		♦	♦
	Access to finance / risk capital	Deployment of new technology often dependent on affordable financing	♦♦♦	♦♦♦
Energy and environment	Waste, water, air		♦♦	♦♦
	Intensive energy use		♦♦	♦♦

Legend: 0: Not relevant
♦: Relevant
♦♦: Important
♦♦♦: Very important

3 Recycled materials / recycling industry

Recycling involves the processing of used materials into new products in order to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air pollution (from incineration) and water pollution (from land filling) by reducing the need for “conventional” waste disposal. Recycling is a key component of modern waste management and is the third component of the "Reduce, Reuse, Recycle" waste hierarchy. Recyclable materials include many kinds of glass, paper, metal, plastic, textiles and electronics (e.g., cell phones and computers).

Referring to our schematic overview of eco-industries in Report 1, the recycling industry belongs to resource management and is a horizontal environment class. It consists of different business activities, such as the production of materials (recyclables) and services.

Figure 3.1 Recycling industry: definition

Business activities / Environment classes	Production of equipment and specific materials	Provision of operational services (incl. monitoring)	Provision of management services	Construction and installation of facilities	Innovation and technological development	Provision of environment consulting services	General public administration
A. CORE ECO-INDUSTRY							
1. POLLUTION MANAGEMENT							
Air pollution control							
Waste water treatment							
Solid waste treatment							
Soil & groundwater remediation							
Noise and vibration control							
2. RESOURCE MANAGEMENT							
Recycled materials		**Recycling industry**			**Recycling**		
Renewable energy production							
Water supply							
Nature protection							
B. CONNECTED ECO-INDUSTRY							
Eco-construction							

not main focus of study

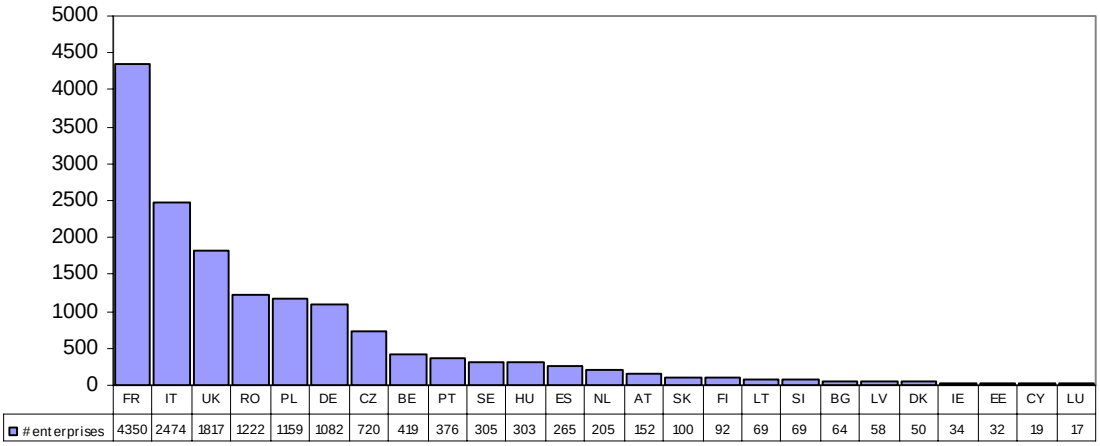
3.1 Sector overview

Eurostat estimates based on data from 25 countries[9], indicate that in 2006 the EU recycling industry counted some 15,500 companies. They generated a total turnover of € 42.4 billion and employed around 137,500 workers (see Figure 3.2 to Figure 3.5). Since 2001 the recycling industry has expanded significantly, especially in terms of turnover. Eurostat estimates based on data from 24 countries[10], indicate that in 2001 the industry counted around 13,500 companies, generated a total turnover of € 19 billion and employed around 106,500 workers.

[9] Missing data for Greece and Malta

[10] Missing data for Greece, Malta and Denmark

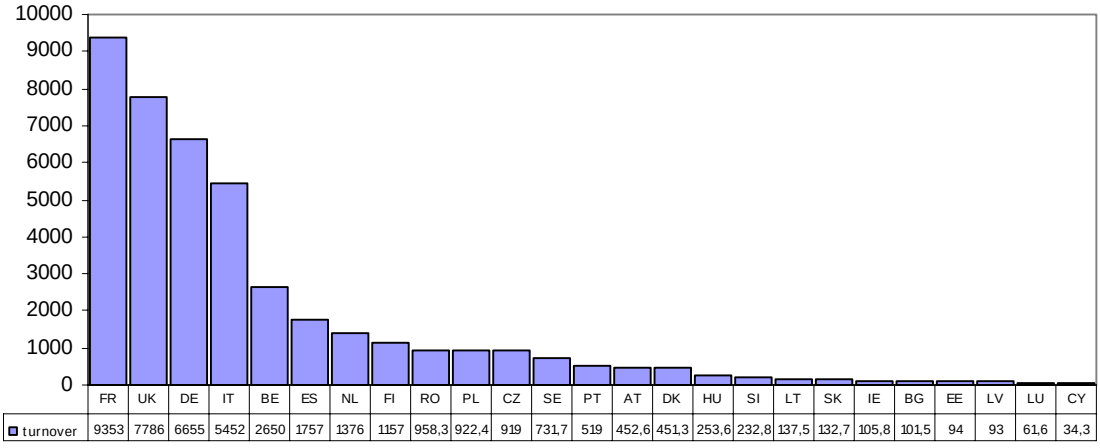
Figure 3.2 EU Recycling industry: number of enterprises by country, 2006[11] (€ million)



	FR	IT	UK	RO	PL	DE	CZ	BE	PT	SE	HU	ES	NL	AT	SK	FI	LT	SI	BG	LV	DK	IE	EE	CY	LU
# enterprises	4350	2474	1817	1222	1159	1082	720	419	376	305	303	265	205	152	100	92	69	69	64	58	50	34	32	19	17

Source: Eurostat SBS data base

Figure 3.3 EU Recycling industry: turnover by country, 2006[12]

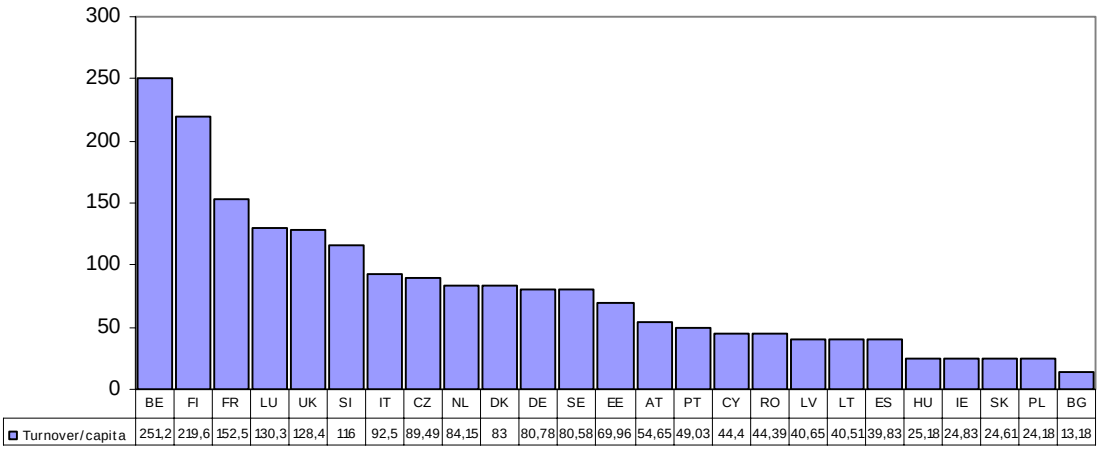


	FR	UK	DE	IT	BE	ES	NL	FI	RO	PL	CZ	SE	PT	AT	DK	HU	SI	LT	SK	IE	BG	EE	LV	LU	CY
turnover	9353	7786	6655	5452	2650	1757	1376	1157	958,3	922,4	919	731,7	519	452,6	451,3	253,6	232,8	137,5	132,7	105,8	101,5	94	93	61,6	34,3

Source: Eurostat SBS data base

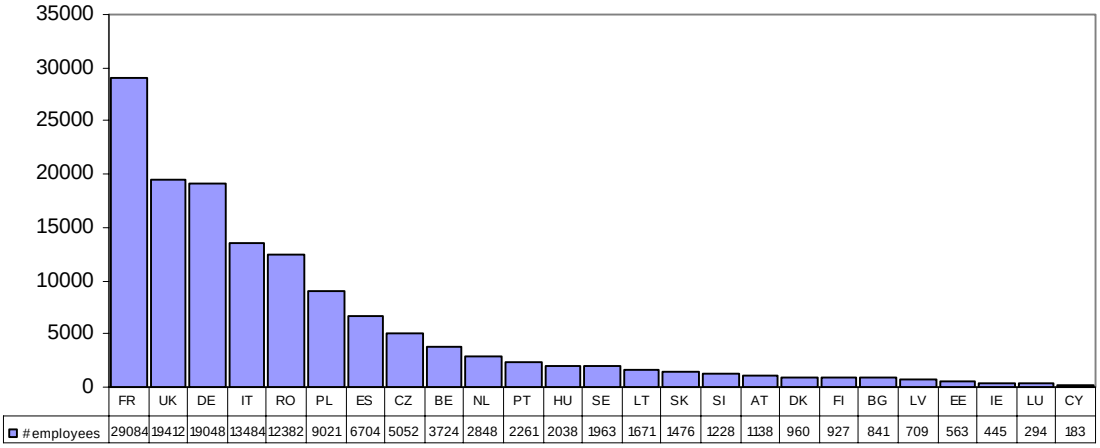
[11] 2005 data for RO, PL, NL, BG, IE
[12] 2005 data for RO, PL, NL, BG, IE

Figure 3.4 EU Recycling industry: turnover per capita, 2006[13] (€)



Source: Eurostat SBS data base

Figure 3.5 EU Recycling industry: number of employees, 2006[14]



Source: Eurostat SBS database

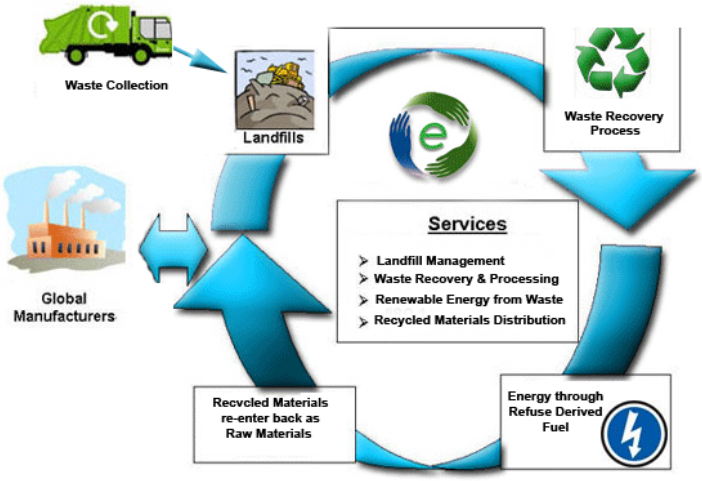
The recycling industry is largely concentrated in the 'old' EU-15 countries. The new Member States account for only one quarter of the total number of enterprises and employees, and generate less than 10% of total turnover in the industry. The most important countries in terms of number of enterprises, turnover and employees are the large Member States France, UK, Germany and Italy. However, turnover per capita is highest in the small Member States Belgium and Finland. Also in the new Member States Slovenia and Czech Republic, turnover per capita is above the EU average.

The recycling industry has several different segments of international importance, such as ferrous metals recycling, non-ferrous metals recycling, paper recycling, textiles recycling (very diverse segment covering second hand clothing, charity and fibre recycling),

[13] 2005 data for RO, PL, NL, BG, IE
[14] 2005 data for RO, PL, NL, BG, IE

plastics recycling, rubber recycling and special alloys. Apart from these international business segments, other more nationally organised recycling activities are the recycling of glass, wood, aggregates, oils and food waste.

Within the recycling business, different business activities can be distinguished. Input for the recycling process comes from the waste collecting companies. After collection, the waste is sorted and the 'unrecyclable' waste goes to landfills. Recyclable waste goes into the recycling process to recover the waste, such that the recycled materials can re-enter the business cycle as raw material.



The industry is characterised by a pyramid structure, with a limited number of very large companies and a large basis of many very small companies (1 to 5 persons).The first group of companies mainly focuses on the processing and delivering of recycled materials, while SMEs mainly focus on the collecting and sorting.

This pyramid structure of the industry is needed from a logistics point-of-view. The very small SMEs play a crucial role in the collection of the waste everywhere in Europe. You find waste collectors practically in every city, thus forming a dense network for waste collection. These small companies provide their (limited amounts of) collected and sorted (this is where these companies add value) waste to medium-sized companies, that consolidate all these smaller amounts of waste into the large volumes that are needed by the large processing companies. This last group needs a constantly large amount of waste to feed into the mills.

Regional specialisation in recycling is very much influenced by the industrial structure of the region. E.g. the OECD countries have much more facilities available for aluminium recycling than other regions in the world, due to the presence of a larger aluminium consuming industry. Apart from the industrial structure, also the cost of labour and energy influences the location of business. Labour intensive segments such as e.g. the sorting of cloths or the manual sorting of cable materials, move to low labour cost countries.

The European market is a 'big consumers' market and it is expected that this will not change in the near future. Therefore, there will always remain a recycling industry in Europe. However, whereas until now the whole 'value chain' of recycling (from collection to processing and delivery) could be found within Europe, its scale and

speciality is expected to change in the future. As many manufacturing industries in Europe (the most important customers for the recycling industry) move to outside of Europe (process of de-industrialisation), this affects the organisation of the recycling business' value chain. Whereas the collection and sorting of waste remains locally organised, there is a tendency that the processing and delivery of recycled materials is moving outside of Europe, to stronger growth markets (e.g. BRIC), especially in manufacturing.

3.2 Micro data

The following table provides a preliminary overview of the top 25 players in the EU-27, ranked according to their operating revenue in 2006. These firm level data have been collected on the base of a top-down approach using the NACE 37 sector classification as the main type of activity, supplemented with information from business associations and web searches.

Most of the EU top 25 companies are located in the larger economies of Europe. The two largest companies are situated in the UK and five of the top 25 are located in Germany. Undoubtedly national market size matters. Yet also companies of smaller economies, such as Ecore BV in the Netherlands and Stena Recycling in Sweden are among the largest recycling firms. Although the company name does not always suggest it, virtually all of these companies provide a wide range of activities waste management and recycling.

Table 3.1 The EU top 25 companies in recycling, based on operating revenue of 2006

recycling Nace 37		
1	EUROPEAN METAL RECYCLING LIMITED	United Kingdom
2	RENTOKIL INITIAL PLC	United Kingdom
3	SITA SA	France
4	INTERSEROH AG	Germany
5	TSR RECYCLING GMBH & CO. KG	Germany
6	DER GRÜNE PUNKT - DUALES SYSTEM DEUTSCHLAND GMBH	Germany
7	WASTE MANAGEMENT INTERNATIONAL PLC	United Kingdom
8	ECORE B.V.	Netherlands
9	TSR RECYCLING GMBH & CO.KG	Germany
10	BIFFA LIMITED	United Kingdom
11	STENA RECYCLING AB	Sweden
12	BEFESA MEDIO AMBIENTE SA	Spain
13	GUY DAUPHIN ENVIRONNEMENT	France
14	KUUSAKOSKI OY	Finland
15	WASTE RECYCLING GROUP LIMITED	United Kingdom
16	SHANKS GROUP PLC	United Kingdom
17	SIMS GROUP UK LIMITED	United Kingdom
18	SCHOLZ RECYCLING GMBH	Germany
19	PURFER	France

recycling Nace 37		
20	ATTWOODS PLC	United Kingdom
21	LAJO Y RODRIGUEZ SA	Spain
22	MOUNTSTAR METAL CORPORATION LIMITED	United Kingdom
23	H.J. HANSEN GENVINDINGSINDUSTRI A/S	Denmark
24	SÉCHÉ ENVIRONNEMENT SA	France
25	AFM RECYCLAGE	France

Source: Amadeus database

3.3 Competitiveness analysis

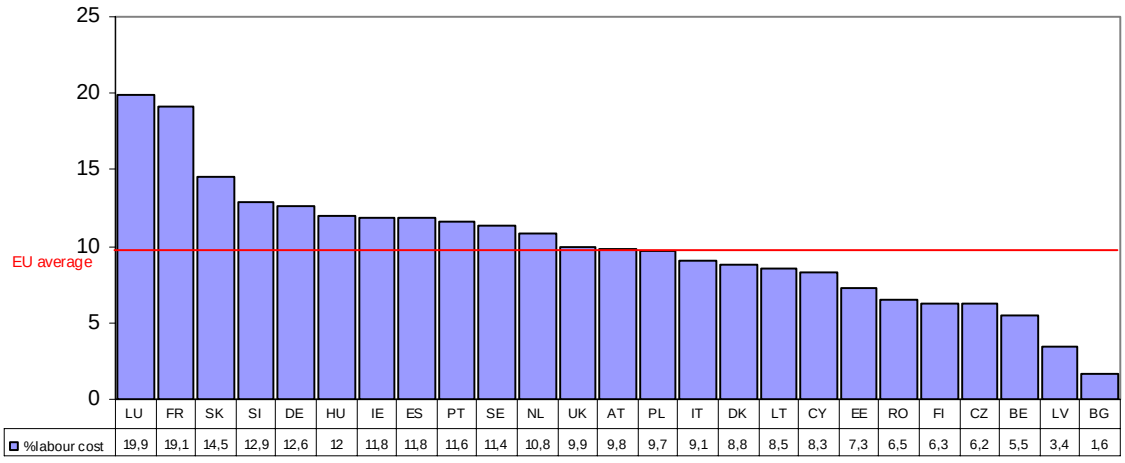
Cost structure and labour

The processing of collected waste itself is very capital intensive. The initial investments to set up a recycling plant are very high. But once the plant is up and running, labour costs make up a considerable amount of total costs, as well as energy costs.

Also the collection and sorting of waste involves a considerable amount of labour. However, the way waste is collected and sorted can differ across countries/regions worldwide depending on the local prices of inputs. E.g. cable recycling in Europe is mainly done in an automated way (machines separate plastic from metals), while in low labour cost countries this is done manually.

Eurostat estimates based on data from 25 countries[15], indicate that in 2006 the average share of personnel costs in total production was around 10% for the EU recycling industry, with values ranging from only 1.6% in Bulgaria to almost 20% in Luxembourg and France.

Figure 3.6 EU Recycling industry: share of personnel costs in production (%), 2006[16]



Source: Eurostat SBS database

[15] Missing data for Greece and Malta
[16] 2005 data for RO, PL, NL, BG, IE

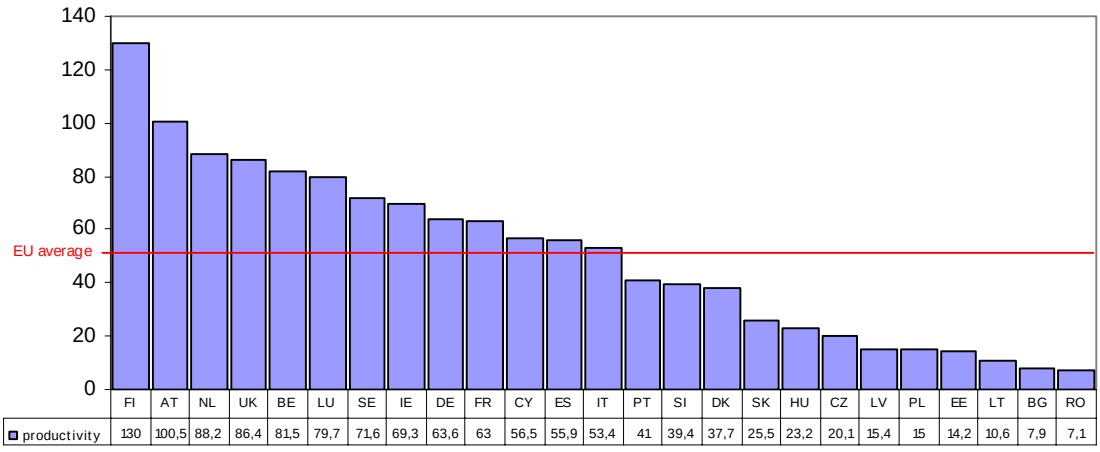
(Labour) productivity

The average gross value added per person employed in the EU recycling industry amounted to € 50.2 thousand in 2006. This is a significant increase since 2001, when gross value added per person employed was only € 35.4 thousand.

Large differences in labour productivity exist across the EU Member States, with average gross value added per person employed ranging from only € 7.1 thousand in Romania to € 130 in Finland. With the exception of Denmark and Portugal, all countries with a lower than average labour productivity are new Member States.

Differences in wages across Member States to a large extent explain the differences in labour productivity. Adjusting labour productivity for these wage differences, the picture is completely different with several of the new Member States showing the highest wage adjusted labour productivity in Europe (see Figure 3.8).

Figure 3.7 EU Recycling industry: gross value added per person employed (apparent labour productivity) (€ thousand), 2006[17]

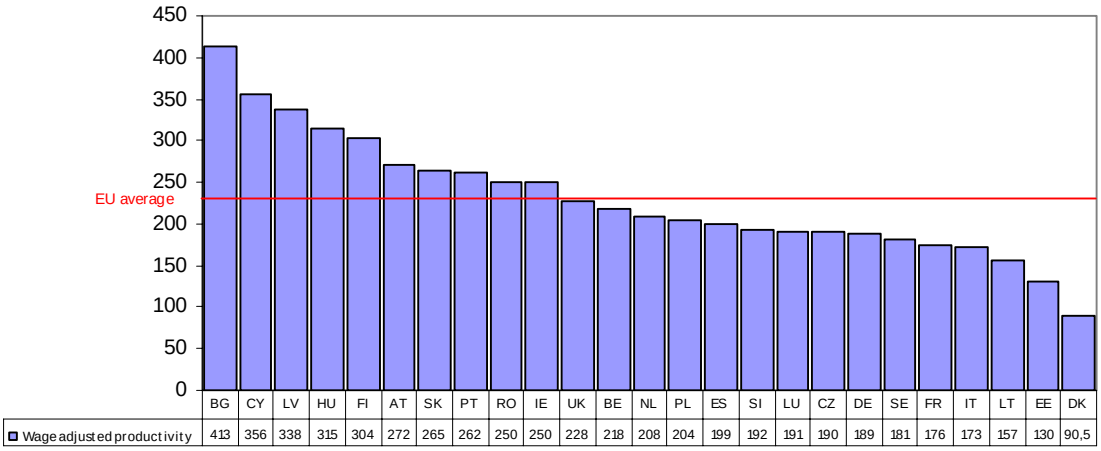


	FI	AT	NL	UK	BE	LU	SE	IE	DE	FR	CY	ES	IT	PT	SI	DK	SK	HU	CZ	LV	PL	EE	LT	BG	RO
productivity	130	100,5	88,2	86,4	81,5	79,7	71,6	69,3	63,6	63	56,5	55,9	53,4	41	39,4	37,7	25,5	23,2	20,1	15,4	15	14,2	10,6	7,9	7,1

Source: Eurostat SBS database

[17] 2005 data for RO, PL, NL, BG, IE

Figure 3.8 EU Recycling industry: wage adjusted labour productivity (apparent labour productivity by average personnel costs) (%), 2006[18]



Source: Eurostat SBS data base

Productivity enhancement

Although more automated sorting systems are coming into use - either displacing persons hand sorting in the EU or increasing sorting capacities - there are more collection activities needing more labour. Productivity enhancements are therefore rather limited.

Convincing millions of consumers to better sort their wastes would increase the quality of wastes entering the recycling systems, thus requiring less manual work in sorting. Also the introduction of the cradle-to-cradle principle – where products are designed with recycling at the end of the life cycle in mind – in many production systems, would potentially enhance productivity, as much of the difficulty in recycling comes from disentangling products that are not designed for recycling.

Demand side conditions

Economic motives make that there has always been a recycling industry. The use of secondary materials instead of new materials is for some industries (e.g. steel industry) much more cost efficient. The last decade however, legislation has become a strong driver for industry growth as well (e.g. end-of-life of household products, cars, etc.; landfill directive,…).

Especially in segments where the economic benefits are less pronounced, legislation has pushed growth. E.g. in recycling cars many more components are now being recycled that were not recycled in the past (e.g. plastics). For some components the question is raised whether this recycling is – even from an environmental point-of-view – so beneficial for society. Often these recycling processes are very costly and energy consuming.

As a consequence of the recent financial crisis and economic downturn, over the last few months prices for many commodities have collapsed. This has a tremendous impact on demand for recyclate materials and thus on the recycling industry (see further).

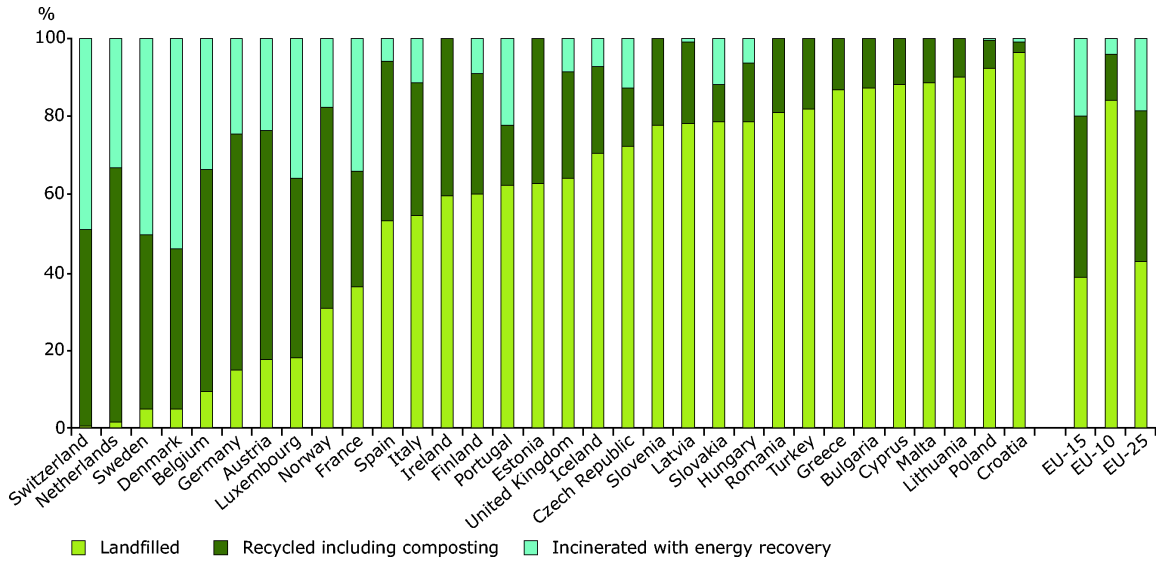
[18] 2005 data for RO, PL, NL, BG, IE

Competition and business strategies

Recycled materials are a commodity, customers look for good quality at a good price. Innovation does not directly drive competition. Only the large companies invest in R&D, especially with the aim of finding better recycling processes that enable them to get 'purer' recycled materials that can be sold at higher prices.

The sector will still grow in volume in Europe, given the fact that consumption has not diminished over the last decade. However, in some segments the percentage of waste that is recycled is already very high, leaving not so much room for further improvement. Only in the textiles segment, there is the impression that there is still considerable room for improvement. Looking at regional developments, the new Member States certainly still have a large potential for growth. Whereas in the old EU-15 Member States more than 40% of municipal solid waste is recycled, recycling only accounts for around 10% in the municipal solid waste treatment in new Member States (see Figure 3.9). Outside of Europe, also the economic growth regions such as the BRIC countries become important markets for the recycling industry.

Figure 3.9 Landfill, Recycling and incineration of municipal solid waste in the EU



EU-15 = old Member States

EU-10 = new Member States

Source: EEA, 2007

Internationalisation

International activities are limited to the large firms that specialise in the processing and delivery of recycled materials. The majority of SMEs (mainly active in collecting and sorting activities) is not internationally active. An exception is the special alloys segment, where SMEs do operate at an international level. As this segment is a very specialised segment with a limited amount of companies (of which many SMEs), most companies operate on a global scale.

It is expected that the recycling value chain (collecting-sorting-processing-delivery) will increasingly be organised on a global scale. As client (manufacturing) sectors move business outside of Europe, also parts of the recycling value chain follow. Especially the processing and delivery activities are affected, and processing plants move to the Middle East or BRIC countries. Collection and sorting remains a predominantly locally organised

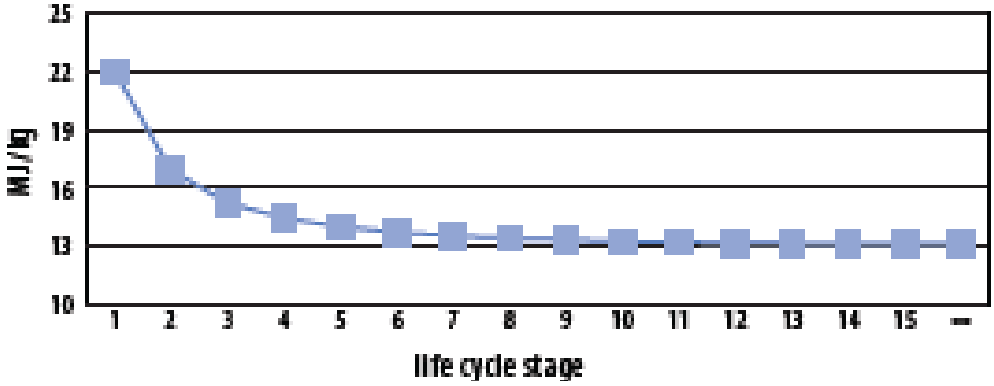
business. As a consequence of the global relocation process, also the international trade of 'waste' is expected to increase.

Although the move outside of Europe to a large extent goes hand in hand with the de-industrialisation process that is taking place, there is the impression that legislation in Europe does not help firms to stay here. Also the high energy costs in Europe push recycling companies to move business towards countries/regions with lower energy costs.

3.4 Recycling and the supply chain

The recycling industry plays an important role in the supply chain of many manufacturing companies. It contributes significantly to the cost efficiency of many client customers consuming recycled materials. E.g. In the steel industry about 50% of the materials used is recycled materials. By using steel scrap instead of iron ore in the production process, the energy requirements per kg of steel drastically reduce.

Figure 3.10 Average energy requirement reduction per kg of steel because of multiple recycling



Source: Eurofer

Potential barriers to optimal collaboration in the supply chain

Downstream

Especially initiatives, regulation,… hindering free trade of waste and recycled materials, such as the waste shipments legislation or trade barriers that governments put up in non-EU countries, make that the recycling sector cannot optimally provide other industries with the goods and services that they need. The existing trade barriers hinder access to customers and thus hinder free supply and demand.

Implementing the Directive 2008/98/EC on Waste, Art.6(2) determination that "End-of-waste specific criteria should be considered, among others, at least for aggregates, paper, glass, metal, tyres and textiles" could well provide the necessary relief for transporting processed scrap as a product from the scrap yards to its users such as the metal-works, pulp-mills, glass works etc.

Upstream

To be able to maximally provide industry customers with recycled materials, upstream producers of products should make use of a product design that optimally allows for dismantling and separation of all components ("design for recycling"). This allows the recycling industry to maximally recycle and thus to keep useful resources in circulation. However, it is felt that the implementation of such "design for recycling" needs to be driven/pushed by legislation, as there is a lack of economic incentive for the producers of products to use such design approach.

3.5 Regulatory and other framework conditions

The purpose of this section is to identify and prioritise the key framework conditions that influence the recycling industry both in terms of its own development and in terms of its inter-linkages with other industries (especially manufacturing industries). The analysis is based around a screening of the sector in relation to the main regulatory and framework conditions[19]; the overall assessment is summarised in Table 3.2.

Regulatory conditions and standards

Regulation

The recycling business is mainly affected by the EU Waste regulation. This is in the first place the revised Waste Framework Directive [*Directive 2008/98/EC*]. A good thing about this revised Directive is that it contains many definitions for terms that were undefined in the past. This led to a lack of transparency and uncertainty. Now some clear definitions have been introduced, thus creating a clearer framework for business.

Next to the Waste Framework Directive, the recycling industry is also influenced by the Waste Shipment Regulation [Regulation (EC) No 1013/2006]. In order to control waste shipments and ensure sound management of the waste, certain procedures and requirements have been introduced in international and EU law. The revised Waste Shipment Regulation streamlines the existing control procedures, incorporates recent changes of international law and strengthens the provisions on enforcement and cooperation between Member States in case of illegal shipments. As the recycling business is organising the value chain on an international scale, the sector depends on the shipment of waste to bring sorted waste to the processing plants and thus is directly affected by the Waste Shipment Regulation.

Apart from the above, also the different directives regulating the waste streams for different products clearly have an impact on the recycling industry, e.g. the End-of-Life Vehicles Directive [Directive 2000/53/EC], the Waste of electric and electronic equipment Directive [Directive 2002/95/EC] and the Directive on packaging and packaging waste [Directive 94/62/EC].

[19] This analysis is in accordance with the general framework for assessment of regulatory and framework conditions agreed as part of the Framework Contract of Sectoral Competitiveness Studies.

Single Market Functioning

The recycling industry expressed the view that at this moment there is enough regulation in place to – ideally – have a good framework for doing business within Europe. However, the problem in Europe is the very different implementation and enforcement of all these directives and regulations in the different Member States. Some Member States have very well implemented regulations and provide business with a stable framework for doing business. Other Member States however, make much less effort to make fair competition possible or change regulation and legislation. The case of Germany is mentioned, were current VAT regulation discriminate against remanufacturing. Also national bans on recyclates exist in some Member States. This makes that uncertainty for business is often too high.

Especially the current European Waste Shipment Regulation very much allows countries to take the opportunity to only protect the own benefits. One cannot really speak of a 'single market', but more of a 'patchwork of Europe'.

An important step in reducing the business uncertainty in the industry is the adoption of clear EU wide end-of-waste criteria, criteria that clearly define when a product is considered waste and when it is no longer considered waste. At this moment such clear criteria are lacking and each Member States gives own interpretations to what is considered waste.

Standards

Next to regulation, also standards and codes of conduct are very important elements in shaping the industry. Based on interviews with the sector there seem to be enough standards and codes of conduct available. The main issue now is to make them be used in a proper way. E.g. at this moment – with the financial crisis – a whole debate is going on in the industry about 'unethical' behaviour of companies not paying and not fulfilling commitments that have been made in the past, clearly acting against the codes of conduct in the industry.

An important guideline in the industry structuring business is the OECD manual on environmentally sound management (ESM) for waste, following the OECD Council Recommendation C(2004)100 on Environmentally Sound Management of Waste. Apart from helping government officers in the implementation of ESM, another purpose of the Guidance Manual is to help individual waste management facilities to continuously improve their environmental performance thanks to the implementation of "Core Performance Elements" (CPEs). It provides practical guidance on the implementation of these CPEs through examples of existing practices and the use of instruments or policies in relation to specific elements of ESM.

'Other' framework conditions

Knowledge and innovation

Innovation is mainly concentrated in the processing activities (although especially process innovation can also be found in sorting), and thus mostly in the large companies. Both competition and regulation push the innovation activities. On the one hand, recycling companies invest in the development of new recycling techniques to improve the quality of the recycled materials, enabling them to increase the price of the recycled material. On the other hand, as regulation pushes for more and more materials to be recycled (e.g. End-of-Life regulations) – materials that were destined for landfill before, innovation activities also concentrate on finding better and more efficient techniques for

recycling these materials. Over the years the role of legislation in innovation has grown and sometimes even pushes the industry to the limits of their current ability to deal with these new materials in an efficient way (e.g. recycling of plastics – see 'competition').

Access to finance

In terms of access to finance for innovation, there seem to be no real barriers. There seems to be enough financial means available for innovation in the sector. The only problem with many funds is the need for cooperation to get the funds. This seems to be a difficult issue for the industry. Collaboration in R&D is certainly not often done.

In light of the recent financial crisis (see also further), access to finance will clearly be influenced. Although future growth expectations are still positive and from a lending perspective the waste sector is still regarded as attractive, new investment projects will be confronted with an in-depth screening against the increased economic and financial risks. Expected financial results from the project will not only have to provide an appropriate return on the capital invested, but also appropriately compensate for the increased risks. Given the very difficult economic situation that the recycling business is in (collapse of prices of recyclate materials, see further), profit margins have dramatically decreased, thus making it hard to guarantee higher returns on investment.

Openness of international markets (trade and investment)

Apart from the 'implicit' trade barriers that still exist in the 'single European market', trade barriers to move specific recycled materials also exist in several countries worldwide (e.g. Russia and Ukraine being the most important to the EU recycling industry), often for protectionist reasons.

Constantly efforts are being made by e.g. BIR to remove trade barriers as only through free trade of recycled materials, companies in the industry can receive a fair price for their product. Trade barriers hinder free trade and distort competition.

Structural change

An important structural change directly affecting the recycling industry is the de-industrialisation in Europe. As the manufacturing industry is an important customer for the recycling industry and these customers are moving away from Europe, this directly impacts the competitiveness of the EU recycling industry. E.g. in the new Member States the steel industry has undergone a major restructuring. This has clearly affected the recycling industry locally. As mentioned earlier, it is expected that over time recycling companies will reorganize their value chain and relocate parts to outside of Europe.

A second driver of structural change affecting the recycling industry is the climate change. Being part of the core of eco-industries, the recycling industry plays a central role in issues such as sustainable use of resources and the development of life-cycle thinking in waste management.

Exogenous conditions and trends

Technological change

The development of new materials indirectly affects the recycling industry, as these new materials can pose new challenges to the industry for recycling. For example, for car

parts remanufacturing, the increased use of electronics in cars implies that certain mechanical parts are not in a car anymore. Therefore, remanufacturing of these parts is not possible anymore. This is a consequence of technological change and the remanufacturing industry will need to adjust to that. Public policy could help this adjustment process by supporting innovation activities of remanufacturing industry.

Socio-economic developments

Over the last few years the ecological awareness in Europe has increased exponentially. People start to realize that something needs to change in the way we live if we want to preserve the environment. More sustainable alternatives to the 'old' way of consuming are being introduced. Recycling clearly is one of these more sustainable alternatives. Over the last few years, Europe has moved up in the waste hierarchy (from disposal of waste to prevention of waste): whereas waste used to be mostly dumped (except for a number of materials such as steel that have always been recycled due to strong economic incentives), more and more attention is paid to the possibilities of recycling and lately concepts as life-cycle thinking and prevention of waste are being introduced.

Global competition

Global competition affects the recycling industry both directly and indirectly. As global competition in other industries forces companies to reorganize their value chain on a global scale (and thus to relocate many manufacturing plants to outside of Europe), this has an influence on the recycling industry as it means that the main customers of recycled materials move away and the EU recycling industry is losing customers.

Whereas in the past the EU recycling industry always had a strong competitive position in the global market, as a consequence of the de-industrialisation the EU recycling industry itself is losing market share.

Recent economic crisis

At the end of 2008, beginning of 2009 many commodity prices have seen a significant price fall, linked with the worldwide financial crisis. E.g. prices for Aluminium have dropped from over $3,000/mt to around $ 1,800/mt between April and October 2008. This unprecedented volatility has confronted the recycling industry with a high level of uncertainty and business risk. As prices for raw materials have collapsed, the economic benefits for customers of using recyclate materials have dropped significantly as well. This makes that demand for many recyclate materials has strongly decreased in that period. Mid 2009 a slight recovery of raw material prices could be observed, suggesting a mild recovery of the price for recyclate materials.

Figure 3.11 Aluminium: 2004 to September 2009 price evolution; USD/Kg

Source: Financial Times: http://markets.ft.com/tearsheets/performance.asp?s=US@AL.1 last accessed 29 September 2009

The market conditions of the beginning of 2009 made it economically unviable for both private enterprise and public bodies to continue to collect and recycle waste streams, with a subsequent threat to jobs in the recycling industry and to the investment already made in, for example, the separate collection of recyclates.

Screening of importance of framework conditions

Table 3.2 provides an overview of the relevance of the different regulatory and other framework conditions for the development and competitiveness of the recycling industry, as well as for its inter-linkage with other industries.

Table 3.2 Recycling industry: screening of framework conditions

Regulatory & 'other' framework conditions			Relevance	
Heading	**Item**	**Issues**	**Sector-level**	**Eco-industry interaction with other sectors**
Regulatory conditions	National regulatory measures		♦♦♦	♦♦♦
	EU regulatory measures		♦♦♦	♦♦♦
	Completion of internal market legislation	Different implementation and enforcement across Member States	♦♦♦	♦♦♦
	Industry and professional regulations and standards	Environmentally sound management (ESM) for waste	♦♦	♦
'Other' framework conditions	Knowledge: R&D, innovation and product/service development	▪ Development of new recycling methods pushed by legislation ▪ Design for recycling	♦♦	♦♦
	Labour force, knowledge and skills		0	0
	Openness of international markets (trade and investment)	Shipment of waste	♦♦♦	♦♦♦
	Structural change	▪ Process of de-	♦♦♦	♦♦♦

Regulatory & 'other' framework conditions			Relevance	
Heading	**Item**	**Issues**	**Sector-level**	**Eco-industry interaction with other sectors**
		industrialisation ▪ Climate change		
	Competition policy issues		0	0
Exogenous conditions	Technological change	Development of new materials	♦	♦
	Social and demographic change	More ecological awareness	♦	♦
	Global competition	▪ Loss in market share EU recycling industry ▪ Economic and financial crisis	♦♦♦	♦♦♦

Legend: 0: Not relevant
♦: Relevant
♦♦: Important
♦♦♦: Very important

3.6 Dynamic SWOT results

The following table summarizes the dynamic SWOT results for the recycling industry. The EU recycling industry has a relatively strong global position. The most advanced plants are found in the EU and the industry adapted to the relatively high environmental standards. The technology is mature, generating increasing quality of the recyclates. The basic laws and regulations are in place and consumers' awareness about the usefulness of recycling grows.

Yet the sector is extremely sensitive to the price variations of raw materials. Especially in perilous financial times SMEs, which form an important part of the industry, have a hard ride in terms of surviving, let alone finding capital for new investments.

Table 3.3 SWOT results for the recycling industry

Strengths	Weaknesses

• **Policy environment**: basic laws and regulations are in place
• **Consumers**: EU is an important consumers market with an increased and more widespread consciousness of the usefulness of waste management. Also on a global scale a favourable perception grows.
• **Technology**:
  o well developed and mature technology
  o increasing quality of recyclates leading to more widespread use
• **International competitiveness**:
  o the EU takes a leading role with a market share of 50%
  o EU companies are used to work with the higher EU standards
  o Most advanced plants are located in EU
	• **Sensitivity to price fluctuations of virgin material** as an alternative for recyclates. Current economic crisis strikes hard in this respect.
	• Dependence on the **activity of particular sectors**, e.g. automotive, construction
	• Different degrees and ways of **implementation** of EU directives within the various EU countries, e.g. vat rules, procurement rules, end of waste criteria.
	• **Capital**: finding enough capital in times of economic crisis is especially hard for SMEs.
	• **Market structure**:: SMEs form an important part of the local waste management services, with particular needs in terms of access to know-how, and capital

Opportunities	**Threats**

• **Policy-making:**
  o clear end of waste criteria
  o harmonized national implementation of appropriate regulations
  o equal VAT regimes and procurement rules for public and private players
  o green public procurement as an exemplar role
• **Innovation**: further cooperation between research institutes (e.g. universities) and the business community and R&D departments of market players
• **New markets**:
  o the New MS are considered having important market potential especially since compliance to EU regulations and standards will require new investments
  o BRIC countries due to increasing environmental
• **New applications**: wider use of recyclates in production processes
• **Potential cost decreases** and productivity increases in waste processing through wider application of C2C and eco-design concepts
	• **Financial crisis**::
	  o due to the financial crisis it became harder to get the necessary finance, leading to a postponement of innovative projects.
	  o prolonged economic crisis will increase strain on companies, especially the SMEs
	• **Commodity and oil price bust**: demand for recyclates and energy from waste will reduce
	• **Energy production** of waste (recovery) at the cost of recycling.
	• **Technological challenges** for recycling new materials in the context of end-of-life regulations
	• **R&D co-operation:** will remain rare within the industry
	• **Trade barriers** continue to exist with the rest of the world
	• **De-industrialisation** in the EU (main client) and **relocation**

With respect to the future development of the sector, quite a number of opportunities can be identified. Although the technology is mature, still technological challenges need to be overcome in the area of recycling new materials, in particular plastics. Initiatives that stimulate the interaction between the companies, as well as those that improve the interaction between the companies and the research community are undoubtedly helpful. It is nevertheless expected that over time recycling companies will reorganize their value chain, including potentially a relocation of certain activities outside of Europe.

The basic rules and regulations have been set in place. Yet progress can be made in terms of further operational refinement. Examples are improving the end of waste criteria, the harmonisation of VAT schemes and equal procurement rules and procedures for private and public players in the recycling industry.

3.7 Overview of potential policy issues

The purpose of this section is to identify potential areas for European policy initiatives that could have an important impact on the recycling industry's own development and on its interaction with other industries (especially manufacturing industries). The analysis is based on a screening of the sector in relation to existing industrial policy initiatives; the overall assessment is summarized in Table 3.4.

Key arguments for policy intervention

Societal drivers

Moving towards sustainable development and environmental care are among the largest challenges our society is facing today. Lack of or inadequate actions to move towards such society can cause many negative externalities. Therefore, sustainable development has been high on the political agenda for a number of years now and will remain in the future. A well functioning recycling industry is a vital part in a sustainable society. Handling the waste amounts created by our society in a more sustainable way than disposal clearly generates positive social externalities. However, moving towards a waste management system where recycling is fully integrated, needs a lot of (ecological) awareness creation, not only downstream in the value chain but also upstream. Life-cycle thinking in waste management should be introduced throughout the value chain, starting with the producers of goods. Especially introducing the concept of 'design for recycling' on a broader scale to effectively move up the waste management hierarchy still leaves a lot of improvement to enhance productivity in the recycling industry. It is felt that due to a lack of economic incentives to implement this concept in manufacturing, policy intervention is needed to make manufacturing industries introduce it. This could be done by bringing the manufacturers of products together with the recycling industry and by increasing the knowledge and skills available on 'design for recycling'

Market structure, conduct, market power

As a well functioning recycling industry is beneficial for society at large, policy initiatives should focus on enabling firms to do business in the most optimal conditions. In the previous paragraphs a number of regulatory barriers have been identified that hinder business in the EU recycling industry. Within Europe, specific attention should go

to lifting the barriers that still hinder the single market functioning. The lack of a uniform implementation of regulations at the level of the Member States creates an uncertain and non-transparent business environment and thus growth and investments in the industry.
Next to the creation of a stable framework for doing business, policy intervention might also be relevant in the area of innovation. At the moment, innovation in the recycling industry is minimal and largely restricted to the few large companies in the industry. However, as the industry is facing many new challenges and plays a critical role in the climate debate, policy can play a role in stimulating innovation in the recycling industry. As in most other industries, specific focus might be on SMEs.

Information asymmetries and regulation

Information asymmetries affecting the recycling industry mainly arise at the side of the end consumer. An efficient recycling system requires well sorted amounts of waste. This requires extra effort from households and industries to separate different sorts of waste and let them be collected via different channels. Despite this extra effort, end consumers are not always aware of the 'benefits' of it. There is often lack of insights into the way these different streams of waste are processed and eventually brought into the economy again. There is a clear role for policy to create more awareness of the usefulness and benefits of recycling to society at large.

Screening against policy initiatives

Table 3.4 provides an initial screening of the recycling industry against existing and potential EU horizontal 'industrial' policy initiatives[20]. This attempts to identify those policy initiatives that, if introduced or extended, could be of most relevance for the recycling industry, in particular in terms of raising performance (e.g. productivity improvements) and/or creating opportunities for sector development.

[20] Based on the Mid-term Review of Industrial Policy, COM(2007) 374.

Table 3.4 Recycling industry: screening of policy initiatives

EU Policy areas			Relevance	
Heading	**Initiatives**	**Issues**	**Sector-level**	**Eco-industry interaction with other sectors**
Trade	Trade policy	▪ Existing trade barriers hinder fair pricing ▪ Shipment of waste essential for industry	♦♦♦	♦♦♦
Better regulation	Proper functioning of the internal market	Lack of uniform implementation of regulation across Member States	♦♦♦	♦♦♦
	Public procurement		♦♦	♦♦
	Competition policy	Enormous impact of financial crisis	0	0
	Better regulation and simplification	Design for recycling concept	♦♦♦	♦♦♦
	Internal standards		♦♦	0
Knowledge and skills	Research and development		0	0
	Intellectual property rights		♦	0
	Innovation policy	▪ Innovation efforts limited, and mostly restricted to large companies ▪ Specific focus on SMEs	♦	♦
	Employment, qualifications, skills / 'Flexicurity'		0	♦
	Access to finance / risk capital	Impact of financial crisis	♦	0
Energy and environment	Waste, water, air		♦♦♦	♦♦♦
	Intensive energy use		♦♦	♦♦♦

Legend:
0: Not relevant
♦: Relevant
♦♦: Important
♦♦♦: Very important

4 Environmental technologies - environmental equipment providers

Environmental technologies are defined as "technologies that are designed to prevent or reduce the environmental impacts, at any stage of the life cycle of the products and activities". Examples of environmental technologies include: wind turbines, solar panels, water-treatment and waste-management systems, hybrid engines or bio fuels; sustainable construction - from passive houses to environmentally-friendly materials; and exploitation of information and communications technology to improve energy use or reduce pollution from industrial processes." (ETAP)

As such, 'environmental technologies' cover many different areas and therefore the sector is difficult to clearly delineate. Referring to our definition in part 1 of the report, and the different activity clusters that can be identified in eco-industries, environmental technologies is a vertical activity cluster encompassing technological development and production of equipment in each of the environmental classes (air, waste, soil and groundwater remediation, noise, etc.). Moreover, within each environmental class one can find very different technologies.

Figure 4.1 Environmental technologies: a fragmented sector

Business activities / Environment classes	Production of equipment and specific materials	Provision of operational services (incl. monitoring)	Provision of management services	Construction and installation of facilities	Innovation and technological development	Provision of environment consulting services	General public administration
A. CORE ECO-INDUSTRY							
1. POLLUTION MANAGEMENT							
Air pollution control	Environmental technologies				Environmental technologies		
Waste water treatment							
Solid waste treatment							
Soil & groundwater remediation							
Noise and vibration control							
2. RESOURCE MANAGEMENT							
Recycled materials							
Renewable energy production							
Water supply							
Nature protection							
B. CONNECTED ECO-INDUSTRY							
Eco-construction							

not main focus of study

4.1 Sector overview

Partly due to the broad definition of environmental technologies, the market of environmental technology suppliers is rather fragmented with many niche players in the industry. Most companies active in the industry are SMEs, only a few large players exist. Exact figures about the number of companies and employment are not available.

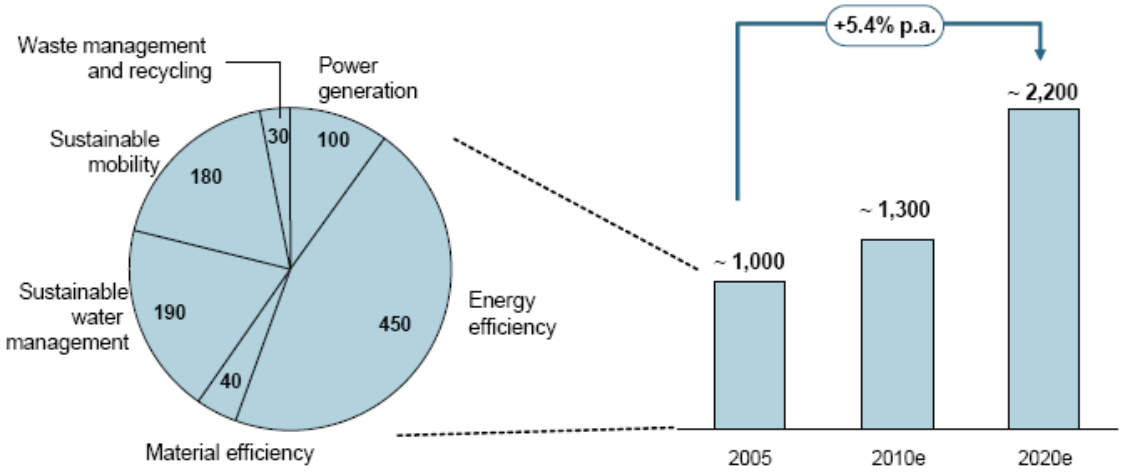
However, EUCETSA estimated in 2006 that around 30,000 companies are active in the industry and some 2 million workers.

The main 'product' of the environmental technologies industry is the manufacturing of equipment supplies. Services are delivered by certifiers, laboratories, consultants, etc. But this is limited, when compared to the delivery of goods.

The main clients are manufacturing industries, with a bias towards specific sectors e.g. the steel industry, chemical or paper industry. These industries have adopted many new environmental technologies over the last few years. A lot of their work has been developed in-house, other work has been done in collaboration with the environmental technology industry. These industries are frontrunners in terms of the implementation of environmental technologies. Many other industries still have a long way to go in reducing their environmental impact through the use of environmental technologies.

As still a lot of environmental challenges have to be dealt with in the future, it is expected that demand for environmental technologies will remain massive. In the medium to long term, there is a huge demand for cheap, but not necessarily low tech, environmental technologies in particular in less industrialised, developing, as well as rapidly industrialising countries in South America, Asia, and Africa. Large market opportunities are (still) expected to be found in especially the new Member States, the BRIC countries and mega-cities worldwide. In the industrialised countries a growth potential of especially 'intelligent eco-innovation' (more radical innovations) is present. A recent study[21] estimated that in 2005 the worldwide environmental technology market reached a value of around € 1,000 billion and it forecasts to double to some € 2,200 billion by 2020.

Figure 4.2 Global market volumes and forecast growth of environmental technology to the year 2020 (EUR billions)



Source: Roland Berger Strategy Consultants

[21] Roland Berger strategy consultants (November 2007), "Innovative environmental growth markets from a company Perspective", project on behalf of Federal Environment Agency Germany.

4.2 Micro data

The identification of companies within the environmental technology sector contains both environmental equipment providers and providers of environmental solutions. Nevertheless the sample is biased to equipment providers, which to a certain extent reflects the main activity in this environmental sector. The next table provides an overview of the main companies that are involved with the development of environmental technology. The list includes both engineering companies with a wide scope of applications across industries such as ABB and Alstom, as well as specialized environmental firms such as Umwelttechnik Österreich.

Table 4.1 The EU top 25 companies in environmental technology and equipment providers, based on operating revenue of 2006

keywords environmental technologies		
1	ABB LIMITED	GB
2	TECNIMONT S.P.A.	IT
3	SWH STADTWERKE HEIDELBERG NETZE UND UMWELT GMBH	DE
4	DIDIER-WERKE AG	DE
5	OUTOTEC OYJ	FI
6	NEUENHAUSER MASCHINENBAU GMBH	DE
7	DOPPSTADT CALBE GMBH	DE
8	WEISS UMWELTTECHNIK GMBH	DE
9	WILHELM GEIGER GMBH & CO. KG	DE
10	KELLER HCW GMBH	DE
11	MARIOFF CORPORATION OY	FI
12	PAUL WURTH UMWELTTECHNIK GMBH	DE
13	ECOSOIL SÜD GMBH	DE
14	GESELLSCHAFT FÜR ANLAGEN-UND REAKTORSICHERHEIT (GRS) MIT BESCHRÄNKTER HAFTUNG	DE
15	MALL GMBH	DE
16	RUDUS BETONITUOTE OY	FI
17	NEW-TEC WEST VERTRIEBSGESELLSCHAFT FÜR AGRARTECHNIK MBH	DE
18	ALSTOM FINLAND OY	FI
19	ARCADIS CONSULT GMBH	DE
20	SCHMOLCK GMBH & CO.KG	DE
21	SW UMWELTTECHNIK ÖSTERREICH GMBH	AT
22	MWB GRUNDSTÜCKSVERWALTUNGS GMBH & CO. KG	DE
23	NEM POWER-SYSTEMS, NIEDERLASSUNG DEUTSCHLAND DER NEM B.V. NIEDERLANDE	DE
24	TRIUMPH INTERNATIONAL HOLDING GMBH	DE
25	PIETSCH HAUSTECHNIK GESELLSCHAFT MIT BESCHRÄNK TER HAFTUNG	DE

Source: Amadeus database

4.3 Competitiveness analysis

Cost structure and labour

The environmental technologies industry is a capital intensive industry. The development and production of environmental technology supplies demands a lot of capital to invest in installations, the development of prototypes, etc.

(Labour) productivity

No labour productivity figures from macro or meso sources could be found. We envisage obtaining results from the micro-economic analysis on the base of the improved company selection.

Productivity enhancement

Most productivity enhancements in the industry take place through new technological and organisational innovations. E.g. new developments in ICT (use of CAD CAM, rapid prototyping) make that the development of prototypes can happen in a more efficient way. Also organisational innovations, such as the set-up of innovation networks where different partners collaborate to develop a new technology, increase productivity. Each partner in the collaboration can specialise and at the same time use the knowledge and expertise of the other partners to come to a new development.

Demand side conditions

Private sector

Environmental technologies include both process integrated technologies (PI) preventing pollutants being generated during the production process, and end-of-pipe technologies (EP) that reduce the release into the environment of any pollutants that are produced.

Process integrated technologies include the use of new materials, energy and resource efficient production processes as well as environmental know-how and new ways of working. Economic motives make that the manufacturing industry has always used PI technologies to make machinery more energy efficient, make more efficient use of resources, etc. However, the main driver was cost saving, not limiting the environmental impact of business as such.

Over the last decade the major growth in the industry has clearly been from a different kind. As more and more regulation has come into place to 'oblige' businesses to reduce their environmental impact, industries have been forced to use environmental technologies to effectively reduce their environmental impact. Often investments were concentrated in end-of-pipe technologies which do not have side-benefits, such as cost saving or increased throughput. Their implementation is mostly driven by legislation.

Public sector and public procurement

The public sector is an important client group for the environmental technologies suppliers. Today, public procurement of goods and services amounts to some 15 to 20% of final consumption. The public sector largely invests in infrastructure and monitoring systems, where environmental technologies can play a major role.

But not only is the public sector an important direct demand source, indirectly it can also affect consumers' behaviour/awareness and thus can help move eco-products into the mainstream. However, it is felt that the public sector is a rather 'conservative' buyer and could do more efforts to adopt new environmental technologies. With the introduction of the green procurement by public authorities a step in the right direction is taken to boost

demand for environmentally friendly goods and services, but as a major information gap exists between the environmental technologies industry and the public authorities (see further) the role of the public sector in the adoption of new environmental technologies is not optimised.

Competition and business strategies

As the environmental technologies industry is composed of many different niches, it can be said that competition in the industry happens on the basis of specific knowledge (innovation). However, price - especially the price at the moment of acquisition - remains very important in the buying decision of customers.

Over time, collaboration in the industry has increased. Different reasons explain this increase:

- As the industry (and society at large) is evolving towards a more integrated approach to tackle environmental challenges, more multidisciplinary know-how and expertise is needed. As the majority of players in the industry are very specialised SMEs, they need other partners to complement each other in projects.
- International collaborations are often set up between 'competitors' in different geographical markets to get access to new markets and new clients.
- As the development of new technologies often involves large investments, collaborations between different partners are also set up to share the risks of innovation.

Internationalisation

Many players in the environmental technologies industry are active on an international scale. As most companies are specialised niche players, the local (national) market is often insufficiently large to restrict business to this market. Therefore, environmental technologies companies do not even restrict business to the EU-market, but also export to non-European countries. Especially the BRIC countries are seen as interesting growth markets for the EU environmental technologies industry.

Global competitiveness

Until now Europe has been a frontrunner in the environmental technologies industry. In particular, the EU is championing eco-innovation practices in construction, food and drink, private transport and recycling. However, there is a strong need to improve the European position further. In the US many high-performing companies are active in the industry as well – especially focusing on renewable energy. Until now the environmental technologies industry in the US has not been supported as much as the European by public authorities (although in several US States many initiatives have been taken), but this might change drastically with the new presidency.

4.4 Environmental technologies industry and the supply chain

Contribution of the environmental technologies industry to the competitiveness of clients/customers

Still a broad range of opinions on the 'need' to invest in environmental technologies can be found across industries, going from 'environmental legislation is a burden we have to live with' to 'sustainable development is key for our business'. E.g. a study by POPA-CTDA[22] has found indications that especially in the new Member States the adoption of ET was perceived as causing high economic losses. Most respondents in the survey that they organised think that the necessary investment costs of environmental technologies are too high; they do not have the necessary financial resources, and the consumers are not willing to pay more for cleaner products.

But more and more manufacturing companies show interest in environmental issues 'beyond the window dressing'. This is shown e.g. in the participation of several large manufacturing companies in the recent "Resource efficiency alliance". Nevertheless, the adoption of new technologies by firms is still clearly dependent upon their economic attractiveness (profitability). Frequently cited benefits for adoption of environmental technology are off-setting rising costs of compliance, savings of raw materials and energy, higher quality of products, increased capacity and efficiency gains.

Over time 'supply chain schemes' (comparable to e.g. the tracing system in meat) will become increasingly important for all industries. The environmental technologies industry can play a critical role in the development and deployment of such schemes.

Potential barriers to optimal collaboration in the supply chain

The most important barrier for business between environmental technologies suppliers and other industries is lack of information and knowledge about the latest developments and potential of environmental technologies at the side of the customer. Customers (including the public sector) are not always aware of all possibilities or of the costs related to each technology. This makes that they do not purchase products/infrastructure with the lowest environmental impact, even when the cost of purchase is in the same range. They also still often only focus on the cost of purchase and do not take a longer view by considering the lifetime cost of goods. To realise the potential of environmental technologies, greater market acceptance needs to be created. A lack of awareness of the real costs of obtaining, using and disposing of materials and energy is still a significant barrier to the wider implementation of many eco-innovations.

Next to information, the absorptive capacity to adopt a new technology is just as important for companies to engage in environmental technologies. Lack of the necessary skills to adopt new environmental technologies is a potential barrier to collaboration in the supply chain. As there is a trend towards more integrated systems (e.g. developments in water energy), multidisciplinary skills will be more needed - not only in the environmental technologies industry itself, but also in the client industries - to optimally take up the new technologies. Often these skills are lacking within the client company at the moment. Also a study by POPA-CTDA[23] indicates that insufficient expertise and

[22] POPA-CTDA (2006), "Survey of Barriers and Drivers to innovation on environmental technologies in the European New Member States"

[23] POPA-CTDA (2006), "Industry sector background study"

understanding of clean technology and the current training and clean technology capacity building at the sector level play a role to consider in the uptake of new technologies by industry. The adoption of a new technology implies the need to integrate new knowledge and sometimes large organisational changes. Especially SMEs often lack the scale needed to introduce these new technologies and do the necessary organizational changes.

When we specifically look at knowledge and technology transfer between the environmental technologies supplier and the client, the protection of intellectual property rights is seen as a barrier for collaboration in innovation between the environmental technologies supplier and the client.

To better disseminate knowledge about environmental technologies and to improve communication, such that the information gap that exists at the moment can be reduced, the formation of partnerships between ALL stakeholders (going from research institutes, to customers, to government, NGOs,…) is crucial.

4.5 Regulatory and other framework conditions

The purpose of this section is to identify and prioritise the key framework conditions that influence the environmental technologies industry both in terms of its own development and in terms of its inter-linkages with other industries (especially manufacturing industries). The analysis is based around a screening of the sector in relation to the main regulatory and framework conditions[24]; the overall assessment is summarized in Table 4.2.

[24] This analysis is in accordance with the general framework for assessment of regulatory and framework conditions agreed as part of the Framework Contract of Sectoral Competitiveness Studies.

Regulatory conditions and standards

Regulation

At this moment the environmental technology industry expressed the view that there is enough regulation in place in the EU to – ideally – have a good framework for doing business. There are well-thought of directives and regulations in place. These regulations have not changed drastically over the last few years, thus providing a rather stable business environment.

However, the major problem in Europe lies in the implementation and enforcement of all these directives and regulations at national level. Some Member States have well implemented regulations and provide business with a stable framework for doing business. In other Member States however (e.g. UK, several new Member States), the national/local political will to take up these 'European' initiatives and follow up the implementation of it by business, is lacking. This results in very different interpretations of law across European countries, leading to barriers for doing business across borders.

Standards

Overall, the industry is not in favour of more standards. Standards are to some extent needed to earn confidence from customers, bankers,… but at the same time they are seen as too tedious and restrictive for innovation. The strictness of standards is seen as a barrier to innovation, taking away a lot of flexibility to deploy new technologies. Moreover, it causes extra delay at the moment of market introduction.

Nevertheless, the industry recognizes that customers and investors must know more precisely the performance and environmental benefits of different technologies so they can purchase and finance products with confidence that are often new to the market. Therefore, the industry is in favour of putting control and performance verification systems in place. Through such verification systems customers can evaluate new technologies on the basis of independent information and test data. In air emission technologies a very interesting initiative has been launched recently within the EU: AIRTV. It involves a self-developed instrument (by the industry) that allows customers to test and evaluate specific air emission technologies on an objective, independent basis. Such verification systems are already in use in among others the US and Japan.

Single Market functioning

In principle we can talk about a Single Market for environmental technology supplies. However, due to the large differences in implementation and enforcement of directives and regulations (see above), in reality no single market for environmental technologies exists. Different Member States ask for different certifications, costs of testing are very different across countries; recognition procedures are very different, etc. meaning that in reality still many obstacles remain for international business.

A good example of existing barriers to internationalisation is the case of the Belgian SME Deep Green, a company that has developed an innovative system for land remediation and had won a project in France for soil remediation. However, the company was not allowed to resell treated soil in France because it is still considered 'waste'. This made the project unprofitable (as the resale of the treated soil was part of the business plan) and thus the Belgian company withdrew from the French market.

In addition to the above mentioned barriers in the product market, there also still does not exist a single labour market in Europe. Although the barriers to the mobility of people within Europe have been largely overcome, labour market regulation is very complex across countries. Especially SMEs do not have the organisational capacity to deal with such complexity and therefore refrain from hiring.

To create an effective single European market for environmental technologies, tackling these issues is of utmost importance.

'Other' framework conditions

Knowledge and innovation

Innovation is a very important driver for the competitiveness of the EU environmental technologies industry. Constantly investing in new technologies and instruments that are more energy efficient or less environmentally damaging is a must to be able to fulfil the needs that the market has in terms of environmental technologies. As industries, governments, households are in an increasing need of new ways to produce, build, consume in a much more sustainable way (either due to an increased ecological awareness or due to environmental regulation/incentives to apply cleaner products and processes), this confronts the environmental technologies industry with clear challenges to be able to respond to this increased demand.

But not only the environmental technologies industry itself invests in new technologies, investments in eco-innovation happen across all industries and several companies that do not belong to the eco-industry invest in the development of cleaner/more energy-efficient products and processes (e.g. car manufacturers developing a hybrid car). Also in the 6th and 7th Framework Programme a lot of emphasis is put on eco-innovation. However, the results from the CIS-4 survey on innovation have shown that at least in the period 2000-2002 the number of eco-innovating firms was still very limited. Only 14% of innovating companies reported that 'reduced environmental impacts or improved health and safety' were a highly important effect of their innovation activity, on average across the EU27 (16% in industry and 11% for services).

Focusing on the environmental technologies industry, innovative initiatives come both from entrepreneurial initiatives in the environmental technologies industry itself and from customer demand. However, the last is the main driver for any innovation with market potential. E.g. the environmental technology to produce cleaner cars already exists for several years, however the car industry was not willing (due to a lack of (economic) incentives) to adopt this technology, implying that there was no market opportunity for this new technology.

It is widely acknowledged that the strongly increased customer demand for environmental technologies is positively influenced by regulation. Regulation forces manufacturing industries to adopt environmental technologies and thus increases demand for environmental technologies supplies. Various empirical studies (ZEW, 2001, Rehfeld 2006) confirmed that complying with environmental regulation was one of the key motivations to innovate among eco-innovation companies. The IMPRESS study (ZEW 2001) indicated that environmental regulations were important for both product and process innovations. The later survey on German companies on product innovation confirmed this finding indicating that compliance with regulations is a more important innovation goal for eco-innovators than for other innovators (Rehfeld et al, 2006). Similarly, CIS-3 indicates that eco-innovative firms rank meeting regulation requirements

as a highly important effect of their innovation activities more often than any other sector. Apart from the positive effects that regulation may also hamper R&D and innovation activities. Nevertheless, analysis of CIS-3 data suggests that the general perception of regulation as a barrier for innovation is not very significant compared with the positive effects of regulation on innovation activities (Europe INNOVA, 2008).

Access to finance

As climate change and other environmental challenges force industry and society at large to invest in environmental technologies, the need to properly finance environmental technology development and commercialisation has never been more urgent. However, access to finance remains a barrier for innovation in the environmental technologies industry. As FUNDETEC research highlights[25]: "The financing difficulties are perceived to be much more salient regarding environmental technologies, which are often considered riskier than other technology investments, and as they are more subject to regulatory risk, and experience greater competitive disadvantages within current market structures". The research found that problems of access to finance mainly relate to two aspects: 1) an expectation gap between technology developers, private investors and policy makers, 2) an existing gap between early-stage innovation and commercialisation leading to the so-called "valley of death". Public funding is mostly focused on pre-market research, not so much on later stages. However, finding enough funding to finance the demonstration phase and market introduction is as crucial for environmental technology firms. Financing these phases mostly happens through corporate funding or own funding.

Although there are venture capitalists active in the market (but they mainly focus on the larger SMEs and the larger projects), most of the SMEs still rely on traditional local banks for their funding. It is therefore very important for environmental technology suppliers to build a strong trust relationship with their bank. This is needed to overcome the information gap that exists between the highly innovative firms and the lenders. Traditional banks are not specialised enough in the technological specifications of the innovation project to be able to fully evaluate the risks involved. Moreover, traditional banks mostly have a rather risk averse profile, making it difficult for environmental technology suppliers to get the funds needed. Especially for larger projects involving higher investments (often already in the demonstration phase), it is difficult to find enough financial means.

Labour force and skills

As in all innovative industries, also in the environmental technologies industry human capital is of major importance for the industry's development. Especially a highly educated workforce in science and technology is of utmost importance to be able to remain competitive in the global marketplace. As demand for environmental technologies is rising, pressure on the environmental industry is rising as well. Within Europe the necessary amount of technically and technologically skilled workers is not available to fully support the growth. For the European environmental technologies industry to retain its competitive position, the influx of 'brains' and knowledge to complement skills of European citizens is needed. Therefore, being able to tap into the non-EU labour market is very important.. But not only is this influx needed because the skills are not sufficiently available within the EU. To be able to perform highly innovate research and develop

[25] FUNDETEC (February 2008), "Funding environmental technologies – final report"

state-of-the-art new environmental technologies, the best brains from all over the world are needed to reach this goal and keep Europe ahead of competing regions in environmental technologies. At this moment however, the labour market lacks the necessary flexibility to address this problem and attract knowledge workers from abroad.

Openness of international markets (trade and investment)

Export from the European environmental technology industry to non-European countries is very important and increasing. Especially the BRIC countries are very promising markets.

Environmental technologies companies as such do not encounter specific problems in doing business internationally/outside of Europe. However, as most companies in the industry are SMEs, they do encounter specific SME-related barriers to internationalisation. Differences in language and culture are especially a barrier for SMEs to collaborate internationally, due to the limited scale of the organisation and the limited resources. In international collaborations (e.g. for innovation projects) it demands a lot of extra effort and time to discuss differences across countries and find solutions that are of mutual interest. Also the many 'informal' barriers that still exist in the market (see case 'Deep Green' above) are particularly important for SMEs. All these differences and complexities put a considerable extra burden on the organisation.

As mentioned in the previous paragraph, a sector specific barrier in international markets relates to the labour market. No open global market exists for the attraction of non-EU people to work in the environmental technology industry. Large barriers still exist when "importing" non-EU workers. As the pool of people with the right technological skills within Europe is insufficient to fully support the growth of the industry,

Structural change

The major driver of structural change affecting the environmental technologies industry is clearly the climate change. It has been widely recognized and accepted that urgent measures and changes in our (consumption) behaviour are needed if we do not want to bring irreversible damage to our planet. The wave of legislative initiatives, goal settings and regulations that have followed this recognition, have been a direct driver for the EU environmental technologies industry to become what it is today.

Exogenous conditions and trends

Technological change

Changing technologies, including continued innovations in microelectronics, biology, chemistry and physics have significantly improved the environmental performance of technologies. Moreover, emerging scientific disciplines, such as bioengineering and nanotechnology are facilitating improvements in products and processes that dramatically cut waste and emissions and reduce resource use.

Societal drivers

Over the last few years the ecological awareness in Europe has increased exponentially. Changing social pressures have pressed companies to address the needs of society and the environment as never before. Issues, such as climate change, deforestation, air pollution and water pollution have pressed industry to find and improve products and processes in order to de-couple environmental impacts and economic growth. Companies also increasingly recognize that investments in environmental technologies can become a source of competitive advantage. This increased attention paid to sustainable development has directly increased the demand for environmental technologies.

Screening of importance of framework conditions

Table 4.2 provides an overview of the relevance of the different regulatory and other framework conditions for the development and competitiveness of the environmental technologies industry, as well as for its inter-linkage with other industries.

Table 4.2 Environmental technologies: screening of framework conditions

Regulatory & 'other' framework conditions			Relevance	
Heading	**Item**	**Issues**	**Sector-level**	**Eco-industry interaction with other sectors**
Regulatory conditions	National regulatory measures		♦♦♦	♦♦♦
	EU regulatory measures		♦♦♦	♦♦♦
	Completion of internal market legislation		♦♦♦	♦♦
	Industry and professional regulations and standards	Environmental verification systems	♦	♦♦
'Other' framework conditions	Knowledge: R&D, innovation and product/service development	▪ Access to finance for innovation ▪ IPR issues limit collaboration across value chain	♦♦♦	♦♦♦
	Labour force, knowledge and skills	Lack of sufficient scientific knowledge within EU	♦♦♦	♦♦
	Openness of international markets (trade and investment)	Lack of openness in labour market	♦♦	♦
	Structural change	Climate change	♦	♦♦
	Competition policy issues		0	0
Exogenous conditions	Technological change		♦♦	♦♦
	Social and demographic change	Rising consumer's environmental awareness	♦	♦♦
	Global competition		♦	0

Legend:
0: Not relevant
♦: Relevant
♦♦: Important
♦♦♦: Very important

4.6 Dynamic SWOT results

The next table provides an overview of the dynamic SWOT results for the environmental technology sector.

Table 4.3 SWOT results for the environmental technology – environmental equipment providers

Strengths	Weaknesses
• Solid strong **demand** for environmental technology solutions from both private and public companies • Increased global demand: especially BRIC countries • **Policy environment**: regulations for a single market are in place, as well as the necessary environmental regulations, e.g. IPPC • **Consumer awareness**: is increasing • **Public support for R&D:** FP7 and other funding programmes provide important stimuli • **Technological position:** EU has a leading position • **Innovation and R&D**: large potential for new applications and valorisation	• Implementation at **consumer** level: costs component relatively more important than future benefits • **Scale economies**: access to markets outside one's own country are important to realise scale economies and improve return on investment • **Internal market:** lack of uniform implementation of directives at the level of the MS creates an uncertain and non-transparant business environment, e.g. differences in cost of testing, recognition procedures. • **SMEs:** vulnerable during financial crises and relatively less resources are available for innovation and exploration of non-EU markets and dealing with different and complex labour market regulations across MS. • **Labour market** : o Technological skill shortages in certain areas o insufficient and difficult access to a world pool of highly skilled personnel • **Information asymmetries** between providers, potential clients, investors and authorities

Opportunities	Threats
• **Policy-making:** o harmonized national implementation of appropriate regulations o improved IPR could promote collaboration in innovation o uniform performance verification systems across MS o easier access to non-EU technology skills, more focussed education programmes • B2B and B2C **platforms** and forums to reduce information asymmetries, e.g. ETAP, ETPs • **Increased global demand**: both in BRIC countries and developing countries • **Innovation**: further cooperation between research institutes (e.g. universities) and the business community and R&D departments of market players, e.g. FP7 • **Technology**: more focus on process integration and prevention compared to end-of-pipe remediation	• **Crisis and finance**: the effects are different depending on the type of environmental market. In general the financial crisis has led to a postponement of innovative projects. Yet it is expected that in the medium term this will take up again. • **Labour**: lack of regular curricula focussed on environmental technology. • **Strong international competition** is likely to intensify, • **Policy: overregulation** leading to administrative burden, e.g. in the area of technological verification schemes. Better to optimize the implementation of current regulation than focussing on additional ones. • **Diverging** implementation of EU regulation among MS

The EU environmental technology and equipment providers have a relatively strong position in the global market. A large technological potential in various new downstream sectors can be identified. Furthermore a sound demand for environmental technology from both private and public companies is expected, both internally in the EU but even more in BRIC countries. Also the drive towards more process integrated environmental solutions geared at prevention rather than remediation opens an important potential.

Yet the EU internal market does not necessary operate as one since a uniform implementation of the various directives at the level of the Member States is currently lacking. Differences in costs of testing, recognition procedures or particular standards imply additional costs and hinder the full exploitation of scale economies. Especially for new applications and equipment the local markets of most Member States are too small to operate at a viable scale. The EU market is therefore essential.

Information asymmetries between providers of technological solutions on the one hand and potential clients, investors and authorities on the other hand do prevail. Therefore it can be suggested that B2B and B2C platforms and forums, such as ETAP and ETPs are very helpful. An improved harmonisation of the implementation at the Member State level of the various regulations is advisable.

A particular point of attention is the lack of skills in particular environmental technology areas. Experts in the field indicated that to their current knowledge no particular environmental technology degrees or curricula exist. Furthermore the current EU labour market regulations make it relatively costly for companies to attract the necessary high skilled people from outside the EU. It is of strategic importance that within the regular education trajectories as well as e.g. in lifelong learning schemes environmental technology gets its place.

4.7 Overview of potential policy issues

The purpose of this section is to make a preliminary identification of potential areas for European policy initiatives that could have an important impact on the environmental technologies' own development and on its interaction with other industries (especially manufacturing industries). To begin with, the possible arguments (justification) for potential policy intervention from an economic standpoint are examined. After this, the analysis is based on a screening of the sector in relation to existing industrial policy initiatives; the overall assessment is summarized in Table 4.4.

Key arguments for policy intervention

Externalities

As urgent actions are needed to decrease the ecological footprint of both companies and individuals, the EU has set the "20-20-20" goals (i.e. deriving 20% of the EU's energy use from renewable energies, reducing CO2 emissions by 20% and increasing energy efficiency by 20% by 2020) in 2008. To reach these ambitious goals, production and consumption patterns will have to change drastically and the further adoption of environmental technologies is a critical step. To this end, an economically viable and competitive EU environmental technologies industry is crucial. However, at this moment the industry is still faced with a limited demand for environmental technologies, given the major challenges that the EU is facing to reach these environmental goals. This suboptimal level of demand, might lead to suboptimal levels of investment in innovation and development and thus hamper the competitive position of EU environmental technologies companies.

The major challenge is to change consumers' preference for the lowest price at acquisition to a preference for the lower total cost over the life cycle as prices do not reflect the real value of natural resources. Consumers should be taught to take a more 'holistic' view at acquisition. A clear role for public authorities lies in the promotion of awareness of the commercial and environmental benefits of environmental technologies. The in 2004 by the Commission's adopted European Technologies Action Plan (ETAP) covers a wide range of activities promoting eco-innovation and the use of environmental technologies. However, still a long way has to be gone.

Market structure, conduct, market power

As a well developed environmental technologies industry is of critical importance to reach the "20-20-20" goals, environmental technologies firms should be able to do business in the most optimal conditions. In the previous paragraphs a number of regulatory barriers have been identified that hinder business in the industry. Within Europe, specific attention should go to lifting the barriers that still hinder the single market functioning. The lack of a uniform implementation of regulations at the level of the Member States creates an uncertain and non-transparent business environment and thus growth and investments in the industry. Nevertheless, a transparent business environment is critical for the industry, as the development of many new environmental technologies involves large amounts of investment and very long research periods (10 to 20 years to bring new technologies to a level of commercialisation is no exception). Only in a stable regulatory environment the necessary funds can be found to invest in new technologies.

Next to the creation of a stable framework for doing business, policy intervention remains important to stimulate and support SMEs to maximally use their entrepreneurship capabilities in developing their organisation and thus the industry. Across all industries SMEs are a vulnerable group due to their small scale operations. This is not different in environmental technologies. Their limited resources make that large investments in new developments are not feasible, access to finance is more difficult because of limited guarantees,… However, as SMEs play an important role in industry, their potential should be used to the full.

Information asymmetries and regulation

The environmental technologies industry is confronted with an enormous information gap that exists between them and customers, authorities and investors. This information gap relates to the lack of understanding of the technological possibilities of new environmental technologies, and the environmental and commercial benefits.

To help the take up of environmental technologies by industry the European Technologies Action Plan (ETAP) has identified that priority needs to be given to the establishment of performance targets in co-operation with all the relevant stakeholders and to the set-up of mechanisms to verify the validity of environmental technologies. As mentioned earlier, the development of environmental technology verification systems such as the AIRTV initiative can be strong instruments in decreasing the information gap.

Research and innovation

As in all other innovative industries, also in the environmental technologies industry policy measures and initiatives are needed to bring the innovation activities to an optimal level. Firstly, a clear role involves the support of basic research. Through initiates such as the 7th Framework Programme or specific European Technology Platforms (ETPs) the EC provides money and a platform for (collaboration in) environmental research. Other current EU instruments supporting R&D and innovation in environmental technologies are Environment LIFE, Structural Funds, Cohesion Fund and the Competitiveness and Innovation Programme (CIP). A second role involves the mobilisation of private financing for research. As the high level of uncertainty and risk related to innovation make that private funding is often too limited, public authorities can play a role to attract more private and public investment in the development and demonstration of environmental technologies in line with the EU objective of 3% of GDP for research e.g. by providing guarantee mechanisms to venture capital for environmental technologies.

Screening against policy initiatives

Table 4.4 provides an initial screening of the environmental technologies sector against existing and potential EU horizontal 'industrial' policy initiatives[26]. This attempts to identify those policy initiatives that, if introduced or extended, could be of most relevance for the environmental technologies sector, in particular in terms of raising performance (e.g. productivity improvements) and/or creating opportunities for sector development.

[26] Based on the Mid-term Review of Industrial Policy, COM(2007) 374.

Table 4.4 Environmental technologies: screening of policy initiatives

EU Policy areas			Relevance	
Heading	**Initiatives**	**Issues**	**Sector-level**	**Eco-industry interaction with other sectors**
Trade	Trade policy		0	0
	Proper functioning of the internal market	Lack of uniform implementation of regulation across Member States	♦♦♦	♦♦♦
Better regulation	Public procurement	Large information gap on costs/benefits of environmental technologies	♦♦	♦♦
	Competition policy		0	0
	Better regulation and simplification		♦♦	♦♦
	Internal standards	Introduction of environmental verification systems	0	0
Knowledge and skills	Research and development		♦♦♦	♦♦
	Intellectual property rights		♦	♦♦
	Innovation policy	Use of eco-innovation still limited across value chain (cfr. CIS-4)	♦♦♦	♦♦♦
	Employment, qualifications, skills / Flexicurity	Existing barriers to influx of non-EU skills	♦♦♦	♦
	Access to finance / risk capital	▪ Non-transparent regulatory framework leading to underinvestment ▪ Limited access to finance due to financial crisis	♦♦♦	♦
Energy and environment	Waste, water, air		♦	♦♦♦
	Intensive energy use		♦	♦♦♦

Legend: 0: Not relevant
♦: Relevant
♦♦: Important
♦♦♦: Very important

5 Renewable energy

5.1 Sector overview

Renewable energy can play a fundamental role in tackling climate change and environmental degradation. It also promises to make an important contribution to the security of energy supply in the light of global competition for increasingly scarce fossil energy resources. Due to these reasons, renewable energy has moved from the margins to the mainstream of power production within the last decade. The International Energy Agency (IEA) estimates that nearly 50% of global electricity supplies will have to come from renewable energy sources to halve GHG emissions by 2050 in order to minimise significant and irreversible climate change impacts[27]. Renewable energy is also seen as key to realising the EU's commitment to reducing GHG emissions by 20% by 2020 as outlined in the European Commission's climate and energy package.

Next to the environmental perspective, renewable energy is also increasingly recognised as a dynamic sector of the economy, with considerable growth and employment potential and is one out of six lead markets identified by the European Commission in the context of the 2007 Lead Market Initiative[28]. Especially high price levels for natural gas and oil have contributed to the attractiveness of renewable energy and have put the sector at the forefront of sustainable industrial growth and resource efficiency considerations.

However, the stage of technological development and market penetration differs considerably between renewable energy sources. Some forms of renewable energy are crossing the divide towards a competitive role in energy markets but there is still more terrain to cover among the different renewable energy sources in terms of economics, technology and scale. While hydro power forms part of the traditional energy mix and can compete with energy from non-renewable sources in terms of price, others are still largely at the stage of demonstration projects (e.g. wave and tidal power). Wind and solar are currently going through a phase of industry consolidation with increasing firm sizes and a growing number companies listed on the stock market.

It is important at the outset of this analysis to point out that the 'scope' of the renewable energy market in Europe varies considerably from country to country, depending largely on regulatory framework conditions. Therefore, it is *de facto* not a European industry as yet, but one that is concentrated in a minority of Member States. This should be borne in mind when talking about the European renewable energy sector.

[27] http://www.iea.org/Textbase/npsum/DeployRenew2008SUM.pdf
[28] COM(2007) 860 final

The following chapters describe the current state of the sector and the main factors determining its competitiveness, taking special account of client industry interaction and the renewable energy sector's place in the value chain. The following sector overview outlines the main characteristics of the sector by looking at the fundamental situation in terms of technological development, industry and company structure as well as market size, for each of the main renewable energy sources.

5.2 Micro data

A big part of the top 25-list, in function of turnover, in the renewable energy sub-sector are subsidiaries of the prominent European energy companies. Besides, there are specialized companies such as the wind turbine manufacturer Vestas[29], which started early in the process of developing a new technology and became market leader in their segment.

Furthermore, it is not a surprise that the German companies are well represented in the top 25. Germany was one of the first European countries to invest in renewable energy research and development (especially wind and solar). With the German Renewable Energy Law (EEG)[30], a successful deployment of renewable electricity has been achieved in Germany.

Table 5.1 The EU top 25 companies in renewable energy, based on operating revenue of 2006

renewable energy		
1	GALP ENERGIA, S.G.P.S., S.A.	Portugal
2	ELECTRABEL SA/NV	Belgium
3	VESTAS WIND SYSTEMS A/S	Denmark
4	H.T.S.O. S.A.	Greece
5	SKF AB	Sweden
6	SHELL ENERGY EUROPE B.V.	Netherlands
7	ABB OY	Finland
8	IBERDROLA RENOVABLES, S.A.	Spain
9	FORTUM POWER AND HEAT OY	Finland
10	SIEMENS WIND POWER A/S	Denmark
11	REPOWER SYSTEMS AG	Germany
12	EDF ENERGIES NOUVELLES	France
13	CARRARO SPA	Italy
14	GAZ DE FRANCE INTERNATIONAL TRADING	France
15	ACCIONA ENERGIA SA	Spain
16	ENEL ENERGIA S.P.A	Italy
17	HANSEN TRANSMISSIONS INTERNATIONAL NV	Belgium
18	POWEO SA	France
19	BONFIGLIOLI RIDUTTORI S.P.A.	Italy
20	EESTI ENERGIA AS	Estonia

[29] Vestas started in 1979 as one of the pioneers in the wind industry. With a 23 per cent market share, and 35,500 wind turbines installed, Vestas is today the world's leading supplier of wind power solutions.

[30] The German Renewable Energy Law – Erneuerbares Energien Gesetz (EEG) was established in 2000 and has been amended twice (2004 and 2006) since its inception. Its purpose is to facilitate the development of a sustainable energy supply. The EEG, a feed-in tariff system, obliges grid operators to connect renewable electricity (RES-E) plants, to purchase RES-E and to pay a fixed remuneration for the RES-E.

renewable energy		
21	BELUGA CHARTERING GMBH	Germany
22	NORDEX ENERGY GMBH	Germany
23	PRYSMIAN CABLES & SYSTEMS LIMITED	United Kingdom
24	CONVERTEAM UK LTD	United Kingdom
25	FORGITAL ITALY S.P.A.	Italy

Source: Amadeus database

5.3 Main sector characteristics by source and use

According to the European Renewable Energy Council (EREC), total turnover of the renewable energy sector in Europe is currently around € 45 billion[31] [32]. They further state that the sector encompasses some 1000 companies and employs 450 000 people.

Hydro

Hydro power refers to the conversion of the kinetic energy of water into electricity in hydroelectric plants and forms part of the traditional energy mix. Hydropower (large and small) accounts for around 85% of RES electricity generation. The distinction between small and large hydro plants is an EU accepted conventional rule (small = limit of 10 MW of installed capacity). However, in many EU countries small means more or less than 10 MW.

In 2006, hydro supplied 9.2% of electricity in the EU27 and, therefore, is by far the biggest renewable source of electricity today[33]. However, hydropower is not expected to increase significantly due to environmental concerns and a lack of suitable sites, particularly within the EU. The total capacity of small hydro installed in the EU25 was 11723.7 MW in 2006. The turnover of small hydropower in the EU is estimated at € 120-180 million per year and the sector currently employs around 20,000 people. The European hydro turbine manufacturers (large and small) have an annual turnover of about € 3.5 billion[34].

Biomass

Biomass is the biodegradable fraction of products, waste and residues from agriculture (including vegetable and animal substances), forestry and related industries, as well as the biodegradable fraction of industrial and municipal waste. Biomass resources can be converted into heat, power and transportation fuels using a range of different processes. The share of biomass in the energy mix differs widely between Member States: From 1.3% in the United Kingdom to 29.8% in Latvia, in the average 4.1%. Solid biomass for

[31] EREC, 2009

[32] We believe that this figure is underestimated as EREC doesn't cover all companies which produce renewable energy. Taking into account figures from Eurostat, contribution of renewables to electricity consumption was 537TWh in 2006 (i.e. 16.0% of total gross electricity generation EU27), contribution of renewables to heat consumption was 61.5Mtoe (=715TWh) in 2006 (i.e. 10.8% of the total heat generation EU27) and contribution of renewables to transport fuel consumption was 5.4Mtoe (=62.6TWh) in 2006 (i.e. 1.8% of total transport fuel consumption). In other words, the total contribution of renewables in 2006 was 1315TWh. Total sales for 2006 are then valued at €52.6 billion (at €40/MWh). Taking into account an annual 10% growth rate, turnover 2008 is estimated at nearly €64 billion.

[33] Source: Eurostat

[34] Source: EREC

heating purposes is the dominant form of biomass utilisation to date. Pellets, chips and various by-products from agriculture and forestry deliver the feedstock for burners, boilers and stoves.

Biomass for electricity production (bio-electricity) also plays an increasing role. Both dedicated biomass and biomass co-firing are used in the electricity generation sector. Special attention is given to biomass utilisation for simultaneous heat and electricity production in combined heat and power plants (CHP) which offer a higher degree of efficiency.

The European bio fuel for the transport sector is made up of two distinct sectors: biodiesel and ethanol. Biodiesel is produced from plants such as rapeseed or sunflower as well as from used cooking oils, tallow or algae (most of the time for use as an additive to diesel fuel). In 2007, the production of biodiesel in the EU27 amounted to 5,713,000 tonnes, with the majority of production coming from Germany (2,890,000 tonnes)[35]. Ethanol (also known as alcohol) is made by fermenting sugars (mainly from cereals such as wheat, maize, sugar beets, corn, barley or sugar cane) and can be used directly as a fuel in its own right and as a petrol additive. The top four EU producers of ethanol are France, Germany, Spain and Poland. The top six consumers are Germany, Sweden, France, Spain, Poland and the UK. Overall consumption of fuel ethanol in 2007 is estimated between 2.5 and 2.7 billion litres whereas total production was around 1.77 billion litres. The gap was, almost exclusively, filled by ethanol from Brazil (98% of imports)[36].

In Europe as a whole, more than 200 biodiesel production facilities were operational in 2008 and additional ethanol production capacity of over 3 billion litres per year was under construction. In Delftzuil (NL), the largest second generation bio fuels plant in the world (+200M litres) will come online in 2009. Industry pioneers in bio fuels are Royal Nedalco (NL), Logen (CA), Diversa/Celunol (USA), Abengoa (SP) and the Broin and DuPont consortium (USA).[37]

Wind

Wind power refers to the conversion of the kinetic energy of wind into electricity, using wind turbines. At sites with the best available wind resource as well as nearby grid access, wind power plants can be competitive with conventional electricity producers. The cost per unit of electricity generated depends on the quality of the wind resource (number of full load hours of operation, investment cost, operation and maintenance cost and turbine longevity. Wind power installations are capital-intensive so the cost of capital (discount rate) is also a decisive factor[38].

The wind power industry has been growing at an impressive rate, within and outside of the EU. The latest industry figures for the EU-27 wind energy market show that cumulative wind power capacity increased by 17.1% to 56346.9 MW (megawatt) at the end of 2007, up from 48122.7 MW at the end of 2006. The top three countries are Germany (22246.9 MW), Spain (15145.1) and Denmark (3132.1 MW)[39]. Six countries worldwide accounted for almost all wind turbine manufacturing in 2006: Denmark

[35] Source: European Biodiesel Board (EBB)
[36] Source: European Bioethanol Fuel Association (eBIO)
[37] Ren21, 2009 update
[38] IEA (2008) Renewable Energy Essentials: Wind, Paris.
[39] Source: European Wind Energy Association (EWEA)

(35.5%), Germany (22%), Spain (18.4%), United States (15.5%), India (7.7%) and China (2.2%). With a combined share of 75.9%, the EU clearly has a dominant market position. According to the IEA, the global wind industry employs around 200.000 people[40]. Wind energy companies in the EU directly employed 108,600 people in 2007; when indirect jobs are taken into account, this figure rises to 154,000.[41] A significant share of direct wind energy employment (approximately 75%) is located in three countries, Denmark, Germany and Spain, whose combined installed capacity represents 70% of the EU total. Wind turbine and component manufacturers account for most of the jobs (59%).[42]

In 2008, the top 10 wind turbine manufacturers globally were (in order of production): Vestas (Denmark), GE Wind (USA), Gamesa (Spain), Enercon (Germany), Suzlon (India), Siemens (Denmark), Sinovel (China), Acciona (Spain), Goldwind (China), and Nordex (Germany). These top 10 were responsible for 85 percent of global production in 2008. The industry continued to push turbine sizes upward, with turbines models of 3 MW or larger now in commercial use (made by Enercon, Repower, Siemens,Vestas, and WinWind).[43]

Geothermal Energy

Geothermal energy is the energy stored in the form of heat below the earth's surface. Beside electric power generation, geothermal energy is today used for district heating, as well as for the heating (and cooling) of individual buildings, including offices, shops and residential houses. The use of geothermal schemes depends on the quality (temperature and density) of the heat available. Relatively low quality heat is used as an input to district heating schemes and some industrial processes, and higher quality heat can be used to produce steam for electricity production in turbines. There is still significant potential to exploit geothermal heat, particularly in the form of heat pump technology.

When it comes to the overall utilisation of geothermal energy, the leading countries in the EU are Italy and France. The leading EU countries in terms of market for geothermal heat pumps are Sweden, Germany and Austria[44].

Solar Power

In the area of electricity generation from sunlight, two technologies currently dominate the market: photovoltaic (PV) and concentrated solar power (CSP).

Photovoltaic refers to the direct generation of electricity from sunlight using solar cells based on semiconductor materials. The most common material used in solar cells is standard crystalline silicon. However, in recent years other technologies including casting wafers instead of sawing, thin film (CdTe, CIGS, amorphous Si, microcrystalline Si), concentrator modules, 'Sliver' cells, and continuous printing processes have been successfully introduced and technological progress remains intense. The three main segments of the PV market are grid-connected systems, off-grid systems and appliances. Until today, the European grid-connected market has been pulled by the rapid development of the German market, essentially based on the Renewable Energies Law (EEG), which, since August 2004, obliges electricity suppliers to purchase photovoltaic electricity at a predefined tariff. Out of a total of 1541.21 MWp installed in 2007, 1103.00

[40] IEA (2008) Renewable Energy Essentials: Wind, Paris.
[41] EWEA (2009), Wind at work
[42] EWEA (2009), Wind at work
[43] BTM Consult (2009), BTM Wind Market Report 2008
[44] European Heat Pump Association

MWp were installed in Germany.[45] Taken together, the top 5 European countries (Germany, Spain, Italy, Portugal and France) account for almost 99% of total capacity installed in the EU.

The leading companies in the solar PV industry in 2008 are Q-cells (GE), First Solar (GE), Sun Tech (China) and Sharp (Japan).[46]

The second method to turn sunlight into electricity is referred to as Concentrated Solar Power (CSP). CSP uses reflector shields (mirrors) to concentrate sunlight. At different stages of technical development, there are four main CSPs technologies to produce thermoelectricity from the sun: parabolic troughs, tower technologies, dish stirling and fresnel. Additionally, photovoltaic and concentrated solar power systems can be combined to concentrate sunlight onto a photovoltaic surface. Currently around 400 MW are commercially operated. In Europe around 300 MW of concentrated solar power plants are either operating or under construction. The installed capacity in Europe is expected to be of 500-1,000 MW by 2010.[47]

CSP saw many new entrants in 2008. Active project developers grew to include Ausra, Bright Source Energy, eSolar, FPL Energy, Infinia, Sopergy and Stirling Energy Systems in the United States; Abengoa Solar, Acciona, Iberdrola Renovables, and Sener in Spain; and Solar Millennium in Germany.[48]

Solar Thermal

Solar thermal stands for the use of sunlight for heating or cooling processes. Currently, the dominant application is hot water and space heating in residential and commercial buildings. Other applications include support to district heating, solar assisted cooling and industrial process heat. A growing number of demonstration projects also show the considerable potential for solar assisted cooling. Solar cooling is at the edge of wide market introduction and substantial cost reductions can be expected in the next few years. Since peak cooling demand is associated to high solar radiation, solar cooling could become an important answer to this challenge in the future.

Solar thermal in Europe is growing at an impressive pace. The capacity in operation was 5 GWth in 1997, 10 GWth in 2004 and is expected to reach 15 GWth in 2008. However, this development is driven by a few leading countries. Almost three quarters of the EU market is still concentrated in just three countries: Germany, Greece and Austria. The capacity in operation per capita (kWth / 1000 inhabitants) ranges from 431 in Cyprus to 179 in Austria and Greece, to less than 10 in high-potential countries like Italy, France and Spain. According to the European Solar Thermal Industry Federation (ESTIF), there are more than 20,000 full time jobs in the solar thermal area in the EU.

Ocean Energy

Ocean energy conversion technologies exploiting the kinetic energy of tidal and wave movement have not yet reached commercial stage. However, major achievements have taken place over the last few years with various ocean energy systems having been

[45] http://energy.eu/renewables/member-charts/photovoltaic-capacities.html
[46] REN21 (2009 update)
[47] http://www.abengoasolar.com/sites/solar/en/our_projects/solucar/index.html
[48] REN21 (2009 update)

deployed at sea in several countries and these technologies are slowly making the transition from research to demonstration to market penetration.
Though ocean energy technologies are not yet economically competitive with more mature renewable energy technologies such as wind, in the medium term these technologies are expected to become significant contributors to energy markets close to Europe's shores. Due to the still largely experimental character of ocean energy there are no data on turnover and employment. Both can be expected to be minimal at present.

5.4 Competitiveness analysis

5.4.1 Cost structure and labour

Most renewable energy sectors are very capital intensive. Even not taking into account the huge R&D costs, the initial investments to set up a wind park or biomass plant or a plant for solar panels are very high. Once the plant is operational, labour costs (thus O& M) – in general – make up a limited amount of total costs.

Concerning employment, figures can be substantially different in function of the source. However, most indicate that Europe should now be close to 400,000 jobs in the renewable energy sector (direct and indirect). Above, there are good prospects that these numbers will mushroom to more than a million the next decade (some even talk about a few million). Question is how many of these will be net? A modeling exercise supported by the EU (see table below) found that under current policies, there could be a net gain of 950,000 direct and indirect FTE by 2010 and 1.4 million by 2020.[49] We believe this isn't realistic also due to a deceleration of new activities related to the economic downturn. We are also convinced that the switch from one sector to another will be higher which means that less netto jobs will be created.

Table 5.2 Employment growth compared to 2000 (1000 Full Time Employment quivalent/year)

	Current Policy strategy		Advanced Policy Strategy	
	2010	2020	2010	2020
Renewables Industry (gross)	726	1020	1376	1987
Agriculture (gross)	346	510	557	761
Conventional displacement	-37	-45	-48	-63
Support mechanisms	-85	-41	-225	-220
Total net employment growth	950	1443	1660	2463

We will focus on Germany as an example for the whole energy intensive industry and on the wind industry (for EU27) as it is the most developed sub-sector.

[49] EREC (2007), Renewable Energy Technology Roadmap up to 2020.

The whole sector: the German case

In 2007, based on numbers from the Renewable Energy Statistics Working Group (AGEE-Stat), the total of new investments in Germany for new installations was €10.6 billion: 44% went to photovoltaic, 20% to wind, 13% to biomass electricity, 10% to biomass heat, 7% to solar thermal and 6% to geothermal. Only 1% went to hydropower. However, even if the domestic investment decreased in 2007 for the first time, turnover of the German domestic manufacturers of RE installations increased in total due to the strong increase in sales volume of photovoltaic systems as well as the undiminished strong competitive position of German wind turbine manufacturers in the consistently growing world market. For the year 2007, the total turnover of the manufacturers was in the €11.8 billion range, an 11% increase over 2006. The gross employment figures that result from this turnover account for around 146,300 people in 2007 (see table underneath). With the growing numbers of installation assets, the employment effects in operations and maintenance become increasingly relevant (they are calculated as a percentage of the investment costs). In 2007, employment due to operations and maintenance of installations using renewable energy increased by 13% to 47,400 people. For biomass the supply of fuels, for transport, power and heat, has to be considered (51,300). In total the gross employment figure is around 245,000 for the year 2007, an increase of about 6%.

Table 5.3 Employment of various sub-sectors in the renewable energy sector in Germany

	Employment from investment (incl. export)	Employment from operation & maintenance	Employment from supply of biomass	Total employment 2007	Total employment 2006
Wind	67500	16800		84300	82100
Photovoltaics	36700	1900		38600	26900
Solar thermal	10200	1900		12100	13300
Hydropower	5000	4400		9400	9400
Geothermal	4200	300		4500	4200
Biomass	13900	17400		31300	33800
Biogas & liquid Biomass	8800	4700		13500	11400
Biomass for power			22800	22800	18200
Biomass for trans-port			28500	28500	32000
Total	**146300**	**47400**	**51300**	**245000**	**231300**

Source: EWEA survey; ADEME, 2008; AEE, 2008a; DWIA, 2008; Federal Ministry of the Environment in Germany, BMU 2008

Wind

In 2007, wind energy increased more than any other power generating technology in the EU. The growth in installed wind capacity has been matched by an increase in related jobs. According to 'Wind at Work'[50], the sector employed 154,000 people in 2007 - 108,600 in direct jobs and the rest indirectly. Compared to 2002, this is an increase of 125%.

[50] Wind at work, European wind energy association, January 2009

Table 5.4 gives the numbers of direct employment from wind energy companies in the EU27. Currently 75% of all direct wind energy jobs are to be found in the three 'pioneer' countries of Denmark, Germany and Spain, but other countries, such as France, the UK and Italy are now beginning to catch up.

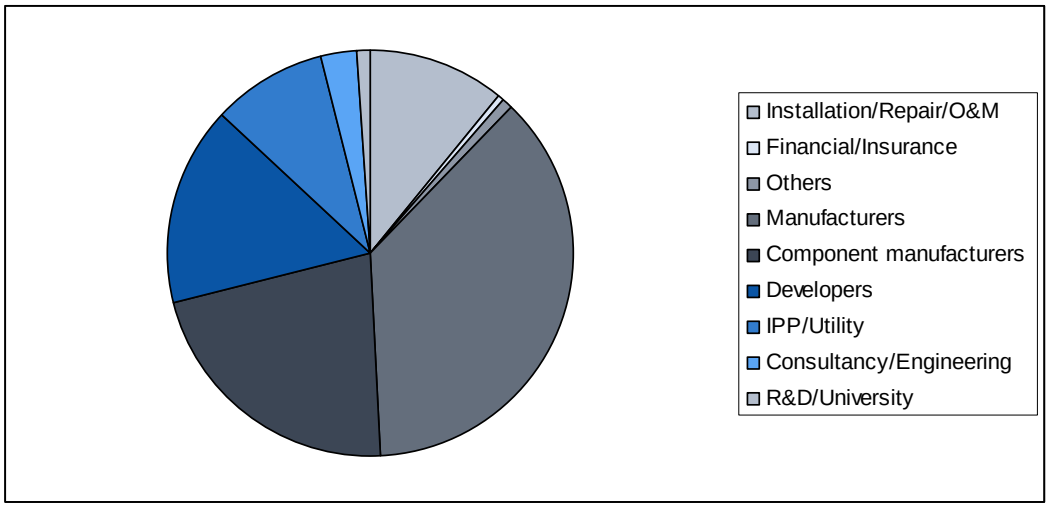
Table 5.4 Direct employment in the EU27 wind industry

Austria	700
Belgium	2000
Bulgaria	100
Czech Republic	100
Denmark	23500
Finland	800
France	7000
Germany	38000
Greece	1800
Hungary	100
Ireland	1500
Italy	2500
Netherlands	2000
Poland	800
Portugal	800
Spain	20500
Sweden	2000
United Kingdom	4000
Rest of EU	400
TOTAL	108600

Source: EWEA survey; ADEME, 2008; AEE, 2008a; DWIA, 2008; Federal Ministry of the Environment in Germany, BMU 2008.

In terms of job profiles, the EWEA report shows that turbine manufacturers are the main employers, with 37% of all direct jobs, followed by component manufacturers and project developers (see also figure underneath).

Figure 5.1 Direct employment by type of company, according to the results of the EWEA survey



Source: Wind at work, wind energy and job creation in the EU, EWEA, 2009

The booming performance of the wind industry has led to a multiplication of job offers, especially in manufacturing and development activities. In the handbook for career advisors and occupational councillors dedicated at the renewable energy sector most job profiles related to the sector were listed (going from all different kind of engineers to landscape architects, planning consultants, people for site management activities and technicians. Most of them are highly educated people or people with special skills.

(Labour) productivity

Calculated on basis of the turnover and employment figures provided by EREC for the renewables sector in the EU, average turnover per person employed is around 100.000€. However, this turnover can be reached in countries like Germany and Denmark but are considerably lower in Southern Europe. Based on figures from the Spanish wind association (AEE) turnover per person employed (direct and indirect) is around 43.000€ in 2007. Labour productivity (calculated as GDP over turnover pp employed) showed a steady increase over several years but it seems – in those first mover countries like Germany, Denmark and Spain – that it will be difficult to continue this line in the coming years (as the market is becoming more mature and international competition thus more severe).

Table 5.5 Labour productivity in the Spanish wind energy industry

	2003	2004	2005	2006	2007
real GDP (base 2003), m €	706.932	727.395	750.144	774.957	799.479
Turnover wind energy sector	1021	1170	1332	1533	1663
Dir + indir employment	27.211	29.413	32.133	35.319	37.730
Turnover per person employed (in €) [t]	37.522	39.778	41.453	43.404	43.281
labour productivity [GDP/t]	0,053	0,054	0,055	0,056	0,054

Source: Estudio macroeconómico del impacto del Sector Eólico en España, December 2008

5.4.2 Productivity enhancement

Some renewable energy sub-sectors – like ocean energy are still in the phase of research and small scale projects. Others like geothermal and hydro are difficult to process towards assembly lines as – most of time – tailored made solutions are asked for. For solar and wind (onshore) there is a growing tendency to move from small-scale, workshop-based production processes towards and higher degree of automatisation.

5.4.3 Demand side conditions

Demand for renewable energy installations largely comes from three client groups: consumers, commercial customers and project developers. In all three groups, legislation has been driving demand to a large extent in the past and is expected to stay an important factor for future demand (see Regulatory and other framework conditions).

5.4.4 Competition and business strategies

In Germany, The wind energy market is increasingly characterized by strong competition dominated by large institutional investors. Bioenergy has not yet established a similar industrial structure with respective competition, therefore higher future returns are expected in this sector compared to that of wind or solar energy. Expectations are also higher for foreign markets than for the German domestic market.

Vertical integration is in issue in the wind and solar industry due to supply chain problems (see supra).

5.4.5 Internationalisation

Stock-market listed companies in the Wind and PV sectors have reached a high degree of internationalisation. The large renewable companies in the EU, like the Danish wind turbine producer Vestas, sell the bulk of their production outside of their respective home markets. In contrast to that, the majority of SMEs in the sector are still strongly focused on their home markets.

Especially in the German wind sector, most see themselves in a good starting position for sales of products and services internationally. In 2015, more than two thirds of the surveyed German manufacturers expect export quotas of more than 30%, almost half of them expect quotas of more than 50%.

By August 2008, at least 160 publicly traded renewable energy companies worldwide had a market capitalization greater than $100 million.

5.5 Eco-industry and the supply chain

Supply chain structures are specific to each of the segments of the renewables market. The most detailed information is available on the PV and wind segments which will be used as examples.

In the PV industry, the cost of the solar module represents around 50 – 60% of the total installed cost of a solar energy system. Therefore, the module price is the key element in the total price of an installed solar system. For the bulk of solar cells, the main input is polysilicon mostly provided by multinational chemical companies (even though a number of large PV module producers started integrating polysilicon production into their businesses). Growth in solar energy has caused shortages of polysilicon and pushed prices to over $400 per kilogram on the spot market in 2008 from just $30 a few years ago. Before the recent solar energy boom, most polysilicon was used to manufacture semiconductors. The new polysilicon production is largely being reserved for solar cell makers, meaning its availability to solar cell makers is expected to increase substantially. Balance of system (BOS) components including everything in a photovoltaic system other than the photovoltaic modules (mounting structures, tracking devices, batteries, power electronics including an inverter, a charge controller, and a grid interconnection) and finally the installation and maintenance of the PV systems account for the remainder of total costs.

In the wind industry, the cost of a turbine can be split up in many different parts/components (up to 8000), which indicates already the many possible bottle necks in the supply chain. Related to cost structure we could say that the most expensive parts are the tower (26%), the rotor blades (22%), the gear box (13%) and the convertor (5%). Bottle necks in the supply chain occur due to high demand, the still limited number of suppliers of some components (which are different from the wind turbine manufacturer), a lack of harbour facilities (for the off shore sector) and the availability of raw materials which resulted in huge price increases (wind turbines went up to 50% and more in three years time). Raw materials whose prices have increased substantially are steel (used in towers, gearboxes and rotors), copper (used in generators) and carbon (used in rotor blades). So, shortages are not only due to a lack of enough investment by the wind turbine manufacturer but also due to the component supplier (who has to do major investment with up to two years lead-in time). The following table indicates the major turbine manufacturers and their suppliers. It gives also a good idea about the internalization of the wind industry and by which extend the sector is vertical integrated.

To cope with the supply issue, some turbine manufacturers are structuring their organization. Of the leading manufacturers, Enercon, Gamesa and Vestas have historically produced all or most of their main components in-house and after the purchase of the Belgian gearbox manufacturer Hansen, Indian company Suzlon is also vertically integrated. Germany on the other hand, has outsourced more, including its blades, considered by many to be the most vital component. Outsourcing raises issues not just of secure supply but also of quality control and design confidentiality.

Table 5.6 Major wind turbine manufacturers and their suppliers

Turbine maker	Rotor blades	Gearboxes	Generators	Towers	Controllers
Vestas	Vestas, LM	Bosch Rexroth, Hansen, Winergy, Moventas	Weier, Elin, ABB, LeroySomer	Vestas, NEG,DMI	Cotas (Vestas), NEG (Dancontrol)
GE Energy	LM, Tecsis	Winergy, Bosch, Rexroth, Eickhoff, GE	Loher, GE	DMI, Omnical, SIAG	GE
Gamesa	Gamesa, LM	Echesa (Gamesa), Winergy, Hansen	Indar (Gamesa),	Cantarey	Gamesa Ingelectric (Gamesa)
Enercon	Enercon	Direct drive	Enercon	KWG, SAM	Enercon
Siemens Wind	Siemens, LM	Winergy ABB Roug	KGW Siemens	Roug, KGW	Siemens, KK, Electronic
Suzlon	Suzlon Hansen	Winergy Suzlon	Siemens Suzlon	Suzlon	Suzlon, Mita Teknik
REpower	LM	Winergy, Renk, Eickhoff	N/A	N/A	Mita Teknik, ReGuard
Nordex	Nordex	Winergy, Eickhoff, Maag	Loher Nordex	Omnical, Nordex	Loher Nordex, Mita Teknik

Source: BTM Consult

5.6 Regulatory and other framework conditions

The purpose of this section is to identify and prioritise the key framework conditions that influence the renewable energy sector both in terms of its own development, and in terms of its inter-linkage with other industries (especially manufacturing industries). The analysis is based around a screening of the sector in relation to the main regulatory and framework conditions[51]; the overall assessment is summarised in table 5.7.

5.6.1 Regulatory conditions

The development of the renewables sector in the EU has been strongly influenced by regulation on both the national and European level. The reason is clear: without these financial incentives on MS level[52], renewable energies couldn't – and most of them still can't – compete with conventional energy sources. This is without taking into account the environmental cost and other externalities of conventional energies.[53] Wind energy, biomass, small hydro, photovoltaics and geothermal are already today significantly

[51] This analysis is in accordance with the general framework for assessment of regulatory and framework conditions agreed as part of the Framework Contract of Sectoral Competitiveness Studies.

[52] On EU-level, financial incentives are given through the research programs like FP5, 6 and 7 (thus R&D related).

[53] In several MS conventional fuels (e.g. nuclear, coal) are still receiving direct or/and indirect subsidies.

cheaper for society than coal if externalities are included (cf. Green Paper on Security of Supply).

On the European level, the 'Electricity Production from Renewable Energy Sources Directive 2001/77' (RES Directive), first established national indicative targets for renewable energy production from individual Member States. In 2003, the directive 2003/30/EC on the promotion of the use of bio fuels or other renewable fuels for transport was voted, which boosted the European bio fuels market. More recently, April 2009, both directives were amended and updated in the directive on the promotion of the use of energy from renewable sources. In this directive, the legally binding renewables target for 2020 were set along with a clear trajectory how to reach them (incl. national renewable energy action plans, access to the grid, guarantees of origin, criteria for bio-fuels, etc.)[54.]

On MS level, different mechanisms are set up to support the production of renewable energies. They can be regrouped under

- regulatory price driven strategies: which means that generators of electricity from RES receive financial support in terms of a subsidy per capacity installed or a payment per kWh produced and sold; the support is thus investment focused such as investment subsidies and tax credits or generation based such as fixed feed-in tariffs (FITs) and fixed premium systems

- regulatory quantity driven strategies (quota based mechanisms): which means that the desired level of generation or market penetration of electricity from RES is set on by a government decision (commonly named as quota obligation); the price is in principle set through competition between generators; most important are tendering systems and tradable green certificate (TGC) systems

The importance of these support mechanisms cannot be marginalized. The impact of the German feed-in system (EEG)[55] is estimated at 125.000 labour places (on a total of 214.000 in the German renewable energy sector).[56] The EEG became also an important investment factor, especially related to export (more than 70% of the in Germany produced wind turbines is for the export and currently, the same development is seen in the German solar industry.

To gather the perspectives of the firms in the German renewable energy sector, a survey was carried out on behalf of the German federal Ministry of the Environment.[57] The results of this survey showed that the EEG was very important for the development for surveyed companies as it sets reliable framework conditions that provide security for the markets in terms of planning and investment as well as support for the demand side by the guaranteeing of tariffs for renewable-sourced generation. The RES sector in Germany

[54] Directive 2009/28/EC of the European Parliament and of the council of 23 April 2009 on the promotion of the use of energy from renewable subsequently repealing Directives 2001/77/EC and 2003/30/EC.

[55] The German Renewable Energy Law (EEG), guarantees that, for a limited time, the nation's electric utilities must buy all wind, solar and other renewable power at a price per kilowatt-hour higher than that of power generated from coal, nuclear or natural gas.

[56] http://www.polderpv.nl/Articles/News/Duitse_EEG_novellierung.htm

[57] Economic Analysis and Evaluation of the Effects of the Renewable Energy Act; a study on behalf of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

has established a high-performance production and service industry structure – including manufacturers, planners, developing firms, etc. – and this development has been supported by the reliable framework the EEG provides. Most respondents confirm that the EEG was and is the driver for the high growth rates, the increasing internationalization of markets and the increasing investment volumes and employment.

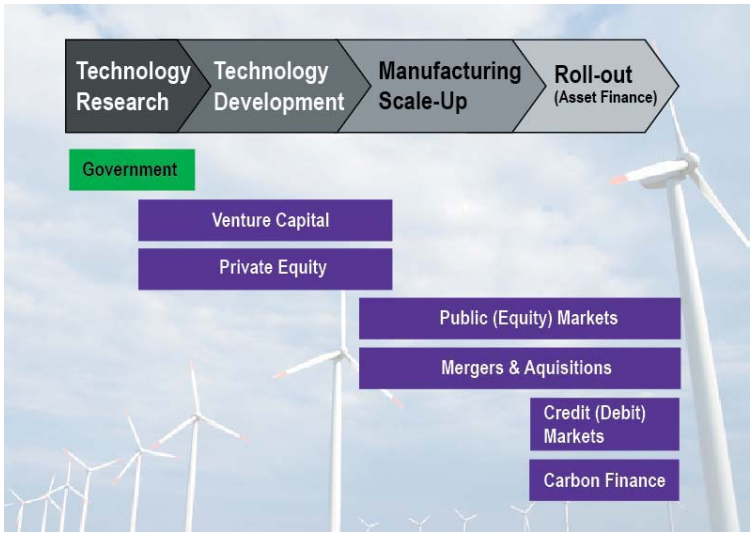
5.6.2 Exogenous conditions and trends

Development of the renewables industry is, therefore, codetermined by a range of exogenous conditions. The two most important, being investment costs and the relative attractiveness of other energy sources. However, it should be noted that all projections point to a steady future increase in overall energy consumption. Therefore, growth of the renewables sector is not necessarily constrained by exogenous factors leading to growth in non-renewables.

Access to finance, investment costs and the financial crisis

Typically for this sector are the very high up-front costs against very low costs for operation and maintenance (O &M). The next diagram gives an overview of potential financing sources for the consecutive stages of product development.

Figure 5.2: Potential financing sources for various product development stages



Source: SEFI, New Energy Finance

An estimated €100 billion was invested in renewable energy worldwide in 2008, including new capacity (asset finance and projects) and biofuels refineries(double the 2006 figure). Almost all of the increase was due to greater investment in wind power, solar PV, and biofuels. Approximate technology shares of 2008 investment were wind power (42 percent), solar PV (32 percent), biofuels (13 percent), biomass and geothermal power and heat (6 percent), solar hot water (6 percent), and small hydropower (5 percent).[58]

[58] REN21 (update 2009)

Although the renewable energy sector initially weathered the financial crisis in late 2008 better than many other sectors, renewable investment did experience a downturn after September 2008. Total clean energy investment in the second half of 2008 was down 23 percent from the second half of 2007.[59] Overall, renewables investments did not escape the general flight from risk and from growth sectors. Most projects have continued to progress, particularly those supported by policies such as feed-in tariffs, others were cancelled or put on hold. BP and Shell for example have announced plant closures. Other companies like Econern had to close down due to lack of finance.

Energy and carbon prices

The price of energy resources, as well as the cost associated to their use (e.g. the need to purchase emission allowances), have a strong influence on the overall composition of the energy mix. In December 2008, a barrel of crude oil traded at roughly $45, or just under €35, down from an all-time high of $147 in July. The prices of other energy commodities, like natural gas, hard coal and lignite have also been decreasing substantially in recent months. Meanwhile, a tonne of CO_2 (EUA) is trading at just € 15 under the EU Emissions Trading Scheme (EU ETS), after trading close to € 28 in late June 2008[60]. Plunging oil and gas prices have made renewable energy sources relatively less cost-effective, while thinner profit margins have prompted big industrial users of power to tighten their budgets for sustainable energy programs. The low carbon and crude oil prices may be an incentive for energy producers in the EU to pay for emissions permits rather than invest in renewables or other technologies that reduce emissions.

Technological change

Technological change that concerns both the renewable and non-renewable energy sector is of considerable importance. Different renewable energies are at different stages of technological and commercial development. In certain locations and under certain conditions, sources such as wind, hydro, biomass and solar thermal are already economically viable. But others, such as photovoltaic, will depend on increased demand to improve economies of scale and lower costs.

We explain below in a nutshell the technological changes of two renewable energy sectors (bio fuels and wind) and one of a connected product (CCS).

Bio fuels

All first generation bio fuels ultimately compete with food production for land, water, and other resources. For that reason it is required to develop and commercialize second generation bio fuel technologies, such as bio refineries and ligno-cellulosics (which enable the flexible production of bio fuels and other products from non-edible plant materials). A possibility is the commercialization of cellulosic ethanol. Cellulosic ethanol can be made from plant matter composed primarily of inedible cellulose fibers that form the stems and branches of most plants. Dedicated energy crops, such as switch grass, are also promising cellulose sources that can be produced in many regions.

[59] REN21 (update 2009)

[60] http://www.co2-handel.de/archive_102.html

Wind

A sector that made a huge progress is the wind energy sector (and especially the off shore one). For many years, the development of wind power systems has largely been carried out by small and medium-sized companies. More recently, as the wind turbines are becoming bigger and more complex and off shore wind parks capital intensive, smaller manufacturers face financial limits. However, with the development of the gearless wind turbines it could be possible for small firms to produce small, high-speed, horizontal-axis turbines with direct-drive generators. Further development will lead to machines with fixed tripods and annular generators in the head. In parallel with the development of the direct-drive generators, the conversion from thyristors to pulse inverters was accomplished. This configuration thus unites the advantages of variable speeds (and the associated reduction in drive-train loading) with those of a grid supply having substantially lower harmonic feedback. A further possibility, which has been considered for large, slow-running turbines in particular, is the combination of a low-speed generator and a turbine-side gearbox. The single-stage gearbox turns the generator shaft at around eight times the turbine speed of approximately 100 revolutions per minute. Thus, even for units in the 5 MW range, generators in compact and technically favourable construction sizes of approximately 3diameter can be used.[61]

CSS (Carbon Capture and Storage)

Coal is the most abundant of fossil fuels and among the cheapest energy commodities currently available. However, the burning of coal also generates large quantities of CO_2. Therefore, it is the combination of coal fired power plants and CCS that receives the most attention. There is no market ready solution but considerable funds have been dedicated to CCS research and first demonstration projects have become operational recently. It will be decisive whether CCS technologies prove to be reliable long term solutions and the price of electricity and heat from power plants equipped with CCS technology.

Societal drivers

The attitude of consumers (and voters) towards the benefits of renewables and towards other energy sources is another important factor for the future development of the renewables market.

Some European energy utilities offer their customers different kinds of electricity. As an alternative to electricity produced from mixed sources (the default option), customers can buy electricity generated from renewable sources with different levels of environmental certification. Many households and companies are switching to environmentally certified wind- and hydro-generated electricity, even though prices are slightly higher.

Climate change agenda, security of supply issues and rapidly rising prices for fuels like oil and gas could change the perception of nuclear by the public and by policy makers. Not a renewable energy source since the supply of fissile material (e.g. uranium) is finite but the process of electricity generation from nuclear fuel is largely free from GHG emissions. The current revival of nuclear energy in a range of EU Member States shows new plants currently being built or planned in Finland and France. Also emerging markets like China, Russia and India pursuing ambitious nuclear energy development plans also

[61] World wind energy association

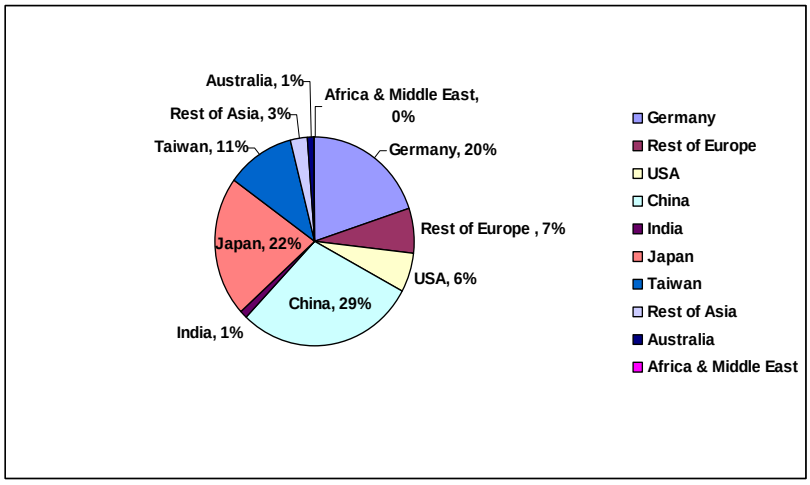
codetermine the future market share of renewables and international growth potential of the industry.

Global competition

As regards global competition, the main challenge for the EU renewable energy sector will be to defend its leading position in a changing market. For the assessment of the competitive pressure on the EU renewables industry, the PV sector will be used as an example since internationalisation has progressed furthest in this segment and industry data availability is comparatively good (although internalisation is also progressing in the wind industry (with China as front runner) and in the ethanol and biodiesel industry (North and Latin America)).

According to the 2007 world market survey of the PV industry publication Photon International, China has overtaken Germany and Japan as the top producer of solar cells in 2007 and Taiwan is catching up fast. After years of German dominance in the sector, China produced in 2008 solar cells with a capacity of 1,200 megawatt, against the 875 MW made in Germany.

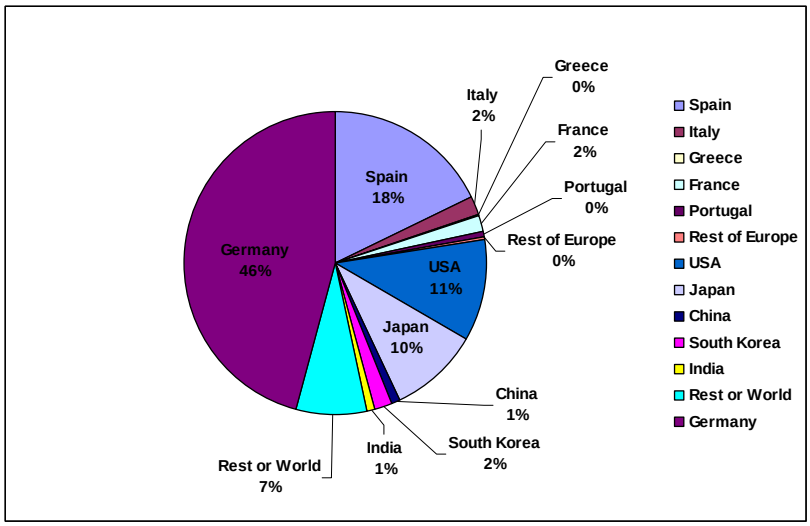
Figure 5.3 Share of global PV cell production in 2007 (measured in MWp)



Source: Photon International, March 2008; EPIA

Even though China and Taiwan have become large producers of PV cells in 2007, they only account for a tiny fraction of new installed capacity. This means that almost the entire production must have been exported to countries with large shares of new installed capacity (e.g. Germany, Spain and the United States), where subsidies for installing solar capacity are high. Japan is also a net-exporter of solar cells even though the difference between production and new installed capacity is far less striking.

Figure 5.4 World PV market in 2007 (new installed capacity in MWp)



Source: EIPA, ASIF, BSW

In contrast to the findings of the Photon International world market survey, the PV Status Report 2008 by the EU's Joint Research Centre states that between 1999 and 2007 the market shares of European and Chinese manufacturers increased from 20% to 25% and from 1% to 25% respectively, whereas the US and Japanese shares decreased to 7 and 23% respectively. However, its projection that by 2012 China will account for 27% of worldwide solar cell production capacity (approximately 42.8 GW), followed by Europe with 23%, Japan with 17% and Taiwan with 14% point to a similar direction.

5.7 Screening of importance of framework conditions

Table 5.7 provides an overview of the relevance of the different regulatory and other framework conditions for the development and competitiveness of the renewable energy sector, as well as for its inter-linkage with other industries.

Table 5.7 Renewable energy: screening of framework conditions

Regulatory & 'other' framework conditions			Relevance	
Heading	**Item**	**Issues**	**Sector-level**	**Eco-industry interaction with other sectors**
Regulatory conditions	National regulatory measures	From price driven to quantitative driven strategies	♦♦♦	0
	EU regulatory measures	Setting of legally binding targets per MS	♦♦♦	0
	Completion of internal market legislation	Different implementation and enforcement across Member States	♦♦♦	0
	Industry and professional regulations and standards	No harmonization	♦♦	♦
'Other' framework conditions	Knowledge: R&D, innovation and product/service development	High upfront costs R&D and innovation depends on role of public authorities	♦♦♦	♦
	Labour force, knowledge and skills	High demand for highly educated people	♦♦♦	♦♦
	Openness of international markets (trade and investment)	High correlation with prices for fossil fuels	♦♦	♦♦
	Structural change	In relation to societal drivers	♦♦	0
	Competition policy issues	Capital intensive + role of governments	♦♦♦	0
Exogenous conditions	Technological change	Learning curves are steep	♦♦	♦♦
	Social and demographic change	Rising consumer's environmental awareness	♦♦	♦♦
	Global competition	EU is front runner	♦	0

Legend:
0: Not relevant
♦: Relevant
♦♦: Important
♦♦♦: Very important

5.8 Dynamic SWOT results

Table 5.8 SWOT results for the renewable energy sector

Strengths	Weaknesses
• **Policy environment**: is very positive for the RES sector due to targets on EU and MS level • **Consumer awareness**: due to big campaigns and financial incentives, consumers do slowly change behaviour and are using more green energy. • **Company awareness:** a green procurement policy is becoming part of a good Corporate Social Responsibility policy; companies are more and more asked about their 'green' actions (especially in dealing with public authorities) • **Technological advancements**: for various RES products, EU countries are world leaders • **Skilled work force**: work in RES demands on average a high education level, which gives an advantage for the EU • **Security of energy supply:** RES are an alternative increasing Europe's security of energy supply	• **Financially depended**: A substantial part of the RES sector can (currently) only survive with public support systems • **Capital intensive:** the RES sector is often very capital intensive which is a burden for some SMEs • **Lack of skilled work force** • **Weak demand side**: the consumer is not ready to pay considerably more for RES • **Information asymmetry**: both consumers and businesses are often not well informed, RES is a rather complex and technical matter • **Cross sectoral collaboration needed**: with other eco-industries such as eco-construction, environmental technology providers • **Learning curve**: a current weakness of the sector is the fact that development is still in the preliminary phases, while other energy sectors have been operating for a long time. There are many technological and innovative developments that need to be introduced in the sector to make it competitive. • Following on from the point above, the sector is still not profitable in comparison with other energy sources. A lot of the sector development is driven forward by subsidies from authorities.
Opportunities	**Threats**
• **Increased global demand**: there is a very high probability (due to geo-political and environmental reasons) that demand will be sustained by regulation and by diminishing fossil alternatives • **More mature technology**: some RES technologies are still not mature: with higher demand and higher prices for RES, investments in R&D will increase • **Regulation**: a further harmonization of regulation on EU level together with further standardization (and thus a better functioning internal market) is expected to provide additional opportunities. • **Integrated companies and further globalisation**: a larger degree of integration	• **Dependence on regulation and financial support systems**: if today's regulation and financial support systems change it is expected that many SME's will get financial problems; • **Labour skills**: training and education is increasingly important due to the increased demand and the lack of adequate programs; • **Employment**: RES is labour intensive for the manufacturing industry and in the R&D phases, but not in the operation phase. This could be a threat in the longer term, especially if the weight of production would move to Asia; • **Dependence on fossil prices:** RES are too dependent on the price of fossil products, since they can be considered to a large extent as

combined with more globalised companies is expected to generate opportunities to cope with the more complex RES issues (bio fuels, PV, geothermic, ..)	substitutes; • **Environmental impact**: some RES (like bio fuels) can have a very negative environmental impact (e.g. deforestation issues, mono cultures). • **Access to finance**: it is important that financial institutions continue in participating in RES investments (due to its high capital intensity) • **New and better alternatives**: there is always the risk that new technologies will be better and more affordable (fusion, hydrogen, etc)

On the international stage the RES sector in Europe is perceived as strong competitively, which is mainly due to the political focus shifting from fossil fuels to alternative forms of energy, and the lead role of the EU in regard to combating climate change. Germany in particular is considered a leader in RES investment and development at least within Europe. Important reasons for this are the high environmental quality standards and the high requirements placed on environmental technology and environmental protection, as well as an important entrepreneurial drive towards valorisation of the opportunities in this field. Even though there is a great deal of political momentum to develop RES in Europe, there is still a hesitation to invest based on environmental protection reasons alone and therefore, risk-capital is lacking. The fact that the sector is relatively young is both a weakness and an opportunity, as the new-technology segments of the sector is currently not profitable without government support, yet potentially could become much more competitive when the technology and know-how in the sector mature.

5.9 Overview of potential policy issues

The purpose of this section is to identify and prioritise potential areas for European policy initiatives that could have an important impact on the renewable energy sector's own development and on its interaction with other industries (especially manufacturing industries). To begin with, the possible arguments (justification) for potential policy intervention from an economic standpoint are examined. After this, the analysis is based around a screening of the sector in relation to existing industrial policy initiatives; the overall assessment is summarised in Table 5.9.

Key arguments for policy intervention

Externalities

The utilisation of renewable energy sources is associated with positive environmental externalities. The most important is that the production of renewable energies directly avoids GHG emissions while other technologies might reduce them by better efficiency or are even only able to store (CCS) them. It is also important, when making comparisons with other technologies and conventional energies, to take into account the total environmental cost and other externalities (like the dismantling and waste cost for nuclear energy).

Geo-political reason

It is well known that Europe is a net importer of energy. The implementation of different types of renewable energies is a must for the EU to become less dependent on those imports and thus a key reason (besides the environmental issue) why the EU and the MS should invest and promote R&D, production and the use of RES.

Market structure, conduct, market power

While experts believe that many new markets could sustain even higher rates of renewable energy penetration, barriers remain. The diffusion and deployment of newly developed renewable energy technologies into markets are particularly important. A key strategy for market acceleration is removing regulatory barriers between countries with significant renewable resources. Global strategies for accelerating the market penetration and diffusion of renewable energies need to engage both developed and developing countries.

Screening against policy initiatives

Table 5.9 provides an initial screening of the renewable energy sector against existing and potential EU horizontal 'industrial' policy initiatives[62]. This attempts to identify those policy initiatives that, if introduced or extended, could be of most relevance for the renewable energy sector, in particular in terms of raising performance (e.g. productivity improvements) and/or creating opportunities for sector development.

[62] Based on the Mid-term Review of Industrial Policy, COM(2007) 374.

Table 5.9 Renewable energy: screening of policy initiatives

EU Policy areas			Relevance	
Heading	**Initiatives**	**Issues**	**Sector-level**	**Eco-industry interaction with other sectors**
Trade	Trade policy	Any indication this is an issue	0	0
Better regulation	Proper functioning of the internal market	Lack of collaboration between MS; we see an Europe with different support mechanisms and thus different speeds of development of RES.	♦♦	♦♦
	Public procurement	Large information gap on costs/benefits of different RES	♦♦	♦♦
	Competition policy	Due to different support mechanism between MS it is difficult to compete with companies from some MS (for R&D and production)	♦♦	♦
	Better regulation and simplification	Simplification and harmonization of support mechanisms	♦♦♦	♦♦
	Internal standards	Internal standards could be useful but the sector didn't indicate this as an issue	♦	♦
Knowledge and skills	Research and development	Is a key issue; although RES is important under FP7, a more harmonized EU policy could lead to better results;	♦♦♦	♦♦
	Intellectual property rights	Could become an issue but isn't indicated by the sector	♦	♦
	Innovation policy	Goes hand in hand with R&D	♦♦♦	♦♦♦
	Employment, qualifications, skills / Flexicurity	Is an important issue: education programs should focus more on RES (and its implementation).	♦♦♦	♦♦
	Access to finance / risk capital	▪ Competition with fossil energies: role of EU and MS could be to increase prices for fossil energy (and to take into account the total environmental cost) ▪ Limited access to finance due to financial crisis	♦♦♦	♦♦♦
Energy and environment	Waste, water, air	The positive link between more RES and waste, water and air is obvious	♦♦♦	♦♦♦
	Intensive energy use	RES is the alternative if we can't reduce our pattern of energy use; also to secure our energy supply	♦♦♦	♦♦♦

Legend:
0: Not relevant
♦: Relevant
♦♦: Important
♦♦♦: Very important

6 Eco-construction / sustainable construction

6.1 Sector overview

The construction market accounts for 6 to 10% of EU's GDP (depending on the source) and with 2.9 million companies (good for 16.4 million operatives or 7.2% of EU workforce), it is the biggest industrial employer in the EU[63]. The built environment is responsible for 42% of total EU final energy consumption and produces about 35% of all greenhouse gas emissions[64]. More than 50% of all materials extracted from earth are transformed into construction materials and products. These figures make clear that construction activities are of major importance for the economy and the environment alike.

The wide-ranging market area of sustainable construction seeks to integrate sustainable development objectives in construction activities. It embraces environmental concerns (e.g. natural resource efficiency), user health (e.g. indoor air quality) and social issues (e.g. independence in old age). It encompasses developing sustainable solutions for residential and non-residential buildings and infrastructure. Sustainable construction is also one of six pilot markets of the European Commission's lead market initiative[65].

Eco-construction focuses specifically on the sustainable dimension by reducing the natural resource requirements (energy, but also water and land) and the overall environmental impact of buildings and infrastructure. In principle, eco-construction starts with design and ends with demolition and recycling. Life-cycle assessment encompasses the assessment of raw material production, manufacture, distribution, use and disposal including all transportation. It will e.g. look at the construction activity itself, the selection of materials, the consumption, emissions and other environmental impacts during the use phase and the management of construction waste is of central importance.

The key challenges faced by the sector are to reconcile construction with environmental sustainability and to contribute to the competitiveness of the EU economy at large by making it more energy and resource efficient. Potentially huge market potential lies in retrofitting the existing building stock according to modern standards.

[63] http://www.fiec.org/Content/Default.asp?PageID=5
[64] http://ec.europa.eu/enterprise/policies/innovation/policy/lead-market-initiative/sustainable-construction/index_en.htm
[65] COM(2007) 860 final

Main sector characteristics

The construction market is divided into three distinct market segments:

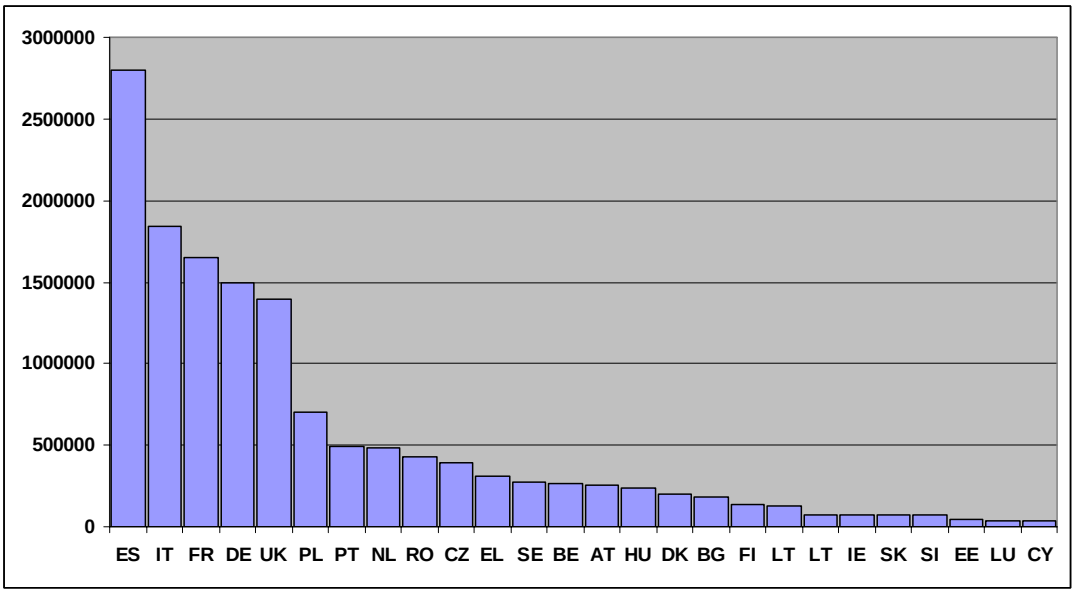
- Residential
- Non-residential / Commercial
- Infrastructure

Furthermore, there is a fundamental distinction between the construction of new buildings and structures and the refurbishing and retrofitting of existing ones. The best results are generally achievable in new buildings where energy and ecological considerations can be incorporated from the ground up. Other distinction is the one between the public and private sector. The procurement procedure is very different and has a big impact on sustainability.

In the construction industry, the scale of companies is usually proportional to the scale of the building projects they typically work on. The bulk of small companies is mainly active in small construction works in the residential market. Medium scale companies mainly dominate the non-residential / office buildings market and large companies are the only ones capable of building large infrastructure projects. Eco-construction should apply to all types of construction and in principle any construction company can be engaged in it.

In the construction industry, the scale of companies is usually proportional to the scale of the building projects they typically work on. The bulk of small companies is mainly active in small construction works in the residential market. Medium scale companies mainly dominate the non-residential / office buildings market and large companies are the only ones capable of building large infrastructure projects. Eco-construction techniques can be applied to any scale of construction and in principle any construction company can be engaged in it.

Figure 6.1 Total number of people employed in the construction sector by Member State in 2006



Source: Eurostat

The specific eco-construction employment can be expected to be much smaller, especially if only the parts of the buildings with a high environmental performance are taken into account. In most cases companies and also employees will be engaged in activities that can be counted towards the eco-part of the industry as well as in conventional construction activities.

The potential for eco-construction is huge, taking into account that it will probably become compulsory to build in a more sustainable way (and thus to minimize waste and energy, to conserve water and enhance bio-diversity). More information about the opportunities can be found in section 6.6.

The market is still strongly fragmented along Member States' borders and Germany, Austria, the Netherlands and the Scandinavian countries are frequently described as the leading eco-construction markets in the EU. Another challenge is the lack of a "common language" in the eco-construction sector across national borders. Even though terms like "passive house" are becoming more widespread in many European countries, they are frequently not fully comparable and are not underpinned by a common technical specification or performance requirement. This makes it essentially hard for buyers and tenants to specify their eco-construction preferences and is also an obstacle for architects and planners when it comes to including eco-efficiency requirements in building specifications and tender documents. Eco-construction also requires a high degree of integration in architecture, design, construction, and building systems and materials.

6.2 Micro data

The following table shows the top 25 companies that have been identified through sustainable construction networks. The company list is biased towards Germany, Switzerland, Austria and Belgium due to the networks that we could identify in the course of this project. Although one has to be cautious in extrapolating the results towards the rest of Europe, we believe on the base of contacts with the sector, a stratified sample has been drawn from an important segment in the EU eco-construction industry. In total 282 companies were identified.

The main players in the list often combine eco-construction with other eco-industrial activities. E.g. the first listed company, Umicore AG, is a leading supplier of precious metals with an expertise in materials science, chemistry and metallurgy. The second company Johnson Matthey has skills in catalysis, precious metals, fine chemicals and process technology. The number three on the list BASF Catalysts Germany is a leading supplier of environmental and process catalysts. The company offers inputs to a wide variety of chemicals, plastics and other products. Further down the list companies can be found that enter the sustainable building market segment from their construction products activity, such as Wienerberger.

As it might be expected that eco-construction or sustainable building becomes more widespread and that many traditional building companies might develop this as a new line of business, it can be envisaged that the identification of eco-construction companies will become more challenging in the future.

Figure 6.2: Top 25 EU companies in eco-construction according to operating revenue (2007)

Eco-construction		
1	UMICORE AG & CO. KG	Germany
2	JOHNSON MATTHEY PLC	United Kingdom
3	BASF CATALYSTS GERMANY GMBH	Germany
4	NGK SPARK PLUG EUROPE GMBH	Germany
5	MAHLE FILTERSYSTEME GMBH	Germany
6	WIENERBERGER	Belgium
7	IBIDEN DEUTSCHLAND GMBH	Germany
8	PFLEIDERER HOLZWERKSTOFFE GSCHWEND GMBH	Germany
9	ARMSTRONG DLW KONZERN	Germany
10	EMITEC GESELLSCHAFT FÜR EMISSIONSTECHNOLOGIE MBH	Germany
11	PCI AUGSBURG GMBH	Germany
12	DYRUP (S) & CO A/S	Denmark
13	AERZENER MASCHINENFABRIK GESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG.	Germany
14	BALCKE-DÜRR GMBH	Germany
15	EGOKIEFER AG	Switzerland
16	POLYPIPE LIMITED	United Kingdom
17	GEALAN FENSTER-SYSTEME GMBH	Germany
18	DONALDSON GESELLSCHAFT MBH	Germany
19	SALAMANDER INDUSTRIE-PRODUKTE GMBH	Germany
20	RELIUS COATINGS GMBH & CO. KG	Germany
21	KRONOSPAN OSB, S.R.O.	Czech Republic
22	VALSIR S.P.A.	Italy
23	REMMERS BAUSTOFFTECHNIK GMBH	Germany
24	SCHÖNOX GMBH	Germany
25	AL-KO THERM GMBH MASCHINENFABRIK	Germany

Sources: Amadeus data, expert interviews and representative organisations

6.3 Competitiveness analysis

Although most companies offering eco-construction have as main activity conventional construction, there is a certain trade off between both: the basic decision is to either build according to conventional, state-of-the-art specifications or to aim for enhanced environmental performance. However, this approach raises difficult conceptual distinction between features and products that are not industry standard but nonetheless profitable after a certain pay-back period (like highly efficient insulation techniques and materials) and features that cannot be expected to become profitable over time and solely contribute to environmental sustainability without translating into a future profit for the owner or tenant. The latter can, by definition, not compete from an economic viewpoint and will only be able to compete with conventional construction if non-economic considerations determine demand (e.g. a positive environmental image).

Within Europe – which is a frontrunner on the international scene – the most competitive firms can be assumed to be where the most important markets for eco-construction are (e.g. in Germany, Austria and the Scandinavian countries). Austria for example has a well performing eco-construction industry (helped by a well developed support policy) and there are strong links between industry and universities, promoting the transfer of knowledge. However, it is rather difficult to go more in-depth as most observations cannot be underpinned by data due to the entanglement of the eco-construction and conventional construction activities in most companies.

Outside Europe, the Asian countries such as Japan or China mainly focus on cost reductions in production rather than the development of radical new products. Also in the US some initiatives are being taken in the area of ecological building and universities are active in research in this area. However, in the US sustainable building still has a strong ideological connotation with alternative ways of living.

(Labour) productivity

Eco-construction (and construction in general) is a highly labour intensive. Personnel cost typically represent about 70% of the total construction cost and the remaining 30% are largely attributable to material acquisition. Sustainable construction requires new skills which are quite different from the traditional ones. It also requires a more integrated building process. Where in traditional building one contractor comes after the other, sustainable building, and especially passive houses, require a closer interaction of the various contractors. Therefore the qualifications of skills matter. Currently there are little or no courses offered in the official curricula that are specifically focussed on sustainable construction.

Productivity enhancement

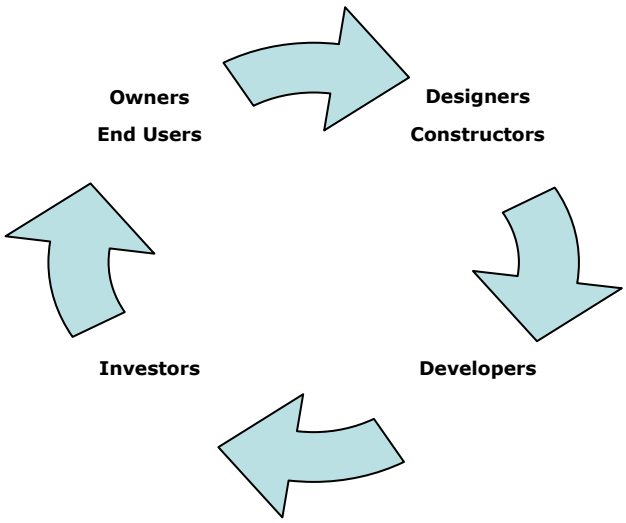
Activity in the construction sector is still largely focused on assembling a large number of small parts on the construction site, involving a high input of manual labour. However, a tendency towards automation and larger pre-fabricated components is becoming increasingly visible. Discrete elements (e.g. concrete elements and window frames) are either produced in standard sizes or made to measure off-site and then transported to the building site and integrated in the construction process. In this way, activities that are traditionally carried out on the construction site are being pooled in a workshop or factory and economies of scale can be exploited. The controlled environment also makes these activities independent from weather conditions. Therefore, the share of the overall value creation happening off-site at workshop or plant level is expected to further grow in the future. This tendency appear to be particularly relevant for the eco-construction part of the industry since building components with high environmental performance rely strongly on accurate and precise assembling with little room for tolerance.

Demand side conditions

Even though advanced technologies and solutions are already available, tested and reliable, barriers remain to their broad uptake and demand is highly fragmented. 40% of demand for construction works comes from the public sector, but decision-makers are unaware of the scope within the existing legal framework for adopting innovation-

oriented solutions. The introduction of life-cycle-costing (LCC) could facilitate the public procurement of eco-construction works.

Furthermore, private and commercial customers are still frequently sceptical and insufficiently informed about eco-construction. However, designers, constructors, developers and investors also play an important role in generating demand. Currently the blame for not demanding or including high eco-efficiency requirements in building projects is frequently passed on from one group to the other. To change this, all groups involved need to be sufficiently aware of the benefits and availability of eco-construction technologies and processes and communication needs to be enhanced. Below circle depicts this situation.



Competition and business strategies

The construction industry and its main customers are still strongly focused on cost/price considerations. Competition is intense and frequently determined by the initial investment and less so by the life-cycle-costs. The transition from a cost-driven market to a value-driven market is only progressing slowly.

Internationalisation

There is a global export market for large scale building and infrastructure projects. In this context it is important to distinguish between the high-skilled architectural and engineering work which is normally carried out in the country where the exporting firm is based and the manual construction work on-site where employment for citizens of the exporting country is usually limited to management and inspection tasks. Many of the bigger EU construction companies are highly international and generate a large part of their revenues outside of their home markets. Examples of such companies include Hochtief (52,000 employees and a sales volume of € 16.45 billion in 2007) and Bouygues (49,800 employees and a sales volume of € 8.3 billion in 2007).

6.4 Eco-industry and the supply chain

The market is mainly characterised by small national niche players, even in countries with a longer tradition of eco-building such as Austria and Germany. Very few larger building companies have their main activity in eco-construction. More recently, there is a trend for more traditional building companies to diversify their product offering to eco-construction as well.

In the commercial area, the two most important client sectors are real estate developers and institutional investors. However, since the business case for the development of sustainable buildings is still largely based on anecdotal evidence, both groups face considerable uncertainty when it comes to assessing the profitability of eco-construction investments.

A pioneering piece of research on the topic, by Eichholtz, Kok and Quigley from the Universities Maastricht and Berkeley recently compared rents and selling prices of green office buildings (Energy-Star and LEED-rated) to conventional office buildings in the United States. They conclude that, on average, certified green office buildings reached higher selling prices and rents than conventionally-built ones. Rents for green offices were roughly 2 % higher than rents for comparable buildings located nearby. Effective rents (i.e., rents adjusted for the occupancy levels in office buildings) were found to be 6 - 9 % higher. The selling prices of green office buildings were found to be about 16 % higher than other nearby buildings. These finding suggest that the eco-construction has the potential to positively affect the performance of its commercial client sectors.

6.5 Regulatory and other framework conditions

Governments across Europe have played an important role in making ecological building more 'mainstream'. Subsidies have been and are still an often used instrument to accelerate the use of sustainable building techniques. However, this has been done on member state level. Result is diversity on regulation and a frequent mismatch of building standards and codes in the EU. Consequently, this leads to considerable administrative burden and, given that the business structure is predominantly local, to a very fragmented eco-construction market. Also national building and planning standards and differences in validated and approved techniques frequently do not allow for the inclusion of innovative (e.g. new types of cement with enhanced environmental performance) or alternative building materials and methods.

Regulatory conditions and standards

Regulation

The *Energy Performance of Buildings Directive* (2002/91/EC) is the most important piece of European regulation for the eco-construction sector. It concerns the residential sector and the tertiary sector (offices, public buildings, etc.) and stipulates:

- A general framework for a methodology of calculation of the energy performance of buildings,
- The application of minimum requirements on the energy performance of buildings,
- The energy certification of buildings, and
- A regime of boiler inspections at regular intervals and in addition an assessment of the heating installations with boilers of more than 15 years of age.

Member States shall apply a methodology, at national or regional level, to be used for the calculation of the energy performance. Hereby it is acknowledged that there are major differences among the Member States with regard to the building stock and construction works which have an impact on the state and the evolution of energy efficiency. One of the objectives of the recasting of the EPBD (2009) is to reduce national differences and – in the long run – a common system for the assessment of energy efficiency. However, the draft of the Directive mentions a comparative methodology which implicitly means that in the future national differences will be accepted.[66] A more recent investigation in the possibilities to harmonize energy performance assessment procedures indicates that, even between countries which share a similar climate, there are considerable differences in the building stock. Hence it will be difficult to compare energy performance.[67]

The *Construction Products Directive* (89/106/EEC) which applies to any products made for permanent integration in construction works sets out a number of essential requirements in terms of working life, mechanical strength and stability, fire safety, hygiene, health and environment, safety in use, noise protection, energy economy and heat retention). The Directive established the framework in which the European construction industry has been operating since 1989. The main elements are:

- Harmonised European standards for construction products adopted by the European standardisation bodies (CEN and/or CENELEC);
- A system of European technical approvals to assess the suitability of a construction product in cases where there is no harmonised standard and a standard cannot or cannot yet be prepared;
- The European Organisation of Technical Approvals (EOTA), which groups together the national approvals bodies, is responsible for drawing up the technical approvals guidelines.

To further enhance the internal market for construction, the European Commission in May 2008 presented a proposal to replace the Construction Products Directive by a new Regulation aimed at removing the remaining regulatory and technical obstacles to the free circulation of construction products in the EU. The new regulation introduces standards at EU level which will replace the myriad of national standards. Implicitly it also introduces a common terminology, which is important in this new field of development. The new

[66] See: Directive of the European Parliament and of the Council on the energy performance of buildings (recast); 13 November 2008; http://ec.europa.eu/energy/strategies/2008/doc/2008_11_ser2/buildings_directive_proposal.pdf

[67] Peter D'Herdt, Dirk Van Orshoven, Peter Wouters et al. (Belgian Building Research Institute (BBRI)); Energy performance regulations: small scale comparison between Flanders, the Netherlands, Germany and France – Subreport 4: Some Lessons learned about comparing EP-requirements, 22 Sept. 2008

regulation introduces the aspect of durability in addition to the other six essential features to which all buildings in the EU have to comply.

Furthermore, every Member State has building and planning regulations that affects the scope for eco-construction. In the Member States with a federal structure competence for building regulation is frequently extended to sub-national levels. The legal competence for planning regulation is usually at regional or local level.

Standards

The construction industry is in general not in favour of standards or quality labels, especially not environment-related labels. However, environment-related labels do provide relevant information to customers that increasingly look for such information. At the international level, the Environmental Product Declaration (EPD) system exists. The system helps organisations to communicate the environmental performance of their products (goods and services) in a credible and understandable way. It is a voluntary system that firms can apply for; the EPD does not make any explicit evaluation of the environmental performance. In that sense it is very different from the Natureplus label, which evaluates building materials according to their environmental friendliness and positive health effects. This label gives customers the guarantee that a building material is produced according to a number of minimum requirements in terms of environmental sustainability.

In terms of testing building materials (for fire safety,…), this has been organised at national level, meaning that different tests need to be done if a material is to be sold in different countries. At this moment work is being done to harmonise these testing systems and make it possible that tests are being recognised across Europe.

Given the above, it is not surprising that the eco-construction sector is still lacking a "common language" which largely refers to the absence of EU wide technical standards behind concepts like "passive house", "zero energy building" or "low-energy house". Standardisation measures can improve the situation and introduce concepts relevant for the further development of eco-construction. This could include:

- Framework, assessment methods and benchmarks for sustainability performances of buildings and supply chain;
- Integration of sustainability aspects in construction design standards (Eurocodes);
- Sustainability criteria and technical assessment of innovative construction products (Construction Product Regulation).

‘Other’ framework conditions

Knowledge and innovation

The two main areas of innovation in eco-construction are products and processes and the supply chain. Examples for innovation in the area of products and processes include:

- Intelligent homes and offices (e.g. lights automatically switch on and off based on automatic detection of human presence, automatic and remote management of heating and cooling);

- Light-weight frontages (to allow more narrow supporting walls and less foundations);
- Local waste water treatment, local water reuse and double sewage (for wastewater and rain water).

Supply chain related innovation is focused on the adoption of a service oriented approach that does not end with the physical delivery, but extends to the use, eventual upgrading and retrofitting of buildings and infrastructure.

R&D is mostly done at universities across Europe, as well as in large industrial companies. Besides this, the implementation of all this knowledge and know-how in the building companies themselves and in the adoption of these new techniques by the market is going slowly (although most can be implemented in an economically feasible manner).

Labour force and skills

This is one of the key issues of this sector. Eco-construction generally requires a better trained workforce than most mainstream construction activities. Especially in small companies, there is frequently a lack of expertise and skilled workforce both with regard to eco-efficient construction and retrofitting. Managerial positions in eco-construction are dominated by engineers and scientists and some companies find it hard to find personnel combining entrepreneurial talent with a sufficiently deep understanding of the science and technology dimension involved in their business.

Sustainable building needs a more integrated concept as for conventional building. As a consequence, each player in the production chain has to have at least a minimum understanding of the whole chain.

Openness of international markets (trade and investment)

Construction is a global industry with generally low legal barriers to trade and investment.

Exogenous conditions and trends

Technological change

In general terms, technological change has been rather slow in the construction industry and most of the techniques involved have not fundamentally changed since decades. The market adoption of advanced building materials, that are resource saving in their application and also in terms of their production, is relatively slow since construction materials are mostly produced and sourced locally. However, the area of eco-construction has been propelled by a constant increase in the technical and methodological capacity to measure the environmental performance of construction materials and buildings. Furthermore, rapid developments in the area of information and communication technology have opened-up the possibility for increasingly "smart" houses and offices.

Technological change is also happening at the interface between the renewable energy sector and the eco-construction sector. The integration of renewable energy technologies in building components is a particularly promising area. Even though this process is at a rather early stage in most markets, it has already progressed relatively far in Japan where

renewable energy companies have acquired construction companies and offer construction material with integrated renewable energy components (e.g. roof or facade elements that come with integrated PV modules or solar water heating modules).

Societal drivers

The main socio-political development driving the eco-construction market is increased awareness of environmental problems and impacts. Especially energy consumption is becoming a more important criterion in the housing and office markets. This is, however, at least partially driven by rising energy prices.

Screening of importance of framework conditions

Table 6.1 provides an overview of the relevance of the different regulatory and other framework conditions for the development and competitiveness of the eco-construction, as well as for its inter-linkage with other industries.

Table 6.1 Eco-construction: screening of framework conditions

Regulatory & 'other' framework conditions			Relevance	
Heading	**Item**	**Issues**	**Sector -level**	**Eco-industry interaction with other sectors**
Regulatory conditions	National regulatory measures	Vary a lot between MS	♦♦♦	♦♦♦
	EU regulatory measures	Long time between legislation and implementation	♦♦♦	♦♦♦
	Completion of internal market legislation	No European benchmarks for sustainability performance; Even the recasted EPBD will not harmonize legislation;	♦♦♦	♦♦♦
	Industry and professional regulations and standards	New regulation on CPD Focus on minimum standards	♦♦♦	♦♦♦
'Other' framework conditions	Knowledge: R&D, innovation and product/service development	Still very academic; lack of implementation know how	♦♦♦	♦♦♦
	Labour force, knowledge and skills	Lack of skilled work force	♦♦♦	♦♦♦
	Openness of international markets (trade and investment)		♦	♦
	Competition policy issues	Needs further harmonization	♦♦	♦♦
Exogenous conditions	Technological change	Needs further implementation	♦♦	♦♦
	Socio-political change	Increased awareness	♦♦	0
	Global competition	Is intense (cost driven)	♦♦	♦♦

Legend:
0: Not relevant
♦: Relevant
♦♦: Important
♦♦♦: Very important

6.6 Dynamic SWOT analysis

Table 6.2 SWOT results for the EU eco-construction sector

Strengths	Weaknesses
• **Policy environment**: sustainable building is promoted and part of the solution to reduce GHG; • **Consumer awareness**: citizens are becoming slowly aware about the environmental and energy issues (especially when the oil price is high) • **Technological advancements**: some EU countries are on world level front runners concerning sustainable building	• **Lack of knowledge of foreign markets**: the construction sector has the highest score on this for all sectors[68]; • **Different regulation across EU countries** • **Lack of capital:** finding enough capital can be hard for SMEs • **Lack of skilled work force**: maybe the most important issue as it will take time to educate the work force • **Lack of common standards** and lack of common language: there is a need to harmonize on different issues • **Weak demand side**: the consumer is not ready to pay considerably more for sustainable building and is not well informed enough about the complex matter • **Cross sectoral collaboration needed**: Eco-construction requires a higher degree of integration in architecture, design, construction, and building systems and materials than in traditional building
Opportunities	**Threats**
• **Removing regulatory barriers**: a further harmonization of regulation on EU level together with further standardization (and thus a better functioning internal market) would generate substantial opportunities for the sector. • **Cross sectoral agreements:** more integrated companies and agreements between sectors to package easier the different services of sustainable building can be expected. • **Increased global demand**: different regulation is pushing for a more sustainable building environment with direct impact on new dwellings;	• **Labour skills**: sustainable building firms should invest themselves in training as regular education is lagging behind • **Economic crisis**: access to finance and a reduced willingness to pay more for sustainable buildings; • **A marginal market** due to relatively high prices for sustainable buildings • **Lack of internal market** and dominance of local and MS regulations that differ substantially

The eco-construction sector in Europe is considered relatively advanced compared to that of other regions in the world. Tackling climate change involves making sure buildings are constructed in an energy efficient manner and produce fewer greenhouse gases. Europe's policy makers, as well as the public, are becoming increasingly aware of the benefits of

[68] Observatory of European SMEs' survey (Gallup 2007).

sustainable housing. The major weaknesses of the sector however still stem from the lack of market demand for sustainable housing as it is usually more expensive than comparable standard housing or office space. The European Commission's role can continue to encourage public authorities to facilitate industry-led innovation by creating the framework for a successful market uptake of innovative services such as eco-construction, which holds potential for the future of the sector. A major threat is the lack of skills in the eco-construction sector, which is of particular importance since the process of sustainable construction requires a more integrated approach than traditional building and it is a predominant SME sector.

6.7 Overview of potential policy issues

The purpose of this section is to identify and prioritise potential areas for European policy initiatives that could have an important impact on the eco-construction sector's own development and on its interaction with other industries (especially manufacturing industries). The analysis is based around a screening of the sector in relation to existing industrial policy initiatives; the overall assessment is summarised in Table 6.3.

Key arguments for policy intervention

Societal drivers

Since the built environment is responsible for the biggest part of the EU's final energy demand and a large share of its raw material consumption, the construction sector offers considerable potential for energy and resource efficiency gains. This holds especially in regard to the relatively old building stock found in many EU Member States where the potential for savings and efficiency gains can be expected to be comparably higher than in other areas (e.g. transport). This would make some of the resources currently taken up by the built environment available for other sectors and would be of substantial to the whole economy.

Market structure, conduct, market power

Construction is a highly fragmented market that is still strongly split along Member State borders – especially in the residential segment. Large companies in the EU construction industry have become global players and face comparably little difficulty in operating in other Member States and globally. However, higher hurdles exist for SMEs who frequently do not have the market expertise and resources to offer innovative products and solutions outside of their home markets.

European regulation like the Construction Products Directive have contributed to the development of the single market in this area but improvement potential remains when the market opportunities and business environment for innovative SMEs is concerned. Specific standards applicable to eco-construction could make an important contribution.

Information asymmetries and regulation

Besides applying its better regulation policy, the EU could further render the regulatory framework more efficient by accompanying measures and awareness campaigns, in order to provide a common reference model on eco-efficiency and sustainability in the construction area.

Screening against policy initiatives

Table 6.3 provides a screening of the eco-construction sector against existing and potential EU horizontal 'industrial' policy initiatives[69]. This attempts to identify those policy initiatives that, if introduced or extended, could be of most relevance for the eco-construction sector, in particular in terms of raising performance (e.g. productivity improvements) and/or creating opportunities for sector development.

[69] Based on the Mid-term Review of Industrial Policy, COM(2007) 374.

Table 6.3 Eco-construction: screening of policy initiatives

EU Policy areas			Relevance	
Heading	**Initiatives**	**Issues**	**Sector-level**	**Eco-industry interaction with other sectors**
Trade	Trade policy			
	Proper functioning of the internal market	Different implementation and bad communication of regulation across and within MS	♦♦♦	♦♦♦
	Public procurement	Too long procedures	♦♦	♦♦
	Competition policy		♦	
Better regulation	Better regulation and simplification	Recasted EPBD is wider but not enough harmonized yet; A simplified CPD	♦♦♦	♦♦♦
	Internal standards	An EPD which is useful (maybe compulsory) and well communicated	♦♦♦	♦♦♦
	Research and development	Too much depending on local initiatives (thus not well organised and communicated)	♦♦	♦♦
Knowledge and skills	Intellectual property rights		♦	♦
	Innovation policy		♦	♦
	Employment, qualifications, skills / 'Flexicurity'	One of the keys for the further development of the sector	♦♦♦	♦♦♦
	Access to finance / risk capital	Is currently an issue for SMEs	♦♦	♦♦
Energy and environment	Waste, water, air	Still a long way to go: EU building regulation should focus much more on the interaction between buildings and waste, water and emissions.	♦♦♦	♦♦♦
	Intensive energy use	A direct trade off: the higher the energy prices the more investment in sustainable buildings	♦♦♦	♦♦♦

Legend:
0: Not relevant
♦: Relevant
♦♦: Important
♦♦♦: Very important

Bibliography

Ecofys, Fraunhofer, EEG, Lei and Seven (2008): Promotion and growth of renewable energy sources and systems.

Ecofys, Fraunhofer, EEG, Lei, Rutter and Seureco (2006): The impact of renewable energy policy on economic growth and employment in the European Union.

Economist (2008) Special Report: The Future of Energy, June 19th 2008. http://www.economist.com/specialreports/displaystory.cfm?story_id=11565685

Eichholtz, Piet, Kok, Niels and Quigley, John (2008) Doing Well by Doing Good? Green Office Buildings.
http://www.dgbc.nl/images/uploads/EKQ_greenbuildings.pdf

EPIA and Greenpeace (2008) Solar Generation V-2008: Solar electricity for over one billion people and two million jobs by 2020.
http://www.epia.org/fileadmin/EPIA_docs/documents/EPIA_SG_V_ENGLISH_FULL_Sept2008.pdf

EREC (2008) Renewable Energy Technology Roadmap: 20% by 2020, Brussels.
http://www.erec.org/fileadmin/erec_docs/Documents/Publications/Renewable_Energy_Technology_Roadmap.pdf

ESTIF (2008) Solar Thermal Markets in Europe, Trends and Market Statistics 2007, Brussels.
http://www.estif.org/fileadmin/estif/content/market_data/downloads/Solar_thermal_markets_in_Europe_2007.pdf

Eurobserv'ER (2008) Solar Thermal Barometer.
http://www.eurobserv-er.org/pdf/baro187.pdf

Eurobserv'ER (2008) The state of renewable energies in Europe (8th Eurobserv'ER report)
http://www.eurobserv-er.org/pdf/barobilan8.pdf

European Commission (2007) Accelerating the Development of the Sustainable Construction Market in Europe: Report of the Taskforce on Sustainable Construction, Brussels.
http://ec.europa.eu/enterprise/leadmarket/doc/sustainableconstruction_final.pdf

EWEA (2009) Wind at work.
http://www.ewea.org/fileadmin/ewea_documents/documents/publications/Wind_at_work_FINAL.pdf

IEA (2008) Renewable Energy Essentials: Wind, Paris.
http://www.iea.org/textbase/papers/2008/Wind_Brochure.pdf

IEA (2008) IEA Energy Policies Review: The European Union 2008, Paris.
http://www.iea.org/Textbase/npsum/DeployRenew2008SUM.pdf

Joint Research Centre (2008) PV Status Report 2008, Ispra.
http://re.jrc.ec.europa.eu/refsys/pdf/PV%20Report%202008.pdf

REN21 (2008) Renewables 2007: Global Status Report.
http://www.ren21.net/pdf/RE2007_Global_Status_Report.pdf

REN21 (2009) Renewables Global Status Report: 2009 Update
http://www.ren21.net/pdf/RE_GSR_2009_Update.pdf

UNEP (2008) Global Trends in Sustainable Energy Investment 2008.
http://www.ren21.net/pdf/Global_Trends_2008.pdf

UNEP (2008) Green Jobs: Towards decent work in a sustainable, low-carbon world, http://www.unep.org/labour_environment/PDFs/Greenjobs/UNEP-Green-Jobs-Report.pdf

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Annex I. Interviews with the key stakeholders: approach

Introduction

All the key stakeholders that were selected at the onset of the study and which gave their consent have been interviewed. Interview notes were drafted on the base of a systematic interview guideline. The interview notes of the key stakeholders have been validated by the interviewees.

In order to promote a consistent and systematic approach for each of the interviews, interview guidelines were developed, which served as a basis for the interviewers. The interviews were developed around two major themes: the competitiveness of the eco-industry itself and the interaction of the eco-industry with the other sectors of the economy.

In addition, in close cooperation with the European Commission, a number of other interviews have been done with the connected industries. A similar interview pattern was followed, although relatively more stress was laid on the link with the core environmental industries and with the other sectors in the economy. Preferably the interviews were done face to face. When this was not feasible telephone interviews were done, usually connecting various interviewees of one organisation in various locations.

The following parts of this report's section will present the list of stakeholders that have been interviewed. We also present the interview guidelines which gives an idea of the questions that we asked. The validated interview reports are presented in the next annex.

Overview of stakeholders interviewed

The following table lists the key stakeholders and the current status of the interview.
Virtually all the key sectors have been covered, with the exception of soil and groundwater remediation. The clean technologies and connected industries have been interviewed as well.

Overview status of the stakeholder interviews

Sector	Potential interviewees	Priority*	Status
Air pollution and control	▪ European Federation of Clean Air and Environmental Protection Associations (EFCA)	High	Interviewed
	▪ Association for Emissions Control by Catalysis's (AECC)	Low	
	▪ European Association for the Science of Air Pollution (EURASAP)	Low	
	▪ International Union of Air Pollution Prevention and Environmental Protection Associations (IUAPPA)	Low	
Waste management	▪ Bureau of International Recycling (BIR)	High	Interviewed
	▪ Packaging Recovery Organisation (PRO)	Low	
	▪ European Federation of Waste Management and environmental services (FEAD)	High	Interviewed
	▪ European Plastics Converters (EuPC)	Low	Interviewed
Soil and ground water remediation	▪ Sita Remediation	High	Interviewed
	▪ Arcadis	Low	
		Low	
	▪ Bilfinger Berger	High	Interviewed
	▪ Veolia Environment		
Noise and vibration control	▪ European Acoustic Organisation	Low	
	▪ ADEME	Low	
Waste and wastewater treatment	▪ European union of national associations of water suppliers and waste water services (EUREAU)	High	Interviewed
	▪ Veolia Water	Low	
Environmental monitoring	▪ European Committee of Environmental Technology Suppliers Associations (EUCETSA)	High	Interviewed
Renewable energy sources	▪ European Renewable Energy Council (EREC): umbrella organisation of most associations listed next	High	Interviewed
	o European Wind Energy Association (EWEA)		
	o European Biomass Industry Association (EUBIA)		
	o European Biomass Association (AEBIOM)		
	o European Bioethanol Fuel Association (eBIO)		
	o European Geothermal Energy Council (EGEC)		
	o European Photovoltaic Industry Association (EPIA)		
	o European Small Hydropower Association (ESHA)		
	o European Solar Thermal Industry Federation (ESTIF)		
	o European Association of Renewable Energy Research Centres (EREC Agency)		
	o European Ocean Energy Association (EU-OEA)		
	o European Renewable Energies Federation (EREF)		
	o European Solar Thermal Electricity Association (ESTELA)		
	o European Renewable Energies Federation (EREF)		
Eco-construction	▪ European Construction Industry Federation (FIEC)	High	Contacted
	▪ European Network of Construction Companies for Research and Development (ENCORD)	Low	
	▪ European Construction Technology Platform (ECTP)	High	Interviewed

Sector	Potential interviewees	Priority*	Status
	▪ Architects Council of Europe (ACE)	High	Interviewed
	▪ Flemish Institute for bio-ecological building and living (VIBE)		Interviewed
Clean technologies and processes	See other sub-sectors, especially renewable energy sources		
Industries that are indirectly influenced by Eco-industries (i.e. 'connected' industries)	▪ European Chimical Industry Council (CEFIC)		Interviewed
	▪ European Federation for Construction Chemicals (EFCC)		Planned
	▪ Conseil Européen de la Construction d'appareils domestiques CECED		Interviewed
	▪ Confederation of European Paper Industries (CEPI)		Interviewed
	▪ SAP AG (ICT)		Interviewed
	▪ German Engineering Federation (VDMA)		Interviewed
	▪ European Association of Metals (EuroMetaux)		Planned
Overarching associations	▪ Association of Environmental Enterprises in Finland		Interviewed
	▪ The Environmental Industries Commission (UK)		contacted
Environmental NGOs	▪ EEB (European Environmental Bureau)		
	▪ WWF		
Consumer organizations	▪ BEUC		

*: The prioritization of stakeholder interviews is based on the definition of the sector. The segments that are the main focus of this study ('core' eco-industry + eco-construction) received a high priority. These have been contacted in the first phase of the project. Representatives of the connected industries have been contacted in later stages of the study.

The interview guideline and consultation note

The purpose of the interview guideline and consultation note is to provide a common interview methodology and to collect in a more systematic way the relevant information needed asking the same set of questions in every interview. The information will also serve to make a sector report which will be compiled using other sources as well. In terms of content, the note is developed around the two major themes of the study: the competitiveness of the eco-industry and the interrelation of the eco-industry with the other industries.

General background

So far, the European Commission has not approached eco-industries as a sector to which it applied the principles of industrial competitiveness. Yet, eco-industries are instrumental in reaching the policy objectives of the European Commission – both in terms of the climate package as the growth and jobs agenda- and have become crucial for the competitiveness of our manufacturing industry and entire economy. To remedy this lack of attention and to contribute to the policy objectives of the European Commission, a

competitiveness policy for eco-industries will be launched. This study is asked to perform a **competitiveness screening of eco-industries** in order to identify those key competitiveness factors which need to be addressed in the industrial competitiveness policy for eco-industries. Additionally, the European Commission recognises that eco-industry has become an important sector that has a crucial **potential for the competitiveness of the manufacturing industry** and other sectors of the economy.

Guideline for stakeholder consultation

The consultation process is aimed primarily at gathering opinions on the structure of supply and demand, key drivers shaping the competitiveness of the eco-industry and potential obstacles that might hinder the competitiveness of EU eco-industry, or that might hinder the contribution of eco-industry to the competitiveness of industry clients and the economy as a whole. From a policy perspective, a distinction can be made between policy dimensions that (i) relate to eco-industry itself, and (ii) the role of eco-industry in the supply chain (major suppliers/major customers) and the interaction between eco-industry providers and industry clients. These two aspects are reflected in the consultation guideline below.

1. Eco-industry – structure, conditions and performance of eco-industry sectors/providers

Market structure

- Demand structure: Identification of different segments/business activities within the sector? Relative importance of services/goods in total sales? Most important client groups? Differences between MS? Differences EU versus US/Japan?

- Supply structure: Identification of different groups of companies in the market (large/small, local/global, specialised/integrated,… firms)? Key players? Market concentration? Differences in market structure between MS? Important changes over time (mergers, acquisitions, entry of new (non-EU) players,…)? Position of SMEs in sector?

- Competitive position of EU eco-industry vis-à-vis non-EU eco-industry? Strengths / weaknesses of EU eco-industry? Key aspects (positive or negative) that impact on the relative competitiveness of EU eco-industry vis-à-vis non-EU based competitors?

Demand conditions

- Key drivers stimulating demand of eco-industry goods/services? Important factors negatively impacting demand? Differences between MS? Differences EU versus US/Japan?

- Importance of public sector as demand driver? Public procurement?

Cost structure and competition

- Capital versus labour intensity of the industry? Differences for goods/services
- Basis for competition (Cost? Quality of product? Innovation?)

Productivity

- Evolution in labour productivity / total factor productivity?
- Drivers enhancing productivity? Role of ICT in enhancing productivity? Differences for goods/services

Innovation

- Key drivers for innovation? Regulation? Competitive pressure? Consumer demand? (International) competition in R&D?
- Contribution of factor markets (capital market, labour market) to innovation: Access to finance for innovation? Match (mismatch) between skill demand and skill supply?
- Role of government as potential driver / barrier for innovation: Role of public R&D investments? Government incentives (specific tax regimes) for innovation?
- (International) collaboration in R&D and innovation? Technology transfer? Protection of IPR?
- Specific barriers to innovation for SMEs?

Internationalisation

- Functioning of Single Market? Key elements that fragment the Internal Market and prevent firms from optimally exploiting scale economies (specific entry barriers, regulation, lack of standards,…)?
- Do SMEs encounter specific barriers to internationalisation?
- Openness of global (non-EU) markets?
- Role of subsidies in potentially distorting international trade?

Regulation and standards

- Role of regulation in promoting/inhibiting competition (e.g. regulation creates entry barriers, adds excessive administrative burden), competitiveness, and market integration?
- Role of standardisation and accreditation in enhancing competitiveness? How important are standards/codes of conduct for stimulating market integration?

Sector development (future outlook)

- Future growth expectations for the sector? Opportunities and threats for future competitiveness and future performance of EU eco-industry? Differences in growth expectation for different segments / in different MS?

2. Role of eco-industries in the supply chain – contribution of eco-industries to (industry) client performance

Contribution of eco-industries to the competitiveness of clients/customers

- Extent to which specialised/external eco-providers contribute (positively or negatively) to the performance of their clients/customers?
- Main differences across client segments (e.g. sectors/industries, large versus SME clients, etc.)?

Factors influencing the effectiveness of supplier-customer relations and performance outcomes

- Potential barriers that inhibit industry (manufacturing) from acquiring the eco-industry goods/services that it requires?
- Potential barriers for knowledge / technology transfer from eco-industry to client industries?
- Do the goods/services provided by the eco-industry to client industries correspond to their needs/requirements?
- Factors/evolutions in the client industry that might potentially harm the competitiveness of the eco-industry?

EU as sourcing destination for international supply of eco-goods/services in relation to US/Japan

- International patterns of specialisation in the provision of services? Who specialises in what type of goods/services? Explanations?
- Main factors influencing international sourcing decisions (e.g. cost, quality, availability, innovation, etc.)?

Structure sector report

For each sector to be covered:

Sector overview

- Description of the sector in the EU and main characteristics (with global comparison, e.g. position of the EU in the global market), with latest available data (e.g. turnover, employment, enterprises, market segmentation, etc.)

- Description of key challenges and factors influencing the development of the sector at EU and global level:
    - Global / broad challenges (e.g. climate/environment, technological change, globalisation, …)
    - Sector specific challenges (e.g. consumer awareness,…)

Competitiveness analysis (focus on eco-industry)

- Evidence on the relative competitiveness of the sector (EU versus main global competitors; across Member States).
    - What are the key factors for determining relative competitiveness (e.g. cost/price, quality, knowledge and skills, economies of scale, reputation and branding, etc.)?
    - Analysis of indicators for benchmarking competitiveness (either based on quantitative or qualitative measures), in particular in relation to productivity measures (both efficiency and effectiveness)

Competitiveness analysis (focus on eco-industry - client industry interaction)

- Evidence on the contribution of the sector to the performance of client sectors
    - Which are the main client segments? What are the main factors that determine demand conditions?
    - Analysis of indicators for assessing and/or benchmarking the contribution made by eco-industries to the performance/competitiveness of client sectors (either based on quantitative or qualitative measures)

Key issues / problems – sector development

- See topics raised under section I above; prioritise and assess the extent of issues/problems

Key issues / problems – eco-industry interaction with other sectors

- See topics raised under section II above; prioritise and assess the extent of issues/problems

On the basis of 4 and 5, complete a framework profile (see Table A).

Table A: Relevance/importance of framework conditions for development eco-industry and interaction with other industries (framework profile)

Regulatory & 'other' framework conditions		Relevance and issues	
Heading	**Initiatives**	**Sector-level**	**Eco-industry interaction with other sectors**
Regulatory conditions	National regulatory measures		
	EU regulatory measures		
	Industry / professional regulations		
	Completion of internal market legislation		
'Other' framework conditions	Knowledge: R&D, innovation and product/service development		
	Labour force, knowledge and skills		
	Openness of international markets (trade and investment)		
	Structural change and geographical cohesion		
	Competition policy issues		
Exogenous conditions	Technological change		
	Socio-political developments		
	Global competition		

Legend:
0: Not relevant
♦: Relevant
♦♦: Important
♦♦♦: Very important

Policy issues

- From 4 and 5 above, can we identify issues/problems that can be associated with market malfunctioning and for which, therefore, there is a potential policy role?
  - Externalities (e.g. R&D, innovation, human capital etc.)
  - Market structure, conduct, market power
  - Information asymmetries and regulation
  - Other
- Screening of potential market malfunctioning issues against existing industrial policy challenges and initiatives (see Table B)

Table B Relevance/importance of (existing or potential) EU policy initiatives for development eco-industry activities and role in supply chain (policy profile)

EU policy areas		Relevance and issues	
Heading	**Initiatives**	**Sector-level**	**Eco-industry interaction with other sectors**
Trade	Trade policy		
	Proper functioning of the internal market		
Better regulation	Public procurement		
	Competition policy		
	Better regulation and simplification		
	Internal standards		
Knowledge and skills	Research and development		
	Intellectual property rights		
	Innovation policy		
	Employment and qualifications		
	Flexicurity		
	Entrepreneurship training and skills		
	Access to finance / risk capital		
Energy and environment	Waste, water, air		
	Intensive energy use		

Legend:
0: Not relevant
♦: Relevant
♦♦: Important
♦♦♦: Very important

Annex II: Validated interview reports

This section contains the validated interview reports. They follow the same outline as the one presented in the guideline for the interviews. Interview reports of the following organisations are presented:

- BIR
- EUCETSA
- EUREAU
- VEOLIA Environment
- FEAD
- CECED
- CEFIC
- CEPI
- VIBE
- EREC
- EUPC
- SAP AG
- VDMA
- Association of Environmental Enterprises in Finland

COMPETITIVENESS OF EU ECO-INDUSTRY

-

Consultation
Bureau of International Recycling

Phone interview with Mr. Ross Bartley (Environmental and Technical Director), 4 November 2008

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1. Eco-industry – structure, conditions and performance of eco-industry sectors/providers

Market structure

The recycling industry has several different segments of international importance:

- Ferrous metals recycling
- Non-ferrous metals recycling
- Paper recycling
- Textiles recycling (is very diverse: second hand clothing, charity, fibre recycling)
- Plastics
- Rubber
- Special alloys
    - And those more national recycling activities, such as of:
- Glass
- Wood
- Aggregates
- Oils
- Food waste

The different business activities consist of collection of waste, sorting, processing and delivering to customers.

The industry is characterised by a pyramid structure, with a limited number of very large companies and a large basis of many very small companies (1 to 5 persons).The first group of companies mainly focuses on the processing and delivering of recycled materials, while SMEs mainly focus on the collecting and sorting. It is estimated that some 42,000 companies are active in Europe, of which around 200 are large companies (i.e. processing > 100,000 tonnes/year).

This pyramid structure of the industry is needed from a logistics point-of-view. The very small SMEs play a crucial role in the collection of the waste everywhere in Europe. You find waste collectors practically in every city, thus forming a good network for waste collection. These small companies provide their (limited amounts of) collected and sorted (this is where these companies add value) waste to medium-sized companies, that consolidate all these smaller amounts of waste into the large volumes that are needed by the large processing companies. This last group needs a constantly large amount of waste to feed into the mills.

The Member States with a higher concentration of large recycling companies are the large Member States GER, FR, UK and ES, and the Nordic countries SE and FI.

Demand conditions

Economic motives make that there has always been a recycling industry. The use of secondary materials instead of new materials is for some industries (eg. Steel industry) much more cost efficient. The last decade however, legislation has become a strong driver for industry growth as well (eg. end-of-life of household products, cars, … , landfill directive,…).

Especially in segments where the economic benefits are less pronounced, legislation has pushed growth. Eg. In recycling cars many more components are now being recycled that were not recycled in the past (eg. Plastics). For some components the question is raised whether this recycling is – even from an environmental point-of-view – so beneficial for society. Often these recycling processes are very costly and energy consuming.

Public procurement

Green procurement is certainly helpful in driving demand. Not only is the public sector a direct demand source, indirectly it also affects consumers' behaviour/awareness

Cost structure and competition

The processing of collected waste is very capital intensive. The initial investments to set up a recycling plant are very high. Once the plant is up and running, also labour costs make up a considerable amount of total costs as well as energy costs.

Also the collection and sorting of waste involves a considerable amount of labour. However, the way waste is collected and sorted can differ across countries/regions worldwide depending on the local prices of inputs. Eg. Cable recycling in Europe is mainly done in an automated way (machines separate plastic from metals), while in low labour cost countries this is done manually.

Basis for competition

Recycled materials are a commodity, customers look for good quality at a good price. Innovation does not directly drive competition. Only the large companies invest in R&D, especially with the aim of finding better recycling processes that enable them to get 'purer' recycled materials that can be sold at higher prices.

Strengths/weaknesses of EU eco-industry – competitive position

The European market is a 'big consumers' market and this will not change in the near future. Therefore, it is expected that there will always remain a recycling industry in Europe but its scale and speciality will change. However, until now the whole 'value chain' of recycling could be found within Europe. Lately, there is a tendency that the processing and delivery of recycled materials is moving outside of Europe, to markets that are characterised by stronger growth (e.g. BRIC). The move outside of Europe goes hand in hand with the de-industrialisation that is taking place, but there is the impression that legislation in Europe does not help firms to stay here. Also the high energy costs in Europe push recycling companies to move business towards countries/regions with lower energy costs.

Productivity

More automated sorting systems are coming into use after for example scrap metal or plastics has been processed, either displacing persons hand sorting in the EU or increasing sorting capacities. However, there are more collection activities needing more labour.

Convincing millions of consumers to better sort their wastes increases the quality of wastes entering the recycling systems.

Innovation

Both competition and regulation push innovation. Over the years the role of legislation has grown and sometimes even pushes the industry to the edge (eg recycling of plastics – see 'competition')

In terms of access to finance for innovation, there seem to be no real barriers. There seems to be enough financial means available for innovation in the sector. The only problem with many funds is the need for cooperation to get the funds. This seems to be a difficult issue for the industry. Collaboration in R&D is certainly not often done.

When we look at the share of public funding versus private funding for innovation in the industry, there is the impression that private funding is much higher than public funding. However, this is only a subjective impression; the interviewee has no hard evidence on that.

Internationalisation

Single Market Functioning

At the EU level there are enough directives and regulations in place that could provide a good framework for doing business in the recycling industry within Europe. However, the problem in Europe is the very different implementation and enforcement of all these directives and regulations in the different Member States. Some Member States have very well implemented regulations and provide business with a stable framework for doing business. Other Member States however, make much less effort to make fair competition possible or change regulation and legislation. This makes that uncertainty for business is often too high.

The current European framework for shipments of waste very much allows countries to take the opportunity to only protect the own benefits. One cannot really speak of a 'single market' but more of 'the patchwork of Europe'.

SMEs and internationalisation

In most recycling segments the majority of SMEs is not internationally active. However, in the special alloys segment SMEs do operate at an international level, as this segment is a very specialised segment with most companies (of which many SMEs) operating at a global scale.

Compared to other firms in the industry SMEs do not specifically encounter other barriers to internationalisation.

Openness of global (non-EU) markets

Trade barriers to move specific recycled materials do exist in several countries worldwide (e.g. Russia and Ukraine being most important to the EU, then from certain countries from South America, Africa and the Middle East), often for protectionist reasons

Constantly efforts are being made by among others BIR to remove trade barriers as only through free trade of recycled materials, companies in the industry can receive a fair price for their product. Trade barriers hinder free trade and distort competition

Regulation and standards

At this moment there is enough regulation in place to – ideally – have a good framework for doing business. The problem is situated at the level of the implementation and enforcement of all this legislation.

A good thing about the new European directive <Directive 2008/98/EC on waste> is that it contains many definitions for terms that were undefined in the past. This led to a lack of transparency and uncertainty. Now at least some clear definitions have been introduced, thus creating a clearer framework for business.

Next to regulation, also standards and codes of conduct are very important elements in shaping the industry. However, as with regulation, there seem to be enough standards and codes of conduct available. The main issue now is to make them be used in a proper way. E.g. At this moment – with the financial crisis – a whole debate is going on about 'unethical' behaviour of companies within the industry not paying and not fulfilling commitments that have been made in the past.

An important guideline in the industry is the OECD manual on environmentally sound management for waste.

Sector development (future outlook)

It is expected that the sector will still grow in volume in Europe, given the fact that consumption has not diminished over the last decade. However, in some segments the percentage of waste that is recycled is already very high, leaving not so much room for further improvement. Only in the textiles segment, there is the impression that there is still considerable room for improvement.

Also the international trade of 'waste' is expected to increase. This goes hand-in-hand with the relocation of parts of the value chain outside of Europe (see 'competitive position' above).

2. Role of eco-industries in the supply chain – contribution of eco-industries to (industry) client performance

Contribution of eco-industries to the competitiveness of clients/customers

The recycling industry contributes very much to the cost efficiency of customers consuming recycled materials. E.g. In the steel industry about 50% of the materials used is recycled materials. By using steel scrap instead of iron ore in the production process, the energy requirements per kg of steel drastically reduce.

Factors influencing the effectiveness of supplier-customer relations and performance outcomes

Potential barriers that inhibit industry (manufacturing) from acquiring from the recycling industry the goods/services that it requires

Especially initiatives, regulation,… hindering free trade of waste and recycled materials, such as the waste shipments legislation or the trade barriers that governments put up in non-EU countries, make that the recycling sector cannot optimally provide other industries with the goods and services that they need. The existing trade barriers hinder access to customers and thus hinder free supply and demand.

The Directive 2008/98/EC on waste, Art.6(2) determines that "End-of-waste specific criteria should be considered, among others, at least for aggregates, paper, glass, metal, tyres and textiles". Implementing this political agreement could well provide the necessary relief for transporting processed scrap as a product from the scrap yards to its users such as the metal-works, pulp-mills, glass works etc.

Factors/evolutions in the client industry that might potentially harm the competitiveness of the EU recycling industry

An important evolution within Europe directly affecting the recycling industry is the de-industrialisation of Europe. As the manufacturing industry is an important customer for the recycling industry and these customers are moving away from Europe, this affects the competitiveness of the EU recycling industry. It is expected that over time recycling companies will reorganise their value chain and relocate parts to outside of Europe.

E.g. in the new Member States the steel industry has undergone a major restructuring. This has clearly affected the recycling industry locally (Eurofer can provide more detailed information about this).

Do the goods/services provided by the eco-industry to client industries correspond to their needs/requirements?

To be able to maximally provide industry customers with recycled materials, upstream producers of products should make use of a product design that optimally allows for dismantling and separation of all components ("design for recycling"). This allows the recycling industry to maximally recycle and thus to keep useful resources in circulation. However, it is felt that the implementation of such "design for recycling" needs to be driven/pushed by legislation, as there is a lack of economic incentive for the producers of products to use such design approach.

EU as sourcing destination for international supply of eco-goods/services in relation to US/Japan

'Specialisation' is very much influenced by the industrial structure in the region. E.g. The OECD countries have much more facilities available for aluminium recycling than other regions in the world, due to the presence of a larger aluminium consuming industry.

Costs of labour and energy also influence the location of business. Labour intensive segments such as e.g. the sorting of cloths or the manual sorting of cable materials, move to low labour cost countries.

COMPETITIVENESS OF EU ECO-INDUSTRY

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Consultation
European Committee of Environmental Technology Suppliers Association (EUCETSA)

Face-to-face interview with Mr. Lionel Platteuw,
Brussels, 18 November 2008

"Personal opinions are expressed in this interview, which do not engage EUCETSA. The author is an independent adviser to EUCETSA and other European Associations."

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1. Environmental technology suppliers – structure, conditions and performance of eco-industry sectors/providers

Market structure

The market of environmental technology suppliers is highly fragmented. Most companies active in the industry are SMEs, only a few large players exist. This fragmentation is partly due to the definition of 'environmental technologies', which covers many different areas and is difficult to clearly delineate. Within EUCETSA the companies in the industry are mostly classified according to the media in which they are active: water, waste, soil or air. But within each media segment one can find very different technologies. As such, many niche players exist in the industry.

The main 'product' of the environmental technologies industry is the manufacturing of equipment. Services are also delivered by manufacturers, certifiers, laboratories, consultants, etc. but this is limited, when compared to the delivery of goods.

The main clients are manufacturing industries, with a bias towards specific sectors e.g. the steel industry, chemical or paper industry. These industries have adopted many new environmental technologies over the last few years. A lot of their work has been developed in-house, other work has been done in collaboration with the environmental technology industry. These industries are frontrunners in terms of the implementation of environmental technologies. Many other industries still have a long way to go in reducing their environmental impact through the use of environmental technologies.

Demand conditions

Economic motives ensure that manufacturing industry has always used 'environmental' technologies to make machinery more energy efficient, make more efficient use of resources, etc. However, the main driver was cost saving, not limiting the environmental impact of business as such. Over the last decade the major growth in the industry has clearly been from a different kind. As "real" costs have fed through and influenced purchasing decisions, and as regulation has grown to 'oblige' businesses to reduce their environmental impact, industries have adopted environmental technologies to effectively reduce their environmental impact. Public procurement is in some sectors an important

lever, as manufacturers that are contracted by public agencies, for example when supplying water treatment plants, have to comply with technological requirements.

For end consumers to take up products manufactured with more environmentally friendly technologies, one of the major challenges is to change consumer preference for the lowest price at acquisition, to a preference for the lower total cost over the life cycle. Prices do not reflect the real value of natural resources. This should change over time. Consumers should be taught to take a more 'holistic' view at acquisition.

Importance of public sector as demand driver and public procurement

The public sector is an important client group for the environmental technologies suppliers. We don't know what % of total sales in the environmental technology industry are to the public sector. Public procurement in Europe of all goods and services is typically about 16% of GDP, so we could infer that ET suppliers are in that bracket.

Not only is the public sector an important direct demand source, indirectly it can also affect consumers' behaviour/awareness. However, the public sector is rather risk averse (for good reasons) and conservative, in adopting new environmental technologies. We believe major information gaps exists between the public sector and environmental technologies suppliers. Public sector is not always aware of all possibilities or of the costs related to each technology. This means that public agencies may not purchase products/infrastructure with the lowest environmental impact, even when cost of purchase is in the same range. It is well known that as in the case of public lighting systems, the traditional focus on the acquisition cost means due consideration was not given to operating costs, so the longer and lifecycle view is neglected. With the introduction of the green procurement a step in the right direction is taken, but the information gap between the environmental technologies industry and the public sector remains a very important issue to address.

Cost structure and competition

The environmental technologies industry is a capital intensive industry. The development and production of environmental technology supplies demands a lot of capital to invest in installations, prototypes, etc.

As the environmental technologies industry is composed of many different niches, it can be said that competition in the industry happens on the basis of specific knowledge (innovation). However, price -especially the price at the moment of acquisition - remains very important in the buying decision of customers.

Productivity

- Evolution in labour productivity / total factor productivity over time?
- Drivers enhancing productivity? Role of ICT in enhancing productivity? Differences for goods/services

Innovation

Innovation in the industry comes both from entrepreneurial initiatives in the environmental technologies industry itself and from customer demand. However, market demand is a prerequisite for innovation to develop beyond demonstration stage. We have witnessed the slow uptake of certain technologies to produce less polluting cars. The car industry, professional and personal buyers were reluctant perhaps due to a lack of incentives, lack of regulation to adopt this technology, implying that there was no market opportunity for this new technology.

Customer demand for environmental technologies is very much driven by regulation. Regulation forces manufacturing industries to adopt environmental technologies and thus increases demand for environmental technologies supplies.

Access to finance for innovation

A good financial partner is critical for the development of a good innovation project. However, access to finance remains a barrier for innovation in the environmental technologies industry. Public funding is mostly focused on pre-market research, not so much on later stages. However, finding enough funding to finance the demonstration phase and market introduction is as crucial for SMEs. Financing these phases mostly happens through corporate funding or own funding.

Although there are venture capitalists active in the market (they mainly focus on the larger SMEs and the larger projects), most of the SMEs still rely on traditional local banks for their funding. It is therefore very important for environmental technology suppliers to build a strong trust relationship with their bank. This is needed to overcome the information gap that exists between the highly innovative firms and the lenders. Traditional banks are not specialised enough in the technological specifications of the innovation project to be able to fully evaluate the risks involved. Moreover, traditional banks mostly have a rather risk averse profile, making it difficult for environmental technology suppliers to get the funds needed. Especially for larger projects involving higher investments (often already in the demonstration phase), it is difficult to find enough financial means.

(International) collaboration in R&D and innovation

Collaboration between SMEs is increasing over time. Different reasons explain this increase:

- Due to the more integrated approach that the industry is taking to tackle environmental challenges, a multidisciplinary know-how and expertise is needed. As most SMEs are very specialised, they need other partners to complement each other in a research project.
- International collaborations are often set up between ‘competitors’ in different geographical markets to get access to new markets and new clients.

- Collaborations are also set up to share the risks of innovation projects and the high investments involved.

Internationalisation

Single Market Functioning

In principle we do have a legal framework and can talk about a Single Market for environmental technology supplies. At the EU level there are well developed Directives and regulations in place, that governments outside of Europe are trying to emulate. These regulations have not changed drastically over the last few years, thus providing a rather stable business environment.

However, the major problem in Europe lies in the implementation and enforcement of Directives at national level. Whereas Regulations are directly applied at national levels, Directives are interpreted by Member States, which leads to uneven implementation. Additional complications arise because simply of abuse, lack of enforcement or poor institutional capacity. This results in very different conditions on the ground across European countries, leading to barriers for doing business across borders. For example, different Member States ask for different certifications, costs of testing may vary hugely; recognition procedures are very different, etc. meaning that in reality still many obstacles remain for international business.

A good example of existing barriers to internationalisation is the case of the Belgian SME Deep Green, that has an innovative system for land remediation and had secured a project in France for soil remediation. However, the company was not allowed to resell treated soil in France because it is still considered 'waste'. This made the project unprofitable (as the resale of the treated soil was part of the business plan) and thus the Belgian company eventually withdrew from the French market.

In addition to the above mentioned barriers in the product market, there also still does not exist a single labour market in Europe. Although the barriers to the mobility of people within Europe have been largely overcome, labour market regulation is very complex across countries. Especially SMEs do not have the organisational capacity to deal with such complexity and therefore refrain from hiring (international) employees. In certain countries, for example Belgium, many SMEs are simply put off by the costs and complexity of taking on employees, whether national or international, which serves neither job seekers nor prospective employers. Much more flexibility in the labour market is needed to fully support growing new industries.

Specific barriers to internationalisation for SMEs

Differences in language and culture are especially a barrier for SMEs to collaborate internationally, due to the limited scale of the organisation and the limited resources. In international collaborations (e.g. for innovation projects) it demands a lot of extra effort and time to discuss differences across countries and find solutions that are of mutual interest. Also the many 'informal' barriers that still exist in the market (see case 'Deep Green' above) are particularly important for SMEs. All these differences and complexities put a considerable extra burden on the organisation.

Openness of global (non-EU) markets

Export from the European environmental technology industry to non-European countries is very important and increasing. Especially the BRIC countries are very promising markets. European companies do not encounter specific problems in doing business outside of Europe.

However, no open global market exists for the attraction of non-EU people to work in the environmental technology industry. Large barriers still exist when "importing" non-EU workers. But being able to tap into the non-EU labour market, is very important. The industry really needs this inflow of non-EU workers, since within Europe the pool of people with the right technological skills is insufficient to fully support the growth of the industry. Moreover, it is crucial to attract the best brains from all over the world to remain competitive.

Regulation and standards

At this moment there is enough regulation in place to – ideally – have a good framework for doing business. The problem is situated at the level of the implementation and enforcement of all this legislation. To create an effective single European market for business, tackling this issue is of utmost importance.

Overall, the industry is not in favour of more standards. Standards are to some extent needed to earn confidence from customers, bankers,… but they are seen as too tedious and restrictive for innovation. The strictness of standards is seen as a barrier to innovation, taking away a lot of flexibility to deploy new technologies. Moreover, it causes extra delay at the moment of market introduction.

In air emission technologies a very interesting initiative has been launched recently, called Environmental technology verification. EUCETSA is involved as a partner in two European research projects called TESTNET and AIRTV. It involves a self-developed instrument (by the industry) that allows customers to test and evaluate specific air emission technologies on an objective, independent basis. Such instruments are also being developed in the US, Canada and Japan.

Sector development (future outlook)

Climate change and the enormous challenges to be addressed mean that demand for environmental technologies will remain massive. Major market opportunities exist especially in the new Member States, the BRIC countries and mega-cities worldwide.

Until now Europe has been a frontrunner in the environmental technologies industry. However, in the US many high-performing companies are active in the industry as well – especially focusing on renewable energy. Until now the environmental technologies industry in the US has not been supported as much as the European by national authorities (although in several US States many initiatives have been taken), but this might change drastically with the new presidency.

2. Role of environmental technology suppliers in the supply chain – contribution of environmental technologies to (industry) client performance

Contribution of eco-industries to the competitiveness of clients/customers

There is a broad range of opinions on the 'need' to invest in environmental technologies. These vary from those that see environmental legislation as a burden we have to live, to those that view 'sustainable development as key to their business'. Prejudice remains strong against industry and manufacturing, with pressure groups using industry as a scapegoat., Manufacturing companies and their employees are no less sensitive to environmental issues than the rest of the population. How curious that people can be polarised into conceptual camps, whereas they are equally dependent and responsible for the vast infrastructure of our cities, our transport systems and our consumption, which our industry produces.

The European Commission initiative on Sustainable Production and Consumption partly addresses these issues. EUCETSA is a partner of a multiple stakeholder initiative called the "Resource efficiency alliance", which brings together a wide range of actors including several large manufacturing companies. See http://www.epe.be/refficiency.html .

Over time 'supply chain schemes' (Comparable to e.g. the tracing system in meat) will become increasingly important for all industries. Environmental technologies industry can play a critical role in the development and deployment of such schemes.

Factors influencing the effectiveness of supplier-customer relations and performance outcomes

The most important barrier for business between environmental technologies suppliers and other industries is lack of information and knowledge about the latest developments and potential of environmental technologies at the side of the customer.

Moreover, as there is a trend towards more integrated systems (e.g. developments in water energy), multidisciplinary skills will be more in demand - not only in the environmental technologies industry itself, but also in the client industries - to optimally take up the new technologies. Often these skills are lacking at the moment.

The formation of partnerships between ALL stakeholders (going from research institutes, to customers, to government, NGOs,…) is crucial for the further development of the environmental technologies industry, to disseminate knowledge about technologies and to improve communication, such that the information gap that exists at the moment can be reduced.

When we specifically look at knowledge and technology transfer between the environmental technologies supplier and the client, the protection of intellectual property rights is seen as a barrier for collaboration in innovation between the environmental technologies supplier and the client.

EU as sourcing destination for international supply of eco-goods/services in relation to US/Japan

- International patterns of specialisation? Who specialises in what segment? Explanations?
- Main factors influencing international sourcing decisions (e.g. cost, quality, availability, innovation, etc.)?

COMPETITIVENESS OF EU ECO-INDUSTRY

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Consultation
European Federation of National Associations of Water and Waste Water Services (EUREAU)

Telephone interview with Mr. Piet Jonker (managing director Duinwaterbedrijf Zuid-Holland, chairman EUREAU Commission Legislation and Economics), 20 November 2008

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1. Water supply – structure, conditions and performance of eco-industry sectors/providers

Market structure

The market for water supply is characterised by local and regional monopolies. This is caused by the high costs of water transport relative to the production cost. Both for quality reasons and cost considerations the preferred option is to use ground water if that is locally available. If there is insufficient groundwater available, then a source has to be found at a longer distance, e.g. from surface water. Surface water supply generally speaking requires more infrastructure and will be operated at a larger scale than ground water supply. Because water supply is almost always a natural monopoly, the infrastructure is most often owned by the local and/or regional authorities. The market structure of water supply is therefore closely linked to the structure of local government. In order to reap economies of scale one frequently finds dedicated co-operation structures of local governments for drinking water supply and waste water disposal. In some countries (e.g. UK, NL) policies have been introduced to actively reduce the number of players in order to reinforce institutional capabilities. In other countries (e.g. FR, ES) economies of scale have been obtained by means of a concession system, in which local governments contract out the operation of water infrastructure to a much smaller number of service providers.

When looking at size of the companies, all types of firms can be found from very small local providers (e.g. in Bavaria, GER, there are around 3,000 water supply companies) to major players such as Veolia or Suez, which operate in countries with a system of concessions.

Cost structure and competition

The industry is very capital intensive. Investments in infrastructure and installations are major. However, the technical life span of the infrastructure is also extremely long (e.g. in London about 40% of the drinking water network originates from the period before 1900).

In general, about 25% of the total cost of water supply companies consists of depreciations.

There is little competition in the industry. In the household market each supplier operates in a local monopoly position. In the industrial market the main competition comes from self-provision by the industrial users (own ground or surface water supply, own waste water treatment). Competition between providers only takes place at the moment of an open call for concessions in countries using the system of concessions (e.g. ES, FR). Concessions for water services often have a duration of more than fifteen years.

Productivity

Productivity in the industry has increased significantly over the years, witnessed by prices (corrected for major investments in quality improvements) lagging behind general price inflation.

ICT has played a major role in enhancing productivity. The introduction of ICT systems has increased the efficiency of many tasks. E.g. the use of digitalised designs of installations instead of paper versions has increased productivity of repair activities significantly.

Innovation

Innovation is clearly driven by regulation. E.g. establishing new quality norms leads to the development/improvement of new techniques to purify water.

Next to innovation in existing segments, regulation has also led to the development of a whole new segment: industrial waste water treatment. Thirty years ago this activity did not really exist, this development is entirely driven by regulation.

Role of public sector in innovation

Most innovation projects are self-financed. Direct public funding for innovation is limited.

At the European level, within the 7th framework programme a large budget is allocated to research in water issues. The results of the research that has been done through this programme so far (via WSTTP), still are difficult to directly implement for companies. Valorisation of the basic research is difficult. On the other hand, TECHNEAU – another initiative that started in the 6th framework programme – is very fruitful. It focuses on dissemination of knowledge among companies and is viewed as a real value added to the companies involved.

(International) collaboration in R&D and innovation

Collaboration in innovation regularly happens within the industry. In NL a successful network for collaboration exists among the players in the industry. As each of the companies operates in a monopoly situation, the companies are no competitors of each other, easing collaboration in research.

Internationalisation

There is a great variety of national regulations on the water companies themselves. The vast majority of water companies are either departments of local government or joint-ventures of several local governments. There are also water companies set up as public-private partnerships and investor owned water companies. Due to the local character of water supply and waste water treatment there are no multinational water companies in the sense of a company that provides services to consumers in more than one country, with some very small exceptions in border regions. Companies like Veolia and Suez set up local companies in each country in which they participate in concession tenders. There are no additional entry barriers for service providers originating from countries outside the EU who want to participate in tender procedures, either for works and services or for concessions.

Some European water companies, most often the larger ones, have activities outside the European Union. The most frequent forms are technical assistance, management contracts, partnerships with the local water company and concessions. These international activities are often partially financed by official development aid. Mainly due to the high exchange rate risk, resulting from the longevity of water infrastructure and the impossibility to export water services, there are very little direct investments by European water companies in water infrastructure outside the European Union. The international activitities of the European water companies are generally small in comparison with their national operations.

Regulation and standards

Regulation and international directives on quality levels of water have always been very important to shape the industry and its activities. Ever since the first Environmental Action Plan was adopted in 1972, more than a dozen of European environmental directives have been issued which have a direct impact to the water supply and waste water treatment industry. The most important ones are the Drinking Water directive, the Bathing Water directive and the Urban Waste Water directive.

On the one hand, regulation creates the market for water supply and even creates new segments (see above: waste water treatment). On the other hand it also affects the industry itself in doing business. E.g. a segment in which many new developments have happened over the last few years is security and the monitoring of water installations (due to increased terrorism threats).

Next to regulation, also many standards are in place in the industry (at all levels: global, European, national) and – although they are considered important instruments in the development of the single market – they bring a lot of administrative burden, whereas their impact in not always effective.

The water supply and waste water treatment companies are required by the Public Procurement Directives to tender out all works and services with values over certain thresholds. Roughly one-third of the total value added in the water sector is provided by outside contractors under these tender procedures. These tender procedures have increased competition amongst contractors. However, due to the general character of the Public Procurement Directives, tenders have to be organised also for works and services

that are less suitable for tendering out. This gives rise to more and more litigation, and increases the administrative burden for water companies.

2. Role of water supply industry in the supply chain – contribution of water supply industry to (industry) client performance

Contribution of eco-industries to the competitiveness of clients/customers

In the very large consumer industries for water (e.g. beer industry, paper industry) most companies have developed their own water system in-house. This makes them independent of any third party for one of their core resources. For these consumers the availability of water is often one of the main location factors. The main clients of the water supply industry are less water intensive users and households.

With respect to the contribution of the water sector to the competitiveness of clients, one can say that as a result of the constant efforts of the water industry to raise productivity within the industry through ICT-investments, the cost of water (in real terms) for clients has remained constant over the last ten years. Important is also that the water supply in the European Union is characterised by a very high reliability, even in comparison to other utilities.

Factors influencing the effectiveness of supplier-customer relations and performance outcomes

In most manufacturing companies the dumping of waste water is highly controlled and managed along specific regulatory guidelines. For these industries the principle of 'the contaminator pays' works well.

However, a large challenge for the water industry comes from those (economic) activities that dump waste water in a very diffuse way, making any control nearly impossible (e.g. agriculture). Here, the principle of the 'contaminator pays' does not work well and final responsibility moves to the waste water company. As they do not always know to what extent and in what way water is contaminated, purification of this sort of waste water is very difficult and sometimes technically not possible with the current state of know how.

Some additional comments made by Mr. Jonker in the context of this project:

In Mr. Jonker's understanding, there is not so much DG Enterprise should or could do to improve the development of the water industry within the framework of their own policies. It would, however, be most helpful if DG Enterprise would use its influence to promote sound policies by other DG's:

- **DG Agriculture**: use the health check of the Common Agricultural Policy to reinforce the polluter pays principle, in stead of continuing the policy to seduce the polluter to pollute less with subsidies, sometimes even imposing a financial burden on those who suffer the consequences of that pollution. This would certainly increase the competitiveness of the European export industry. In a large number of European member states with draught problems, agricultural water supply, mainly for irrigation, is often state subsidised, shifting the financial burden to industry and the population. Why is the user pays principle not applied when it comes to agriculture?

- **DG Research**: the funds for water research under the 7th Framework program should be more oriented on technological solutions. At present, the bulk of the funds available goes into fundamental research into long-term changes in the water system (climate change etc.)
- **DG Market and DG Competition**: respect subsidiarity and leave it to the member states to organise their water services in accordance with their ideas on the best way to organise local government. Do not try to extend procurement procedures outside its present scope, for instance to concessions. Provide more room for collaboration between local authorities in the present public procurement directives in order to reap the benefits of economies of scale (i.e. expand the definition of "in-house").
- **DG Justice**: do not pursue the idea of having a directive on critical infrastructures and leave the protection of water infrastructure against terrorist attacks to the member states. After all, the consequences of such attacks are only felt locally in the absence of international trade in water.
- **Secretariat-general**: use Better Regulation to roll back the 'juridification' of European regulation. Take away the incentive to litigate by increasing thresholds, introducing more "de-minimis"-stipulations and give more room for making exceptions in order to prevent imposing unintended burdens. And take impact assessments serious before introducing new legislations. The impact assessments should also include the impact which the new legislation will have for the legislations and institutions of the member states, as it is there were most implementation problems arise.

This list is not meant to be exhaustive. As the water industry is probably one of the industry's most regulated by European legislation, it is better to give priority to improve existing policies instead of inventing new ones.

COMPETITIVENESS OF EU ECO-INDUSTRY

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Consultation
Veolia Environment

Face to face interview with
Mr. Jean-Claude Banon,
(Group Executive Representative with the European Union Institutions) and
Mr. Cédric de Meeûs,
(Deputy Representative with the European Institutions)
Brussels 10 December 2008

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1. Eco-industry – structure, conditions and performance of eco-industry sectors/providers

- **Market structure**

Veolia Environment is active in environmental services. It provides integrated environmental systems and solutions. Strictly speaking it does not supply environmental goods and products, but rather long-run technological solutions, based on a systemic service approach. Veolia runs environmental infrastructure on behalf of municipalities and industrial clients. Thus, the core business is basically services.

Veolia is present in waste management, water treatment, energy efficiency and transport. In 2007 its consolidated revenue was 32.6 billion €, of which 29% in Europe, 34.8% in Asia-Pacific and 7.6% in North America. 67% of Veolia's revenue comes from local public authorities and 33% from industrial companies. In terms of types of services offered, water counts for 34% of the revenue, waste management for 28%, energy services for 21% and transportation for 17%. Veolia Environment counts more than 319,000 employees.

The market for environmental services is very competitive. In the market segment of local public authorities, a preference to operate "in-house" may often prevail which basically closes the market. The situation is very contrasted, depending on the sector of service and the country; for instance, water services tend to be outsourced to the private sector less frequently than waste management and Northern and Eastern European countries tend to outsource to a much lower extent than Western and Southern Europe.

When local authorities decide to outsource, the assignment of a contract for services is driven by European competition and internal market rules (thus involving official/public competitive tendering processes), which are open to all suppliers, (at times, both private and public). The largest international competitor for Veolia is Suez Environnement in the water and waste sectors, counting 63,400 employees in 2007, and 12 billion € turnover. Besides, there are numerous competitors active on the market, in one of the four segments of activities in Europe and further afield. Those competitors include private and public entities.

In the market segment of corporations, competition comes from both other global suppliers of services and from vendors of technology that package their products in a service offer (e.g. General Electric).

The market for integrated environmental systems is typically not an SME market, because of the sheer size of the projects in the public services area. Veolia typically works with consortia for building infrastructure projects, in which the partners are not SMEs usually. However, Veolia does co-operate with local SMEs in the course of the realisation or operation of environmental projects and facilities. Within the eco-industry SMEs are typically found in the delivery stage of eco-goods. e.g. photovoltaic panels are made by relatively large enterprises, yet the installation is done by a local SME.

The European "environmental services" sector has a unique expertise. Veolia itself has a history of 150 years. They have a unique 'savoir faire' and are well positioned throughout the world. In fact most of the largest environmental services providers are European. The EU has a good position in providing basic environmental services.

- **Demand conditions**

The urgency of fighting against global warming should impose on all economic agents (public authorities or businesses) a new approach to decision-making and to integrated management (economic, environmental and social) of business processes. Eco-innovation does not boil down to technology. Innovation in connexion with climate policy resides also in the ability to marry technologies of different maturities into models that are also economically and socially efficient and which are capable of delivering the required performance consistently over extended periods of time.

The key driver stimulating demand for the sort of services that VE offers is market awareness of this new paradigm. Whilst EU policy making and legislation is certainly spreading awareness, decisions in the field are still largely driven by classical economic considerations. Local authorities should move to the view that policy making in such areas as transport and energy should be driven by their ambition to achieve certain climate related targets by a certain date, whereas delivery of services should be driven by performance obligations consistent with such global targets.

In this perspective, their consideration of the benefits of a partnership with the private sector should be guided by a desire to tap novel ideas and to move to the targets efficiently. Il should not be obscured by a fear of "privatisation". As a matter of fact, true privatisation of public services – i.e. the sale of public assets - has occurred very rarely (for instance the water industry in England and Wales). In most instances where Veolia is involved in operating improving public services, the infrastructure remains the property of local authorities.

Educating the consumer is another important demand condition. Appropriate communication, not only on the price, but on the quality as well is crucial. In this way a more content-driven market can be developed, rather than a pure price-oriented one.

Demand of services by the business sector is driven by a more customary attitude that outsourcing may mitigate risk, make economic sense and allow the enterprise to focus on its core expertise.

- **Cost structure and competition**

The services provided by Veolia are local services. Economies of scale are limited. The cost structure is very largely fixed except for energy services.

The market for both local authorities and industrial clients is very competitive. Price has been the driving consideration for award. Performance in terms of service quality and eco-performance should become more significant considerations.

- **Strengths/weaknesses of EU eco-industry – competitive position**

Europe has a track record of developing successfully a consistent regulatory framework related to environmental management. Countries outside the EU are seeking an inspiration in that policy framework.

Veolia's development outside the EU is a testimony to the interest created by the EU regulatory approach as well as to the benefits of a holistic approach to environmental management.

In the context of a global agreement on the need to fight climate change, Europe could expect environmental services to be under increasing demand. It would therefore be in the interest of Europe's eco-industry to stimulate the development of partnerships between the public and private sectors in pursuit of climate change and sustainability achievements.

Focus should not be on public versus private management, a choice which must remain the prerogative of public authorities, but on spreading a culture of performance in reaching environmental targets. And in that context, the EU should ensure that obstacles to PPP are suppressed to allow local governments that are interested to pursue that approach. There are still too many practical obstacles to the choice of a partnership approach: a lack of clarity perhaps on the EU legal framework that applies some procedural difficulties in combining structural funding with PPP, misunderstanding on the potential conflicts, just to name a few.

- **Productivity**

Productivity is primarily a consideration for Veolia's clients. It is Veolia's view that the outsourcing of public services proceeds on the basis that the private sector can provide the services at a price that compares favourably with the existing cost structure. The clients also look often for an improvement in the quality of service and for a sharing of risks with an environmental expert.

For local authorities, when an investment in infrastructure is involved, PPP are an efficient approach to optimising the performance of the infrastructure over its lifecycle.

PPP is also an excellent way of developing skills and flexibility of the labour market. Very often, Veolia takes over the operation of a service from a local authority under the condition that the workforce cannot be reduced. Typically, however, there would be redundant labour. In such cases Veolia proposes training where new skills are learned, and redeploys the people. E.g. in the NMS, due to automation, the redundant manpower is retrained in multi-tasking, maintenance, … This results in an increased flexibility and a de facto increase in labour productivity of the plant, without laying-off people.

- **Innovation**

The EU innovation policy has a tendency to focus on technology. Yet a tremendous innovative potential exists in the area of "systems operations" and the adoption of creative and systemic approaches to performance delivery.

"Green procurement" is typically associated with environmental labelling and "green" equipment. Yet there is more to it if one considers the need to develop a holistic vision on how to reduce emissions. E.g. in the area of transportation, reducing the CO2 footprint by using green busses alone, may deliver significantly smaller results than using an integrated approach, including adjustments of the traffic flows, efficient and optimised management of public transport, etc. From an environmental point of view the return on investment from solely focusing on green technology (e.g. alternatively-fuelled busses) may be smaller than from simple measures improving the efficiency of public transport and displacing private transport.

- **Internationalisation**

Open public procurement is important for market opening and for the systemic environmental services business. Yet there is a lot of variation across EU countries. In France, for example, the four markets for local water management, waste management, energy and transport services are open. In Germany, waste management is open, yet water and transport are by and large in-house services of the local authority. The Länder appear more willing than the cities to contemplate competitions for the provision of transport services. The situation in the new Member States is highly variable. In the Czech Republic, for example, the water market is quite open for PPP; transport not so much. In Poland, the energy services market is open, yet not the other market segments. In other words a rather patchy picture emerges.

The estimate is that still 80-90% of the environmental services in the EU are provided by public players. Interestingly enough, this is similar in the US, with more private players to be found in the waste management segment.

The situation in China is improving. Pollution problems are substantial and China relies on the expertise of private players to implement environmental solutions.

- **Regulation and standards**

The single market

The single market in the EU works well, with one exception: for Public Private Partnership (PPP). Despite their many potential benefits, it must be said that the practice of PPP is not developing rapidly in Europe. The main reasons for this lack of progress are as follows:

- a certain distrust by many local politicians for involving the private sector in the delivery of public services, conveniently fed by the view that it is "wrong" to allow profits to be made on essential services;

- the lack of practice of PPP in many countries of the EU, combined with a perceived lack of clarity on the legalities surrounding PPP; to which may be added real or imaginary constraints;

- the perceived complexity of PPP projects requires supervision by skilled public administrators who may be in short supply;

- investment required in EU environmental and transport infrastructure might be an opportune conduct for PPP; however the practice of community funding has not tallied easily with the pursuit of PPP for a mix of procedural and conceptual issues, so that local authorities focus on capturing EU funding for their infrastructure needs and postpone any thinking process on the possible optimisation of services by recourse to private expertise.

Without attempting to create any form of regulation, the EU should bring together elements of guidance on PPP in order to facilitate their emergence as an approach allowing to harness expertise and finance in support of sustainable public services of quality mindful of minimising the climate footprint of urban areas. Such guidance should cover any legal clarification required, compatibility of structural aid with PPP, financial tools available, information on good PPP practice and benefits and training of administrators.

Beyond that general guidance, these are specific issues where countries wishing to promote PPP would benefit from fellow members expertise. This can be done through the Centre of Expertise for PPP managed by the EIB.

Co-ordination of EU-policy

There appears to be a lack of joined-up thinking between various EU policies in respect of cohesion, energy and climate, environment and innovation. The EU is a forerunner with good ideas for policy making on climate change. But ties between the various policies may be tenuous. This may have concrete ramifications in the field. For instance, large water plants may be built using cohesion funding. Yet the pipe system through which the water is brought to the tap, may be in bad shape, leading to a decrease in efficiency from an overall systems point of view.

- **Sector development (future outlook)**

As previously outlined, the need for local authorities to achieve results in terms of climate impact, could help spread a culture of efficiency and optimisation of resources, which in turn might generate an increased interest in the expertise of the private sector, its capability to take risks, to come up with innovative solutions and to commit to performance targets.

It would be desirable that obstacles to PPP that can be managed should be smothered ahead of this evolution.

2. Role of eco-industries in the supply chain – contribution of eco-industries to (industry) client performance

- **Contribution of eco-industries to the competitiveness of clients/customers**

The environmental services that Veolia provides can significantly improve the productivity of their clients, and contribute to sustainability. An example is given by the Province of Limburg in the Netherlands that has contracted out the integrated operation of all its public transport services, which allows maximising the benefits of intermodality. It includes a central control room where train, tram and bus transport is optimized in real time, in function of demand and the situation on the road and rails. Rather than having bus services, railway transport and trams competing with each other, the integrated service allows for a smooth public transport facility, which in turn leads to better time use and access for the customers. Furthermore it leads to a better 'desenclavement', opening up of the region.

One specific service offered by Veolia is energy efficiency. When offered to companies, it goes directly to their competitiveness. When put in action for local authorities, it goes to improving their performance in terms of climate footprint and energy dependency.

Better management of water resources is crucial to the quality and reliability of the public water service. This is particularly obvious in the context of emerging economies: water scarcity may be a reflexion of bad management. Good water and waste management services are prerequisite to the development of economic activity.

- **Factors influencing the effectiveness of supplier-customer relations and performance outcomes**

(see previous answers)

- **EU as sourcing destination for international supply of eco-goods/services in relation to US/Japan**

(see internationalisation, and market structure)

Mr. Banon and Mr. de Meeûs expressed their gratitude for being consulted and indicated that they would appreciate being involved in the March stakeholders meeting.

COMPETITIVENESS OF EU ECO-INDUSTRY

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Consultation
FEAD
(Fédération Européenne des Activités de la Dépollution et de l'Environnement)

Face to face interview with
Mr. René Schroeder,
(Policy Co-ordinator)

Brussels, 05 June 2009
And e-mail reply on a limited set of core questions December 2008

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1. Introduction

The context of the study, focus on competitiveness of the EU eco-industry and the links with the upstream and the downstream industries.

2. Competitiveness issues

The EU waste management industry

FEAD primarily represents private waste companies and such public entities which subscribe to fair competition. It represents approximately 70% of the household waste market in the EU-27 and handles more than 75% of the industrial and commercial waste. FEAD represents more than 4000 companies in the EU and Norway. It is estimated that, together, these companies employ more than 350,000 people.

FEAD strongly advocates for equal conditions guaranteeing uniform fair competition, e.g. equal VAT rates.

Demand conditions – importance of green procurement

FEAD considers green public procurement as important for the waste management industry. The life-cycle of products, including the waste stage, should be taken into consideration when developing criteria for green public procurement.

Innovation

The role of government as a potential driver / barrier for innovation in the waste management industry

Due to unequal tax regimes, FEAD members have experienced that the policy of some governments may lead to potential barriers to innovation. Different tax regimes (i.e. VAT) apply for the public and the private sector. In some cases, the public sector pays no VAT for the collection and management of waste whereas their private competitors have to pay the full VAT. FEAD strongly advocates for PPPs in which private companies are the driver for innovation.

Barriers to innovation

The current financial crisis also has its impact on the waste management industry. FEAD members find it harder to obtain the necessary financing. Innovative projects have to be postponed.

Regulation and standards

Adequate regulation at EU level can stimulate competitiveness and growth. In that regard, it is important that EU legislation is equally implemented across Europe. FEAD welcomed a certain extension of the scope in the new proposal for an Industrial Emissions Directive which creates a better level playing field by including installations that were not part of the IPPC Directive in the past.

Single Market functioning

Fair competition between the public and the private sector remains a high concern for the competitiveness of the waste management sector. In particular three important issues can be noted:

- Remanufacturing and unequal VAT

  Pursuant to art. 13 of Directive 2006/112/EC on the common system of value added tax, activities or transactions of public entities are not subject to VAT as long as public entities engage themselves in these actions or transactions as public authorities. The main problem about this rule is the fact that it is left to the Member States to define and declare actions and transactions of a public entity as a part of a public authority.

  In a number of Member States, public sector waste management companies are exempted from paying a value added tax (VAT) for their services (*please see attached document*). This creates a market distortion as private sector waste management companies are required to pay a high VAT rate. One of the major problems is the incorrect transposition of relevant EC Directives (in particular 2006/112/EC on VAT) into the national law of Member States.

  Concerning the proposal for a Directive amending Directive 2006/112/EC as regards reduced rates of value added taxes on labour-intensive services such as waste management and waste water management services, a key criticism is that the application of reduced rates is only optional: i.e. the Member States themselves decide whether reduced VAT-rates on certain services are applicable. Where some Member States currently favour public bodies by exempting their

activities and transactions from VAT, it is unlikely that they would apply reduced rates on services which are subject to public private competition.

FEAD and its members advocate equal treatment of private and public sector companies in the waste management business and the application of uniform VAT rules.

Fair and open procurement and tendering

In the field of services of general interest, contracting authorities often avoid tendering procedures for public works contracts, public supply contracts or public service contracts by awarding these contracts to other public entities. They thereby claim that this cooperation is part of the state administration and therefore not subject to European procurement law. This practice creates an unfair access to the public services for private companies. The ECJ decided that the so-called 'in house' procedure in public-public cooperation is a legal exemption from procurement law, as well as the cooperation of public entities in order to fulfil their public tasks. However, the criteria of "in-house" procedures and for public-public cooperation in the field of their public tasks are set by the ECJ. The ECJ however tended to soften these criteria in its latest jurisprudence. As a result, the awarding of public works contracts, public supply contracts or public service contracts from one public entity to another public entity without tendering is becoming increasingly common. Tendering conditions should be improved in this respect, e.g. by providing EU-wide contract models and setting clear and binding rules and criteria for public-public cooperation.

Fair competition for material flows

As an example the German 'blue bin dispute' is mentioned. In Germany paper waste is collected in municipal collection-containers or in blue bins placed at private households by private companies. As the value of paper waste increased, private waste management companies decided to provide private households with their blue bins in order to collect paper waste directly from private households; this was opposed by many local authorities who tried to prevent private commercial collection by administrative and jurisdictional means. However, the administrative courts allowed private commercial collection of waste paper at private households, industry and trade. Nevertheless, the German Government is planning to impose an obligatory registration of private waste management companies for private commercial collection. The competent public authorities would thus be able to reject a private commercial collection of material flows if it hinders the functioning and the economic efficiency of the local public sector waste management company. Therefore public companies are in a relatively better position to acquire the waste paper.

Also the WEEE directive is important for future market development. FEAD welcomes the Commission's initiative to increase the national targets for the collection and recycling of WEEE (collected and recycled WEEE waste per head) and the EU-harmonised approach in doing so, with common objectives for Member States.

Standards

Standards can play an important role for the competitiveness of the waste management industry. End-of-waste criteria that will be developed in the near future as a result of the new Waste Framework Directive can help to define at what stage waste is not considered waste anymore. However, FEAD stresses the importance of a harmonised system aiming at an equal application of EOW criteria across the EU. This way loopholes in the absence of EU wide EOW criteria should be avoided. Furthermore, by-products could be problematic for health and safety as some industries might claim certain waste streams as by-product that would then fall out of the waste definition, i.e. declassification of certain hazardous waste streams.

- **SMEs**

The topic of languages is a big issue for SMEs in the context of the various new legislations and policy initiatives at EU level. Large companies have access to qualified and specialised personnel, yet the SMEs not. In particular two examples were given:

- The revision of the IPPC directive and the BREFs. Best Available Reference Documents (BREFs) are important guidance documents and established as part of the Sevilla process. The proposed Industrial Emissions Directive (revision IPPC) foresees that BREFs should become legally binding. For the moment, however, these guidance documents are just available in English. Once they become legally binding, they should be available in all official EU languages.

- REACH: a huge number of guidance documents are available only in English.

This gives the SMEs a comparative disadvantage in terms of preparation and know-how about the legislative issues that apply to their activities.

- **Sector development (future outlook)**

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2. Contribution of waste management industry to the competitiveness of clients/customers

Waste management is an industry that has contributed significantly to reductions in greenhouse gases over the past decade. Its green credentials are important to the overall carbon footprint of clients/customers and can assist in its reduction. In that regard, a number of studies underline the importance of recycling in the reduction of greenhouse gas emissions (Ökopol: Climate Protection Potentials of EU Recycling Targets. January 2008; ETC/RWM study: Municipal waste management and greenhouse gases. January 2008; Prognos study: Resource savings and CO2 reduction potentials in waste management in Europe and the possible contribution to the CO2 reduction target in 2020. October 2008 etc.)

Furthermore, some of the FEAD members' member companies are applying the EpE (Enterprises pour l'Environnement) to measure the carbon-footprint of their installations.

3. Is the eco-industry in crisis?

The waste treatment sector suffered from the financial and economic downturn, but the expectation is that it will increase again in the coming period (precise timing is hard to determine due to the general uncertainties concerning the markets). E.g. scrap metal use depends on the demand for construction works and cars. Construction works within and outside the EU are gaining momentum again and this will trickle through to an increased demand for scrap.

4. Comments and questions on the interim report?

In general the interim report is OK. The chapter on the framework conditions are interesting. Few remarks are made:

p. 97 environmental regulation and issues: why 8 when all sub-issues have a 9

p. 102: PPP, no value: an 8 would be appropriate

p. Split up the categories: carbon capture and storage , 2nd generation biofuels, biomass, ...

Part 9.3.: in general OK

List of companies: include Veolia Environnement, Sita

p. 129: single market functioning is more important issue than standards; therefore the suggestion is to put it after regulation.

p. 132 figure 39: update it.

COMPETITIVENESS OF EU ECO-INDUSTRY

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Consultation
CECED
(Conseil Européen de la Construction d'appareils Domestiques, European Committee of Manufacturers of Domestic Equipment)

Face to face interview with
Mr. Luigi Meli,
(Director General)
Mrs. Korrina Hegarty,
(Government Affairs Manager, Environment)
And
Mrs. Kamila Slupek
(Government Affairs Specialist)
Brussels, 03 June 2009

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1. Introduction

The context of the study, focus on competitiveness of the EU eco-industry and the links with the upstream and the downstream industries.

2. Competitiveness issues

- **CECED, its industry and the relation with the EU eco-industry**

The producers of domestic household appliances are connected to the EU eco-industry, and contribute attaining the EU environmental goals in basically in two important ways:

- Energy efficiency, and
- Environmental damage remedy.

Examples of companies are Arçelik, BSH Bosch und Siemens Hausgeräte GmbH, Candy Group, De'Longhi, Electrolux AB, Fagor Group, Gorenje, Liebherr, Indesit Company, Ariston Thermo Group (former Merloni Termosanitari), Miele, Philips, Saeco, SEB and Whirlpool Europe. CECED's member associations cover the following countries: Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Switzerland, Turkey and the United Kingdom. Beside the domestic household appliances, the industry produces and incorporates environmental technologies such as air-to-air heat pumps, water heating, cooling systems,...

Energy efficiency has been the most relevant source of investment in the last 15 years, with amounts of approximately 1 billion € per year. Significant improvements have been made over time with improvements of over 70% in energy efficiency in refrigerators and washing machines. The A+ and A++ are already up to 50% of the market, depending on the country. In descending order the most important markets in the EU are: Germany,

Netherlands, Italy, France, and Spain. A new labelling system with higher categories of energy efficiency (beyond A-categories) is currently under discussion.

- **Competitiveness and position of EU producers in the world**

Domestic equipment manufacturing is characterised by volume sales, combined with relatively small profit margins. Raw material and component costs count for about 60 to70% of total costs. Cost increases lead mostly to price increases of the products produced, in an effort to safeguard the relatively narrow profit margins.

Scale economies are important. Plants producing less than 1 million units per year come in a critical zone, where survival is threatened.

Labour costs are another key factor in the sector's competitiveness picture. In terms of volumes produced, Italy and Poland are leading EU countries. Yet in terms of value added Germany lays ahead. Turkey is more important in terms as a producing country than Spain, not only because of labour costs, but also because its relatively larger domestic market.

Concerning the competitive position vis-à-vis the rest of the world the EU domestic equipment manufacturers produce for many product types the most energy efficient products. The EU product's energy performance is from technical point of view considered to be superior to that of the US (Energy Star) and Japan (Top Runner). In Europe 98% of dish washers and washing machines sold are of class A. For refrigerators, even higher classes (A+ and A++) are currently available. New labels are being discussed with th EU authorities as the current ones do not allow to support innovation further:. The A++ class of European label for the refrigerators is the most energy saving in the world.

Note that measurement of energy efficiency globally should be done on comparable bases. Energy efficiency should be measured with the same (washing) performance. Both factors have to be incorporated for a fair comparison. CECED is aiming to get global standards in these fields but it is perceived to be a long term process. So far other regions do not include washing performances in their labeling schemes. CECED supports the extension of the EU approach to other Regions.

In the EU there is no law on energy efficiency for dishwashers, refrigerators and washing machines. The standards have been set through **voluntary commitments** of the industry in co-operation with the Commission.

Although the producers are more and more globalised, the products are mainly regionally determined, due to product preferences. E.g. in the US washing machines with vertical axe washing systems are preferred compared to the EU models with horizontal ones. Yet energy and water use are substantially higher in the US models than in the EU models. In Japan cold water washing machines are preferred, which evidently provide quite different washing performances than the warm water versions.

EU is at the forefront in reducing GHG in refrigerators. China follows the EU technology and models. Yet the adoption of the latest (and most energy efficient) technologies, with equal or even better performance, depends ultimately on the price.

Three factors play a crucial role in adopting and producing the newest technologies:

- Average product life
- Life time of the industrial platform
- Technological progress translated in the lifetime of the highest energy category, (before it is overtaken by a more energy and water efficient class)

The average product life is 13 to 15 years. The life of the industrial platform is about 5 – 7 years. Policy makers are asking to shorten the life time of the highest energy label class from 5 to 3 years. Consequently the payback period will be reduced and depreciation of the industrial platforms will be accelerated. In other words the quest for more energy efficient appliances and the energy labelling will accelerate the investment cycle considerably, while the average life time of the goods produced (the depreciation period) will remain virtually the same.

- **Policy**

With respect to the decreasing life time of the industrial platforms, and the increase in energy efficiency and energy labelling, CECED favours any policy measure - e.g. tax credits for purchasing more efficient product -, that would help replacing older appliances, with lower energy efficiency, and reduce the payback period for investments made.

In order to contribute to a global playing field, energy efficiency schemes should be comparable and measure the efficiency and performance in the same way.

The interrelation of eco-industry with the other industries is very important. Policy should take account of the bigger picture as illustrated by the WEEE directive and the leakage problem (see regulation and standards). It is important to envisage all players in the field.

- **Innovation**

Investment in the domestic appliances industry has been driven to a large extent by the search for a better energy and water efficiency. Innovation plays a crucial role in this respect. In terms of bringing the innovation to the market, eco-labelling is very important, since it informs the consumer about the efficiency status of the appliances.

- **Internationalization and the internal market**

See Competitiveness and position of EU producers in the World

- **Regulation and standards**

See previous sections. In particular the

- WEEE directive
- Voluntary agreement on energy efficiency

Also the restriction of hazardous substances (RoHs) is important.
Note that the industry has made voluntary agreements on energy efficiency and states that this proofs that voluntary agreements can work equally well as regulations. CECED welcomes the conditions that made these voluntary agreements possible. However

CECED decided in 2007 not to renew its voluntary agreements as manufacturers considered that the framework conditions would have not allowed to support sector competitiveness.

Main reasons: lack of enforcement of energy label directives and lack of financial incentives to consumers to support the penetration of efficient products on the market.

Concerning the WEEE directive (Dir 2002/96/EC), CECED highlighted and documented the so called **leakage problem**. The directive puts the responsibility and cost of treating WEEE with the producers. However, collection and treatment are not entirely within the control of the producers. Producers do not have enforcement power to make consumers hand in end-of-life products. Given the potential value of used WEEE, dealers, scrap dealers, municipal waste collectors, recyclers and other operators on the waste treatment market, are equally involved. Yet these operators are not subject to the WEEE directive, and consequently do not bear its compliance costs, nor are bound to any quality prescription in handling WEEE.

Furthermore, the producers of domestic equipment tend to end up with the low value WEEE, since higher value WEEE goes primarily through other operators. This implies that in times that the WEEE value fraction has a high price, this waste is treated through the other channels, and the producers end up only with small amounts and vice-versa. Consequently in times of high WEEE prices, the domestic equipment manufacturers do not have the volumes to benefit from the scrap raw material price increases. While in times of low WEEE value, producers are faced with large stocks of WEEE with little or no market value. The same reasoning can be made on the product level: the producers receive mostly the products with low or negative value, while the higher value products end up elsewhere in the waste treatment cycle.

A related issue is that there is no clear cut definition of end of product life. Old appliances can be reused or exported to third countries, thereby introducing products with lower energy standards, and therefore from global environmental point of view sub-optimal. In this respect the definition of waste is important and its implications for free waste trade.

CECED therefore advices that all players on the WEEE market be subject to the directive.

- **Sector development (future outlook)**

Various elements determine the future outlook of the sector:

- Energy efficiency is bound to increase, yet law of decreasing returns starts to emerge (concave efficiency curve over R&D outlays) E.g. washing machines using water of 15°C.
- Smart grid approach with intelligent demand using renewable energy sources. E.g. a water heating system that incorporates the pattern of use and optimizes performance and energy use.
- Eco-design related to energy and water consumption.
- The energy building directive (for buildings smaller than 1000m2). Energy efficient housing, buildings imply energy efficient appliances such as heating, ventilation, lamps, ... In other words, sustainability is not just about making a sustainable house or building the shell, but equally about the use of the building and sustainable activities inside it.
- Use of hazardous substances

2. Role of eco-industries in the supply chain – contribution of eco-industries to (industry) client performance

- **Contribution of eco-industries to the competitiveness of clients/customers**

Resource efficiency.

- **Factors influencing the effectiveness of supplier-customer relations and performance outcomes**

(see previous answers)

- **EU as sourcing destination for international supply of eco-goods/services in relation to US/Japan**

Not addressed

3. Is the European domestic equipment manufacturing industry in crisis?

The economic downturn is hitting the household appliance industry as well. An average -10% in sales is registered at European level. Some countries like Spain or UK register falls of sales in the range of -20%. Taking into consideration that the household appliance market is dominated by replacement, the 10% to 20% decrease of sales is an unprecedented situation. Fluctuations were traditionally within +/- 5%.

The evolution of the financial crisis into economic and, then, employment crisis may hit even more severely the durable consumer goods market. The sector urges national authorities to consider, in the frame of the economic recovery plan, the establishment of measures for incentivising the uptake of super efficient technology.

4. Comments and questions on the interim report?

Not discussed.

Annex: List of documents provided

CECED, 2006, *Energy-efficiency, a shortcut to Kyoto targets. The vision of European home appliance manufacturers*, Brussels. 43 pp;

CECED, 2007, Requirements for the Collection, Transportation, Storage, Handling and Treatment of Household Cooling and Freezing Appliances containing CFC, HFC or HFC, Brussels, 21 December 2007

COMPETITIVENESS OF EU ECO-INDUSTRY

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Consultation
CEFIC
(European Chemical Industry Council)

Face to face interview with
Dr. Joachim F. Krueger
(Executive Director)
Mr. Ben Knappenberg
(Product Stewardship)
Dr. Peter Botschek
(Director Energy, Health, Safety & Environment)
Ms. Ann Dirksen
(Energy, Health, Safety & Environment)
Ms. Monika Drążek
(Economist, Industrial Policy Department)
Dr. Gernot Klotz
(Executive Director Research & Innovation)
Brussels, 11 June 2009

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1. Introduction

The context of the study, focus on competitiveness of the EU eco-industry and the links with the upstream and the downstream industries.

2. Competitiveness issues

- **The European chemical industry (desk research)**

Cefic is the Brussels-based organization representing the European chemical industry:

- representing 29 000 companies that produce 30% of the world chemicals and employ about 1.3 million people.
- 22 national chemical federations and 6 associated federations across Europe.
- About 100 Sector Groups addressing issues relative to more than 120 product families.
- Over 50 Strategy Implementation Groups and Issue Teams dealing with the industry's strategic concerns such as REACH, energy, environment, international trade, research & innovation and many others.
- Close cooperation with the US, Japan and other major chemical countries through ICCA and many federations and trade unions.
- It is one of the top three industries in 11 of the EU's 27 member states and its annual sales (€ 556 billion in 2003) are greater than some member states' GDP.
- Accounting for 34% of global output, the EU is the world's first largest chemicals-producing region - ahead of Asia and the USA. It is also the world's

leading exporter and importer of chemicals, accounting for more than half of global trade.

The industry is also a major provider of jobs. Throughout the EU, some 25,000 chemical companies employ about 1.7 million people or 7% of all those working in EU manufacturing industry. Furthermore, chemical industry employees tend to be better qualified, trained and paid than the average industrial worker.

Personnel costs in the EU chemical industry are typically 50% higher than in other manufacturing sectors. As well as those directly employed by the industry, 3 million more work in sectors that supply the industry or rely on its products.

The chemical industry in Europe consumes 5.7 exa-joules of energy per year as feedstock and fuel. Energy cost can be up to 60% of production cost for certain chemical products. (CEFIC)

The Chemicals Industry significantly shapes other economic activities and has a vital importance for Europe's economy. The High Level Group identified three key challenges for the European chemicals industry:

1. The increasingly difficult energy and feedstock situation with a high impact on costs.
2. Climate change, and global environmental challenges more generally
3. Strong competition from industry in emerging countries and barriers to market access in these countries.

In its conclusions the High Level Group highlighted three key factors for the continuing success of the chemical industry:

1. More innovation and research and strengthening networks and clusters are keys to securing competitiveness and sustainability. More innovation needs greater private commitment and a favourable policy framework.
2. Responsible use of natural resources and a level playing field for sourcing energy and feedstock are success factors. Constant efforts to improve efficiency and to provide innovative solutions to contribute to Europe's energy saving targets are needed.
3. A competitive chemicals industry needs open world markets with fair competition to fully unlock its potential to ensure a successful future of this industry in Europe.

From the interview...

- **Regulation and standards**

The industry is heavily affected by regulation and feels there is a tendency that this is driving prices up to the extent that they will be forced to move to places where it is cheaper to produce. In this respect environmental policies affect the industry both directly and indirectly. As an example of the latter the costs of animal waste (slaughterhouse waste) was given. This serves as an important input for many detergents. However the policies promoting the use of this material for energy generation have driven up prices at

slaughter houses to the extent that they have become to expensive for the chemical industry. Part of the challenge for the industry thus lies in security and affordability of inputs and to compete with subsidized usage like energy generation. The issues of availability of raw materials in Europe is seen as key to the industry's survival here.

- **Eco-industry policy**

The industry questions the renewable energy policy in terms of the raw materials that serve as inputs, e.g. bio fuels raw materials from Latin America and Southeast Asia. The EU must be careful not to export its problems. All imports of such raw materials need equal treatment at customs.

While Cefic agrees that some high potential renewable energy projects require public kick-off funding for a limited period, technologies depending on long-term subsidies are not a feasible strategy and only create misallocation of resources better spent elsewhere. Ambitious political targets such as a significant increase of the share of renewables in the EU energy mix must not lead to such unsustainable developments.

The IPPC regulation is seen as one that affects several of the sub-sectors in the industry. The problem – which is as relevant for eco-industries as it is for the chemicals industry – is that the regulation is implemented differently across member states (different standards).

In terms of white biotech (industrial biotechnology) the industry takes many initiatives by itself. In other words it does not outsource this to specialized firms.

The power sector is mentioned as strong player with direct influence on the Chemicals sector. In the view of CEFIC, the power sector is in fact opposing some energy efficiency initiatives, such as independent Combined Heat and Power Stations (CHP).

CEFIC mentions the Third Energy Revolution concept, in which the energy grid would be much like the internet, where everyone could make a contribution. The chemical sector has a lot of excess heat that is used in the "Verbund structures" but could be re-used in such grids, too.

It is CEFIC's belief that good solutions need some initial support, but it is *against subsidized technology*. "What we don't want is artificial markets that are only sustainable in the EU and need protection". The industry is *against border adjustments*, as it potentially evokes retaliation, which could be much more damaging to an industry that is a global player.

- **Internationalisation and the internal market**

In the view of CEFIC at this moment a shake-out is taking place in the industry and the landscape after the ETS and the current crisis will look profoundly different. The industry

can still compete on higher value added products relying on the whole base chemicals supply chain, but if competitors in **Middle East and China** start moving up the ladder we won't be able to fill the niches anymore due to interruptions in the supply chain. In this respect they fear the Chinese approaches to Climate Change mitigation that will not have comparable efforts and costs like Europe has with ETS. In addition emerging economies request technology transfer more or less for free.

- **Innovation**

Could **innovation** be the solution?

According to CEFIC the current EU innovation system is not working, as it **focuses too much on research and not enough on implementation/application**. The solutions and technology are there, but there is no system to help implementation and this is where policy should assist. Unfortunately the policy system is splintered. The wider sustainable development issues cannot be solved by member states or individual DGs, but need concerted effort.

Innovation is only truly innovation if it is broadly available to the public.
SusChem, an initiative of CEFIC and company consortium developed the Smart Energy House, which is a net producer of energy. This is now a commercially viable PPP.

Recycling still faces major hurdles because of transport limitations in the case of chemicals. Moreover, substance regulations make recycling difficult (just the smallest trace of a substance can mean the product is not allowed; it is hard to keep products 'pure' in recycling).

According to CEFIC it is **important to think more in terms of processes, not just products**. Likewise ETS is set for products, while in an interconnected industry such as chemicals it makes much more sense to look at processes and value chains. The interconnected nature of the industry makes it complex, but it is also part of its strength.

Recycling has now reached a level of 60-70% in the plastics industry. The technology that allowed for this was developed in the chemical industry.

Many changes are cost driven, but a lot has also been achieved through self-commitments (e.g. cleaning up the Rhine river).

Another important driver consists of **requests from customer industries, such as the automotives industry asking for specific applications**. These kind of innovative, high value added activities and the presence of strong EU networks of industry are crucial for the industry's continued presence in the EU.

- **Other framework conditions**

Security of raw materials forms another crucial issue.

According to CEFIC the policy system is flawed in the sense that it needs a strategic vision for EU industry that does not just assume linkages to form, but that support the forming of these linkages and addresses the real issues (e.g. that of education and how to retain industry in the EU). In this respect the industry seems to be chasing the regulator now to get the European house in order.

3. Role of eco-industries in the supply chain – contribution of eco-industries to (industry) client performance

The chemical industry has spearheaded discussions about its relation to climate change and environmental challenges and has a clear interest in the development in **renewable energy** and reduction of energy usage. It uses fossil fuels both as a raw material and as an energy source for its processes and would prefer reducing its use of the latter in particular (not burn it but use it as raw material).

The industry sees itself as closely connected to eco-industry and in part overlapping with it, arguing that it **produces products that contribute to environmental protection, increased energy efficiency and better recyclability**, such as insulation materials, "green" tires, rechargeable batteries, special paints, etc.

An important issue in relation to environmentally friendly inputs is that of the quality and reliability of supply (constant flow). The materials produced by the Chemical industry go into **extensive supply chains** and as such the industry sees itself as connected to almost all industries and activities in the EU.

"… waste prevention is still the most effective way to save energy and reduce CO2 emissions This also needs to be considered in product and process development [not just recycling] ." (EC, 2009)

COMPETITIVENESS OF EU ECO-INDUSTRY

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Consultation
CEPI
(Confederation of European Paper Industries)

Face to face interview with
Mr. Bernard Lombard,
(Trade and Competitiveness Director)
Mr. Jori Ringman,
(Recycling and Product Director)
Brussels, 28 May 2009

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1. Introduction

The context of the study, focus on competitiveness of the EU eco-industry and the links with the upstream and the downstream industries.

2. Competitiveness issues

- **The European paper industry**

The European paper industry is an important connected eco-industry (see also section 4 of this note). It contributes to waste treatment (paper recycling), renewable energy generation – currently the 1st producer and consumer of bio energy - and carbon storage. More than 60 million tons of paper is recycled every year in the EU. About half of the raw material is considered "virgin". However, the major part of this half is also residues from other industries (e.g sawdust or chips). The material that is wood in the form of logs accounts on average for about one quarter of the fibre supply. In packaging more than 70% of the input is recycled material (73.5% in 2008).

Business models are changed and challenged. In the context of an increasing, yet concave, demand, it is expected that a higher proportion of turnover will come from the production of bio energy. Although paper mills are energy intensive, through the production of own bio energy some are self-sufficient and can even supply power to the grid. Through huge investments in CHP - Combined Heat and Power- the pulp & paper industry has increased substantially its energy efficiency. The future is a net surplus production that can be put on the grid.

Other prospective avenues in the field of eco-activities are the more systematic extraction of valuable chemicals which can be used in food and pharmaceuticals.

Paper is one of the most regulated industries. It is energy intensive, and uses large quantities of water. The paper industry is characterised by scale economies. Paper mills are usually located close to the raw materials, which is wood or recovered paper. Yet the latest trend is to locate the mills closer to the markets, which favours strongly mills based on recycling. This is clearly visible in the announcements of mill closures.

The paper industry is a high capital intensive industry. SMEs have a relatively large size compared to the ones of other industries. The very small ones often operate on particular niche markets.

- **Competitiveness issues**

Raw material efficiency is one of the key drivers in the competitiveness of the paper industry. China uses mainly recovered paper, because of the relatively little amount of forests. South America on the contrary has vast plantation forests that grow quickly.

The strategy of the industry to survive in the EU is based on energy efficiency and efficiency of raw materials use but also new market developments through R&D and innovation. The paper industry feels competitive pressure from other industries that deliver substitute products such as plastics or aluminium in packaging.

- **Eco-industry policy**

Legislation (Packaging and Packaging Waste Directive) has contributed significantly to the collection of used packaging material and has indirectly helped the industry to increase collection of other papers too. Yet sometimes the legislation creates inadvertent disadvantages: e.g. IPP (Integrated Product Policies) set rules for procurement of paper much stricter and on wider areas of life-cycle than any other materials. This tendency may continue in the SCP (Sustainable Consumption and Production), creating potentially market distortions where paper is in competition with other materials or technologies.

It is noted that the paper industry is one of the most regulated industries, and at the same time energy and water intensive. Stricter environmental regulations in the future are not perceived as potentially problematic, as long as the same rules are applied to every player. For instance in terms of the use of wood, the bio fuels industry is subject to very limited regulation and less strict sustainability criteria than the paper industry. The paper industry is in comparison very regulated. This creates a distortion of the paper industry's competitiveness in the raw materials market. CEPI advocates the same regulations and requirements for all users of wood.

Access to finance is a crucial issue as well, especially in the current crises.

The scope of the term 'eco-industry' has to be reconsidered and widened. The old definition is not in line with the climate change debate. Related to this is the issue of terminology: e.g. bio streams for other industries.

Since the paper industry is an interlinked industry, a systemic approach with an integrated view is to be preferred. For example, a local authority's decision on the collection method of used paper may not serve ecology and resource efficiency if the decision is assessed with too narrow boundaries taking into account simply the direct collection costs, omitting the cost of later sorting, losses in material and increase of residues landfilled as well as unnecessary handling and transportation of materials that are not suitable for recycling.

A stable policy environment and legislation is very important in order to reduce the systemic risk inherent in investments, especially in the area of green public procurement.

In this respect it can be noted that the Chain of Custody (CoC) certification – a scheme voluntarily developed by the European pulp & paper industry - is a cost factor to the industry, while other competing industries do not have these costs.

CEPI indicates that the reward to CoC in the EU does not come back to the paper industry yet, although they bear the costs of it. The price of paper has been largely determined by world market, thus irrespective of the cost components. Yet green public procurement would provide a channel to get a return on the CoC certification.

- **Innovation**

Innovation is mainly focussed on efficient energy use, (bio mass and water).

Much resources has been invested in the past 10 to 20 years to increase possibilities for using recovered paper in high quality products. Two examples: in early 1990's it was estimated that a maximum of 30% of recycled fibre could be used in newspaper production, whereas now it is 100%; and less than 10 years ago it was considered impossible to use recycled fibre in magazine production, yet now some magazine grades already use 100% and the average utilisation of recovered paper in printing and writing paper (excluding newsprint) is increasing. In any case, paper, virgin and recycled alike, has to keep up with ever increasing fitness for purpose requirements from the constantly faster and more complicated printing and converting processes. To be able to do so requires much R&D.

The paper industry has invested in developing eco-design of paper and in cleaner and more efficient production processes. The former is clearly demonstrated in e.g. the lighter grammage of paper.

- **Internationalisation and the internal market**

The EU paper industry is a net exporter, approximately 17% of production. With respect to the trade of recovered paper, some 17,6% of paper collected in Europe was bought by companies recycling outside of EU. CEPI would prefer keeping the whole resource for recycling in Europe, but with the international trade rules, the resources like that cannot be protected.

EU pulp & paper industry has to face rising protectionism in connection with the severe economic downturn, which adds to the existing tariff and non-tariff barriers. As examples, China imposes 7.5% import duty and India 10% import duty. It has to be noted that on the contrary, since 2004 and according to the 1994 Uruguay Round agreement, European pulp & paper markets have been fully opened to imports implying no import duty at all.

- **Regulation and standards**

(see other parts of the interview)

CEPI has been active in developing voluntary commitments and industry standards to fill the gaps of existing legislation and CEN/ISO standards. These are most often in form of

best practice guidance, for example a set up of a traceability system of recovered paper (www.recoveredpaper-id.eu)

- **Sector development (future outlook)**

An important factor is the availability of raw material, in particular wood. In Europe the forest surface increases yearly, yet only 40-60% is available for harvesting due to factors such as transport connections and the ability to reach the places.

Yet plenty of recovered paper is available as well if it is collected separately and not used for other purposes such as waste to energy. The EU paper industry is the global leader in terms of know-how of paper recycling.

The McKinsey report indicated that achieving the target of generating 20% of Europe's energy needs by renewable sources by 2020 on the assumptions in the Commission's Roadmap for Renewable Energy would create a shortfall in the supply of wood from EU forests.

Not so much the export and import from the rest of the world is important, but the internal EU market. This is a major challenge: how can one enhance the competitiveness of the EU paper industries on the EU internal market for the future?

2. Role of eco-industries in the supply chain – contribution of eco-industries to (industry) client performance

- **Contribution of eco-industries to the competitiveness of clients/customers**

Eco-industry techniques and solutions have helped the EU paper industry becoming more competitive, mainly through the increased use of recovered paper and the generation of bio energy.

The level of production at the moment would not be possible without using the same fibre several times (in recycling) as there would be no sufficient supply of virgin fibres to support it. Even at the moment, when over half of the fibres are recycled, the virgin fibre supply is considered tight. The same applies to energy: if the EU paper industry would have no bio-energy available, the cost of energy would be unbearable. On the other hand, applying both recycling and bio energy has made the EU paper industry competitive to the extent that the industry can produce a surplus that can be sold to other regions - despite many other factors in European production that are less advantageous compared to other producers outside the EU. This competitiveness, however, is mostly serving the downstream industries, as the EU paper industry cannot increase the price of paper which is set on the global markets. In many reports assessing the paper value chain, for example by PricewaterhouseCoopers, the suppliers to paper industry, as well as the downstream users of paper have much better profitability than the paper industry itself.

- **Factors influencing the effectiveness of supplier-customer relations and performance outcomes**

Quality management is important. Yet it can be challenging to secure the same quality standards upstream, especially under conditions of supply shortages. In the case of recovered paper, regular forums have been held with the upstream suppliers in order to discuss the quality standards. The recycling techniques are at their point of zero marginal returns. Further increases require optimization of the input material. Within the EC this is feasible, and has been organised by CEPI in the European Recovered Paper Council (www.paperrecovery.eu) where the whole paper value chain including sectors such as the ink industry, publishers, printing industry meet to develop eco-design towards improved recyclability. Yet on a global scale the challenge is larger. Lots of packaging, magazines and catalogues are produced in China or India and subsequently imported to EU.

The voluntary sector agreements at EU level are successful. The recognition of the European Commission is essential.

- **EU as sourcing destination for international supply of eco-goods/services in relation to US/Japan**

Not directly addressed

3. Is the European paper industry in crisis?

In March 2009, the paper and board production went down 14.7% in the EU, compared to the same month previous year. Recovered paper consumption declined 10.8% compared to the previous year. The paper industry is a pro-cyclical industry. The consequence of the crisis will be an accelerating restructuring process in the industry, leading to a higher concentration. In the past, before the crisis, the paper industry was not very profitable and did not experience a big boom as in some other industries. Lots of closures occurred.

All investments are currently on hold. This is the case in Europe, but as well in China. Upstream it has a negative impact on the uptake of poor quality recovered paper (co-mingled collection) and the woods harvest[70].

The crisis put the urgency of new business models in the spotlight. Beside paper, also bio energy and chemicals are becoming more and more important. It is expected that after a few years of slow growth, the new business models start to pay off gradually. However the older mills are expected to face further challenges with a critical downturn of activities.

For SMEs the crisis hits particularly hard since they have less margin to look for other opportunities and businesses. Big companies have access, in theory, to stock market finance. Yet here plays the risk of stock market price fluctuations and the consequences of the company's tendency to focus on quarterly results which may put too much emphasis on short-term results, potentially contradicting the company's medium and long

[70] Note that recycling is a self-adjusting system: what is consumed, is available in collection for new production, which is at the level of what will be consumed. So CEPI sees no problems in uptake of recovered paper in general.

term interests. Therefore it has been noted that even cost efficient investments into energy efficiency projects that have a payback time of, say, 18 months, cannot be made, as the money invested now shows no results (or shows negative results) in the current quarter. The CEOs / CFOs of a company have no guarantees that they would still be occupying their seats when the benefits of such investments are visible, 5 to 6 quarters later.

A long-term outlook is in the current situation rather difficult. On the structural scale one may expect a reorganisation of the supply chain, with more energy savings, less transport and more cluster production.

4. Comments and questions on the interim report?

The OECD definition of eco-industries, as used in the interim report, is rather outdated. Since about 50% of the paper production uses recovered paper, the industry contributes significantly to reaching the environmental policy goals. Paper industry is closer linked to the environmental industries than might be perceived at first view.

- Recycling: 66% of the paper and board consumed in Europe is recycled. It is the industry's goal for 2010.
- Renewables: the paper industry is the biggest producer and user of biomass energy.
- Energy efficiency: the paper industry is the biggest CHP sector in the EU.
- Carbon storage: Tree growing is one of the major CO2 storage mechanisms in nature (after the oceans). Through the use of paper and recycling the industry contributes storing CO2 in its products as well and prolongs the storage of CO2 through recycling.

A UN panel report (4th assessment report of UNFCC) indicated that "a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fibre or energy from the forest will generate the largest sustained mitigation benefit".

From this perspective the paper and pulp industry is a very important connected eco-industry. CEPI therefore favours a widening of scope of the term 'eco-industry' including the paper and pulp industry. This would fit better with the climate change policy (CO2 capture, renewable energy production).

Annex: List of documentation

CEPI, s.n., The European Paper Industry, Delivering Competitiveness and sustainability, Brussels, 20 pp
CEPI, 2007, The European Paper Industry, A Bio-Solution to Climate Change.
CEPI, 2007, Bio-energy and the European Pulp and Paper Industry – An Impact Assessment. A summary of the Mc Kinsey report.

COMPETITIVENESS OF EU ECO-INDUSTRY

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Consultation
Vlaams Instituut voor Bio-ecologisch bouwen en wonen (VIBE)

Face-to-face interview with Mr. Peter Thoelen
Antwerp, May 4th 2009

Introduction and general background

VIBE is a non-for-profit organisation that aims to promote sustainable and healthy building in Flanders (Belgium)[71]. It provides information on bio-ecological building to individuals, building enterprises (architects, builders, producers of building materials,…) and government. At governmental level, they are a recognised partner in the development of targeted policies to promote and support sustainable building. VIBE has developed a VIBE quality label for building enterprises that perform well in bio-ecological building. VIBE is also internationally networked through Natureplus, an international organisation promoting health-conscious building and accommodation. VIBE is the Belgian contact point for this organisation. For the evaluation of building products, VIBE also makes use of the Natureplus quality label for sustainable building materials.

Market structure: supply

- The market is mainly characterised by small national niche players, even in countries with a longer tradition of eco-building such as Austria and Germany. Very few larger building companies have their main activity in eco-construction. But the last few years there is a trend for more traditional building companies to diversify their product offering to eco-construction as well (e.g. Bostoen, a large Belgian building company, recently set up a 'passive houses' division).
- Many of these specialised niche players have started their business out of 'ideology' and put very high priority on the quality of the product/service they deliver. Many fear that when they grow, they would lose control over the quality delivered. A real organisational structure that can guarantee the quality level is mostly lacking. This is a clear barrier for growth.
- The construction industry at large has for a long time been very sceptical about sustainable building. But recently, the industry is starting to show interest in the concept (although the focus for them is mostly still on energy-efficiency, not so much the other aspects of sustainable building). Reasons for this increased attention are a combination of governmental promotion actions, a growing demand from consumers' side for this type of building and increased media attention for ecological building. This turnaround has been facilitated by a number of frontrunner in the industry that have started to invest in it as well as

[71] Sustainable and healthy building is not equivalent to energy efficient building. The focus is not exclusively on energy saving aspects, but also on ecological use of water and use of bio-ecological building materials.

the large sector federations that have started to provide information on this way of building and started to organise trainings in this field.

Market structure: demand

- The most important segment for eco-construction is the private houses market, large building projects are still rare. In Austria and Germany already a larger number of larger projects can be seen (large apartment projects, large office buildings).
- In general, eco-construction in the industrial buildings market is very much underdeveloped. A problem in this segment is the depreciation period of energy-related investments. This period is most often too long for industrial building projects to take into consideration.
- Until now governments have not really played an exemplary role by applying the principles of ecological building in their own offices and buildings. However, doing so could have a catalytical effect on other consumers. Recently, the Flemish government has made up a list of energy norms to be applied to their own buildings.

R&D and innovation

- R&D in this area is mostly done at universities across Europe, as well as in large industrial companies. In the latter group, especially chemical companies are active, focusing their R&D on substituting petrochemical derivatives by natural products.
- Quite some cross-border (European) programmes are set up (via INTERREG, EFRO) on the topic of sustainable building. However, these programmes mainly focus on demonstrations and sensitization campaigns. To VIBE's knowledge, funding of R&D projects through the FP7 programme is not used/known by the industry at the moment.
- In VIBE's opinion the problem in innovation in eco-construction lies not so much in the development of new techniques and technologies (the R&D part), but much more in the implementation of all this knowledge and know-how in the building companies themselves and in the adoption of these new techniques by the market ("if we would already apply all the things that we know, that would already be a whole lot"). The techniques and technologies have much improved over the last years, that most can be implemented in an economically feasible manner.

Education and training

- The building industry still has a lot to learn about sustainable building. At this moment most builders cannot apply the sustainable building techniques in a proper way. However, this is crucial to make the concept work. E.g. If techniques of air sealing are wrongly applied, a passive house is worthless.
- Sustainable building concerns an integrated concept. Each player in the production chain has to work much closer together with other players, rather than working in a sequential order as is normally done in traditional building. To be able to efficiently build in a sustainable manner, 'building teams' are necessary in

which the architect, builder, roofers,… closely interact. This demands a very different organisational structure compared to traditional building.

- In Belgium, recently several professional trainings have been developed and marketed to fill this lack of specialised knowledge. These trainings receive a lot of attention from the construction industry. However, in the degree programmes 'sustainable building' is still very much underrepresented in the courses; most often this issue is tackled in electives, rather than in compulsory courses.

Regulations and (industry) standards

- Governments across Europe have played an important role in making ecological building more 'mainstream'. Subsidies have been/are an often used instrument to accelerate the take up of sustainable building techniques (e.g. in Germany: subsidies for using natural building materials, in Belgium: subsidies to isolate roof,…). The main focus was often largely energy-saving.
- As the industry becomes more 'mature', subsidies should slowly be replaced by other policy measures to enhance the competitiveness of the industry. Especially adequate training should be provided for the industry to develop the necessary skills.
- In terms of testing building materials (for fire safety,…), until now this has been organised at national level, meaning that different tests need to be done if a material is to be sold in different countries. At this moment work is being done to harmonise these testing systems and make it possible that tests are being recognised across Europe.
- The construction industry is in general not in favour of standards or quality labels, especially not environment-related labels. However, environment-related labels do provide relevant information to customers that increasingly look for such information. At the international level, the *Environmental Product Declaration (EPD)* system exists. The system helps organisations to communicate the environmental performance of their products (goods and services) in a credible and understandable way. It is a voluntary system that firms can apply for; the EPD does not make any explicit evaluation of the environmental performance. In that sense it is very different from the *Natureplus label*, which evaluates building materials according to their environmental friendliness and positive health effects. This label gives customers the guarantee that a building material is produced according to a number of minimum requirements in terms of environmental sustainability. At the company level, in Flanders VIBE has developed the *VIBE-label*. This quality label guarantees customers that an architect, builder, building materials producer or building materials retailer does business that is in line with a number of minimum requirements established by VIBE. Companies can receive one, two or three stars according to the level of environmental sustainability of their business.

Competitive position EU versus other regions

- Until now Europe has been a frontrunner in ecological building. Although Asian countries such as Japan or China are active in the production of products such as solar panels, they mainly focus on cost reductions in production rather than the

development of radical new products. Also in America some initiatives are being taken in the area of ecological building and universities are active in research in this area. However, in the US sustainable building still has a strong ideological connotation with alternative ways of living, goat wool socks, etc.

- Within Europe, especially Austria is exemplary. The country has a well performing eco-construction industry, a well developed policy to support the competitiveness of this industry and strong links between industry and universities promoting the transfer of knowledge.

COMPETITIVENESS OF EU ECO-INDUSTRY

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Consultation
European Renewable Energy Council (EREC)

Interview with Mr. Oliver Schäfer, 29/10/2008

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1. Eco-industry – structure, conditions and performance of eco-industry sectors/providers

- **Market structure**

The renewable energy market has several different segments:

- Wind
- Solar Power
- Solar Thermal
- Biomass
- Geothermal
- Small Hydro
- Ocean Energy

Total turnover of the renewable energy sector in Europe is currently around € 40 billion. The sector encompasses some 1000 companies and employs roughly 400 000 people.

However, there is no genuinely European renewables industry so far since activities are concentrated in a small minority of Member States (DK, DE, AT, ES, NL). Significant wind energy industry is only located in 3 countries (DK, DE, ES). Company structures differ across the segments of the renewables sector.

- **Demand conditions**

The bulk of demand comes from project developers and private consumers. Some demand also comes from public authorities and manufacturers of other appliances (e.g. appliances that contain PV modules). Economic incentives provided by regulation (e.g. feed-in tariffs) are a strong driver for industry growth. However, energy from biomass and wind is increasingly able to compete with fossil energy sources in terms of price.

Public procurement

Green public procurement has the potential to generate considerable demand for renewable energy technology. Especially in the context of public building and infrastructure projects.

- **Cost structure and competition**

Basis for competition

Innovation leading to better product performance or a decrease in production costs are of central importance for competition in the sector. Therefore, the competitive position of the renewable energy sector in the EU is closely linked to successful R&D activities.

- **Strengths/weaknesses of EU eco-industry – competitive position**

The European market is the single biggest market for renewable energy products to date and European companies are among the technological leaders in most segments of the renewables market.

- **Productivity**

o Evolution in labour productivity / total factor productivity over time?

o Drivers enhancing productivity?

- **Innovation**

The research and development and especially pre-commercial development capacity of firms is seen as crucial for their competitiveness. Activities include R&D partnerships and other forms of collaboration with universities and research institutes.

- **Internationalisation**

Single Market Functioning

SMEs and internationalisation

Openness of global (non-EU) markets

Trade barriers or intellectual copy right issues are not seen as a major impediment to the international market success of firms based in the EU.

- **Regulation and standards**

A long-term stable policy framework is key to the future development of the sector. Greater harmonisation across EU Member States is seen as a very important factor. A simplification of the frequently highly complex national regulations (including planning and zoning laws) would also benefit the renewables industry.

- **Sector development (future outlook)**

Further growth is expected in Europe and globally. Tighter financing conditions could, however, negatively affect growth rates in the short-term. Referring to a recent study by EREC and Greenpeace, the argument is made that between 2015-2020 renewables will be

the most cost-effective form of energy due to their resource saving effect. This is seen as the main contribution to the competitiveness of other industries / the economy at large.

- Ongoing work on a Directive to harmonise the framework conditions for renewables in the Member States are an important development for the sector

- The fact that roughly 60% of the EU's budget for energy research is spent on nuclear energy research is seen as a problem. More money should go into renewables research.

- Support for renewables should be specifically integrated into the structural and cohesion funds in the future

2. Role of eco-industries in the supply chain – contribution of eco-industries to (industry) client performance

- **Contribution of eco-industries to the competitiveness of clients/customers**

Energy is seen as the main output of the renewables sector (electricity, heat, biofuels, biogas etc.) and less so installations or appliances. Therefore, the availability of clean, reliable and increasingly price-competitive energy constitutes the main contribution of the sector to its client industries and the overall economy. This goes along with a reduction in the dependency on imported fossil fuels.

Clearest upstream / downstream linkages are found in PV, wind, solar thermal and biomass. Background information is available on market structure, components and suppliers in these areas (for PV for instance the market is broken down into appliances / grid-connected / off-grid).

The biggest contribution of the renewables sector to any individual upstream sector is probably towards the construction sector. There, renewable energy / energy savings technologies are a major driver of innovation and market success.

In terms of downstream, the renewables sector is a major customer for basic industries (metals), the chemicals industry (silicon, glass) and the electronics industry (components of inverters etc.)

  - Example 1: Producers of wind power installations are among the biggest client sectors of the European steel industry.
  - Example 2: Producers of solar panels are among the biggest clients of the European polysilicon and copper industries.

- **Factors influencing the effectiveness of supplier-customer relations and performance outcomes**

  Potential barriers that inhibit industry (manufacturing) from acquiring from the renewables industry the goods/services that it requires

  Factors/evolutions in the client industry that might potentially harm the competitiveness of the EU renewables industry

  Do the goods/services provided by the eco-industry to client industries correspond to their needs/requirements?

- **EU as sourcing destination for international supply of eco-goods/services in relation to US/Japan**

The EU renewables sector is seen as "still ahead" of the global competition, but some players are catching up fast (China, India and the US explicitly mentioned). The potential for cheap mass production in China and India is seen as a growing challenge to producers in Europe (especially in the more established fields of PV and Wind). Rapidly rowing market share of Chinese PV module suppliers in the EU market.

Roughly 60% of the production (installations, components etc.) of the renewables sector in the EU are being exported. This is taken as prove that the technology is competitive on the world market.

COMPETITIVENESS OF EU ECO-INDUSTRY

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Consultation
EuPC
European Plastics Converters

Face to face interview with
Mr. Alexandre Dangis (Managing Director)
Mr. Paulo Bochicchio (Public affairs director)
Brussels, 22 June 2009

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1. Introduction

The context of the study, focus on competitiveness of the EU eco-industry.

2. Competitiveness issues

- **EuPC, its industry and the relation with the EU eco-industry**

EuPC is the professional representative body of the plastics convertors within Europe whose activity embraces all sectors of the plastic converting industry including recycling.

It represents about 51 European Plastics Converting, national and European, industry associations (mostly SMEs) consisting of close to 50,000 companies, producing over 50 million tonnes of plastic products yearly with a total turnover of 300 billion euro, employing more than 1.6 million people.

Packaging remains the biggest end-use for plastics at 37% followed by building and construction at 21%. Automotive and electronic use 8% and 6% resp. Finally, medical, leisure and other applications use 28%.

The recovery rate of post-consumer end-of-life plastics stands now at 50% in the EU. The recycling rate of post-consumer plastics has increased to over 20%. The energy recovery rate increased over the last 5 years to nearly 30%.

- **Competitiveness and position of EU producers in the world**

The plastic industry is a major manufacturing sector in the EU and world wide, producing about 25% of the total estimated worldwide plastics production of 260 million tonnes.

- **Policy**

The EU should harmonize the existing regulations and promote EU manufacturing. On top of that EU funds should be made available for research and innovation in plastics converting and recycling.

The EuPC is setting up a scientific committee in order to advise the EU institutions where to put the focus for the next decade in terms of research.

- **Innovation**

Besides the energy savings enabled by plastics in cars, aircrafts and trucks, plastics facilitate innovation in a variety of ways:

- aesthetic designs and intelligent textiles (e.g. the new swimming suits, in health care)

- cheaper solutions (leading for ex to more affordable cars)

- **Regulation and standards**

The revised Waste Framework Directive provides a framework to drive waste management practices in the EU. In the eyes of the EuPC, the revision was badly needed to bring clarity in a number of important areas. The revised WFD provides a strong drive for resource efficiency and diversion of waste from landfill. It recognises the 5 step waste hierarchy (reduce, reuse, recycle, recover and disposal). It also defines recycling broadly which will stimulate further development of innovative recycling solutions, to encompass recycling of plastics' chemical building blocks for use as raw material. Important is also that efficient energy-from-waste is now classified as recovery rather than disposal.

- **Sector development (future outlook)**

The European plastics industry is undergoing a restructuring phase. Climate change, the sustainability of the plastic products and effective management of waste, collection and recycling systems (maybe also looking at alternative ways of financing recycling) and stimulating more the use of 'recyclates' in plastic products are the key issues.

Bioplastics (= bio-based and biodegradable plastics) are the future (if the reserves of fossil feedstock decrease further and prices for oil increase) as they can be made from any feedstock containing carbon and hydrogen. Bio-based plastics today have only a share less than 1% of the total plastic market.

2. Role of eco-industries in the supply chain – contribution of eco-industries to (industry) client performance

- **Contribution of eco-industries to the competitiveness of clients/customers**

Resource efficiency:

Without plastics packaging , it has been estimated that the tonnage of alternative packaging materials would increase by a factor of 4, emissions of green house gases by a factor of 1.5 and waste by a factor of 1.6 in volume. In addition, plastics packaging saves resources by protecting food during transport.

Climate protection:

In cars, around 60% of weight of the plastics used enhance comfort and safety while 40% are used in applications contributing to weight reduction. Homes and buildings are kept warm (or cool) by plastics insulation. Also in renewable energy, plastics are playing an

important role and their components will further increase the efficiency of e.g. photovoltaic panels or wind turbines.

Generally speaking, plastics contribute in many ways to a sustainable use of resources:

- reduce: plastics save energy and CO2 emissions
- reuse: plastics soft drinking bottles, the carrier bag, etc
- recycle: bottles, industrial packaging films, etc
- recover: the residual streams which are not appropriate to mechanically recycle in an eco-efficient way can be used for energy production

The material recycled and energy recovery of post-consumer plastics waste varies significantly by country. In some countries like Switzerland, Germany, Sweden and Denmark there is very little landfill. A study of Prognos showed that 27% of the EU Kyoto target could be saved if all waste currently going to landfill was to be diverted to recycling and energy recovery. The best results were achieved without specific targets but with flexibility to explore recycling and energy recovery where it best served the specific waste stream. Interesting is that countries with high recovery rates do well on both recycling and energy recovery AND that recycling performance is fairly similar across most of the EU27. Consequently, countries which have high dependence on landfill must not only exploit their full recycling potential but also expand their energy-from-waste network. A complete resource management strategy needs to address recycling AND energy recovery, as no country will be able to recycle all post-consumer waste.

- **EU as sourcing destination for international supply of eco-goods/services in relation to US/Japan**

This isn't the case for recycled plastics; it is rather the opposite. The demand for the waste product is high in Asia (due to an high demand for the recycled product that could be used for new plastic applications and due to lower labour costs (manual selection).

3. Is the European plastic recycling industry in crisis?

The sector has been very strongly impacted by the effects of the financial turmoil. Due to a declining oil price, the virgin material became much cheaper, even cheaper than the recycled material. Recycled plastics are estimated to become competitive at an oil price higher than 70$ per barrel (also due to the fact that more and more material is exported to Asian countries).

4. Comments and questions on the interim report?

Comments have been provided with respect to plastics recycling.

Annex: List of documents provided

EuPC, 2008, *The compelling Facts about Plastics 2007*, Brussels. 23 pp;

EuPC, Newsletter Spring 2009

COMPETITIVENESS OF EU ECO-INDUSTRY

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Consultation
SAP AG

Telephone interview with
Mrs. Christine Wenzel,
(EU Government Relations Manager, Global Communications, Brussels Belgium)
And
Dr. Bertram Wiest, Sven Denecken
(VP SAP Sustainability Solutions, SAP Headquarters, Walldorf Germany)
Brussels/Walldorf, 25 June 2009 / 27 July 2009

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1. Introduction

The context of the study, focus on competitiveness of the EU eco-industry and its links with the upstream and the downstream industries.

- **SAP, eco-industry and sustainability solutions**

It is understandable that ICT has not been classified to the eco-industry as such. Yet it has to be noted that in ETAP for instance ICT is included and is perceived as an enabler having a cross cutting influence on all sectors involved. The key role of ICT is measuring. Without measurement, data are not available and processes cannot be monitored and managed. This requires among others a good software. Eco-industries and sustainability issues are considered throughout the entire ICT sector as a major opportunity.

SAP is the world leader in business software, providing services to 26 industries. In terms of sustainability solutions, the focus is on Sustainability Performance Management, resource efficiency and energy management within a company's operations and across the value chain as well as on ensuring safety of products and operations. It has to be noted however that this field is not an established market yet. The solutions are currently "not a commodity" yet and lots of consolidations in the sustainability ICT are expected. It is a brand new ICT field; though, with high expectations.

SAP's approach towards sustainability is dual: one the one hand as an exemplar, on the other hand as an enabler. It is SAP's vision that the first is a prerequisite of the second.

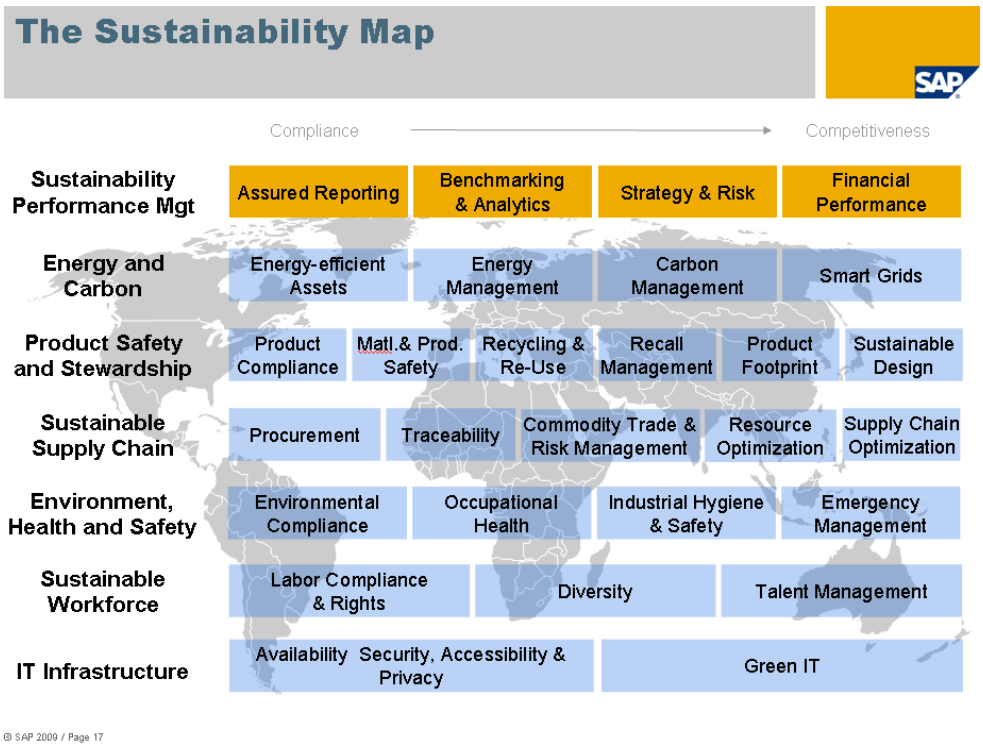
As an **exemplar** SAP took the sustainability issue as a key strategic focus. The target has been set to reduce SAP's CO2 emissions by 50% by the year 2020. Additionally annual sustainability reports are being published indicating the environmental and sustainability performance of the company which meanwhile has become benchmark in the industry. Sustainability also involves change management inside SAP and unlocking the potential of the workforce to support Sustainability on a regional basis.

As an **enabler** [to other industries, including eco-industries], SAP provides products and services in the area of Sustainability to support customers to achieve improvements in that space. While SAP will lever the opportunities having an integration with its

Enterprise Resource Planning, Customer relationship, Procurement and Supply Chain Management Systems – a new area of solutions is needed to tackle the issues holistically: analytical capabilities and measurability is a key issue. A new customer base is envisaged. E.g. for companies in certain industries like consumer products that put a huge emphasis on health and safety, quite a number of opportunities for sustainability solutions exist.

In terms of sustainability solutions the following areas are envisaged by SAP are:

- Sustainable performance management; strategy risk management needs data from operational system in order to define goals and measure sustainability performance and evolution. This all the way connected to the financial balance sheet
- Energy and Carbon (CO2) management
- Product Safety and Stewardship
- Sustainable Supply Chain
- Environment, Health and Safety
- Sustainable Workforce
- IT Infrastructure



Source: SAP

What Energy and Carbon is concerned, an example was given of a large refinery that could measure its energy consumption more accurately, reduce it, and became more efficient in terms of emissions through SAP's sustainability software. Another example of energy and CO2 management is the area of commercial buildings where Sap is investing in an on demand solution. Through the ICT solutions provided, emission will become more measurable, can be reported and targets can be formulated. ICT can have a huge impact in these fields.

A third area of energy and CO2 management is supply chain software, which is especially helpful in the area of product traceability as well as calculating a product's carbon footprint.

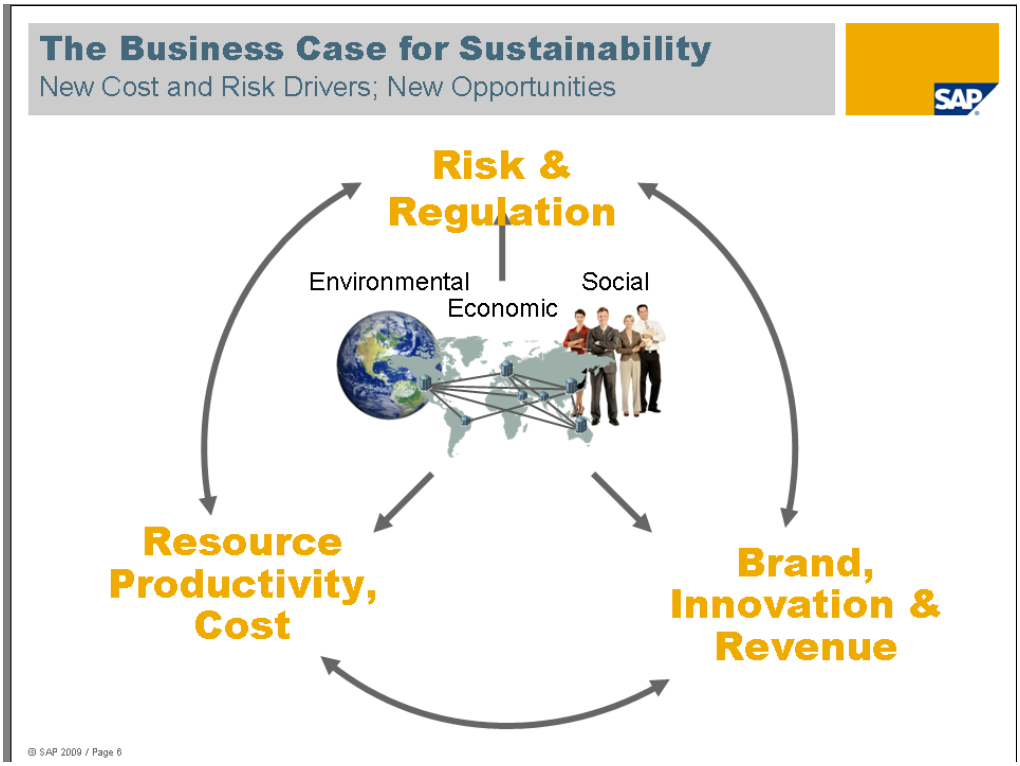
The mainstream view of ICT and sustainability is having more energy efficient data centres and greener computers. Since the main PC producers are located in the US, it is not surprising that the US is leading in the hardware part of green IT.

Green enterprise software is a new market without established players. There are a lot of start-ups in the US that provide specialised software. It is expected that these will consolidate relatively fast. Although it looks that in terms of start-ups the US is more active in green software, it still has to be seen whether these start-ups are viable. What is more probable is that they will be integrated in bigger US players over time. At this stage it is however too early to determine whether from a global point of view the EU is in a leading position or not, for sure the EU needs to increase its activities not to miss the boat.

- **Competitiveness**

The main drivers for the green ICT applications are

1. Regulation and compliance; sustainability reports for transparency and accountability
2. Brand reputation and opportunities for innovation securing revenue
3. Price volatility for resources like energy to be part of the corporate planning equation
4. Increase energy efficiency is leading to saving significant costs
5. Investments in infrastructure, especially the utility sectors. The impression exists that the recent economic recovery programmes are focussed on infrastructure, e.g. the smart grid area.
6. On the customer side, the issue of connectivity plays an important role. Not only companies but also NGOs are active here. The focus is often on product and people safety which have a huge impact on the brand if not executed properly.



Source: SAP

These factors have always been relevant, but now they become more reinforced. Sustainable operations (SAP as an Exemplar) and sustainable solutions (SAP as an Enabler) are one of SAP's top 5 priorities.

- **Eco-industry policy**

(Indirectly discussed in other parts of the interview).

- Standardization and regulation still are huge drivers for change inside the companies
- R&D starts to tackle this topics as many decisions are made already in this phase ("Design for Environment"), innovation needs to be seen under this angle too

- **Innovation**

Sustainable solutions are one of SAP's top priorities. Example of innovation areas are:

- Sustainability performance management
- Sustainable design
- e-mobility
- intelligent houses

- smart grids
- Emergency Management

Each time the data side is covered. SAP has a strong co-operation in FP7 programmes, as well as others.

The 'go-to-the-market' switch is the challenging part. This is not typical for sustainability software, but also for other innovations.

At EU-level quite a number of innovation programmes exist. SAP would welcome more initiatives specifically to reduce the time to market. Existing initiatives such as the Competitiveness and Innovation Program (CIP) are often focussed on innovative ICT solutions for public sector.

The US are much faster in this area. A lot has to do with finding early stage financing and the provision of venture capital. This is not to say that in the EU no funding programmes exist, such as the KfW programme in Germany, which provides support for starting companies. Yet the government can certainly play a role here, not only in the financing side, but also in the area of bringing universities, start-ups and other players together. The EU-wide research programmes are helpful in this respect.

A major difference between the US and the EU is the diversity of the Member States in rules, regulations and programmes. It brings substantially more bureaucratic burden than in the US. Harmonization across the EU-market would be very helpful. Standardization is very helpful in the development phase. Two policy instruments are mentioned:

- Incentive provision through financial schemes or subsidies
- Public sector early adoption.

As an example of the latter, SAP solutions for emission measurement (and control) at city level are indicated.

- **Internationalization and the internal market**

The internal market is an important issue in the provision of sustainable solutions. **Standardization** is a major issue for SAP. Often country legislation is very different from each other, e.g. the health and safety regulations. SAP provides so called 'local content' to the existing software to make it tailor made to the country. However for SMEs it is often hard to follow this product strategy, since one needs a minimum critical size to make the local content additions profitable. For a large player as SAP it is easier to reach the minimum critical production size for all the local content niche markets than for small players. The sunk costs for each local content addition are for size classes similar, but their market sizes differ.

SAP favours having the same standards across Europe, and possibly at a global scale, of environmental or carbon footprint measuring. It is better that the industry takes an initiative in standardization rather than being imposed. The technical expertise is vested within the industry and from this point of view the initiative should best come from there.

Voluntary sector agreements might be helpful. However it has to be noted that still a lot of movement is expected and that sustainable ICT is relatively young.

On the international, global scale it is worthwhile to note that Australia has a strong movement towards sustainability as well. India and China do not spearhead the development, but are expected to pick up fast.

Japan is very active in the ICT sustainability field both in terms of regulation and on the company level. The main driver here is that most of the products and services produced are destined for export.

The value chains get globally more connected, with a lot of outsourcing. Calculating a product's carbon footprint becomes more complex. Green enterprise software can help extracting, monitoring and reporting the various types of operations data that are needed for sustainability management in a consistent manner.

- **Regulation and standards**

(See previous part of the interview)

- **Sector development (future outlook)**

(See SAP eco-industry and sustainability solutions)

It is expected that in the future sustainability issues cannot be overlooked. Energy efficiency will become a major competitiveness factor and management need to get track and control of it. This provides an important window of opportunity for ICT sustainability solutions.

Innovation will remain important to exploit various business opportunities. Climate change policies, consumer awareness and the potential for cost savings are important drivers that may shape the future.

2. Role of eco-industries in the supply chain – contribution of eco-industries to (industry) client performance

- **Contribution of eco-industries to the competitiveness of clients/customers**

Higher resource efficiency, energy efficiency, green branding with clients including eco-industry.

- **Factors influencing the effectiveness of supplier-customer relations and performance outcomes**

(see previous answers)

- **EU as sourcing destination for international supply of eco-goods/services in relation to US/Japan**

Not directly addressed

3. Is the eco-industry in crisis?

Sustainability will become more and more a key differentiator for companies. Compared to other ICT- applications, the sustainability solutions performed rather well. One has to indicate though, that the sustainability solutions are not a commodity yet. The market is in development and therefore one can only give a careful assessment.

4. Comments and questions on the interim report?

No particular comments on the interim report.

Annex: List of source material

SAP, 2009, The Business of Sustainability. Information Technology as a Catalyst for Short- and Long-Term Profitability, SAP, 20 pp.

COMPETITIVENESS OF EU ECO-INDUSTRY

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Consultation
VDMA
(Verband Deutscher Maschinen- und Anlagenbau - German Engineering Federation)

Telephone interview with
Dr. Claudia Schöler,
(Adviser Legal Affairs, Technical and Environmental Affairs, VDMA European Office)
And
Mrs. Neami Denz,
(Spokesperson VDMA Environmental Technology Forum, VDMA Frankfurt am Main)
Brussels/Frankfurt am Main, 04 June 2009

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1. Introduction

The context of the study, focus on competitiveness of the EU eco-industry and the links with the upstream and the downstream industries.

- **The VDMA and its industry**

VDMA's industry consists on the one hand of the so-called 'traditional sectors' such as paper packaging machinery, metal shaping, mining equipment, and environmental technology equipment manufacturing on the other hand. Examples of the latter are air pollution control, waste management machines, waste water technologies and renewable energy technologies. Particularly for these industries, Mrs. Denz represents VDMA at the board of EUCETSA. It is estimated that following the OECD's definition of the eco-industry, about 20% of VDMA's members are active in eco-industry activities (integrated environmental technology, end-of-pipe-technology, etc.).

It is indicated that there is no competition (or rather a borderline) between the old and 'new' branches; the latter being the environmental technology equipment manufacturers.

Certain branches of VDMA are actually situated in the core eco-industry, such as waste treatment and recycling technology or waste water technology. Particular for this industry the process approach is important. In the past there was a focus on end-of-pipe-technologies but nowadays the focal point is on the overall optimization of processes (integrated approach).

- **Competitiveness and the German engineering industry**

It has been observed by the interviewees that the environmental technology branches today are faring relatively better than the classic branches: the average of drop in orders in mechanical engineering at the moment is 47% (3-month-comparison to 2008), the branches of environmental technology are less affected (about between 10 and 40%).

The year 2008 was for all environmental technology branches very successful (e.g. turnover waste water technology plus 8% in comparison to 2007, production air pollution technology plus 5% in comparison to 2007).

The EU and the German engineering industry (also referred to as machinery industry) are among the forerunners in the world. E.g. Germany has 3 major incinerator producers, of which one, MARTIN GmbH Munich, supplies 10% of the european market. There are quite a number of German large companies among the core eco-industry players.

From the perspective of suppliers of environmental technologies, environmental legislation can provide an important framework condition for the proliferation of environmental protection technology. Without the (more advanced) legislation and applications in Germany, there would undoubtedly be less investment in environmental technology, and subsequently a less favourable competitive position vis-à-vis the rest of world.

- **Eco-industry policy**

Yet a note of caution was issued not to go too far in the issuing of laws and regulations. As an example the current proposals for the **verification scheme for environmental technologies** of DG Environment was mentioned. The view was expressed that only technologies that have a value are tradable, and that the ones without value will automatically not be sold. From this point of view there is no practical need for the environmental verification schemes. Especially, since it involves additional administrative burden, without adding additional value to the customers. VDMA pointed out that environmental technologies like e.g. recycling plants are always individual constructions in a b-to-b-market. The operation is dependent on the input waste material (composition, physical parameters like moisture). Thus there couldn't be done a comparison between two plants. Anymore most of the suppliers have own testing centre, in which they can perform there equipment with the individual waste input of their client. Last but not least the verification process can only verify parameters but not reliability and a long life-cycle which are both important for clients.

Currently there is virtually no level playing field in the EU27 in waste management. Since about 20 year Germany has had a high range of legal environmental policy especially recycling management policy. Yet this was not everywhere in the EU, e.g. the UK and Italy, which relied traditionally more on landfill.

Impact of environmental legislation depends on the sector and may differ between 'suppliers' of the environmental technologies and 'operators' of technologies (environmental services). E.g. in waste water treatment, the technology suppliers built up over the years a technological advantage due to policy pressure. In renewable energy the advantages are more equally spread. The regulatory environment is in this particular case important due to the special law (Renewable Energy Legislation – Erneuerbares Energien Gesetz - EEG) subsidizing renewable energy in Germany. The EEG regulates the feed-in of renewable energy in the electricity network using compensation of electricity fed into the grid. Hence exists an incentive for the operators to build such renewable energy plants and to buy technology from adequate suppliers.

In creating an EU level playing field VDMA advocates a further and uniform implementation of the existing regulatory frameworks at EU level, rather than creating new legislation and initiatives which will have to be implemented in the future.

- **Innovation**

The legislative framework conditions are an important driver for innovation and R&D. Due to Germany's forerunner's position in the EU, together with e.g. the Netherlands, France, Denmark, innovations in eco-technology have been made, which currently provide the competitive advantage.

- **Internationalisation and the internal market**

Is the internal market functioning for eco-industry? It depends on the country and sub-sector. In some countries, apparently less political pressure exists on environmental issues than in Germany. This implies that the need for purchasing advanced (and expensive) technologies is lower. In this respect an EU level playing field should be advocated.

In this respect IPPC and BAT are important (see next point)

- **Regulation and standards**

Unified technical standards, all over EU_27 would create an important stimulus for the internal market. At the EU level the framework is in place, e.g. the IPPC Directive and Best available technologies (BAT). Yet the mutual coherent implementation at member state level still remains a challenge. BAT is currently not correctly implemented by all Member States. The revision of the IPPC Directive hopefully improves the situation in that sense that all Member States use BREFs as foreseen by the EU legislator .

- **Sector development (future outlook)**

In general hard to tell, due to lots of uncertainties.

- In waste water treatment a distinction has to be made for the situation outside the EU and inside the EU. Outside the EU it is expected that demand will increase over the next two years. Yet inside the EU, a lot depends on the evolution of the general economic conditions, say the crisis.
- For waste management (recycling), it is expected that the situation will improve in the next half to one year. Yet, the prices of recovered goods will certainly not attain again the levels of last year, which was rather exceptional.

2. Role of eco-industries in the supply chain – contribution of eco-industries to (industry) client performance

- **Contribution of eco-industries to the competitiveness of clients/customers**

Resource efficiency.

- **Factors influencing the effectiveness of supplier-customer relations and performance outcomes**

(see previous answers)

- **EU as sourcing destination for international supply of eco-goods/services in relation to US/Japan**

Not directly addressed

3. Is the eco-industry in crisis?

For the eco-industry as a whole this is rather difficult to answer, since the situation differs according to sub-sector (or branch):

- Waste water treatment technology: this sector does it currently well in comparison with the average of all mechanical engineering branches.
- Renewable energy technology: similar, increasing activities.
- Technology for biomass, biodegradables: are going well in comparison with the average of all mechanical engineering branches.
- Air pollution control: relatively stable activities
- Waste management and recycling technology: declining activity
- Plastics recycling technology: pressure: about -30% turnover

4. Comments and questions on the interim report?

How did the consultants arrive at the list of enterprises for the micro-analysis? On the base of selection of companies by NACE code in the Amadeus data set. For recycling (37), waste water collection and purification (90.01), processing, collecting of household waste (90.02), collecting and processing of agricultural, industrial and construction waste (90.03) the companies can be relatively easy identified. Yet for other sectors such as renewable energy, air pollution control, no predefined sectors exist. For these type of sectors keyword searches of company descriptions were done, supplemented by information from the relevant associations on the web and an additional control of activities for the major companies on the www. It was indicated that the lists in the interim report were preliminary.

VDMA indicated that help could be provided with identifying companies in Germany in various sectors.

Annex: List of industries in which VDMA members are active

Actuators
Agricultural Machinery
Air-handling Technology
Air Conditioning Technology
Air-pollution Controll

Building Material Machinery

Casting Machines
Ceramics Machinery
Compressors, Compressed Air and Vacuum Technology
Construction Equipment
Cutting Tools

Dies and Molds
Displays
Drying Technology

Electronics Production Equipment
Engines and Systems
European Ceramic Technology Suppliers

Finishing (washing, bleaching, dyeing) Machinery
Firefighting Equipment
Fluidpower
Flat Panel Displays
Food Processing and Packaging Machinery
Foundry Machinery

Garment and Leather Technology
German Flat Panel Display Forum
Glass Technology

Heat Pump Technology

Industrial Valves
Industrial Furnace Manufacturing

Jigs and Fixtures

Knitting Machinery

Large Industrial Plant Manufacturing
Lasers and Laser Systems for Materials Processing
Laundry and Textile Technology
Length Measuring Technology

Machine Tools and Manufacturing Systems
Machine Vision
Man-made Fibre Production, Machinery for
Marine and Offshore Equipment Industry
Metallurgical Plants and Rolling Mills
Materials Handling and Logistic Technology
Mining Equipment
Metal Shaping

Natural Stone Machinery
Nonwoven Machinery

Offshore Equipment
Organic Electronics Association

Packaging Machinery
Pharmaceutical + Cosmetic Machinery
Photovoltaic Solar Technology
Plastics and Rubber Machinery
Polymer Electronics
Power Transmission Engineering
Precision Tools
Printed Circuit Board Production Equipment
Printed Electronics
Process Engineering, aseptic
Process Plant and Equipment
Productronics
Pumps + Systems

Recooling Technology
Robotics
Robotics + Automation
Rubber Machinery
Recycling Technology
Refrigeration Technology

Semiconductor Production Equipment
Sewing and Garment Technology
Shoe and Leather Technology
Spinning Machinery
Surface Treatment Technology

Technical Textiles, Machinery for Textile Machinery
Thermo Process Technology

Vacuum Technology
Valves and Taps for Domestic Appliances
Ventilation Technology

Water Technology
Wastewater Technology
Weaving Machinery
Woodworking Machinery
Work and Tool Holders
Waste Treatment and Recycling Technology

Source: VDMA, 2009, http://www.vdma.org/wps/portal/Home/en/Branchen?WCM_GLOBAL_CONTEXT=/vdma/Home/en/Branchen
(accessed 04-06-2009)