POLICY INSTRUMENTS FOR SUSTAINABLE INNOVATION

Technopolis BV

Editors
Jan-Frens van Giessel
Geert van der Veen

Main contributors
Leonhard Joerg
Philippe Larrue

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Contributions to this report have been made by:

Patries Boekholt, Technopolis Amsterdam, The Netherlands
Jan-Frens van Giessel, Technopolis Amsterdam, The Netherlands
Leonhard Joerg, Technopolis Vienna, Austria
Philippe Larrue, Technopolis, Paris, France
Alasdair Reid, Technopolis Brussels, Belgium
Geert van der Veen, Technopolis Amsterdam, The Netherlands

Vladimir Balaz, Institute for Forecasting, Slovak Academy of Science, Slovakia
Attila Havas, Institute of Economics, Hungarian Academy of Sciences, Hungary
Janis Kristapsons and Anda Adamsone-Fiskovica, Centre for Science Technology Studies, Latvian Academy of Sciences, Latvia
Karel Klusacek, Technology Centre AS, CZ
Marina Ranga, Science Policy Research Unit, University of Sussex, Romania

For more information you can contact Geert van der Veen:

Technopolis BV
Keizersgracht 62
1015 CS Amsterdam
The Netherlands
+31 20 5207593
geert.vanderveen@technopolis-group.com

Table of Contents

Summary

In this summary the results of a Technopolis research project on the (financial-economic) instruments in Europe to support innovation in the area of sustainability are presented. This project is part of the Dutch EU-Presidency preparations for the Informal Environmental Council on July16-18, 2004. The project consisted of two phases. In phase 1 the relevant instruments were listed per European country (not a complete overview, but an overview of the most important and most specific instruments for innovation in the area of sustainability). At the end of phase 1 a selection was made for instruments that seemed to have a large impact on innovation and sustainability and that might be suitable to introduce at a European level (EU or part thereof). These instruments are described in more detail in phase 2 of the project. The instruments are categorised in subsidies, fiscal facilities, financial instruments, regulation, and other.

Subsidies (chapter 2) to stimulate innovation are used in every country across Europe. Some of them are specifically aiming at sustainable technologies, while others have a generic character but with a positive effect on sustainability. They are aiming at developing new technology and, in this way, creating opportunities for new business.
The programmes started out as subsidies supporting projects from individual companies or research groups. In the last 10-15 years the support of consortia of researchers and companies (instead of individual companies) became more and more important. In this way it was tried to obtain more structural effects.

There are various possibilities in the set up of a subsidy programme to promote sustainability.

1. The first method is to make sustainability the explicit aim of the programme and exclude projects that do not contribute to achieving sustainability (i.e. a specific programme for sustainable innovation). Less drastic versions of this method are assigning a minimum share of the budget to sustainability projects or (in procedures where proposals are compared with each other) giving projects with positive effects on sustainability an extra appreciation in the evaluation.
2. The second method is to stimulate projects with positive effects on sustainability by means of giving them extra facilities within a stimulation programme (higher percentage of subsidy, broader definition of acceptable costs, etc.).
3. The third method is to stimulate sustainability project by giving extra attention to this type of projects when communicating the programme to possible applicants.

This type of measure is fairly easily transferable to the European level, since R&D subsidies are a well-known instrument for the EU. Environmental aspects can easily be part of FP7 or can function as an add-on to FP7. The way the Flemish DTO programme is organised is an example of how this can be done.

Subsidies can also be used to support market introduction of new environmental technologies. The Dutch SRM scheme offers ideas for this (§2.4). At EU level this method of supporting market introduction of new sustainable technologies fits well with the EU LIFE programme. This programme focuses on demonstration of new technologies from an environmental point of view. The national pre-selection followed by a final selection at European level makes adjusting to differences between the various EU countries possible, and involving both suppliers of new technology as well as customers can increase the market orientation.

In general, **loans** are loosing ground. Loans from revolving funds are e.g. used in France.

Overall but tax incentives are on the increase. This differs among the EU countries. Denmark, Sweden, the Netherlands, and Romania have special tax instruments to encourage industrial R&D, while for instance Finland and Germany do not use these instruments.
These **fiscal facilities** (chapter 3) decrease the administrative burden for companies, when compared to subsidy instruments (and loans). Administration costs for the government are lower as well. Possibilities to restrict the free-rider effect (companies getting support that would have performed the action without the support) are however limited.
In the 1990s fiscal (tax) benefits to stimulate R&D have been become more important in various countries in Europe. These instruments are generally considered to be successful: they give rise to extra R&D, are very suitable for supporting SME's and are well received by companies performing research. At the moment they have no specific effect on sustainable innovation.

In the Netherlands it has been successfully tried to use fiscal facilities as a way to promote market growth in the area of sustainable technology. Four fiscal instruments are used (in conjunction) to promote application of (new) environmental technologies. These instruments show that it is possible to use fiscal instruments for very specific policy targets without having very high administration costs. They also show that innovation can be promoted by this means.
Since and there are differences between the various fiscal systems (fiscal policy is the responsibility of the member-states) the Dutch instruments are not directly transferable to other countries (or the EU level), but there are lots of possibilities to adapt them to the local situation.
These fiscal instruments provide possibilities for promoting off-balance financing of advanced environmental equipment as well, since operational lease is allowed.

Other financial instruments (chapter 4) for the support of innovation in the area of sustainability are among others specialised venture funds in Eastern Europe (The *Central & East European Environmental Investment Fund (EIF***)**, which is a venture capital fund investing in companies that profit from selling environmental goods and services. The Fund has been capitalized at € 22 million through the year 2008 and operates in Central and Eastern Europe with special emphasis placed on Poland, Hungary, Slovak and Czech Republic, Bulgaria, and Romania.
In France a green fund is established to guarantee bank loans for investment projects

that can result in energy savings or the use of renewable energy to SMEs. (FOGIME: Investment Guarantee Fund for the Management of Energy). FIDEME is an green investment fund for environment and energy management and providea mezzanine financing, a category of intermediary financing between loans and equity usually used prior to an IPO, to companies involved in waste valorisation, energy saving or renewable energy.
In Austria contracting is used as a new financial tool for boosting investments in energy saving technology. The typical contracting model offers an integrated technology and service packages to energy consumers. The investment is pre-financed by the government and repaid by realized energy savings. This off-balance financing is expected to reduce entry barriers for new clean technology significantly.

These types of instruments can also be set up by other countries or at EU level.

Regulation (chapter 5) is not often used explicitly for innovation purposes. The EURO norms (EU level legislation) for the emissions of trucks are among the few exceptions.

The Green Accounts Act in Denmark is an example where innovation was also targeted with a regulation measure. Clear is that regulation with detailed prescription of the type of solution that is to be used works counter productive for innovation. Regulations describing performance criteria have a more positive impact on innovation, especially when the criteria are made stricter from time to time.

It is recommended to take innovation into account with environmental regulation in all European countries and at EU level. In our opinion the largest (and probably cheapest) possibilities to make environmental policy contribute to the Lisbon goals in the area of competitiveness are in making environmental regulation more innovation oriented.

In their actions to meet EU environmental regulations the new EU countries can learn from the Western European experiences that strict obligations that have to be fulfilled on short term lead to expensive end-of-pipe technology. Longer-term adaptation strategies with emphasis on clean technologies may reduce costs significantly and offer chances.

A special form of regulation is the use of voluntary agreements or **negotiated agreements** (chapter 6). With regard to this study the Portuguese voluntary scheme with the pulp and paper industry is remarkable. Due to its membership in the EU and the EU's legislative power with respect to environmental matters Portugal had to adopt fairly advanced environmental regulation. Many Portuguese companies have been unable to follow the pace of tightening of environmental regulation and went out of compliance. The Portuguese voluntary scheme was an attempt of the government to close that gap, without leading to plant closures. The scheme was not a clear-cut success, as compliance with the regulatory standards had to be forced upon firms via fines and court cases. However, only one out of the 8 mills covered by the scheme had to close down.

An example of innovation in negotiated agreement between the government and industry is the Benchmarking Negotiated Agreement for CO2-emission reduction in Flanders. In the negotiated agreement on benchmarking the energy intensive industries in Flanders promise to belong to the most energy efficient companies in the world by 2012. The Flemish government in return promises not to come with extra measures in this area.
Benchmarking might be an option for other countries as well. It is however not an option supporting new innovations, but primarily an option supporting the application of new, already developed, technologies. Costs for this scheme can go down when other countries adopt this type of schemes, because information exchange can the reduce costs.

Public purchasing is one of the environmentally most significant fields, which comes under the direct responsibility of governments. Applying green criteria offers a huge, albeit unknown, environmental relief potential. Although public authorities have been developing **green procurement** (chapter 7) practices for more than 20 years, no common strategy in Europe has yet been established. The approach in Denmark is regarded as well developed. The Danish action plan requires public authorities to contribute to environmental objectives via their purchasing activities and draw up a green procurement policy. When guidelines for environmental purchasing were developed Green procurement started to take off. In 1998, 90% of the State institutions and governmental companies had set up such a policy and adopted an action plan.
Lack of information is the main barrier to green purchasing. Increasing attention is paid to the European policy and legal framework. There is a potential conflict between freedom of trade and environmental considerations. The publication of the EU handbook on Green Procurement by the end of May 2004 is expected to provide opportunities to combine integrated product policy with EU regulations.

Greening of the taxes (chapter 7) is considered important among many countries. Especially levies on energy (electricity, gas, fuels) are often used. 95 % of the environmental tax revenue in Europe comes from the energy and transport sector. Environmental tax on household waste, water and bottles are also used in some countries.
Green taxes (as part of a green tax or budget reform) are an economically efficient instrument for reducing consumption, pollution and other environmentally harmful activities to an acceptable level. It gives producers and consumers strong incentives to change their production and behaviour. Such green taxes will create revenue that can be used to lower income taxes or to finance environmental friendly projects. Furthermore, green taxes will make investments in innovative green technology attractive, and will make current polluting products much less attractive.
The direct impact on innovation is however questionable. In order to provide a real incentive the tax rates are often to low because of political reasons (competitive position of industry, etc).
Green taxes can in theory be implemented at the EU level, but this requires unanimous agreements, which have proved very difficult to achieve. On the other

hand the EU treaty gives the possibility for each member state to introduce its own green taxes, also in areas where norms and standards are harmonised

There are many examples of **other non-financial support measures** (chapter 8) combining innovation and sustainability. In this study it was chosen to focus mainly on financial instruments. One example that was worked out (since it has a financial component) is the Swedish Environment-driven business development scheme. This programme, in which intermediaries are stimulated to develop new methods of business innovation together with companies have a positive on competitiveness and lead to reduced environmental impacts of products and operations. A precondition for the programme to work is that almost all involved companies in Sweden work already systematically with environmental issues. To what extent the programme can be used at EU-level depends for a large part on the environmental orientation of companies in the different EU member states.

In chapter 9 a case study is sketched on the use of various instruments to promote wind energy in four EU countries. This case study shows that support for technology development is important, but that creating favourable market conditions for a longer period is far more important, both leading to widespread application (and thus a positive environmental effect) as well as to creating a substantial industry. However when there is no technological base from the past, market support alone will not easily lead to a strong home based industry.

In chapter 10 the most important observations on policy instruments that might trigger innovations in the area of sustainability are recapitulated. Financial/economic instruments can clearly play a role in strategies to make Europe the most competitive region the world. It should be however noted that details in the set-up of measures are often important in determining the success of a measure. Also context and underlying policy strategy are very important. Instruments should therefore be tailor made to the policy purposes and context. And since the context is dynamic, instruments should preferably be dynamic or very robust.

1 Introduction

In this report the results of a Technopolis study on policy support instruments in Europe that have both a positive impact on innovation and sustainability are given. The research was carried out in the period March-May 2004, and is part of the preparations for the Dutch EU-Presidency in the second half of 2004. On July 16-18 the Informal Environmental Council will be held in Maastricht, where the contribution environmental policy can make towards improving the competitive position of the EU economy is an important topic.

The study consisted of two phases that will be described below.

Phase 1: Inventory of instruments

In phase one of the project an overview was made of policy instruments at national level in the various EU countries (the old EU-15 and some new countries) and at EU level. To obtain this information internet and the Technopolis relation network as well as interviews with responsible programme managers were used to retrieve information and select the interesting instruments with an (potential) effect on innovation in the area of sustainability. This overview was not meant to be exhaustive: it was meant to provide examples of successful instruments in the various countries. We focussed on economic and financial instruments, but in the examples you'll find also short descriptions of other types of instruments from the range of possible policy instruments that governments can use.
Every instrument was classified according to the type of intervention and the position of the instrument in the innovation process.

Types of government instruments considered were (numbers refer to columns in figure 1):

- A1=subsidies
- A2=loans
- A3=taxes and levies to discourage certain activities
- A4=positive tax measures (tax credits etc.)
- A5= other financial/economic instruments
- B1=regulation
- B2=negotiated agreements
- C=other instruments

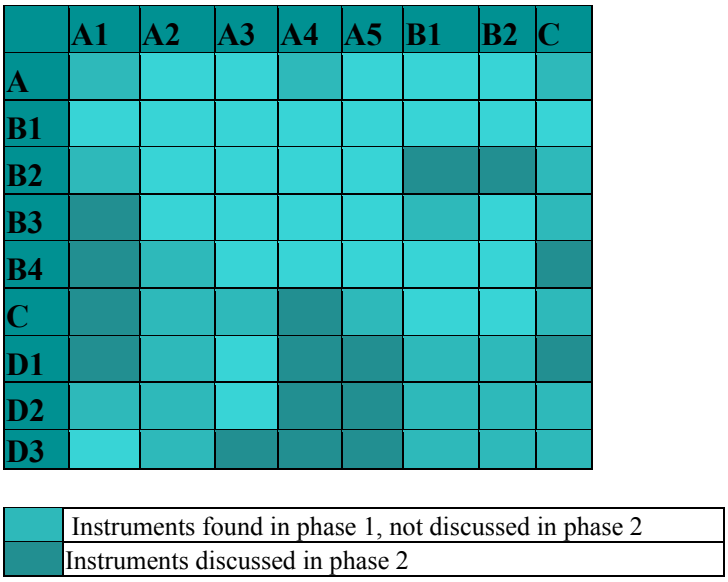
The possible positions of the instrument in the innovation process were defined as (numbers refer to the rows in figure 1):

- A=education
- B1=IPR
- B2=norms and standards
- B3= centres, laboratories and institutes
- B4= network building
- C= R&D trajectory
- D1=market introduction, first movers

- D2= market growth, early adopters
- D3= other market instruments aiming at reaching wide application

All the instruments considered in phase 1 are given in appendix A. Based on this overview of instruments (figure 1) it was concluded that the variety in policy instruments to promote innovation in the field of sustainability instruments is large. North Western European countries use more elaborate systems of policy measures then Southern (and probably East) European countries. Real, proven, effects of the programmes are often not well known.

Figure 1 Overview of instruments



Despite the large variety among the analysed countries some overlap in instruments between the countries exists and some general trend could be identified.

Instruments

- In almost all countries the main emphasis for innovation support is on subsidies to support R&D. This is also valid for innovation for sustainability. Subsidies, however, are used for many purposes.
- In general, loans are loosing ground, but tax incentives are on the increase. Although loans can have a higher leverage than subsidies (since they are, at least partly, paid back), the administrative burden is higher, as well for the government as for the loan receiving companies. Tax incentives have low administrative costs, and are used in the innovation policy and in the environmental policy
- Levies and taxes are widely applied. Greening of the taxes is considered important among many countries. Especially levies on energy (electricity, gas, fuels) are often used. Environmental tax on household waste, water and bottles are also used in some countries. Revenues are used either for subsidising sustainability or lowering other taxes. In countries like Denmark, Finland green taxation is an important aspect of the tax system.
- Other financial/economic instruments, e.g. Investment and guarantee funds are

becoming more and more widely applied, a lot more experiments are running
- Despite the fact that environmental regulation has some kind of effect on innovation it is not often explicitly used to stimulate innovation
- There are quite a number of other (non-financial, non-regulation) measures used.

Position in the innovation process
- There is not much specific attention for education in the policy domains of innovation and sustainability. This may be embedded in the normal educational systems of the various countries, and these have not been researched in this study.
- There are no obvious reasons why there should be specific attention for IPR in the area of innovation and sustainability. The normal instruments (Patent Office and promotion of the use of IPR should suffice. No specific instruments were therefore found.
- There is also little specific attention for norms and standards, when considering innovation and sustainability. Only in the case of green procurement deciding what is green and what is not leads to specific programmes on norms and standards (apart from normal environmental legislation)
- Institution building and networking are considered as important in the sustainability filed as anywhere else in the field of innovation. Subsidy programmes and promotional activities are the normal instruments used.
- As stated above R&D stimulation with subsidies is core of the policy in many countries.
- There is a shorter tradition on market stimulation. This is the area where traditional subsidies can work (and are sometimes very effective) but where all types of other instruments (financial, including taxes, and others) have been developed in the last few years. Many are project based (not company based???).
- Most countries have some kind of support instrument(s) to stimulate the start-up of new technology based firms and the transfer of scientific knowledge to the industry (e.g. providing capital to start-ups, advice, networks, etc). Specific programmes for the start up of sustainable companies are rare.

Other
- Eastern European countries have a chance to be more pro-active then the North Western European countries have been in the past. In their actions to meet EU environmental regulations the new EU countries can learn from the Western European experiences that strict obligations that have to be fulfilled on short term lead to expensive end-of-pipe technology. Longer-term adaptation strategies with emphasis on clean technologies may reduce costs significantly and offer chances. They could use their arrears to their advantage and in this way efficiently meet their environmental targets and create an innovation oriented environmental policy as well (and therefore increase their competitiveness). Their present policy measures are, in most cases, not organised that way.
- It should be noted that details in the set-up of measures are often important in determining the success of a measure. Also context and underlying policy strategy are very important. Since the context is dynamic, instruments should preferably be dynamic.

Phase 2: Description of successful instruments

After phase 1 a selection was made[1] of instruments with a proven impact on innovation and environment that might be of interest to use more broadly in Europe. Interviews (by telephone) were held with programme managers and government officials to get more insight in the factors determining the success of the programme. Again the aim was not to be exhaustive, but to get information on the outcome of the programme (did it actually work and how did it work?), on the success factors of the programme (why did it work?) and on the transferability to other situations (can it work elsewhere in the EU-countries, or at EU level?).

In the table below (figure 2) an overview of the selected instruments is given. The instruments are described in the corresponding chapters (chapter 2-8).

Figure 2 Classification of the selected instruments

	A1	A2	A3	A4	A5	B1	B2	C
A								
B1								
B2						§5	§6	
B3	§2.1							
B4	§2.3							§8
C	§2.2			§3				
D1	§2.4			§3	§4, §7.1			§8
D2				§3	§4			
D3			§7.2	§3	§4			

In chapter 9 a case study on the development of wind energy in the Netherlands, Denmark, Germany, and Spain is presented. The scope of the case study is on policy instruments, and underlying policy strategies, that have had a major impact on the introduction of wind energy and the creation of a competitive, domestic wind energy industry in these countries.

This report ends with chapter 10 in which our most important observations are given on policy instruments that might trigger innovations in the area of sustainability.

2 Subsidies

Subsidies to stimulate innovation are used in every country across Europe. They are aiming at developing new technology and, in this way, creating opportunities for new business. These programmes started out as subsidies supporting projects from individual companies or research groups. In the last 10-15 years the support of consortia of researchers and companies (instead of individual companies) became more and more important. In this way it was tried to obtain more structural effects.

In some countries there is one programme covering the whole range of R&D, from fundamental research towards development and demonstration, while in other countries there are separate programmes for each phase of research (e.g. feasibility studies, incubator centres, etc). Other programmes focus more on the market trajectory of the innovation process. The different subsidy programmes that are running in the various member states of the EU cover this whole range, and will be described below.

Some countries have programmes that are aiming specifically at sustainable technology, while others have more generic, or sector oriented programmes. There are many possibilities in between. Sustainability can be promoted in different ways:

1 The first method is to make sustainability the explicit aim of the programme and exclude projects that do not contribute to achieving sustainability (i.e. a specific programme for sustainable innovation). Less drastic versions of this method are assigning a minimum share of the budget to sustainability projects or (in procedures where proposals are compared with each other) giving projects with positive effects on sustainability an extra appreciation in the evaluation.
2 The second method is to stimulate projects with positive effects on sustainability by giving them extra facilities within a stimulation programme (higher percentage of subsidy, broader definition of acceptable costs, etc.).
3 The third method is to stimulate sustainability projects by giving extra attention to this type of projects when communicating the programme to possible applicants.

It is generally considered that generic innovation programmes have positive sustainability effects and that programmes in the innovation area that promote sustainability have a positive effect on innovation. Specific targeting of sustainability in innovation programmes leads however to an increase of sustainability in the outcomes of the programme.

To take sustainability into account in the innovation policy can be a part of a strategy to make the EU outstanding in sustainable performance. It builds on present strengths of EU industry and R&D and can make EU industry more competitive.

2.1 Infrastructure: incubation and competence centres

There are several examples of successful competence centres programmes in Europe e.g. the Swedish Competence Centre Programme and the Austrian K*plus* programme. In general, the main goal of these programmes is to strengthen the link between

BOX 1: Environment Park

Environment Park (Envipark) was founded in 1970 in Turin with environmental technology as a focus. In the late 80ies ICT was taken aboard as the second thematic focus. At the present time the park works on full capacity and hosts firms, agencies, laboratories and specialised offices in a space of 15,000 sqm. Among the 66 firms situated in Envipark around 50% do have a focus on environment. For the development of the building complex low environmental impact solution have been implemented. Thus the park itself is used as an illustrating example of the use of green technology in the construction sector.

Environment Park S.p.A runs the park. It is based on a public private partnership model in which the public support was concentrated on the initial investment (including EU FESR support for the areas with a declining industry). Shareholders are the local government of Turin, next to a range of associations (e.g. Chamber of Commerce Turin and the Industrials Association Turin) and private firms (e.g. SMAT–Metropolitan Company Waters Torino S.p.A). The operation of the park is not supported by public money.

With a staff of 13 employees Envipark covers a wide range of activities:

- Incubator function: 10 out of 66 hosted firms were founded within Envipark. This is supported by the possibility to provide relatively cheap and functional real estate space with centralised logistic services. Furthermore Envipark tries continuously to scout for promising business models and young entrepreneurs. In retrospective the incubation function has been implemented on a fairly informal operation level. So far Envipark does neither apply an explicit exit-strategy nor provide explicitly management or financial support for the new firms.
- Technology transfer and knowledge sharing: Envipark is seen as a pool of excellence clustered within an attractive real estate site. To enhance the use of comparative knowledge and competences within the park is seen as an important function of the park management. This starts with managing the portfolio of enterprises and research laboratories in a way that creates co-operation opportunities and is further addressed by specific information activities (e.g. about the legal and technological evolution in the environmental field).
- Visibility and Marketing: Envipark organises product and service exhibitions, through the creation of temporary or permanent “windows” on site. Furthermore Envipark has organised and promoted the first Biennale of the Eco-efficiency in Turin in 2001.
- Programme development and implementation: In the last years Envipark was involved in a wide range of programming and network activities at the regional, national and EU-level. For example Envipark promotes the diffusion of innovative technologies and good practices into the local SME community. Fields of operation are: Environmental Certification, Eco-compatible architecture, Electromagnetic and indoor pollution, planning and management of water resources, acoustic pollution and recovering of contaminated sites.

Overall the Environment Park in Turin has successfully positioned itself both as an attractive site for innovative firms in the environmental field as well as a node for various research and promotion network in the area.

academic research groups and industrial R&D: concentration of research activities is the key mechanism. Research on environmental issues is usually a topic in one or more of the programme centres, but never an explicit goal.

In Italy, **Envipark**[2] (Box 1) seems to be quite an original example of building a competence cluster of private firms and research institutes around (applied) environmental research and development. Envipark is a technology and science park that is focused on environmental technology. The primary purpose of the park is to promote the development of applied environmental research and enhance science-industry cooperation. Important in the success of such a park is the portfolio of enterprises and research laboratories: this should be managed in such a way that the use of comparative knowledge and competences within the park is enhanced by creating opportunities for co-operation. Important is the provision of relatively cheap and functional real estate space with centralised logistic services. Networking support, (extra) marketing support, and visibility contribute to the added value. Beyond the added value created directly for firms and institutes within the park, such physical platforms can be used as portal and catalyst for a wide range of policy measures. Visibility and good anchoring within the research and relevant enterprise sectors help to improve policy delivery, particularly for awareness, diffusion or training measures.

The experiences with Envipark are encouraging. Even though it has proved to be a real challenge to maintain the thematic focus throughout the ups and downs of the real estate markets, green technology proved to be mature and diverse enough to develop a sustainable portfolio of firms and institutes within the park. Such physical clusters on sustainable technology can be made in other EU countries as well; synergy between the companies and institutes in the centres is however crucial for its success.

2.2 Research & Development

In all European countries subsidy-programmes for R&D support have been found, either specifically aimed at developing (more) sustainable technologies or having a more generic character, but in general having a (substantial) effect on sustainability. The EU is, within the Framework Programmes (FP), also very active in the area of R&D subsidies (with large programmes specifically directed towards environmental research, and other programmes with an environmental spin-off).

In order to make sustainability really the third pillar in the Lisbon process it has to be integrated in the whole of FP7. As stated above, there are various possibilities to promote sustainability-oriented projects within R&D programmes. The Flemish (Belgium) **DTO-programme**[3] (Duurzame Technologie Ontwikkeling; Sustainable Technology Development, Box 2) seems an elegant way to accomplish this.

DTO is an add-on programme to the most important Flemish R&D support programmes. In this add-on programme all three mechanisms to influence the sustainability component in R&D subsidy programmes have been implemented: a minimum share of the budget is assigned to sustainability projects, sustainability

BOX 2: DTO - Sustainable Technology Development

In Flanders R&D support is organised in horizontal programmes with no technology targeting or limitation, by the IWT-agency. There are programmes for e.g. university research, strategic basic research, industrial research and individual grants for researchers, etc. DTO comes on top of these programmes. Every application for a subsidy in one of the IWT-programmes can apply for DTO-status. DTO status is given to those projects that aim at reduction of environmental impact of at least 30%.
For every targets have been set (based on programme history and policy wishes) on the percentage of the subsidy that must be spent on DTO-projects. Then the normal project evaluation procedures are followed. When, within a certain tender the DTO-targets are not met with the normal procedure, then DTO-projects that meet the minimum quality criteria receive an extra appreciation and get funded (in stead of higher ranking non-DTO proposals).

DTO-projects from industry get an extra funding of 10% as well. This may also stimulate the amount of sustainability-oriented projects that are submitted for a grant.

The DTO-programme started in May 2002. The first evaluation will be performed at the end of this year (2004). At the moment 14% of all projects have received DTO-support. In some cases this has led to the approval of a DTO project instead of another project: therefore DTO has had a positive influence on the number of supported sustainability oriented projects (in the industrial programmes). The application procedure for DTO projects might also make applicants consider the environmental impact of their programme better. In the two years of DTO there has however not yet been a remarkable increase in the number of sustainability-oriented applications.

projects from companies get a subsidy-increase of 10%, and additional marketing activities are performed.

Sustainability is important for almost every sector or technology field, and commercial possibilities can also be found in very wide areas. Only a broad programme can cover this whole area. Making it an add-on programme makes easy communication possible (one message for the add-on programme, not interfering with the communications of every specific programme).
Since the programme is fairly generic in its set-up there are many possibilities of adapting the programme to local circumstances and wishes (percentage of sustainability required, subsidy percentage, amount of marketing effort, etc). This makes the programme suitable for application in other countries or at EU level.

2.3 Network building

R&D subsidies are most often project based. In the 1990s many EU countries realised that results from technological projects alone was a sub-optimal way of government intervention in the area of innovation. R&D programmes became more and more oriented towards influencing the R&D structure by requiring cooperation in projects and supporting network development. In this way the spillovers of government intervention increased and the effects of a subsidy programme became longer lasting than the projects of the programme.

R2Is[4] **(Réseaux Industriels d'Innovation,** Box 3) are an example of such a programme. R2Is are an instrument from the technology support domain and are financed by the French Ministry of Industry. They are meant to be complementary to the pre-existing technology policy instruments that promote science-industry or pre-competitive horizontal collaborations.
This programme shows that innovation policy that is not specifically aiming at sustainability can very well have positive sustainability effects, however, specific targeting of sustainability from the beginning could have increased the effect.
Important in the set-up are the vertical approach (along the chain from raw material suppliers to distributors of end products) and the line up with the organisation of the industry sector (the choice for incorporating competence centres in the programme design given the strong regional specialisation of the French textile industry).
Transfer of this approach to EU level seems possible; especially in industry sectors were value chains have strong cross-border characteristics. However, organisation and coordination might be very difficult and costly, so it might be easier to implement this approach at national level in other countries, or organisation forms including only two or three countries.

2.4 Market introduction

Subsidy schemes for the support of market introduction are considered to be disturbing the market. The use of these instruments is therefore restricted by EU legislation. In the area of energy and environment the EU legislation for market introduction is less strict because the positive environmental effects can outweigh the market disturbance. Therefore some support measures do exist. Fairly often these consist of subsidies for consumers buying products (e.g. low energy refrigerators,

BOX 3: R2Is - Réseaux Industriels d'Innovation

R2Is (Réseaux Industriels d'Innovation) are an example a networking programme, from the French Ministry of Industry. R2Is are organized according to logic of industrial *filière* (*i.e.* vertically), which is essential to maximize interactions among all the stages of the value added chain, from the raw material suppliers to the distributors.
This policy instrument has been implemented for the very first time in the textile and clothing industry with the creation of the R2ITH in 2002. A second one, in the plasturgy *filière*, will soon be formed. Given the strong regional specialization of the French textile industry, eight regional competence centres have been created. So far 9 projects were financed (after approval by a national strategic orientation committee) for a total amount of €11.5m, to which industry contributed 43%. The budgets of projects range from €250,000 to €5.6 million.

No evaluation has been yet carried-out of and the nine initial projects are still currently running since the public financing from the Ministry of Industry was blocked, postponing the debut of the projects. Moreover, the limited amount of fund eventually granted by public authorities has greatly reduced the results that were initially expected.

However, from the design of the program some interesting learning can be derived regarding the development of "sustainable innovation": Although the creation of sustainable development axis is not the mere result of "green communication", the integration of the environmental dimension within R2ITH remains limited. The official project approval file contains no environmental criteria beside: innovation, strategy, partnership quality, added-value and techno-economic feasibility are the criteria according to which each project is evaluated prior to receive R2ITH financing. Two projects out of nine belong to the sustainable development axis (Development of new technologies for the treatment of dyeing wastes; Reduction of materials and equipments used such as reels). Use of non-environmental criteria can therefore lead to sustainability projects but not in all cases: since the prime motive for the creation of R2ITH was the need for the French textile and clothing industry to strengthen its competitiveness relatively to low-cost countries it is not surprisingly that sustainability plays a small role. Innovation as well as environment was seen as parallel ways of differentiating their product in a context of increasing competition.

In the set up chosen chances were missed to integrate sustainability more substantially: R2ITH could use e.g. its vertical organization to implement a life-cycle environmental impact assessment of the projects. However, the creation of a specific green label has recently been addressed within R2ITH in order to valorise the environmental efforts of the industry through differentiation of products.

high efficiency heating boilers or solar panels). These programmes tend to be fairly costly for the direct effect they have, but they may lead to the creation of lead markets and to production increase, economies of scale and consequently cost price decrease. These instruments are very specific, because they usually support only very explicitly defined products.

One of the very few examples of a subsidy scheme to support market introduction of new environmental technologies that is less specific, and aiming at opening up industrial markets, is the Dutch subsidy scheme **SRM**[5] (**S**ubsidy scheme **R**eference projects **E**nvironmental technology, Box 4). This programme was considered to be an effective instrument to support market introduction. It improves innovation because it limits the risks for both innovators and first customers.

Important in the set up of the programme are the (perceived) simplicity of the application procedure and the way (and moment) the relevant actors are involved. Developers of technology are facilitated in finding customers. Customers are helped at their critical point: the grant decreases the risks of an investment in new technology.

This method of supporting market introduction of new sustainable technologies can be transferred to other countries, since it has not really a specific context. It also fits well with the EU LIFE programme. LIFE focuses on demonstration of new technologies from an environmental point of view. The national pre-selection followed by a final selection at European level makes adjusting to differences between the various EU countries possible. Involving both suppliers of new technology as well as customers can increase the market orientation of LIFE.

BOX 4: SRM - Subsidy scheme Reference projects Environmental technology

The SRM-programme (active from 1994 to 2002) provided help to developers of new technologies in overcoming the entrance barrier for their techniques. Near the end of an R&D project (but before market entrance) suppliers of environmental technology could apply for a grant of 25% of the investment costs in an industrial installation. When their application was approved they received a 'conditional subsidy'. They could use this 'conditional subsidy' in their search for the first customer by offering them the subsidy as a discount on the normal price. The subsidy was made effective only after the contract between supplier and first customer was signed, and paid after the investment was made[1].

In the 8 years the programme was running 179 companies received a grant. In total €11.2 mln was granted. 75% of the amount was actually paid; this means that approx. 75% of the companies that received a grant was able to find a first customer. The first customer really did function as a reference; in most cases the first customer was followed by a second (and often more others). In total every granted euro has led to a turnover of €19 (situation 2002).

In an evaluation the instrument was considered an effective instrument to support market introduction. It improves innovation because it limits the risks for both innovators and first customers. The evaluation procedure by external experts has added value as well. Most projects supported are incremental innovations, of which many were inspired by (forthcoming) regulations.

Important in the set up of the programme are the (perceived) simplicity of the application procedure and the way (and moment) the relevant actors are involved. Developers of technology are helped in their activity of finding customers. Customers are helped at their critical point: the grant decreases the risks of an investment in new technology.

3 Fiscal facilities

Fiscal (tax) measures, in general, decrease the administrative burden for companies compared to subsidy instruments (and loans). Administration costs for the government are lower as well. Possibilities to restrict the free-rider effect (companies getting support that would have performed the action without the support) are however limited.

In the 1990s fiscal (tax) benefits to stimulate R&D have been become more important in various countries in Europe. These instruments are generally considered to be successful: they give rise to extra R&D, are very suitable for supporting SMEs and are well received by companies performing research. At the moment the R&D support schemes have no specific effect on sustainable innovation, since no sustainability criteria are included in the evaluation procedure.

In the Netherlands it has been successfully tried to use fiscal facilities as a way to promote market growth. Four fiscal instruments are used (in conjunction) to promote application of (new) environmental technologies[6] (Box 5).

Free depreciation of Environmental Investments Measure (**VAMIL**), Environmental Investments Relief Scheme (**MIA**), and Energy Investments Relief Scheme (**EIA**) show that it is possible to use fiscal instruments for very specific policy targets without having very high administration costs. In almost 15 years of experience with this type of instruments (VAMIL started already in 1991) the Ministries of VROM and Finance have learned to give these instruments a positive effect on innovation as well.

Eeligible investments for one of the schemes are stated on a list. The yearly update of the lists of equipment secures spreading of innovations while not hindering new innovations in their market entrance. One of the things learned is that detailed descriptions of the instruments hinder innovation: the descriptions now have become more generic, and equipment is more described in terms of performance (e.g. emissions, energy use). The way greenhouses are supported in MIA is a good example of this. The environmental impact of greenhouses is described with a rating system: every percent improvement with regard to the standard situation in a certain year is given one point. The number of points necessary to qualify for support under the MIA scheme increases every year. This has increased the amount of innovations from suppliers of greenhouses (and even to structural cooperation between some of them).

Other ways of securing innovation are found in the **Dutch Green Fund Scheme**. Energy related projects that receive funding must perform an energy scan (an evaluation of the energy situation) every five years. In order not to loose their green financing they are also obliged to follow the suggestions for energy saving from the scan (as long as they are economically reasonable).

BOX 5: Four Dutch fiscal instruments

Green Fund Scheme
The green fund scheme is a green investment fund (managed by banks) that invests only in certified sustainable projects (green projects). A government office performs the certification of the projects. The (private) investors that make their investments in the green investment funds receive a tax reduction over the profits they make with those investments (the investment is free from property tax). Because of this they are satisfied with a lower interest rate, and therefore the Green Investment Fund can offer lower interest rates to the green projects they invest in.
The success of Green Fund Scheme lies in the leverage that is created with the government investment: the government only misses the property taxes (approx. 2% of the investment/year) and administration costs are low (less then 1% for the government, and for the banks the same costs as for normal investment funds).
In total 2845 projects have been financed with green investment funds (1995-2002), with a total investment of €4.9 billion!

Free depreciation of Environmental Investments Measure (VAMIL)
VAMIL is a tax facility offering companies the opportunity to apply free depreciation on environmentally friendly operating assets. If the asset is operational and fully paid for, it even allows depreciation of the full purchase price in the year an asset is acquired. This provides an attractive liquidity and interest gain for these companies. Eligible operating assets appear on a special 'VAMIL list' on which a wide variation of eligible investments is stated. Once every year the list is evaluated: new developed technologies are added and technologies that have become ‘normal technologies’ (market share 30% or more) are removed. It is a relatively cheap programme: the government only pays the interest loss and administration costs. Since the effects on the liquidity position of companies can be very positive this instrument is well regarded by companies. VAMIL mainly accelerates intended investments.

Environmental Investments Relief Scheme (MIA)
The MIA is designed to stimulate investment in environmental technology in the broadest sense. It gives businesses wanting to invest in environmentally friendly production methods the opportunity to deduct some of the investments from the taxable profits (either corporation tax or income tax depending on the legal structure of the company). This scheme is also updated every year in line with technological developments.
In the period 1997-2002 more than 100.000 investments received support from the MIA. Total investment costs amounted to almost €4.8. In 2002 almost half of the budget was spent on investments in wind turbines. Combined heat/power generation was the second largest group of investments. SMEs were responsible for 92% of the applications and 75% of the investment budget.

Energy Investments Relief Scheme (EIA)
EIA is a comparable system to the MIA, but on the list of Energy Saving Equipment and Sustainable Energy Equipment are stated. The percentage of support is different from the MIA (higher, because of political reasons, the actual investment support ranges from 5-20%.).
Green Investment Funds are supporting investments in the market-introduction phase: market share < 10%). VAMIL is aiming at supporting equipment in the phase of market growth (5-30%). EIA and MIA are supporting until market-saturation. Projects that are supported by Green Investment Funds can also use the other instruments, while MIA and VAMIL can also be combined. Therefore: the earlier in the market-development the higher the support.

The Green Fund Scheme can also be used to set up risk capital funds for environmental technology development. This has however not happened, probably because the banks running the funds are risk evasive.

MIA/VAMIL is also used in helping to create lead markets. Law as from January 1st, 2007 will oblige low emission stables. Putting these stables on the MIA/VAMIL list will give a stimulus for farmers to invest already now. This will create a lead market for the stable builders. Furthermore, these fiscal instruments provide possibilities for promoting off-balance financing of advanced environmental equipment as well, since operational lease is allowed.

Since fiscal policy is the responsibility of the member-states and there are differences between the various fiscal systems the Dutch instruments are not directly transferable to other countries (and certainly not to EU level), but there are lots of possibilities to adapt them to the local situation.

BOX 6: FIDEME

FIDEME (Investment fund for Environment and Energy Management) was created in 2003 by ADEME. It has the statute of a FCPR (Fonds Commun de Placement a Risques), which 50% of assets must consist of shares, convertible bonds or participating interests in unlisted target companies. Although FCPRs exist since 1983, the surge in the number of FCPRs since the end of the 1990s testifies that the recent legislation changes have made this financial instrument an easy and tax efficient vehicle for raising investment in risky ventures. The FIDEME is managed by CDC-Ixis (Caisse des Dépôts) Environment et Infrastructure. FIDEME invests in convertible shares issued by companies that need financing for an investment in renewable energy technologies (especially wind energy) or recycling and waste valorisation technologies. FIDEME also funds suppliers of technologies related to energy management and waste valorisation (limited to 10% of the fund). The fund represents an investment capacity of €45m (€15mln ADEME, € 30mln other partners: mainly Caisse des Dépôts and other financial investors such as several Banques Populaires, Caisses d'Epargne and two Italian investment banks). This financial amount allows the partners to access investments in the range of Euros 0.5-5m.

An interesting feature of FIDEME is the fact that it provides funds through mezzanine financing. This type of financing is located between loans and private equity. Prior to the creation of FIDEME, this position was identified as the weak point in the balance sheet of French firms. It is characterised by its mid to long term temporality and the size of the funds that can be raised. Since the counterpart of this investment is a convertible bond, it is stable while leaving the opportunity to be transformed in private equity. Moreover, it is characterised by hands-off management, which is of course not the case with venture capital, while still providing the opportunity of technical support and advises from ADEME engineers who are in charge of the technical, energy and environmental approval. ADEME engineers also often identify the company and the project and bring it to the FIDEME. However, beside the interest of mezzanine financing, the real strength of FIDEME as a policy instrument lies in the association of public and private actors, conciliating the objectives of sound economic practises and environmental/energy benefits for the society. Precisely, two leverage effects are triggered through the participation of ADEME in this guarantee fund:

- ADEME, which contributes one third of funds, is the last organisation to be reimbursed in the case of failure of the SME. Since the banks are reimbursed first, this can be assimilated to a 33% guarantee mechanism.
- The funds awarded by ADEME are not remunerated, which permits the interest rate to be about 33% lower. It has been calculated that the exit interest rate of FIDEME was about 6 to 7%, while it is usually about 10% in venture capital.

This mechanism has been approved by the European Commission. It has been decided that 20% of the funds allocated through this fund by ADEME will be considered as direct public aids to industry (given that the rate of failure is expected to be around 20%).

Another originality of FIDEME is the "non-addition" principle: the FIDEME must intervene only in cases when it is considered that the investment project could not be financed by other means. CDC-Ixis and ADEME evaluates this condition.

So far, 20 projects are already financed or are about to be financed. Demands originating from companies that have energy or environment related investments but that cannot find relevant means of financing these investments are numerous.

4 Other financial instruments

Apart from subsidies and tax incentives a whole range of financial instruments is used. As mentioned in the introduction chapter direct loans are becoming less prominent, because administration costs are high and the leverage of the government euro is rather low. The more 'modern' instruments are aiming at increasing leverage by e.g. combining public and private money and/or by using public money as a guarantee only. The area of intervention can also vary very much. For example there are instruments to increase the amount of risk capital available, instruments to provide equity financing, loan guarantees to encourage the start-up of new technology based firms. In the Netherlands they are even discussing the set up of an insurance for First Movers (first investors in new equipment with significant possible sustainability impact). Most of these instruments originate from innovation policy and are generic. However, some are specifically oriented towards improving the environment and will be described in the following sections.

4.1 Investment Funds

There are several forms of investment funds that differ in the way and the extent to which they share risk with the companies they invest in. Risk sharing can vary from providing simple loans to participation in the private equity and the management of the companies. Governments and governmental agencies often participate in investment funds, because they are considered to be market-based financial instruments, which have a rather high leverage effect and do not require direct intervention from public authorities in the allocation of the funds and the selection of investors. Government participation is often needed and justified, because private capital is difficult to attract since many sustainable investments, for example industry investments in clean and energy-efficient technologies, are risky but offer high (potential) social benefits.

When devoted to upstream stage, these government-supported investment funds might lead to the creation of new businesses.

A fund that invests in convertible shares issued by companies that need financing for an investment in renewable energy technologies (especially wind energy) or recycling and waste valorisation technologies is the French **FIDEME**[7] (Investment fund for Environment and Energy Management, Box 6). Funds are provided partly by government agency ADEME (€15 mln) and partly by various private investors (banks etc, €30 mln). The participation of ADEME gives guarantees for the banks (ADEME is the last organisation to be reimbursed in case of failure) and makes lower interest rates possible. ADEME also provides technical support.

It is worthwhile noticing that another fund like FIDEME was created in 2003 in the area of energy or environment, the FCPR 3E (Emertec Energie Environnement). It represents €11,5 mln, originating from CDC PME (SME branch of Caisse des Dépôts, €5 mln), CEA (Nuclear Energy Agency, €2,5 mln), IFP (French Oil

BOX 7: EIP - Environmental Investment Fund

An important venture capital fund active in Eastern Europe is the Central & East European Environmental Investment Fund, which is a venture capital fund investing in companies that profit from selling environmental goods and services. The Fund has been capitalized at € 22 million through the year 2008 and operates in Central and Eastern Europe with special emphasis placed on Poland, Hungary, Slovak and Czech Republic, Bulgaria and Romania. The Fund operates under the abbreviated name: Environmental Investment Partners (EIP) and is managed by Environmental Asset Management (EAP). EIP invest at between € 0,5 and 3,5 million per company and has now new investments. The Fund is always a minority shareholder, usually in the range of 20-45% and the investment is usually made on long term, from 2 to 7 years. EIP does not invest for periods longer than 10 years, so that investments that are likely to lead to stock exchange listing are preferred, next to companies with development and recapitalisation possibilities.

Through its international network, the Fund may help investor companies identify possible strategic investors, joint venture partners, and access international distribution channels. Its shareholder network includes such renowned institutions as The European Bank for Reconstruction and Development, CDC IXIS Private Equity (France's leading environmental venture capitalist), VMH from Belgium (an international leader in waste processing), First Analysis Corporation (America's leading environmental venture capitalist) and the Swiss government.

The Fund provides growth capital to dynamic companies in the environmental industry (ranging from organic agriculture, environmental finance and eco-tourism, to renewable energy, recycling services, waste treatment and construction or operation of energy-efficient heating plants, landfills, and waste water treatment plants and companies committed to operating sustainable).

The Fund invests across all stages of development including start-up, expansion, pre-IPO’s and buyouts. The geographical scope of the Fund does not impose any limitations on the investor companies, which may operate beyond the territory of Eastern and Central Europe. EIP does not take an active role in the day-to-day management but it intends to assist management through its representatives on the Supervisory Board, in developing strategy and growth plans of the company.

Institute, €1 mln) and Natexis Private Equity (€3 mln). It aims at providing seed capital for high technology projects related to environment and/or energy. It targets investments in the €0.5-5 million range and has a duration of 10 years. ADEME might get involved in later fund raising rounds of the FCPR 3E, in addition to FIDEME.

Since the lack of private equity at various stages of firm growth is a common feature of almost all European countries the creation of such an investment fund at the European level and its support by a European institution, most likely the European Investment Fund (EIF), could offer great benefits. EIF already participates in a European guarantee fund, the Growth and Environment scheme, since 1996 (see section 4.2 for more detailed information). Many investment funds – not directed at environmental investments – already proceed at the European level and benefit from higher leverage effect, economies of scale and learning processes.

CDC IXIS, the managing company of FIDEME, is also participating in the **EIP**[8] (Environmental Investment Partners, Box 7), which is a venture capital fund investing in companies that profit from selling environmental goods and services in Central and Eastern Europe. EIP invest at between € 0,5 and 3,5 million per company. The Fund is always a minority shareholder, usually in the range of 20-45% and the investment is usually made on long term, from 2 to 7 years. EIP does not invest for periods longer than 10 years, so that investments that are likely to lead to stock exchange listing are preferred, next to companies with development and recapitalisation possibilities. EIP does not take an active role in the day-to-day management but it intends to assist management through its representatives on the Supervisory Board, in developing strategy and growth plans of the company.
At the moment only five participations have been realised in four countries. There seems to be more potential for extending this kind of intervention.

4.2 Guarantee funds

In general, these funds guarantee loans either directly (e.g. when companies are pre-financing contracts with foreign parties) or indirectly to companies. In this case the fund guarantees the banks that grants certain kind of credits to SMEs.
Guarantee funds have a high leverage for the government. Since the government only has to pay when a loan is not reimbursed it allows for intervention in a much greater number of projects then is possible with traditional subsidies (with the same amount of funds). It also allows banks to get involved in projects that they could not finance before, because of the high risks and long return on investments.

FOGIME[9] (Fonds de Garantie des Investissements de Maîtrise de l'Energie; Energy Management Investment Guarantee Fund , Box 8) is a French public/private loan risk coverage mechanism. The fund was not a large success from the start, although it offered high guarantee cover, up to 70% of the loan that has been contracted, while SME loans are usually guaranteed at a rate of 40% of the amount. There are two reasons for this. During the first two years of implementation the SME had to pay a prime (0.85% of the amount of the loan) on the interest rate for its loan to benefit from a FOGIME guarantee. This prime proved to be too high for the SME target

BOX 8: FOGIME

FOGIME (Fonds de Garantie des Investissements de Maîtrise de l'Energie; Energy Management Investment Guarantee Fund) is a loan risk coverage mechanism created in November 2000 as an initiative from the BDPME (French development bank for SMEs) and the ADEME (French Agency for Environment and Energy Management).
It is part of a larger fund, the SOFARIS fund (National Guarantee Fund for the development of SMEs) that guarantees loans contracted by SMEs. Within this national fund, FOGIME is dedicated specifically to SMEs investments in the field of rational use of energy and energy sustainability. The guarantee fund has a budget of approximately Euros 17.8 million (€ 8.4 mln, ADEME, € 9.4 mln. BDPME). While SME loans are usually guaranteed at a rate of 40% of the amount, FOGIME offers high guarantee cover, up to 70% of the loan that has been contracted. About 50 projects have been funded with the help of the scheme so far.

Practically, FOGIME does not finance nor guarantee directly SMEs. The fund guarantees the banks that grant certain kind of credits to SMEs. To be eligible for FOGIME guarantee, conditions apply to both the company: It must be an SME, not active in banking, agriculture or real estate and the amount of the loan must not exceed Euros 750,000.

The scheme for the granting of guaranteed loan is the following: i) the SME asks for a medium to long term credit to its bank in order to finance an energy management related investment; ii) the bank asks the BDPME to provide guarantee for the loan; iii) the BDPME consults the ADEME for technical and energy approval of the investment (so far, the ADEME approval does not include any environmental criteria); iv) if the BDPME accepts to guarantee the loan, the bank grants the loan.

The type of investments that FOGIME aims at encouraging are mainly efficient equipments for the production, use, recuperation and storage of energy; investment related to modification of industrial equipments and processes that could result in energy saving; renewable energy investments. Investments in the production of equipments that aims at allowing energy saving in other companies are also eligible for the FOGIME guarantee fund.

The main strengths of FOGIME lie upon the association of both public and private funds. Firstly, since it associates both public and private funds to guarantee SMEs' loans, this mechanism permits to benefit from a high leverage effect. It allows ADEME, with a same amount of funds, to intervene in a much greater number of projects that is possible with traditional subsidies. It allows banks to get involved in projects that they could not finance before because of the high risks and long return on investments.
Secondly, it associates public and private competencies. Both BDPME and ADEME have a comprehensive network of agencies localized in French regions. The relationships between ADEME and BDPME regarding for instance the technical eligibility of the investment occur at the level of their relevant regional agencies. It is widely acknowledged that the geographic and institutional proximity is essential for addressing and solving of environmental problems and, hence, for encouraging environmental innovation. This is all the more important since most SMEs operate preferably at the local level.
Thirdly, the participation of ADEME also allows synergies with its other types of investment support instrument, especially the "pre-investment subsidies in environmental technologies" mechanism. Most often, the FOGIME guarantee follows the awarding of a pre-investment subsidy. The latter paves the way toward the intervention of FOGIME since the technical feasibility and energy statement report have already been carried-out. Also, in this case, the relational link between ADEME and the SME is stronger, which reduces the risk of failure of the investment.

group. Since this prime has been reduced to 0.60% and even 0.45% under certain conditions the number of projects managed by FOGIME has significantly increased. Moreover, banks were sometimes reluctant to apply for FOGIME guarantee because of the complexity of the process, especially the ADEME approval process when the investment was not a follow-up of a previous pre-investment subsidy. In that case, the time necessary for an ADEME approval was hardly compatible with the regular temporality of banks loan granting process. Methods of simplification are currently being discussed, for instance the possibility of relying upon energy efficiency norms for approval instead of specific ADEME investigations.

At European level a similar financial instrument is already present since 1996, namely the Growth and Environment scheme. The European Investment Fund (EIF) runs this programme and aims at easing the financing of environmentally friendly investments. To be granted an EIF-guaranteed loan, the company must be have 100 employees (instead of 250 employees in FOGIME), the loan must have a maturity between 3 and 10 years (instead of 2 to 15 years in FOGIME) and have a value of up to €1 mln (instead of €0,75 mln in FOGIME). So far, the Growth and Environment Scheme has guaranteed over 4,000 loans for a total value of €1.4 billion, granted by 34 financial institutions in the 15 old Member States.

Until now the Growth and Environment scheme has not guaranteed any investments in Central and Eastern European countries. Given their relatively low development of financial markets, they are still very dependent on traditional bank loans that are often poorly suited to energy and environment investment projects. The extension of green investments guarantee funds in these countries is therefore a priority for a greater and more rapid diffusion of "environmentally benign technologies". This is most needed in those countries that now have to cope with the environmental catch-up challenge.

4.3 Energy contracting

Another public-private cooperation is the example of Energy Contracting. This instrument is used in Germany and Austria. Energy Contracting is a financial instrument designed to enhance investments in energy saving technologies. The basic configuration resembles an outsourcing contract between the contractor and the organisation in which the investment is realised. The interesting feature is that the investment is financed by envisaged energy savings. The contractor pre-finances the investment and bears the technical risk (Box 9). Two types of investment can be distinguished: investments in new energy facilities and investments in broad energy saving measures.

Energy contracting looks like a fairly straightforward financial tool, which should be easily picked up by the market. At first sight the rational for public intervention is meagre. However, practice shows that there is a persistent underinvestment[10] in energy saving technologies. Against this background energy policy in some European countries put the development of an energy contracting market on the agenda. So far Germany and Austria seem to be those countries where energy contracting eventually gained some momentum and developed into a fairly differentiated market.

BOX 9: Energy contracting

The basic configuration of an energy contract resembles an outsourcing contract between the contractor and the organization in which the investment is realized. The interesting feature is, that the investment is financed by envisaged energy savings. The contractor pre-finances the investment and bears the technical risk.

There are two types of energy contracting: Energy contracting for investments in new energy facilities on the one hand and energy contracting for energy saving measures in general. The first variation deals with a discrete investment. Here energy contracting focuses on the saved energy that can be linked the investment. Usually the contractor guarantees a certain amount of saving returns on which the financial arrangement can be based upon. Returns on energy savings above this level can be shared between contractor and the customer organization. From the perspective of the customer the energy contract bears some important benefits: First, the contractor brings in know-how for selection, assessment and implementation of technological solution. Second, the technological risk can be outsourced. Third, the investment does not burden the own budget. In sum, the contracting model sets appropriate incentives for taking investment decisions from which both sides can benefit. The second segment of the energy contract market is more complex. Whereas in the first variation the object of the contract is a discrete investment, contracting of energy saving can combine a whole basket of facilities and different measures. Often structural measures (isolation) as well as new arrangements in the facility management are combined with investments in new energy technology. The customer-contractor relation resembles more of an outsourced facility manager relation than of one we would find in leasing market. The duration of the contract can vary. Practitioners indicate a range between 5 and 15 years.

The role of the state has been one of the market initiator and market developer. Among the measure that seem to have played an important role are:

- Awareness and Promotion. Both on the federal as well as the regional level a range of activities were set to promote energy contracting. Even though the concept itself looks fairly simple and easy to implement, the practice is quite more complex. Contract design is crucial and difficult to standardize.
- Pilot projects have been essential to illustrate the potential of the instrument and reduce fears. As reported by our interviewees the promotion activities only helped to get the market started after the first range of pilots were successfully accomplished. The mentioned intermediaries played an important role not only to promote the instrument but also to actively setting up the first pilots and breaking the ice.
- Trust building. First experiences showed that not all contractors in the market have the necessary competence to successfully implement energy contracts. In a young market negative example can have negative impacts on the whole market. Against this background a list of quality-checked contractors has been published by intermediary organizations like EVA and ESV. This helped potential customers to select trustworthy contractors.
- Training. Particularly for public bodies willing to contract out energy saving investments training was important. Training covered not only contract design but also the design of specific tenders.
- Financial support. Opinions about whether extra financial support is necessary or not still diverge. At least in Upper Austria the local government has launched an energy contracting program that foresees financial support (around 10% of project costs) of contracting projects. It can be questioned whether the financial support is the trigger. What seems important that the financial support creates specific requirements for the project/contract and thus function as an indirect quality control from the side of the funding organisation.

The energy contracting program is run by ESV (Energiesparverband), which is the central agency running also a broad initiative where energy consulting is offered. In this context energy contracting can be seen as a follow-up instrument helping firms, households and communities to eventually realise identified saving potentials.

As for the market size little quantitative information is available yet. Some qualitative information on the market segmentation was brought forward in the interviews conducted in the course of this research. Interestingly in the Austrian energy contract market is that the share of energy saving seems much higher than in Germany. The reason for this is not entirely clear, but public support for the promotion of energy contracting and the role a group of intermediaries have played as market developer seem to be important success factors in Austria.

Another reason for the relative big share of the energy saving segment in Austria might be that in the first phase of market development local communities and public organisations (e.g. hospitals) were the predominant target groups. It is likely that those groups tend more towards the energy saving contracts than the private enterprise sector. The fact that energy contracting in Austria was actively brought into the realm of public entities shows another interesting aspect of the instrument: It can be used as a mean to mobilise public procurement for sustainable technologies. For the further development of the market experts see substantial potential for growth in the private industry sector.

Overall energy contracting seems to be a promising instrument for enhancing the diffusion of energy technologies. The success of the model is that it brings together different perspective of both parties and creates the right incentives to pursue common goals. It reduces the risk of investment and mobilises additional financial resources. The Austrian example shows furthermore, that energy contracting can also be used as a mean to indirectly use public procurement as an additional demand for green technology.

Transferability to a EU level seems difficult since the role of the government is indirect and close proximity and trust seems key factors in the success. The instrument can probably be well transferred to other countries, especially those where a well-developed structure of intermediaries (in the energy field or in the innovation field) exists and can play a central role. The role of the EU can be to support the exchange of experiences across countries and to enhance the awareness for the potential of the instrument.

BOX 10: Green Accounts Act

The Green Accounts Act was introduced in Denmark because of increasing public concern regarding environmental issues in the 1980s and 1990s. The objective of green accounts is to enhance the publics' access to information about the environmental performance of polluting companies and to motivate reporting companies to improve their environmental and resource efficiency. Approximately 1000 Danish companies are obliged to publish green accounts. These companies are already regulated under the Environmental Protection Act as particularly heavy polluters. Around 150 -200 companies have decided voluntary to publish green accounts. The green account statutory order give some freedom for the companies on how to present their environmental profile in order to suit the different communication needs of the companies.

Green accounts include three mandatory topics, an introduction of the company, a statement by the management, and the actual environmental data. The focus of green accounts is on the environmental report and gives companies an opportunity to communicate their environmental performance to their stakeholders, neighbours, etc. Future plans and goals, as required for EMS, should also be described if the companies have such, but it is not a requirement. The green account reports are often more detailed (in terms of emission data, etc) than EAMS environmental reports. Some companies use the EMAS environmental report as their green account (a possibility which is given in the statutory order). An advantage of EMAS is that it is recognized in the EU, while green accounts are only recognized in Denmark.

The green accounts act (and statutory order) is evaluated in 1999. Amongst other things, the evaluation showed that 41% of the companies believed they had achieved environmental improvements. Some companies used environmental information collected for the green accounts in implementing cleaner technologies, others to choose between differences in resource saving equipment and alternatives. It seems that greater competitive advantages had been achieved in markets where environmental demands were becoming more dominant. About half the companies preparing green accounts report have gained economic benefits from their work with the accounts. Most companies taking part in the evaluation could not give actual figures, but approximately 25% who had experienced economic benefits saved approx. €10.000 and a fourth saved more than approx. € 35,000 a year. Hence the evaluation indicates that both economic end environmental benefits can be achieved through green accounts.

However, the evaluation also showed that the primary target group for green accounts – the general public – distrusted the quality of information and used the accounts on a very small scale. This is caused by the facts that companies did not write the accounts specific for the public. The information in the accounts was still too complex and detailed and didn't interest the public and neighbours of companies. On the other hand, local authorities and other professional users (e.g. insurance companies and investors) are very interested in the green accounts.

Based on the evaluation the green account act and the statutory order was modified. The administrative framework was changed which gave the local authorities a more important role to play. Now the local authorities have to give a statement on the (certain parts of the) green accounts of the companies. Actually, this statement indicates whether the account are in line with knowledge the local authority has about the company through its permitting and controlling work. As a result of this a dialogue occurs between the authorities and the companies, which both parties considered as good and useful.

5 Regulation

Environmental regulation traditionally was seen as bad for business, something that impairs companies' competitiveness. The consensus on this was challenged by business professor Michael Porter (1991) saying that: *The conflict between environmental protection and economic competitiveness is a false dichotomy. It stems from a narrow view of the sources of prosperity and a static view of competition. Strict environmental regulations do not inevitably hinder competitiveness advantage against foreign rivals; indeed they often enhance it*. Porter does not say that regulations are per se good for business; only certain types of regulation will spark innovative responses[11] (and since money spent on environmental innovation cannot be spent on other innovation the total effect is unclear).

Thus when regulation hinders innovation it has a negative impact on competitiveness. Therefore regulation should explicitly used to stimulate innovation. The way Zero Emission Vehicles were stimulated in California is a well-known example (although not completely successful in meeting long term objectives)[12]. Another, less spectacular (from innovation point of view), but effective (from environmental point of view) measure is the EURO norms for the emission of trucks (see appendix A).

Both examples have in common that they state a long term, (more or less) ambitious goal without describing in detail to the industry how to reach this goal. Regulation with detailed prescription of the type of solution/technology that has to be implemented has a counter-productive effect on innovation. Regulations describing performance criteria have a more positive impact on innovation, especially when the criteria are made stricter from every year. Long term goals offer also better possibilities for innovation then short term goals: innovations tends to take time, but large steps can be taken.

Specific government programmes to make environmental legislation innovation oriented (or some kind of innovation check on environmental legislation) were not found in this study.

It is recommended to take innovation into account with environmental regulation in all European countries and at EU level. In our opinion the largest (and probably cheapest) possibilities to make environmental policy contribute to the Lisbon goals in the area of competitiveness are in making environmental regulation more innovation oriented.

An interesting example of how regulation can be used to create awareness, and from there improve environmental performance, innovation and improved economic performance, is the **Green Account Act**[13] in Denmark (Box 10). The Green Accounts Act had two objectives. The first objective is to enhance the publics' access to information about the environmental performance of polluting companies in order to promote dialogue around environmental issues. The second objective is to motivate reporting companies to look at their processes and products and improve

their environmental and resource efficiency. Approximately 1000 larger polluters are obliged to publish green accounts, around 150 -200 companies have decided voluntary to publish green accounts.

In general both the government (local and federal) and the companies recognise the advantages of green accounts for the environment and economy. An evaluation showed that more then 40% of the companies that published a green account actually made environmental improvements and gained economic benefits. For many companies, this will primarily be the very sensible philosophy that, "if we consume less resources or utilise these more effectively then we will minimise costs and increase profits". To what extent green accounts really changed the innovative behaviour of companies or whether environmental improvements or investments in cleaner technologies would have made anyway is difficult to determine.

The concept of green accounts might be used at European level. Every country already has to report emissions of major companies to the European Commission and many companies have already some form of EMS running. It shouldn’t be too difficult to integrate green accounts. The role of the local authorities (the question of giving a statement or other way of external audit) can be different (depending on national regulation), but this has to be reviewed per country. Whether very small companies (e.g. less than 20 employees) should publish green accounts (because the administrative burden) is an issue as well. Best practise examples among countries should be used to diffuse knowledge about how to report green accounts.

BOX 11: Benchmarking in Flanders

As all EU countries Belgium has to reduce its emission of greenhouses gases (Kyoto Protocol). Energy efficiency is regarded as the main approach to meet this target. Already in 1999, the Flemish Government took the view not to impose absolute caps to the energy intensive industry, as this would obstruct their expansion possibilities. Neither was chosen for equal reductions per enterprise in terms of percentage, because this would harm industries that have taken early actions and favour industries that are still spilling; also shrinkers would be favoured and growers would be harmed. The choice was to work with objective standards, and for this purpose the Benchmarking method was preferred.

Within the benchmarking method industries voluntarily commit themselves to belong to the world top with regards to energy efficiency (top 10%) by 2012. As a compensation government guarantees not to impose other measures concerning energy efficiency or CO_2. This particularly applies to levies and emission ceilings on CO_2.
The Benchmarking covenant in Flanders was drawn up for large energy intensive industries from all industrial sectors. Currently, approximately 180 companies signed the covenant, which is more then originally expected. The covenant is valid until 2012.

As steering group of the covenant a "Commission Benchmarking" is formed, consisting of representatives from the ministries and the industrial sectors. This Commission takes care of the general coordination, finds solutions for bottlenecks in the execution (for instance particular situations which may arise by assessing the best standard), controls the progress and publishes reports on the results of the covenant.

After signing companies first have to make a benchmarking study, a study performed by experienced consultants in which their energy consumption is benchmarked with the energy consumption of comparable sites elsewhere. This is rather difficult since not one process is the same and data availability is limited: Foreign companies are not always willing to co-operate and there exist no international best practise database for energy efficiency.
The benchmark studies determine whether a Flemish company belongs to the best 10% or not. Based on this study the participant draws up an Energy Plan, which contains all measures necessary to realize and maintain the best international standard in 2012. The terms to realize these measures are defined by the covenant, based on the economic efficiency. From that moment on, the industry will annually draw up a monitoring and progress report.

The calculations and the execution, being highly important parts of the covenant, should be accurately followed up. For this purpose an independent authority is funded: the Verification Office. This verification office must approve the benchmarking consultants and the used methodology prior to the start of the study. It also checks and verifies the submitted Energy Plan, the execution of the measures as well as the monitoring and reporting. It draws up advices and reports in behalf of the Commission Benchmarking.

Exact figures on benchmarking results are not available yet. Companies are still working on their Energy Plan and the impact on environment and innovation is difficult to determine. In general, it seems that companies become more and more positive about the Benchmark covenant. Many companies have reported good progress in understanding their technical processes and impact on energy emissions. They begin to understand that benchmarking can offer possibilities for optimization, energy saving, and consequently major cost reductions (energy is the major cost for the energy-intensive industry). However, there are also companies, which use the benchmarking covenant inappropriate and do not (yet) see the advantages of it.

6 Negotiated Agreements

A special form of regulation is the use of voluntary agreements or negotiated agreements. In this type of regulation government on the one side and companies (most often at sector level) on the other side, make a contract with each other in which they set targets, time schemes, actions and obligations for the future in order to improve the environment. It offers more flexibility than legislation and can therefore be more tailor-made.

With regard to this study the Portuguese voluntary scheme with the pulp and paper industry is remarkable. The pulp and paper industry was the first to be offered a voluntary scheme in Portugal. It is strongly linked to pre-existing regulation. The scheme intervened in a particular regulatory context. In fact, due to its membership in the EU and the EU's legislative power with respect to environmental matters at that level, Portugal has adopted fairly advanced environmental regulation. Many Portuguese companies have been unable to follow the pace of tightening of environmental regulation and went out of compliance. The Portuguese voluntary scheme is an attempt of the government to close that gap, without leading to plant closures. Via a precise timetable for progress in environmental performances, it gives signatories a delay for total compliance with existing regulation. In addition to that, financial assistance is available. Companies that did not sign the voluntary scheme do not benefit from these advantages and instead are fined if non-compliance with standards is detected. The scheme was not a clear-cut success, as compliance with the regulatory standards had to be forced upon firms via fines and court cases. However, only one out of the 8 mills covered by the scheme had to close down.

Another interesting example is **Benchmarking**[14] Negotiated Agreement for CO_2-emission reduction, which is used in Belgium/Flanders (Box 11) and the Netherlands. Benchmark is chosen as a method because it favours innovating industries that already have taken action, still offers opportunities for expansion (as opposed to absolute caps on energy use), and is rather objective.

Benchmarking has synergy with the EU IPPC directive, which obliges European Member States to integrate energy efficiency requirements in their environmental permits. However, the BAT studies (Best Available Technologies) do not give useful references on energy efficiency. The existing references are unreliable. Therefore one of the objectives of benchmarking is that such specific references are going to be defined.

Nowadays, benchmarking, as a method to stimulate industry is to save energy and reduce the emission of CO_2, is only used in the Netherlands and Flanders. Flanders started later and has, based on the Dutch experience, been able to create a larger stimulus on extra investments in energy efficiency[15] by applying stricter benchmarking methods.

In Flanders more companies are involved then originally expected. Believed is that companies are actual investing more in cleaner energy technologies due to the covenant. To what extent the benchmarking covenant contributes to the CO_2 emission reduction target is unclear yet.

At this stage both government and companies in Flanders are satisfied with the results so far and the expectations are high. Many companies have participated in the covenant and use very good benchmarking methods, which almost automatically will result in environmental benefits. The effect on innovation is mainly the application and diffusion of state of the art energy efficient technologies.

Benchmarking can be used at EU-level, but the introduction in the EU must be left to the individual countries. To what extent different countries will actual use it depends on their specific CO_2 targets (strict CO_2 targets as in Belgium and the Netherlands put pressure on energy saving) and their culture (for instance Germany has a lot of experience with industrial efficiency). Flanders hopes that other EU countries will recognize the advantages of benchmarking and see it as an effective tool to reach the CO_2 reduction targets. Benchmarking becomes much more efficient when it is used at a larger scale across the EU.

7 Direct government intervention

Two areas that fall under the direct responsibility of the government and have a potential effect on innovation and environment are public purchasing and taxation. Applying green criteria for public purchasing offers a huge, albeit unknown, environmental relief potential and has an indirect effect on innovation. Taxation (including the use of levies) is traditionally an import government instrument and gives consumers strong economic incentives to change their (pollutive) behaviour. The effect, however, on innovation is questionable.

7.1 Green public procurement

Most of the **green public procurement**[16] activities started in the beginning of the 1990s. Green procurement is an important instrument for sustainable development and provides a stimulus for new and innovative environmental friendly products and services. It is often coincided with the introduction of an eco-label system. In many countries green-purchasing institutions are created, like the Austrian Procurement Service (1997) and the Danish National Procurement Ltd. (1994) that offers a commercial purchasing service to governmental and municipal institutions taking environmental issues into consideration.

During the 1990s, green-purchasing issues found their way into numerous national and regional policies, programmes and legal instruments. Two approaches can be distinguished in general. The first is to integrate an obligation for green purchasing into national law (purchasing law or environmental law). Although tried in Germany and Austria, there is no case where this approach is reported to have been successful. This might be due to the lack of sanctions, but it is even more important to state that enforcement of such a requirement is virtually impossible.

The second approach was taken by Denmark. It consists in obliging public authorities to set up a green purchasing policy. Denmark adopted its “Action Plan for Sustainable Public Procurement Policy” in 1994. This action plan requires public authorities to contribute to environmental objectives via their purchasing activities and draw up a green procurement policy before 1996. However, by 1996, it became obvious that the so far achieved effects had been quite modest, and a number of new activities were initiated. The most important initiative was the development of guidelines for environmental purchasing. In 1998, 90% of the State institutions and governmental companies had set up such a policy and adopted an action plan.

As in most countries no accounting system for green purchasing is available, so there is little quantified information on the actual impact of green procurement on the environment and market. In general, green procurement has not been implemented to the extent originally expected, but activities are increasing and there are great expectations for the future. The integration of environmental demands in public procurement will remain on the European policy agenda. Activities include capacity building, and the development of information tools and favourable framework conditions.

BOX 12: Examples of green taxes across Europe[18]

Tax on	Applied in	Evidence on effectiveness
Motor fuels	All European countries	Some impact reported on vehicle fuel consumption (e.g. in case of UK Fuel Duty Escalator). Main short-term impact is substitution in response to tax differentiation (e.g. lower rates for unleaded petrol and low-sulphur fuels, e.g. in Denmark)
Other energy use (including carbon and sulphur taxes)	Many European countries	Clear energy-efficiency improvements and fuel substitution observed in countries with highest tax rates (e.g. Denmark, Finland, Sweden) Rate differentiation (e.g. by sulphur content) leads to rapid substitution processes
Motor vehicle registration or sale	most European countries	Some evidence of downward impact on car ownership; main impact when differentiated by environmental classification (emissions and energy use) and in cases where revenues are used to finance car scrapping (premiums)
Motor vehicle ownership/use (annual taxes, incl. Eurovignette)	most European countries	Main impact when differentiated by environmental classification (emissions and/or energy use)
Motor vehicle use (road pricing, tolls etc.)	Several European countries	Usually applied as a cost-covering charge; evidence on effectiveness as an environmental policy instrument is still lacking
Industrial emissions to air and water	Several European countries	Clear incentive effect in a limited number of cases (e.g. Swedish NO_x charge; Dutch, French, German water pollution taxes); elsewhere main effectiveness through recycling of revenues to environmental investments (e.g. France, several accession countries)
Agricultural inputs (fertilisers, pesticides, etc)	BE, DK, NO, SE AT, FI (abolished)	Limited direct impact (as a price incentive) on use; 'soft signals' (awareness raising) possibly more important (e.g. when revenues used for financing training programme e.g. Sweden)
'One-way' packaging and other disposables	BE, DK, EE, FI, HU, LV, NO, PL DE (local level; abolished)	Local taxes in Germany reported to be effective, but withdrawn for legal reasons; positive impact on re-introduction of deposit-refund systems observed in Estonia
Chemical substances (e.g. solvents, CFCs)	BE, CH, CZ, DK, HU, IS, SK	Contribution to reduction in CFC use reported in Denmark
Batteries and accumulators	BE, DK, HU, LV, SE	Mainly instrumental in stimulating collection of spent batteries
Car tyres	DK, HU, LV	Revenues used for financing treatment of spent tyres
Water abstraction	Several European countries	Decrease in industrial groundwater use observed the Netherlands after introduction of tax
Waste (apart from cost-covering charges)	DK, EE, FI, IT, NL, NO, SE, GB	Effective in several cases (e.g. Danish waste tax) on recycling, waste reduction, and shift from landfilling to incineration, reuse and recycling.

Lack of information is the main barrier to green purchasing. Better possibilities for documentation on products and suppliers are considered as an essential tool for further implementation, especially in Denmark and Sweden. One of the main current activities in Sweden is the development of an Internet-based tool for green purchasing. In Denmark, there are activities going on as to integrating environmental issues into e-trade. Environmental purchasing guidelines are being updated and additional guidelines are being developed.

Increasing attention is paid to the European policy and legal framework. In Sweden, the prevailing uncertainties about the legislative possibilities in the EU for the integration of environmental demands in tendering is seen as one of the main barriers to green purchasing. The need for a clear framework is stressed on all levels, ranging from purchasers at the local level to the Secretary of State for the Environment. Sweden also considers it especially important to increase the possibilities for green procurement in the European public procurement directives. Denmark and Sweden are the ones to drive on the development of a EU integrated product policy. Their governments are especially concerned about the potential conflict between freedom of trade and environmental considerations, and are pondering on how to combine the integrated product policy with EU regulations.

The EU is expected to publish a handbook on Green Procurement in May 2004. This might be a good starting point for a EU wide Green Procurement policy.

7.2 Green taxation

Green taxes[17] (as part of a green tax or budget reform) are an economically efficient instrument for reducing consumption, pollution and other environmentally harmful activities to an acceptable level. It gives producers and consumers strong incentives to change their production and behaviour. Such green taxes will create revenue that can be used to lower income taxes or to finance environmental friendly projects. Furthermore, green taxes will make investments in innovative green technology attractive, and will make current polluting products much less attractive.

Green taxes can in theory be implemented at the EU level, but this requires unanimous agreements, which have proved very difficult to achieve. On the other hand the EU treaty gives the possibility for each member state to introduce its own green taxes, also in areas where norms and standards are harmonised. For example, Denmark has implemented the PVC tax, which also covers packaging, even though, according to EU laws of free movement of goods and non-discrimination, Denmark is not allowed to ban PVC-packages from other EU countries. Using the same strategy Denmark is allowed to implement green taxes on vehicles without particle filters even though making particle filters obligatory would be against EU legislation.

Most European countries have introduced taxes on environmentally harmful products and activities (Box 12). By 2001 8 EU member states apply carbon taxes and 9 apply taxes on waste disposal. The number of product tax schemes is also increasing on products like batteries, packaging, and car tyres, but as much as 95 % of the

environmental tax revenue in Europe comes from the energy and transport sector. Less then 5 % comes from taxes on other items.

Evaluation of environmental taxes (in Denmark, Finland, Sweden, Netherlands) shows that these taxes have a positive influence on the environment (see for example successful cases as water pollution, Swedish NO_x charges, and tax differentiation on leaded and unleaded petrol). To what extent these taxes provide an incentive to save resources and invest in innovative green technologies (e.g. energy efficient technologies) is questionable and often very limited. In order to provide a real incentive the tax rates are often to low because of political reasons (competitive position of industry, etc). Hence environmental taxes have a more short-term impact on substitution between energy types, as tax rates are often differentiated according to the sulphur of carbon content.

BOX 13: Environment-driven business development

The main objective of the programme Environment-driven business development is to integrate environmental issues into the core business strategy of small and medium-sized enterprises (SMEs) in order to strengthen the competitiveness of SMEs and reduce the negative environmental impacts. The programme is managed by the Swedish Business Development Agency (Nutek) and has a budget of € 3 million. Nutek has a lot of experience in stimulating companies (especially SMEs) to work more systematically with the environment.

When the call for proposals was launched 150 applications were received. After selection 60 applicants were given the opportunity (with a small grant of 80.000 SEK from Nutek) to develop project plan further and find companies that are really interested in the project and want to contribute to it financially. This resulted in 34 projects.

The applicants are typically regional development agencies, municipalities, consultants, universities and industrial research organisations. They manage the project. The actual projects are conducted in networks with active participation by 350 SMEs. On average there are 10 companies per project. Tools, methods and products coming out of these projects will be documented and disseminated widely. Nutek contributes 30% of the total project costs, the remaining is paid by companies own time and finances, county administration boards, trade organisations, European Union funding or other means.

19 projects focus on ”Environmentally sound products as a competitive device” where the global demand for more sustainable products is addressed at a local level to find innovative solutions. In some of these projects design for the environment is linked to business strategy and tools for design for the environment (DfE) are applied, tested or developed. A lot of companies work actively with supply-chain co-operation and some focus on environmental market communication, for example Environmental Product Declarations.
Another 15 projects work with ”Operational development focusing on continuous improvements”. The demand stems partly from the general challenge to create staff participation in order to achieve continuous improvements and more specifically from a lot of companies loosing momentum for continuous improvement within the boundaries of their environmental management systems. Participating SMEs are aiming to integrate ecological and social sustainability aspects into core business development. Some projects are primarily focusing on employee participation and leadership commitment to improve business and environmental performance. A couple of projects are using environmental performance indicators to bring about continuous improvements in a specific region or business sector. A handful projects are looking into the area of responsible entrepreneurship, i.e. ways for SMEs to respond to and work with Corporate Social Responsibility.

Since the programme is still going on there are no end-results yet. However, some projects are already finished and Nutek has contacted the involved companies in these projects (40 companies) and asked them some questions regarding the effect of the programme on competitiveness and environmental benefits This evaluation shows that:

- 79% of the companies believe the programme has a positive impact on their business.
- 22% of the companies state that the programme has increased their competitiveness
- 36% of the companies believe they can prove a reduced environmental impact of their products or operations due to changes done in the project.

In general, 90% of the companies say that the programme has worked well. Despite the small sample size, these preliminary results show an impact of the programme on competitiveness of companies and environmental impacts.

8 Other instruments

There are many other instruments in use for the stimulation of innovation and/or sustainability. Prizes and other competitions reward outstanding performance and generate (free) publicity to create awareness for innovation and sustainability. Foresight exercises help to inform decision makers and can create inspiring and accepted views on the future that may lead to coherent new policies. Technology platforms may lead to exchange of knowledge, combined vision and strong networks that form a sound base for innovation.
Important instruments that are used and can play an even lager role in a policy mix to increase competitiveness and sustainability. This study however was (due to limited available time and budget) asked to focus on financial/economic instruments to promote innovation.

One example of a programme that is not completely financial is given in this chapter. It concerns the programme Swedish **Environment-driven business development**[19] (Box 13) that started in 2001 and will end by 2005. The main objective of the programme is to integrate environmental issues into the core business strategy of small and medium-sized enterprises (SMEs). Subsidy is given to intermediaries to help companies strengthen the competitiveness of SMEs and reduce the negative environmental impacts. Based on preliminary results and comparison of these results with evaluations of earlier programmes with a similar scope, indicates that the environmental-driven business development programme has a positive effect on competitiveness, reduced environmental impacts, and environment oriented innovations.

To what extent the programme can be used at EU-level depends for a large part on the environmental orientation of companies in the different EU member states. In Sweden it is considered an important success factor that companies involved in the programme already work systematically with environmental issues before they participate.

9 Case study: Wind energy

In this chapter the introduction and development of wind energy in four European countries is described. It is not our the intention to give a complete overview of all the aspects regarding the development of wind energy in these counties[20], but to give an insight in policy instruments, and underlying strategies, the government can use in order to stimulate the development, market introduction, and diffusion of a sustainable innovation, like wind energy. In the next sections wind energy in the Netherlands, Denmark, Germany, and Spain is described from a policy perspective. This chapter ends with an overall conclusion and lessons learned.

9.1 Netherlands

Since the beginning of the seventies several research programmes for the development of wind energy in the Netherlands were launched by the Ministry of Economic Affairs, e.g. the National Research Programmes on Wind Energy (1976 and 1981) and the Integral Programme on Wind Energy (1986). The emphasis of these programmes was on research and the goal was to support R&D of wind energy and (large) turbines. In the latter programme, besides R&D subsidies, also economic stimulation measures for turbine buyers were introduced in the form of investment subsidies. This increased domestic demand for wind turbines, but payback times were still long because of the low buy-back tariffs paid by electricity companies to wind turbine owners.

In 1992 a more practical oriented programme for the application of wind energy in the Netherlands was launched (TWIN 1) and followed by TWIN 2 in 1996. However, the main focus was still on research and development of large, cost efficient turbines. Since 1996 all electricity in the Netherlands is charged with an ecotax (average of 6 €cent/kWh). Wind energy (and all other renewable energy source) is exempt from the ecotax. Moreover a production subsidy is given on electricity produced from wind energy. This stimulated demand, but domestic renewable electricity production was not sufficient to cover the ongoing growth of demand for sustainable energy. As a result a large proportion of this demand is met through imports, which was also eligible for the ecotax exemption and the production subsidy. This made the Dutch renewable electricity market a very attractive export market for foreign producers of renewable electricity, but did not stimulate the development of – for example - wind energy in the Netherlands. Since 2003 the regulation is changed to limited imported renewable energy[21].

Looking back it turns out that Dutch policy on wind energy was not very successful in achieving its goals; the installation of 1,000MW wind in 2000 (and 2000 MW in 2010) and building a strong international competitive position in wind turbine industry. Dutch wind energy policy has been dominated by (very) large R&D subsidies to research institutes and large turbine manufactures. Attention for (potential) buyers (e.g. electricity companies, but also private owners) and market introduction was very limited. For many years electricity companies were not really interested in wind energy and very sceptical about the potential of wind energy as

alternative for fossil fuels. The payback tariffs of electricity companies remained low (approx. 3.5 €cent/kWh) and were not supported by the government until 1996. Together with the high price of wind turbines it was not profitable to invest in wind energy. Demand increased a bit with the introduction of an investment subsidy on wind energy in 1986, but the home market remained relatively small in the Netherlands. Furthermore, the exemption of wind energy from the ecotax and a production subsidy did increase demand for renewable energy, but did not increase the installation of wind turbines in the Netherlands. Today, all Dutch turbine manufactures went bankrupt and - despite an increase of 25% in 2003 - the installed wind power capacity in the Netherlands is 912 MW[22, 23].

9.2 Denmark

Besides a large R&D programme (wind power programme 1977-1984) to stimulate R&D of large turbines and small support to the research institute Risø, Danish policy on wind energy was mainly focussed on the demand side. The government started already in 1979 with an investment subsidy of 30% for wind turbines to stimulate private owners to invest in wind energy. The home market was further extended when in 1984 the electricity companies reached an agreement with the government that obligated them to buy all the electricity that independent owners of renewable energy sources fed into the electricity grid at the rate of 85% of the consumer price. Together with a refund of the CO2 tax on electricity for wind energy and a production subsidy it was very profitable to invest in wind energy in Denmark. This policy positively influenced the domestic market for wind energy and the development of Danish wind technology (learning by doing, etc). The demand for wind energy was further increased by the 100 MW agreements between the government and the electricity companies in 1985 and 1990. This agreement forced the utilities to erect 100 MW of wind turbine generating capacity within the next five year. By the year 1991 the investment subsidies were phased down, because it was reasoned that the turbines would have become cost effective. After 2000 the very high payback tariffs for wind energy were decreased for an average of 8 €cent/kWh in the period 1984-2000 to 4.4 €cent/kWh in the period 2000-2003[24].

To conclude, Danish wind energy policy was rather successful in achieving its goals. In 2003 Denmark has 3,110 MW[22] of wind turbines installed and it generates 20% of its power from wind energy. Danish wind turbine manufactures belong to the world top and dominate the market. According to BTM Consult[1] Danish firms supply about 44 percent of the world sales. This success has three main reasons. First of all, the development of wind energy was not steered by the government. Some R&D subsidies were given, but R&D was practical oriented and based on the needs of the wind manufactures. The Test and Research Centre at Risø provided “hands on” knowledge and technology to the wind turbine manufactures. Secondly, the Danish wind energy policy focussed especially on the demand for wind energy, which was already stimulated in 1979 by investment subsidies for buyers. This resulted in a strong Danish home-market and had a positive effect on technology development, because there was feedback from the users to the manufactures about technological problems (learning by doing). Besides the investment subsidies, which were terminated in 1991, electricity companies were obligated to buy electricity produced

from wind and the payback tariffs on wind energy were relatively high (due to a refund of CO2 tax and a production subsidy). Thirdly, from the beginning all actors were involved in the development of wind energy in Denmark, including the major potential buyers, the electricity companies who played a very active role. This resulted in a common vision on wind energy in Denmark.

9.3 Germany

With 14,609 MW[22] (2003) of wind power capacity installed Germany is by far the world biggest market. This is even more remarkable as wind energy production took-off only in the late 90ies. Besides various R&D programmes, the Electricity Feed-in Law (EFL, 1991) and the Green Energy Act (EEG, 2000) played a crucial role in setting the right framework condition to make investments in wind energy attractive. The law was accepted because there was political consensus that wind turbines should be supported and a successful lobby of the powerful green movement in Germany.

The law required utilities to accept electricity delivered to the grid by independent wind turbines and to pay 90 percent of the average consumer electricity price. Since the payment was based on a law and not a temporary programme, the income generated from wind turbines was both high and predictable, which greatly reduced the risks associated with investment. Farmers, private individuals and firms had a clear economic incentive to invest in wind turbines and, as a consequence, private capital was mobilised on a large scale.

Currently the fixed tariff for wind energy is around 8.8 €cent/kWh (ranging from 6.2 to 9.2 €cent/kWh depending on the location). Taking the current market price (around 3.5 Cent/kWh) the fixed tariff secures an indirect subsidy of 5.3 Cent/kWh. A further incentive for investment is given by granted tax advantages for individuals when they investment in renewable energy production. Overall the EEG helped to mobilise substantial financial resources and in the end the development of a dynamic market.

The last year however was the first year in which the installed capacity of wind energy decreased. This is taken as the sign of a maturing market. At least onshore the scope for further expansion seems limited, as suitable sites for new installations have become rare. Moreover recent discussions have shown that acceptance of wind energy is being challenged as increasing costs and environmental concerns (landscape, noise) have become more visible. Against this background a recent revision of the EEG has lifted the investment threshold by reducing the fixed tariff more quickly than previously (1,5% yearly). Furthermore up grading of existing wind power installations (repowering) has become another focus of the German wind energy policy.

Even though German seems already in a maturing market phase policy commitment for further expansion remains strong. In the context the development of wind energy installations offshore is seen as one of the most promising strategy. First pilot installations have been completed in the last year.

9.4 Spain

Like Germany the take-off of wind energy in Spain occurred later than in most other countries such as the Netherlands, Denmark or the USA, but Spain has rapidly caught up. Spain was ranked fourth in 1999, third in 2000, and now second in the world in terms of installed capacity (6,202 MW in 2003[22]). The success of an indigenous wind energy industry is also remarkable: in 2002, three Spanish companies -Gamesa Eólica, Made and Ecotècnia- were in the top ten largest wind power systems manufacturers.

As in most countries, the first instruments used to support the early development of wind energy were investments, R&D subsidies or tax credits, implemented at the central or regional level This has undoubtedly helped the development and demonstration of the first prototypes in the 1980s and beginning of the 1990s. However, it is in the late 1990s that rapid growth was initiated by regulations enforcing a preferential treatment to operators of wind farms in terms of high, guaranteed, electricity prices and a priority access to the grid (Special Regime Decree in 1994, Electricity Sector Law in 1997, Decree 2818 in 1998). More precisely, Spain operators could opt for a fixed price or the market price plus a premium. The first option was largely chosen given the relatively high price that was guaranteed. In 1999, this price was fixed at Euro 6,6 €cent per kWh, which represented a premium of Euro 3,2 €cent on the electricity price. The price has been reduced in 2000 to 6,3 €cent per kWh (a premium of 2,9 €cent).

The profitability of investments in wind energy was such than many actors entered the field, sometimes with no experience at all, motivated by speculation. They were largely financed through bank loans, which interest rates are of course much lower than the almost guaranteed profits. Another factor of success is the support provided by autonomous regions and local entities, for instance La Rioja (credit line for demonstration projects), Navarra and Andalusia (subventions for electricity generation).

However, the installed capacity has increased dramatically, the reduction of cost has not followed the same path. Innovation-led cost reduction is all the more important since the best -*i.e.* windier- locations have already be taken. As a consequence, either the energy efficiency is decreasing because they are now installed in less favourable locations or the costs are rising because the wind turbines will have to be installed offshore.

Measures that support innovation in wind energy technology are therefore also most needed beside preferential tariffs in order to realise the Spanish objective of achieving at least 12% of electricity demand from renewable energy by 2010. With a contribution of wind energy of 11.2% within these renewable energy sources, this target implies an "*extraordinary growth*" as it is claimed in the Plan for the Promotion of Renewable Energy in Spain. Although a very rapid growth actually took place since this plan was released in 1999 by IDAE, the determination of the relevant mix of "demand-pull" and "technology-push" policy instruments to keep the

same pace until 2010 is not obvious. “Will the feed-in tariffs be sufficient?” and “at what cost for the tax payers that afford the “green electricity” premium?” are becoming increasingly essential questions in Spain.

9.5 Conclusion and lessons learned

In the seventies both the Netherlands and Denmark started with the introduction of wind energy and the creation of a strong wind turbine industry. Both countries had a good position to become the world leaders in wind energy, because there was a lot of potential for wind energy (coastal and windy regions) and there was a good industrial and scientific knowledge base for wind energy. While in the Netherlands government policy was for a long time focussed on research and technology development, Danish policy was more oriented towards market stimulation by investment subsidies and subsidy on the payback tariffs of wind energy. This has proved to be a more effective strategy then the Dutch strategy in achieving the goals.

Germany and Spain started just in the late nineties with the introduction of wind energy. The success of wind energy (in terms of installed capacity and wind energy industry) in these countries is largely determined by a very favourable demand driven government policy. The high payback tariffs together with a guaranteed energy delivery period of 20 years (in Germany) and easy connection to the grid provided the right framework condition to make investments in wind energy attractive.

In Denmark, Germany, and Spain the government support for the feed in tariffs on wind energy has worked well to create the right environment for investments in wind turbines. This support policy has triggered demand for wind energy and created a home-market, which in turn supported the development of a strong and competitive wind energy industry. For instance, the German wind energy industry employs 45.000 people in 2003. An overview of the installed capacity of wind energy and government support on the feed in tariffs of wind energy in four countries is given in figure 3.

Figure 3: Overview of wind energy characteristics (2003)[1]

	Installed capacity[22] (MW)	Share wind energy of total electricity prod.	Government support on tariff since	Feed in Tariff** (€cent/kWh)[26]
Germany	14.609	6 %	1991	6.2-9.1*
Spain	6.202	5 %	1994	6.3
Denmark	3.110	20 %	1984	4.4
Netherlands	912	1 %	1996	7.8-9.7 *

* Depending on location

** Price paid by electricity companies to wind turbine owners (market price including government subsidies)

However, there is considerable debate regarding the effectiveness of government support for feed-in tariffs. The major criticism with regard to feed-in tariff is that they have failed to ensure that electricity from wind is generated and sold at minimum costs. Due to the regulation there is no competition between alternatives and the long

period guarantees save investments, but does not provide incentives for further innovation and cost reduction. A protected niche for a new technology was created by regulation. The current challenge seems to be how fast the protection can be lifted in order to create the right incentives for further innovation.

The scope for further expansion of wind energy, at least on shore, seems limited, as suitable sites for new installations have become rare. Recent discussions have shown that acceptance of wind energy is being challenged as increasing costs for the society (the price for subsidy on green energy in Germany is €1.7 billion annual[27]) and environmental concerns (landscape, noise) have become more visible. The high costs have made the Danish government decide to reduce the feed in tariffs from 8 €cent/kWh to 4.4€cent/kWh for all turbines build after 2000. In Germany a recent revision of the EEG has lifted the investment threshold by reducing the fixed tariff more quickly than previously (1,5% yearly).

Hence technology development and R&D subsidies are important, but not enough to introduce an innovative technology like wind energy on the market and create a substantial industry around it. The success stories in Denmark, Germany, and Spain and the failure in the Netherlands show clearly that creating favourable market condition is also important. Market based subsidies (e.g. investment subsidies and subsidies on the pay-back tariffs) together with a clear (long term) political vision that wind turbines should be supported provide powerful (economic) incentives to invest in wind energy and mobilize private capital. However, a demand driven policy can only work if there is sufficient knowledge and a technological base from the past available in the country.

10 Conclusion and recommendations

The solution for many environmental problems is often found in new technology development and innovation. For many years the incentive to apply environmental-friendly technologies is given by strict environmental regulations and obligations to industry to meet short-term environmental goals. This has often resulted in the application of expensive, and often inefficient, end-of-pipe technologies.

Although the relation between environment and innovation is complex and not fully understood yet, our study shows there are many examples of policy instruments in the European countries that have both a positive effect on environment and innovation. These instruments are often more efficient and effective in achieving environmental goals and stimulate companies to view environmental issues as a business challenge. The results of this study suggest that more innovation oriented policy instruments have a larger impact on sustainability than strict environmental regulations. The major observations and recommendations of this study are given below.

Subsidies
Subsides are often used in Europe to stimulate innovation. All countries have instruments for R&D support, varying from basic and applied research to more market oriented product development (technology push). Market pull instruments, however, are also very important in order to introduce an (sustainable) innovation on the market. In this study many examples are given of programmes that are used to strengthen this market pull by promoting demand of innovations. These market-oriented programmes can be used as an example to promote application of new technologies as well as to stimulate wider application of already proven technology coming from abroad.

It is suggested to discuss the appropriateness to introduce environmental aspects in all parts of European RTDI programmes (e.g. the Framework Programmes) either by integrating them in the evaluation procedures or by adding an add-on programme to FP7. The way the Flemish DTO programme is organised is an example of how this can be done. Furthermore, there seem to be possibilities to increase the market orientation of the EU LIFE programme. The Dutch SRM scheme offers ideas for this. It is suggested to investigate the possibilities.

Fiscal and financial instruments
There are several examples of fiscal facilities that promote innovation and decrease environmental impact. Since fiscal policy is the responsibility of the member-states every country should evaluate the possibilities and decide whether they want to use a fiscal instrument adapted to the local situation.
Other financial instruments for the support of innovation in the area of sustainability are specialised venture funds, green funds to guarantee bank loans related to environmental investments to SMEs, energy contracting (government lease) and investment funds mezzanine financing. These types of instruments can also be set up by other countries or at EU level.

Regulation
Regulation is not often used explicitly for innovation purposes. The EURO norms for the emissions of trucks are one of the few exceptions. Clear is that regulation with detailed prescription of the type of solution that is to be used works counter productive for innovation. Regulations describing performance criteria have a more positive impact on innovation, especially when the criteria are made stricter from time to time.
It is recommended to take innovation into account with environmental regulation in all European countries and at EU level. In our opinion the largest (and probably cheapest) possibilities to make environmental policy contribute to the Lisbon goals in the area of competitiveness are in making environmental regulation more innovation oriented.

An example of innovation oriented environmental regulation is benchmarking. This is an instrument that can be used by other countries, as well at EU level. It is however not an option supporting new innovations, but primarily an option supporting the application of new, already developed, technologies. Costs for this scheme can go down when other countries adopt this type of schemes, because information exchange can the reduce costs. Another example is the green account act in Denmark.

Green procurement
Green procurement is one of the environmentally most significant fields, which comes under the direct responsibility of governments. Lack of information is the main barrier to green purchasing. Increasing attention is paid to the European policy and legal framework. There is a potential conflict between freedom of trade and environmental considerations. A way to combine the integrated product policy with EU regulations should be developed.

Final remarks
There is not one single programme that will be able to grasp all possibilities for combining environmental profit and economic profits. Combinations of instruments are often far more effective (and/or efficient).
The wind energy-case has shown that which specific set-up of instruments and which combination of instruments is used, strongly depends on context, goals and strategies chosen.
Furthermore, details in the set-up of instruments are often important in determining the success. Also context and underlying policy strategy are very important. Since the context is dynamic, instruments should preferably be dynamic (or very robust: i.e. their effect is rather independent from the circumstances).

Clear and ambitious goal setting, consistent goal keeping and drafting practical and consistent strategies come first. The study on eco-efficient strategies by MERIT and Risø, as well as part of the preparations for the July 2004 Informal Environmental Council, gives approaches for this policy making step. Most of the considered strategies can be worked out with instruments sketched above. The government toolbox offers enough possibilities to really develop programmes and instruments to set everything in motion.

References

1. The decision on the instruments to be worked out in phase 2 was made by the steering committee with participants from VROM and Economic Affairs, based on an interim report by Technopolis
2. Sources: Envipark activity report. http://www.envipark.com and an interview by telephone with an employee of Envipark S.p.A..
3. Sources: telephone interview with Ms. Kathleen Gorris, Programme Manager DTO from IWT Brussels, April 27, 2004; website www.iwt.be/DTO.htm
4. Sources: Interview with Ms. Jarrigeon, General Secretary of R2ITH, Friday April the 23rd, 2004; Web site: http://www.r2ith.org; ANVAR Newsletter
5. Source: Telephone interview with Corry van Driel, former programme manager of SRM, Senter, April 27, 2004; Evaluation of SRM by EIM, 2002; Senter overview of SRM effects, 2003.
6. Source: telephone interview Mr. Theo van Bellegem, Ministry VROM, April 28, 2004; Jaarverslag EIA 2002 (Senter, 2003); Jaarverslag Groen beleggen 2002 (Novem, 2003); EIA Brochure 2004 (Belastingdienst/Senter, 2004); MIA-VAMIL brochure 2004 (Belastindienst/VROM, 2004).
7. Source: interview with Benoist Mary, ADEME. April 2004. Paris
8. Source: Environmental Investment Partners. 2004. http://www.eip.com.pl/english/1_1.html.
9. Source: interview with Benoist Mary, ADEME. April 2004. Paris
10. Underinvestment can be observed when investments are not undertaken even though expected returns are higher than capital costs.
11. This reference to porter was taken from 'Blueprints for an integration of Science, Technology and Environmental Policy, Rennings et. al. 2003.
12. The USA is not considered in this project.
13. Source: Danish Environmental Protection Agency. The Danish Green Accounts: Experiences and internal effects. Http://www.mst.dk/indu/05050000.htm and an interview by telephone with Ms. Lise Fogh Pedersen who is responsible for green accounts at DEPA.
14. Source: Commission Benchmarking. http://www.benchmarking.be/en/covenant.html and an interview with Mr H. van den Bergh, director of the Flemish Verification Office. Antwerp, 7th May 2004.
15. PriceWaterhouseCoopers. 2003. Evaluatie Benchmark covenant Energie-efficiency.
16. Based on: International Council for Local Environmental Initiatives (ICLEI). 2001. The world buys green – International survey on national green procurement practices.
17. Based on: Danish Ecological Council. 2003. Global Environmental problems can be solved using economical instruments.
18. European Environment Agency. 2000. Recent developments in the use of environmental taxes in the European Union.
19. Source: NUTEK. Summary Environmental-driven business development.

http://www.nutek.se/sb/d/154/a/1822, visited April 2004 and an interview with Mr. Stefan Henningsson, responsible programme coordinator at NUTEK
20. For a more detailed description of the development of wind energy in the Netherlands and Denmark we refer to: Kamp, L.M. 2002. Learning in wind turbine development: a comparison between the Netherlands and Denmark. Proefschrift Universiteit Utrecht and Johnson, A., Jacobsson, S. 2000. The Emergence of a growth industry: a comparative analysis of the German, Dutch and Swedish wind turbine industries. Unpublished paper. Sweden.
21. For more information regarding this topic we refer to: Sambeek, E.J.W., van, and Thuijl, E. 2003. The Dutch renewable electricity market in 2003. ECN-C-03-037.
22. American Wind Energy Association. 2003. Global Wind Energy Market Report.
23. Ecofys and KEMA. 2003. Duurzame energie in Nederland 2002. http://www.novem.nl/default.asp?documentId=18295
24. Danish Wind Industry Association. http://www.windpower.org/en/articles/wtmindk.htm.Visited April 2004.
25. BTM Consult. 2000. International Wind Energy Development. World Market Update 1999.
26. For a detailed overview and discussion of the feed in tariffs for renewable energy in different European countries we refer to: Sijm, J.P.M. 2002. The performance of feed-in tariffs to promote renewable electricity in European Countries. ECN-02-083.
27. Ministry of Economic Affairs. 2004. TWA nieuws – special duurzame energie.