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## Executive Summary

This report presents the results of the fourth phase of the FP6-project RAPIDO, which provides a review and analysis of the European Environmental Technologies Action Plan (ETAP) and the role of environmental technologies in rural areas (Work Package 4). The report addresses five main objectives: 1) to review and assess environmental technology initiatives set up by the European Environmental Technologies Action Plan (ETAP); 2) to examine how ETAP supports environmental technologies relevant to rural areas; 3) to identify the most relevant actors and markets in the development of environmental technologies; 4) to identify the job-creation potential of environmental technologies in rural areas; and 5) to identify how environmental technologies are disseminated and problems with their dissemination.

The overall goal of ETAP is to reduce pressure on natural resources, while at the same time improve the quality of life for EU citizens and stimulate economic growth. ETAP aims to streamline the Member States efforts to improve conditions for the uptake of environmental technologies and focuses on reducing the economic, regulatory, technological and social barriers to innovation across a broad range of thematic areas.

In the first stage the role of ETAP was analysed basing on the assessment of 12 national roadmaps from a representative group of EU Member States. The national roadmaps are the primary planning and coordination tool of ETAP. They show a Member State's progress toward implementing ETAP and act as a forum for exchange of knowledge, experiences, and best practices across Member States. In the second stage of the study, 13 case studies were conducted to provide an in-depth analysis of environmental technology initiatives specific to rural areas. The case studies were selected from work completed in Work Packages 1-3 of the RAPIDO project, as well as from EU-wide databases of projects funded by LEADER+, LIFE, and INTERREG instruments and online research.

### Key findings

The Environmental Technologies Action Plan (ETAP) has significant potential to streamline and focus Member States' efforts with regard to environmental technologies; however, its voluntary nature limits its effectiveness. In addition, since information included in the roadmaps is decided by the Member State, it is difficult to compare across countries. Thus, it remains unclear the extent to which the roadmaps support the promotion of environmental technologies. The roadmaps highlight many activities currently underway in the EU, and it is evident that MS are focused on increasing new environmental technologies. In the absence of roadmaps in some Member States (for example, Slovenia, Lithuania, Bulgaria, Estonia, Luxembourg), it is not possible to say to what extent efforts across the entire EU are sufficient.

The case study approach provided more detailed information on which role environmental technologies play in rural areas, including information on the most relevant actors and markets, the job-creation potential and methods and problems with their dissemination across rural areas.

**Actors and markets.** The case studies showed that the most frequently occurring collaborative efforts involve partners from regional and local levels. Successful co-operation among these stakeholders can facilitate implementation of new projects, while failure to include all relevant actors can result in unnecessary delays. In addition, a common problem is bridging the gap between technological innovations to the market.

**Job-creation potential.** Key findings from the case studies show that rural innovation creates a positive impact on job creation (especially related to renewable energy production<sup>1</sup>); however, the full impact of the projects on the local economy is difficult to determine given the temporary nature of some of the jobs and the exclusion of a multiplier effect in the analysis. These findings support those of Work Package 2, which suggest that the field of renewable energy production reveals a clear-cut potential for job creation in EU rural areas, especially in the bioenergy and the forestry sectors. In this context it should be noted that, in accordance with the set of indicators for sustainable innovation in rural areas suggested in Work Package 1, only those environmental technologies that fully consider all the aspects of sustainability (e.g. environmental and social sustainability of bioenergy production) should be promoted.

**Methods and problems with dissemination.** Local and regional government officials were identified as a target of most stakeholder communication strategies, given their potential role as a facilitator in the approval and adoption process of environmental technologies. Building confidence in new environmental technologies among government officials was a key factor in the long-term success of many case study projects. The occasionally difficult and time consuming process of working with governmental officials often led to the beneficial result of a more streamlined process, hopefully paving the way for more rapid approval of similar projects in the future.

### **Policy recommendations**

The key findings highlight areas for policy makers to improve uptake of environmental technologies across the EU, especially in rural areas. Currently, the Environmental Technologies Action Plan (ETAP) has limited visibility and its voluntary nature limits its effectiveness. In addition to making ETAP compulsory, improvements could be made to the requirements of the national roadmaps to enhance implementation and communication between countries to overcome shared challenges. For example, the current toolbox of possible instruments to support environmental technologies could be enhanced by a requirement to introduce strategic objectives, targets and milestones to the national roadmaps. More measurable objectives and standardized guidelines for reporting would help to monitor progress and increase awareness of the technologies and ETAP itself.

Furthermore, the link between ETAP-related initiatives and rural areas often remains unclear. Thus it is difficult to determine how those initiatives support environmental technologies relevant to rural development. By setting up the development of rural areas as an ETAP-target this link could be strengthened.

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<sup>1</sup> Different types of local-scale renewable energy production were analysed in the case studies. These include for example: biomass heating systems and heat-power cogeneration plants (Lavanttal), a local heating system fueled by wood from farmland hedgerows (Saint-Hilaire du Maine), the use of biomass from forestry and agriculture in a small-scale local biogas powerplant (Energiedorf Jühnde),

In addition, the variation in the extent and focus of ETAP-related activities in individual Member States suggests that further exchange of experience and best practice approaches among Member States is necessary, in particular to boost support for environmental technology development/ promotion in the new Member States. In addition, policy makers should prioritise efforts to bridge the gap between technological innovation and the market, as well as remove various regulatory barriers that prevent project commencement and implementation. In part, the former might be achieved by providing financial support to investors such as local or regional communities, development associations etc. to reduce risks early on in the innovation process. Removing regulatory barriers call especially for speeding up authorisation processes, reducing the level of bureaucracy and administration work linked to funding and thus the creation of innovation-friendly regulations.

Finally, successful promotion of environmental technologies requires an appropriate marketing and knowledge transfer on benefits that can be generated through its implementation. While financial benefits are often generated on a long-term perspective, are difficult to assess or play a minor role, positive environmental as well as socio-economic impacts provide a wide variety of clear non-monetary values that boost rural development. Those values can comprise among others improvement of water quality, preservation of landscapes, sustainable use of resources, climate-friendly production methods (from an environmental perspective) as well as improvement of self-confidence of general population and their identification with the region itself, increasing stakeholder engagement in associations and improvement of social relations (from an social-economic point of view). In the short term, these benefits need to be highlighted by relevant policies at all levels and marketed at the project level to inform relevant stakeholders and stimulate the uptake of environmental technologies. In the longer term, the policy objective should be to assign monetary value to these environmental and social-economic effects, to ensure that the positive externalities of environmental technologies can be internalised.

# 1 Introduction

Environmental technologies are receiving increased attention in European Union as an instrument for reconciling environmental protection and economic growth, and thus for meeting the long-term challenge of sustainable development. The European action plan on environmental technologies (ETAP) adopted by the EU Commission in 2004 defines environmental technologies broadly as “all technologies whose use is less environmentally harmful than relevant alternatives”, including “technologies and processes to manage pollution (e.g. air pollution control, waste management), less polluting and less resource-intensive products and services and ways to manage resources more efficiently (e.g. water supply, energy-saving technologies.)”<sup>2</sup>.

## 1.1 Objectives and structure

The overall aim of Work Package 4 of RAPIDO project was to review and assess environmental technology initiatives relevant to EU rural areas and the strategies for their dissemination. Specifically, the WP4 had five main objectives:

1. To review and assess environmental technology initiatives set up by ETAP, including the review of original objectives and their implementation, actions identified by the Commission Communication, and national roadmaps for environmental technologies.
2. To examine how ETAP supports environmental technologies relevant to rural development.
3. To identify the most relevant actors and markets in the development of environmental technologies (specifically, in the areas of innovation, dissemination and uptake)
4. To identify the job-creation potential of environmental technologies in rural areas
5. To identify how environmental technologies are disseminated and the problems experienced with their dissemination

In addressing objectives 2 – 5, specific environmental technologies relevant to rural development were selected from the sectors identified by WP2 and WP3<sup>3</sup>, as well as from other sources. This report is also closely linked to WP5<sup>4</sup> as it complements and feeds into the analysis of actors involved in the development and dissemination of innovative initiatives in rural areas.

The structure of the document is as follows: the following sections explain the methodology used in the analysis; in particular, the assessment of ETAP national roadmaps and the case study approach. In sections 2 and 3, results of the ETAP review and individual case studies

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<sup>2</sup> Commission of the European Communities, 2004: Communication from the Commission to the Council and the European Parliament. Stimulating Technologies for Sustainable Development: An Environmental Technologies Action Plan for the European Union, COM(2004) 38 final, Brussels, 28.1.2004. Available online at: [http://ec.europa.eu/environment/etap/information/documents\\_en.html](http://ec.europa.eu/environment/etap/information/documents_en.html)

<sup>3</sup> Work packages 1 (RAPIDO, 2007, D1) and 2 (RAPIDO, 2008, D2) respectively, identified best practice examples for innovation in rural areas and reviewed key areas for innovation in agriculture, forestry and food industry based on the results of 103 expert questionnaires. Work package 3 (RAPIDO, 2008, D3) identified the sectors where innovation could help to create employment in rural areas.

<sup>4</sup> Work package 5 (RAPIDO, 2008, D5.1-D5.4) reviewed processes and roles of different actors (public/ private) and provided an overview of methods to transfer innovation to the relevant actors.

are presented. Section 4 draws the main conclusions and the key recommendations stemming from this work package.

## 1.2 Methodology

### 1.2.1 Assessment of national ETAP initiatives

Twelve Member States were selected for an assessment of national ETAP initiatives: Austria, Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, the Netherlands, Poland, Spain and United Kingdom. Member States were chosen according to geographic diversity and expected length of experience with promotion of environmental technologies.

The assessment of national ETAP-related initiatives and how they encourage the development of environmental technologies was largely based on a review and analysis of the ETAP national roadmaps. National roadmaps are the main planning and coordination tool for ETAP implementation at the level of Member States. The roadmaps indicate to the Commission how far a Member State has implemented ETAP and act as a forum for the exchange of knowledge, experiences, and best practices in Member States. They are essential for an overview of the state of play of environmental technologies in Europe. Additionally, the Commission views these roadmaps as living documents, which should be periodically updated.<sup>5</sup>

For follow up questions regarding the content of the roadmaps, MS representatives were contacted. Unfortunately, only Poland, Germany, Czech Republic, Denmark, the Netherlands and Spain provided additional information. In the case of Germany, the second national workshop on ETAP, taking place in September 2008, provided valuable information on German ETAP initiatives. Representatives from Austria, Hungary, Italy and the UK were not reached despite multiple attempts. The resulting gap of information mostly influenced the comparative analysis of barriers to the development of environmental technologies in these Member States. As a result, the analysis of the implementation of the ETAP, as well as the national measures taken in view of existing technical, regulatory, economic and/or social obstacles, provides a broad overview across the European Union, but is not comprehensive.

Additional information on ETAP initiatives was also obtained through an analysis of the first and second implementation reports for ETAP and other resources available online.

Information obtained from the roadmaps, interviews, and other sources was categorized and analyzed in a matrix. The analysis focused on the following topics:

- Scope of Content
- Key Sectors
- Setting up new initiatives
- Absorbing existing initiatives
- Funding Sources

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<sup>5</sup> *Commission staff working document accompanying the Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions. Report of the Environmental Technologies Action Plan (2005-2006). COM(2007) 162 final, Brussels, 2.5.2007.*

- Barriers: Technical, Regulatory, Economic and Social
- Dissemination and Communication Initiatives
- Projects/programmes related to rural areas

### 1.2.2 Case study approach

The assessment of ETAP roadmaps was complemented with a case study approach to allow for a more in-depth analysis of environmental technology initiatives relevant for rural areas (in order to meet objectives 3 – 5). In the first step, a pool of potential projects was created by drawing on the database of case studies from WP1 – 3, as well as EU-wide databases of projects funded by LEADER+, LIFE, and INTERREG funding instruments. In addition, a number of projects were included in the pool through online research. From this pool of potential projects, 13 projects were selected using the following criteria:

- Project focus is on environmental technologies most relevant for rural areas
- Project represents a balanced geographical distribution among the Member States

Case study guidelines were developed in order to facilitate data collection and analysis. Data collection included documentary analysis of available reports, project websites, as well as interviews with project managers. A description of projects and a discussion of case study results is provided in section 3 of this report.

## 2 Review and assessment of the Environmental Technologies Action Plan (ETAP)

### 2.1 Introduction to ETAP

The central aim of ETAP is to help reduce pressure on natural resources while improving the quality of life of EU citizens and stimulating economic growth<sup>6</sup>. The European Commission established ETAP as an instrument to contribute to the objectives of the Gothenburg Sustainable Development Strategy and of the Lisbon Strategy to make the EU “the most competitive and dynamic knowledge-based economy in the world [...]”<sup>7</sup>. The ETAP aims to reduce the barriers to the establishment of new technologies and implementation of existing technologies. Its EU-wide focus aims to ensure EU’s leading role globally in developing and applying environmental technologies and help to mobilise relevant stakeholders.<sup>8</sup> Focusing on environmental technologies across the Community should reduce the EU’s dependence on oil and help to protect the economy against GDP losses<sup>9</sup>. It is argued that EU goals relating to environment and competitiveness can only be achieved through cooperation and concerted action among the Member States, and ETAP aims to ensure this cooperation.

ETAP includes three main action areas, which in turn include 25 sub-actions<sup>10</sup>:

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<sup>6</sup> Commission of the European Communities, 2004, op.cit.

<sup>7</sup> European Union - Treaty of Lisbon, 2007: Amending the Treaty on European Union and the Treaty Establishing the European Community (2007/C 306/01). Official Journal of the European Union, 17.12.2007.

<sup>8</sup> Commission of the European Communities, 2007: Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions. Report of the Environmental Technologies Action Plan (2005-2006). COM(2007) 162 final, Brussels, 2.5.2007.

<sup>9</sup> The Commission’s 1<sup>st</sup> Implementation Report on ETAP refers to a study suggesting that an increase of 10% in the share of renewable sources in electricity production can avoid oil-induced GDP losses in the range of \$29–\$53 billion in the US and the EU (\$49–\$90 billion for OECD).

<sup>10</sup> For more complete information on actions see: Commission of the European Communities, 2007, op.cit.

1. *Getting from Research to Markets.* Actions in this area aim to improve the innovation process and transfer inventions from laboratories to the market. Examples of actions include the establishment of technology platforms; improvement of testing, performance verification and standardisation related to environmental technologies; as well as an increase in and improvement of research, demonstration and dissemination. Specific activities to improve performance verification, for example, include linking the various European testing and assessment centres to increase consistency and comparability of performance verifications.
2. *Improving Market Conditions.* Many market-related factors hinder the application of already existing environmental technologies (for example, price signals that favour less eco-efficient solutions). To create incentives and remove economic barriers, this action area focuses on mobilising instruments to share the risks of investment, increasing leveraging investments, and promoting green public procurement. Further, measures focus on building support in civil society to increase social acceptance. Activities to remove economic barriers resulting from environmentally harmful subsidies are already underway in the EU, such as introducing new taxes or tax incentives combined with harmonised performance targets.
3. *Acting Globally.* International development goals can only be achieved through concerted effort of the global community. Therefore, the EU also aims to promote eco-innovation and responsible investment in developing countries. In particular, the EU is pushing for the elimination or reduction of tariffs on environmental goods, services and technologies in the context of the WTO negotiations.

A central policy instrument of ETAP is provided by national roadmaps, which Member States were asked to prepare by the end of 2005<sup>11</sup>. These roadmaps act as a planning tool<sup>12</sup>, highlighting existing activities linked to environmental technology promotion, outlining new initiatives, as well as providing information on financing tools and dissemination activities.

The ETAP national roadmaps differ significantly from programming tools such as the rural development or regional development programmes: they are voluntary planning tools to facilitate integrated action on environmental technologies, but they do not have a compulsory budget or targets and are not subject to a formal approval process. As such quality control is limited and national roadmaps vary greatly in terms of their content.

In the roadmaps the main action areas and their sub-actions were simplified and Member States are asked to describe activities most relevant to the following broad headings:

- Research and Development (Actions 1-2)
- Verification of technologies (Action 3-5)
- Performance Targets (Action 6)
- Mobilisation of Financing (Actions 7-15)
- Market-based Instruments and State Aid (Actions 16-18)
- Procurement (Actions 19-21)

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<sup>11</sup> To date 21 MS plus Norway have handed in Roadmaps. Roadmaps are still missing from Bulgaria, Estonia, Latvia, Lithuania, Luxembourg and Slovenia. See: [http://ec.europa.eu/environment/etap/policy/roadmaps\\_en.html](http://ec.europa.eu/environment/etap/policy/roadmaps_en.html)

<sup>12</sup> *Commission staff working document accompanying the Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions. Report of the Environmental Technologies Action Plan (2005-2006). COM(2007) 162 final, Brussels, 2.5.2007.*

- Awareness raising and training (Action 22-23)
- Acting Globally (Action 24-25)

While the Commission suggested this common structure for the roadmaps, Member States decided what should be included in the roadmaps and not all roadmaps address all categories. The French roadmap, for example, contains very limited information and uses categories only similar to the ones above, whereas the UK's roadmap is extensive and follows the priority areas more closely. The variation in content and depth of information provided makes it difficult to develop a comparative analysis of national roadmaps.

The intent for the first revision of roadmaps, foreseen for 2007, was to include the addition of planning and strategic elements, including specific targets and milestones<sup>13</sup>. However, these revised roadmaps are not yet available on the Commission's website. So far only Poland and Denmark have published additional guidance documents. For example, Poland has prepared the Implementation Programme for the national ETAP for 2007-2009 with a perspective for 2010-2012.

Following the preparation of roadmaps, the Commission has planned to monitor progress of national initiatives and report every two years to the European Council on the state of implementation. The latest implementation report of ETAP for the period 2005-2006 shows that while Member States have made progress (e.g. since the launch of ETAP, about €1.4 billion has been awarded to environmental technology projects under the 6th Framework Programme), some key areas still need additional input to enable Europe to deliver large-scale environmental and economic benefits. The report lists five priority areas for future action<sup>14</sup>:

- Further Green Procurement
- Mobilise greater financial investments
- Establish Technology Verification and Performance Targets systems
- Build on promising practice of Member States
- Focus on sectors with high gains

## **2.2 Content of national ETAP roadmaps**

The following section presents the results from the analysis of the selected national roadmaps and reports on key sectors, barriers, funding sources, initiatives that have been set up or absorbed, application of dissemination tools and initiatives, as well as the link of ETAP to rural areas.

### **2.2.1 Scope of key sectors & priorities**

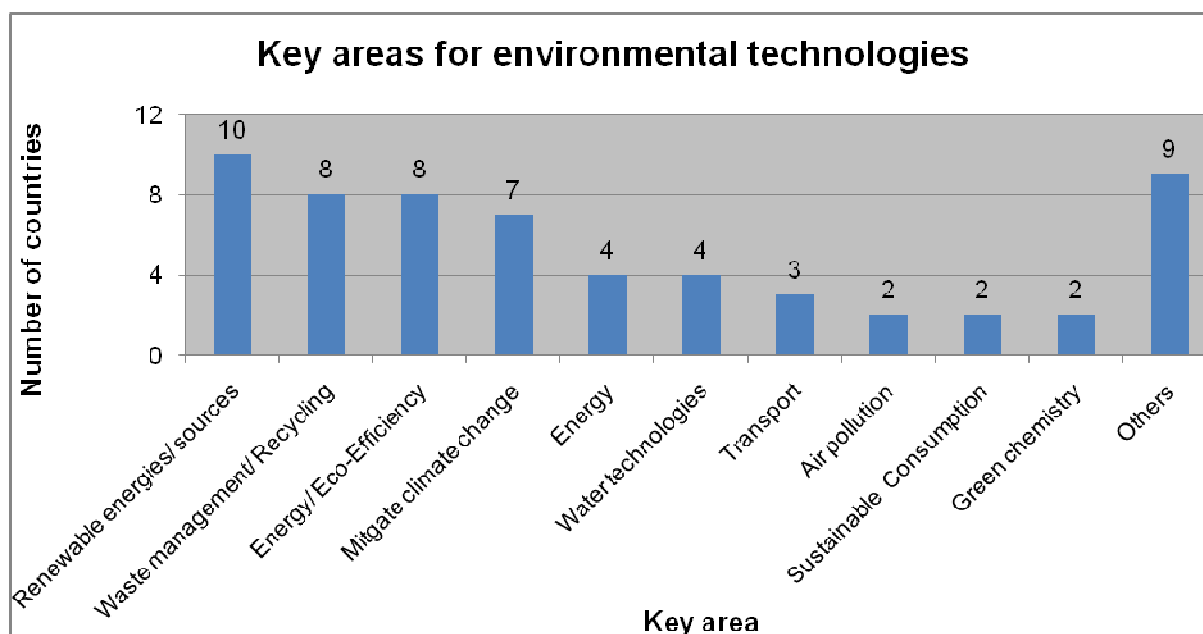
The use and development of technologies related to renewable energies such as wind power, biomass, photovoltaic, water power etc. is a major sector. High priority is also given to energy and/or eco-efficiency as well as waste management and recycling (see Figure ). All

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<sup>13</sup> Commission Staff Working Document, 2007, op.cit.

<sup>14</sup> Commission of the European Communities, 2007, op.cit.

three key areas reflect the need to create synergies between environmental protection and economic growth.<sup>15</sup>



**Figure 1: Key sectors and priority areas for research, development and implementation of environmental technologies**

Examples given by Member States for energy and/or eco-efficiency include energy-efficient industrial processes and materials, fuel cells, efficient electricity use in all consumer sectors (e.g. in office equipment, buildings or transport), as well as the use of fossil energy, water and raw materials. Thus, not only costs for energy, resource input and waste management can be reduced, but also environmental performance of companies can be improved. Moreover, there are clear links to waste management and sustainable consumption of resources and energy as well as reducing emissions and air pollution. In some national roadmaps air pollution is listed as a separate key sector and refers specifically to the industry and transport sector. In order to avoid and reduce air pollution that is harmful to the environment and health, appropriate eco-efficient technology in general (DK) as well as Low Carbon Car Programmes (UK) should be strongly promoted. Nevertheless, a majority of analysed countries emphasize in their national roadmaps that mitigation of climate change is a big challenge to be considered in the development of environmental technologies and addresses this issues within several policies.

Further key areas encompass transport (CZ, HU, ES) addressing research and development of sustainable environmental technologies<sup>16</sup>, water technologies (PL, NL, ES, DK) targeting water supply and sanitation, water resource management and risks associated with flooding, as well as green chemistry (FR, DK) targeting, for example, the development of advanced agro materials.

<sup>15</sup> According to ETAP, the keys to this goal are environmental technologies whose use is less environmentally harmful than relevant alternatives (Commission of the European Communities, 2004, op.cit. p.2). These include technologies and processes to manage pollution (e.g. air pollution control, waste management), less polluting and less resource-intensive products and services and ways to manage resources more efficiently (e.g. water supply, energy-saving technologies).

<sup>16</sup> Including, for example, the improvement of efficiency of jet engines and internal combustion engines, research of hybrid propulsion, research of vehicles for the use of fuels with high contents of biocomponents, so-called "fuel flexible vehicles" (CZ)

“Other” areas for environmental technologies include chemicals, biologically based production, molecular plant biology and catalysis (DK), public procurement, fiscal incentives; FINE Particles - Technology, Environment and Health (FI), sustainable logic systems, soil protection (PL), sustainable forestry and protection of biodiversity (DE), cleaner production (AT) and urban sustainability, improvement of production processes (ES).

### **2.2.2 Obstacles to the uptake of environmental technologies**

ETAP was developed from the need to streamline Member States’ efforts to improve conditions for the uptake of environmental technologies (ET) to foster sustainable development. Therefore, the main goal of the ETAP is to reduce economic, regulatory, technological and social barriers. Annex II of the Communication on ETAP<sup>17</sup> outlines the main barriers to environmental technologies:

A major issue with respect to economic barriers is the general market failure of not taking costs of environmental pollution into account, which leads to the “systematic underinvestment in environmental technologies”<sup>18</sup>, further compounded by government interventions in other technologies (e.g. fossil fuel production) through subsidies. Another major economic barrier identified is high up-front costs of ET’s, especially if new infrastructure is needed, thus deterring potential investors. Moreover, ET’s can be perceived as a risky investment, not only due to these up-front costs, but also due to the potential for changing political priorities. Lack of adequate venture capital is especially an issue for SMEs and start-up companies.

On the regulatory side, unclear and unstable legislation can cause market uncertainty, thus reducing incentives to investment and can deter investors in general. Legislation can be unclear when it is overly detailed, which on the one hand can limit innovative thinking and on the other hand further discourages investors due to complication technical specifications. Additionally, MS can differ in legislation, which can affect the diffusion of ET’s if they do not comply with the requirements of each Member State. Another issue is that limit values established in legislation (e.g. limit values for air pollution) can curb innovative thinking, and, if done poorly, can favour non-environmental technology. Limit values do not encourage attaining the best results, but not setting values and standards may also hinder ET uptake, as there is no measurement.

Beyond market and governmental issues, technological barriers can also hinder ET uptake. In order for ET’s to become competitive on the market, research and development (R&D) is needed; however, R&D is still not at the appropriate level, partly due to economic barriers. Furthermore, the link between university research and industry is still not well enough established to ensure that R&D leads to concrete products on the market.

Finally, social and diffusion barriers can directly influence uptake by end consumers as well as investors. The current major lack of information about the potential of environmental technologies reduces consumer confidence as they do not know the costs and benefits of a product. This lack of consumer confidence reduces acceptance and thus use of new ET products. Even if acceptance is there, distribution channels for new technologies need to be established. Diffusion can also be hindered due to lack of adequately trained staff to install and maintain new technologies.

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<sup>17</sup> Commission Staff Working Document, 2007, op.cit.

<sup>18</sup> Ibid.

Table 1 lists analysis results on key barriers to the uptake of environmental technologies and measures to address them.

**Table 1: Key barriers to the development of environmental technologies in selected Member States<sup>19</sup>**

	<b>Economic Barriers</b>	<b>Regulatory Barriers</b>	<b>Technical Barriers</b>	<b>Social Barriers</b>	<b>Measures to address Barriers</b>
Czech Republic		Government has not concentrated too much on environmental technologies		Lack of information	Government is now part of high-level working group of ETAP and plans to focus on ET during EU Presidency; Publication of a Book atlas presenting ET's
Denmark			Relating to air pollution and agriculture pollution		Carrying out assessments of Danish strengths in air pollution abatement; New law specifically requires the agriculture sector to use proven technologies
Finland	Lack of funding for networking and bureaucracy, surrounding funding		Commercialisation and international marketing are the biggest challenges to overcome	Lack of networking	Networking on national and international level to increase the visibility of Finnish products; improving preconditions for venture capital investments and increasing availability of risk financing for reference plant stage
Germany	Lack of knowledge regarding green public procurement regarding legality and benefits				An internet portal to provide information and advice to decision-makers regarding possibilities and benefits of green public procurement; new High-Tech Strategy: increasing the government's role in providing demand for innovation.
Hungary	Few national subsidies available for environmental technologies	Ability to enforce environmental protection is still weak in decision-making; Current non-compulsory systems to promote environmentally-friendly development of products are ineffective	Technologies tend to focus on end-of-pipe solutions as opposed to preventative environmental protection; Link between universities and business inadequate	Non-environmentally friendly attitude limits growth	Creation of a database which posts R&D results and lists companies involved in environmental technologies; Greater involvement in the EU Technology Platforms; Implementation of new credit and subsidy programme (2007)

<sup>19</sup> Information on barriers was obtained from the roadmaps or from personal communication with MS representatives.

	<b>Economic Barriers</b>	<b>Regulatory Barriers</b>	<b>Technical Barriers</b>	<b>Social Barriers</b>	<b>Measures to address Barriers</b>
Netherlands			Problems bridging the gap between research innovation and a demand driven market; Existing technological approaches to water supply and sanitation are reaching their limitation		Taking part in various Technology platforms
Poland	Lack of financial means for R&D and existing economic conditions; Access to external financing sources is still difficult		Infrastructure needed to commercialise new or existing technologies is still poorly developed		Increasing funding opportunities
Spain	Lack of financial instruments	Bureaucracy of government			

Economic and regulatory barriers represent the strongest obstacles to the development of environmental technologies according to the new Member States. Although the roadmaps of Austria, France, Italy and UK do not specifically mention barriers to environmental technologies, because there was no requirement from the Commission to state current barriers, there are likely barriers in these countries as well.

The analysis indicates that barriers differ among MS but a common thread is the challenge of bringing technologies to market. Even countries with a more established history with environmental technology development (e.g. the Netherlands) need a better bridge from research to market. Through active participation in various technology platforms and a greater focus on public-private partnerships, which are outlined in most of roadmaps, MS will be able to better link new technologies with commercialisation. Another commonality is the problem funding, either lack of financial mechanisms (Hungary, Poland, Spain, Finland) or lack of understanding on how to best use existing resources (Germany).

### 2.2.3 Funding sources

While the ETAP itself does not provide funding, guideline documents point towards various funding opportunities. To facilitate the uptake of environmental technologies a broad mix of financial instruments and funding sources are used at EU, national and local level. Instruments include EU level funds; national institutions and programmes; and fiscal instruments such as capital allowances, equity loans and reduced VAT (see Figure 2). Through these diverse sources, it is the EU's goal *"to increase research and technology developing to 3% of GDP by 2010, which is important as it should result in more environmental technologies becoming available for market application."*<sup>20</sup>

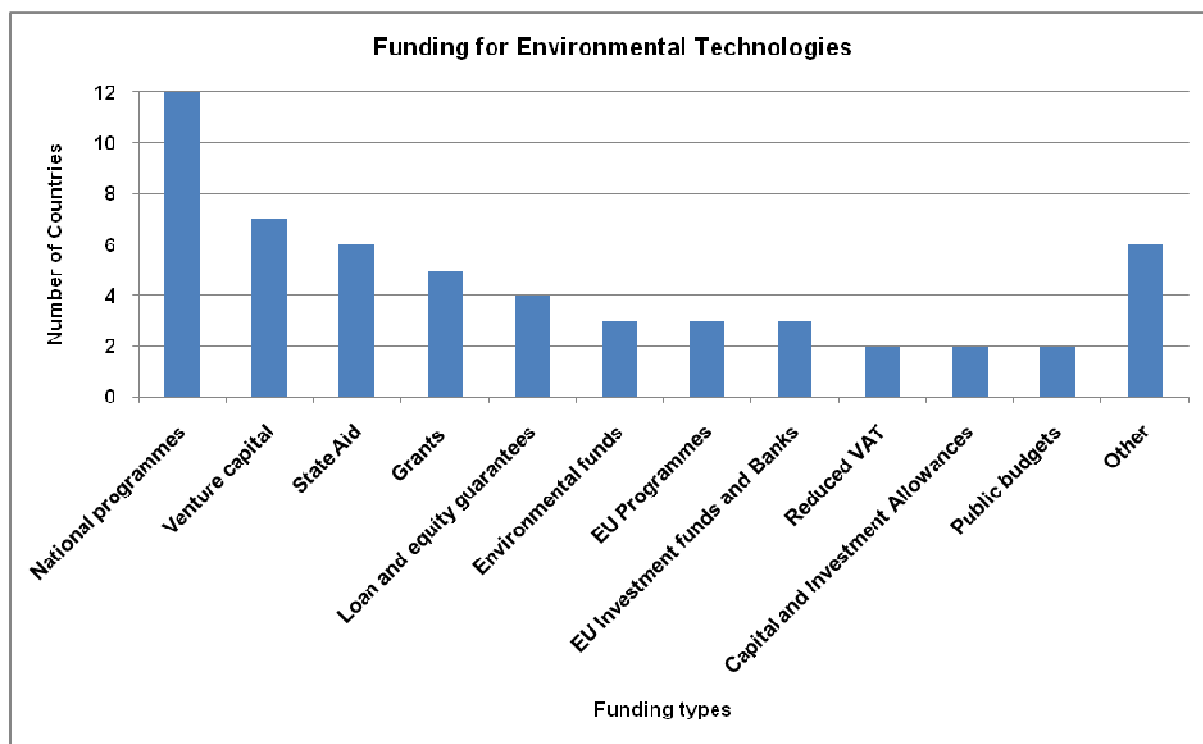


Figure 2: Types of funding for Environmental Technologies

<sup>20</sup> Commission of the European Communities, 2004, op.cit.

As Figure 2 shows, there are numerous sources of financing. It is not possible to identify total amounts spent on supporting environmental technologies, nor trends in terms of the proportion of funding allocated to the three main action areas. Based on the information provided in the roadmaps, the following observations can be made.

At EU level, in addition to existing programmes (e.g. 7th Framework Programme, LIFE-Environment, Structural Funds, Cohesion Funds), the new Competitiveness and Innovation Programme (CIP) concentrates on already existing environmental technologies and looks to increase commercialisation through the use of financial instruments, in particular the support for investment funds involved in eco-innovation. Out of the € 3621 million CIP budget, the sub-programme 'Entrepreneurship and Innovation' earmarks € 443 million exclusively for eco-innovation. Since CIP is a new initiative, most of the ETAP roadmaps do not mention this financing opportunity except for UK, Denmark, Finland, and Poland.

With regard to other existing EU funding opportunities mentioned above, most MS do not mention their use; however, it can be assumed that all Member States take advantage of the Framework Programme and Structural and Cohesion Funds. As mentioned before, since the launch of ETAP, about €1.4 billion has been awarded to environmental technology projects under the 6th Framework Programme. Based on the roadmaps analysed, it appears that new Member States focus more on EU-level financing sources than on national funding opportunities. For example, Hungary mentions that national subsidies are still lacking and their financing section mainly discusses various EU initiatives.

All Member States have a range of national sources of funding for eco-innovation. For example, the German Federal Environment Foundation, which receives its financing from the privatisation of the former steel group Salzgitter AG, has supported over 6200 projects to date totalling €1.2 billion. Principal funders include the Ministry of Environment, Ministry of Science and Technology, or the Ministry of Industry and Trade. Public-private partnerships play a significant role in environmental technology development. These partnerships, along with fiscal instruments, help to reduce investments risks. Tekes, a Finnish agency funded by the Ministry of Trade and Industry, provides on average 50% of funding for relevant programmes, with the other half matched by participating companies and research institutes. In addition, purely private funding also plays an important role in eco-innovation. In Poland, the Business Angel, a private investor, invests on average € 13.000 – 130.000 (50.000 - 500.000 PLN) into highly promising firms. Although private-public partnerships were mentioned by only a few MS there appears to be significant potential to develop these partnerships further.

Member States also mobilise fiscal instruments to promote environmental technologies. In Austria, for example, its federal guarantee instrument "Austria Wirtschaftsservice" provides loan and equity guarantees, which transfers part of the investment risk to the state. One of the major barriers to environmental technologies outlined in Annex II of the ETAP Communication<sup>21</sup> is risk of investment, so funding sources lowering risks for investors are especially helpful. The UK is another MS where fiscal instruments play a large role: its programme of enhanced capital allowances for energy-saving technologies enables businesses to write off 100% of first year costs against taxable profits. The UK Carbon Trust further supports climate change technologies by offering interest free loans to purchase energy-saving equipment.

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<sup>21</sup> Commission of the European Communities, 2004, op.cit.

Although the roadmaps point to many different funding schemes, a complete picture of all sources is not possible, nor is it possible to determine the total amount of funding currently being spent on environmental technologies. However, information provided by MS is a good basis for knowledge exchange on funding opportunities among the MS, especially for new MS.

#### **2.2.4 Setting up new initiatives/absorbing existing initiatives**

One of the main aims of the national roadmaps is to present a state of play of environmental technologies in Europe and to indicate how Member States will realise objectives of the ETAP. As such, each MS was evaluated in terms of their existing projects/programmes regarding environmental technologies (before the establishment of ETAP in 2004) as well as their new initiatives (after 2004). Information provided in the roadmaps shows that while some Member States already focus on environmental technologies, others are only in the beginning stages. Broadly speaking, EU-15 countries tend to have more established programmes, while new MS are just beginning to focus on environmental technologies.

Many environmental technology projects pre-date ETAP. Countries such as Germany, Finland, Denmark and the Netherlands have placed a much heavier emphasis in their roadmaps on absorbing existing programmes compared to setting up new initiatives. In general, these countries were heavily involved in environmental technology development before the establishment of ETAP. Denmark does not mention any new programmes per se, but has put in place legal requirements to use best available technologies to control pollution in the agricultural sector. The UK and Austria are similar in that environmental technology projects are already well established; however, their roadmaps also describe a number of new programmes. On the other hand, new MS (for example, Poland and Hungary) have some existing programmes and appear to be setting up a number of new initiatives, mainly focusing on actions to improve the economic and market situation for environmental technologies.

Another distinction can be made in terms of the extent to which Member States emphasize sector specific initiatives. Roadmaps of old Member States tend to focus on topic-specific initiatives such as energy-efficiency, bioenergy and hydrogen and fuel cell development. Although new MS also present topic-specific programmes (for example, the Czech Republic's "Rational Exploitation of Energy and Renewable Energy Sources" programme), these are mentioned much less frequently and the roadmaps focus more on general instruments to removing economic barriers without specifying technologies or sectors. New initiatives mentioned by Hungary and Poland focus on the establishment of long-term credit schemes and investment funds, as well as on the incorporation of environmental criteria into funding decisions. Hungary's new National Public Procurement Action Plan will include green measures to follow. The Czech Republic mentioned that the government has not concentrated on environmental technologies, yet their roadmap does not point to any new initiatives. It should be kept in mind, however, that these roadmaps may not provide all information regarding environmental technologies. MS were asked to list activities most relevant; as such, it is difficult to judge the state of play.

Moreover, certain MS (Germany, Denmark, Netherlands, Austria and Finland) focus more on addressing technical barriers by stressing participation in and establishment of (new)

Technology platforms<sup>22</sup> and joint ventures, such as ERA-Nets and the Susprise initiative<sup>23</sup>. Focusing on networking and bridging the gap between research and industry will enable research and development to lead to concrete products on the market, a current challenge both Denmark and Finland specifically mention. Technology platforms do not receive much attention in the UK, Spain, Italy, Hungary, Poland, and Czech Republic.

Although the roadmaps highlight a number of new and existing initiatives, it is still unclear to what extent ETAP affects Member States. None of the roadmaps analysed specifically mentioned that initiatives created since 2005 (after the roadmaps were due to the Commission) were a direct result of ETAP. However, the numerous programmes described in the various roadmaps indicate that significant effort is being made to promote environmental technologies. While the roadmaps themselves may not present a complete picture of actions undertaken at MS level, it is clear that the programmes presented contribute to overcoming barriers to environmental technologies.

### **2.2.5 Dissemination tools and initiatives**

The ETAP identifies different diffusion barriers for the uptake and use of environmental technologies. These barriers include - inter alia - the lack of knowledge about the costs and benefits throughout the life-cycle and about socio-economic issues, resulting in a low level of public acceptance and the use of, e.g., green biotechnology products by consumers. The uptake of environmental technologies by industries and companies (in particular SMEs, the target audience for environmental technologies), is mainly hampered by the lack of access to finance and information that is not linked to the SMEs core business.

Moreover, there is often a lack of adequately trained staff needed for the installation and maintenance of technologies, and distribution channels for new technologies are not as good as those for established technologies.

In order to address these difficulties, several actions have been set up by the ETAP, such as increasing demonstration and dissemination activities, establishing technology platforms and stakeholder networks, developing an EU catalogue of existing directories and databases on environmental technologies, raising business and consumer awareness as well as the exchange of best practice among Member States. Responsibilities for the implementation of these actions are shared among the EU and its (research programmes), Member States, national, regional and local authorities, trade associations and NGOs.

Drawing on the analysis of 12 Member States (see Figure 3) it becomes obvious that digital types of media such as internet portals, action and technology platforms<sup>24</sup>, networks and forums are widely implemented to inform business, SMEs, local & regional authorities or respectively stakeholders interested in adopting environmental technologies. Besides providing comprehensive information on environmental technologies, these initiatives are

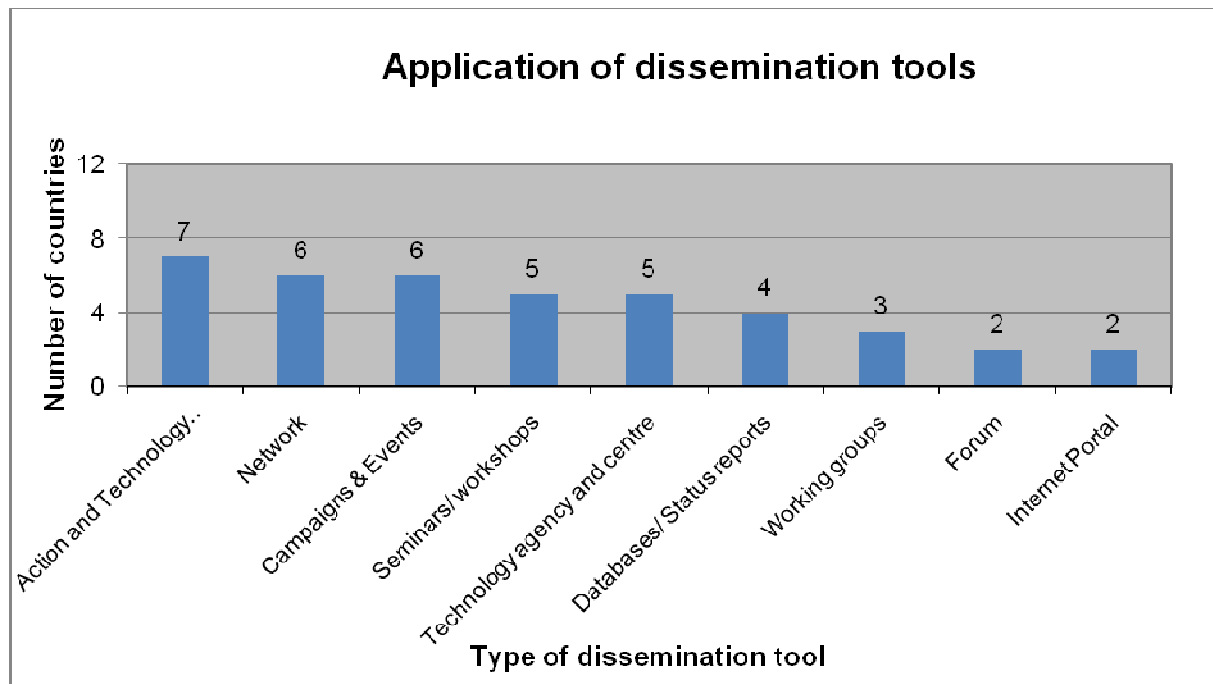
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<sup>22</sup> A number of EU Technology Platforms are directly linked with ETAP: Hydrogen and Fuel Cells, Photovoltaics, Water supply and sanitation, Sustainable Chemistry, Biofuels, Forest-based Sector were all mentioned by Germany.

<sup>23</sup> Susprise Initiative includes the Netherlands, Austria, Belgium, Sweden, Denmark, the UK, France, Switzerland, Italy and Spain. The mission of SUSPRIZE is "to expand cooperation and coordination among national sustainability research activities across Europe by promoting networking between government programmes in this sphere".

<sup>24</sup> According to the second ETAP-implementation report (Commission of the European Communities, 2007, op.cit), more than 30 Technology Platforms have been launched in the EU and a number include environmental technologies as part of their agendas. Member States actively participate in most Technology Platforms through voluntary "Member States Mirror Groups", which have the task of allowing coordination with national initiatives and projects, ensuring a two-way flow of information from and towards the platforms, and acting as a discussion forum for Member States (Commission of the European Communities, 2005)

seeking, for example, to provide pro-innovative services for SME's and education in general, report on research activities as well as to bring together relevant stakeholders such as scientists, developers, investors, representatives of the financial sectors and environmental authorities.



**Figure 3: Types of dissemination tools for environmental technologies in the EU**

In this context, databases have been established in order to showcase the results of R&D and to promote markets for available technologies. Moreover, some national authorities also provide reports on the current status of certain environmental technologies.

Some Member States have created specific technology agencies and centres to support direct co-operation with the industry and to offer innovative technologies. In some cases, these technology centres (as, for example, the Energy Savings Trust in UK) aim to encourage and promote energy efficiency and the integration of renewable energy sources through advertising programmes and marketing campaigns, advice centres and the endorsement of energy efficient products. In addition, specific working groups have been set up to support the integration of environmental concerns (and technologies) into sectoral policies. Some examples are presented in the following box.

**Box: Examples of dissemination initiatives**

- The “**Cleaner Production Germany**” Portal (<http://www.cleaner-production.de/>) provides comprehensive information about the performance of German environmental technologies and environmental services
- The **technology platform “Kompetenznetzwerk Wasser”** (<http://www.waterpool.org>) focusing on quality assurance, water resource quality and its sustainability over the long term and the **platform “Eco-Industry”** (<http://www.austrian-environment.at/>) have been established in Austria. “Eco-Industry” is cooperation between the Austrian Federal Ministry of Economic and Labour and the “Austrian-Environment Cluster Management” helping to promote Austrian products, processes and system solutions in the field of environmental technology via the internet world-wide.
- The UK Government is working with a number of **prominent business networks** to secure the participation of senior business leaders and relevant experts. Moreover, **Knowledge Transfer Networks** helping to share ideas and facilitate innovation are part of the Technology Programme. In addition relevant Knowledge Transfer Networks, including on materials and fuel cells exist and further Knowledge Transfer Networks on Resource Efficiency and Waste Minimisation and on Integrated Pollution Management are planned. Germany created a **national ETAP network** in 2007 comprising actors from industry, science

and major groups.

- In the Czech Republic a **forum or the Exchange of Information on the Best Available Techniques** has been created.
- In Denmark, a **secretariat at the Environmental Protection Agency** ([www.ecoinnovation.dk](http://www.ecoinnovation.dk)) was established to respond to inquiries from enterprises, entrepreneurs, researchers and authorities about eco-efficient technology; help new and small environmental enterprises to contact the relevant authorities and institutions, including regional incubators; prepare analyses, surveys and information materials; and carry out dialogue with the manufacturers and consumers of eco-efficient technology about how to best promote the development of new technology.
- Proposals and ideas for integrating the environment into sectoral policies is the job of **specific working groups** in Spain, led by an Autonomous Community.; e.g., New Technologies for Sustainable Development and Financial Framework Working Group.

To address the wider public and consumers and to raise public awareness, campaigns and public events are the most common tools applied in Member States, such as:

- the Dutch **campaign “A Will to compete: A Competitive, Clever and Clean Europe”**. This campaign resulted from the recognition that environmental technology could make a significant impact and positively affect the quality of life without negative effects on consumption levels, industrial growth and employment; and
- the **“National Energy awareness week”** in Finland. This campaign targets company personnel as well as the general public across the country, provides tools and material, organizes seminars and workshops, competitions, training, plays and information stands.

Since “raising business and consumer awareness” is a priority action in ETAP’, some Member States have developed and implemented corresponding state programmes or strategies. These include, for example, the Czech State Programme of Environmental Education and Public Awareness, the awareness and information meetings programme of the French Association of Industrial Environment Professionals or the Enviro-wise programme in the UK. The role of these programmes is to offer free, independent and confidential advice and support to businesses on how to increase profits, minimize waste and reduce their environmental impacts. Seminars and workshops are an essential part of these programmes and successful dissemination in general, but are often not mentioned explicitly in the national roadmaps.

### 2.2.6 ETAP and rural areas

The ETAP roadmaps indicate a strong potential for eco-innovation in rural areas. While there is no specific geographic scope in the roadmaps, sector/technology specific programmes are also applicable to rural areas. Initiatives mentioned in the roadmaps that are most relevant to rural areas pertain to the following sectors: renewable energy, agriculture, forestry, and water sanitation.

The sector with the most activities and the greatest number of Member States involved is renewable energy. Renewable energy, and especially bioenergy and biogas, is very relevant to rural areas. Both the agriculture and the forestry sector contribute significantly to this sector. The activity most mentioned by the MS to promote renewable energy is networking between industry and research entities: through participation in trans-national technology platforms (bioenergy, hydrogen and fuel cell, photovoltaic) and ERA-NET networks as well

as national programmes (e.g. Austria's Energy Systems of Tomorrow) and centres. For the most part, the trans-national networking activities were emphasized by the EU-15 Member States, whereas research networks in new Member States tend to be limited to the national scale. Financial instruments are also used: Germany guarantees renewable energy producers prices for electricity fed into grid. Italy is at the forefront of tradable White certificates, or Energy Savings/Efficiency certificates, where producers, suppliers or distributors of electricity, gas and oil are required to undertake energy efficiency measures for the final user.

In the agriculture sector, the focus of activities varies among the Member States. Denmark, for example, has established an Agro-Business Park that focuses on agricultural technologies and links industry and research activities. Poland, on the other hand, has placed greatest efforts on improving credit schemes for investments in agriculture. Italy, through its Sino-Italian Cooperative, provides support for sustainable agriculture and forestry management through training for rural youth on afforestation, as well as testing and disseminating best practices in agriculture and forestry.

Based on the information available in the analyzed national roadmaps, it appears that very little emphasis has been placed on the forestry sector to promote environmental technologies. As mentioned above, Italy provides assistance to Asia through training and dissemination. Germany's approach to support forestry is through fostering technology platforms and other networks, such as the WoodWisdom-Net, whose objectives are to deepen the collaboration between European funding organisations in the field of wood material science and to integrate research resources from different countries to promote the competitiveness and sustainability of the European forest cluster<sup>25</sup>.

Waste sanitation and water quality technology is another significant area of focus. Participation in the EU-level technology platform is only mentioned by Germany, and activities under this theme focus on national actions. Within the national programme "Environment and Protection of Natural Resources," the Czech Republic focuses on alternative waste technology to uphold EU standards. On the other hand, Finland, Austria and Spain focus more on water quality issues. Austria has established a national technology platform "Kompetenznetzwerk Wasser" to address floods and droughts and water management in general, while Finland's Testnet project focuses on water technology research.

Based on the information available in national roadmaps and the interviews with national coordinators, it is not possible to identify any detailed patterns or issues in relation to sector specific programmes for environmental technologies and their link to rural areas. While water sanitation and agriculture appear to a focus of activities at the national level, bioenergy is more a trans-national issue. There are, of course, exceptions, for example Italy's agriculture activities focus more on acting globally, and Member States all have national renewable energy programmes in addition to their EU-level networking activities.

The link between environmental technologies and rural areas is examined in more detail in the following sections where results obtained from case studies are discussed.

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<sup>25</sup> <http://www.woodwisdom.net>

### Key policy recommendations

- ✓ The Environmental Technologies Action Plan should be compulsory.
- ✓ To improve monitoring of progress of each Member State:
  1. The requirements of the National Roadmaps should include measurable strategic objectives, targets and milestones
  2. The guidelines for reporting should be standardised
- ✓ In order to strengthen the link between environmental technologies and the development of rural areas, the development of rural areas should be included as an ETAP-target.
- ✓ Further exchange of experience and best practice approaches among Member States is necessary, in particular to boost support for environmental technology development/ promotion in the new Member States

## 3 Environmental technologies and rural areas: case study results

A case study approach was designed to obtain more detailed information on which role environmental technologies play in rural areas and how ETAP-initiatives support environmental technologies relevant to rural development. Table 2 below summarises the 13 case studies. Importantly, in the absence of systematic data available in published sources, case study approach also helped to identify:

- the most relevant actors and markets in the development of environmental technologies (specifically, in the areas of innovation, dissemination and uptake);
- the job-creation potential of environmental technologies in rural areas; and
- how environmental technologies are disseminated and the problems experienced with their dissemination.

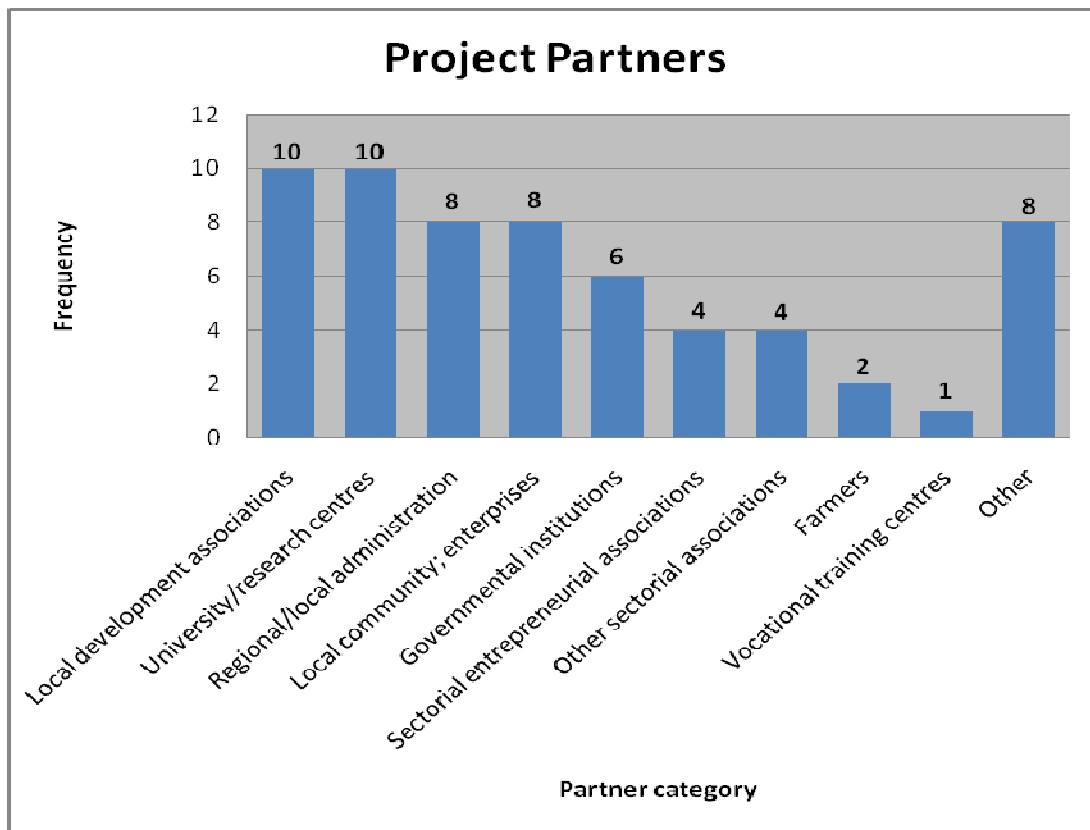
**Table 2: Case studies analysed**

No	Case study	Country	Type of environmental technology	Programme
1	Saint Hilaire du Maine	FR	Renewable energy: Heating system fueled by wood from farmland hedgerows	LEADER+
2	Depuranat	ES, PT, FR	Research project on domestic waste water purification systems using natural treatment methods	INTERREG III B
3	Bioregional Minimills Ltd.	UK	Development of new technology that can produce paper from agricultural residue (straw)	ETAP
4	Robinwood : giving rural Europe a new future	IT, DE, ES, UK, SK	Research project: Hydro-geological improvement, Optimized Forestry Development, Production of Energy from Wood	INTERREG III C
5	Facilitating innovation in	AT	Identification of the needs of existing	(Private

No	Case study	Country	Type of environmental technology	Programme
	the Lavanttal region		companies with regard to innovation, support services and job training	initiative)
6	ECO-Timber Competence-Centre	DE	Forestry (type of processing), sustainable and energy-saving housing construction	LEADER+
7	Bio-energy village Jühnde	DE	Renewable energy: bio-energy (using biomass from forestry and agriculture in a biogas power plant)	LEADER+
8	AlpEnergyWood, Wood energy promotion	IT, FR, DE, AT, SL, CH	Renewable energy: wood fuel production	INTERREG III B
9	Kilkenny Cereal Biofuel Processing Plant	IE	Production of biofuels and vehicle conversion	LEADER+
10	Estonia wastewater purification system	EE	Municipal wastewater purification system using vegetation filters	LIFE
11	RegioSustain – biomass and energy generation	DE, PL, A, SI CZ	Knowledge transfer regarding production and energetic utilisation of biomass	INTERREG IIIC
12	Centre of Experts Lower Saxony Network for Renewable Resources 3N	DE	Biomass production, education, and eco-tourism	(public private partnership-initiative)
13	Preagro II: Precision Farming	DE	Research project on Precision farming in Germany	(funded by German Ministry of Education and Research)

### 3.1 Relevant actors for environmental technologies

The successful innovation, dissemination and uptake of new environmental technologies requires the participation of relevant stakeholders, which include business actors and SMEs, national and local policymakers, farming and forestry groups, and others (as also shown in WP3 and 5). Findings from the case studies show that the most frequently occurring collaboration efforts involved partners from regional and local levels (see Figure 4). Successful co-operation among these stakeholders can greatly speed the implementation of new projects, while failure to include all relevant actors can result in unnecessary delays.



**Figure 4: Categories of partners in environmental technologies projects**

Local development associations, often established within the scope of rural development initiatives such as the LEADER+ instruments, bring together various local stakeholders through public-private partnerships. While their focus is not exclusively on environmental projects, they play a central role in promoting environmental technologies through coordination, communication and implementation activities (for example, in the Saint Hilaire project).

Regional and local administrations often provide the impetus to a project or partnership by authorising funding, co-ordinating activities, and providing access to facilities.

Researchers in academic, environmental, agricultural, economic and social research institutes can play a critical role in efforts to educate other stakeholders, encourage local acceptance and adoption of environmental technologies, or support the efficient operation of projects. Often, applied researchers can provide a bridge between R&D and the implementation of specific technologies. The Depuranat research partners, for example, coordinated activities, encouraged stakeholder participation, disseminated information, facilitated communication, conducted research, and provided funding for the implementation of pilot projects focused on wastewater treatment through constructed wetlands.

Locally based enterprises and community groups play an important role in garnering acceptance and support for a project. Their presence creates a sense of ownership among community members and they have the potential to play a key role in marketing and disseminating environmental technologies. Some of the activities taken on by local enterprises include co-ordination, implementation, administration, and dissemination.

Additionally, there are also a number of organisations ranging from small non-governmental organisations (NGOs) and village networks to supranational governance bodies that are

often involved in the partnerships. In the case studies, these organisations served primarily as a source of funding and technical expertise.

### **3.2 Renewable energies as a key market for environmental technologies in rural areas**

The analysis of national ETAP roadmaps identified renewable energies and energy efficiency as priority sectors for environmental technologies with significant potential for future development. Previous work within the RAPIDO project, and in particular the survey of innovative projects undertaken in WP1 and WP2, similarly points to renewable energies and bioenergy as having of the most recent innovations in rural areas.<sup>26</sup> Renewable energies were also identified as having a high relevance and future development potential in rural areas, with nearly one third of innovation-takers pointing to this sector as the area on which future investments should focus<sup>27</sup>. The results of WP3 confirmed that renewable energy sector offers significant potential for job creation<sup>28</sup>. Not surprisingly, renewable energies also feature as the most prominent environmental technology in the analysis of case studies. Projects linked to renewable energies were even more dominant in the pool of potential case studies.

The emphasis on renewable energies as the focus for environmental technologies in rural areas has been reinforced by policies at various levels, including renewable energy targets (Biofuels Directive, for example), the European Biomass Action Plan, extensive technological innovations and R&D investments, as well as an expected increased in demand and attention in view of international climate change mitigation objectives<sup>29</sup>. Case study research indicates that this sector appears to have received the most systematic support in terms of funding, regulatory conditions, and public dissemination. Renewable energies are well promoted by public authorities, which are key actors in innovative developments in rural areas. This holds particularly true for biomass heating plants.

A quantitative assessment of the economic potential of environmental technologies for rural areas was beyond the scope of the case study research. Indeed, most case study projects did not have profit generation as a primary aim, or were not able to estimate the economic impact beyond effects on job creation as discussed in the following section. Many of the projects had networking, capacity building, and promotion of technologies as their primary objectives (for example, Robinwood and AlpEnergy) or were at a pilot stage. Only the Bioregional Minimills initiative has foreseen direct incomes from the projects. A less frequently occurring but still significant impact was the creation of small and medium enterprises. Three of the projects resulted in the creation of small and medium-sized enterprises (SMEs) and one project lent support to SMEs.

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<sup>26</sup> The definition of this sector is broad and includes cases of diversification of agriculture through the introduction of environmental technologies, establishing new processes to use renewable resources in the production of goods or products, obtaining and using renewable energy on farms and the production of bioenergy.

<sup>27</sup> RAPIDO, 2008: Report on results of questionnaire on promising concepts and areas where to focus for innovation in agriculture forestry and food industry. Deliverable No.: 2. Fördergemeinschaft Nachhaltige Landwirtschaft e.V. (FNL), Germany.

<sup>28</sup> RAPIDO, 2008: Sectors where innovation enhance rural employment. Deliverable No.: 3. University of Trás-os-Montes e Alto Douro (UTAD), Portugal.

<sup>29</sup> See, for example: Hillring, Bengt, 2002: "Rural development and bioenergy – experiences from 20 years of development in Sweden", *Biomass and Bioenergy* 23: 443 – 451. and Madlener, Reinhard and Martin Koller, 2007: "Economic and CO2 mitigation impacts of promoting biomass heating systems: An input-output study for Vorarlberg, Austria". *Energy Policy* 35 (12): 6021-6035. and Hillebrand, Bernhard, 2006: "The expansion of renewable energies and employment effects in Germany", *Energy Policy* 34(18) p. 3484-3494

### 3.3 Job creation potential of environmental technologies

Previous surveys and literature review found that rural innovation creates a positive impact on job creation and job security and that most of the new jobs were related to biofuel production<sup>30</sup>. Key findings from the case studies reflect these conclusions; however, the full impact of the projects on the local economy is difficult to judge, given the temporary nature of some of the jobs and the exclusion of a multiplier effect in the analysis. The following is a descriptive depiction of job statistics based on the case studies.

For the eleven projects for which there was reliable employment information had a positive effect on job creation, both directly through the opening of project positions and indirectly through increased local demand for supporting services (e.g. construction). Among the nine projects for which firm figures were available, a total of 56 new positions were directly created. As shown in Figure 5, over half of these positions (31) were full-time, whereas the rest were part-time. As shown in Figure 6, technical positions made up the largest share of new jobs created (a total of 24), followed by service positions (a total of 13).

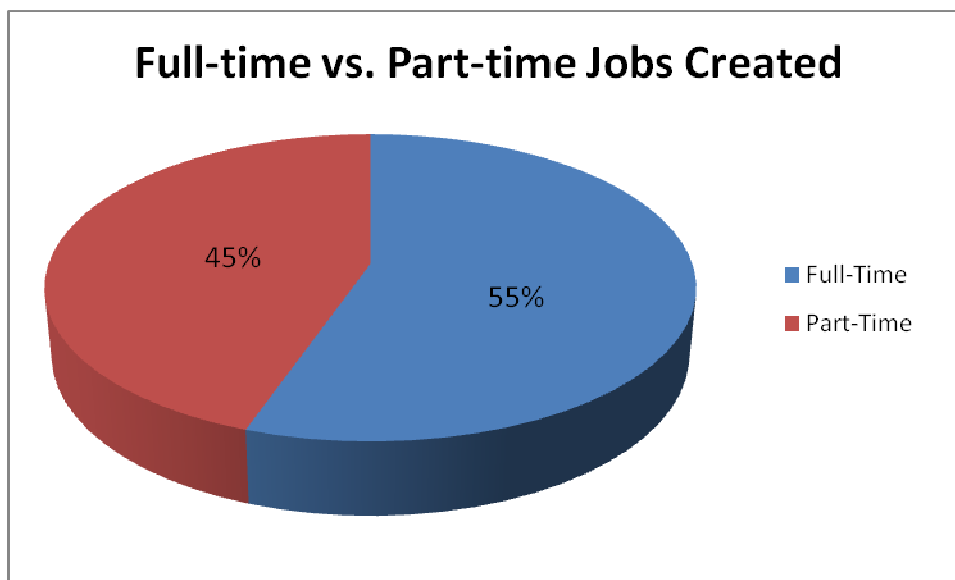
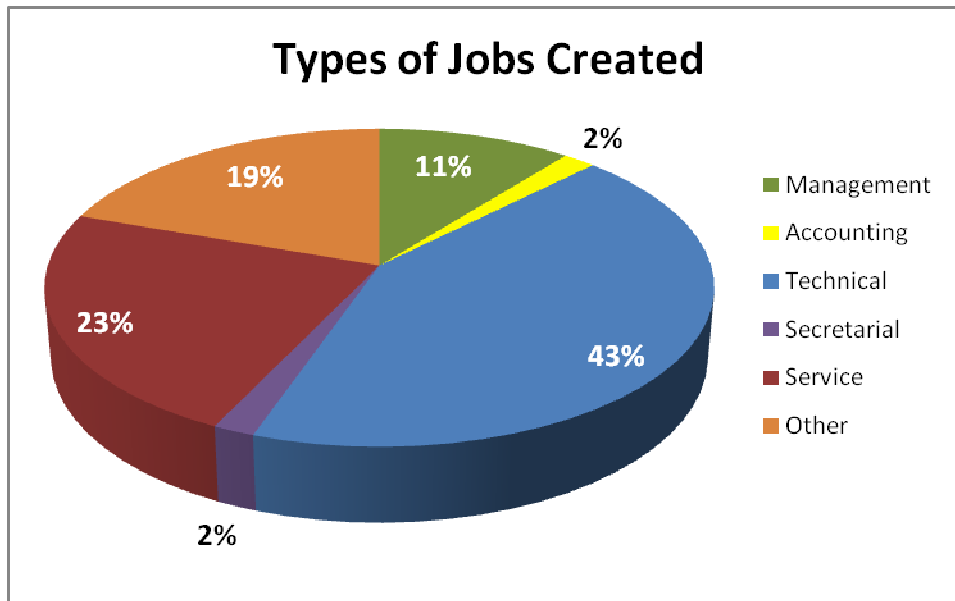


Figure 5: Shares of Full-time and Part-time jobs created

<sup>30</sup> ADAS consulting LTD., 2003: "Renewable Energy and its impact on Rural Development and Sustainability in the UK." Del Rio, Pablo, and Burguillo, Mercedes, 2008: "Assessing the impact of renewable energy deployment on local sustainability: towards a theoretical framework." *Renewable and Sustainable Energy Reviews* 12 (2008) 1325-1344. Kammen, Daniel, Kapadia, Kamal, and Fripp, Matthias, 2004: "Putting renewables to work: how many jobs can the clean energy industry generate?" Goldman school of public policy, University of California, Berkeley. 13 April 2004



**Figure 6: Types of jobs created in case study projects**

The projects also had the effect of supporting complementary industries in the region. For example, the Bioregional MiniMills project secured the jobs of as many as 50 mill workers in the UK. Another benefit of several of the projects was that many stakeholders received training regarding the technical innovations being introduced. For example, 511 participants of the Preagro project received training over a two year period through the hosting of a number of seminars. Innovation initiatives in the Lavanttal also incorporated large training components into their projects, training upwards of 150 and 230 individuals respectively. Jühnde and Estonia Wastewater also had notable training programs.

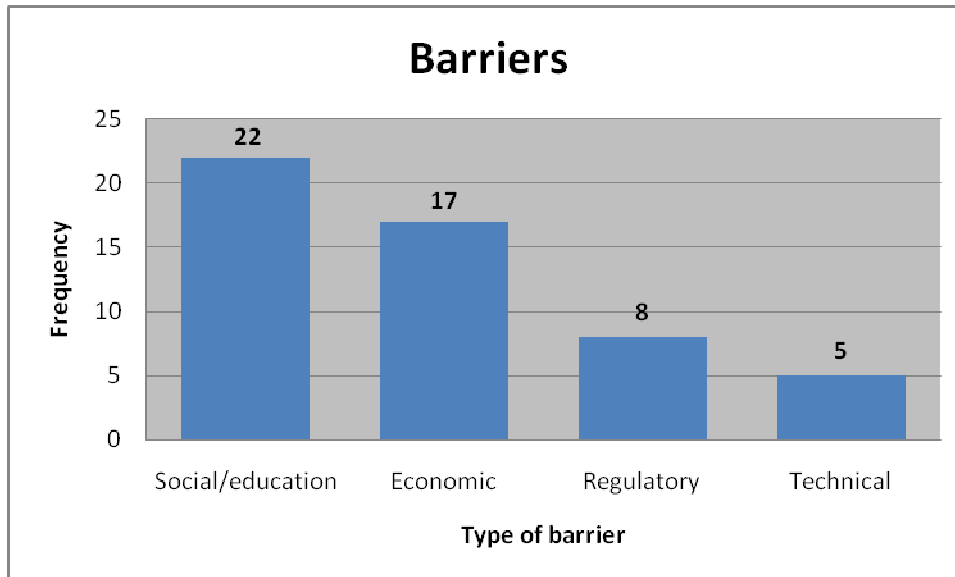
These findings support those of Work Package 2, which suggest that the field of renewable energy production reveals a clear-cut potential for job creation in EU rural areas, especially in the bioenergy and the forestry sectors. This is mainly due to external factors such as domestic policies (CAP reform, Biofuels directive) influencing land-use and energetic crop production, as well as to technological innovations and an expected increase in demand.

### 3.4 Barriers to environmental technologies

Results from the case studies generally supported findings from previous studies and surveys, but the results were mixed when the barriers to environmental technologies were considered. The studies and surveys all identified similar barriers; however, the frequency with which they occurred varied. According to the literature review, the most common obstacles were bureaucratic and regulatory<sup>31</sup> However, findings from the review of ETAP initiatives and WP2 survey results highlight economic and technological obstacles as the most frequent challenges. As shown in Figure 7 below, the most often cited barrier by case study respondents dealt with social and educational barriers.

<sup>31</sup> Hillring, 2002: Rural development and bioenergy – experiences from 20 years of development in Sweden. *Biomass & Bioenergy* 23, 443-451. and Hadjimanolis, A., 1999: Barriers to innovation for SMEs in a Small Less Developed Country (Cyprus). *Technovation* 19, 561-570. and Wickenhagen, A., Pontieri, A. and Gerhard K. H., 2002: Innovative Rural Development Initiative. Case Study 5: Mechanic: A private initiative to establish a high-tech company in Carinthia, Austria. Extracted from the IIASA Interim Report IR-02-014. International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria.

The discrepancies begin to dissipate when we disaggregate each group of barriers within the case studies. For example, there were six subcategories under social and educational barriers and only two subcategories listed as technical barriers. Lack of infrastructure, a type of technological barrier, occurred more frequently than any of the subcategories of social and educational barriers. When the disaggregate is considered, the lack of finance (as an economic barrier subcategory) is also among the most frequently cited barriers, bringing the case study results in agreement with the ETAP review and the WP2 survey results.



**Figure 7: Types of barriers to the introduction of environmental technologies in rural areas identified in the examined case studies**

### 3.4.1 Technical Barriers

One common technical barrier encountered by the initiatives was a lack of sufficient infrastructure. For example, the Depuranat initiative often found that the sewage systems often did not have the capacity to handle the volumes required for their waste water purification systems. Construction also was a problem for some of the projects. For example, the Jühnde project experienced numerous delays in the building of the biomass power plant which slowed progress. Perhaps the most common technical barrier to project success was a lack of technical knowledge, which is not surprising given the pioneering nature of many of the projects.

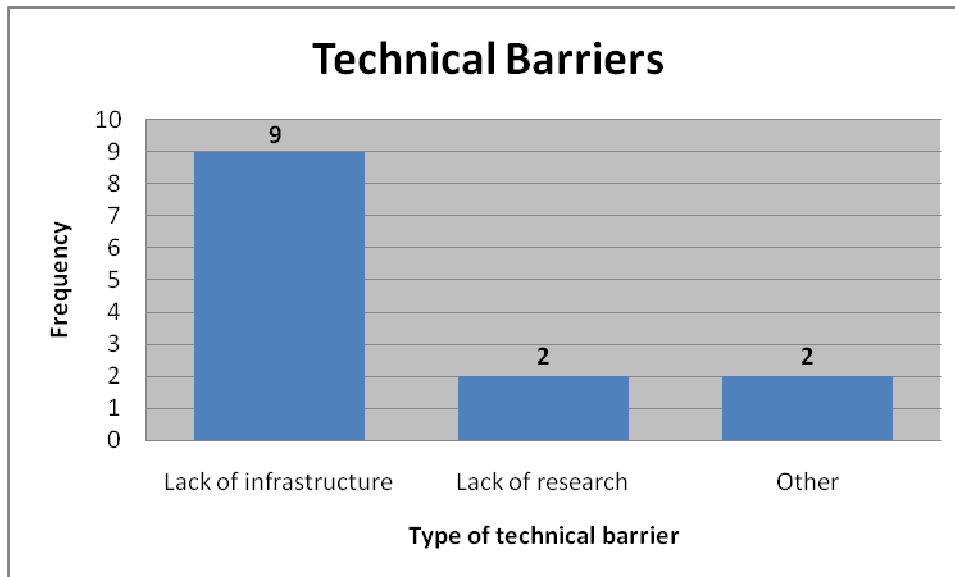


Figure 8: Types of technical barriers identified in the examined case studies

### 3.4.2 Regulatory Barriers

Various regulatory barriers became obstacles to project commencement and implementation. Many local government authorities has burden some processes for reviewing and approving new projects which were time consuming and did not often properly account for new environmental technologies. This problem was amplified for projects requiring the approval of multiple jurisdictions. The Eco-Timber project required local authorities to modify existing land use plans in the city of Dahlen. Many of the projects found existing regulations to be unfriendly to innovation and sometimes even disincentivised innovation. For example, an observation from the Saint Hillaire case study was that in some cases it was often more profitable for a farmer to spend time on administrative paperwork in order to maximize payments from Common Agricultural Policy (CAP) rather than sustainably harvest hedgerows. Other projects were unable to move forward until existing legislation was changed to accommodate the new technologies.

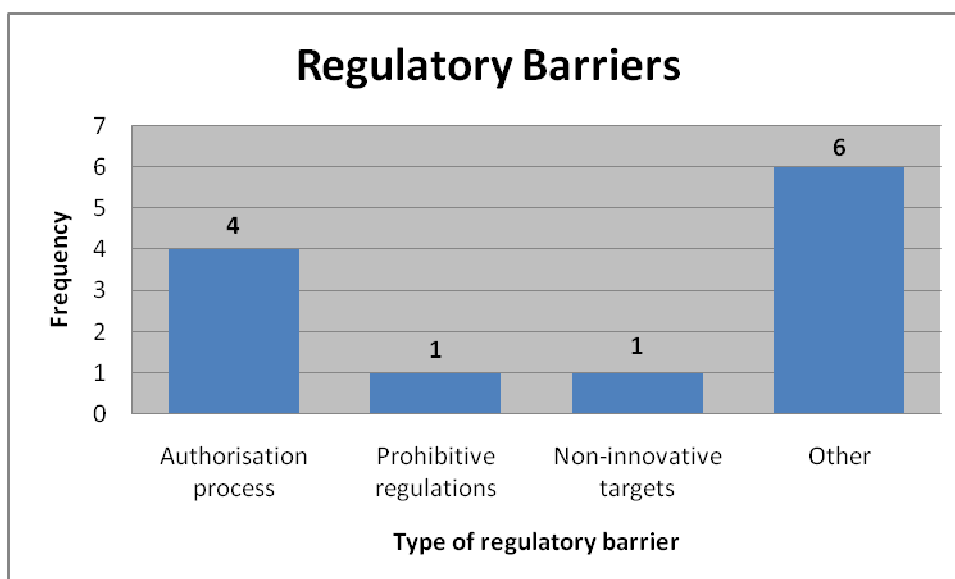


Figure 9: Types of regulatory barriers identified in the examined case studies

### 3.4.3 Economic Barriers

Many of the projects had difficulty securing financing and investment. Several projects had high upfront costs and were unlikely to be self-financing in the short term. For the Kilkenny project, this challenge was complicated by uncertainty over the whether they would be able to secure biofuel tax breaks. Often, public financing was not available. Even when financing was secured, funds were not available at the times needed in the case of the Wastewater Purification project. The Alpine Energy project found that their budget did not take into all costs eventually encountered. One of the more stubborn economic barriers was the financial accounting system itself. Market alternatives to environmental technologies often do not have to account for the negative externalities of their practices, nor can new technology projects always financially capture many of the environmental benefits on their income statements. This was part of the findings during the implementation of natural wastewater treatment systems in the Depuranat project. Uncertainty about the financial benefits of a new technology among stakeholders sometimes was a significant barrier to widespread adoption, as the Preagro project discovered for the introduction of precision farming technologies. This problem was compounded by the expectation of high initial costs until economies of scale could be achieved. Lastly, some projects found it difficult to gain access to the marketplace.

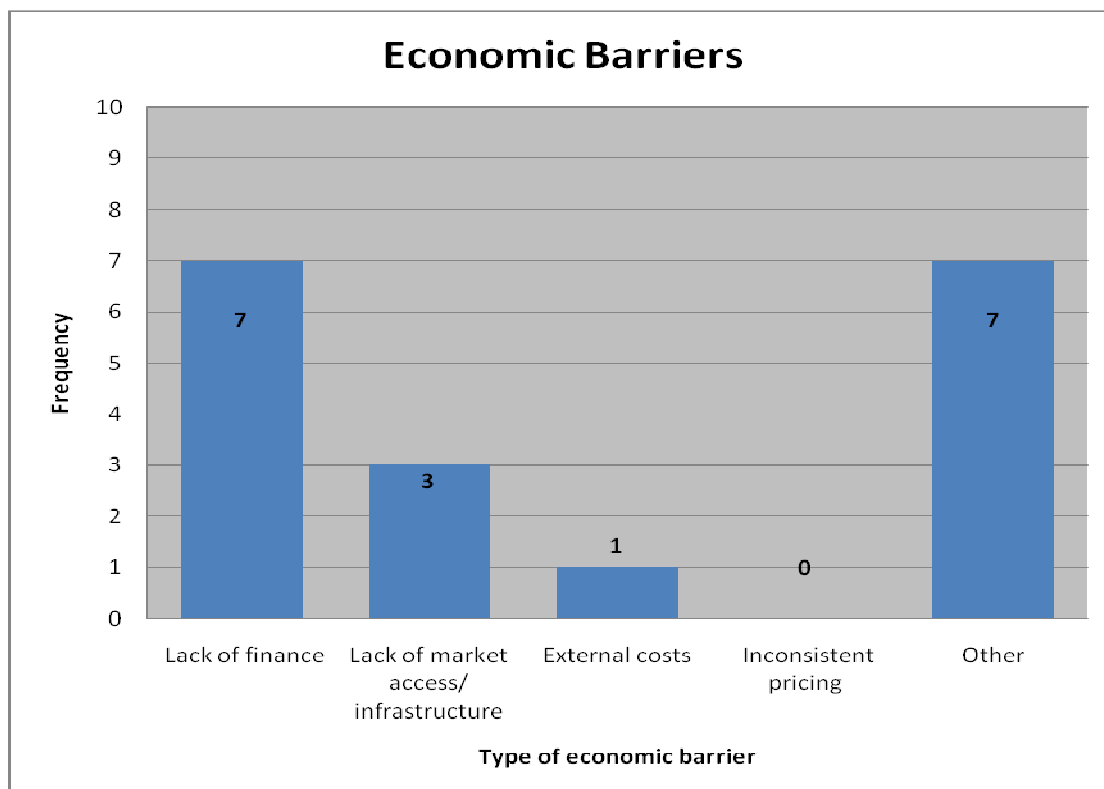


Figure 10: Types of economic barriers identified in the examined case studies

### 3.4.4 Social and Educational Barriers

One challenge encountered by almost all projects was gaining acceptance for new technologies by stakeholders, be they clients, business partners, neighbours, or government officials. Many of the technologies were completely unfamiliar to the various stakeholders. This information gap complicated the resolution of many of the regulatory and financial barriers. Even those stakeholders who were enthusiastic about the new technologies often did not have the technical knowledge or expertise to properly implement them, nor were

there always enough sufficiently trained individuals available locally to operate them. Largely due to this disconnect, many projects had problems formulating effective communications strategies. This task was made more difficult by a lack of informational and teaching materials. Language barriers also presented problems for some projects.

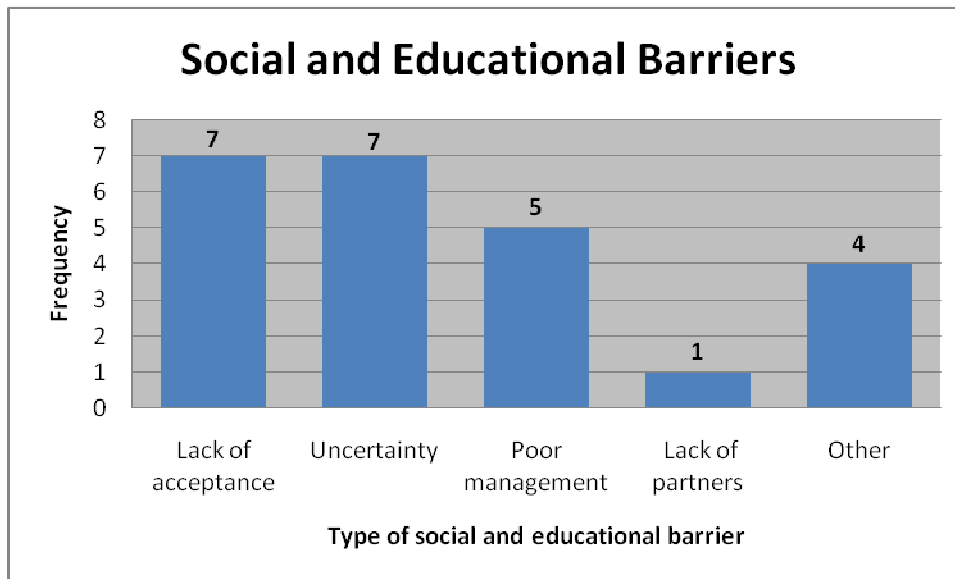


Figure 11: Types of social and educational barriers identified in the examined case studies

### 3.5 Dissemination of environmental technologies

Business or innovation networks can contribute substantially to the successful dissemination of environmental technologies. Several case study projects focused on the creation of networks for the exchange of experience, know-how and capacity building. Support for these projects came largely through the EU regional development funds, in particular the INTERREG funding instrument which links stakeholders across national borders. For example, RegioSustain project developed cooperation and knowledge transfer on the topic of renewable energies, linking German, Czech, Polish, and Slovenian actors. This 'external' stimulus and support was instrumental in the development of a local district heating plant in Slovenia, and in contributing to increased awareness of renewable energy potentials in the other partner regions.

Another case study project – Jühnde BioEnergy Village – mentioned the European LEADER+ Renewable Energy Network (ELREN)<sup>32</sup>, which has several aims. First, it facilitates exchange among LEADER+ Local Action Groups throughout the EU of technical know-how, application experiences, basic commercial information and co-operation opportunities in the fields of Production of Energy from Renewable Sources (REprod) and of Energy Performance of Buildings (EnSav). Second, it encourages application of micro-technologies in rural areas by local public institutions and agencies, SMEs and private households. Third, it disseminates basic information on country policies relating to renewable energies, the applicable legislation and available funding / incentives.

Local and regional government officials were identified as a target of most stakeholder communication strategies, given their potential role as a facilitator in the approval and adoption process of environmental technologies. Building confidence in new environmental

<sup>32</sup> Website: <http://www.elren.net>

technologies among government officials was a key factor in the long-term success of many case study projects. Government buy in was necessary not only for obtaining required approvals and regulatory amendments, but also for encouraging the more widespread promotion and adoption of the technologies. The occasionally difficult and time consuming process of working with governmental officials often led to the beneficial result of a more streamlined process, hopefully paving the way for more rapid approval of similar projects in the future. A good communication strategy targeted at the government was also viewed as a way of reducing the risk of future regulatory burdens being adopted in the future. While email was effectively used for much of the day-to-day correspondence, nearly all projects provided for significant face time with the various stakeholders, which often took the form of regular meetings or the creation of standing committees.

In terms of dissemination instruments, the case study results illustrate that a variety of different media and processes are relevant for the dissemination of environmental technologies. Project and technology information, for example, was distributed through:

- Websites;
- TV and radio coverage;
- Radio spots;
- Press conferences;
- Newspaper articles
- Newsletters and brochures;
- Journal publications;
- Hotlines; and
- Advertising campaigns.

This was combined with various forms of public outreach, including:

- Public events, seminars and workshops;
- Training courses;
- Committee meetings;
- Town halls;
- Site visits; and
- Trade fairs.

**Key policy recommendations:**

- ✓ Efforts to bridge the gap between technological innovation and the market should be prioritised.  
E.g. by providing financial support to local investors to reduce risks early on in the innovation process
- ✓ Remove various regulatory barriers that prevent project commencement and implementation  
E.g. by shortening authorisation processes, reducing the level of bureaucracy and administration work linked to funding and thus the creation of innovation-friendly regulations.
- ✓ There is a need for appropriate marketing and knowledge transfer about the benefits that can be generated through the implementation of environmental technologies.
  1. These benefits need to be highlighted by relevant policies at all levels and marketed at project level to inform relevant stakeholders and stimulate the uptake of environmental technologies.
  2. The long-term policy objective should be to assign monetary value to these environmental and social-economic effects, to ensure that the positive externalities of environmental technologies can be internalised.

## **4 Conclusions and policy recommendations**

While the Environmental Technologies Action Plan has significant potential to streamline and focus Member States' efforts with regard to environmental technologies, its voluntary nature represents a constraint on the transparency of its implementation as well as possibly its effectiveness. Since information included in the roadmaps is up to the discretion of the Member State, it remains unclear to what extent the roadmaps support the promotion of environmental technologies. The roadmaps point to many activities currently underway in the EU, and it is evident that MS are focused on increasing new environmental technologies. In the absence of roadmaps in some Member States (for example, Slovenia, Lithuania, Bulgaria, Estonia, Luxembourg), it is not possible to say to what extent efforts across the EU are sufficient. The implementation report on ETAP as well as the information that was obtained directly from authorities responsible in Member States for ETAP implementation do not allow for sufficiently critical and in-depth evaluation of ETAP implementation. It was not possible to clearly see how activities related to ETAP were complementary (or possibly overlapping) with each other.

### *Policy Recommendations*

The key findings highlight areas for policy makers to improve uptake of environmental technologies across the EU, especially in rural areas. Currently, the Environmental Technologies Action Plan (ETAP) has limited visibility and its voluntary nature limits its

effectiveness. In addition to making ETAP compulsory, improvements could be made to the requirements of the national roadmaps to enhance implementation and communication between countries to overcome shared challenges. For example, the current toolbox of possible instruments to support environmental technologies could be enhanced by a requirement to introduce strategic objectives, targets and milestones to the national roadmaps. More measurable objectives and standardized guidelines for reporting would help to monitor progress and increase awareness of the technologies and ETAP itself.

Furthermore, the link between ETAP-related initiatives and rural areas often remains unclear. Thus it is difficult to determine how those initiatives support environmental technologies relevant to rural development. By setting up the development of rural areas as an ETAP-target this link could be strengthened.

In addition, the variation in the extent and focus of ETAP-related activities in individual Member States suggests that further exchange of experience and best practice approaches among Member States is necessary, in particular to boost support for environmental technology development/ promotion in the new Member States. In addition, policy makers should prioritise efforts to bridge the gap between technological innovation and the market, as well as remove various regulatory barriers that prevent project commencement and implementation. In part, the former might be achieved by providing financial support to investors such as local or regional communities, development associations etc. to reduce risks early on in the innovation process. Removing regulatory barriers will rely on shortening authorisation processes, reducing the level of bureaucracy and administration work linked to funding and thus the creation of innovation-friendly regulations.

Finally, successful promotion of environmental technologies requires appropriate marketing and knowledge transfer about benefits that can be generated through its implementation. While financial benefits are often generated using a long-term perspective and are difficult to assess or play a minor role, positive environmental as well as socio-economic impacts provide a wide variety of clear non-monetary values that can boost rural development. Those values could comprise improvement of water quality, preservation of landscapes, sustainable use of resources, climate-friendly production methods (from an environmental perspective) as well as improvement of self-confidence of general population and their identification with the region itself, increasing stakeholder engagement in associations and improvement of social relations (from an social-economic point of view).

In the short term, these benefits need to be highlighted by relevant policies at all levels and marketed at the project level to inform relevant stakeholders and stimulate the uptake of environmental technologies. In the longer term, the policy objective should be to assign monetary value to these environmental and social-economic effects, to ensure that the positive externalities of environmental technologies can be internalised.

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<sup>33</sup> Final Roadmaps are available at: [http://ec.europa.eu/environment/etap/roadmaps\\_en.htm](http://ec.europa.eu/environment/etap/roadmaps_en.htm)

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## Annex I: Case Study Guidelines

### 1 General data

- **Project Title**
- **Environmental technology** (*tick box(es) and specify*)
  - Biofuels
  - Renewable energy
  - Water recycling
  - Forestry
  - Flood prevention
  - Agricultural techniques
  - Others (*please specify*)
- **Short description of project objectives** (max ½ page)  
→ *Please describe in a few sentences the type of environmental technology involved.*
- **Contact**
  - Name
  - Institution
  - Position
  - Address + country
  - E-mail
- **Duration of project** (beginning and end)
- **What are the main financial sources of the project?** (*tick box(es) and specify, indicate the budget in €*)
  - EU programmes/projects (LEADER, LIFE, INTERREG...)
  - National programmes/projects
  - Regional programmes/projects
  - Local programmes/projects
  - Private funds
  - Self-Financing
  - Others (*please specify*)
- **Level of implementation** (*tick box(es) and specify*)
  - Local (e.g. just one village, one town)
  - Regional (for example, federal state)
  - National
  - EU-wide
- **Profile of rural area**
  - Inhabitants/km<sup>2</sup>,
  - Unemployment rate,
  - Development of infrastructure (transport, social/ medical/educational facilities)
  - Main source of income
  - Others (*please specify*)

## **2 ETAP-relevance**

*Please take into account that exist several technology programmes can exist, which have been established under the ETAP-programme, but are not named after ETAP or known as ETAP-relevant.*

- **Is the project part of a broader national environmental technology initiative (similar to ETAP)?**
- **Is the project part of another action plan (for example, biomass or forestry plan) or associated with a local/regional/national development strategy? Please specify.**
- **Have you heard of the ETAP Programme (provide footnote on ETAP)<sup>34</sup>? If so, where or from whom did you hear about it? What do you know about it?**

## **3 Market relevance**

*Overall aim of this section: Identification of the markets most important for environmental technologies (some case studies might give information on the market potential of the selected technology; in others, this might not be relevant at all)*

**Is the project relevant from a market perspective? (tick box(es) and specify)**

- Establishing a new technology/product/ process
  - Purchasing industrial property rights
  - Creation of small and medium sized entrepreneurships
  - Others (*please specify*)
- **Which marketing channels do you use? Is there a link with public procurement (i.e. specific state, regional institutions targeted)?**
  - **Was there profit generated by the initiative? Please provide the amount if available.**

## **4 Actors/Stakeholders**

*Overall aim of this section: Identification of the actors most important for environmental technologies (actors important for innovation, dissemination and uptake)*

- **Who initiated the project and for what reason? (tick box(es) and specify)**
  - Local/regional population (e.g. farmers, landowners; working groups)
  - Local, regional, national authorities (e.g. farmers associations, forest/agriculture office etc.)
  - EU public authorities;
  - Business partners;

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<sup>34</sup> The ETAP program was established by the EU in 2003 to promote environmentally friendly technologies to promote job growth in a sustainable way. The Plan aims to establish actions around three main themes: 1) getting from research to markets; 2) improving market conditions and 3) acting globally. In 2004 a Commission Communication on ETAP set up 25 actions around these three themes. The following questions aim at evaluating the role of ETAP (Environmental Technology Action Plan) in fostering innovation in rural areas.; See [http://ec.europa.eu/environment/etap/index\\_en.htm](http://ec.europa.eu/environment/etap/index_en.htm) for more details; COM (2004) 38 Stimulating Technologies for Sustainable Development: An Environmental Technologies Action Plan for the European Union.

- NGOs
- Other (*please specify*)

● **Who provided incentives for the initiative?** (*tick box(es) and specify*)

- Consultants
- Business partners
- Local Authorities /programmes
- National/regional authorities programmes
- Client
- Others (*please specify*)

● **Target group addressed by the project?** (*tick box(es) and specify*)

- Farmers
- Small and medium sized entrepreneurships
- Research institutes
- Others (*please specify*)

● **Who are/were the organisation partners during the process of innovation (designing and/or implementing)?**

*Here are some possible activities (roles):*

- Leader/champions
- Coordination, administration etc.
- Stakeholder involvement
- Dissemination/Communication
- Implementation of initiative
- Providing financing
- Others (*please specify*)

<b>Actors</b>	<b>Name of Actor</b>	<b>Activities (role), provide details if possible!</b>
Local development association(s)		
Sectorial entrepreneurial association(s)		
Other sectorial association(s)		
Governmental institution(s)		
Regional/local administration		
Vocational training centre(s)		
University(ies) and/or research Centre(s)		
Local community; enterprise(s)		
Farmer(s)		
Unemployed persons		
Others ( <i>please specify</i> )		

## **5 Impacts resulting from the innovative initiative**

- **What kind of impacts have been generated (see examples below, please provide additional information if available)?**
  - Quantitative (N° of jobs created) and qualitative impacts (permanent jobs) on employment (if yes, please provide details under the 'job creation potential' question that follows)
  - Income generation effects (e.g. by hiring land to set up windmills, compensation payments for the local community, profits from new business/industries/sale)
  - Demographic impact (e.g. fixing people on the territory; immigration instead of migration)
  - Promotion of local self-sufficiency (e.g. increased energy supply)
  - Educational impacts (specific training activities which increases education/training skills of local population)
  - Impact on the productive diversification of the area (exploring further economic sectors besides agriculture such as tourism, social services, ICT etc.)
  - Social cohesion and human development (improvement of socioeconomic prospects of young population and of self-confidence of general population; increasing stakeholder engagement in associations, improvement of social relations etc.)
  - Impact on tourism (projects provide a "demonstration effect" and attract visitors)
  - Industry creation (?)
  - Impact on the municipal budget (community receives compensations from the company; successful implementation of project may entail granting of subsidies to the firm and local community from EU/national or regional funds)
  - Endogenous development (use of local available human, physical and capital resources)
  - Ecological impacts (improvement of water quality, preserving landscapes etc.)
  - Others: \_\_\_\_\_
  
- **How are the benefits distributed among stakeholders (i.e. who gets what and to what extent)?**

### **Job creation potential/effects**

*Overall aim of this section: How jobs have been created and the potential for further job creation or diversification*

- **Due to the implementation of innovations that you know about, have ...**

	Yes	No	Don't know	In case of „yes“, how many / which?
... existing jobs been secured?	( )	( )	( )	
... new jobs been created?	( )	( )	( )	
... new sources of income been generated?	( )	( )	( )	
... improvements in areas such as environmental protection, nature conservation, social structure etc. been achieved?	( )	( )	( )	

• **What types of jobs have been created / secured?**

Type of job	( X )	Full or part time	Do the jobs run beyond the length of the project duration? How long?	Number
Management	( )			
Accounting	( )			
Technician	( )			
Secretariat	( )			
Service	( )			
Others _ _	( )			

• **In what sectors have new jobs been created? (agriculture, tourism, social services, forestry ...)**

• **Have stakeholders/employees received training before/during the innovation process?**

- Type (e.g. continuing vocational training, sporadic vocation training or specific training for ICT\* use)
- Duration (months, years ...)
- Funding (funding sources and amount of funding)

• **What and how many stakeholders participated in such training activities?**

**6 Implementation process and Obstacles/Barriers experienced**

• **How long did the process of implementing particular innovations last from the first idea to complete setup? (months or years)**

• **Which barriers have you experienced during the implementation of the environmental technology/initiative? (tick boxes and describe in detail)**

Technical barriers:

- Lack of technological infrastructure (equipment, knowledge...)
- Lack of research
- Others (*please specify*)

Regulatory barriers:

- Prohibitive regulations (e.g. regarding planning and safety)
- Inadequate authorisation processes
- Non-innovation friendly use of public funds (non-innovation targeted public procurement and infrastructure choice)
- Other (*please specify*)

Economical barriers:

- Lack of financing/investment
- Lack of access to market and/or infrastructure

- Inconsistent pricing structures
- Non-internalisation of external costs (e.g. costs for water purification)
- Other (*please specify*)

Social and educational barriers:

- Lack of consultation before or during the implementation process
  - Poor management (lack of stakeholder engagement, poor internal communication)
  - Lack of acceptance from clients, business partners, neighbours etc.
  - Lack of partners
  - Limited access to information and communication technology (ICT)
  - Uncertainty due to lack of education, training, knowledge
  - Other (*please specify*)
- How did you overcome these barriers?

## **7 Communication and Dissemination**

*Overall aim of this section: How to raise awareness about the availability of environmental technologies, which actors (governments, business, NGOs, the media, financial institutions)*

- **How did you (and relevant stakeholders) obtain information relating to the environmental technology/initiative?**
- **Which media do you use to disseminate information on your project/environmental technology?**
  - Website
  - Newsletter
  - Public events
  - Demonstration trainings
  - Technology platform, stakeholder form etc.
  - Published studies
  - Flyer
  - Others (*please specify*)
- **Is your project/initiative part of a business/innovation network or technological platform?**
- **Which media do you use to communicate with relevant stakeholders in the project?**

## **8 Outlook to future action**

- **Where do you see the role of government (on a regional, national and EU-level) in fostering openness for innovation and assisting in the implementation of environmental technologies? Please indicate briefly which political measure would be appropriate to address the main problems.**
- **On which environmental technologies should future investment in rural areas be focused and why?**