

# **Cleantech Finland – improving the environment through business**

*Finland's national action plan to develop  
environmental business*





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## ***Business will play a crucial role in meeting global environmental challenges***

Climate change and the deterioration of the environment are global concerns. The sufficiency, rising costs and increasing regulation of energy and natural resources are also the focus of keen discussion. All of these factors have boosted technological developments and the growth of environmental business. In future, environmental expertise and business will play a crucial role in solving environmental problems. However, this will require the rapid development of environmental markets. Environmental industries and services, and especially 'clean technologies', are expected to become the fastest growing sector this century. Environmental expertise can be defined as the ability to use energy and materials more efficiently based on life cycle approaches and the avoidance of negative environmental effects.

Finland's positive image in environmental issues and as a high-tech country helps to promote exports of environmental expertise and the growth of the sector and its labour force. However, we have not yet been able to fully exploit our potential. Even though Finland has often been rated as one of the world's leading countries in the environmental sector, we have not been as successful in terms of exports, especially where small and medium sized businesses are concerned. This slow growth is due to weak expertise on trade issues within companies, the dispersed nature of the sector, and the relative unwillingness of national markets to adopt new innovations. On the other hand, Finnish multinational companies are well represented among business leaders in environmental expertise.

The Environmental Programme of Sitra, the Finnish Innovation Fund, was established to encourage the development, internationalization and integration of the environmental sector. Sitra has been active in environmental issues ever since its foundation. Significant early projects have included a basic assessment of the state of the environment in Finland (1968–1970), major waste inventories in industry (1971–72), a large-scale community water and environment project (1973–77) and an industrial wastewater project (1978–81). These Sitra projects contributed to the formation of the energy department within the Ministry of Trade and Industry in 1975, and to the establishment of the Ministry of the Environment in 1983. Sitra now aims to pave the way once more for a major renewal of industry and services. This time round, such efforts are focusing on the emergence and growth of new businesses based on clean technologies - known for short as 'cleantech'.

The new national action plan has been drafted to kick-start developing environmental businesses. The plan aims to create a common vision that will encourage cooperation between businesses, research institutions, public administration and financiers in the necessary national development projects.

The National Action Plan has been prepared together with the business sector, related organizations, the authorities and research institutes. We want to extend our warmest thanks to all parties for their enthusiastic and active participation in the preparation of the Action Plan during autumn 2006.

Helsinki, 15 January 2007

On behalf of the Environmental Programme of Sitra,

Esko Aho  
President

Jukka Nojonen  
Executive Director, Environmental Programme

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## **Summary: Environmental business as a new foundation for Finnish industry – project implementation and recommendations**

The total value of global environmental business markets is around 600 billion euros. Traditional environmental technologies are emphasized in this estimate, and new clean technologies are not yet significantly included in the statistics. The whole sector is growing by around 10 per cent. Clean technologies are growing fastest: for example, the annual increase in wind and solar power technologies is as high as 30%. Legislation has traditionally been the driver for growth. The rising prices of energy and natural resources make clean technologies more viable. The economic consequences of climate change and its harmful environmental impacts are becoming even more important drivers for growth than legislation.

Finland has a strong environmental image. In international comparisons of sustainability Finland has been ranked among the best in world. The turnover of Finnish environmental business is estimated to be around 4.5 billion euros. At the beginning of the current decade there was considerable concern as the field only seemed to be increasing by about 3% annually – much less than in other countries. The main engines of environmental business in Finland are the few strong companies operating in international markets. Many Finnish small and medium-sized enterprises (SMEs) are constantly creating new technologies, but there is still plenty of unrealized potential for the commercialization of their products, especially as the sector is very dispersed in Finland. Clustering is only at its early phase, and regulation and incentives defined by the public sector influence markets considerably. More cooperation is therefore needed between smaller and larger companies.

According to the vision set out in the new National Action Plan, Finland will be a leading cleantech country by 2012.

To achieve this vision, the plan recommends four strategic projects to be initiated during the period 2007–2012:

1. **Finland – the most well-known cleantech country globally.** Environmental expertise is a key factor behind the competitiveness of exports, and serves as a top-brand.
2. **Finland as an optimal platform for the growth of environmental business.** By developing the national business environment Finland will become a pioneering market with enhanced environmental expertise.
3. **Finnish excellence in focus areas.** A strategic center for energy and environment will be established.
4. **Most efficient international business networks.** Finland will build up incentives for cooperation and establish enhanced best practices. A special programme will be set up for growth companies.



Initiating these projects will require wide-ranging efforts beginning from early 2007 onwards. First, the Government Programme of the new government must define the requisites for environmental business. Second, functioning of cooperation networks in the focal areas must be taken care of. Thirdly, the coordination of developing environmental business must be organized. For these reasons, turning environmental expertise into success factor requires a strategic owner that is responsible for coordination and promotion of development.

Project	Action	Responsibility*	Timetable	Recommendations
Finland – the most well-known cleantech country globally	Environmental expertise into a top brand	<b>Finpro</b> , companies, Environment forum, Lahti Science and Business park, Sitra	2007–2012	<ul style="list-style-type: none"> <li>- Marketing and communication programme</li> <li>- Building a brand utilizing Finland's image</li> <li>- International networks with Finland and the EU as channels</li> </ul>
Finland as the optimal growth platform for environmental business	Finland as a pioneering market	<b>Ministry of Trade and Industry</b> , Ministry of Agriculture and Forestry, Ministry of Finance, Environment Forum	2007–	<ul style="list-style-type: none"> <li>- Environmentally and innovation friendly public procurement</li> <li>- Verification of eco-efficiency</li> <li>- Broad cooperation between the private and public sectors</li> </ul>
	Environmental and business views into education	<b>Ministry of Education</b> , Environment Forum	2008–	<ul style="list-style-type: none"> <li>- The best material efficiency service center in the world</li> <li>- Environmental business into education</li> </ul>
	Financing system supportive of innovations	<b>Ministry of Trade and Industry</b> , Sitra, Ministry of Finance	2008–	<ul style="list-style-type: none"> <li>- Capital fund for environmental work</li> <li>- Tools for financing reference plants and feasibility studies</li> </ul>
Finnish excellence in focal areas	A Strategic Centre for Science, Technology and Innovation (SHOK)	<b>Companies</b> , Academy of Finland, Tekes	2008–	<ul style="list-style-type: none"> <li>- SHOK to become the engine of national development</li> <li>- Developing environment based business through SHOK</li> </ul>
	Centre of Expertise programme	National Cleantech Cluster, <b>Lahti Science and Business Park</b> , Ministry of Trade and Industry, Ministry of the Interior	2007–2012	<ul style="list-style-type: none"> <li>- Centre of Expertise programme develops regional cooperation, the division of labour, and the national cleantech centres.</li> <li>- Foresight system operational</li> </ul>
	Foresight	<b>Ministry of the Environment</b> , SHOK, Finpro, Sectoral Research Institutions	2008–	<ul style="list-style-type: none"> <li>- Basis for evaluations and a focus for developing environmental expertise and research</li> </ul>
	Evaluating environmental know-how	<b>Ministry of Education</b> , Academy of Finland, SHOK	2008–	
Most efficient international corporate networks	Incentives and practices for networking	<b>Environment Forum</b> , Finpro	2008–	<ul style="list-style-type: none"> <li>- Creation of cooperation concept based on the lead company model in order to internationalize SMEs</li> </ul>
	Programme for growth companies	<b>Ministry of Trade and Industry</b> , Finpro, Technology Centers, Ministry for Foreign Affairs	2008–	<ul style="list-style-type: none"> <li>- Development of best practices of networks and cooperation of lead companies and SMEs</li> <li>- Faster growth for middle-sized companies with the help of the Growth company programme</li> </ul>

\*) Lead party highlighted in bold script

**Figure 1.** Cleantech Finland – improving the environment through business. National Action Plan to promote environmental business. Implementation of projects and recommendations.



## Definitions

### Environmental know-how and clean technologies

In this report, environmental know-how is understood as a comparative energy- and material efficiency based on a life-cycle approach and the avoidance of negative environmental impacts.

Clean technologies (cleantech) include all products, services, processes and systems whose use results in less harmful impacts on the environment than their alternatives. Clean technologies offer clients added value while also reducing harmful impacts on the environment directly or elsewhere along value chains. Examples include clean industrial processes, the use of renewable energy sources, energy efficiency, material efficiency, the recycling of used materials, environmental monitoring and soil cleaning technologies. In recent years environmental know-how has become a significant factor in competitiveness. Cleantech has thus become a focus area in both technological developments and society as a whole. The term cleantech is already used globally by businesses and especially by investors.

### Clean technologies (cleantech)

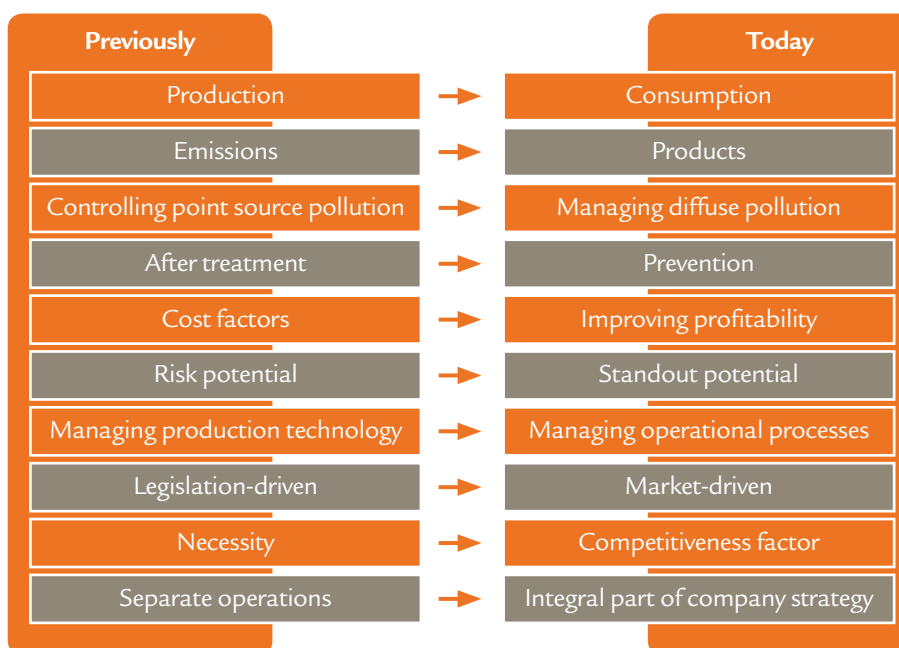
*include all products, services, processes and systems that result in fewer harmful impacts on the environment than their alternatives. Cleantech brings added value to customers while also reducing direct or indirect negative environmental impacts.*

### Environmental expertise

*includes know-how on ways to improve energy or material efficiency based on life cycle approaches, as well as ways to avoid and reduce negative environmental impacts.*

### Environmental business

*involves commercializing clean technologies in such a way that environmental expertise forms a key factor in competitiveness.*

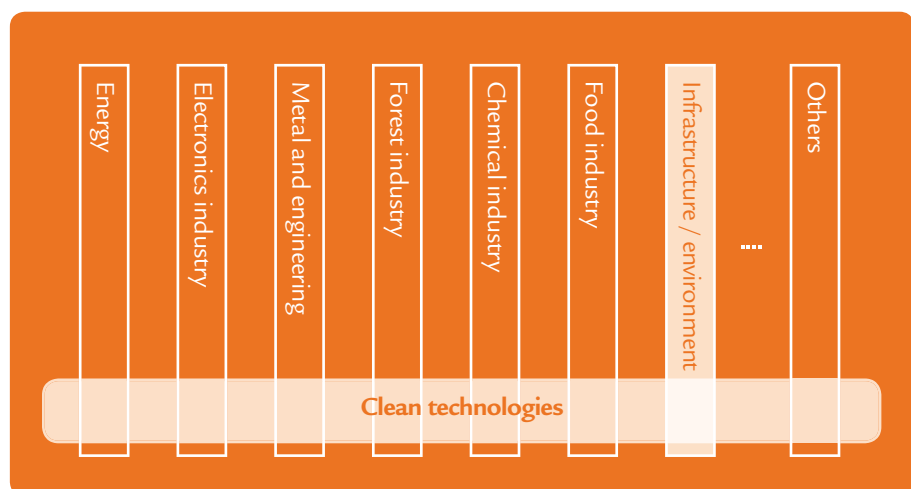


**Figure 2.** Environmental business has become a significant factor in competitiveness. There has been a major shift from end-of-pipe technologies into clean technologies. Source: Linnanen – Markkanen – Ilmola (1997): *Ympäristöosaaminen*.

Environmental technologies and techniques have earlier been perceived as a part of municipal technologies. Traditional environmental technologies include water supply management, wastewater treatment, waste management and air protection. Cleantech is rapidly expanding away from traditional end-of-pipe technologies into the prevention of environmental damage through savings in energy and materials, the choice of less polluting production methods, the use of renewable energy sources and the development of closed material circulation systems. Cleantech permeates almost all industrial sectors, but it can still be hard to specify exactly which technologies can be classed as cleantech.

The methods used to define and measure technologies, products and services related to environmental business require continuous development. According to the definitions used by the EU and the OECD, focus areas include emission management, cleaner technologies and products, as well as sustainable production and actions that save natural resources. Sitra has been working within Finland and the EU to build up an effective definition of environmental business and compile the relevant statistics. The actual extent of environmental business cannot be defined in the same way as traditional industrial sectors, because the concept of cleantech permeates the whole of our society.

**Figure 3.** Placement of clean technologies in industrial sectors. Cleantech penetrates horizontally through all industrial sectors where various types of environmental expertise and technologies are used. The most important sectors of the municipal and environmental sector include water supply, wastewater treatment, waste management, recycling, environmental monitoring, construction, transportation and the protection of soil, air and water.



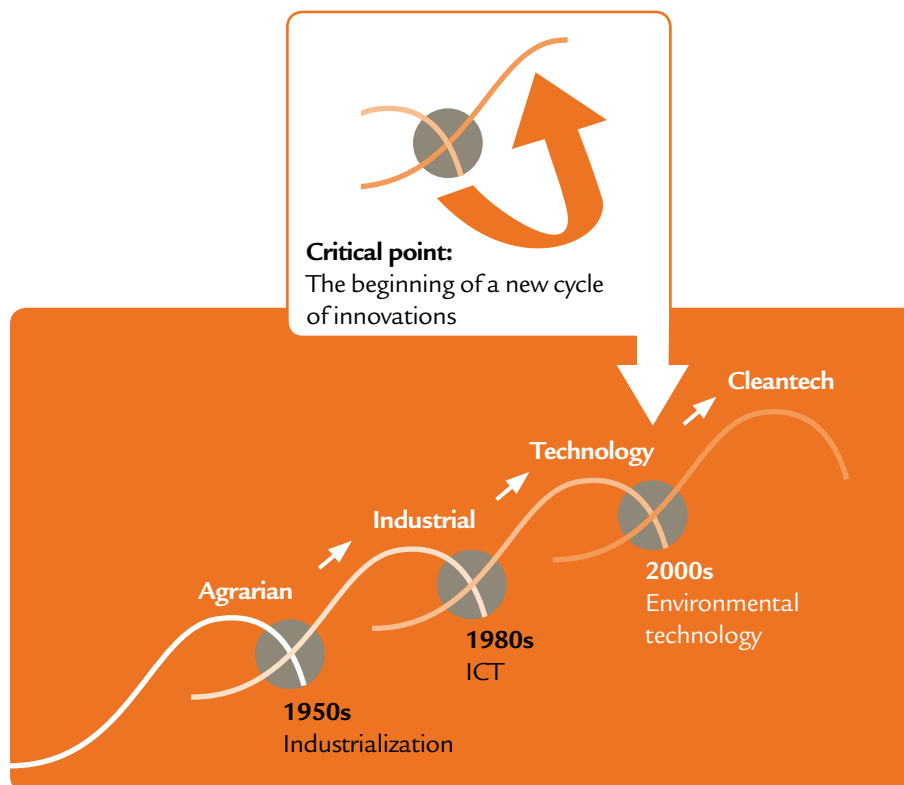
## Environmental business

The current uptake of cleantech is comparable to the rapid surge in information technologies in the 1970s. The integration of information technology and telecommunications technology has boosted growth in both sectors over the last three decades. This has brought many new innovations to the public and spread the use of information technologies to all spheres of society. There have been remarkable changes in society due to the consequent economic growth, especially as new technologies have reduced the material inputs into products and production. Cleantech is now entering all spheres of life and industry in a similar way, as can be seen in Figure 3.

Cleantech companies create products and services which have smaller negative impacts on the environment than their alternatives. Cleantech improves quality, profitability and eco-efficiency, while also promoting well-being.

Thanks to high levels of know-how, Finland has an excellent opportunity to take a leading role in the rapidly growing field of environmental business development. However, this will require the same degrees of effort and unanimous support from society as a whole that earlier helped to boost Finland's ICT-industry.

Cleantech can improve quality, profitability and eco-efficiency while also promoting well-being.



**Figure 4:** In the take-off phases of technological development the speed of innovation is an important factor in competitiveness. At the beginning of the 21<sup>st</sup> century concern about climate change and dwindling natural resources are encouraging the rapid adoption of cleantech.

## Plenty of potential for international growth

### Markets increasing rapidly

Definitions and statistical measurements of environmental business are still under development. This means that cleantech is not yet covered adequately in Finnish or international statistical surveys, which usually focus on traditional environmental techniques. However, the global market is roughly estimated to amount to 600 billion euros, with Europe accounting for around one third of this sum.

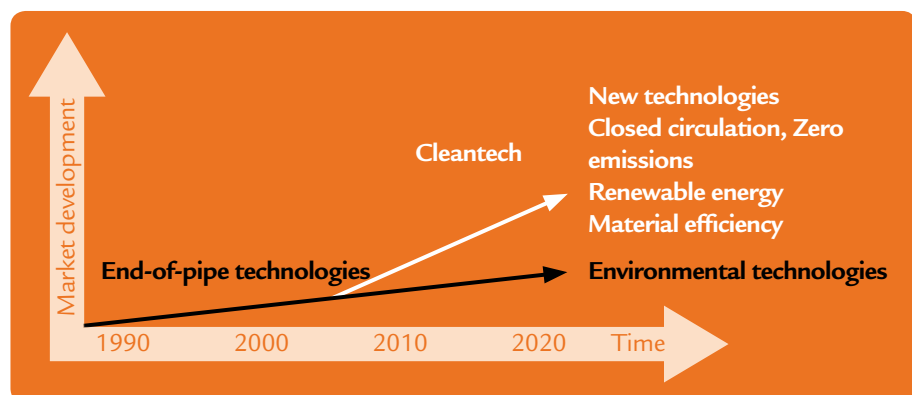
This market is increasing by almost 10% a year. However, the growth rate varies significantly according to the industrial sector. Technologies for renewable energies are growing fastest. The annual growth rates for solar and wind energy technologies, for instance, can be as high as 30%.

Changes in investment markets anticipate the development of global markets and introduction of new innovations. Capital investments in cleantech have risen rapidly. Technological developments, changes in market forces, and various global and national environmental obligations are examples of the mega-trends that have promoted such investments. Technological breakthroughs produce solutions that are more environmentally friendly and cost efficient. Applications of IT, nanotechnologies, biotech, material technologies and electronic sensor technologies have all contributed to this trend. In North America risk capital flows into cleantech increased by 35% in 2005, and cleantech now covers almost 15% of all capital investments. Renewable energy technologies and material efficiency account for the biggest share of risk capital in international markets. The water sector is expected to also become a major sector.

In Finland the total turnover of environmental business is estimated to be some 4.5 billion euros. At the beginning of the current decade there was considerable concern as the field only seemed to be increasing by about 3% annually – much less than in global markets overall.

**Figure 5:** Cleantech is the fastest growing technological and investment sector.

Source: Helmut Kaiser presentation at Cleantech Forum in Lahti, 2006.





Facilitators of growth include: environmental legislation, population growth, climate change, energy and raw material prices and concern over the state of the environment.

### ***Growth increasingly driven by market mechanisms***

Environmental legislation has traditionally been the principal driver behind the growth of environmental business. Other common drivers include population growth, climate change, and economic factors such as the prices and availability of energy and raw materials, as well as concern about the state of the environment. Market based measures such as emissions trading are also becoming more significant in addition to legislative controls. All these trends make it likely that environmental business markets will continue to develop rapidly.

The traditional boundaries of environmental sectors are dissipating and technological solutions in different fields are drawing closer to each other. One such example is the way that biogas generated in wastewater treatment can be collected and used as a vehicle fuel. New innovations and the development of environmental business require special sensitivity when it comes to the way the authorities define legislation and provide incentives.

Markets are steered by the following mega-trends which also influence the environmental sector:

#### **Globalization**

- Free movement of people, capital, technology and companies.
- Strong will to improve standards of living in developing countries.
- Production shifting to countries with cheaper costs.
- Rapid spread of knowledge and technology.
- Fewer and fewer companies are gaining ever larger market shares.

#### **Climate Change**

- The strengthening of the greenhouse effect due to the burning of fossil fuels.
- Warming of the climate, potential sea level rises, changes in rainfall, and increases in extreme weather events such as severe storms, floods and droughts.
- Increased awareness of environmental issues among politicians and the public.
- Need for new infrastructure planning and developments to facilitate adaptation to climate change.

#### **Urbanization**

- Absolute and relative population growth in urban areas.
- Increased environmental and health problems in urban areas.
- Urgent need for improved air quality, water supply, sewerage and waste management.
- Improved noise control also needed in future.

**Growing middle class in developing countries**

- New markets for consumer goods resulting in pressure on the environment.
- The way of living of the middle class have significant environmental effects through food production and production and use of commodity goods.

**Wastage of natural resources and shortages of energy and raw materials**

- Reserves of fossil fuels and other non-renewable raw materials increasingly depleted.
- Wastage of natural resources leading to excessive consumption rates and rising energy and raw material prices.
- Erosion becoming an ever more widespread problem due to more intensive land use.
- Increasing use of chemicals resulting in environmental problems.

**Scarcity of fresh water**

- Water reserves and water quality declining, resulting in environmental and health problems.
- Population growth in areas with water shortages a potential source of conflicts.

***Finland's strong environment image*****Early recognition of environmental priorities**

Finnish legislation has since the late 1950s contributed to reductions in negative environmental and health impacts. Finnish industry has worked with water protection since the 1970s. The timely establishment of the Ministry of the Environment and the effectiveness of Finnish environmental legislation have been important factors contributing to Finland's environmental image. In the mid 1990s the eco-export committee first promoted Finnish business based on environmental technologies. Since the beginning of the 1990s Finnish industry has emphasized the importance of eco-competitiveness, the use of environmental technologies and an environmental approach to product policy. Unanimity on the importance of the continuous development of new technologies has long been a feature of Finland's industrial sector. Continuous technological development can help to solve environmental problems, secure competitiveness and create new environmental business.

Finland has an excellent image in many ways. Finland has been ranked very highly in global competitiveness by the World Economic Forum (WEF), in surveys measuring gender equality, and in the OECD's PISA survey of educational standards. According to Transparency International, Finland is also one of the least corrupt countries in the world.

Finland also ranks highly in environmental comparisons, and has been the leading country three times in the WEF's environmental sustainability index. In 2006 Finland was also ranked third worldwide in the WEF's Environmental Performance Index. Finland's strengths include the capacity of society to handle environmental issues and challenges.

Finland is consistently ranked among the top countries in the world in comparisons of environmental performance.

Finnish firms have gained important commercial and international visibility in several environment business sectors.

### **Environmental business strengths**

High levels of environmental research have significantly contributed to the success of Finnish environmental business. Finnish businesses have gained important international visibility in several sectors of environmental business, including:

#### ***Energy intensive industrial processes***

Finland has a wide range of expertise related to industrial processes, especially in the forest and metal industries. On a global scale the processes of Finnish producers have the highest standards in energy efficiency and other environmental characteristics. Significant companies include Metso, Andritz and Outokumpu Technology.

#### ***Industrial automation and electrical power technology***

A lot of energy can be saved in industrial applications by utilizing modern automation and control technologies. Energy efficient electrical motors, frequency converters and power quality control systems have been successful in growing global markets. Notable companies include ABB, Vacon and Nokia Capacitors.

#### ***Combustion and gasification technologies***

There is a long tradition in Finland of the efficient use of domestic fuels, for example in the pulp and paper industry. Fluidised bed combustion technologies have been developed in Finland to facilitate the burning of demanding solid fuels including wood. This Finnish technology has been in demand in growing global markets for power plant boiler technologies. The biggest providers include Foster Wheeler Energia and Metso Power. High-efficiency diesel and gas engines are produced by Wärtsilä. Renowned Finnish makers of energy-conserving stoves and fireplaces include Tulikivi and Nunnalahden Uuni.

#### ***Cogeneration of heat and power***

Another of Finland's strengths is the cogeneration of heat and power in industry (especially the pulp and paper industry) and in communities. Alongside well established Finnish district heating technologies, new district cooling systems are also now being developed for a potential new market opening. District heating networks have very high coverage in Finland's largest cities. Major companies in this field include Fortum and Pohjolan Voima.

#### ***Collection and handling of wood-based fuels***

Finland has top-level expertise in the harvesting of residual wood fuels. John Deere Forestry (formerly Timberjack) has developed the brushwood log system to improve the efficiency of logging residue harvesting. Ponsse is another internationally significant producer of forest machinery. Major providers of biomass handling technologies include Raumaster and BMH Wood Technology.



***Biofuels and pollution control in transportation***

High quality work is being done in Finland in refining environmentally friendly fuels and in the cleansing of exhaust emissions. Neste Oil is a major player in international markets for fuels based on petroleum and biomass. Finnkatalyt and Ecocat are the most significant Finnish providers of exhaust purification technologies for vehicles and small devices.

***Wind power***

Several Finnish companies deliver components for wind power facilities on international markets. ABB, Moventas, Rautaruukki and Ahlstrom are internationally renowned companies. WinWind has grown and internationalized rapidly in recent years, thanks to its innovative concepts for wind power plants.

***Waste management and recycling***

Finland has also worked to improve waste management and recycling technologies. Kuusakoski is a leading recycler of metals in Baltic Sea region and one of the largest refiners and suppliers of recycled metals in the world. Lassila & Tikanoja is the biggest domestic provider of waste management and recycling services. The firm's activities are also expanding in the Baltic Countries, Russia and Sweden. Successful smaller companies include Molok (innovative deep waste collection containers), Tana (landfill rollers) and Cross Wrap (stretch wrap packing machines). Lamor Corporation has done well in international markets for oil pollution prevention equipment and services.

***Water management***

Finnish firms also have considerable expertise in municipal and industrial water supply and wastewater management systems. The most significant companies include Kemira, Uponor, Oras and YIT.

***Environmental monitoring***

Vaisala is the most successful Finnish company in the field of environmental monitoring, where it is a global market leader in many areas. Important products include devices, systems and services for detailed accurate meteorological monitoring. Finnish firms are also among world leaders in the measurement of small particles with negative environmental impacts. One firm that has commercialized such expertise is Dekati.

***Consulting***

Pöyry is a major provider of consultancy and planning services on a global scale. Pöyry focuses on energy, the forest industries, infrastructure and environment. Most of the corporation's turnover comes from outside the Nordic Countries. The Finnish Consulting Group is a prominent actor especially in the public sector and in international markets.

**Details of five pioneering Finnish environmental technology companies are summarised below:**

## **Cross Wrap**

Cross Wrap was founded in 1994 to commercialize and market an innovative packing machine designed by Kalle Kivelä, the founder of the company. Cross Wrap delivers stretch wrap packing machines for packing various wastes and recyclable materials for intermediate storage and transportation. Cross Wrap has delivered more than 100 machines to 27 countries. Some 20 million tonnes of various waste materials have been packed using these machines. The company's product range also includes demolition lines and processing lines for wrapped bales.

Cross Wrap's clients include waste management and collection companies, recycling companies, waste incineration plants and process industry companies. Due to tightening European waste legislation, waste materials will increasingly have to be transported and temporarily stored in the future. This means a growing demand for safe and efficient packing solutions. The need to optimize transport and storage in order to save energy costs also increases market potential.

## **Kemira**

Kemira is a chemicals company that provides solutions in four main areas: pulp and paper chemicals, water purification chemicals, specialized chemicals and paints. Kemira is a global company operating in 40 countries.

For Kemira, environmental issues represent a key area of expertise and a growing business opportunity in terms of the need to find and implement more environmentally friendly solutions. Recycling and the management of industrial sidestreams are booming business areas with environmentally positive impacts. Kemira purifies industrial wastes and refines them into chemicals for use in wastewater management, for instance. The company also develops new products to exploit the sidestreams generated by its own production processes. There is plenty of potential for the expansion of operations in water purification and water services. Kemira has rapidly strengthened its business in this field, where business volume almost doubled in 2005.

## **Lamor**

Lamor Corporation is a family company founded in 1982, which started its operations by installing oil pollution prevention equipment in Soviet vessels. The company has subsequently grown into a major provider of wide-ranging oil pollution prevention systems.

Lamor has supplied equipment and systems to more than 50 countries around the world. Most of the oil pollution prevention systems used in Russian oil terminals and harbors are from Lamor, for instance. Other important products include brush skimmers, oil

booms, oil/water separation equipment and pollution combating vessels. Lamor's products cover the whole field of oil pollution prevention. The company works with the planning, financing and production of systems, also managing product development, and overseeing the use and maintenance of products, and participating in emergency operations.

## Metso

Metso is a major multinational technology company, whose customers in 140 countries mainly work with the processing of natural resources in the fields of pulp and paper, mining, energy and oil. With the help of the technology and services provided by Metso, clients can use natural resources more efficiently and optimize their production processes. Metso's core business includes energy saving and solutions that reduce environmental loads such as noise and dust control. Environmental technologies and sustainable development are an integral part of Metso's operations. Metso has for example actively developed technologies and services that promote recycling and the use of recycled materials.

The turnover of Metso's metal recycling business has almost tripled during the last five years, with profitability almost quadrupling. Metso is the world's largest supplier of metal recycling technologies. Customers include steelworks, foundries, and plants that break up and recycle vehicles and household appliances.

## Pöyry

Pöyry has been involved in developing modern environmental technologies since 1960. During the 1960s and 1970s the main focus was on technical solutions for processes in the forest industries. Since the 1980s various external purification solutions have become increasingly important due to expanding business areas and new legislation. Pöyry provides services in water protection and air protection for customers including municipalities and other industry sectors in addition to the forest industry.

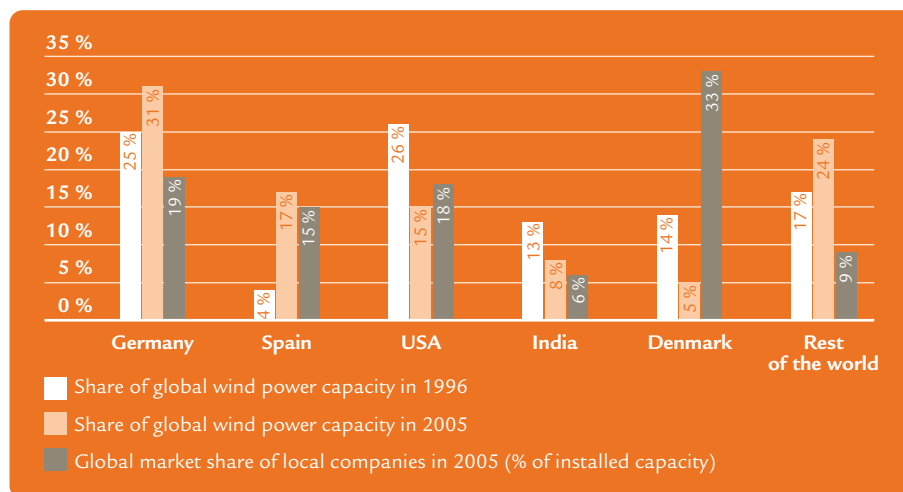
Environmental consulting and planning continue to be one of the company's most important and rapidly growing business areas. Pöyry has grown through acquisitions extending its geographical range and also by increasing its expertise in specialized areas through product development and training. Examples of the company's specialized environmental know-how include various pollution control technologies, the broad utilization of satellite images, various solutions for laser-scanning, ground and bedrock surveys, modern data management and survey methods. Pöyry's global network of offices enables the company to closely follow technical developments and find suitable clients for consultancy and planning services. Pöyry employs more than 6,000 experts in almost 50 countries.

## Commercializing the potential of SME's is still a major challenge.

**Figure 6.** Early success in domestic markets is often a prerequisite for success in global markets. In the wind power sector, for instance, Danish companies have become reliable suppliers worldwide thanks to their early foothold in domestic markets. Finnish companies often have a strong market position in component deliveries within value chains. *Source: P. Mikkanen et al (2006): Ympäristöteollisuuden kotimarkkinoiden kehittäminen Suomessa.*

### National cooperation to realize market potential

The few strong Finnish enterprises that work in international markets are the main drivers of environmental business in Finland. But many small and medium-sized companies are also continuously generating new technologies and solutions. The commercialization of products originating from SMEs is a major challenge, however. National markets play a crucial role in this context, as they form a vital platform for growth and internationalization. This is evident for example in the success stories of wind power companies (Figure 6).



## There is clearly a need to strengthen international business skills in environmental business.

New innovations need an enabling environment in addition to technological know-how in order to succeed. All stakeholders have to bear their responsibilities if Finland is to become an exemplary energy efficient country characterized by almost closed material circulation and sustainable economic growth. Environmental awareness is needed everywhere. Consumers and industry must actively take care of the environment. Considerable expectations are directed towards consumers, the education system, research policy, political decision-makers and the public authorities. Even if environmental business is already mainly market based, the role of regulations and incentives from the authorities is still important.

It is evident that international business knowledge is needed to develop environmental business. Presence in international markets is a precondition for success. Actors in the environmental field should be networked to enable smaller and larger actors to engage in mutually beneficial cooperation.

A clear focus is needed in a small country like Finland to create new success stories by combining Finnish know-how and the expertise of companies in areas with real market potential. The purposeful spotlighting of success stories is one way to raise the profile of environmental business and Finnish know-how.

Increased environmental awareness due to concerns about climate change has enabled the potential for environmental business to be widely perceived around the world. The EU has led the way for the growth of environmental business. The EU is preparing development proposals for the sector based on the national plans within the EU Environmental

Technology Action Plan (ETAP). The EU has also established an eco-innovation forum to promote the necessary exchange of information.

In the Nordic region, Denmark has been particularly active especially in the early 1990s when Eastern European markets opened up and in developing wind energy technologies. In Sweden, the governmental organization Swentec has been established to promote environmental technology. The Nordic Council's Nordic Innovation Centre (NICe) has chosen environmental business as one of its target sectors for financing. NICe has started to finance projects that aim to network Nordic environmental enterprises to help them reach international markets. National development projects also exist in other European countries and in several states in the USA.

### **Utilizing innovative solutions**

New and improved environmental technology solutions are being developed continuously by Finnish companies and research institutes. But the transformation of such new ideas into profitable business has proved to be the bottleneck. The turnover of Finnish environmental business has not increased in line with either the environmental image of the country or international developments. The effective enforcement of environmental regulations in industry has promoted environmental business. However, trends have not been as favorable as anticipated in infrastructure projects and in the public sector. The adoption of new solutions involves risks. The willingness to take such risks has often been missing, especially in public infrastructure projects. In some cases innovative solutions are not adopted due to new competitiveness and procurement laws.

Better financing systems are needed for innovative potential solutions. In Finland extensive financing is available for product development, but good results have not led to commercial breakthroughs often enough. Putting the results of development into practice would require more efforts in the creation of innovative first markets.

### **Time for national cooperation**

There is an evident need to intensify national cooperation. The administration of environmental issues is divided between several ministries in Finland, and the business and organizational field is also fragmented, with networking and cluster development still in their early stages. However, actors are slowly finding each other: an environmental technology cluster (cleantech cluster) has been established under the Centre of Expertise Programme set up by the Ministry of the Interior and the Ministry of Trade and Industry. The cluster includes important regional actors.

The drafting of this national action plan has been an inclusive and consensual process. Both the private sector and the public sector are clearly willing to promote the utilization and commercialization of clean technologies. This common vision and the competitiveness potential in Finland create an exceptionally good basis for clean technologies to become a new pillar of Finnish industry.

The opportunities for environmental business are widely recognized around the world.

More effort must be made to create innovative markets to utilize the results of development work.

## Making Finland into an environmental business leader

The need to respond to environmental challenges both creates and requires new business areas.

Finland's vision for environmental business is based on the view that the need to solve environmental problems and the growth of the cleantech market represent vital opportunities to build up such business. Consequently, a national decision has been made to build up cooperation to develop environmental business. The need to respond to environmental challenges both creates and requires new business areas. Finland has decided to turn the cleantech business into key area of growth and internationalization. Finland aims to strengthen its position as a leading country in environmental terms, and as a forerunner in the development of environmental business.

**The National Action Plan for Environmental Business aims to make cleantech into a new pillar of Finnish industry.**



The national action plan aims to ensure that Finland is the best known forerunner in cleantech by 2012. High-level expertise must be developed in focus areas, and a favorable environment must be established for the development of environmental business and internationalization. Such conditions should enable the projected annual increase of 15 per cent. The total turnover of environmental business can thus be doubled in five years, to 10 billion euros in 2012. Cleantech will become a vital pillar of the Finnish economy.



The actions needed to achieve the goal are grouped into four categories:

#### **Finland as the world's best known cleantech country**

Finland is the best known environmental country in the world. The image of Finland's environmental cluster promotes the internationalization of companies and is based on strong environmental know-how. This image is built into a globally known cleantech brand. It helps to network and internationalizes Finnish companies and characterizes Finland as a country with high-tech and environmental expertise worthy of investment and location choices.

#### **Finland as the optimal growth platform for environmental business**

Functional domestic markets and a favorable environment for innovation form the basis for internationalization and annual growth of 15%. Procurement, financing and subsidy systems that support innovations and environmental technologies provide rapid access to markets for new solutions. Environmental issues, entrepreneurship and business know-how are linked and highlighted at all levels of education.

#### **Finnish excellence in focus areas**

A Strategic Centre for Science, Technology and Innovation on energy and environment will be established by 2008. The centre will combine the best Finnish and international expertise from the private and public sectors. This will lead to significant new openings to improve growth and internationalization.

#### **The most effective international corporate networks**

In environmental business a cooperation model is created that combines enterprises, governance, research and financing. A good basis is created for exporting Finnish knowledge into international markets. Network-based cooperation will give Finnish environmental industry a significant competitive advantage.

According to the longer-term vision, Finland will become a society with almost completely closed material cycles by 2020. This can be achieved by creating eco-innovations, by developing national markets and clean technologies, and by effectively exporting Finnish expertise.

#### **Focus areas**

National efforts need to be focused on selected areas. In practice, focus areas will be defined by market forces. In addition to expertise and market potential, such efforts will require strong pioneering enterprises and efficient international business networks.

The National Action Plan includes five selected sub-areas of environmental business with strong companies and growth potential:

The longer-term vision sees Finland becoming a society with almost completely closed material cycles.



**Renewable energy**

Bioenergy is seen as a Finnish strength. Leading companies include boiler manufacturers Metso Power and Foster Wheeler Energia, John Deere Forestry as a technology provider in the bioenergy supply chain, and Neste Oil, who aim to become a leading biodiesel producer. Finland also has strong suppliers of wind power components such as ABB, Moventas and WinWind.

**Recycling of materials**

The recycling of materials and the utilization of waste will increase rapidly in the future. The strongest domestic companies are Lassila & Tikanoja and Kuusakoski.

New legislation and public support for development (including Tekes's Streams programme) have boosted this sector. Many innovations aim to redefine wastes as by-products and useful new raw materials. An increasing conceptual differentiation between wastes and products will promote market developments.

**Resource saving processes**

It has become more vital than ever to manage material flows effectively. The growing scarcity of natural resources and increasing prices of raw materials are forcing companies to improve their material efficiency. It is vital to improve the regulation of industrial processes to achieve economic benefits and minimize negative environmental impacts. The Finnish metal industry is a pioneer in developing such systems. Other systems that save raw materials include the closed circulation systems developed by forest industry companies. Top companies in this area include Metso, Outokumpu and Andritz.

**Energy saving technologies**

Voluntary energy saving agreements and widespread government support for development have established favorable conditions for energy saving technologies to succeed in global markets.

Metso and Outokumpu are the biggest technology suppliers for energy intensive industry. The most significant suppliers of technologies to help industry use electricity more efficiently are ABB, Vacon and Nokia Capacitors.

**Water treatment**

Clean water is a vital resource for people everywhere. Global markets related to water supply are growing rapidly due to increasingly frequent water shortages and water quality problems. Investments in wastewater treatment will also go on increasing. More attention will be given to the removal of micropollutants from fresh water, the direct utilization of treated wastewater, the recycling of water used in industrial processes, the recovery of nutrients from wastewater and the treatment of sludges. Markets are expected to grow in both municipal and industrial water services in industrialized and developing countries alike. Key Finnish actors in these sectors include Kemira, Pöyry and FCG.

## Four strategic goal-oriented projects

### *Finland as the world's best known cleantech country*



Finland already has a good reputation for environmental standards. In international environmental evaluations Finland has performed outstandingly. However, it must be noted that the readers of such evaluations are mainly researchers and politicians, rather than companies and their customers. A nationally accepted profile must be created and built

into a strong brand based on Finland's existing environmental image and on the stand as the best supplier of clean technology solutions. This requires a credible basis, the widespread adoption of environmentally friendly methods, long-term cooperation between companies, and the consistent reshaping of attitudes.

#### **Marketing and communications programme**

In order to utilize environmental expertise and to transform it into internationally expanding coordinated and effective marketing efforts are needed based around a commonly agreed theme, which could be "Cleantech Finland". The key enterprises, business organizations and public sector organizations should together launch a professionally designed marketing and publicity programme designed to build up Finland's image and makes the "Cleantech Finland" brand known to various stakeholders.

Communications based on one consistent brand must aim to improve awareness of Finnish companies among both national and international customers and financiers. Training and other means can be used to encourage skilled experts to work in environmental business and also change wider public attitudes. Marketing should stress socially progressive solutions, with widespread participation from actors in the public sector.

A common marketing and communications programme for the whole cleantech sector.



Major companies, network leaders and SMEs should all ensure their own operations support the “Cleantech Finland” brand. This supports companies’ own development as well as national developments as a whole, by boosting know-how, employees’ professional skills and innovation. In accessing international target markets, the impressive international networks of Finpro, Tekes and the Ministry for Foreign Affairs should be utilized.

### **Finland as the optimal growth platform for environmental business**



Public sector procurement, financing and subsidy systems favourable to environment and innovations will guarantee rapid access to markets for new solutions.

Environmental business is increasingly seen as a lucrative investment.

Functional domestic markets and a favourable environment for innovations can provide the basis for internationalization and the sector’s projected **15% annual growth**. By 2012 environmental business in Finland will reach a turnover of 10 billion euros. Favourable public sector procurement, financing and subsidy systems will guarantee rapid access to markets for new solutions.

Thanks to political commitment and the effective division of responsibility between the public and private sectors, incentives for domestic industry are already well developed and in active use.

As a consequence of such cooperation the image of Finnish environmental business has become clearer. Environmental business represents a lucrative investment. The corporate world and the public both recognize it as a constantly developing pillar of Finnish industry and services.

The long-term strengthening of the environmental sector is also based on education and training. Positive attitudes towards the environment, innovativeness and entrepreneurship are emphasized at all levels of education.

More suitable conditions for new innovations – end especially for their improved commercialization – can also be created by developing funding systems.

### Finland as a pioneering market

Finland must become an efficient first stage market for environmental innovations. All national stakeholders need to collaborate on the development of environmental business. The aim is to build consensus on the idea that Finland's competitiveness can be improved through investments in national markets, and that this will ultimately lead to exports and create jobs. Finland's own energy and climate change policies could be pioneers in this context. A long-term national climate change and energy strategy that promotes innovations must be created.

Creating well functioning national markets requires several actions – consumers should be encouraged to make environmentally friendly choices by improving their awareness, through marketing, better consumer information and other tools. Such measures should particularly focus on recycling, energy saving and choices of energy sources.

Public procurement policies must favour environmentally friendly and innovative solutions. The total value of public sector procurements in Finland amounts to nearly 25 billion euros annually. The Ministry of Trade and Industry is the most important actor. Its resources and expertise for the promotion of green procurement policies and environmental business should be strengthened. An information and service center should be established within Motiva to help public sector procurers within local or national authorities to give more consideration to environmental issues and innovations in their search for the best overall solution. The most important actors in this context are the Finnish Environment Institute and the Association for Finnish Local and Regional Authorities.

The public sector still needs to get verified information on new and improved technology to encourage such financial investments. Such verifications of the eco-efficiency of new technologies are also important for international competitiveness. Finland's active involvement in developing the EU European Environmental Technologies Verification System (EETVS) is crucial in this respect.

The division of responsibility between the public and private sectors must be reviewed. This can result in improved efficiency, better governance, other synergies, improved international competitiveness and higher exports of Finnish environmental expertise. It could be beneficial, for instance, to incorporate the international business services of sectoral research institutions.

Legislation strongly influences environmental business. Representatives from the private sector must be involved in the preparation of new legislation. New forms of cooperation should be tested when renewing waste legislation, for example. Foresight and an active approach are needed in both the private and the public sector in order to improve the opportunities for environmental business through international fiscal work.

A material efficiency center will be established within Motiva. This centre must be developed into an internationally competitive center that supports the private sector and especially SMEs. The most important tasks of the center would include the conduction of material audits, the development of material accounting systems as well as steps to encourage their adoption by companies. The operations of the service center must promote the use of the MASCO concept (Material Service Company).

Finland's long-term energy and climate change strategy must promote investments in environmental innovations.

Public sector procurements must favour environmentally friendly and innovative solutions.

Verification systems must be developed for eco-efficient technologies.

A pioneering material efficiency service center will be established in Finland.

Renewable energy technologies will be actively supported.

Renewable energy sources will be supported by continuing to promote existing Finnish forms of energy production, regardless of any competitive advantages obtainable through emissions trading. This will ensure that the share of renewable energy will be increased and the competitiveness of technology companies improved. The current models of investment subsidies and refunds of electricity tax can be replaced by feed tariffs. Using feed tariffs would ensure rapid market penetration. Financial incentives are also needed to encourage households to save more energy and use more renewable energy sources. For instance the Housing Fund of Finland could increasingly subsidise heating systems that use ground source heat pumps or boilers fuelled with pellets made from woodchips.

#### **Environmental business in education**

Innovative business approaches and environmental technologies must be better integrated into education. A broad understanding of environmental issues is needed at all levels. Environmental issues should be covered in school subjects including biology, physics, ecology, health and technology. An internet-based information package will be developed for teachers and schools. The demonstration project on environmental certificates for schools will be further developed. Entrepreneurial approaches must be more highlighted in vocational and higher education. This can both encourage students to work in the environmental field, and build wider awareness that will increase the demand for environmental products and services.

In higher education, environmental subjects are already fairly popular. However, entrepreneurial thinking and business opportunities are not always highlighted enough. Training related to the commercial prospects for environmental technologies should be increased, in cooperation with or even under the leadership of business schools.

The strategic center on energy and environment will direct research into key areas from a business perspective. The establishment of a specific 'Cleantech Academy' should be considered. This academy would produce tailored training according to the needs of environmental businesses. One possible model could be to provide training organized by a commercial actor that does not compete with public training. In the longer term, the education model of the academy should also influence university curricula.

#### **Funding mechanisms to promote innovation**

SMEs capabilities and willingness to internationalize and grow must be improved in order to make Finland an attractive environment for investment. A venture capital fund for investments in cleantech is needed to strengthen and internationalize the fragmented SME sector. Tax incentives are needed to generate environmental financing and encourage consumers to make environmental choices. Increased socially responsible investments (SRI) would also support environmental businesses. These measures can all help to finance growth and provide capital for new environmental schemes.

A new venture capital fund is needed for cleantech investments.

A model for financing reference plants is needed to encourage the establishment of environmentally friendly and eco-efficient reference projects in Finland or possibly in target markets. The objective is to gain faster access to new markets for environmental innovations. In these investment-heavy solutions public subsidies are crucial for the first reference projects, which can then effectively demonstrate technologies and commercial potential.

Financing for reference plants should not be limited to Finland. Conditions vary greatly between countries, so a plant operating in Finland might not be the best reference. The Clean Development Mechanism (CDM) and Joint Implementation (JI) instruments of the Kyoto Protocol allow for the establishment of reference plants in target areas. However, such investments will not be possible without close cooperation between the Ministries of Trade and Industry, the Environment and Foreign Affairs.

The financing of demonstration projects must be extended, and information on such opportunities should be better shared. The Ministry of Trade and Industry should extend its financing of demonstrations beyond the energy sector.

Feasibility studies also need a new financing instrument. Early involvement in the preparation of projects and the development of funding and model solutions often provides the key to competitiveness and future involvement in the implementation of subsequent projects. Financing should be directed to the key business sectors and target countries. Both research institutions and companies would need improved financing for feasibility studies. The responsibility for such improvements lies with the Ministry of Trade and Industry.

Spin off financing additionally needs to be developed. Innovations are often generated outside the mainstream of industry and at the interfaces between different sectors. The aim is to be able to commercialize innovations generated within industry. Possible tools include venture capital investments, grants and establishment of a special fund.

New financing solutions are required for environmentally friendly and eco-efficient reference plants.

Feasibility studies for environmental projects require their own financing instrument.

Spin off financing must also be developed, since innovations often arise outside of the mainstream.



### *Finnish excellence in focus areas*



A strategic centre will be formed to encompass excellence from the energy and environmental sectors.

Becoming a pioneer involves making specific choices and focusing on certain areas where there is potential to build up excellence in the longer term. It is important to establish a strategic centre for the environmental and energy sectors which can combine top level national and international expertise from both the public and private sectors. This will promote the groundbreaking initiatives necessary to improve growth and international competitiveness.

In addition to this strategic centre 'cleantech centers' based on regional expertise will also be developed with a common goal to boost environmental industry. A national evaluation of environmental expertise will provide a basis for the development of basic research within universities.

#### **A strategic centre for energy and environment**

A Strategic Centre for Science, Technology and Innovation focused on environment and energy is needed to direct the development of research activities and business into national growth areas. This centre would be formed and managed by companies, and one of its tasks would be to resource research activities according to national priorities and focus areas. The centre could also help to streamline innovation. Public financing for basic research should also support the same goals.

In establishing this center the importance of environmental know-how and the potential for environmental lead business in other strategic centers proposed by the Science and Technology Policy Council must be remembered.

The center will make development and research activities more efficient by removing duplications. It will also facilitate the faster adoption of research outcomes by companies. One of the main goals of the center should be a significant increase in environmental business.



Other appropriate functions for the center are:

- Evaluation
- Foresight (i.e. technology, legislation, markets)
- International networking of technology research
- Developing experimental environments and conducting pilot and demo projects
- Building up the profile of the sector, especially internationally.

### **Centre of Expertise Programme**

The Centre of Expertise Programme has a central role in developing the environmental cluster and in compiling and aligning regional resources. The programme will also continue to implement Sitra's Environmental Programme by creating strong actors and regional centers of expertise in the shape of new cleantech centers. The programme will also reallocate responsibilities between regions. Resources for support and development will be aligned to increase and internationalize environmental business. This will help to make cleantech business a new pillar of Finnish industry.

The programme's national cleantech cluster and future energy technologies cluster should be integrated into the operations of the strategic centre and the overall implementation of the National Action Plan.

### **Foresight**

Environmental business and development of the sector require foresight based on broad cooperation of various sectors and strong international expertise. This will provide companies with vital information on the development of technologies, legislation and markets as well as on international foresight activities. The strategic foresight of companies is often restricted to their own specialized fields of expertise. Broader foresight activities require cooperation between companies and the public sector. The Ministry of the Environment, the strategic centre for energy and environment, Finpro and sectoral research institutes can all play important roles.

### **Evaluation of environmental expertise**

Public research and development activities related to environmental technologies are spread around the country and administered by different authorities. There is not enough information about their coherence and overall effectiveness. Even if Finnish environmental expertise is generally regarded as excellent, there is still a need for a critical international evaluation of current levels of Finnish expertise and research. This would facilitate the alignment of research and development activities to support the growth and internationalization of the industry. This evaluation must be based on a deep understanding of the business and scientific background.

The research groups currently spread around universities must be connected to enable them to work both as part of national and international networks. This network should take into account the needs of environmental business and be highly motivated for collaboration.

The Centre of Expertise Programme will play a key role in developing the environmental cluster.

Environmental business needs foresight.

### The most effective international corporate networks



Network management and cooperation are already important factors in competitiveness.

Environmental companies everywhere are dispersed, because the sector is still so new. The ways networks cooperate and are managed are becoming a significant competitiveness factor. Cooperation between large companies and SMEs is particularly challenging in this context. The Dutch and the Danes have both been successful pioneers in this respect.

An efficient platform for networking cleantech companies must also be created in Finland. The execution of wide-ranging projects and tough international competition both necessitate network-based activities. In many cases involving complete solutions single companies working alone are not capable of responding to the needs of the customers.

#### Incentives and best practices for networks

Networks must exploit the best expertise available in the sector. It is important to analyze opportunities to network with companies in other branches and with the public sector. Suitable incentives are needed to encourage the formation of corporate networks. Possible incentives include:

- the launching of networks of domestic companies, international partners and public actors from the beginning
- the prospect of guaranteed long-term cooperation
- suitable financing opportunities for the start up and preparation phases
- training related to permanent and reproducible cooperation models
- rapidly applicable models for new projects
- improved cooperation between system and component suppliers improved cooperation between system and component suppliers.

In networks client-centered activities usually involve the provision of complete solutions, which require a cluster based approach. The most efficient company networks are the so-called lead company networks, which are lead by companies that work directly with the clients. It is therefore crucial to identify or even set up Finnish or international lead companies.

The most important tasks of such networks include:

- the development and testing of network models for environmental technologies
- intellectual property rights (IPR) issues and considerations related to the distribution of profits
- preparation and training for teamwork collaboration
- support for SMEs to develop company networks.

Networks will be established in focus areas where technology, business and international partners will all work in collaboration. Such networks thus bring together companies, administrators, researchers and financiers to provide a firm basis for the export of expertise.

### **Programme for growth companies**

There are a lot of small, early-phase companies in the environmental business, and comparatively few medium-sized companies going through the internationalization phase. A special programme should therefore be established for growth companies in the environmental field. This programme should promote development, financing, training and other tailored measures to encourage the growth of such companies. The growth potential of lead company networks and clusters in international markets must also be analyzed as a part of the programme. Based on this analysis, a network cooperation model should be introduced to companies, enabling all parties to improve growth and realize profit opportunities.

National or international lead companies must be identified or established.

There is a shortage of medium-sized companies in the internationalization phase in the environmental sector.

## ***National Action Plan due for launch in 2007***

The implementation of the National Action Plan will require wide-ranging joint efforts and close cooperation between companies and the administration. The long-term development of the environmental business requires a strategic owner, backed up by both lead companies and SMEs, who will take overall responsibility for the necessary developments. Joint efforts to create this type of strategic ownership must be initiated immediately.

The new Finnish Government, which came into office in April 2007, must promptly define a new national policy for environmental business, and prepare an action plan to promote environmental business.

### ***Governmental action plan for environmental business***

The new Finnish Government is expected to prepare such a governmental action plan for environmental business in 2007. The plan will align the work of the ministries to promote activities designed to build up business based on environmental know-how into a significant internationalizing growth sector and an important employer.

The action plan should highlight the importance of consumer-centered and demand-based initiatives, as well as the involvement of citizens and business in environmental issues. Cooperation between public and private actors should also be emphasized in the solutions for environmental problems, the financing of environmental business and in research and training. Policies on energy, innovation and environmental issues must be brought closer together to form a mutually supportive entity.

### ***Creating a strategic owner for the action plan***

A strategic owner is needed to coordinate the implementation of the National Action Plan. This is the first and most important project in promoting environmental business. A decentralization of responsibilities will hinder improvements and make it hard to achieve the projected doubling of the turnover of Finnish environmental business by 2012.

The establishment of the content, participants and working methods of strategic centre for environment and energy is also central to the long term development of environmental business in Finland. The national expertise programme will additionally bring significant added value by promoting cooperation and networking.

The creation of a strategic owner for the national action plan is a development process. In the first phase it is recommended to form an "environmental forum" composed of companies and business associations. The key task of this forum would be to launch and coordinate the implementation of the Action Plan. To conduct the practical work, a secretariat could be formed, for example under the Association of Environmental Enterprises. The forum should closely cooperate with the authorities and networked with researchers, training providers and non-governmental organizations. Operations could be initiated in

The new Finnish Government is due to launch the new action plan in 2007.

An environmental forum must be set up to encompass the work of companies and business associations in the environmental sector.

pilot schemes within selected key focus areas. The forum should be first established during 2007, and then possibly be made more substantial as business develops.

There are several alternative ways to organize the forum. It could form platforms for the most promising sectors to promote and coordinate internationalization. The founders would be the leading companies and organizations in the environmental business. Another possibility is to establish a platform in corporate form, such as “Cleantech Finland Ltd”. Capital stock for such a platform would be gathered from companies, business associations and public actors. This company could act as an umbrella organization marketing and selling Finnish environmental expertise.

## Appendices

### Participants in the preparation of the National Action Plan

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Eloranta Jorma, President and CEO	Metso Corporation
Hautojärvi Sirkka, Permanent Secretary	Ministry of the Environment
Hietaniemi Lauri, Managing Director	Green Net Finland
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Kivelä Satu, CEO	Cross Wrap
Larsen Bent, President and CEO	Lamor Corboration
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**Excursion arrangements:**

Jarimo-Lehtinen Mirja, Project Manager Sitra  
 Sipiläinen Taru, Programme Assistant Sitra

**Workshops and excursions:**

The National Action Plan was developed through four workshops which included various excursions.

*Workshops:*

22.–23.8.2006 and 29.–30.11.2006 at Capgemini ASE-center in Helsinki  
 In addition two smaller workshops were organized in 31.10 and 11.12.2006.

*Excursions:*

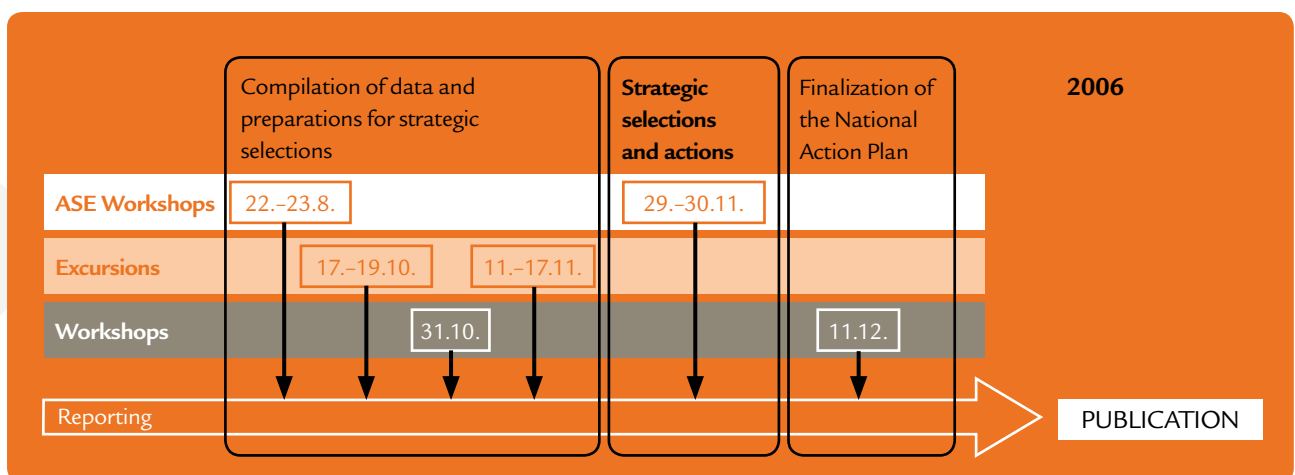
Two excursions were organized during the drafting of the National Action Plan.

*17.–19.10.2006 Netherlands and Denmark*

The themes of this European excursion were the business potential of environmental technologies, innovations and financing, responsible investments, ways to promote exports of environmental technology, and stakeholder cooperation.

*11.–17.11.2006 Japan*

This excursion focused on foresight, strategies for a recycling society, innovation activities, industry and research policies, and the cleantech business. The excursion was organised in collaboration with Tekes.



### Environmental business clusters and subsectors

Main sectors	Subsectors
Clean processes, materials and products	Material efficient production methods Low emission production methods Material efficient final products Ecologically disposable products Production of ecological materials (nano-, biomaterials etc)
Efficient energy use and energy saving	Monitoring, auditing and certification of energy production and consumption Energy efficient machines, equipment and systems Low energy equipment, insulation etc.
Clean energy production	Bioenergy and biofuels Wind energy Solar energy and heat pumps Hydrogen and fuel cell technology Other low emission energy technology
Recycling	Collection, recycling and reprocessing of materials Composting and anaerobic digestion
Waste management	Waste collection and transportation Waste treatment Waste storage and final disposal Waste-to-energy
Water management and waste water management	Water and waste water measurement, monitoring and analysis Tap water production, treatment and purification Industrial waste water treatment Municipal waste water treatment Other activities related to water treatment and protection of water systems
Air pollution control	Measuring of air quality and emissions Air conditioning and filtering Cleaning of exhaust and combustion gases CO2 capture and sequestration
Soil and landscape protection and restoration	Soil analysis and measurement Clean-up and restoration of soil Environmental construction and landscaping
Noise abatement	Measurement of noise Soundproofing and protection of hearing Planning of acoustics and soundproofing
Environmental data collection, PR, administration	Research and education Publishing activities, exhibitions, conferences Data and communication systems Consulting, assessment, financing, legal services Environmental sector networks and organisations Governmental activities



## ***This is Sitra***

### **Building a successful Finland for tomorrow**

Sitra, the Finnish Innovation Fund, is an independent public foundation promoting the well-being of Finnish society under the supervision of the Finnish Parliament. Sitra was established 40 years ago, in 1967, to mark the 50th anniversary of Finnish independence.

Sitra's responsibilities are stipulated in law. Since its establishment, Sitra's duty have been to promote stable and balanced development in Finland, the qualitative and quantitative growth of its economy and its international competitiveness and co-operation.

Our operations are governed by a vision of a successful and skilled Finland. We have always approached our operations with strong belief in the future and in the ability of the latest technology to generate well-being.

As early as in the 1960s, we were already launching projects to promote innovation, and ever since then, our role as a public financier of the development of technology and its applications, and later also as a venture capitalist, has been significant. In addition to innovations, we have from the very beginning also funded research.

Sitra has always been quick to address questions central to the growth of the Finnish economy and the well-being of its citizens. Sitra's independent and autonomous position has provided it with an ideal foundation wherewith to carry out this task.

It is characteristic of Sitra to be the initiator of new activity and, once this has been established, to move on to new areas.

Currently, we have organised our operations into fixed-period programmes by which we aim to achieve as great a social impact as possible.

Our current programmes focus on health care, food and nutrition, the environment, Russia and India and they are geared to improve Finnish competences and competitiveness in collaboration with other partners. The programmes comprise studies, strategy processes, innovative experiments, business development and corporate funding.

Sitra's activities are financed by the yield from its own endowment capital and its financing activities. Esko Aho is the President of Sitra, which has a personnel numbering 100.

## ***Environmental Programme 2004–2007***

### **Boosting environmental business**

Finland is known around the world for its competencies in the field of the environment. This reputation is an ideal foundation for the growth and internationalisation of business based on environmental and clean technologies.

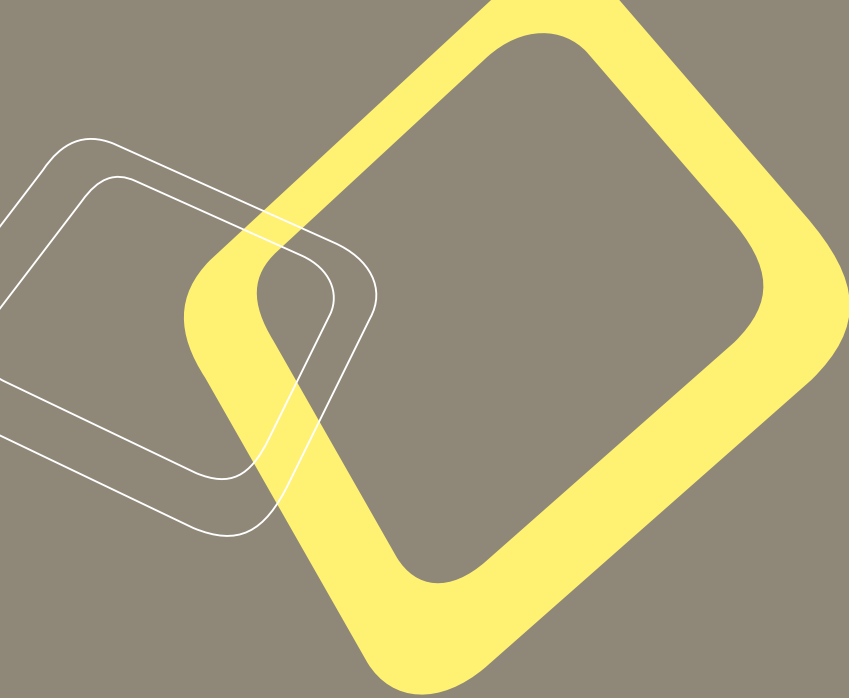
Our aim with the Environmental Programme is to increase the significance of the Finnish environmental business, develop the domestic markets and networks in the sector and improve its competitiveness in the global markets.

Solving environmental problems and reacting to the challenges posed by climate change have been widely acknowledged to present important business opportunities. Developing new solutions in environmental technology into successful innovations requires appropriate forms and methods of funding. The central tool in the programme is venture-capital investments.

We are carrying out the programme in close collaboration with businesses, the public sector and other stakeholders. We will draw up an action plan for the environmental technology field in Finland, with the aim of making Finland a leading country in environmental business.







# SITRA

Sitra, the Finnish Innovation Fund convened a group made up of representatives from business, the administration, research institutions and organizations to draft a National Action Plan to develop environmental business in Finland.

The vision defined for the National Action Plan sees Finland as a leading cleantech country. The goal is that by 2012 Cleantech will form a new pillar for Finnish industry, with an annual growth rate of 15%.

To help realize this vision, actions have been set out within four strategic projects: Finland as the world's best known cleantech country; Finland as the optimal growth platform for environmental business; Finnish excellence in focus areas; and the most effective international corporate networks.

The coordinated implementation of these strategic projects will require close cooperation between all actors and full commitment to the Action Plan. Sitra will work to ensure that the National Action Plan is fully implemented.

**Finnish Innovation Fund**