STIMULATING INDUSTRIAL INNOVATION FOR SUSTAINABILITY:
AN INTERNATIONAL SURVEY FOCUSED ON TECHNOLOGY

FINLAND

Dr. Mari Pöyhönen (RAND Europe)
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1. INSTITUTIONAL CONTEXT/BACKGROUND

1.1. OVERVIEW OF FINNISH ECONOMY

Finland suffered from a severe economic recession in the beginning of the 1990s. Many large manufacturing low-technology industrial sectors had difficult times and unemployment rose to nearly 20 percent in 1994. Finland has recovered quickly from the recession with structural changes in Finnish industry (the total value of export has increased threefold between 1990 and 1998). In addition to the traditionally strong pulp and paper industry, new high-technology companies—especially in telecommunications and information technology—have grown rapidly (in 1998, electrical equipment and electronics contributed 20 percent of the total value of exports). However, the pulp and paper industry remains an important industrial sector; because this industry draws heavily on natural resources and is energy-intensive, it is of major importance in considering the Finnish approach to environmental issues. In this industry, Finland has been able to create innovative solutions and is the world leader in technological knowledge (Finland has 0.5 percent of the world wood resources, but supplies around 50 percent of the global expertise in pulp and paper technologies). Figure 1 presents the development of Finnish export by sectors of industry since 1970.

![Figure 1: Finnish export by sector (% of total exports)](image)

In spite of the growth in recent years, unemployment continues to be a problem. Industrial activities are unevenly distributed across the country and the unemployment rate remains very high in some regions. The main issue on the agendas of the most recent governments has been to find solutions to unemployment. Because SMEs have been considered to be essential in solving the problem, public R&D support to SMEs as well as regional development support have been special focus areas.
1.2. AN OVERVIEW OF THE NATIONAL INNOVATION SYSTEM RELATED TO SUSTAINABILITY

Figure 2: The Finnish National Innovation System related to sustainable development

Figure 2 presents an overview of government players related to sustainable development and innovation. At the highest political level, there are two interministerial bodies (both chaired by the prime minister) that affect innovation and sustainable development policies:

- The Science and Technology Policy Council makes the main recommendations and gives guidance for Finnish science and technology policy. The council produces a national science and policy review every three years; the most recent one was in 2000.
- The Finnish National Commission on Sustainable Development develops Finnish sustainable development strategies and coordinates different measures on sustainable development at different levels (all ministries, industrial organizations, research etc.)

The principal ministries responsible for legislation and regulation, distributing R&D money, and promoting sustainable development are

- The Ministry of Environment. This ministry is responsible for environmental protection, regulation, land use, and housing issues; it coordinates environmental cooperation and support to Central and Eastern European countries.
- The Ministry of Trade and Industry. This ministry is responsible for industrial issues, technology policy, and energy policy; it controls the activities of Tekes, VTT, and Motiva (the Information Center for Energy Efficiency).

Other ministries that have an important role in sustainability discussion are:
- Ministry of Education (university research)
- Ministry of Transport and Telecommunications (transport issues)
- Ministry of Agriculture and Forestry
Figure 3: The development of R&D investments in Finland

Figure 3 presents the evolution of R&D investments in Finland. Private investments and university funding have both increased very rapidly. The National Technology Agency (Tekes) has the main coordination and implementation responsibility of directing public R&D funds to industry. In 1998, Tekes distributed around 90 percent of public R&D money that is directed to industry; 20 percent of this money was given to companies as loans and the rest as subsidies to product development (42 percent) and research (38 percent).\(^1\) Tekes has its main office in Helsinki, plus 14 regional offices that offer services to companies throughout Finland. The main ways Tekes operates are:

- Coordinating and implementing technology programs (described in detail later) as well as providing funds for individual R&D projects.
- Activation: strategic advice and technology expertise services to companies; focusing on SMEs and new technology based business.
- Developing the innovation environment: promote networking, disseminate information (Tekes research), and actively participate in technology policy discussion.

The Academy of Finland supports research activities in universities. They also have their own research programs that provide additional research funds for universities and focus on specific themes. During the 1990s, the Academy of Finland and Tekes increased their cooperation.

Many different research institutes operate partly under the ministries and get some of their funding from ministerial budgets (however, during the last ten years, the role of many of them has changed and they need to more aggressively seek other sources of funding.) The most important ones related to sustainability are the Technical Research Center (VTT) and the Finnish Environment Institute (SYKE). Other important research institutes include the Economic Research Institute (ETLA) and Forestry Research Institute (METLA).

The Finnish National Fund for Research and Development (SITRA) is an independent public fund that provides venture capital for high technology companies and has its own research program. Other important public financing sources for starting companies are the Regional Development Fund (KERÄ) and Finnish Industrial Fund (Suomen Teollisuussijoitus Oy) that invest mainly in various regional funds.

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\(^1\) Tekes Annual Report 1998
1.3. FINNISH POLICY ISSUES AROUND SUSTAINABILITY AND TECHNOLOGY

The Finnish National Commission for Sustainable Development (FNCSD) has coordinated the strategic work around sustainability and helped to prepare the Finnish Government Program for Sustainable Development. The program focuses on three major elements of sustainability.2

**Ecological sustainability**
- slowing down climate change, cutting down greenhouse gas emissions and increasing the efficiency of production and use of energy, especially non-renewable energy sources,
- preserving biological diversity and safeguarding the productive capacity of renewable natural resources.
- safeguarding the high level of environmental protection in Finland and using cost-effective and preventive measures

**Social sustainability**
- strengthening the joint learning and innovative processes of different actors in order to increase the ability of Finnish society to meet challenges
- combating unemployment and other social problems and reducing their effects through adequate social security
- supporting local projects for sustainable development and enhancing public participation and its influence on local issues (note: regional development).
- supporting socially sustainable development and good governance of environmental and health issues in the developing countries and economies in transition (this is focused on the Baltic countries and Russia).

**Economic sustainability**
- using all resources effectively and decreasing unemployment
- promoting economic activity that increases economic and human capital, knowledge and skills as well as safeguarding natural capital
- supporting the use of market-based and voluntary measures in developing products and production methods
- promoting environmental awareness and opportunities to choose environmentally sound products
- promoting research and development in environmental technology and turning technological innovations into commercial products
- modifying taxation in a direction that supports employment of people and reduces environmental loads.

In addition to government's sustainability program, different stakeholder groups have defined their own programs for sustainability in cooperation with FNCSD. The groups with completed and approved sustainability programs include:
- Association of Finnish Local Authorities
- Confederation of Finnish Industry and Employers (TT)
- Federation of Finnish Commerce and Trade
- Central Union of Agricultural Producers and Forest Owners (MTK)

The main practical themes around sustainability policy issues at this moment are focused around:
- The challenge of climate change. Finland has difficulties restricting its emissions in order to meet the Kyoto agreements. This is partly because the economy is growing rapidly and as a consequence increasing its need for energy.

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2 see details from: http://www.vyh.fi/poltavoikeke/program.html
- Increased use of voluntary policy instruments and emphasis on transparency in creating new instruments.
- Improved competitiveness of Finnish industry by means of eco-efficiency and eco-competitiveness. Technological development focuses on improving the processes instead of end-of-pipe technologies. The challenge is that Finnish industry is already very efficient and further improvements, if possible, are very expensive.
- The challenges and opportunities of structural change in industry and information society developments.

Sustainable development is linked to science and technology policies. In Spring 2000, the Science and Technology Council released its latest overview of science and technology situation and recommendations for future. The main themes appearing in the report related to the present study are as follows:
- There is a strong support to further strengthen cooperation across different political sectors. There should be a focus on integration among employment, regional, and environmental policies.
- In the mid-1990s, additional resources were given to increase cooperation among different ministries. The resulting cluster program activities have worked well and there is support for further development of them and the use of the same networking models for other research programs as well.
- Further work must be done to establishing an innovation network that covers all regions.
- Public R&D support should increase by a total of 200 million EURO during the years 2001-2004.

1.4. INTERACTION OF GOVERNMENT AND INDUSTRY

Finland has a tradition of "negotiated agreement" between government and industry, which means that new laws and regulations usually have strong support among different interest groups. Thus, industry representatives participate actively in the preparation of laws and regulations as well as in developing research activities. The development of new programs is usually very closely linked with industry needs. In creating new instruments, it takes a long time to make changes because of long discussions. In the end, however, laws are well received and followed. Monitoring activities are very light; for example, environmental licenses rely mainly on self-reporting.
2. CLASSIFICATION OF POLICY INSTRUMENTS

2.1. INSTRUMENTS STIMULATING SUSTAINABILITY

As mentioned in the previous section, the Finnish government has traditionally mainly had a role of facilitator and cooperator in supporting sustainability. This tradition of consensus has created an atmosphere where voluntary agreements are very well received (e.g., energy saving agreements). It is reasonable safe to assume that in the future, voluntary actions will continue to be preferred over tighter environmental norms and increased taxation.

Table 1 gives an overview of the instruments used by the Finnish government to stimulate sustainability. Different programs (giving direct support to stimulate sustainability) vary a lot, but a few general characteristics describe the modalities of contracting, organization and the methods to assess effectiveness in Finland. Two of the types of programs are described in detail in the following section (Tekes technology programs and Environmental Cluster Program coordinated by the Ministry of Environment).

2.1.1. Modalities

Generally in Finland, programs launch a public call for proposals to which companies and/or research institutes respond. The resulting proposals are usually evaluated in committees based on loosely defined set of criteria; the specification of the work required is often left quite open and thus proposals and the ensuing projects can vary widely in content. Programs are under no obligation to spend all of their budget if the quality of proposals is low.

2.1.2. Organization

Programs usually have a steering group and individual projects have their own steering groups. Generally, during the project the required reporting is minimal. Companies conducting projects often are only required to provide proof that they have conducted the work; other public documentation, such as of the results of the project, is not demanded. Project conducted by research institutes are generally required to do more reporting and produce public results. Project work generally follows the proposed plan; because Finland is a small country, failure to diligently strive towards intended project completion becomes known, and future opportunities for funding are jeopardized. Recently, more attention has been paid to project dissemination activities and networking of information providers and users. Programs usually include at some level seminar activities where the results from different projects are presented at a program level.

2.1.3. Methods to assess effectiveness

The effectiveness of government actions is assessed at different levels. All major organizations - different ministries, Tekes, Academy of Finland, research institutes, etc.- have been evaluated by international evaluation teams. These evaluations have given recommendations for future developments and for types of instruments that should be supported (for example, technology program activities of Tekes have received positive evaluations and encouragement for further development).

At the program level, there is usually an evaluation and/or final program report after a program is finished covering basic indicators describing the projects (money allocated, number of projects and companies involved etc.). As much as possible, evaluations are done by outsiders; often international experts are used. Recently, evaluations have become more structured and standardized. For example, Tekes started its own evaluation unit in early 2000

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3 The list is far from exhaustive. For example, waste management and safety regulations and taxation instruments are left out from the list although they could be linked with sustainability and innovation.
and is further developing and structuring its evaluation activities. However, there is still no common methodological or organizational structure for evaluations across all organizations.

Table 1: Instruments used by Finnish government to stimulate sustainability

<table>
<thead>
<tr>
<th>Name of the instrument and coordinator (s)</th>
<th>Description (also selection process and effectiveness assessment)</th>
<th>Type of support/ instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tekes technology programs</strong></td>
<td>In 1999, over 60 technology programs were sponsored by Tekes. They vary in their size, scope, and organization. The money is given as a subsidy based on a project proposal to companies or research institutes that have industrial partners. Usually Tekes provides 50 percent of the project funding and the rest is paid by the participating company/research organization. The programs also include often a lot of dissemination of results and knowledge transfer activities. Generally, the program theme can be focused on an industrial sector or a specific technology area. Environmental programs are either targeted on an environmental area or, more often, the environmental theme is integrated with other technology programs. Since 1994, Tekes has also had the coordination responsibility over all energy related R&amp;D support. In 1998, about 40 million EURO of technology program money was targeted to environmental issues. (Details of these programs are described in the next section.)</td>
<td>Subsidies (and activities to disseminate the results)</td>
</tr>
<tr>
<td><strong>Tekes technology projects</strong></td>
<td>Tekes also provides subsidies or loans to individual projects based on individual project proposals outside technology programs.</td>
<td>Subsidies and loans</td>
</tr>
<tr>
<td><strong>Technology clinics, strategy consulting and technology services</strong></td>
<td>Tekes gives different strategic help to companies and offers different technology expertise services. The technology clinic initiative, for example, aims at decreasing the bureaucracy of project start-up and helps companies to find partners or to apply for funds for promising ideas.</td>
<td>Expert services, information dissemination</td>
</tr>
<tr>
<td><strong>Cluster programs</strong></td>
<td>There are seven cluster programs, each run by a group of ministries. Tekes, the Academy of Finland etc. and focusing on different themes. Together the cluster programs have a budget of 250 million EURO. The environmental cluster program coordinated by the Ministry of Environment will be described in detail in the following section.</td>
<td>Subsidies</td>
</tr>
<tr>
<td><strong>Top research institutes</strong></td>
<td>The Academy launched a few years ago a new instrument to give additional research funds to &quot;top research institutes&quot; (in 1998, about 7 million EURO). This far, the evaluation criteria have not included environment as a separate issue, but the model could be used to direct money to &quot;top environmental research units&quot;. This instrument has been very well received.</td>
<td>Research grants for universities</td>
</tr>
<tr>
<td><strong>Academy research programs</strong></td>
<td>The Academy has research programs that focus around specified themes. Recent programs have been conducted in climate change, sustainability in agriculture, ecological construction, etc. In 1998, about 26 million EURO was allocated through all of the Academy research programs. These programs are directed to universities and to basic research. Inclusion of industrial partners is encouraged, but not required.</td>
<td>Research grants for universities and research institutes</td>
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<tr>
<td><strong>New environmental protection law</strong> (enacted 1.3.2000).</td>
<td>The new environmental protection law combined previous air, water and chemical laws under one unified licensing practice following EU specifications. Constraints were not tightened, but companies need now to apply for one operating license that covers all their environmental impacts, i.e., instead of separate water and air emission licenses, they now will have only one license. The new law introduced a re-organization of licensing practices and increases interaction among governmental officials. It may increase the work in some companies because they now need to consider their environmental strategies as a whole.</td>
<td>Law</td>
</tr>
<tr>
<td><strong>Energy taxation</strong></td>
<td>Finland changed its energy taxation structure at the beginning of 1997 because that structure made it difficult for domestically generated electricity to compete with imports. Tax on fuels used in electricity generation was removed and taxing the end product - electricity - was introduced. In heat generation, the tax continues to be based on the carbon content of the fuel. The taxes on heat generation are determined on equal terms for all consumers, but electricity taxes are lower for industry and professional greenhouse growers.</td>
<td>Tax</td>
</tr>
<tr>
<td><strong>Voluntary energy saving agreements</strong></td>
<td>In 1997, the Finnish Ministry of Trade and Industry started several voluntary agreements with communities representing consumers of energy and the energy industry. Upon acceptance of a voluntary agreement, companies assign a responsible person for energy issues, undertake an energy audit or analysis, draw up a plan for increased efficiency of energy consumption, consider energy efficiency when budgeting for investments, and report annually on issues related to efficiency of energy consumption to their trade organization. The Ministry of Trade and Industry for its part provides financing for energy audits and analyses as well as energy-conserving investments particularly for companies and communities that have signed voluntary agreements. Motiva (see immediately below) promotes and monitors the progress of voluntary agreements.</td>
<td></td>
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<tr>
<td><strong>Motiva</strong></td>
<td>Motiva, the Information Center for Energy Efficiency, which primarily operates with the ministry's budgeted funds, implements the government's energy conservation program by encouraging companies and private consumers to adopt more efficient ways of using energy. Motiva's task in the industrial sector is the promotion of energy efficiency by performing energy analyses, developing methods, advancing the implementation of new, energy-saving technology, and distributing information.</td>
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</table>
3. SPECIFIC EXAMPLE PROGRAM DESIGN CHARACTERISTICS

In this section, we describe in more detail the environmental cluster program of the Ministry of Environment and the Tekes technology programs related to environment. For both programs, there will be first an overview of the background, then description of objectives and organization of the work.

3.1. ENVIRONMENTAL CLUSTER PROGRAM

Background

In the mid-1990s, additional money (about 250 million EURO resulting from the privatization of some big Finnish government-owned companies) became available to support R&D activities. The Science and Technology Council recommended that the money should be used to increase interaction among ministries and companies and cluster programs were suggested as a means to do this. This recommendation was preceded by a series of studies where eight industrial clusters were identified to be of major importance in Finnish economy\(^4\). The council came up with a suggestion for seven separate cluster programs\(^5\) that gave together additional budget sources to five ministries. The objective of the programs was to strengthen industrial R&D activities together with increasing interaction among public and private sectors as well as among the ministries. The environmental cluster program was the one that is of most relevance to the present project. The clusters were themselves not completely independent; for example, the environmental cluster program cooperates closely with other clusters, most notably the forest cluster program.

The environmental cluster program focuses on sustainability and is coordinated by Ministry of Environment in cooperation with Ministry of Trade and Industry, Ministry of Transport and Communications, Tekes, and the Academy of Finland. It was designed by a steering committee consisting of members from the Ministry of Environment and other participating groups. The steering committee divided the program into three parts:

The Eco-efficiency phase of the program is now approaching its end; our description is largely based on the experiences of this phase. Eco-efficiency was budgeted for about 13 million EURO, of which a little more than a third was contributed by the Ministry of Environment, one-sixth by Tekes, and the remainder by a variety of actors.

Objectives and themes

Generally, cluster programs have an objective to support research in different sectors that would generate new businesses and jobs. This objective was defined in a period of high unemployment, and—as we noted above—employment remains a concern. The more specific objectives of the environmental cluster are to produce knowledge, innovations, expertise, and cooperation in the environmental sector and to promote sustainable development, entrepreneurship, economic growth and employment. Collaborative projects aim at enhancing contacts among researchers, research groups, and users of research findings.

The objective of increasing cooperation grew out of experience in the first activities of the


\(^5\) Forest, food, well-being, transport, telecommunication, national workplace development, and environmental cluster programmes.
cluster, where each of the actors had its own focus and the cluster was in danger of losing coherence. Tekes focuses on technological research and product development with companies and the Academy of Finland focuses on research at universities and research institutes. Ministries have their own research budgets, but this research is quite limited in amount, scope and structure. Cooperation has allowed the cluster to fill a knowledge gap and to structure research efforts so that the results are more useful for policy makers.

The program was divided into six topic areas:

- **Material flows and life cycle analysis**: "Eco-efficient Finland" - material flows and production processes of the whole nation. Life cycle analysis projects in, e.g., forestry, metal industry, construction, agriculture, water management and natural stone industry (13 projects)
- **Eco-efficiency of production processes and products**: Redesign of products and production processes. Recycling. Focus on increasing eco-efficiency and finding the ways to implement IPCC directive. (18 projects)
- **Environmentally sound infrastructure**: infrastructure planning and sustainability (6 projects)
- **Environmental data systems and eco-management** (10 projects)
- **Development of environmental business, eco-export, and marketing** (5 projects)
- **Environmental and innovation policies** (7 projects)

**Organization of the program, project selection and management**

The steering group consisted of a few members from each participating organization and industrial representatives (together about 15 members and one full time scientific coordinator from the Ministry of Environment), who met on a regular basis. They designed the program, selected the projects, and ensured that the work was coordinated.

In the beginning, the program was not very clearly defined. The first call for proposals was sent out as a very open offer to provide funds for research in the area of sustainable development. The proposals that were received varied in not only in subject matter but in quality, and very few were funded. Some of the applications were clearly more suitable for other funding sources and were directed there. Thereafter, proposals were requested in a more structured manner, in the form of three targeted calls (done separately by Tekes, the Academy of Finland, and Ministry of Trade and Industry). After each call, all proposals were evaluated by the entire steering group with help from experts. The programs funded in this phase of the environmental cluster program focused on fundamental research, technological development, and systems and policy analysis. Altogether, 70 companies and 170 research units participated. It is expected that in the following program phases, there will be more emphasis on infrastructure issues, and several pilot projects and other more applied projects are anticipated.

For each selected project, a steering group of few members was appointed with always one member from the financing organization and persons from industry to monitor the work. The project contractors reported to the steering group of the progress of the work. The program included a set of seminars, whose audiences ranged from one sub-program through the environmental cluster program as a whole to all of the cluster programs together, or industry-wide. These seminars were the principal means of disseminating the results of the program and enhancing cooperation among the various actors.

**Hurdles**

The program thus far is regarded as very useful and successful. The major problem was during the startup when the first calls for proposals were sent out without enough preparatory work and need assessment and with a very tight timetable. A new type of program was not yet
Further information on specific programmes and a list of environmental related programmes can be found from Tekes home pages: http://www.tekes.fi

3.2. TEKES TECHNOLOGY PROGRAMS

Background
Tekes began in 1982, when a committee was formed to consider how such a technology advancement agency should function. The committee recommended that Tekes identify and focus upon technology areas that are important for Finland. The original proposal included seven such technology areas. Since its inception, Tekes has steadily grown in size and scope, and the institution is widely regarded as a major success. Today, Tekes covers over 60 technology programs, which consume about 40 percent of the Tekes budget (about 150 million EURO in 1998). These programs vary in size from about 1.5 to 100 million EURO. Basically the programs can be focused on the needs of a specific industrial sector or around a specific technology area. Very often the programs are linked with each other so that subsequent programs can more easily build upon earlier work. Some of the programs have a larger national focus. International cooperation is also often integrated with technology program activities (Nordic programs in cooperation with, e.g., NUTEK, and EU programs).

Tekes focuses on supporting technological development. Environmental technology is defined to be a technology that aims at having positive impacts on environment. The main Tekes principle in supporting environmental technology development and environmentally friendly business practices is transparency. Environmental technology should not be isolated from other technology development, but rather it should be integrated with all technology programs. About 80 percent of funds allocated to environmental technologies are allocated over all technology programs (horizontal support). However, there are also targeted environmental programs that use around 20 percent of the funds allocated to environmental technologies. Together the environmentally targeted technology programs had a budget of over 9 million EURO. The amount of money used for environmental technology development within other programs is estimated to be between 30 and 50 million EURO (the aim to integrate environmental technology with all technology development makes it difficult to precisely separate "green" money from other funding).

Objectives and themes
The overall objective of Tekes is to promote the competitiveness of Finnish industry and the service sector by technological means. With environmental technology programs the wider objective is to increase the knowledge base and stimulate exchange of knowledge so that both the Finnish companies and environment benefit from the technology development projects.

The specific objectives and themes of technology programs with an environmental focus differ considerably one from another depending on whether they are targeted or horizontal programs and on their target technology areas. The creation of the program can follow one of many paths; the initiatives may come from industry, but from Tekes itself. Below, short descriptions are given of a few programs covering these different types.6

Technology and Climate Change - Climtech (1999 - 2002, 2.5 million EURO)
The Finnish energy system is already relatively efficient. Finnish energy technology is well developed and innovative, especially in the fields of energy efficiency and the utilization of renewable energy sources. The Climtech program includes tasks to:
• Investigate the development needs and applications of technologies that will limit climate

6 Further information on specific programmes and a list of environmental related programmes can be found from Tekes home pages: http://www.tekes.fi
Generally, technology programs proceed in the following way:

Organization of program, project selection and management

- Support the application and commercialization of Finnish technology.
- Analysis of climate change control with the help of an overall picture.

During the first phase, the program objective is to identify the most important development fields; this work is coordinated and conducted by VTT Energy. ClimeTech is a new type of a technology program because it is principally research focused and identifies areas where possible new technology programs will be started later. ClimeTech can be seen as a follow up of the SIHTI 2 (1993 - 1998) program that focused on energy and environmental technology.


The aim of the Finnish Research Program on Water Services and Technologies is to promote the competitiveness of the Finnish water sector industry and to increase research activities on water supply and sanitation. The program is targeted on environmental technologies in one industrial sector. It aims at creating increased interaction and knowledge base around water issues. The program covers many different technology areas. The main areas of interest are:

- water treatment technology
- maintenance and rehabilitation of water supply and sewerage systems
- operation and control of treatment plants, water distribution and wastewater collection
- wastewater treatment and sludge disposal
- water supply and sanitation at rural areas
- pretreatment of industrial waste waters and landfill leachates

**Smart and Modular Building Automation - SaMBA (1995 - 1999, 11 million EURO)**

SaMBA is an example of a program which is tightly focused on one technology - integrated and intelligent building modules - and where the sustainability issues are horizontally included. At the time of launching the program, over 75 percent of building automation systems were imported while less that 10 percent of the systems produced in Finland were exported. The objectives of the program were to change the situation so that building automation export from Finland would equal to import. Sustainability issues are an essential part of the program as the intelligence in buildings is linked with energy saving and environmentally friendly construction. The program has been completed and was considered to be very successful.

**Organization of program, project selection and management**

Generally, a technology program proceeds as follows:

1) Tekes prepares the programs. The process takes usually couple of years and involves a lot of interaction with industry. The needs in industry are very often driving program development. The programs also often build upon previous programs. The resulting detailed plan for a program is given to the board of Tekes for approval.

2) The program usually has a coordinator outside Tekes. The coordinator is an expert in the specific technology area and has a responsibility for all practical arrangements. The coordinator has an important role in initiating the program and opening the calls for proposals. Thus far, coordinators have been generally appointed by Tekes. However, in the future there may be more often an open competition for the coordinator task.

3) Companies and research institutes prepare their project proposals following guidelines provided by Tekes. Typically, the companies need to invest around 50 percent of their own money in the project that they propose. Tekes also gives funds for research projects done by research institutes, but in these cases the projects need to have a clear connection with industry and companies as partners.

4) The program has a steering group that includes representatives from Tekes, ministries, and industry. The steering group gives recommendations to Tekes which projects should get funding, but the final decision regarding funding rests with Tekes. The main criteria for funding include the anticipated impact of the project on the competitiveness of the
company, the technological challenges, a realistic evaluation of the resources available to complete the work, the need for Tekes support, and the potential networking impacts.

5) Each project has a small steering group that follows the progress of the work. Projects have a reporting responsibility. However, business secrets are respected and the companies do not need to produce public reports on their projects. The funding given to research institutes usually requires more detailed reporting, accompanied by a dissemination plan.

6) Technology programs typically last from 1 to 3 years. After the program is completed, there is usually a final report on the content of the program and an evaluation done by outside evaluators. The programs also include seminar activities throughout the program life time.

Tekes projects always have a clear technology focus. Thus, the knowledge produced is not basic science, but rather on technological development, systems and policy analysis, pilot projects and implementation. The current emphasis is on technological development and pilot projects, although Tekes is showing some interest in greater support for implementation.

**Hurdles**

Different programs vary a lot and there have been a variety of problems during the history of Tekes. However, Tekes has evolved in a manner to overcome major problems as they are encountered, and proactively seeks to be flexible enough to anticipate future problems.