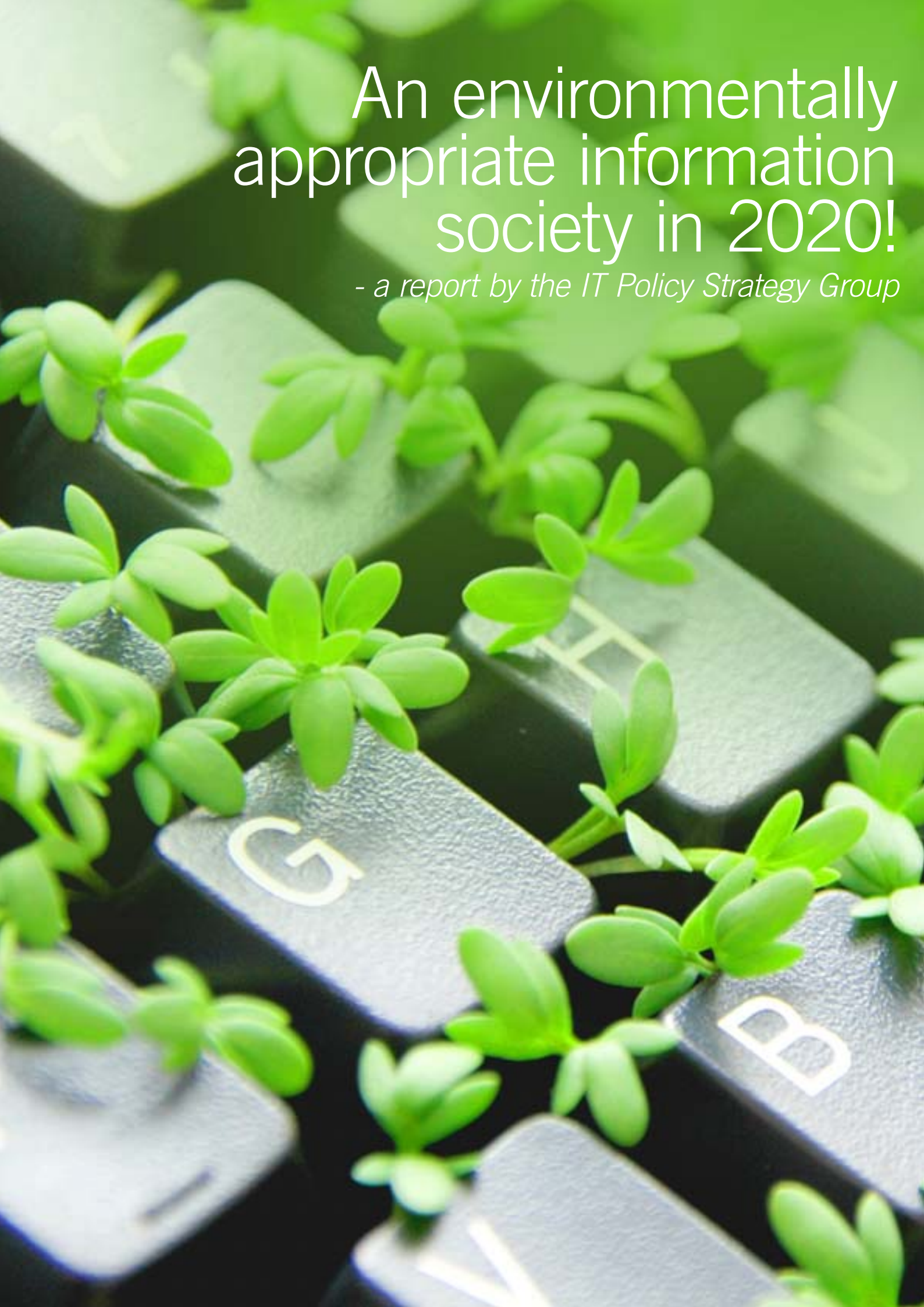

An environmentally appropriate information society in 2020!

- a report by the IT Policy Strategy Group

We would like to give our thanks to all those who have contributed to this work!

Stockholm 17 oktober 2006

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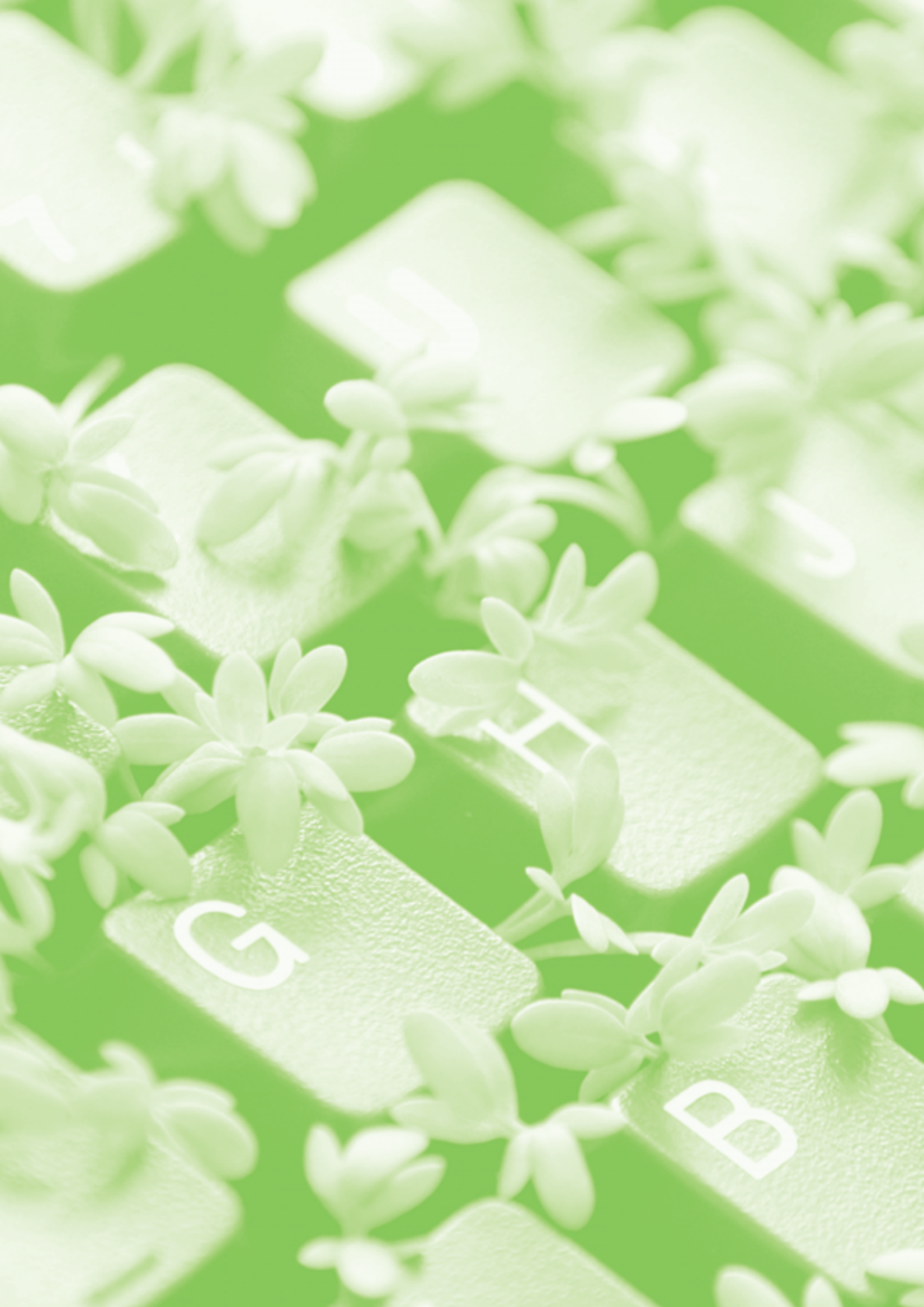
Summary

Like the rest of the world, Sweden faces major challenges in which climate change, competition for natural resources, demographic change and growing economies must be managed. Innovation and new thinking are required to turn these challenges into opportunities. There is also rapid development in new technology that is making a major contribution to changes in society. Properly used, technology can be a tool to extract economic and environmental benefit from the increased needs. IT is a key factor and can contribute to breaking the negative trend, in which increased growth leads to greater environmental impact.

This report by the IT Policy Strategy Group contains a proposed national strategy for an environmentally appropriate information society, the intention of which is to demonstrate the opportunities afforded by IT for exploiting environmental challenges to bring about greater efficiency, productivity, innovation and increased exports. Sweden is often held up as a leading IT country and should exploit the opportunities afforded by IT in the form of resource- and energy-efficient solutions, increased efficiency, scope for modified lifestyles and international competitiveness. Environmental technology is a sector for the future with a growing international market. By investing in increased use of environmental technology solutions, the Swedish market can grow and innovativeness within the sector can increase. This creates greater profitability for consumers and producers and, especially, it means less environmental impact on our society.

The way to an environmentally appropriate information society in 2020 is through coordination and the creation of networks, setting up clear goals and focusing on a number of areas. There are now good prerequisites for carrying forward the work within this field and it is important to take early action. To achieve an environmentally appropriateinformation society, transport must be made more efficient, travel and mobility should be replaced by accessibility, construction and housing must be more energy-efficient and the environmental impact of IT products themselves must be reduced. This strategy includes proposed measures and in all these fields, IT is both a catalyst and a tool.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Introduction

Sustainable development is a central concept in discussions about the future. The earth's resources are finite and the world's needs are growing. Economic growth has traditionally been followed by increased environmental impact, posing a serious dilemma which must be dealt with. There is also rapid development in new technology, which is making a major contribution to changes in society. Properly used, technology can be a tool to extract economic and environmental benefit from the increased needs. IT[1] can help to break the negative trend, in which increased growth leads to greater environmental impact[2]. Within the framework of its mandate, the IT Policy Strategy Group has opted to focus on the environmental perspective in the concept of sustainable development, in order to illuminate a very important sector of the information society, since IT development and environmental impact go hand in hand. The Strategy Group and its working group on IT and environment therefore put forward this proposal for a national strategy for an environmentally appropriate information society in 2020. The report is not an in-depth analysis but aims to provide a source of inspiration and ideas.

Sweden is often held up as a leading IT country and should therefore exploit the opportunities afforded by IT in the form of resource and energy-efficient solutions, increased efficiency, the scope for changing lifestyles and international competitiveness. This development can also help to reduce the currently unsustainable consumption of goods and services. The basis for this is environmental technology, i.e. all technology that is less harmful to the environment than the available alternatives, and it embraces technology and processes to limit pollution, less polluting and resource-intensive goods and services, and methods for more efficient management of resources. That means that environmental technology pervades all economic activity and sectors[3] , including IT solutions that support more efficient transport, travel and energy use. IT is seldom marketed on environmental grounds but intelligent solutions, for example for more efficient use of energy, are now becoming more sought-after, in step with rising energy prices and greater climate change. This creates scope for innovations with greater potential and profitability for consumers and producers, while the Swedish market also grows. Environmental technology is a sector that is gaining ground in Sweden. Currently the market is primarily within Europe, but the world market is also increasing, which provides good opportunities for Swedish enterprises to increase their production and exports[4]. The environmental technology sector is an industry for the future which combines employment, economic growth and a better environment.

IT investments are made by industry and users with a desire to increase efficiency, growth and in certain instances to reduce environmental impact. IT products have become more energy-efficient at lower production costs and lower prices, which increases demand and use. For the long-term development of the information society, it is important to draw attention to the potential environmental effects inherent in increased IT use. At the same time, the holistic perspective is important too, for example because increased energy consumption as a result of increased IT use can be of benefit if its effects over the longer term lead to greater energy savings in other sectors. If decision-makers and users are conscious of the positive and negative effects and their impact on the environment, there is a greater chance that the decisions taken will lead to a positive environmental development of the information society.

A key question for development within IT and the environment is to ensure, both nationally and in the European and global perspectives, that information is efficiently and widely disseminated in society at large. Geographical information has a special position in the environment sector. Access to harmonised and standardised digital information is one of the mainstays in conducting an effective environmental policy, in supervising and rectifying the situation in the environment, in efficient management within the environment sector and in the development of services on the market. An efficient information infrastructure embraces not only information and basic services but also a common framework of rules for their exploitation and financing, etc.

The public and private sectors must cooperate in order to increase environmental consideration in their activities and in doing, so exploit the potential afforded by IT. IT is not the only tool but it can be a catalyst and a carrier for various solutions. Efforts from different actors and sectors can create synergy effects that take development in the right direction. Cooperation between the different sectors of society is crucial and it is important that key actors take part and see the value of the work. While the domestic front is central in this task, Sweden's export dependency, increased globalisation and the transboundary nature of environmental problems all mean that active work has to be directed not only towards Sweden.

The report is arranged as follows. Chapter 2 deals with the working group, its remit and delimitations. Chapter 3 describes a future scenario of an environmentally appropriate information society in 2020, in which development has gone in a positive direction and growth in the information society is ecologically sustainable. Chapter 4 presents three focus areas with proposals for measures. Chapter 5 describes what are known as 'rebound effects'. The report reflects only the working group's proposals and has therefore not been jointly processed in the Government Offices.

[1]Information technology, here used to denote both IT and telecommunications,
[2]Decoupling – past trends and prospects for the future. Gothenburg, Physical Resource Theory. Azar, C., J. Holmberg, et al. (2002)
[3]Definition according to the EU Action Plan COM(2004) 38: Final Communication from the Commission to the Council and the European Parliament.
[4]Report from Framtidens Näringsliv, IVA. http://www.iva.se/templates/Page.aspx?id=1101

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2. Background

2.1. The IT Policy Strategy Group

The IT Policy Strategy Group was appointed by the Government on 18 June 2003 and concluded its task on 31 October 2006. The Group's remit is to provide advice to the Government and to be a driving force in achieving the IT policy goal of an information society for all. An important task is to manage, in cooperation with other actors in society, Sweden's vanguard position in the IT sector. The group's work has focused on considering IT policy from a broader perspective, in which benefit, need and business development within all policy areas and sectors of society are central concepts. The IT Policy Strategy Group works on the basis of a number of focus areas for IT policy. These are accessibility and public confidence, growth, environment and an environmentally appropriate information society, healthcare and social services, schools and learning, culture, democracy and digital gaps, and the legal dimension of the information society. And as part of this work, the IT Policy Strategy Group appointed a number of working groups, all headed by a member of the Strategy Group and coordinated by a project coordinator from the Strategy Group's secretariat at the Ministry of Industry, Employment and Communications. The working groups are broad in composition, with representatives from both the public and private sectors.

2.2. The working group on IT and environment

The working group on IT and environment was formed at the behest of the Strategy Group during the spring of 2005, to produce a proposal for a national strategy for IT and environment, in cooperation with other activities in progress in this area. Work on the strategy is an important part of the Strategy Group's focus area 'Environment and an environmentally appropriate information society'. In a number of instances, comments have been obtained from actors outside the working group, including during the workshop that was arranged in Stockholm on 12 June 2006. Participants in the workshop from the public and private sectors, and also the research community, had the opportunity to give their views and make proposals on the initial proposal for the national strategy[5].

The group submits its final document in the form of the proposal for a national strategy "An environmentally appropriate information society in 2020". The working group has been under the leadership of Ylva Hambraeus-Björling, chairman of the Strategy Group and CEO of IT-Företagen. Carolina Otterskog, from the IT Policy Strategy Group, has been the coordinator and project leader. The members of the working group are listed in Annex 1.

2.3. Delimitations

The report focuses on how innovative IT solutions can contribute to a reduction in environmental impact. It is also necessary to see the link between sustainable development and IT in general, but because of the breadth of the area, this report focuses on IT and the environment. Delimitations have also had to be made with respect to the group's remit, time-frame and the scope of the strategy. The IT Policy Strategy Group's other focus areas have dealt with other aspects within the concept of sustainable development linked with IT, such as for example IT in the healthcare and social services, IT and culture, and accessibility and public confidence in IT. The essence from all these areas is to be found in the IT Policy Strategy Group's final report[6]. The working group considers it important that work should also be done on, for example, IT and the work environment and on other parts of the social dimension within sustainable development.

The focus areas that the working group chose for the strategy are based on a selection of sectors in which applications are of the greatest interest from the point of view of the environment and the economy. The working group is conscious of the difficulties of seeing all potential environmental gains and effects, as well as rebound effects, within the focus areas chosen. As the basis for the environmental prioritisation, the group has taken its starting point in the results of the European research project "The Future Impact of ICT on Environmental Sustainability"[7], in which the environmentally most interesting IT applications have been identified and a quantitative assessment made of their environmental impact up to the year 2020, see annex 2. No financial analysis of the proposals put forward has been made. The examples of applications given within the respective focus areas are chosen at random to demonstrate how economic and environmental gains can be achieved with the aid of IT.

In the course of the work, account has been taken of earlier and ongoing efforts within the IT and environmental area. The IT Bill "From an IT policy for society to a policy for the IT society"[8] and "Strategic challenges – an elaboration of the Swedish strategy for sustainable development"[9] comprise the overall frameworks. These two strategic and central documents show that both IT and sustainable development are highly topical and important questions for Sweden's future. In this work use has also been made of the final report and other material produced by the Forum for IT and environment[10]. IT and the environment have a place on the political agenda and the proposal for a strategy "An environmentally appropriate information society in 2020" shows how it can be handled. Much work is being carried out in Sweden, within the EU and internationally, which in different ways focuses on IT and the environment. A selection from this work is summarised in annex 3 and also under the respective focus areas.

[5] For more information see the Strategy Group's website at www.regeringen.sb.se/d/2495

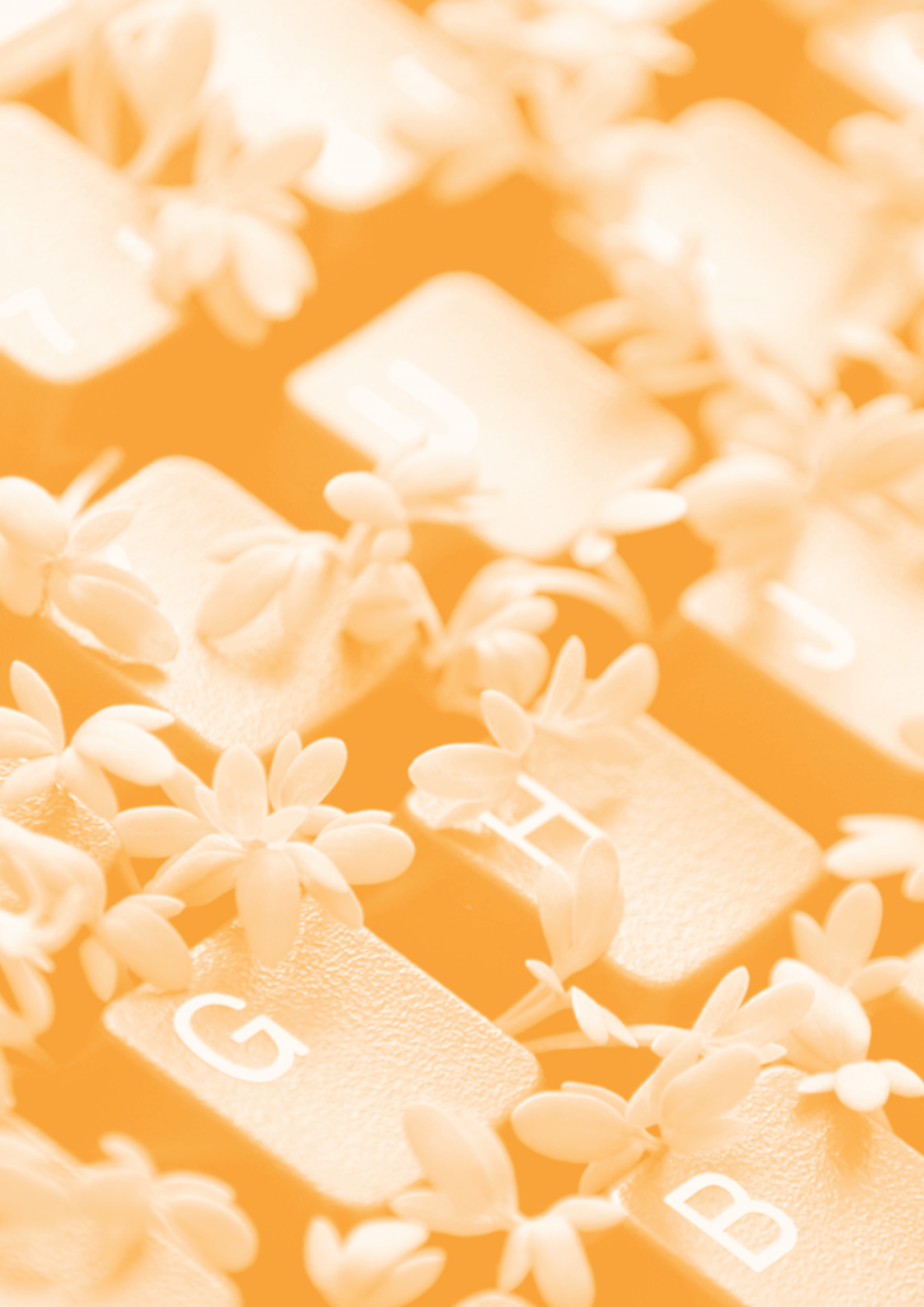
[6] The final report will be published on 31 October 2006 at www.regeringen.se/sb/d/2495

[7] The Future Impact of ICT on Environmental Sustainability Erdman et al., IPTS Report EUR 21384 EN (2004).

[8] Från IT-politik för samhället till politik för IT-samhället, Government Bill 2004/05:175.

[9] Strategic challenges – an elaboration of the Swedish strategy for sustainable development. Communication 2005/06:126.

[10] Forum för IT och miljö, www.regeringen.se/sb/d/108/a/26674



3. An environmentally appropriate information society in 2020 – A future scenario

3.1. The present situation

The world faces major challenges in which climate change, competition for natural resources, demographic change and growing economies must be managed. Innovation and new thinking will be required to turn these challenges into opportunities. Sweden is an actor in the global arena and Swedish efforts must be set in relation to the external world. The focus should lie on central issues such as future markets and predominant needs. The limited availability of natural resources is a matter that will become even more topical in the coming years.[11] This means that efficiency will have to be increased to enable more welfare to continue being generated in the future. Fewer natural resources must be used than now in order to continue to enjoy the goods and services that are in demand. The size of the challenge can be alarming but also inspiring.

This discussion is not new and a future scenario often benefits from being put in relation to a historical background. That allows us to learn from mistakes and to see whether previously desired development has been successfully achieved. The first international conference on environmental issues was held in Stockholm in 1972 and it was in principle the first occasion that brought to the fore the need for a change in direction in Western industrialisation, if development was not to lead to greater negative impact on the environment. During the conference it became clear that an overhaul of the use of natural resources was necessary if the problems were not to accelerate.

"A point has been reached in history when we must shape our actions throughout the world with a more prudent care for their environmental consequences. Through ignorance or indifference we can do massive and irreversible harm to the earthly environment on which our life and well-being depend. Conversely, through fuller knowledge and wiser action, we can achieve for ourselves and our posterity a better life in an environment more in keeping with human needs and hopes."[12]

The UN organised a world conference in Rio de Janeiro in 1992 on Environment and Development. During the conference, which is regarded as a landmark, the world's leaders agreed that development was not sustainable and that measures were needed to change the negative trend.

"Humanity stands at a defining moment in history. We are confronted with a perpetuation of disparities between and within nations, a worsening of poverty, hunger, ill health and illiteracy, and the continuing deterioration of the ecosystems on which we depend for our well-being." [13]

A follow-up conference to the Rio meeting was held in 1997 to establish how the work on sustainable development had been carried forward. The outcome was not very successful and there was great disappointment that the undertakings made in 1992 had not been implemented.

"We acknowledge that a number of positive results have been achieved, but we are deeply concerned that the overall trends with respect to sustainable development are worse today than they were in 1992. We emphasize that the implementation of Agenda 21 in a comprehensive manner remains vitally important and is more urgent now than ever." [14]

During that period, environment issues began to come more to the fore in the business sector and the climate issue was put on the international agenda. In 1997 the world's political leaders met in Kyoto and signed a UN agreement, known as the Kyoto Protocol, on reductions in emissions of greenhouse gases. Progress has been made since then and at the UN Summit in Johannesburg in 2002, world leaders again met to discuss sustainable development. On this occasion, security and stability had also become important points on the agenda. Environment issues have thus been extended to include economic and security policy.

"The deep fault line that divides human society between the rich and the poor and the ever-increasing gap between the developed and developing worlds pose a major threat to global prosperity, security and stability. The global environment continues to suffer. Loss of biodiversity continues, fish stocks continue to be depleted, desertification claims more and more fertile land, the adverse effects of climate change are already evident, natural disasters are more frequent and more devastating and developing countries more vulnerable, and air, water and marine pollution continue to rob millions of a decent life." [15]

At the WSIS (World Summit on the Information Society) conference in 2003, there was discussion of the importance of pursuing of technology development and the use of IT in a manner that facilitates sustainable consumption and production.

"The private sector and civil society, in dialogue with governments, have an important consultative role to play in devising national e-strategies… government, civil society and the private sector are encouraged to initiate actions and implement projects and programmes for sustainable production and consumption…"[16]

Now, in 2006, IT has become an integrated part of society. Correctly used, this development can contribute to a reduced impact on the environment in which IT and IT solutions can be powerful catalysts. IT can accelerate different trends and policy instruments and incentive structures can guide development in a positive direction.

3.2. Overall external trends

This future scenario of the year 2020 is based on a number of general external trends which in all probability will impact on the world. There follows a description of four of the most important external trends.

[11] Foreign Affairs Sep/Oct 2005, Hunting Globally for Resources samt i rapporten, The Millennium Ecosystem Assessment (MA). http://www.millenniumassessment.org//en/Products.Synthesis.aspx

[12] United Nations Conference on the Human Environment Paragraph 6 Stockholm, 5 to 16 June, 1972.

[13] United Nations Conference on Environment and Development Agenda 21, Chapter1Rio de Janeiro,3-14 June 1992.

[14] The Commission on Sustainable Development (Rio +5) Statement of Commitment New York, June 1997.

[15] World Summit on Sustainable Development, The Johannesburg Declaration on Sustainable Development Johannesburg, September, 2002.

[16] World Summit on the Information Society, WSIS, December 2003.

Uneven income distribution

Income distribution in the world is increasingly divided between extremes and the disparities are growing rapidly. In 1988 the disparity in median income, between the five per cent who had most money in the world and the five per cent who had least, was 6:1, whereas today that figure is 200:1. The number of people who live on less than $2 per day has increased from 2.5 billion in 1982 to almost 3 billion today.

The growing world population

Over the next 40 years, the world population will increase by about 50 per cent. The increase from the current 6.5 billion to 9 billion people will take place almost exclusively in poor countries. By 2020 the population will probably have increased by 1 billion, equal to a whole new India, to over 7.5 billion. If a brake is put on this development, the world population can perhaps be limited to 8 billion in 40 years' time, before subsequently falling slowly. If this limitation does not succeed, the world population may instead reach as much as 11 billion and still be in the middle of a population explosion within the same time-frame. Nine billion is thus a mean figure which constitutes a target for the future.

Changed age structure

One of the most interesting trends in the coming decades is the demographic change in the world's age structure. This will require a radical restructuring of society and its systems to enable fewer to do more for a greater number of people in the ageing population. The global change in age structure has meant that fewer people support a greater number of the old. In 1950, 12 people supported each older person, today it is 9 people, and by the year 2050 there will be 4 people to support each older person. The change can contribute to a shift to a more environment-friendly society and hence to a great need for IT to make society more efficient.

Geopolitical change

Economic trends are very often extremely uncertain, but assessments from actors such as the global investment bank Goldman Sachs show that in 40 years, China will be the world's largest economy and India the third largest. Global competition will increase, as can already be seen; for example, since 2003 the world's largest recipient of foreign direct investments has not been a western country, China having taken over the USA's role in that context. The price of commodities such as metals, oil and agricultural products is often dependent on what China is prepared to pay.

IT as "Accelerated technology development" can be added to these four external global trends. Global markets, greater research exchange and mass production increase the rate at which technical breakthroughs reach a global mass market. This brings to the fore Sweden's role in the global market. IT can contribute to greater efficiency in the use of energy and transport, as well as to greater efficiency in other parts of society, which can make a positive contribution to a reduction in environmental impact and help to deal with the external world trends that will shape the future. Future IT development will be one of a number of decisive factors as regards how the world will look in 2020.

3.3. The future

Against the background described above, IT has great potential to affect future society. This future scenario shows a development that has gone in a desirable direction, where the world's challenges are managed in an efficient manner and environmental impact has diminished. It requires future policy choices with the right measures, clear responsibility and specific goals. IT is, and will remain, a catalyst in this work. For a real change, in which IT can help to turn the trends, the focus on the importance of environmental issues must be broadened from a narrow concentration on, for example, natural resources and emissions, and extended to take in business development, economic savings and export opportunities as well. An environmentally appropriate information society in 2020 will have at its centre four different areas in which development has gone in a positive direction and the environmental impact on society is no longer increasing in step with increased growth.

Environmental monitoring

By 2020, the navigation system Galileo will have been in use for a long time and will have developed into an efficient tool used to monitor natural resources, the extent of deserts, deforestation and oil spillage at sea. This will have given the EU a greater knowledge base and better control over events affecting the environment. This in turn will also have improved the possibilities for the EU to take timely action and to manage events that earlier would have entailed major and difficult problems.

More effective work travel

The ever more globalised economy will undergo dramatic changes up to the year 2020 after a number of oil price rises. The increased fuel costs, together with the greater importance of the climate issue, will have led countries and enterprises to rationalise transport and travel. Flexible forms of work will have become the norm and development will have been driven by the insight that flexible work can increase productivity, reduce costs for premises and increase comfort and well-being. Virtual meetings will also have become the norm and will largely have replaced physical meetings. This develop-

ment will have brought about a reduction in work journeys, which will have contributed to increased productivity and economic savings. The technology was in place early but it required a number of measures and behavioural changes for flexible work forms to make a breakthrough. An important part of the technological development was the new laser projectors which made virtual meetings extremely flexible. In 2020, however, retinal projectors have been begun to be used increasingly. The development towards more efficient travel has led to a large reduction in carbon dioxide emissions from people transport and major economic savings have been made as regards previously very costly work journeys.

New technological solutions and dematerialisation

Technological development has led to a thorough dematerialisation of, for example, music, video, books, films and services. Physical goods have gradually been replaced by digital products in step with the development of technological solutions, e.g. digital paper and print-on-demand have made progress. This has also meant that high quality production in the home (printing photographs, updating books) is taken for granted. The implementation of 24-hour public administration and the use of e-id in contacts with public sector digital service functions mean that the need to send physical documentation has vanished. New technical solutions have also helped to deal with the demographic changes in a positive way, for example in the care of the elderly and social care. During its presidency of the EU in 2009, Sweden showed many examples of IT solutions in use in the health and social services and in the fully operative 24-hour public administrations. Asia has worked intensively on dematerialisation and is in many cases in the vanguard in this area in order to meet the needs of an increased population. Dematerialisation has also helped to hold back the increase in demand for natural resources through greater efficiency in recycling and waste management. Taken as a whole, the development of technical solutions and dematerialisation has led to a reduction in demand for natural resources and to some extent of transport.

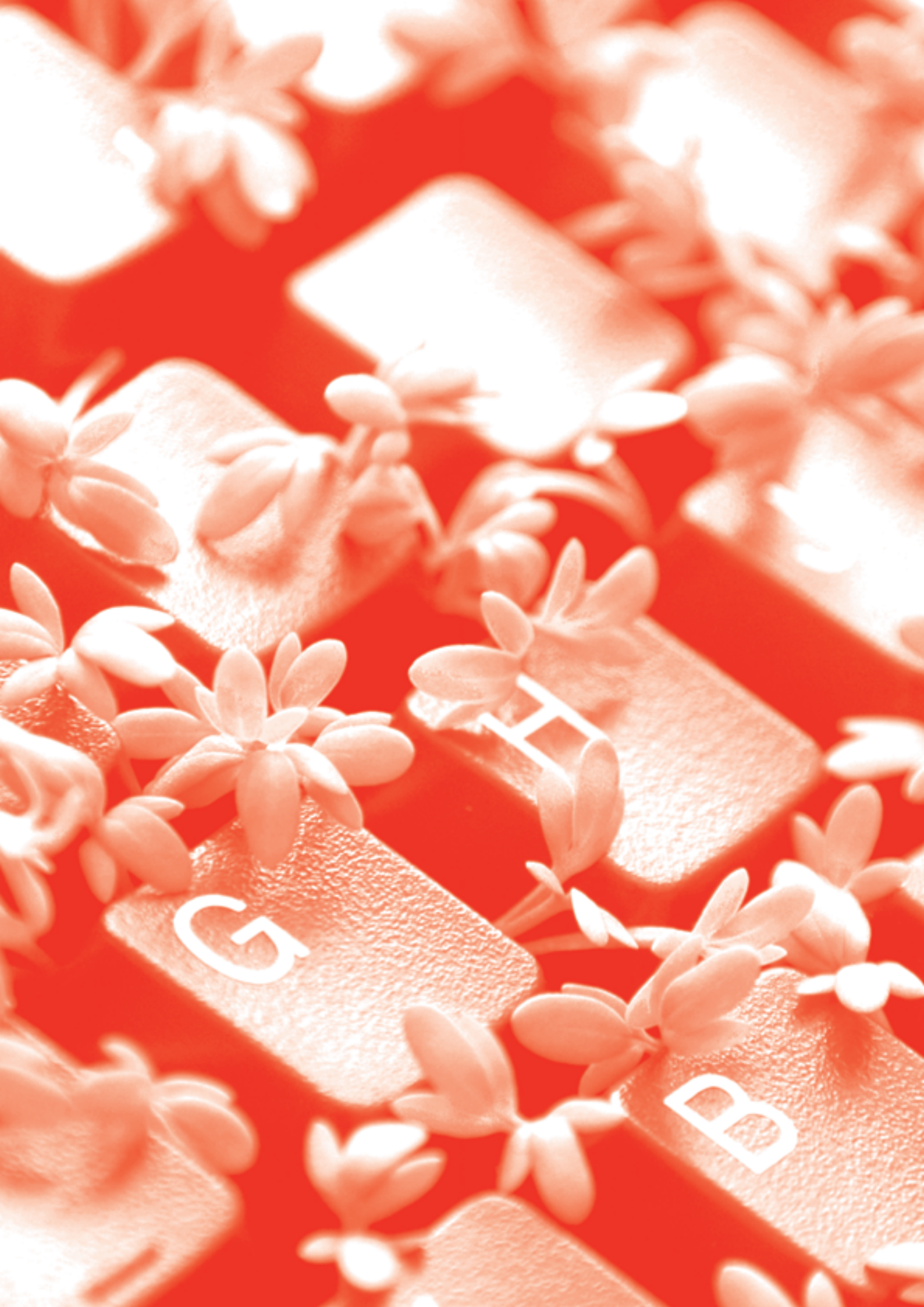
The progress of environmental technology

Sweden's investment in a strong environment technology sector, with IT solutions as the catalyst, has led to a major Swedish export success. This development was initially driven by public procurement, in which clear and strong demands were placed on business and industry to produce environmental technology solutions, especially in construction and housing. Procurements of technology also enhanced the opportunities of small enterprises to participate and to increase their innovativeness. Subsequently, the business sector also began to muster their forces around environment technology and, with China's 11th Five-Year Plan leading the way, new opportunities appeared and Swedish environmental technology enterprises became major suppliers to China. Swedish working methods, with cooperation between business and the public sector, have functioned as a catalyst for innovation and new technology. This method of cooperation has now become a globally applied model. Shanghai Expo 2010 is normally seen as a milestone in this work.

[17] http://www.newlaunches.com/archives/sony_develops_smallest_led_projector.php
http://www.lightblueoptics.com/features.htm

[18] http://www.audioholics.com/news/editorials/eyeprojectorretina.php

[19] http://www.indiasocial.org/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4. An environmentally appropriate information society in 2020 – The Strategy

An environmentally appropriate information society in 2020 is a vision that can be achieved; Sweden is on the way. But it is a situation requiring investments, resources and commitment. The way to it goes via responsibility, networks, clear goals and a strategic choice of measures in vital areas.

If the work is to be focused and specific, a number of overall measures will be required.

Responsibility and networks

The Government must create a coordination function to drive cooperation within the area of IT and the ecologically sustainable information society and to promote development, build networks and support export opportunities. There are very good prerequisites for carrying forward the work within this area and the early establishment of a coordination function is therefore desirable.

Clear goals

The coordination function should also formulate specific goals for a number of strategic IT solutions. There are interesting examples of such goals at the EU level, where the business sector and stakeholder organisations have jointly formulated a number of joint targets as regards the potential of IT to reduce environmental impact[20]. For example, carbon dioxide emissions are to be reduced by 50 million tonnes a year by 2010, through the use of IT solutions such as virtual meetings, dematerialisation and flexible forms of work. Goals and results of this kind can be very interesting matters to pursue during Sweden's Presidency of the EU in 2009.

Focus areas

To create conditions for a more ecologically sustainable information society, measures are proposed within the framework of two focus areas: transport and travel, and construction and housing. These two areas have been selected because applications within them will bring the greatest environmental and economic gains in the short term[21]. Transport and travel, construction and housing put strains on the environment, strains that can be greatly reduced through more efficient use of IT. This in turn brings positive side-effects in the form of economic savings and gains. Achieving an environmentally appropriateinformation society by 2020 requires greater efficiency in transport, with travel and mobility being substituted by accessibility, while construction and housing become more energy-efficient. Attention must also be drawn to a further area, the environmental impact of IT products themselves. This is not an area of primary interest, as seen from a broad environment context. But society's use of IT products entails environmental damage in the form of emissions, energy-use and material disposal. That means that this too constitutes a focus area in relation to other measures to limit the environmental impact of IT products themselves. The leadership qualities demonstrated by the IT industry in many areas should be spread more widely to ensure that it is exploited in the creation of a better dynamic between different industries.

There are many driving forces behind the environmental transformation of the business sector. For example, ambitious environmental work today conveys a competitive advantage that can reinforce a brand. Even if the measures required operate within different areas, they are united in the objective of maximum environmental benefit, at maximum economic advantage.

4.1. Transportation and travelling

Society's demand for transport is increasing and, according to a number of forecasts, will continue to increase. This means that society must manage transport demand as well as maintaining ecologically sustainable development. The development of passenger and goods transport in Sweden and Europe cannot currently be termed sustainable, as has been established in a newly published report by the European Environment Agency (EEA)[22]. In the last ten years, passenger transport in Sweden has increased by 14 per cent and goods transport by 26 per cent. Emissions are estimated to increase by a further two per cent per year in future. Since 1990 the road sector's carbon dioxide emissions have increased by about nine per cent, which comes almost exclusively from heavy lorries[23]. It all adds up to a major environmental impact.

The transport sector is developing in a more ecologically sustainable and energy-efficient direction, through work on alternative fuels and fuel-efficient technology. But how is transport and travel as a whole to diminish and become more efficient? Transport and travel fulfil important functions that must be ensured with the minimum possible environmental impact. There are major opportunities to make present transport methods more efficient and to change the demand for transport and travel. This requires measures that not only lead to a reduction in environmental impact but can also result in economic savings and shorter transport times in the passenger and goods transport sector. Rising oil prices also mean that there is now a great interest in such measures. Development can have rebound effects[24]in the form of increased transport and travel if efficiency gains result in lower transport prices serving to increase demand. That is an area that must be studied further, in order to steer development in a positive direction.

IT and reliable access to geographical information are some of the most important tools in changing and modernising the passenger and goods transport sector and we have

[20]Saving the climate@ the speed of light, http://www.etno.be/Default.aspx?tabid=1123.
[21]Basis for "The Future Impact of ICT on Environmental Sustainability", prepared for the European Commission 2003 -2004 by Erdmann et al., IPTS.
[22]EEA- European Environment Agency publication TERM: transport and environment 2005.
[23]På väg mot ett oljefritt Sverige (Towards an oil-free Sweden) – final report from the Commission against Oil Dependency, 28 June 2006.
[24]See ch. 5

therefore decided to put forward proposals as to how IT can contribute to more efficient transport and travel.

4.1.1. More efficient transport

Thanks to its geography, sparse population and export-dependent industry, Sweden has traditionally had a great requirement for transport for growth and development. Road transport also accounts for approximately 25 per cent of the Swedish emissions of greenhouse gases, in which heavy lorries and buses account for approximately 24 per cent of carbon dioxide emissions. Goods transport by road is estimated to increase by 30 per cent and goods transport by rail by 18 per cent between 2001 and 2020[25].

The transport sector must manage an increased need for efficient and flexible transport with high standards of delivery, at the same time as more rigorous demands are made for a reduction in environmental impact. This requires among other things optimisation of the transport network and better logistic planning. Customers are today prepared to pay for high environmental standards, that being the third most important factor in the choice of supplier for transport and logistics services, the most important being cost-efficiency and punctuality. That is a change in priorities as compared with four years ago, when environmental performance was ranked as the 11th most important factor in the choice of supplier for transport and logistics[26]. Previously, extension of the physical infrastructure has been the traditional way of solving traffic problems but it also created scope for additional transport. With IT as a tool there is an opportunity to change this development; IT is widely used in traffic management but it is not fully used in, for example, the road transport sector. The transport and logistics systems used today are good, but insufficient and incompatible with one another. This means that transport is not optimised, that different modes of transport do not always cooperate and that the opportunities for greater efficiency are lost.

Various forms of intelligent transport systems (ITS) mean that logistics and route-planning can be made more efficient and improved, both through better oversight as a result of improved planning tools and through access to information. Information is a key factor in the work on ITS and through better access to information in real time, the transport industry can optimise planning and choose the best possible routes and modes of transport. That makes transport more cost-effective and reduces its environmental impact. Sweden can take the lead in this area, become competitive in the transport industry and create export possibilities in the form of intelligent transport systems. The market for ITS is expected to be one of the greatest growth markets in 2010 and is estimated to grow seven-fold between 2000 and 2010. The Swedish Road Administration considers that one of the critical factors for success in ITS is better quality of the digital infrastructure and services. Today the lack of standardisation in ITS is an obstacle to its use in the transport industry and also to the development of intermodal traffic[27].

Increased use of ITS can have rebound effects, since greater efficiency and easier road transport lead to cheaper and more transport, which in turn can contribute to increased environmental impact[28]. This should be taken into account in the work on developing transport systems and in the choice of appropriate policy instruments.

4.1.1.1. Decisions and initiatives in this area

- In the strategy for growth, Innovative Sweden[29] is one of the prioritised areas in which to develop infrastructure promoting renewal and sustainable growth. One part of the work is to develop both efficient systems for transport and logistics and IT infrastructure for the future. In the strategy it is stated that the Government, by making electronic infrastructure available, such as the NVDB (the National Road Database), can create unique prerequisites for attracting foreign development capital at the same time as innovative transport and logistics services are developed. Digital transport networks are also a priority theme in the EU's 'INSPIRE' Directive.
- The IT Bill (Government Bill 2004/05:175) indicates the transport area as one that offers great opportunities for improvements and greater efficiency on the basis of IT and states that well-developed IT tools are a precondition for cooperation between different modes of transport contributing to the development of more efficient and ecologically more sustainable transport solutions.
- According to the Transport Policy Bill (Government Bill 2005/06:160) adopted by the Riksdag (Swedish Parliament), transport policy is an important part of the package of measures in support of sustainable growth and welfare. The general objective of the Bill is to ensure nation-wide, for both Swedish citizens and the business sector, a transport system that is socioeconomically efficient and sustainable in the long-term. It is laid down in the Bill that new technology, including IT, must contribute to developing a sustainable transport system at the same time as industrial policy aspects are taken into account. The Bill emphasises investment in ITS.
- The final report by the Commission against Oil Dependency contains proposals to improve efficiency in the transport industry, using IT as a tool. This includes, for example, making freight logistics more efficient with the aid of ITS, achieving a higher load factor for lorries and optimising cooperation between road, rail and waterway transport.

[25]Moderna transporter: transportpolitiska propositionen (Modern transport: transport policy bill) 2005/06:160
[26]Green Cargo: Annual and Sustainable Development Report 2005, p. 8.
[27]National ITS strategy 2006-2009. Swedish Road Administration.
[28]Erdmann et al. (see previous ref), "Higher transport efficiency due to improved ICT-based supply chain management leads to a full rebound effect (more transport at the same cost), explaining why ICT has an increasing effect on freight transport.".
[29]Innovativa Sverige, Ministry Publication Series 2004:36

- Within the framework of its remit to establish long-term plans for transport infrastructure, the Swedish Road Administration has identified ITS as an important means. In 2009 Sweden will host the ITS World Congress. The Congress functions as a meeting-place for those active within ITS and communications. In the run-up to the Congress Sweden has embarked on work to implement ITS applications, work which is highly positive and which it is hoped will produce effects within the area. Examples of the areas invested in are traffic management, logistics/planning and ePayments.
- Future trade is a dialogue project, a voluntary agreement between the Government and a number of enterprises, local authorities and regions. The purpose is to bring about sustainable trade in perishable goods by 2025. This work has gone through a number of phases and the project has reached agreement in the form of a policy document that shows the direction taken in the work. The actors have thereby undertaken to work jointly to promote sustainable trade in perishable goods.

Examples of applications

There are several examples of IT solutions for lorry depots and freight companies. One is Co-driver, a service which lorry drivers can operate with a handheld computer. The computer is linked to the lorry's electrical system and monitors how the vehicle is functioning, all information being shown on the driver's display. The driver is given information about fuel consumption and even steps that facilitate more economical driving. The driver can also send and receive messages from the company management. In addition much of the administration can be carried out via the handheld computer. At those freight companies and lorry depots that have installed Co-driver, fuel consumption has been reduced by between six and twelve per cent. This has also led to greater awareness among the drivers about their fuel consumption and average speeds have been reduced by about four kilometres per hour. All in all, this has resulted in more fuel- efficient driving thanks to the lower speed[30].

The Lantmännen group has used a mobile system to reduce the length of journeys made by their vehicles when delivering fodder. By using vehicle computers, the lorries become an integrated part of the logistics chain, which has led to more rapid despatch of invoices and reduced paperwork. A few minutes after a completed delivery of fodder, the invoice can be on its way from the accounts department irrespective of where in the country the delivery has been made. At the same time, the driver can receive driving orders direct in the vehicle and book times for loading at terminals in order to avoid queuing, the information being sent to the driver via GPRS (General Packet Radio Services). The system also includes a navigation system and route optimisation in the delivery vehicles.

In forestry, higher demands from the industry in the form of, for example, more precise delivery times and tougher environmental requirements made it necessary to make the transport flow more efficient by reducing the number of miles driven without a load. By exploiting IT and digital road databases in the 'SMART' system, Skogsåkarna use it as a base for transport planning. During 2005, Skogsåkarna vehicles drove approximately 28 million kilometres and during that time saved through return loads approximately 2.16 million kilometres, approximately 7.5 per cent. The SMART system has increased the proportion to approximately 10-15 per cent, which means a saving of between 2.8 and 4.2 million kilometres per year.

4.1.2. More efficient travel

Passenger transport to and from work, at work, and in private has also increased in Sweden in recent years. Passenger transport by car in 2004 constituted about 85 per cent of passenger transport, while the fuel consumption of passenger cars in Sweden is on average 20 per cent higher than in the other EU countries. Passenger cars and vans account for about 73 per cent of the carbon dioxide emissions from road traffic[31]. While Swedes also regularly travel by air, train and public transport, the car is still the principal means of transport.

Passenger transport accounts for a large part of society's environmental impact, above all through carbon dioxide emissions. As in the freight transport sector, work is being conducted in a number of areas to make transport more fuel-efficient and to increase the use of alternative fuels, which is of course positive, but the alternative of making travel more efficient is less often discussed. To accelerate the development in which accessibility replaces mobility, intensive work is required to reduce the need for physical journeys. IT offers completely new opportunities to reduce the environmental impact from passenger transport[32], but it is not used sufficiently extensively to counter the trend of increasing transport, and change progresses only relatively slowly. Human beings will always have a need to be able to travel, both in their work and privately. But by relying on more efficient travel, travel patterns can be altered so that, for example, the need for work journeys can diminish and public transport improved, which will reduce the total impact from passenger transport.

In step with the increasing IT use outside offices, above all of mobile telephones, computers and broadband connections, it becomes technically possible for more and more people to work flexibly[33]. But although the technology exists and many would like to work flexibly to a greater extent, the employer's attitude to flexible forms of work often puts a stop to the development. If distance-working is permitted to a greater extent than today, this form of work can contribute to a reduction in work journeys. An active introduction of

[30] www.vehco.se

[31] Moderna transporter: transportpolitiska propositionen (Modern transport: transport policy bill) 2005/06:160

[32] The concept of passenger transport embraces work and study journeys, official travel, service journeys, shopping trips, health and social care journeys, etc.

[33] The concept of flexible forms of work means work that is done at a distance, regularly, and for a given minimum period per week.

flexible forms of work also has an environmental potential in the form of reduced needs for heated office space and for travel in the course of work. For the employee, there can be greater flexibility and time-savings. This can, however, also result in increased costs and a requirement for extra space for the employee in the home environment. In the longer term, there can also be consequences for social planning and housing patterns, which will need to be studied to provide the basis for sound development in this area. IT is nevertheless to a large extent a precondition for flexible forms of work, through technical solutions for distance-work and a well-developed public IT infrastructure.

IT is expected to be integrated in every conceivable area with the aid of, for example, future applications of new technologies such as RFID (radio frequency identification)[34]. It is probable that IT will to an increasing extent move from the desktop computer to "the Internet of things"[35], in which networks are linked together through new technology, with a broad register of applications.

A further important area for more efficient travel is the increased use of travel-free/virtual meetings[36] in working life. Many of the work journeys undertaken today could be replaced by travel-free/virtual meetings, which not only save time and expense for the employer but also lead to a reduced environmental impact in the form of journeys not being made. The reduced time spent on work journeys gives positive effects in the form of more efficiently-used working time and can also contribute to increased productivity.

IT can also be used to exploit existing systems of public transport and the transport network more efficiently, for example through better and more accessible information about travel routes and real-time traffic information for travellers and road-users. This enables greater freedom of choice about the mode of travel, which can save unnecessarily long journeys and ultimately even reduce costs.

In addition to the above, a well-developed IT infrastructure throughout the country could enable localisation of job opportunities at places that otherwise would not have been relevant because of their geographical situation, which can contribute to more vibrant rural areas and reduced long-distance commuting.

More efficient travel has very great potential to reduce the environmental impact from passenger transport. Of course, the introduction of measures in this area will also require examination of the potential effects in adjacent areas, such as social planning, social dimensions and accessibility.

4.1.2.1. Decisions and initiatives in this area

- In the IT Bill (2004/05:175), flexible forms of work are judged to be able to lead to positive environmental effects as regards a reduction in work journeys, a more even spread of travel throughout the day and a reduced need for heated office space. Virtual meetings are also expected to lead to a reduction in the need for travel. The Government, local authorities and county councils are emphasised as potential models in this area that should be able to disseminate their knowledge and experience to other agencies and enterprises. In December 2005 the Swedish Agency for Economic and Regional Growth (Nutek) was given a remit to examine whether both the opportunities and the prerequisites for distance work can be increased in sparsely populated rural areas by means of 'enterprise hotels'. Since 2005, the Swedish Road Administration has been running a project for the purpose of disseminating knowledge about flexible forms of work and travel-free meetings, and highlighting best practice examples.
- The Commission against Oil Dependency argues in its final report that IT provides wholly new opportunities to reduce the environmental impact of passenger transport. The technology already exists, it is relatively simple to harness the environmental and financial gains and there are major opportunities to exploit innovative policy instruments. The Commission considers that the Government should set an example in this area in order to give impetus to the development and use of alternative methods of passenger transport, which would then also have effects in the private sector, both as regards use and development. The Commission argues that a precondition is access to flexible forms of work and the practice of virtual meetings.
- In the Transport Policy Bill (2005/06:160), it is stated that improved IT infrastructure provides access to work and services without creating increased transport requirements. In addition to investments in IT infrastructure, investments in transport infrastructure and the promotion of sustainable transport solutions are also of importance. In response to a Government remit, the Road Administration is working within the framework of this Bill on a programme for Sustainable Travel.
- Vinnova and others have backed the development of a Centre for Sustainable Communications at KTH (the Royal Institute of Technology) in Stockholm. This Centre is to research and develop the prerequisites for ICT (Information and Communications Technology) to contribute to sustainability. The Centre disposes of a

[34]Radio Frequency Identification. A technique that uses radio waves to identify and store information at a distance from small combined radio transmitters/receivers and memories.
[35]ITU Internet reports 2005, www.itu.int
[36]A travel-free, or virtual meeting, takes place at a distance by means of telephone conference, video conference or various forms of computer-based meeting forms.

multidisciplinary research platform for research and development in sound and image communication which contributes to increased inter-accessibility of people, irrespective of their place of residence. The objective is to develop methods and "mediated" (media-based) services as real alternatives to travel and physical transport.

Examples of applications

TeliaSonera has established, after examination of the company's environmental impact, that over 75 per cent of its total emissions of carbon dioxide is generated by travel and transport on company business. By actively working with flexible forms of work – "Work where you are" – and by a deliberate choice of the form of meetings, carbon dioxide emissions were halved during the period 2001- 2005. As examples of positive effects, mention may be made of a significant reduction of physical travel, in favour of "virtual meeting" forms, and an approximately 50 per cent reduction in office space. Over the last twelve months, company journeys have levelled out, at the same time as the number of participants in Telia Telemeetings has continued to increase – a fact that suggests that the increase in travel which is evident in the rest of society has been replaced by telemeetings within the company.

To facilitate monitoring of travel costs, various emissions etc., TeliaSonera is developing in cooperation with its suppliers a computer-based tool for travel-related environmental information. This tool should make it possible to monitor development down to the level of group manager[37].

4.1.3. Proposals for measures in the field of transport and travel

ITS is a key factor for the transport industry. They require cooperation and interoperability between different systems in order to be applied across national frontiers, between different actors and between different modes of transport. Harmonised systems and common basic functions are also necessary.

- The Government should ensure that a working group is formed comprising representatives of the transport industry and researchers in this field, alternatively that the remit to IVSS (Intelligent Vehicle Safety Systems)[38] should be broadened to include establishing basic functions within ITS, working for harmonisation between the different transport systems and seeking to bring about interoperability between present and future systems. An important task for the group would then also be to highlight systems that can lead to transport solutions that are more ecologically sustainable, taking account also of rebound effects.

Through the public procurement process, it is possible to guide and follow the outcome of procurements conducted. This means that the Government and its agencies, being major purchasers, can both act as a powerful requirement-specifier and purchaser and also monitor chosen suppliers.

- Environmental requirements should be gradually tightened in the public procurement of transport services for both passenger and goods transport, and in the central government procurement of transport, there should be continuous monitoring to ensure compliance with the environmental requirements laid down. The information collected should also be conveyed to the private sector as the information basis for private procurement.

More sophisticated research and development in ITS can put Sweden at the leading edge as regards use and also contribute to the development of systems. These systems could help to reduce the environmental impact from the transport sector and it is therefore of great importance that potential rebound effects are also taken into account in this work.

- The Government should devote further funds for research and development of ITS in close cooperation with the transport sector, in order to develop competitive and usable systems that contribute to a reduction in environmental impact from the transport sector.

Flexible forms of work are an important factor in reducing physical travel. To increase the use of flexible forms of work, the Government, as a major employer, should set an example in this area. The experience and knowledge that emerge can then have knock-on effects in other public and private sectors, as regards both use and development.

- The Government must set an example in this area and give its companies and agencies a remit to implement a policy for flexible forms of work by the end of 2007. The results of this introduction must then be compiled and included in the annual reports.

The use of virtual meetings is also a key factor for reducing physical travel. In this area too, state-owned companies and agencies have considerable potential to lead the way in the development and application of the alternatives to physical meetings that are currently already on the market. That can add impetus to the development and use of alternative methods of passenger transport, which then also have effects elsewhere in both the public and private sectors, both as regards use and development.

- The Government must give state-owned companies and agencies a remit to implement a policy for virtual meetings by 2007 at the latest. The results and experience must then be measured and followed up in annual reports.

The agencies have considerable scope to follow up and assess the measures implemented under the auspices of central

[37]Starkare affärer med Miljö och hållbar utveckling. [Strong business deals incorporating the environment and sustainable development] Report 2005 T32242-06, TeliaSonera Sverige.
[38]Swedish cooperation initiative between central agencies, the business sector and organisations working to increase road-safety http://www.ivss.se

government, thanks to the control that is exercised. Monitoring possibilities must be exploited.

- The Government should task its agencies to report the number of employees who work flexibly, the number of virtual meetings held and also the space used per employee/year.

To show that Sweden really is a country at the leading edge of IT and an environmentally appropriateinformation society, the Riksdag should examine the possibility of creating a mobile Parliament, in which Members of Parliament can participate in distance-voting, committee work is conducted through virtual meetings, and virtual meetings are also adapted to parliamentary debates in the plenary chamber.

The general public and small enterprises have ad hoc transport requirements. It should be possible to satisfy these requirements by a service in which the counterpart and successor to the country postman or courier firms carry goods and services to and from the consumer, the general public and small firms, as well as service and product salesmen. With the aid of extended eTrade and other electronic services (both private and public) this transport could be optimised.

- A remit should be given to an appropriate body to study possible business models for such local transport optimisation for the general public/consumers. A pilot project with practical application in an appropriately large community should be established. In compensation for this proposal, VAT could, for example, be reduced on food products traded electronically.

To establish a factual basis and information about the potential rebound effects that may be caused by developments within the area of transport and travel, the Government should allocate resources for research into rebound effects and how they can be countered.

4.2. Buildings and housing

Despite progress in the development of new materials, improved building technology and better technology for energy optimisation, the trend towards reduced energy consumption per square metre has halted in recent years and energy consumption per square metre of heated space in new constructions has remained more or less unchanged since 1993. In Sweden just under 40 per cent of the total national energy consumption goes to the heating and running of housing and premises. Of this 40 per cent, about 70 per cent is used in housing; Sweden has one of the highest living-space areas per capita in the world and the heating of these areas is energy-demanding. Large living areas also require more lighting[39]. Increased use of residential space as offices can, however, contribute to a more efficient use of these areas.

[39]www.energimyndigheten.se

Sweden is more dependent on electricity than many other countries. The climate creates a need for heating and politically driven solutions have ensured the supply of cheap electricity to households and premises for heating purposes. At the same time, new architecture and the increased use of technology and electronics, above all in office environments, have led to a greater need for cooling in the summer, which is very energy-demanding. All in all, it results in substantial energy use in Sweden for our homes and premises. In a number of studies and reports[40] it is noted that there is unused potential for energy savings in buildings. The potential for greater energy efficiency in the heating of buildings has been calculated at approximately 40 per cent over a term of 15-20 years, on the proviso that the technological economic potential is exploited to the full. Further, as regards a number of state-owned properties, a Government enquiry reported major potential for greater efficiency[41]. Significant energy-saving can be achieved by relatively simple measures.

To reduce energy consumption in buildings, there are currently many examples of intelligent control of lighting, heating, water and ventilation. An intelligent building combines such functions and can optimise them. The technology thus largely exists but it is too seldom used. This is notwithstanding the fact that energy efficiency measures are of great importance to reduce the environmental impact from buildings and housing, and also result in savings in the form of reduced energy costs. IT has great environmental potential to create positive changes in the use of energy in the construction and housing area, a potential that must be exploited more than it is today.

4.2.1. Buildings

A building has a long life-span and major rebuilding and renovation occurs at long intervals. Energy consumption in buildings must therefore be taken into account right at the planning stage in order to create a building that is as energy-efficient as possible. Today it is possible to construct, at no significantly increased cost, buildings that are substantially more energy-efficient. In Sweden 3-4 per cent of the total proportion of buildings is new and within this new building, IT solutions are frequently used to reduce energy consumption.

But existing buildings account for the greatest use of energy. More than 90 per cent of the buildings that are expected to exist in 50 years have already been built. In order to bring about much greater energy-efficiency in the short term, it is therefore important also to examine the existing buildings and to see how they can become more energy-efficient[42]. The installations that, for example, now attract tax reductions or that are marketed as energy-saving are often new heating methods, energy-efficient windows or insulation. Control systems for the use of energy are all too sel-

[40] Energideklarering av byggnader – för effektivare energianvändning [Energy declarations for buildings – for more efficient energy use] (Official Government Report [SOU] 2004:109): Background report from Chalmers University of Technology as part of the National Board of Housing, Building and Planning's governmental assignment "Piska and Morot [Stick and Carrot]" (ref. M2005/5069/Bo).
[41]The National Property Board, the National Fortifications Administration, The Swedish Rail Administration, Swedish Civil Aviation Authority (LFV) and the Swedish Road Administration.
[42]Nationellt program för energieffektivisering och energismart byggande proposition [Bill concerning a national programme for greater energy-efficiency and energy-smart building] 2005/06:145

dom mentioned as a further good way of reducing energy consumption in existing buildings and premises, despite the fact that they are very effective. Technology development means that methods that today are regarded as advanced or expensive will in the near future become competitive. In new construction, individual metering and control, intelligent laundry rooms and 'away buttons' are more and more often installed, whereas in existing buildings there is only individual metering. The future norm in new construction is expected to be alarm functions, need-controlled ventilation, air quality control and adaptation to distance-working. In existing buildings, wireless technology for sensors in particular are becoming the norm[43]. This development shows that IT is becoming a more integrated part of buildings, but its potential can be exploited to a much greater extent than is the case today.

Decisions and initiatives in this area

- The IT Bill (2004/05:175) underlines that intelligent building functions and systems for residential properties are regarded as having considerable environmental potential, particularly as regards achieving greater efficiency in the use of energy. According to the Swedish Energy Agency, the comparatively limited use of such systems is because of a lack of demand for technological solutions. The Agency is therefore running a number of projects to increase the use of energy-efficient technology in construction. It is also proposed that the National Property Board (SFV) should be given a remit to report on how government bodies erecting new buildings can increase their use of IT in the planning and building process, in order to reduce environmental impact. Its effects are also to be assessed.
- In July 2006, the Riksdag adopted a national programme for energy efficiency and energy-smart construction (Government Bill 2005/06:145) that aims to muster support for worthwhile energy-efficiency measures in Sweden. A more efficient use of energy, that leads to a reduction in demand and takes cost-efficiency into account, releases resources at the consumer level. This is expected to favour economic growth by increasing consumer purchasing power. More efficient use of energy also releases resources in the public sector that can be exploited for other purposes that are more urgent from the social point of view, such as healthcare, schools and social services.
- The Commission against Oil Dependency proposes in its final report that a "council" or "centre for energy efficiency" should be created with the task of driving forward more proactive development of sector objectives, reports about this development to the Riksdag and the Government, as well as monitoring and regular increases in targets. The Commission also proposes the adoption of a target to improve energy-efficiency nationwide by at least 20 per cent by the year 2020. Reduction in the consumption of electricity for space-heating is also proposed and should be brought about by, among other things, intelligent control of lighting, heating and ventilation. Major potential is ascribed to IT to create positive changes in the future.
- The appropriation directions issued in 2006 to agencies under the Ministry of Sustainable Development state that they must report the total energy consumption on their premises and in what forms. The agencies must also report on what measures, including public procurement procedures, have been taken to reduce and make the total use of energy more efficient.
- The National Board of Housing, Building and Planning and the county administrative boards are responsible energy efficiency issues, including the support for energy efficiency in public premises that has been extended up to and including 2008. That means that owners of premises that are used for public activities can continue to apply for support for energy efficiency measures and for switching to alternative sources of energy.
- The Swedish Energy Agency is allocating SEK 30 million in 2006-2008 for a new research programme for energy, IT and design. By developing modern IT methods in combination with product design, the programme aims to influence energy use by households, particularly as regards electricity, domestic heating, hot water and electric heating. The target is to improve energy efficiency and increase energy saving.
- On 1 October 2006 energy declarations for buildings were introduced. This means that buildings will be inspected and that certain information about the energy use in buildings and the indoor environment is to be given in an energy declaration when selling, letting or constructing buildings. It gives the owner the opportunity of reducing energy costs by means of the proposals for measures given in the energy declaration. The object of the law is to promote effective use of energy and a good indoor environment in buildings.

Examples of applications

There has been a Visualisation Studio at Chalmers University of Technology on Lindholmen since 1999. Scientific research and industrial cooperation on the VR (virtual reality) tool is also conducted at the studio. In brief, it consists of digitally processing all information relating to a building project from the very first day, an interim result being the ability to demonstrate intended

[43] Miljömöjligheter med smarta tjänster och funktioner i bostäder [Environmental opportunities with smart housing services and functions]. Report by the LIP (Local Investment Programme) office in Stockholm and Green IT. www.stockholm.se/lip

projects to all parties concerned at an early stage. The Visualisation Studio has from the outset participated in the planning of Ericsson's new office building on Lindholmen. 700 Ericsson employees could be shown around the new building long before it was built, with the aid of 3-D spectacles and a 'powerwall' on which models were shown.

Since September 2005 there have been new international, open standard, Industry Foundation Classes (IFC) for information exchange of plans, building and administration related information. On the basis of this standard the internationally active organisation International Alliance for Interoperability (IAI) is working to establish the Building Information Model (BIM) as the de facto standard worldwide under the name buildingSMART. The Swedish IAI is taking part in this work, with Sweden and the Nordic Area as their base. Software and applications exist and it is time to shift to a new digitally-controlled planning, building and management process. One and the same digital 3-D model can now accompany a project from its early outline stage, via program documents, to detailed planning and production, before finally being used in running the management phase. By inputting materials, times and costs in the model, production can be simulated and the fine detailing of financial calculations can be carried out in the digital model. Intelligent content can be added stage by stage to the same model and, when the project is completed, constitute the basis both for supervision of its operational and maintenance plans and for client adaptations, re-building and, in the long term, demolition, re-use and recycling.

Vasakronan, together with the Royal Institute of Technology and ÅF, is running a project to demonstrate the potential for using the centralised security management systems of commercial buildings in support of inspection, energy-optimisation and experience-analysis. The method of approach is that all readings and control signals are logged into the security management system with high-resolution and subsequently assessed rationally with the aid of powerful visualisation. The system has contributed to better inspection of heating and sanitary equipment systems and a reduction in energy consumption, without significant cost. It is used in among other places Kista Science Tower and can lead to energy savings of up to 20 per cent, while maintaining the internal temperature and ventilation[44].

4.2.2. Housing

Society is about to undergo extensive digitalisation of homes and premises. Today computers are used in the home mainly for work, information-gathering and entertainment but within the near future IT will become an integrated part of the home. Security and safety solutions and communication systems are converging with entertainment and media systems as well as with white goods. The focus is more and more on the user's needs but unfortunately the technology for domestic use, in which energy-use and such-like can be linked with the local network of the house, is not sufficiently user-friendly.

Today the home-owner can receive a grant to convert from electric and oil heating to more environment-friendly alternatives. Within the framework of these incentives, there should also be opportunities to give subsidies for intelligent energy systems in order to make further efficiency gains in heating and energy use. The final consumers are often unaware of the extent of their energy use. That applies particularly to those living in blocks of flats. There is unfortunately also relatively little detailed knowledge about how final consumers opt to control their energy use. The Swedish Energy Agency is, however, investigating and improving the knowledge base about household energy use, and this is expected to generate interesting information in this area. The development of IT in combination with product design would probably influence household energy use, particularly as regards household electricity, heating, water and electric heating. With the aid of IT, methods can be developed to draw the attention of households to their own energy consumption and to provide information about how they can optimise, manage and keep a check on their energy use.

A number of technological solutions are now ready to be put into operation in household and service establishments but there is no demand from consumers, because they are not conscious of any need. It can be assumed that there are also other needs among consumers for information technology management such as planning, security, lighting or entertainment. Information is a decisive factor in the dissemination of knowledge about efficient energy use. IT offers excellent scope for new methods of information dissemination that increase awareness of, and understanding for, energy issues among consumers. It may be a matter of systems enabling users to learn from others or of systems that on the basis of user behaviour can make reasonable choices on behalf of the user.

The increased use of technical products in the home and at the workplace has meant that large amounts of energy are consumed by equipment that is constantly left on standby. Information about this and about the amount of relatively unnecessary energy consumption should be more effectively disseminated. During 2006-2007, the Swedish Energy Agency will conduct a campaign entitled "Reduce energy use and save both money and the environment", to increase awareness of energy consumption and environmental thinking.

[44]Report "Karlstads Bostad AB, Pionjärerna. Hur man lyckas med individuell mätning av energi i praktiken" [Energy metering: how to succeed in practice], Metrima se: http://www.metrima.se/se/AboutUs/KarlstadsBostadsAB.pdf

4.2.2.1. Decisions and initiatives in this area

- In the IT Bill (2004/05:175), it emerges that lack of demand for technological solutions is the main reason why intelligent building functions are not applied to the full extent possible.
- In the national programme for energy efficiency and energy-smart construction (2005/06:145), it is stated that during the budget year 2005, SEK 11 million was allocated to testing, labelling and certifying energy-demanding equipment. The results of the work carried out will be circulated to households and suppliers and can then stimulate purchases that minimise energy-use. This activity also includes developing methods with a view to facilitating the installation by consumers of technically complicated energy-efficient equipment. In June 2006, the previous Government decided to give the "Energy Services Commission" (dir 2006:89) a remit to study the consequences of, and present proposals about, compulsory individual metering and invoicing of domestic hot-water and electricity consumption in blocks of flats. To reduce the environmental impact from housing and to convert the energy system, measures are required both for greater energy-efficiency and for more efficient supply based on renewable forms of energy. Not least, there is an overall need to increase knowledge about possible measures to improve energy-efficiency in existing buildings and in connection with major rebuilding. In the next 20 years, approximately one million housing units need to be renovated. That presents a unique opportunity to use the new technology developed during the 1980s and 1990s, with the ambitious target that the one million housing-unit programme should produce Europe's most energy-smart housing.
- Guidelines for future work on research, development and demonstration in the energy area, including the energy and construction area, are dealt with in the Bill on Research and New Technology for Future Energy Systems[45]. The implementation of these efforts in research, development, demonstration and commercialisation in the energy area should mainly be structured within the six theme areas: Construction as Energy Systems, the Transport Sector, Fuel-based Energy Systems, Energy-intensive Industries, the Power-Generation System and Energy-System Studies. The energy research part of the responsibility for improving energy-efficiency in construction and for promoting the conversion to a sustainable energy supply is focused on the building and its accompanying installations and equipment, and on the people who live in or otherwise use the building. Within the theme of Building as Energy Systems, the Swedish Energy Agency has formulated a vision and targets for measures for greater energy efficiency and renewable energy supply in construction. The Agency proposes the establishment of a centre for energy and resource-efficient construction and management, and in addition will prioritise studies of cooperation between technological systems, IT, information and behaviour.

[45] Forskning och ny teknik för framtidens energisystem [Research and new technology for future energy systems], Government Bill 2005/06:127

Examples of applications

Thanks to computerised management of the monitoring of its whole property portfolio, Bostads AB Poseidon has new opportunities to manage and monitor all systems round the clock – an investment that reduced energy consumption by 7 per cent and that brings cost savings of SEK 10 million per annum. Through structured energy efficiency efforts, Poseidon has since the end of the 1990s reduced energy consumption from heating and hot water in its housing units by 18 per cent, from 188 kWh/m² down to 154 kWh/m². Carbon-dioxide emissions have diminished by about 4 000 tonnes per annum and heating costs have been reduced by about SEK 25 million per annum or SEK 1 000 per flat/year[46].

Karlstads Bostads AB has installed a system for metering electricity, hot and cold water in over 1400 flats, which makes it possible for owners of the buildings to take readings of energy consumption by the occupants. Based on this information, energy costs can be fairly apportioned among the tenants, which creates an incentive for them to economise on energy. The consumption of hot water has been reduced by between 25 and 50 per cent and that of cold water by 15 to 20 per cent.

Helsingborgshem has developed and installed a system of its own for individual heating and hot-water metering in approximately 1 000 flats, with an energy saving of 15-20 per cent as a result. The objective of this 'comfort metering' is that increased knowledge and the ability to influence their own energy costs should stimulate tenants to save energy. In addition to savings, the system also provides a welcome freedom of choice in being able to choose the comfortable level of heating oneself. Cost amortisation varies from property to property, between 4 and 10 years[47].

4.2.3. Proposals for measures

Relatively few investments are currently made in IT to improve energy efficiency. An increase in its development and use would not only bring environmental benefit, but would also result in financial savings.

- A study should be made about whether the proposed extension of the tax reduction for certain installations in small houses for environmental improvements (L2004:1204) can be expanded to include investments

[46] BLICC Report # 3 Sweden: Climate change: adaptation and growth
[47] AB Helsingborgshem "Införande av komfortmätning" [The introduction of comfort-metering] April 2005, http://www.helsingborgshem.se/GetFile.asp?id=59

in intelligent control systems to improve efficiency in household energy consumption.

- Central government, as a major property-owner, has an opportunity to manage and monitor energy use in the premises and properties of official bodies, and it ought to be possible to use IT to a greater extent for this purpose. New opportunities for IT to contribute in this context should also follow from future requirements for monthly electricity meter readings.

- The Government should instruct all agencies to report, as part of their work in managing environmental issues, how they are working towards improved energy efficiency in their activities, including the use of intelligent control systems.

The forthcoming introduction of energy declarations for buildings, which enters into force on 1 October, 2006, means that cost-effective proposals for measures to improve energy efficiency must be submitted to the National Board of Housing, Building and Planning.

- Prerequisites for increased use of intelligent building functions that can be used to realise environmental gains and financial savings during the management phase, should be studied. The forthcoming energy declarations should be exploited to include them.

o The imminent renovation of the many housing units built within the framework of the 'one million programme' must include intelligent control systems for more efficient energy systems.

4.3. The environmental impact of IT products throughout their lifecycle

The environmental impact of IT products themselves is of course also an important area within the framework of a strategy focused on the scope for IT to reduce environmental impact in society. IT has become an integral part of society within a very short period of time. That has led not only to substantial efficiency gains for society, but also to increased environmental impact, along with greater use of energy and materials.

The IT industry is one of the biggest industrial sectors in the world and it is expected to continue to grow rapidly. Even if the environmental impact of one single unit of production is small, the large output of products and services means that the total impact is considerable. It is therefore important that the industry should work actively to minimise its environmental impact, throughout the whole lifecycle of its products and services. The IT industry is relatively new and is working on environmental issues. At the same time, there is a need to strengthen further the environmental perspective within the IT sector and to get to grips with those areas in which potential for improvement exists but where the environmental potential is not yet visible. There is also major potential in public procurement, which requires a continuous development of purchasers' IT skills. This will provide the best conditions for them to specify well-considered requirements that drive development in a positive direction, and it must be done in combination with monitorable environmental requirements.

4.3.1. The impact of IT products

The environmental impact of IT products during their lifecycle is often connected with particular chemicals in specific products or the energy consumption of a given application when in use. The environmental impact can arise at different stages in the lifecycle – in the extraction of raw materials, manufacturing, distribution, use and recycling/decommissioning. At the manufacturing stage, the impact on the environment, seen in a lifecycle perspective, is relatively substantial because there are still many undesirable substances in use which in the present situation cannot be wholly substituted (such as certain heavy metals and flame retardants). However, development is progressing and both market demands and legislation are driving the development towards substitutes and eco-design. There is a problem in, for example, the semiconductor industry, which is growing rapidly internationally and where ever more refined and advanced technology requires purer metals, which in turn creates more mining waste and a demand for greater volumes of water used in production.

For most products, environmental impact is at its greatest during use. There, a change towards more energy-efficient products can be seen, particularly as regards mobile telephones and laptop computers. The development of more rapid network communications requires more powerful computers, which in turn require more ancillary equipment such as servers, routers, networks and climate control, which in its turn again requires more energy. Much energy is also required for equipment that is in use round-the-clock. At the same time, copper wiring in networks is being replaced by fibre cables that are less energy-demanding in both manufacture and use. Access to broadband contributes to increased use of the Internet, which also has an impact on energy consumption in the end-equipment. All in all, the result of this development is that IT products will continue to consume large amounts of energy.

The final phase in the lifecycle of IT products is their 'end-of-life', where negative environmental impacts have previously been most evident. Since the introduction of producer responsibility in Sweden in 2001 and producer-managed systems for collection and treatment of electronic

waste have developed, the negative trend has been reversed. Collected volumes of electronic waste have increased from 20 955 tonnes in 2001, of which IT waste constituted 3 277 tonnes, to 126 500 tonnes in 2005, of which IT waste was 22 700 tonnes. Among other reasons, this is because of larger volumes (improved collection but also higher consumption) and increased efficiency [48]. There are currently agreements between Swedish local authorities for the collection and pre-treatment to be carried out by licensed contractors in accordance with regulations. This means that waste products are largely recovered as pure metals with minimal landfill. A further factor that increases the need for recovery is the growing demand for metal and higher raw material prices on the world market. In the run-up to the new legislation on producer responsibility, which is based on harmonised EU legislation, Sweden easily meets the targets for collecting and recovering electronic waste. One problem in this context is, however, a grey zone of enterprises that do not meet their legal responsibility and hence distort competition on the market.

Within the industry, there is the knowledge and commitment both to phase out certain chemicals and materials and to reduce energy consumption in the use of products. In this context, consumer demand plays an important proactive role. Some of the industry's environmental challenges are to phase out use of environmentally hazardous substances in products, and to minimise energy, water and chemicals consumption in the extraction of raw materials and in manufacture. Other challenges are to minimise energy use and electromagnetic fields in the user phase, as well as to create sustainable and recyclable products. Many of these factors can be addressed in the design phase. Examples of how co-operation about the way in which lifecycle environmental impact can be reduced are to be found within the mobile telephone industry, where leading actors, with the support of the EU Commission, have performed a study[49].

The energy use of IT products is rarely discussed in a broader perspective. If technology is an enabler in other sectors of society and contributes to new methods of working and methods of exploitation, which in turn contribute to positive environmental effects, a certain increase in energy consumption can be of benefit if the objective is a reduction in consumption as a whole. Assessments must be guided by the total effect.

4.3.1.1. Decisions and initiatives in this area

- • The IT Bill (2004/05:175) states that IT equipment must be included in a sustainable ecocycle. The Government wishes to encourage reduced energy consumption and environmental impact from IT products that are material- and energy-efficient and can readily be recycled and re-used. In addition, the products must not contain or require the use of substances that can have negative effects on human health or on the environment. The Bill also proposes that the public sector set a good example by specifying environmental requirements in the course of public procurement. Environment-friendly public procurement is a very important tool in the work of guiding society towards long-term sustainable development.
- In June 2005, the European Parliament and Council adopted Directive 2005/32/EC on the eco-design of energy-consuming products. After this Directive has been implemented in national legislation (2007) by committee procedure it will provide the basis for common EU requirements as regards products needing energy in order to function. The standards must subsequently be met before a product may be released onto the market. The objective of the common EU rules for eco-design is to prevent differences in national regulations from resulting in trade barriers in the internal market, as well as to improve the energy efficiency of products and lifecycle environmental impact and to integrate these aspects as early as in the product design stage. By improving the resource efficiency of energy-demanding products, sustainable development will be achieved in the longer term and will contribute to security of supply for energy. Among such products that may be included in future are a number of types of IT products. The Directive can also lead to demands for common functions for a number of products, such as energy consumption during standby.

Examples of applications

Product development at Hewlett-Packard (HP) has shown potential energy savings in both mobile products and in servers[50]. Because the mobile units "switch off" unused parts of the display, a battery can last for up to 11 times longer. For energy saving in servers, 'leaf servers'[51] are used, which consume approximately 40 per cent less energy in use and cooling compared to a traditional server.

According to Sun Microsystems, there are major opportunities for energy saving by replacing servers and home computers with thin clients[52]. By consolidating servers and running a number of applications per server, the number of servers can be reduced, which reduces the requirement for electricity supply and cooling. For example, an enterprise which today has 50 servers can reduce that number to 10 with the aid of server consolidation on modern servers. If each server today consumes on average 600

[48] Elkretsen, www.elkretsen.se
[49]Reports from the study: http://ec.europa.eu/environment/ipp/mobile.htm

[50]A unit with hardware and programs that forms the interface between local computer networks and another unit. The server receives the request for use by the unit and controls these wishes so that they are answered in their turn. A server is also the computer that receives calls from Internet-subscribers and sends them on.
[51]Leaf servers, also known as card servers, which are located on a circuit board together with the processor and hard disk, etc. The cards are built into units for placing on a stand so that they can be stored on a shelf, like books.
[52]A thin client has very little processing capacity of its own and relies on the server where there is software and computing power. They contain e.g. no hard disk

watts (including ancillary equipment, data storage, cooling) the servers consume in total 30 000 watts. If one kilowatt hour is assumed to cost one Swedish krona (SEK), the annual cost is approximately SEK 262 000. But if the number of servers is reduced, the energy requirement becomes approximately 6 000 watts, which gives an annual cost of approximately SEK 52 560. With modern servers the energy saving is even greater. A shift from desktop computer to thin clients can reduce the kilowatt consumption from 80 watts to 4 watts, which can also bring substantial energy savings.

Networks are becoming larger and larger and require more energy, but through systematic increases in, for example, efficiency, remote control and network maintenance, major energy savings can be achieved. For example, in Sweden, TeliaSonera has over a period of three years reduced its carbon dioxide emissions by at least 50 per cent by increasing network efficiency and also placing greater reliance on remote control and maintenance.

4.3.2. Dematerialisation

The development of a more ecologically sustainable society requires a clear resource perspective. IT services and products can contribute to the replacement of physical goods by services. This phenomenon is commonly termed dematerialisation and it helps to reduce the environmental impact. Current examples of dematerialisation include media services on the Internet for music, film and literature that to a certain extent have replaced the physical products in the form of CDs, books, newspapers, catalogues, tickets and manuals. The banking, postal and healthcare services that are accessible electronically have also reduced their resource requirements.

The education area has introduced a process for dematerialisation, with distance courses being made available at times that suit the student and with a content tailor-made to meet the student's intended study. With less travel, less centralised management and fewer physical resources being used, dematerialisation of education promises major efficiency gains. There are major opportunities here at the political level to justify more rapid development by means of controlled procurement, certification systems and the standardisation of processes, methods and knowledge systems.

The health sector also has major potential for dematerialisation. Remote diagnosis, personal sensors and health monitors and other individually applicable technology, make it possible for health services, both for the sick and the healthy, to be dispersed and moved from physical clinics to the general public. This process of change will reduce transport, waiting times and set-up times for both the public and health service personnel when all health information is available on request and on the spot.

If the resources saved by less costly products are applied to immaterial service consumption, a net gain arises for the environment and healthcare, due to the fact that this kind of services in general uses fewer physical resources compared to products. Nor does this entail a general threat to society's ambitions to create growth and employment, since there is a partial change in the growth content and expanding sectors create new job opportunities in small and medium-sized enterprises.

4.3.2.1. Decisions and initiatives in this area

- In June 2006 the previous Government launched an eStrategy[53] with overall objectives and guidelines for the future development of electronic administration. The purpose of the strategy is to make government administration more efficient and to improve its services to the public and to enterprises. One stage in the work is the introduction of electronic purchasing processes, which will lead to economies in public expenditure. The strategy is to be implemented up to the year 2010. It is part of the work on the Lisbon strategy to make the European Union the world's most competitive economy.

Examples of applications

From 1 July 2009, all agencies must handle their incoming and outgoing invoices electronically. This implies a public expenditure saving of about SEK 4 billion and in addition the transition to electronic invoicing also means savings in the form of reduced paper consumption and less transport.

The introduction of ePrescriptions in Apoteket AB has had a number of positive effects, in which both doctors and pharmacists save up to 30 minutes per day in administration. There is also a reduction in administration at healthcare centres and for the individual patient, who no longer needs on each occasion to collect a paper prescription and take it to the pharmacy.

TeliaSonera's Telesvarstjänst [telephone answering service] is used today by more than one million subscribers. By exploiting a telecom network service, instead of using an ordinary telephone answer machine, there is an energy saving corresponding to the annual consumption for about 3 000 houses.

4.3.3. Proposals for measures

A frequent problem in the development of new technology is the lack of means and potential purchasers. The development of new IT products with high environment potential requires support in the form of resources and a reliable and informed customer base.

[53] http://www.regeringen.se/content/1/c6/06/59/89/e90e3e49.pdf

- Calls for tenders in public procurement of IT products with high environmental potential must be issued where a number of purchasers are organised and announce a technical competition for a product that is still to be developed. The organised purchasers undertake to buy a given number of products from the successful enterprise. This method results in more rapid development of new technology than would otherwise be the case.

By benchmarking against the rest of the world, Sweden can acquire a good information base enabling investments to be directed to growth areas in environmental technology which can have substantial impact internationally.

- A suitable body should be given the task of developing benchmarking in the area of environmental technology, with the focus on technology that exploits IT solutions, in order to target measures in the area. The findings from these surveys can be applied in the allocation of research resources.

IT products are often characterised by their short life-span and high capacity that is seldom used to the full. Industry manufactures what is in demand and users buy what industry supplies. In order to impose tougher requirements on product life-span and usable content, one or more powerful purchasers are required. Public procurement by central government confers major purchasing power and hence provides a great opportunity to influence product development.

- The Government should exploit the opportunities within public procurement in order to give further support to the production of energy-efficient and environment-friendly IT products by training those responsible for purchasing.
- Knowledge must be disseminated within the public sector about the way in which IT systems can be made more energy and cost-efficient. The public sector's capacity to spearhead development must be exploited.

One problem in recycling IT products that have reached the end of their useful life relates to those companies which, despite legislation and sector agreements, do not live up to the requirements that have been set. This damages the image of the IT industry and moreover causes environmental impact.

- Within the framework of its cooperation council, the IT industry should conduct a debate about the enterprises that do not meet the set recycling requirements and should also work actively to persuade the whole industry to comply with legislation and sector agreements.

The ongoing progress in the education sector towards dematerialisation is a step in the right direction and political decisions can advance this development still further.

- o In its role as client and purchaser of education services, the Government should work in support of measures aimed at dematerialisation.
- The Government should work for the introduction of more flexible models for the assessment of higher education through new certified education levels.
- As an employer, the Government should attach a premium to education that is made accessible through new and more flexible channels.

Within the healthcare sector, much work is being done at different levels to make companies more efficient and the end-result of much of this work is dematerialisation.

- Political decisions should be aimed at promoting development by various measures of support for decentralising the work of clinics in both exploiting and providing spearhead skills with the aid of digital services.


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5. 5. Rebound effects

The increased demand for, and use of, products that follow from greater energy efficiency and lower production costs and price are called rebound effects. These effects can result in increased resource use and also increased consumption opportunities for the consumer as prices fall. IT products are developing and improving very rapidly. Moore's law[54] has long applied in the IT industry, which in simplified terms means that the capacity of IT products doubles and increases exponentially every 18 months, without any increase in price. The development has resulted in relatively constant prices for IT products despite the fact that their capacity is growing. It has led to the use of IT products in the great majority of sectors and, in the opinion of many, to growth in society through improvements and greater efficiency in processes, manufacture and administration. It has also resulted in an increase in the readiness to invest in IT products at the same time as expectations about their possibilities and the demand for them grow.

The use of IT has entailed changes and rebound effects that have an impact on the environment. For example, the vision of the paperless society has not been realised, paper consumption has on the contrary increased in step with the increased use of IT. eTrade has also entailed rebound effects since while the logistics of eTrade have improved and production has become more efficient, eTrade has resulted in an increase in freight transport. Rebound effects of virtual meetings and flexible forms of work can mean that that the reduced need for journeys results in people living further from built-up areas, which entails longer journeys. International research also points to the need for an increase in home-heating as a factor in the introduction of flexible forms of work, though that is not the case in Sweden where heating is in most instances at the same level, round the clock.

According to many researchers, IT provides considerable opportunities to improve the environmental potential of the information society[56], but decision-makers and users must be conscious of the rebound effects their use can entail. The size and impact of rebound effects is controversial in research. It is not their existence that is in question, but their effect. It is vitally important that the whole chain is studied in discussions about rebound effects. Rebound effects are not always negative, and an increase in energy consumption in one area can reduce energy consumption in another, with the result that the final balance becomes positive. We need greater knowledge about this, to enable decision-makers and consumers to take correct decisions that lead to a positive contribution by IT to an environment-friendly information society, in which economic growth does not always result in increased environmental impact.

[54] Moore's law was defined by Gordon Moore in an article in 1963. It stated that the number of transistors in integrated circuits doubles every year. In 1973 he modified this definition, to the effect that this happens every second year.

[56] Environmental Impact Assessment Review 22 (2002) 509-523. A. Plepys, http://www.lub.lu.se/cgi-bin/show_diss.pl/tec_799.html

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Annex 1

Members of the working group on IT and environment. This report is the outcome of the joint work by members of the Group. Its purpose has not been to achieve consensus on all points, so not all members support all proposals advanced in it.

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Others who have provided input for this report, in addition to the workshop organised by the working group, are:

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Annex 2

What IT applications can produce the greatest environmental changes in the period up to 2020?

(+) a positive environmental change

(-) little or no environmental change

- Control of heating, cooling and ventilation in buildings (+)
- Transition from product to service (+)
- IT support in passenger cars (-) and public transport (+)
- IT support during travel (+/-)
- IT support for goods traffic (-)
- Greater efficiency in the use of materials and energy in industry (+)
- Electronic waste (-)
- More efficient, more renewable energy production (+)
- B2C eTrade creates more waste and goods transport (-) but can reduce passenger transport
- Virtual meetings can reduce passenger transport (+), probably to a greater extent than flexible forms of work
- There will be a drastic increase in energy use of IT products, but this is negligible in comparison with the other effects (-)

Source: The Future Impact of ICT on Environmental Sustainability"(2004).
Erdmann et.al, Institute for Prospective Technological Studies, European Commission

Annex 3

Previous and current measures on IT and the Environment

Sweden

The IT Bill, From an IT policy for society to a policy for the IT Society (2004/05:175) indicates a new attitude, in which IT policy has become a policy for the IT society. IT is therefore no longer a separate policy area but an integral part of all policy areas, in which work is conducted jointly to create a sustainable information society for all. That means that IT is no longer a separate target but a means to achieve other targets. The IT Bill has three sub-goals:

- IT must contribute to improved quality of life and to the improvement and simplification of everyday life for people and enterprises
- IT must be used to promote sustainable growth
- An efficient and reliable physical infrastructure with high transmission capability must be accessible nationwide, inter alia to give people access to interactive public eServices

IT and ecologically sustainable development are designated as a part of the Bill's sub-goal Sustainable Growth, and the activities indicated there are also to be found in this document.

As part of its overall work on sustainable development the previous Government presented in March 2006 a further elaborated strategy for sustainable development (Communication 2005/06:126) in which four strategic challenges are highlighted:

- Build society sustainably
- Stimulate good health on equal terms
- Meet the demographic challenge
- Promote sustainable growth

The concept of sustainable development means "development that meets the demands of the present without compromising the ability of future generations to meet their own needs"[57]. In the Government Communication it is stated that the IT Policy Strategy Group is producing a proposal for a national strategy for IT and an environmentally appropriate information society. It further indicates that public sector procurement should set an example in promoting sustainable development. Insofar as is permissible under the terms of the Swedish Public Procurement Act (1992:1528) and of EC Regulations, public procurement procedures should include requirements relating to social considerations and to concern for the environment. Those responsible for public procurement must have access to tools, training and other support in order to be able to lay down these requirements.

In the Government Offices work is now in progress on a national programme for sustainable consumption and production, in accordance with the above-mentioned Communication (2005/06:126). The first part of this programme was presented by the Ministry of Agriculture, Food and Fisheries in March 2006 and consisted of an action plan for sustainable consumption, aimed at households. The second part of this programme will be presented in spring 2007 and will consist of an action plan for sustainable consumption and production, for enterprises and the public sector.

These two strategic and central documents show that both IT and sustainable development are highly topical and important questions for Sweden's future. IT and the Environment are on the political agenda, and the strategy "An environmentally appropriate information society in 2020" shows how this question can be managed.

In the forthcoming proposal for an Action plan for sustainable consumption and production, IT is considered to be one of the more important tools to reduce harm to the environment and human health from the consumption and production of goods and services. In the proposal for an action plan two of the focus areas are transport, and construction and housing. Here IT has an important role in reducing environmental impact. The proposal for an Action plan for sustainable consumption and production makes reference to the report "An environmentally appropriate information society in 2020" and its intentions and a number of these proposals will be presented, because all ideas and proposals that are presented in this report can contribute to sustainable consumption and production. The final drafting of a National action plan for sustainable consumption and production in the business and public sectors must be coordinated with that of a National strategy for IT and the environment, on the basis of the two proposals, for an Action plan and a Strategy respectively, which will be presented in the autumn of 2006.

In Sweden, the Government intends to produce action plans that utilise both the environmental and innovative potential of public procurement. The directive (dir.2004:47) to the Public Procurement Commission states that the Swedish standpoint as regards social and environmental concerns must be taken into account. In accordance with the supplementary directive (dir. 2005:39) the Inquiry should analyse the scope for introducing regulations that oblige a public procurement unit to lay down demands and environmental requirements, and also that the new directives are compatible with ILO Convention 94, concerning Labour Clauses in Public Contracts. In the Public Procurement Commission's fi-

[57]Our Common Future, report by the World Commission on Environment and Development (the Brundtland Report) Red. Bertil Hägerhäll. Book publishers: Prisma and Tidens förlag (Stockholm) 1998.

nal report "New procurement regulations 2" (SOU 2006:28) the Commission proposes the introduction of a regulation obliging a procurement unit to specify environmental and social requirements. This report is currently being processed within the Government Offices.

EU and international considerations

Sustainable development has been an overall objective of the EU Treaties since 1999. In 2001 the EU's adopted its first strategy for sustainable development. It identified a number of unsustainable trends and horizontal instruments for promoting sustainable development. The Lisbon Strategy is the collective concept for the EU's strategy for growth and employment. This strategy was complemented in 2001 by the addition of an environmental dimension. The EU's policy for exploiting the potential of the digital economy and its capacity to deliver growth, job opportunities and modern public eServices is called i2010. The programme is a central part of the renewed Lisbon Strategy.

In Barcelona in 2002 a decision was taken to develop the international part of the sustainability strategy and the EU's proactive role in the global work for sustainable development was thereby reinforced. The EU Sustainable Development Strategy (SDS) has been revised and seven main questions have been identified: climate change and clean energy; public health; social inclusion, demography and migration; the management of natural resources; sustainable transport; and global poverty and development. A number of objectives, targets and proposals for measures are to be found on each of the main questions[58].

Within the EU a series of initiatives have been taken in the area IT and the Environment. On the environmental side of the policy major efforts have been made, including making accessible digital information in support of environment policy in its broad sense. Examples of such initiatives are the INSPIRE Directive (Infrastructure for Spatial Information in Europe) and GMES (Global Monitoring of Environment and Security). The i2010 Programme is also designed with the clear aim of contributing to sustainable growth. Through INSPIRE, a legal framework will be established for a European spatial data infrastructure. The implementation of INSPIRE in Sweden will require comprehensive efforts, above all in the public sector, but will also bring major gains in many business areas. GMES is an action programme for the collection, dissemination and exploitation of environmental information, with remote analysis from satellites as one of the main supports. The objective is to create an independent European capacity for global environmental survey, including the handling of natural disasters, etc.

A grouping has also been formed at the European level, ICT and Sustainable Forum. It is led by a number of global IT enterprises, together with well-informed representatives of the European Parliament and various Directorates, and its objective is to carry forward debate and demonstrate opportunities. The Swedish parliamentarian, Anders Wijkman, is chairman of the group.

GeSI, the Global eSustainability Initiative, is an international association of the major actors in the IT industry, whose cooperation is supported by the UN Environment Programme (UNEP) and the International Telecommunication Union (ITU). The objective of GeSI is to create an international forum to improve development and production as well as access to IT, with a view to contributing to sustainable development. GeSI is also to stimulate cooperation and exchange of experience in the international IT industry and support enterprises in developing countries. GeSI is also working on, among other things, the Electronic Industry Code of Conduct (EICC), the result of which is to be that the technology industry will endeavour to improve sustainability criteria in the production chain.

Within the EU work is also being conducted with a view to the elaboration by Member States of three-year national action plans to reinforce efforts to make public procurement environment-friendly. The action plans must include targets and corresponding measures.

[58] In December 2003, DG Information Society published a report entitled Assessing Opportunities for ICT to contribute to sustainable development. This report gives an account of IT's possibilities and call for cooperation between industry and decision-makers .http://www.euractiv.com/en/sustainability/analysis-ict-contribute-sustainable-development/article-151441

[59] www.gesi.org