Editorial: Social implications of sustainable information society

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Abstract: This special issue is a broad scientific discussion on Sustainable Information Society (SIS) based on the research results of the multiannual R&D programme in Finland called 'KESTY'. This involved the study of the societal implications to the questions of SIS focusing on the joint interests of the Information Society (IS) and Sustainable Development. Basically, the development of IS and Sustainable Development (SD) has been segregated. The new revelation that interdependencies of IS and SD are multiple and important has been the driving force and basis for this research programme. The research work has generated new understanding and knowledge on SIS and its social implications through several interdisciplinary approaches on the cross and joint impacts of IS and SD. There are also several policy recommendations that can be deduced from the research results that can be used for conducting a unified and mutually supportive development of IS and SD.

Keywords: information society; sustainable development; sustainable information society; eco-efficiency; indicators; knowledge management; immaterialisation; dematerialisation; citizen empowerment; telework.

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1 Introduction

> "Humanity cannot make the sweeping changes that are required for a sustainable future (*e.g.*, in consumption patterns, energy and transportation policies, the redesign of communities international relations and much more) without a dramatic increase in the intensity and quality of human communications." (Elgin, 1994)

Information Society (IS) and Sustainable Development (SD) are trends that have been forcefully promoted by most nations, more so since the early 1990s. However, the development of the two has been segregated. The relationships to and impacts on one another are not well understood, thus, there is an urgent need for interdisciplinary research, particularly on the joint impacts and interdependencies of IS and SD. For this purpose, the SIS project (SIS = Sustainable Information Society) called KESTY under the National Environment Cluster Programme in Finland was launched in 2000.

The set of articles of this issue is a broad scientific discussion on the research on Sustainable Information Society (SIS) based on the multiannual programme on SIS in Finland. In addition to analysing the results of the research done during the period 2000–2003 the main aim is to produce ample and novel knowledge on SIS and elaborate on a set of policy recommendations for R&D activities in the academic, political and commercial world.

The themes of the research programme include concept analysis, indicator development and other criteria relevant to the generation of new understanding on SIS. The future research methodology is used for creating new understanding and alternative future images for SIS. The themes encompass several approaches that are integrated, including ecological knowledge management, the civic society relationships between policy making and citizen's empowerment on SIS matters, concerning especially living, working, travelling, food production, eco-efficiency pursuits and new ideas of young people and other citizens as consumers. In addition, the material and energy flow and improved information flow are related to one another but also to quality of life in general.

2 Context of sustainable information society

The Information Society (IS) and Sustainable Development (SD) have been the major trends under discussion for the last decade of this millennium. Both approaches and development processes are forcefully promoted by almost all nations, especially the USA and the European Union (EU). Both processes have varying impacts on economy, ecology and society – even cultural diversity – but what is their impact on one another? Should not their cross impact and joint impact on societies be studied (Keskinen, 1999a–b; 2001a–2001b)?

Since the early 1990s, the development of IS and SD has been segregated. The main reason for this is that IS development has been conducted by private enterprises whereas SD has been the concern of public sector and organisations. However, there is almost no research done on the actual reasons for this segregation. The environmental administrations have not collaborated with the IS development actors, and both issues have been studied separately in all European and other Western countries. The sustainable development processes were then and still are being conducted by the environmental administrations in each country. The collaboration with other sectors is

extensive, but the information society issues have not been raised into the discussion in the same way as the ecological questions have been brought to light in the IS discussions. One of the few European efforts to this effect was the Terra 2000 Project (Terra 2000, 2000) that was a response to the pressing need to align the creation of a networked, information – and knowledge-based society (and its accompanying new economy) with the requirements for the achievement of sustainability and of sustainable development in general.

In contrary, recently the R&D and political discussion within the EU has focused on security issues. This is of course partly because of the 9/11 catastrophe and the rise of global terrorism. For example, the SIS issue is not present in the current 6th Framework Programme for years 2002–2006 (EU Commission, 2002). Instead, the UN development programmes took on board the SIS issue. This reflects the new understanding that ecology and ICT have strong interdependencies especially in developing countries. The World Summit for IS organised by UN in 2003 clearly states this. However, the information technology developers are more interested in sustainability (ecology, culture, social issues) than are the environmental actors interested in information technologies (WSIS, 2003).

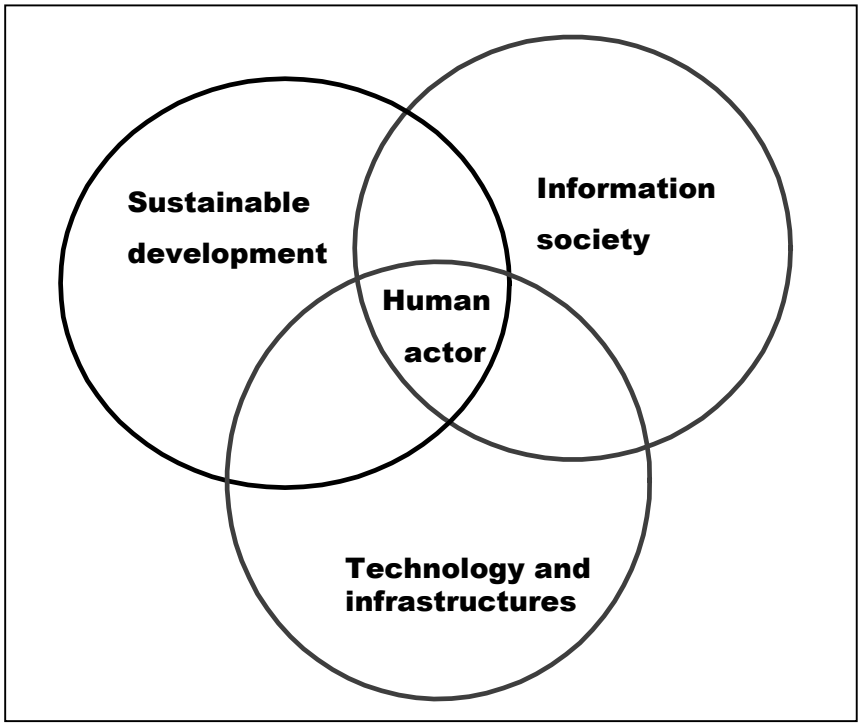
3 Rationale for sustainable information society

Early on, the relevant questions were stated as: how can the two big development ideas be integrated in a fashion as to bring benefits and added value to the ideas themselves and societies? What are the mutual interests of these ideas? What are their interdependencies? What approaches can be done to understand such an overwhelming number of interactions? How does one conduct a study of such an interdisciplinary field of both parallel interests and conflicting interests (see, *e.g.*, ASIS, 2000)? Thus, the two issues that are poised to transform our society are firstly, the challenge of sustainability, and secondly, the headlong rush into the information age. Both issues are multifaceted, unimaginably complex, and driven as much by individual choices as by government policies. And more fundamentally, they are both global issues that cannot easily be considered or regulated at the nation state level of the (IST99, 1999; EU IPTS, 1999). Understanding either of these issues in isolation is daunting enough, so it is with great trepidation that their interrelationship is even raised (Keskinen, 1999a).

Further, some other fora have continued to make relevant questions in the joint interest area of Sustainable Development and the Information Society, such as the Information Society Forum set up by the EU Commission in 1995. The questions posed were: How can Information and Communications Technologies (ICT) help and support the realisation of sustainable development. Is the development of information and communications technologies sustainable (EU IS FORUM, 1996; 1997; EU IPTS, 1999)? It is evident that today sustainability is widely accepted as a desirable aim, but achieving it necessitates much more than just passive acceptance. ICT and the changes they engender provide many opportunities for achieving the aim of sustainability (ASIS, 2000; FAW, 1995).

The following illustration (Figure 1) describes the interdependencies of Information Society and Sustainable Development, putting the human being as the actor in the joint interest area (Keskinen, 1999a).

Figure1 Interdisciplinarity of sustainable development and information society



Source: ACTS (1995)

The relevant questions are further developed by asking: How can human beings, the citizens, and the nations act and decide in order to realise sustainable information society in an operational environment where both social sustainability and technology development are closely interdependent? In the democratic environment of postmodern information societies citizens should have an important and active role in the societal decision-making processes (Keskinen, 1997). Further, what kind of skills and information do citizens need for this task? For example, how can they say something important about the future of biomedicine – when it is very difficult even for biomedical professionals? From this point of view the developers, politicians and citizens alike must focus on decision making processes and the skills needed to use and modify data, information and knowledge (Viherä and Nurmela, 2001).

4 Research and development on information society and sustainable development

The separate development of SD and IS is now discussed in an international context. Various points of view through SIS research history are discussed and the separate approach and thinking of IS and SD research efforts are pointed out, as well as some efforts to integrate the two.

4.1 Environmental development

The first UN summit on global environmental concerns was held in Rio 1992. The documents of the summit did not reveal any concern for the ecological aspects of information technology development or vice versa, neither did the documents on the follow-up conference UNGASS five years later (Rio, 1992; UNGASS, 1997). The global community finally showed some understanding on SIS in the WSIS conference in 2003. WSIS 2003, stated in their declaration: "We also reaffirm that democracy, sustainable development, and respect for human rights and fundamental freedoms as well as good governance at all levels are interdependent and mutually reinforcing."

The UN organisation ITU has also been active in trying to promote the environmental approach to ICT. The first effort to define research needs and active actors in the field was taken in 1996, when the first ITU conference in the field was held in Tunis. It is perhaps not so surprising that the next WSIS conference in 2005 will also be held in Tunis. As far as Finnish efforts are concerned, it is worth noticing that Finland also participated in the ITU conferences (Keskinen 1996; WSIS, 2003).

4.2 Growing awareness in technology industry and business

There is a gradual and increasing awareness of the interaction of economic and ecological factors towards the turn of the century. The European Telecommunications Network Organisations have had environmental Charters since 1997 (ETNO, 1997–2004). ETNO includes such major operators as France telecom, Telecom Italia and NOKIA. The EU Transport Directorate and the European Environment Agency have studied the ecological implications of transport, too, on the programme of Sustainable Transport (EU Commission Transport, 2004; EEA, 2004). Information technology enterprises such as NOKIA have also studied their ecological impacts and drafted sustainability strategies. TELIASONERA declares:

> "TeliaSonera aspires to be a 'good corporate citizen' by acting ethically and responsibly and by promoting sustainable development within the marketplace, the workplace, the environment and the community at large. The telecommunications industry can be a catalyst for sustainable development in many ways. Several of TeliaSonera's services, such as teleconferencing and voicemail in the network, are replacing travel and products." (TELIASONERA, 2004)

The Confederation of Finnish Industries has also a common charter on societal responsibility that includes ecological concerns (TT, 2003). It is not commonly known, however, if these efforts have resulted to changes in operations. On the other hand, the World Business Council for Sustainable Development has been active since 1994 in promoting the ecological approach to business development and pursuing to raise the awareness of sustainability in business (WBCSD, 2004).

Perhaps the major stumbling block to the integration efforts has been the ICT Bubble Burst at the beginning of the 1990s that actually widely hindered the pursuit of any new approaches to ICT, such as ecological ones (OECD, 2003). The macro-economic analysis done by the OECD indicates that other problems aside from the eco-efficiency have become more pending and urgent for the telecommunications industry after the ICT bubble burst. Apparently the burden of reconstructing the sector still prevails ten years after, thus, hindering the refocusing on the ecological questions that is constantly

becoming stronger because of the pressure arising from societal and governmental policies. The day may be near, and indeed, a much needed one, when the ecological questions will override the plain economic ones, or rather, what should be more apt, the ecological and economic approaches will be integrated to the benefit of both producers and users.

4.3 European efforts to integrate information society and sustainable development

Various efforts to study the Sustainable Information Society (SIS) have been done in the EU countries, but they have remained 'remote islands of knowledge' so far (IST99, 1999). The starting point was commissioner Martin Bangemann's report on Europe and the global Information Society (Bangemann, 1994) that was presented to the EU Council Summit meeting in Corfu in 1994. This was the first joint effort of the EU Commission to promote the information society, focusing especially on the markets and the SMEs and on streamlining the administrations' operations. The ecological concerns were not included.

Ten years of information society development since the Bangemann Report have seen many IS projects. In the first EU IS conference in February 1995 there were ten multinational IS Pilot Projects launched jointly with the G7 (G8 IS Pilots, 1996). The one and only pilot project encompassing IS and SD was called 'Environment and Natural Resources Management (ENRM)'. It agreed on a standard (ISO23950 or Z39.50) to locate information sources more easily on global networks, thus laying the foundation for a virtual library of environment and natural resources management information. The project promoted a standard set of metadata elements for locator records. It also adopted a policy for publishing resources via a Global Environmental Information Locator Service developed for conventions on climate change and biodiversity (ISPO, 2000). Thus, ENRM aimed to increase the electronic linkage and integration of distributed databases of information relevant to the environment.

The EU five-year R&D Framework Programmes (FP) included constantly growing investments in IS research, technological development and demonstration. The EU R&TD 4th Framework Programme 1994–1998 included two approaches to the ecological issues on IS, namely, the Telematics for Environment and Telematics for Administrations. The latter included a major effort on integrating European administrations' IS activities in the various administrative domains as well as in environmental administrations. Both of these efforts were introductory in the sense that the IS they conceived was not actually developed enough to realise the ambitious goals of these processes (EU Commission, 1994). The 5th FP saw a rising interest in the ecological and social aspects of IS development (EU Commission, 1998).

In addition to the IS Pilots and the FP's High-Level Expert Group (HLEG), assisting IS Forums were established to bring the human aspect to the discussion on information society. These bodies were European, and they produced many reports, such as the Green Paper on how the EU citizens should be considered as the prime subjects of IS development (HLEG, 1996; 1997).

In addition to the EU R&D Framework Programmes there were other EU projects dealing with environmental concerns in the domain of IS, *e.g.*, the Advanced Communications and Technologies Services (ACTS, 1995). ACTS research strongly complements a broad range of community policy initiatives, such as, improving the

competitiveness of European enterprises in global markets, achieving sustainable economic growth, creating more employment opportunities and new ways of working, and strengthening the single market through the development of trans-European networks.

Another EU project established later during the 5th Framework Programme (EU Commission, 1988) acting on ACTS recommendations was the Alliance for a Sustainable Information Society (ASIS). This alliance is involved in voluntary but active participation in the process of developing a Sustainable Information Society, pursuing the goal of worldwide sustainability by applying the information and communications technologies inherent in the Information Society to help solve current economic, social and environmental challenges in order to build a fair, fulfiling, prosperous and sustainable future for all (ASIS, 2000; see also Schauer, 2000). The ASIS understanding is very well proven by the subsequent research done in Finland after the turn of the century, as will be presented in the following chapter.

What happened towards the end of the millennium acted as a kind of starting shot. The latter half of the year 1999 saw the first Finnish EU Presidency, and thus the EU Annual Information Society conference IST99 was held in Helsinki. There were about 3000 participants in the conference, but the workshop on Sustainable *e*-nvironment managed to get only 20 people to attend. The issue of SIS was poorly understood and only a few academic or administrative experts were interested. However, the EU Millennium Declaration that actually included the environmental sustainability approach to IS was launched that year (European Summit, 1999). Unfortunately, five years after this declaration no documented improvement in understanding the interdependencies of IS and SD has been done. Again, this is a manifestion of how far rhetoric is from actual understanding of the actions needed to fulfil the goals. But politics do not always give obvious answers to what should be proper actions.

Furthermore, the EU Information Society Project Office (ISPO, 2000) launched the Quality of Life Thematic Portal (Quality of Life, 2004) declaring that:

> "A range of EU policies and activities aim to use the information society to improve Europe's environment: the Information Society will play an important role in sustainable development, with new technologies and organisational structures reducing the environmental impact of industry and society."

From then on, the environmental concerns were more or less embedded in the new concept of 'Quality of Life' that was then brought to the EU R&D 5th FP (INFSO, 2004), thus making the interplay of IS and SD invisible again.

In addition, the political initiative e-Europe was launched in 2000 to ensure that the European Union fully benefits from the changes that the information society will bring. (E-Europe, 2000). At the European level, several measures have been taken to promote the information society: the liberalisation of telecommunications, establishment of a clear legal framework for e-commerce and support for the industry and R&D. The key objectives of the eEurope focus on universal access and digital literacy of Europeans. It is noteworthy that the ecological concerns or the demand of sustainable development were not addressed at all in this context either.

5 Information society and sustainable development in Finland

In Finland the segregational development of IS and SD has been the trend as well. In the domain of information society, the government has established a National Advisory Board of IS and assisting IS Expert Forum in 1996. The first National IS strategy was launched in 1996. Other actors in these domains include the Futures Committee of Parliament, established in 1994 (Futures Committee of Parliament, 2004). Later on, the Finnish Information Society Council was established in 2003. It is a negotiation body to steer the development of the information society and to coordinate cooperation efforts between the administrative branches and between administration, organisations and business ventures.

In the domain of sustainable development, the Finnish Sustainable Development Committee was established in 1993 in Finland (SD Committee, 1993) after the Rio 1992 conference. This wide-based Committee brought up to the public discourse many important themes of SD, acted as an interpreter between national and international movements and supported the work of other societal actor groups. In autumn 2001 the Committee started a participative multistakeholder process across the whole society. The new National Programme for Sustainable Development in Finland was established in 1998 for the years 1999–2002.

It is noteworthy that neither of these processes found any connections between them or needed to integrate SD and IS development or studied their interdependencies as the turn of the millennium approached. However, the first effort to study the joint interests of IS and SD was the joint seminar of National Committee of SD and National Committee of IS in April 1997 (Keskinen, 1997).

5.1 Efforts to join information society with sustainable development in Finland

Finally, after a decade or so of frustrating 'clarion calls', the academia slowly adopted the SIS as an R&D domain. The Finnish Academy funded a major three-year project on Citizenship and Ecomodernisation in the Information Society – The Futures Approach – (FUTU) in 1996 (FUTU Project, 1996). The project with its ten subprojects was based on the understanding that:

> "Ecomodernisation means deconstructing and redefining the central role of industrial modernization in pursue for a sustainable future for the planet and its citizens. In this late-industrial transformation, innovations related to the emergence of information society form a new assembly of driving forces and actors. In business and economy, motives for creating information age are ranging from short-term opportunistic profit making, or middle term search for a better strategic positioning to futures envisioning and making new advance of human progress. However, all too often only the business to business push has been recognized as the relevant driving force of development, and the citizen pull ignored or assumed as non-relevant".

The project produced six PhD graduates on the issue of SIS.

The update of the first National IS Strategy prepared in 1996 was conducted by SITRA, The Finnish National Fund for Research and Development in 1998 (SITRA, 1998). The results include a strong backing for sustainability by stating the mission as follows:

> "Finland is progressing towards a knowledge-based society. To be able to make the best use of the opportunities inherent in the information society and ward off relevant threats, Finland needs a vision and a strategy. The rapid rate of change necessitates constant revision of the strategy. Finland wishes to be a forerunner in the construction of an information society based on humane and sustainable development." (SITRA, 1998)

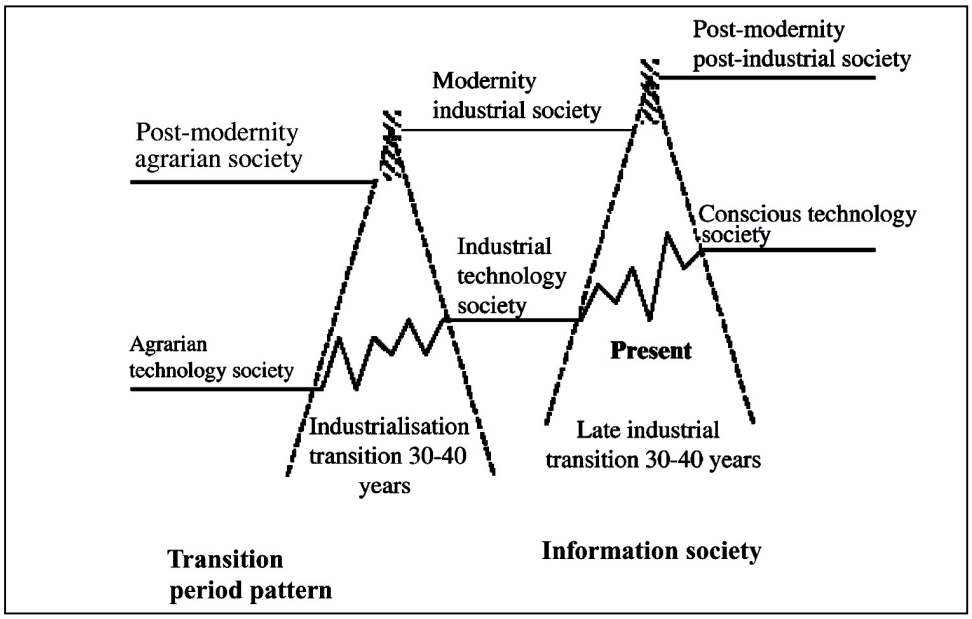
5.2 KESTY programme

The declaration of the national IS strategy by SITRA was not taken on by the next government in spring 1999. But by year 2000, the most comprehensive research effort to integrate IS and SD was launched as the national KESTY Programme (KESTY = Sustainable Information Society in Finnish).

5.2.1 Early studies: citizenship and ecomodernisation in information society

A large project on citizenship and SIS was conducted in Finland at the end of the millennium that made a deep-going analysis of the information society (FUTU Project, 1996) resulting in a theory of periods of transformation that emphasise the decisive role of the intermittent phase of a complex transformation from one stage to the next one. Complexity involves the unpredictability of change; what can be observed in the transitional period does not reveal what characteristics the emerging future will have. According to this framework, the period of transition between the preceding and later stable stages of the system is an adaptation phase. A period of transition will last for decades. It is argued here that during this period the prevailing dominant rationale of manufacturing (industrial society) is loosing its dominance to another type of rationale (Figure 2).

Figure 2 Information society as a transition period of societal development



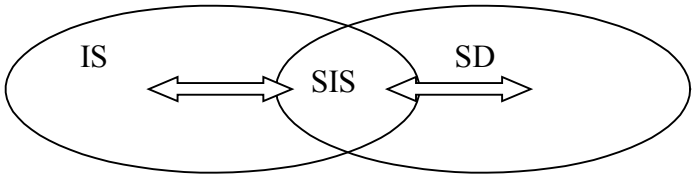
This present-day transition period is called the Information Society because of the essential role of ICT infrastructure being built during this time. In the larger framework of modernity the prevailing transition period is merely a part of a late-modern transition to postmodernity (Wilenius, 1997). The prevailing rationale of the industrial society is losing its ascendancy to the new rationale of a post-industrial, service-intensive economy. Today, the world is in the middle of a great transitional period that will result in a radically different form of society, as different as industrial society was from the preceding agrarian society (Wilenius, 1997; Malaska, 1991; Viherä, 1999).

These early studies resulted in several doctoral studies on the various aspects of SIS. These studies were financed by the Science Academy. The Ministry of the Environment took the next research effort step by establishing the Finnish Environmental Cluster Research Programme 2000–2003 (Honkasalo and Alasaarela, 2003) where the studies were financed by several ministries. In this context the KESTY (SIS in Finnish) research cluster was defined to focus on the joint and cross impacts of IS and SD. After the call for proposals 15 projects were accepted to study the issue. These focused on the ecological, cultural, social and economic criteria and their potentials for aiding sustainable development in the information society (Honkasalo, 2003).

5.2.2 KESTY research objectives

When studying the impact of IS on SD – the very core of SIS – the main questions selected for KESTY were: How can IS development support and help in realising SD? Under what conditions is the development of IS ecologically sustainable? What are the environmental, social and cultural impacts of IS and SD and their implications on societies? These questions essentially explain the content of the joint interest area (JIA) of the two (see figure 3).

Figure 3 SIS – Joint interest area of IS and SD



The KESTY programme focused on the SIS that was regarded as Joint Interest Area (JIA). The first aim was to create more understanding on the most important phenomena in ecological, economic and sociocultural areas – and the critical limits and borderlines of these phenomena (Heinonen *et al.*, 2001; Jokinen *et al.*, 1998). Then these had to be combined with the tools to achieve harmony and sustainability, in this case the ICT.

When studying the joint interests of SD and IS, understanding the interactions between the urban-built environment and the natural environment is relevant. This calls for a holistic multidisciplinary research approach on human-nature relationships focusing on land-use planning and infrastructure development. In addition, the trends in consumption and production have impacts on the development of urban forms. In order to decrease the environmental load, it is essential to influence the structure, quality and volume of production and consumption. New research challenges focus on developing

environmental policy instruments to favour the nonmaterial aspects, the development needs of new technologies from the viewpoint of eco-efficiency, and developing indicators, measures and information facilities and systems that are reliable and can provide easy access to relevant information (Kahilainen, 2000; Heinonen *et al.*, 2002).

5.2.3 Main results of the KESTY subprojects

The main subprojects of KESTY and their main results are (for detailed discussions please refer to individual articles in this special issue):

1 E-knowledge: coinformation society – criteria and actions

   Sustainable dimensions of information society are thoroughly studied, concepts are explained and defined, and new indicators created. The E-Knowledge portal was created where all new study results and documents can be found. (E-tieto, 2004). The reports describing the many aspects of SIS are numerous and provide a wealth of new data, information and knowledge. The reports discuss various aspects of SIS, such as criteria, potential activities and opportunities of SIS, conceptual analysis, local applications of sustainability approach to information society, regional strategies and social innovations, impact of art and culture, the rising of new know-how society where ICT is used properly to enhance human capabilities, SWOT analysis of SIS, digital balance and communications services, telework, telepresence and other emerging e-life phenomena. (Heinonen *et al.*, 2004; Hietanen *et al.*, 2004; Väyrynen, 2002).

2 Agriculture, information society and sustainable development

   This was a pilot research on the impacts of IS on the sustainability of agriculture. The main result suggests that the experts have a very positive attitude towards the information society and its development potential. They consider the IS to provide considerably more ecological, economic and social development opportunities than to create potential risks or threats to SD. (Aakkula *et al.*, 2002; Jokinen, 1997; 2002).

3 The young people's consuming cultures in transition

   In this project the young people and their views on environment were studied. The majority of young people see environmental problems as really threatening. The study found that there is a gender division in the attitudes towards environment: boys lean toward technology while girls are more enthusiastic about green consumerism (Autio and Wilska, 2003).

4 The role of new information technologies in environmental awareness and actions in everyday life

   The project studied the relation between SD and IS and how people perceive these in their everyday lives. The results indicate that while environmental friendliness is often emphasised in the images promoting IS, people recognise that the information society has its own environmental problems. Many people are particularly concerned about the global production of ICT devices and the quick turnover of these (Heikkinen *et al.*, 2004).

5 Dematerialisation: the potential of ICT and services

The prospects for reducing natural resources use in Finland with a focus on the role of ICT and service innovations from a consumer and end-user perspective were studied. The results reveal that at present there are few environmental requirements on the services and solutions of IS and hardly any focusing on the environmental performance of the services themselves. To change this, a new concept of eco-efficiency' has been introduced to avoid the political problems that legislation or economic instruments have encountered. Companies pointed out win-win solutions, in which natural resource conservation also saves money and brings profits. This will not be enough to reduce materials throughout the entire economy; rather it is important that the new service economy be more labour-intensive. Ultimately, this will most probably also require changes in the cost structure (Heiskanen *et al.*, 2001, Heiskanen, 2002a–b; Heiskanen and Jalas, 2003).

6 Ecological telework, living, working and trafficking changes in cities through telework

The aim of the project was to analyse the significance of the eco-managed introduction of telework in relation to sustainable urban form and functions. Eco-managed introduction of telework requires information and knowledge on environmental impacts of telework as well as their assessment. In the chosen Finnish case areas, possibilities were explored for linking residential areas with well-developed ICT infrastructure to the eco-managed introduction of telework. Telework can also be integrated as part of a lifestyle based on sustainable development. On the basis of analysing various implementations of telework a presentation of best practices together with recommendations for actions as regards the promotion of ecomanaged telework is made (Heinonen *et al.*, 2004).

7 New urban management in Europe – self-organising assessment of Local Agenda 21 activities

The UN Environmental Summit in Rio 1992 launched the Local Agenda 21 process, where local communities worldwide started to redirect their activities towards ecological sustainability (Rio, 1992). Today, the LA 21 Processes are at different stages of their work and progress. This project together with LASALA project (Local Authorities' Self-Assessment for Local Agenda 21) created an online tool for self-auditing the sustainability development processes (Grönhom *et al.*, 2001; Joas and Grönholm, 2001).

8 Environmental policies of everyday life

The aim of this pilot study was to develop a theoretically and conceptually new research activity on the areas of potentials and limitations of ecological modernisation of every life, and cultural preconditions of environmental policy. In the study, the Finnish traditions are incorporated to ecological modernisation, asking how nature relationship is interpreted in different life situations and, how people see and construct meanings to environmental questions in the context of everyday life (Massa and Haverinen, 2001).

9 Telematics of goods transport and environment – mobility management

This study was to throw light no mobility management by focusing on the Tampere Region in Southwestern Finland. The mobility management is primarily a demand-oriented approach to passenger and freight transport that involves new partnerships between actors (such as municipalities, companies, organisations) and a set of tools to support and encourage change of attitude and behaviour towards sustainable modes of transport. The case study on the Tampere region indicates that it is high time to start a discussion on the means to advance sustainable transportation system. Hardware measures that are already used in transport planning should be accompanied by mobility management measures. A wider collaboration between different actors is also needed (Kiiskilä *et al.*, 2002).

10 Citizen participation in the information society development

The focus of this study was on the possibilities of citizen participation in the SIS – how IST and networks can be employed to enhance public discussion and urban planning practices based on citizens' jury models (Heikkilä and Lehtonen, 2004).

11 Spaces of mobility and immobility

The project studied 'Amenity Landscapes' that refers to the process by which certain places and environments are created, appropriated and preserved for their cultural, natural and national uniqueness. Usually this is due to their aesthetic value. But in addition to the aesthetic dimension, amenities may also refer to material, social, embodied and virtual aspects of a landscape. The dictionary phrase, 'amenities of a town', refers to both *social and material* conveniences and experiences for tourists and visitors, ranging from hotel rooms to social services or the degree of hospitality of hosts (open-heartedness, warmth and welcome) (Veijola, 2003; Lüthje, 2004).

6 Recommendations

In the future there will be a great deal of technological diversity, which will probably lead to different kinds of tools and personally targeted contents and equipment. This technological high-tech will be able to help us create sustainable futures – if and only if the technology can be developed so as to help us build better social machinery – the social high-tech. The task then of socially sustainable technology is to help people, cities and nations avoid and minimise inequalities and digital divides. In the future better decision making and planning processes, better information, better education systems and new technological innovations are needed to help in this social task.

Typically, the majority of studies on the ecological dimension of the information technologies implicate that all new activities that pursue environmentally friendly development have both benefits and setbacks. Basically this is because all human activities use natural resources and produce waste. The rebound effect of innovations in this field is clear. For example, when new ICT is employed the increase of equipment production increases natural resource consumption. Or, if people start to do telework the traffic tends to increase anyhow because of increased freedom of action thus diminishing the beneficial effect of reduction in work traffic. Electronic commerce at first glance

seems to reduce consumer and postal traffic but many research show that people tend to increase traffic by 'window-shopping' more often. The logistics must also be considered – if the logistics is not streamlined accordingly, development may actually increase postal traffic.

As environmental problems evolve and technologies or economic activities change, it is also necessary to monitor and revise rules and regulations in order not to get out of tune with the situation. More generally, command and control policies often give rise to unnecessarily costly solutions to environmental problems and this has stimulated the search for ways of using market mechanisms to achieve environmental aims. Whatever controversial experiences there are about using compulsory legislation or employing voluntary action support towards sustainability in the society; it is evident that this is not a question of either-or; rather, humankind and the natural globe need all possible activities combined – resembling more 'a puppet-on-a-string' approach than good-bad contraposition. Thus, there are two everlasting operational challenges to be met: the efficient ways of pursuing win-win policies and the power of stick and carrot. There is a need for a conscious effort to build policies and actions that allow democratic development encompassing the satisfaction of majorities and minorities of peoples alike. Imposing environmental taxes and laws is a form of the stick but the human mind needs rewarding, too, (thus the carrot) to become more eco-efficient. In societies, human beings make decisions, and therefore, their actions will always be value-rational, guided by human emotions, needs and desires and based on sociocultural environment. Not only do people need facts but also ample motivation and mental feelings of well-doing and well-being.

The fact that no development plan so far has proven to be exclusively eco-efficient actually implies that no one action on one field makes a difference but that many more social innovations and technological ones should be jointly made and executed. This again forms a huge challenge to the global community: first, whose responsibility is it to get many independent actors to work in unison, and second, how can the very diverse needs of different communities on different development levels be integrated? Often the problem itself incorporates the solution, too – perhaps the global communications and ever-increasing access to common knowledge will provide a necessary tool for a true worldwide collaboration.

All in all, the new policies need new foci. The young Finnish philosopher and researcher of information society, Dr. Pekka Himanen emphasises in his report for the Committee for the Future, Parliament of Finland, in 2004, that "We should no longer focus on reacting to something that has already happened: instead we should act beforehand and boldly lead the way."

7 Conclusion

The Information Society and Sustainable Development have been developed without studying their interdependencies. Some of the ecological, social and cultural aspects were included in some of the information society projects conducted in Europe towards the end of the twentieth century, but the emergence of an understanding of the need to integrate the IS and SD has been slow.

The ecological use of ICT depends heavily on societal actors and factors. Mobile phones and internet were rapidly taken into wide use because they seemed to answer some imminent needs for better communications over borders. Telework, videoconferencing and e-commerce seem to be adopted slowly, even though these are expected to entail most promising potentialities for ecologically sustainable development. Mobile communications and worldwide networking, however, are slowly changing the way people move and act, these being rather unpredictable in the macro-scale. The environmental effects of this gradual change are still very dormant and mostly subliminal (Honkasalo, 2004).

The research results from the Finnish initiative show, that in the future, the different societal groups need to combine old-fashioned material information technology (high-tech) with nonmaterial social high-tech (*i.e.*, innovative decision making processes and education systems). The task of socially sustainable technology is to help people, cities and nations avoid and minimise those divides. In other words, the development of the technological high-tech is alive and doing well, but in the future, the need for developing social high-tech becomes ever more urgent. This would include the notion of 'social machinery': *i.e.*, there is the need for better decision making and planning processes, better information, better education systems, as well as the need for new technological innovations to help societies in their social tasks (Hietanen, 2003).

The development of information technologies offers the opportunity to process and store information in an efficient way thus diminishing the use of materials and energy per service unit. The products of electronic industry can become more efficient by each new version and generation. However, there are major problems and setbacks accompanying this development. So far, the electronic industry development has not reduced the amount of paper used. In addition, the amount of electronic waste has grown enormously and the response to this has been varied – organised recycling has only just started on the one hand and on the other, the pursuit to reduce the amount of materials and energy before the assembly line is not included in the business strategies of the electronic industry in general. Another feature is that if the new equipment actually does satisfy users' needs, they will be readily accepted. (Keskinen 1999a–b; Honkasalo, 2004).

In summary, an inherent problem that mankind must deal with is how to change the course of the current development towards ecologically sustainable development. The ecological problems of information society must also be considered. However, as can be deducted from the research on SIS the information society and sustainable development do not automatically go hand in hand; international developments are moving toward the direction of a 'mobile society' with an increased movement of people, goods and services. Part of this movement – but by no means all of it – can be replaced by data communications. Especially, decreasing the need for physical movement should be acknowledged as a conscious objective. Unfortunately, this aim is at present a secondary one and considered only as a possible supplement to development.

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Appendix

Amaterialisation

This means that the number of immaterial products and services will increase in production and consumption. Amaterialisation is a characteristic means of Information Society to produce and enhance dematerialisation and immaterialisation.

Benchmarking

Developed in such areas as Total Quality Management (TQM), benchmarking involves the comparison, ranking or rating of different business processes, units or companies against standards. The aim is to identify ways of improving the performance of operations, systems, and processes. Environmental benchmarking is a growth area.

Biodiversity

The word – a contraction of 'biological diversity' – is sometimes used as a synonym for 'Life on Earth'. But its specific meaning, referring to the number, variety and variability of living organisms, will be central to 21st century values, thinking and action.

Cultural dimension of sustainability

The aim of a culturally sustainable development is to develop and enhance the diversity of specific habits, activities and products that are common to societal groups, regions or individuals.

Decoupling

The term *decoupling* refers to breaking the link between 'environmental bads' and 'economic goods.' Decoupling occurs when the growth rate of an environmental pressure is less than that of its economic driving force (*e.g.*, GDP) over a given period. Decoupling can be either *absolute* or *relative*. Absolute decoupling is said to occur when the environmentally relevant variable is stable or decreasing while the economic driving force is growing. Decoupling is said to be relative when the growth rate of the environmentally relevant variable is positive, but less than the growth rate of the economic variable.

Demand Side Management (DSM)

DSM can be applied in any industry where a product can be replaced by a service. The central principle is that a company or utility learns to provide (and have customers pay for) services (*e.g.*, heated rooms, lighted spaces) rather than kilowatt-hours or therms of gas. Often, the market needs to be provided with new price signals or other incentives.

Dematerialisation

Dematerialisation has to do with production and is defined as reducing material and energy intensity per produced unit. This is close to the concept of eco-efficiency. The main principle of dematerialisation is to produce 'more with less'. As production processes are dematerialised, the environmental burden per produced unit is reduced. Practical examples of ongoing dematerialisation through information technology are the reduction in the size of mobile phones and the improving of energy efficiency and the processing power of portable computers.

Digital divide

Digital divide is also called knowledge gap. The divide means polarisation of information society in terms of access to information, knowledge acquisition, use and dissemination between various societal groups and individuals. The habitual reference is to see citizens divided into 'the haves' and 'the have-nots'.

Eco-auditing

Eco-auditing means assessment of the impacts of (local) activities on environment. The auditing process typically consists of environmental monitoring, internal audits of selected municipal establishments, and involvement of staff in in-house study groups and seminars, and continuing environmental education and information of the public.

Eco-efficiency

Eco-efficiency involves the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle, to a level at least in line with the Earth's estimated carrying capacity.

Eco-intelligence

An activity is called eco-intelligent if it uses new innovative technologies, ICT and others, for reducing hazardous environmental impacts in itself or in its operative environment. In material and natural resources consumption, an activity is eco-efficient if it can produce more outcomes from less investment.

Ecological dimension of sustainability

Ecologically sustainable development means the principle that the ability of the nature to function properly (the well-being of nature) must be sustained in all circumstance. Nature cannot be substituted for other commodities.

Ecological footprint

The ecological footprint is an aggregate measure of human impact, which measures the amount of nature we use. It shows how much productive land and water an individual, a business, a city, or a country occupies to produce all the resources it consumes and to take in all the waste it makes. This area can then be compared to the existing space on the planet that is biologically productive.

Ecological rucksack

The ecological rucksack of a product contains all the invisible material input that have been exploited from the nature for producing the product and that are not ingredients of the product itself.

Ecological transparency

Ecological transparency means the growing understanding of the impact that all human processes, activities and models have on sustainability.

E-commerce

E-commerce = a purchase + a chain. The common meaning of 'to purchase' is to obtain something by paying money for it, but there is are also 'free' e-commerce transactions, *e.g.*, in the field of C2A or B2A, that can have impacts on the transport demand. Purchase. A purchase is an action where goods or services are objects for transactions. Transactions are physical, digital or both, and they always include transportation through communication means, either concrete (roads, highways, streets, rails, seas and air) or electronic (telephone, data, information networks which although transferring

non-physical substance need concrete physical means, such as telephones, televisions, cables, PC's satellites *etc.*). Thus, *all transactions have ecological impacts*. Furthermore, purchasing as an activity is within e-commerce divided into sections of B2B, B2C, A2B, but also other connections exist: C2B, B2A. Chain. In a chain of commercial actions there are both digital and physical transactions between activities: searching for information, marketing, ordering, billing, producing, packing, delivering, disposing, recycling, servicing, maintaining, developing and research. All these are managed by logistics.

Ecomodernisation

Ecomodernisation means deconstructing and redefining the central role of industrial modernisation in pursue for a sustainable future for the planet and its citizens. In this late-industrial transformation innovations related to the emergence of information society form a new assembly of driving forces and actors.

Economic dimension of sustainability

Sustainable economic development means that the benefits of economic activities must be disseminated on equal terms and as widely as possible to the economy of societies within the currently living generations and between the present and future generations.

E-democracy

E-democracy, Teledemocracy: e-Democracy means the use of modern information and communications technologies as instruments to empower the people in a democracy to them help set agendas, establish priorities, acquire relevant knowledge, make important policies and participate in decision making and implementation in an informed and deliberative way.

E-governance

E-governance is considered to be an integrative term for e-Government and e-Democracy, to start with, but also other e-oriented operations in the knowledge society can be placed under the 'umbrella', however, the contents of the concept are still under constant development. e-Governance means governing personal or organisational life with the help of ICT (see Governance).

Environmental Impact Assessment (EIA)

Environmental Impact Assessment (EIA) is the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made. Its objectives are:

1 to ensure that environmental considerations are explicitly addressed and incorporated into the development decision making process

2 to anticipate and avoid, minimise or offset the adverse significant biophysical, social and other relevant effects of development proposals

3 to protect the productivity and capacity of natural systems and the ecological processes which maintain their functions

4 iv) to promote development that is sustainable and optimises resource use and management opportunities.

Environmental Management System (EMS)

The main international EMS standard is ISO 14001. There are also emerging regional EMS systems, notably the European Union's Eco-Management and Audit Scheme (EMAS).

Factor 4, Factor 10

Key terms in the thinking of Germany's Wuppertal Institute and the US Rocky Mountain Institute. To be sustainable during a period when human populations will likely double and average living standards increase significantly, industry needs to increase its resource conversion efficiency by a minimum Factor 4 (*i.e.*, 75% reductions in resource consumption for any unit of production). Given that western societies typically consume 20–30 times more than their less developed counterparts, the Carnoules Declaration calls for Factor 10 improvements (*i.e.*, 90% reductions).

Governance

Although the term governance is often used synonymously with the term government it tends rather to be used to describe the processes and systems by which a government or governor operate. The term government and governor describe the institutions and people involved. It is often used by *corporate organisations* to describe the mechanisms by which they are governed.

Green GDP

Currently, different definitions exist on Green GDP, also called Green Accounting. Basically, it is an adjustment of traditional GDP, deducting resource and environmental costs in economic activities. Although specialists hold different opinions on just what Green GDP is, they do agree on two things about it. First, it provides us with another perspective on GDP, and one that can improve environmental protection and rational resource utilisation. Second, sustainable development is the emphasis of Green GDP, and this involves not only our generation, but also all future generations.

Immaterialisation

Immaterialisation is a question of consumption and is defined as replacing the physical means of satisfying one's needs and wants with immaterial means. We all satisfy our needs and wants by consuming goods and services. Information technology can lower the environmental burden by creating possibilities for immaterial ways of doing things, for

example, using video conferencing instead of travelling. The immaterialisation potential is born of social innovations – changes in behaviour patterns both on the individual and especially the social level.

Impact assessment

A technique developed by Procter & Gamble to optimise the value delivered to customers and consumers, and to reduce the environmental or other impacts associated with the production, shipment, use or disposal of products.

Indicators of sustainable information society

Indicators describe the relationship between the information society and sustainable development from different viewpoints such as scientific and political discussion, the way the information society is dealt with in reports on sustainable development, and the use of internet and relationship between indicators and scenarios.

Information society

Post-modern societal transformation era where processing information dominates over processing material. Also referred to as Knowledge Society.

Information society indicators

Indicators that describe the stage of progress in the information society, such as the number of mobile phones, electronic equipment and software production, and the use of internet.

Informationalisation

Term used by Manuel Castells meaning the process of societal transformation to information and knowledge domination.

Knowledge management

In an organisation, the means and ways to produce, process and disseminate information and knowledge is called knowledge management.

Lean Production

Pioneered by Toyota, this is the Japanese approach to waste management and resource efficiency. Aims are to avoid the production of goods that no one wants or which fail to meet expectations, the use of processing steps that are not needed, and the non-productive transport of people or materials.

Life cycle assessment

The overall process of assessing the life-cycle impacts associated with a system, function, product or service. Sometimes considered to include four stages: initiation, inventory, impact analysis and improvement.

Local Agenda 21

(LA21) is the comprehensive programme for local actions agreed to by delegates from most countries of the world at the United Nations Conference on Environment and Development that took place in Rio de Janeiro in 1992. It provides a blueprint for action in all areas relating to sustainable development of the planet.

Material flow analysis

Assessment of materials and energy related environmental impacts based on systems analysis. The analysis includes indicators for sustainability, determination of materials intensity (MIPS), Total Resource Requirements (TMR), Direct Material Input (DMI), resource productivity and eco-efficiency of process-chains and regions, analysis of resource consumption, materials throughput of economies, and study of the driving forces behind.

Material Input per Service Unit (MIPS)

Proposed by Professor Friedrich Schmidt-Bleek of Germany's Wuppertal Institute, the MIPS approach focuses on the 'Material Intensity Per unit Service'. The approach aims to measure the "total material and energy throughput in mass units (like kilograms or tonnes) per unit good or per mass unit of good, from cradle to grave". As the units of service clock up for a product like a car, so the MIPS 'invested' in each unit of service supplied fall. The greater the durability of the product, within limits, the fewer the MIPS needed per unit of service.

Mobility management

Mobility management is primarily a demand-oriented approach to passenger and freight transport that involves new partnerships between actors such as administrations, companies and organisations.

Motivation – Access – Skills (Competence) (MAS)

These are the three preconditions for citizen participation in the e-Democracy. Motivation. The sender and recipient of communications must have a reason for sending messages and learning new skills. Human needs for self-expression, attachment, societal interaction, association and control of one's own life are motivating reasons. In addition, to be motivated people need to feel that their opinion is heard and can have an impact on decisions. Without motivation citizens will not participate in the public issues. Access. Access to communication involves existence of technical and logical access point, communications device and permission to access. Skills. Communications skills and competence mean that a person has the ability to use channels of communication, opportunity, access, and skills to use the devices involved and to formulate message.

Post-modernism

By Jean-François Lyotard: Post-modern as a historical/cultural 'condition' based on a dissolution of master narratives or metanarratives, a crisis in ideology when ideology no longer seems transparent (see Lyotard's *The Post-Modern Condition: A Report on Knowledge*). By Frederic Jameson: Post-modernism as a movement in arts and culture corresponding to a new configuration of politics and economics, 'late capitalism': transnational consumer economies based on global scope of capitalism (see Jameson's *Postmodernism, or The Cultural Logic of Late Capitalism*).

Rebound effect

Even though the material and energy consumption per unit are reduced, the overall consumption can still grow if more units are consumed. This increasing environmental burden is what is meant by rebound effect. A rebound effect also occurs when the development of information technology causes growth in material or energy use, as has happened with paper where the increasing number of computers and printers in offices has led to higher paper consumption.

Remanufacturing

Pioneered by companies like Xerox, remanufacturing involves the recovery of equipment or products for servicing, upgrading and re-sale as working systems. Potentially offers much higher environmental returns than recycling.

Resilience

The informal concept of stability refers to the tendency of a system to return to a position of equilibrium when disturbed. Also called robustness.

Social capital

Social capital is a feature of the corporate culture. It includes elements of common language, mutual trust, adherence to norms and internal communication.

Social dimension of sustainability

Social and cultural sustainable development encompasses the well-being of societies, communities, groups and individuals where social, cultural, economic and ecological needs are harmoniously satisfied.

Sustainability

The best-known definition is the one of World Commission on Environment and Development. This suggests that development is sustainable where it "meets the needs of the present without compromising the ability of future generations to meet their own needs." Sustainability has three dimensions: ecological, economic and socio-cultural dimensions (see Triple Bottom Line).

Telework

Telework is any work that is executed with the help of ICT with temporal and spatial independency.

Total Material Input (TMI)

A measure that includes total material flows and hidden material flows of an economy.

Triple bottom line

Sustainable development involves the simultaneous pursuit of economic prosperity, environmental quality and social equity. Companies aiming for sustainability need to perform not against a single, financial bottom line but against the triple bottom line.

Virtual community

Virtual community is a community that builds on virtual actions. Virtual actions are operations that are conducted in information and communications networks, such as phones, email, chat, IRC, games, *etc.* Typically the personal connections only occur in the virtual world. Also called cyber community.

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