

The

IPTS

REPORT

March/99

32

ISSN: 1025-9384

5 EURO
EYPO

EDITED BY THE INSTITUTE FOR PROSPECTIVE TECHNOLOGICAL STUDIES (IPTS)
AND ISSUED IN COOPERATION WITH THE EUROPEAN S&T OBSERVATORY NETWORK



SPECIAL ISSUE: INFORMATION SOCIETY AND SUSTAINABILITY

10 A European Way into the Global Information Society

17 A Strategic Alliance for a Sustainable Information Society

24 Information Technology for Sustainable Societies-Public Policy Perspectives in Japan: The Case of Telework

32 Indicators of a Sustainable Information Society: Policy Analysis and Application

39 Sustainable Information Society Policies in Asia: Standing firm despite financial turmoil

EUROPEAN COMMISSION
Joint Research Centre



ENGLISH VERSION

ABOUT THE IPTS REPORT

The IPTS Report was launched in December 1995, on the request and under the auspices of Commissioner Cresson. What seemed like a daunting challenge in late 1995, now appears in retrospect as a crucial galvaniser of the IPTS' energies and skills.

The Report has published articles in numerous areas, maintaining a rough balance between them, and exploiting interdisciplinarity as far as possible. Articles are deemed prospectively relevant if they attempt to explore issues not yet on the policymaker's agenda (but projected to be there sooner or later), or underappreciated aspects of issues already on the policymaker's agenda. The long drafting and redrafting process, based on a series of interactive consultations with outside experts, guarantees quality control.

The clearest indication of the report's success is that it is being read. An initial print run of 2000 for the first issue (00) in December 1995 looked optimistic at the time, but issue 00 has since turned into a collector's item. Total readership rose to around 10,000 in 1997, with readers continuing to be drawn from a variety of backgrounds and regions world-wide, and in 1998 a shift in emphasis towards the electronic version on the Web has begun.

The laurels the publication is reaping are rendering it attractive for authors from outside the Commission. We have already published contributions by authors from such renowned institutions as the Dutch TNO, the German VDI, the Italian ENEA and the US Council of Strategic and International Studies.

Moreover, the IPTS formally collaborates on the production of the IPTS Report with a group of prestigious European institutions, with whom the IPTS has formed the European Science and Technology Observatory (ESTO), an important part of the remit of the IPTS. The IPTS Report is the most visible manifestation of this collaboration.

The Report is produced simultaneously in four languages (English, French, German and Spanish) by the IPTS; to these one could add the Italian translation volunteered by ENEA: yet another sign of the Report's increasing visibility. The fact that it is not only available in several languages, but also largely prepared and produced on the Internet World Wide Web, makes it quite an uncommon undertaking.

We shall continue to endeavour to find the best way of fulfilling the expectations of our quite diverse readership, avoiding oversimplification, as well as encyclopaedic reviews and the inaccessibility of academic journals. The key is to remind ourselves, as well as the readers, that we cannot be all things to all people, that it is important to carve out our niche and continue optimally exploring and exploiting it, hoping to illuminate topics under a new, revealing light for the benefit of the readers, in order to prepare them for managing the challenges ahead.

P r e f a c e



*A*s we enter the new millennium the emerging Information Society (IS) is one of the main drivers of social and economic change. It is an increasingly powerful force for on-going innovations in private services such as electronic commerce and in public services such as telemedicine and open learning. It is also increasingly embedded in social life beyond the work environment.

This development is interwoven with sustainability considerations, both in the environmental sense, as well as in the wider sense of the sustainability of the emerging information society as a whole – the themes of this special issue of the IPTS report.

To begin with, a society in which computers are everywhere and are networked will be a society in which the growing importance of information will raise concerns about its use and misuse, what has come to be called digital security and privacy. People want to know that their personal data are secure, that the transactions they make are private and that on-line information will not be used against them.

Moreover, security considerations need to be addressed in order to take advantage of one of the opportunities presented by the emerging information society: electronic commerce, and the promises it holds for increased competitiveness, and job creation.

At the moment there are wide global variations in practices on how such information are protected. Even across Europe there is no common framework. Resolving this situation can only become more urgent as on-line devices and the possibilities for surveillance proliferates. Common standards and frameworks on an international level are essential.

The European Commission has set a lead in this area through its Directive on Protection of Personal Data and a proposed directive on Digital Signatures.

The rising importance of access to information will also raise concerns about exclusion, and the emergence of information 'haves' and 'have-nots', and about the sustainability of systems which do not address such gaps. The fragmentary character of regulation, when it exists, in this case, too, will have to be overcome.

Finally the emergence of the information society will interact with efforts to enhance sustainability in the environmental sense. The increasing ease in processing and transmitting information and completing tasks remotely will have repercussions, sometimes quite complex and even conflicting, on transport, pollution and congestion patterns. Exactly because the impacts are multi-faceted, and not always clear-cut, our emphasis should be on thorough analysis and on taking advantage of the opportunities presented without underestimating the costs.

In sum, continued concerted policy action is required in order to prepare the path towards a sustainable information society.

Olsson

THE IPTS REPORT

32
MARCH 1999

EDITED BY THE INSTITUTE FOR PROSPECTIVE
TECHNOLOGICAL STUDIES (IPTS)
And issued in Cooperation with
the European S&T Observatory Network

PUBLISHED BY THE EUROPEAN COMMISSION
Joint Research Centre
ISSN: 1025-9384
Catalogue Number GK-AA-99-002-EN-C
DEPOT LEGAL: SE-1937-95

DIRECTOR
Jean-Marie Cadiou

EXECUTIVE EDITOR
Dimitris Kyriakou

EDITORIAL BOARD
C. Fahrenkrog, P. Fleissner, J. Gavigan,
M. González, H. Hernández, D. Kyriakou, I. Maghiros
(Production Manager), P. Sørup, A. Soria, C. Tahir.

PRODUCTION
CINDOC-CSIC/CL SERVICIOS LINGÜÍSTICOS

PRINT
Graesal

TRANSLATION
CINDOC-CSIC/CL SERVICIOS LINGÜÍSTICOS

COPYRIGHT

The views expressed in this publication do not necessarily reflect those of the European Commission
© ECSC-EEC-EAEC Brussels-Luxembourg, 1997
Reproduction is authorised, except for commercial purposes, provided the source is acknowledged.
The EC may not be held responsible for the use made of the information.

THE IPTS REPORT

is published in the first week of every month, except for the months of January and August. It is edited in English and is currently available at a price of 50 EURO per year, in four languages: English, French, German and Spanish.

SUBSCRIPTIONS

For a subscription to The IPTS Report, or to amend an existing subscription, please write with full details to:
The IPTS Report Secretariat
IPTS, JRC Sevilla
World Trade Center
Isla de la Cartuja
E-41092 Sevilla, Spain
Tel: +34-95-448 82 97
Fax: +34-95-448 82 93
E-mail: ipts_sec@jrc.es

Web address: www.jrc.es/iptsreport/subscribe.html

C O N T E N T S

SPECIAL ISSUE: INFORMATION SOCIETY AND SUSTAINABILITY**4 Editorial****10 A European Way into the Global Information Society**

European experience has a unique contribution to make to the debate on the transition to the Sustainable Information Society, in particular in areas such as social sustainability, cultural diversity and the environment.

17 A Strategic Alliance for a Sustainable Information Society

The new information technologies can make a unique contribution to the development of the sustainable society. However, the processes involved are vast and complex making it necessary to set up a strategic alliance between industry, NGOs, consumers and other political stake-holders.

**24 Information Technology for Sustainable Societies-
Public Policy Perspectives in Japan: The Case of Telework**

Among the many possible impacts of ICTs on sustainability teleworking and telecommuting can make a potential contribution to reducing CO₂ emissions. A recent study in Japan has looked at the scale of the possible contribution, and instruments that could help to achieve it.

**32 Indicators of a Sustainable Information Society: Policy Analysis
and Application**

Benefiting from innovative applications of information and communication technology requires coordination in order to achieve a balance between investment and skills. This in turn makes it necessary to have assessments of a country's position in order to identify possible policy trade-offs.

**39 Sustainable Information Society Policies in Asia: Standing firm despite
financial turmoil**

Despite recent economic upheavals countries in Asia, in particular China and India, are continuing to support efforts to develop the information society, with sustainability concerns present in their thinking.

EDITORIAL

Erik Bohlin, *IPTS*, with Alois Frotschnig, *IPTS*,
and Robert Pestel *DG XIII, European Commission*

The aim of this Special Issue on the *Information Society and Sustainability* is to highlight perspectives and policies aimed at developing Sustainable Information Societies. The special issue has collected contributions for this complex topic from all around the world.

Concern for sustainable development has been rising on the world scene as one of the most central issues for the future of mankind. Starting from environmental issues, the sustainability debate has recently broadened in scope to include social aspects and culture. What sustainability is all about has also changed— from static views that emphasize the preservation of current resources for future generations toward more dynamic views which emphasize the development of more opportunities for future generations.¹

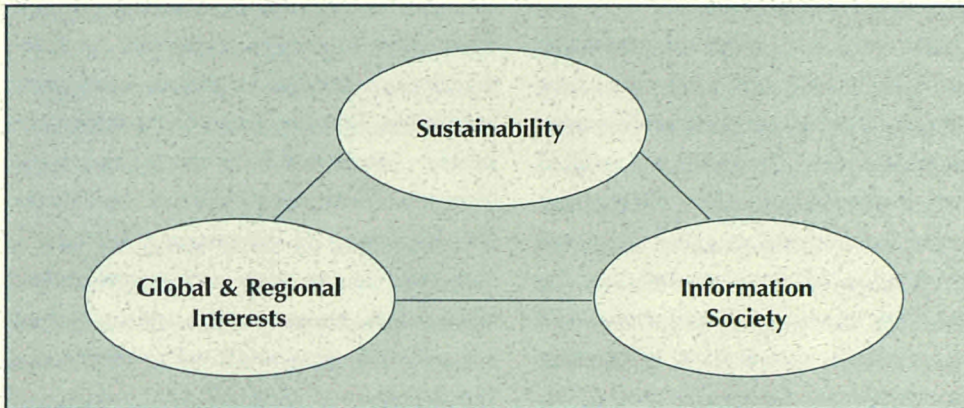
Furthermore, sustainability is now viewed less as a purely ethical and redistributive question but more as a question of informed self-interest. Competitiveness and sustainability have previously been portrayed as opposites, but there is a growing recognition that these two issues are mutually reinforcing. Industrialization and growth without attention to sustainability may not only be problematic for some ill-fated groups of society but may seriously limit any region's aspiration for prosperity, as the dynamic repercussions of unsustainability on its citizens may be significant and take unexpected turns.

While a global context is emerging involving several centres of power and growth, - such as the United States, China, Japan, India, Russia and Europe, to mention just a few - there will be a corresponding need to develop strategies that enhance and sustain the respective regions, as well as to develop strategies for mutual consensus and collaboration. In this context, sustainability becomes a strategic concern, fundamental to long-term prosperity and security for any nation or region of the world seeking to have influence in the 21st century.

Building an Information Society is equally a strategic concern. It is generally recognized that the Information Society will be instrumental to growth and well-being in the 21st century. For any region or nation, it is critical to find a path toward an Information Society that builds on its particular characteristics and strengths. Since there is an increasing awareness worldwide that the Information Society can help us to achieve sustainable development, the momentum towards the information society is correspondingly reinforced.

The motivation for this special issue is derived from the three elements shown in Figure 1 – Sustainability, Information Society and Global/Regional Interests. Our aim is to highlight the intellectual linkages and bridges between the three elements through a mixture of broad and more focussed perspectives on the respective elements of the figure.

¹ For elaborations on the shift towards a more dynamic view, see Leisinger, K (1998), Sustainable development at the turn of the century: perceptions and outlook, *International Journal of Sustainable Development*, Vol. 1, No. 1, pp. 73-98, 1998.

Figure 1. Fundamental Building Blocks

The linkages between the Information Society and Sustainability deserves some additional explanation. Similarly to the general sustainability debate, sustainability is viewed here in a wide sense, encompassing environment, economy, social issues and culture.

The expectation that the Information Society contributes to environmental sustainability is primarily derived from a perception that the use of information and communication technologies (ICT) contributes towards immaterialization and dematerialization of the economy. *Immaterialization* refers to the fact that the value added in the Information Society is intangible in nature, taking the form of information and knowledge. Information use and reuse is to a large extent a clean activity. *Dematerialization* refers to the fact that ICTs contribute towards an economy where output is raised at the same time as input of material resources is reduced. The

impressive workings of the well-known (and remarkable) trends in cost/performance ratios for microelectronics – frequently referred to as Moore's law - provides a basis for this view. The significant capacity increases information transmission enabled by advances in fibre optics has reinforced the view that information transport can take place with little input of material resources. Information transport is a generally clean activity.

However, while the Information Society will certainly restructure distance and time constraints, and hence the need for certain types of transport, the emerging new net-based market structure and increasingly information-based consumption may serve to increase environmental pollution as well. For instance, books directly ordered from online –book stores or net-grocery shopping may in fact increase customized transport. Other examples can be

mentioned. Within teleworking, the actual reduction of transport may turn out to be less than anticipated as a result of alternative journeys being made, such as personal trips during the day, increased customized delivery to the teleworker, etc. Therefore, a so-called 'rebound' or 'boomerang' effect might occur where the environmental gains from the dematerialization of the economy may be outweighed by increased resource intensive or polluting demands elsewhere. It is therefore important to evaluate the *net effects* of ICT on environmental sustainability, not only the positive effects.

Likewise, there is both good and bad news for other aspects of sustainability. It is well known that one of the greatest apprehensions of the Information Society is the resulting separation of the information-rich and the information-poor, seriously impacting social cohesion. Social cohesion involves cultural aspects too. Since English is today the lingua franca of the networked society, there is a concern about cultural homogenization on the one hand (i.e. the 'Americanization' of society), and exclusion of those groups which do not master the language. Furthermore, the transition towards the Information Society is creating challenges for employment, at least in some industries and for certain types of skills, thereby exerting new pressures upon our societies.

On the other hand, it is difficult not to be fascinated by the seemingly unending growth in information processing capacities, and the resulting opportunities for various forms social interlinking. The very nature of the Information Society, dominated by a sharing and giving mentality, networking without boundaries, ubiquitous reuse of information – reinforces a view that life can grow and expand without taking away resources from others. Indeed, humanity is facing a new frontier – cyber-space. This is a space of mankind's own making, and whether it will prove to be useful will depend on the collective impact of actions, decisions and thinking taking place within it and around it. The new frontier offers new opportunities for new interactions across boundaries and new ways to knit our societies together.

Moreover, the maturing Information Society does not necessarily imply cultural homogenization. There are several factors that will drive the network to become culturally conditioned. On the 'supply' side, the political need to keep regions integrated in the face of disintegrating tensions, e.g. between the information rich and the information poor, will stimulate the promotion of policies that unify, such as using the network to preserve and harness the cultural heritage. On the 'demand' side, human limitations on processing the vast information resources available on the net will

infuse demand for interpretations, screens, aggregations and adaptations. In order to economize on human processing, there will be a growing demand for culturally conditioned intermediaries that facilitate access and reliable interpretations.

In the end, human choice still takes precedence over technology. Policy efforts to infuse sustainability through the Information Society involve coordination of several policy areas, suggesting a broader frame of reference for Information Society policies than has been the case in the past. The papers in this volume reflect this spirit – the centrality of human choice and policy.

The first paper by J. van Dijk *et al* is primarily focused on the policies aimed at reaching a sustainable Information Society in a global context. After a broad overview of European and global developments, the paper seeks to position the European approach as a platform to develop the Information Society in a global context. The authors argue that a European Way could be more vigorously promoted in the global discourse, in order to shape global frameworks so they become more conducive towards sustainability. The policy nature of the paper gains particular significance from the fact that two of the authors are members of the Information Society Forum, a High-Level Advisory Group of the European Commission.

The second paper by A. Frotschnig *et al* shows how some of these thoughts have developed in practice in a pan-European collaborative project. Specifically, it is argued that a Strategic Alliance is required for a Sustainable Information Society, in which industry, NGOs and citizen/consumer organizations are working together, both setting the agenda for action and providing the critical mass needed to achieve sustainability. To that end, the ACTS program of the European Commission has funded the project ASIS (Alliance for a Strategic Information Society). ASIS has the objective of providing convincing evidence of the ways in which ICT can make a positive contribution to sustainability, and to suggest the most fruitful areas of action. ASIS has created a Statement of Intent to be signed by its members, and is facilitating the Industry Action Groups in their formulation of scenarios and their assessments. ASIS aims to strengthen the European-wide policy debate and to demonstrate how the objectives of sustainability can be co-supportive of the development of the Information Society.

The article by H. Mitomo and H. Oniki provides a quantitative assessment of the environmental impacts of ICT from a wide-ranging study conducted by the Japanese Ministry of Posts and Telecommunications (MPT). In a global context, this study is unique and it contains some promising results. Specifically, the

paper suggests that the net effects of a sample of ICT-related activities will make a 7% contribution for the Japanese CO₂ reduction target for 2008 set by the Kyoto Protocol. Some detailed assessments of the impacts of teleworking and telecommuting are likewise presented, providing a 2% contribution to the target. Moreover, the private and social benefits of teleworking and telecommuting over and above environmental sustainability are quantified as well. In view of the wide benefits, the paper suggests that policy should stimulate teleworking and telecommuting e.g. through fiscal instruments.

R. Mansell *et al* take a broader view of sustainability, encompassing strategies for knowledge generation and capability development – not only in production but also in consumption-related activities. The paper develops a framework and a set of indicators for measuring the Information Society development for a particular geographical unit. The proposal represents a step forward compared to other benchmarks as it not only raises infrastructure aspects but encompasses user and producer capabilities in the Information Society. An application of the set of indicators is presented for Poland and Spain, and some policy implications are put forward. In particular, the framework and the set of indicators is a promising tool for comparative policy prioritizations, since it takes a wide-

ranging view of what the Information Society promises to bring about – knowledge capabilities.

The final article by E. Bohlin *et al* presents an overview of the challenges posed by the recent financial turmoil for the future development of the Information Society in Asia. The main conclusion is that fundamental policy goals of the Information Society are not likely to be radically modified. The Information Society is a more long-term concern, and so is sustainability. Two countries are investigated in more detail – China and India – and they are of interest to follow in the context of their strategic objective: to become centres of growth and influence in the 21st century. The final paper thus returns to the global concerns and outlooks advanced in the first paper, closing the circle for this special issue.

Looking forward, the underlying technological trajectory and momentum of the Information Society can reinvigorate our thinking and attitudes, with the attendant changes in behaviour. Explorations in cyber-space can bring mankind some important perspectives: innovation is based on networking, resources can be used without material depletion and people can behave in a way that leave future generation with the same, if not more opportunities. We could tentatively call this approach an Eco-Cyber Life Style. Whatever

we call it, wider uptake of an emerging mindset based on the increasing returns and networking of cyber-space may turn out to become as important as the Darwinian concept of "survival of the fittest" has been in past ages, and an ethically far more appealing one.

The inherent momentum of the Information Society will not stop there, however. As the Information Society permeates our way of life there will be corresponding need to process information and make judicious use of the

knowledge obtained. Leadership in the Information Society will be less about timely information ("Information Advantage") but will instead move into knowledge. However, enlightenment will not necessarily lead to sustainability, but there will be a corresponding need to temper the powers of knowledge from individual and collective opportunism – wisdom. Regions that will allow and empower their peoples to participate in the search for wisdom – in its broad, ethical sense - will benefit growth and fulfilment among citizens.

A European Way into the Global Information Society

Prof. Dr. Jan A.G.M. van Dijk, *University of Utrecht*, Dr. Robert Pestel, *DG-XIII*, Prof. Dr. F. J. Radermacher, *FAW*

Issue: This article examines the challenge of identifying a way towards a global Information Society that is sustainable. This means a society that adequately balances economic, social, cultural and environmental concerns of the world under a long-term perspective. Clearly a model of development which simply extends current resource-intensive lifestyles of the OECD to the world's population as a whole would threaten both global ecological stability and many local cultures, and eventually pose a threat to social harmony in Europe.

Relevance: The present patterns of economic globalization are forcing ever more deregulation, increasingly short-term orientation and an ever faster rate of change, which in some cases makes sustainability yet harder to reach. However, European experience can make a valuable contribution to developing a global sustainable Information Society, and to the work of policymaking bodies around the world.

The Information Society Forum has analysed the central – perhaps predominant – role of information and communication technology (ICT) in eventually reaching sustainability and improvements in the quality of life

Introduction

The paper deals with a *European Way* in the sense of a vision of how to move towards a *global Sustainable Information Society*. Better ways into the future and towards sustainability are now being broadly discussed within Europe. Here, sustainability is understood as an adequate balance between society's economic, social, cultural and environmental concerns from a long-term perspective. This topic is also central to the *Information Society Forum (ISF)* which is the key advisory body to the European Commission concerning all questions of Europe's participation in a transition into a world-wide Information and Knowledge Society.

In this context, the Information Society Forum has analysed the central – perhaps predominant – *role of information and communication technology (ICT)* in eventually reaching sustainability and improvements in the quality of life. The Forum takes the position that whether we can reach a sustainable state will be decided while shaping the future Information Society. That is because, on the one hand, these technologies are major drivers of economic globalization in a world that will eventually reach 10 billion people or more, and because of this – in an indirect way – are now causing additional social and environmental burdens world-wide. This is a typical so-called *rebound effect* of technological progress. On the other hand, these technologies offer, in principle, huge



opportunities for overcoming social exclusion, for supporting cultural diversity, for stimulating the economy and for reducing environmental burdens by increasing material productivity. While this so-called dematerialization is a typical, promising feature of most technological progress, ICT has by far the highest potential in this regard.

Whether information and communication technologies will, in the end, lead to more sustainability or not, essentially depends on the *further development of global economic and societal frameworks and corresponding attitudes and values*. Building such frameworks is the single most important challenge to politics and societies when entering the 21st century. In this respect, better global instruments are needed in the social and ecological fields in particular, to commit the industrialized states to support and co-finance social and ecological developments and standards in countries in transition and in developing countries, aiming in the long run at something like a global civil society and a global citizenship. Here, caring for and trading of ever-scarcer environmental resources - such as an atmosphere with a sufficiently low concentration of greenhouse gases - in the form of pollution rights is seen as an instrument to justify and organize such co-financing. In this context, the Kyoto protocol and its international instruments (Tradable Permits, Clean Development Mechanism, Joint Implementation) offer promising starting points for further agreements and international partnerships.

The Historical Dimension

Over the past 50 years, and particularly the last 20, Europe has moved rapidly towards ever closer co-operation between the European states. This is the story of a huge success, closely linked to important personalities such as Churchill, de

Gasperi, Monnet, Schuman, Spaak, Adenauer, de Gaulle, Mitterrand, Kohl, and others. When we look at how this process was organized we can make out a typical European style. This endeavour was governed by legal processes, agendas, deadlines, and contracts. These were binding political commitments and not merely forms of self-organization by society. Clearly, building Europe involved a *primacy of politics over the economy*, although its first achievements were economic in nature (a market and a currency). If we look now for what would characterize a European Way towards worldwide sustainable future development, we see a strong concern for social questions, employment issues, cultural diversity, education, environmental issues, the role of government influence and good governance. One strong aspect is that Europe asks for *equity among its people, not only for equal opportunities*. Europe aims to achieve reasonable living conditions for everybody as a result of its social and economic processes. Europe wants society to be responsible for caring about the dignity of every citizen and for the state of the environment.

The discussions going on within Europe about how to approach the future worldwide, and about how to bring European experiences into this process, are strongly influenced by history. This has been a history of ups and downs, great successes, but also of great difficulties including wars, injustice, and cruelty. As a result of this accumulated experience many countries of Europe have now learned to live together in a way which is adapted to a diversity of backgrounds and cultures. Europe should now bring its experience into the difficult global debate, into an intensive exchange with North and South America, Russia, Africa, and in particular Asia with its many peoples and cultures. In these discussions, a joint way into the future has to be

Whether information and communication technologies will, in the end, lead to more sustainability or not, essentially depends on the further development of global economic and societal frameworks and corresponding attitudes and values

The discussions going on within Europe about how to approach the future worldwide, and about how to bring European experiences into this process, are strongly influenced by history. This has been a history of ups and downs, great successes, but also of great difficulties

The global economic order today is much too concerned with the short term, leading to an skewed distribution of wealth, creating high risks in the financial area, providing capital with escape routes from social and environmental responsibility

Although markets are the clear choice for the transformation of resources and skills into economic activity, it should be obvious that markets need proper frameworks

found that respects *the dignity of all humans* on this earth and, at the same time, keeps the *global environment intact*.

What is Going Wrong Today in Global Governance?

Due to political will and technological progress, the world is now integrating economically into *one single world-wide market*, which is the essential aspect of the present globalization process. This is to a high degree being accelerated by the power of ICT *and its ability to eliminate distance*. If we ask what governs development today in this global market, it is primarily the *regime of the WTO and of the financial markets, both characterized by the idea of "free trade" and deregulation*. But we have to be aware that these regimes were never designed to be the order system of one global market, but rather as *regimes for trade*. It is therefore not surprising that we are witnessing increasingly difficult situations, because these regimes are not really adequate frameworks for the state of affairs we are in. The global economic order today is much too concerned with the short term, leading to an skewed distribution of wealth, creating high risks in the financial area, providing capital with escape routes from social and environmental responsibility, not preventing child labour, and imposing (arguably too much) cultural uniformity, etc.

In fact, "free trade" as well as "planned economies", both essentially 19th-century concepts, are prone to an undue accumulation of power and/or to the limitation of the effective exercise of liberty, whether by private interests using their wealth to encroach on political decisions or by the state itself. Neither concept, by itself, sufficiently accounts for the true value of social capital, cultural achievements or the environment. This is because caring for these

issues was not their original job. The role of the economic system is instead to optimize economic activity via markets under frameworks. Here, frameworks are the proper place for ethics and politics. Where has there ever been an economy without frameworks? Even today's so-called free market is not free, but ruled by a framework: GATT/WTO, the international financial order, and corresponding regional and national order systems. The question hence is for the best framework. Paradoxically, less regulation often leads to less freedom for most or even all citizens. Therefore, *although markets are the clear choice* for the transformation of resources and skills into economic activity, it should be obvious that *markets need proper frameworks*. This is where a European Way enters the stage. The aim should be, from the point of view of European tradition and experiences, to establish, in the long run, a strong global economic, social, environmental and cultural framework with corresponding values and attitudes, based on elements of a common world-wide ethic, within which people then may interact with all the vigour of a free market-place. We now certainly need improvements to the framework we have, i.e. GATT/WTO and the international financial system. As they are today, they will not lead to sustainability or long-term stability.

The Promise of an Emerging European Way¹

From 1994-1995 onwards a strong push towards an Information Society by the EU Commission and other policy-makers and opinion shapers contributed to new ways of thinking about Europe's future. At first, this change was more a supplement or slight revision of the primarily economic and technologically driven nature of the existing policy, with all kinds of disparate social aspects that had been dominating the debate until that time. Later on it started to

develop into something more, a mode of development for a typical European Information Society.

Intervention

Both Europe and the US agree that market forces will lead us into the Information Society. This premise and historical decision is a fact of great importance with lasting effects well into the 21st century. However, in Europe, and even to a larger extent in East Asia, it is held that deliberate policies of the government and of the social partners are needed to develop, and *correct when needed*, the "design" of the Information Society. This is the topic of adequate frameworks of (otherwise) free markets, which is at the centre of the discussion in Europe.

Interconnection and open standards

After some attempts to extend the traditional natural monopolies of telecommunications into a single Europe-wide IT infrastructure in the Eighties, the EU turned to a policy of liberalization of telecommunications in the Nineties. However, the wish to realize an open and accessible infrastructure and universal services for every citizen in Europe, and hopefully in the world at large, leads to a strong emphasis on policies of interconnection and open standards.

Social aspects of sustainability

One of the characteristics of a European Model for the Information Society is the recognition that the Information Society must be socially sustainable. The exclusion of a large part of the population from participation in the Information Society, and the gradual deterioration of social cohesion of our societies by increasing gaps of development between social classes, sexes, ages, countries and regions and by a complete fragmentation and privatization of information and communication, is considered unacceptable. A continuation of

this process would jeopardize democracy and many of our social and cultural values.

Europe, with its old tradition of a *social welfare state*, a *social market economy* and *consensus building society* is in a good position to build a socially sustainable Information Society, as long as world market forces do not undermine its efforts. Overall, the European approach is based upon public-private co-operation and consensus building. The wind of change that has been building up in Europe after 1994 is mainly characterized by an effort to preserve social sustainability. In practice it means great attention of the EC, the national governments and the social partnerships on 1. new job opportunities, 2. education, training and lifelong learning, 3. public services in information supply, 4. affordability and accessibility of resources for everyone, and 5. policies of social cohesion between the regions. Important 'Green Papers' from the Commission, documents of the Information Society Forum (ISF) and high-level expert groups [1, 2, 3, 5, 6, 9, 10, 11] stress these issues in detail. Europe thus far has had the funds and the intention to bridge - within a framework of subsidiarity - the increasing gap in the adoption of information and communication technology which appears between the Northern and Southern member states (not to mention the Eastern-European countries) and the unevenly developed regions within European countries. In this way Europe is investing into cohesion and, at the same time, is broadening the base for the development of the Information Society and its markets of the future.

Cultural and linguistic diversity

The kind of information society Europe wants is a *culturally and linguistically* diverse community. This is the offspring of its rich (multi)cultural history. The EU promotes and invests in frameworks that support cultural

The European approach towards building a socially sustainable Information Society is based upon public-private co-operation and consensus building

The Information Society Forum is now moving into a phase of more concrete proposals developing a clear European identity in the global Information Society in form of a European Way into a global sustainable Information Society

diversity, although these cost money. Proceeding this way, we hope in Europe that in the long run, even under the present economic frameworks, the European tradition of broad stimulation of cultural productivity, creativity, education and a public information supply will put us in an even better position in future cultural markets and multimedia services. It is hoped, moreover, that these markets will develop the demand for cultural diversity, including "high culture".

Environmental aspects of sustainability

The conferences in Rio and Kyoto have shown that the EU and its member states are prepared to take strong measures for environmental protection. In the EU, a relationship between the development of the Information Society and an *ecologically sustainable economy* is made directly. It even inspires optimistic perspectives of a reconciliation of economic growth and sustainable development in the Information Society via proper market frameworks to be implemented globally [4, 5, 6, 7, 8, 12]. Whether this will prove to be yet another technological illusion (another rebound effect) in a line of many predecessors (technical solutions to basic problems of humanity) or a realistic perspective remains to be seen. In the logic of this paper, this will depend on the global economic and societal frameworks and corresponding attitudes and values that we will create or will develop in the future for this global Information Society.

A civil rights orientation

Europe has done much to develop a legal basis for all kinds of civil rights in relation to the Information Society. In principle this is needed to guide most self regulation, although there is always the danger of a technological lag. For instance, the EU can be very proud of its *Directive of the Protection of Personal Data*.

International framework and co-ordination

The EU is the prime actor in stimulating relatively neutral international frameworks and co-ordination covering technical, commercial and legal aspects. (For the latest proposal see the so-called *Bangemann Charter* and the *Global Economic and Societal Dialogue*). As the Information Society is not altogether a radically different type of society and the ICT market is only one of several others, there is no *need to create all kinds of new international bodies* (as e.g. in the U.S. Domain Name System proposal). Existing bodies and fora like the UN, WTO, OECD, G-8, WIPO, ILO, ITU, UNCTAD, UNFCCC are perfectly able to do this if appropriately empowered. To prevent a bias of vested interests and one-sided economic views, organizations of users of information technology and society at large have to be involved and given a suitable place.

In the perspective of these seven characteristics, and others, the Information Society Forum has proposed many ideas and proposals for a normative model of the Information Society in the last three years and in two annual reports and other documents [5, 6, 7, 8, 9, 10, 11]. The Forum is now moving into a phase of more concrete proposals developing a clear European identity in the global Information Society in form of a European Way into a global sustainable Information Society. Not in an artificial attempt to make a profile or compete against others, but to defend and extend the principles and values we stand for as Europeans, while at the same time hoping to identify paths for the future that have a chance to work - peacefully and in a socially acceptable fashion - in a world-wide perspective.

Towards a Global Framework

Our central message is that the world economic regimes, e.g. GATT/WTO and the international financial market system, have to be




developed further into a stronger framework of global governance. What we propose may be summarized - from another point of view - so as to reclaim, on the global level, the *primacy of politics* - in the widest, non-partisan sense - over economics. This can be achieved by increasing multilateral international agreements, and enforcing them, and dialogues solicited in the international bodies concerned. Europe should bring its best traditions and experiences from its own past and from its own processes of increasing co-operation and integration into these debates, and should become more pro-active on the issues.

The need to reach a consensus will obviously make building an international framework a time-consuming process. We have to accept as a priority the *intellectual challenge of consensus building* with our partners all around the globe - encompassing North and South America, Japan, Russia, South-East Asia, China, India, Africa and others. The EU can play a strategic role in achieving this global consensus. During the transition Intra-European political processes can help defend our social and ecological standards through focused market policy, incentives, motivation wherever possible and could even consider protection where necessary and socially beneficial (taking all the repercussions into account). However, if present market forces make adjustments unavoidable, we must be able to modify existing European achievements, even if it hurts - at least temporarily.

A number of important events are due to be held in 1999 which could become vehicles for improvement to present patterns of global economic and social organization. These include:

- the meeting of G-8 leaders in Cologne, 18 June;
- the further development of the Agenda 2000 for Europe;
- COP5, Bonn, end of 1999, concerning the post Kyoto issue;
- continuing discussion of the Multilateral Agreement on Investment (MAI) and its successor measures within the OECD and the WTO; here the emphasis could be on reshaping the world financial systems and on enhancing the economic regimes by social and ecological aspects including co-financing mechanisms;
- promoting the global business dialogue and the global societal dialogue, both initiated by Commissioner Bangemann and the EU Commission.

All these are not easy issues, but they have to be addressed now and with energy. We need global dialogues for better frameworks, enriching economic and financial patterns of coordination. This can only be developed through consensus. We must also begin to face the intellectual challenge of consensus building with our partners around the globe. 

About the authors

Jan A.G.M. van Dijk is Associate Professor at the Department of Media and Communication, Faculty of Social Sciences, Utrecht University. He teaches courses in the Social Aspects of Information and Communication Technology in society and in organizations. He is the author of numerous books and articles about this subject. His best known books are translated in English and will be published by SAGE (London, Thousand Oaks CA and New Delhi) in 1999: 'The Network Society, social aspects of new media' and 'Digital Democracy, Issues of theory and Practice'. Van Dijk is a member of the Steering Committee of the Information Society Forum of the EU and has many advisory roles in The Netherlands.

About the authors

Robert Pestel is with the European Commission, DGXIII (Fifth Framework Research Program on IST - Information Society Technologies).

Dr. Pestel is involved in a number of activities related to the contribution of ST to sustainable development.

Among others, he is correspondent to Working Group 4 of the Information Society Forum ("Sustainable Development in an Information Society"). Since the 1970s he has been involved in systems analysis of world issues, including world modelling, at several international research institutes.

Franz Josef Radermacher is the Scientific Director of the FAW (Research Institute for Applied Knowledge Processing), Ulm, and Professor of Computer Science at the University of Ulm. He is a member of the Steering Committee of the Information Society Forum of the European Commission and chairman of Working Group 4 "Sustainable Development in the Information Society". He had the same responsibility within the Forum 2000 of the German Government (1996-1999). 1997 Scientific Award of the GMÖOR (German Society for Mathematics, Economics and Operations Research). Since 1997 Member of the Scientific Advisory Council of the EXPO 2000 concerning the topics "Planet of vision" and "The 21st century".

Keywords

frameworks, globalization, European way, social economy, politics, sustainability, Information Society

Note

1- For more detailed information, see Jan A.G.M van Dijk: The European Model of the Information Society. <http://www.ispo.cec.be/>

Acknowledgements

The authors wish to thank Dr. Claudio Carrelli, Head of Eurescom and President of the Information Society Forum of the European Commission for intensive discussion and feedback on the orientation of this paper.

References

- 1- European Commission, High Level Group of Experts: *Building Networks for People and their Communities*, 1997.
- 2- European Commission, High Level Group of Experts: *Building the Information Society for Us All*, 1997.
- 3- European Commission: Green Paper *Living and Working in the Information Society: putting People First*, 1997.
- 4- Forum Info 2000: *Nachhaltige Entwicklung und Informationsgesellschaft*. Bericht der Arbeitsgruppe 3 des Forum Info 2000, Bonn, 1998.
- 5- Information Society Forum: *Networks for people and their communities - Making the most of the Information Society in the European Union*. First annual report, June 1996.
- 6- Information Society Forum: *Second annual report*, 1997.
- 7- Information Society Forum: *Information Society, Globalization and Sustainable Development*. Contribution of Working Group 4 *Sustainability in the Information Society* to the 2nd Report of the Forum. FAW Ulm, 1998.
- 8- Information Society Forum and Forum Info 2000: *Challenges 2025 - On the way to a sustainable Information Society*. FAW Ulm, 1998.
- 9- Information Society Forum: *Barcelona Declaration: Contribution to the European Summit on Employment in Luxembourg*, 1997.
- 10- Information Society Forum: *Newark Declaration: The Convergence of Lifelong Learning and Work Reorganization as a Key Element for Job Creation in the Information Society*, 21 May 1998.
- 11- Information Society Forum: *Schönbrunn Declaration: The Information Society Forum's response to the 1999 Employment Guidelines*, 12 November 1998.
- 12- Tochtermann, K., Frotschnig, A., Ottitsch, M.: *Strategic Alliance for a Sustainable Information Society. The IPTS Report*, Special Issue, 1999.

Contacts

Prof. Dr. Jan A.G.M. Van Dijk, Department of Media & Communication, Utrecht University
Tel.: +31 302 534 767, Fax: +31 302 534 674, E-mail: J.vanDijk@fss.uu.nl

Robert Pestel, DG-XIII

Tel.: +32 22 963 524, Fax: +32 22 962 981, E-mail: robert.pestel@bxl.dg13.cec.be

Prof. Dr. Franz Josef Radermacher, Research Institute for Applied Knowledge Processing (FAW)

Tel.: +49 731 501 100, Fax: +49 731 501 111, E-mail: radermacher@faw.uni-ulm.de

A Strategic Alliance for a Sustainable Information Society

Alois Frotschnig and Mathias Ottitsch, *IPTS*, and Klaus Tochtermann, *FAW*

Issue: The new technologies of the Information Society, and the changes they facilitate and induce, provide unique opportunities to help achieve sustainability. However, it is not always clear how to capitalize on these opportunities. Nevertheless, what is clear is that no single entity acting alone can possibly hope to achieve sustainability. A Strategic Alliance is therefore required, in which industry, NGOs and citizen/consumer organisations could work together towards sustainability, both setting the agenda for action and providing the critical mass needed to achieve it.

Relevance: The European Commission took up the concept of a sustainable Information Society early on. Several recent initiatives at European level will help to position this issue better in the European-wide policy debate. One of these activities is the setting up of a Strategic Alliance to promote the shift towards a sustainable Information Society and to demonstrate how best the objectives of sustainability can be supported by inducing the development of the Information Society to move in the direction of sustainability.

Analysis

The new technologies which are driving today's Information Society offer many specific and attainable routes to sustainable development through their contributions to increasing material efficiency, their support for increased Eco-efficiency, their ability to support more sustainable lifestyles, and through their inherent ability to improve governance in modern society. Also the Information Society and its technologies are continuing to have a direct impact upon such issues as democracy and inclusion, freedom of choice, fairness, and the rationalization of human

activity. These achievements and the changes they have brought about are often referred to as the "sustainable" Information Society.

The sustainable Information Society will allow far more opportunities than ever before to create value, to tap creativity, to empower citizens and enhance their dignity, to provide a source of information and entertainment and give rise to a greater sense of purpose for people in all aspects of their lives. However, the transition to a fully sustainable Information Society requires one critical ingredient: collective positive action to shape it, so that it contributes fully to the larger goal of achieving a sustainable world. What is

The Information Society and its technologies are having a direct impact upon such issues as democracy and inclusion, freedom of choice, fairness, and the rationalization of human activity

The scale of the task involved in bringing about the transition to a sustainable information society is clearly beyond isolated individuals or organizations

less clear is where and how to begin. Much of what has been achieved to date has been largely based upon the goodwill and determination of concerned individuals acting alone, rather than upon any widely accepted consensus of what should be done and how best to do it.

Fully publicizing and realizing the enormous potential benefits of the sustainable Information Society requires a far more co-ordinated effort and a much wider overview than can be possibly be achieved by isolated individuals or organizations. And reaping the potentially huge benefits will require such significant changes in attitudes and practices among corporations and individuals that it will only be attainable by creating an extremely broad consensus basis.

This will be a massive and complex undertaking. No single entity can possibly hope to achieve it in isolation. But a Strategic Alliance of influential member organizations - working together voluntarily while sharing their expertise and experience across a broad range of social and technological issues - can. We believe it is the only way that the requisite critical mass can

be attained, and concerted actions undertaken towards the goal of achieving a sustainable world.

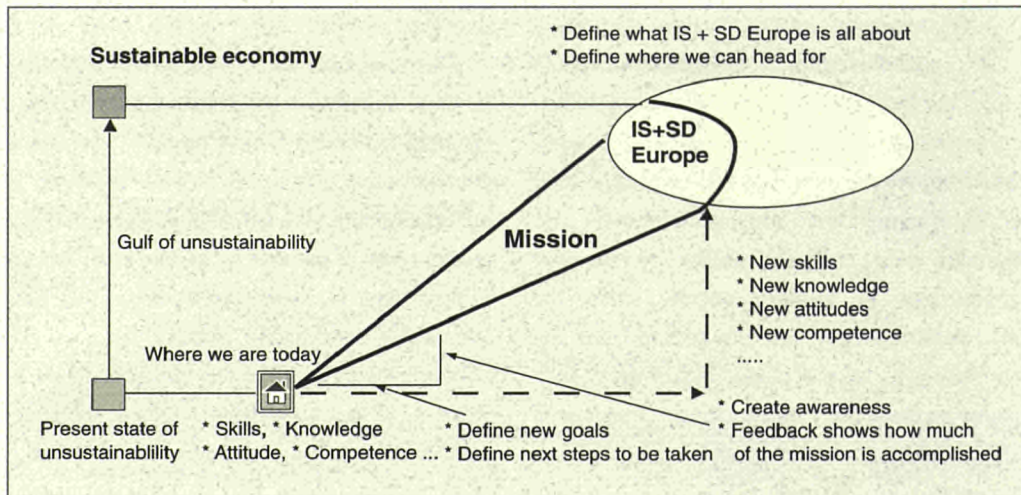
ASIS, an initiative financed by the European Commission

The main objective of the ASIS¹ project is to form a Strategic Alliance that consists of members of industry, business, government, NGOs, research, citizen/consumer organizations, and individual citizens. These members can work together towards achieving worldwide sustainability, both by setting the agenda for action and providing the critical mass needed to achieve it. The aim is to trigger and promote this Strategic Alliance during the lifetime of the ASIS project (i.e. February 2000).

The mission statement of ASIS (Figure 1) is formulated as follows: Demonstrate how best the key value of sustainability can be supported by inducing an appropriate direction to the development of the Information Society. This will involve creating a climate of understanding and commitment. The Alliance will encourage the

The purpose of ASIS is to create a strategic alliance bringing together industry, business, NGOs, government, etc. to work together towards achieving worldwide sustainability, both by setting the agenda for action and providing the critical mass needed to achieve it

Figure 1. Mission of ASIS



very wide participation of public and private organizations that is required to work towards the new ways of working, playing and living that comprise a Sustainable Information Society. This society may be seen as the next step along the path towards a fair, fulfilling, prosperous and sustainable world.

ASIS is demonstrating how the results of ACTS (Advanced Communications and Technology Services), together with other activities, open a new window of opportunity for combining sustainability with a high quality of life throughout the world. A number of ACTS technical projects, such as CICC, COVEN and COBRA have been exploring how our lives might change as many different services are integrated into a unified and persistent "Personal Information Environment". Whatever the final shape an integrated services environment of this type might take, that is, whatever one's view of what the Information Society might be, it will assuredly differ markedly from today's ICT, and be more pervasive and deeply integrated in all areas of our lives. This is the moment when it is still possible to influence the social and cultural style of Personal Information Environments in such a way that they lead the community towards a more sustainable future.

Over the last 25 years the communications and IT industries have been seen to be one of the strongest contributors to environmental protection, improving the efficiency of industrial processes and improving the effectiveness of travel, for example by means of multimedia meetings. However, recent prototypes of the Personal Information Environment have indicated that ICT can offer a much more profound contribution to sustainability. It is likely to be the catalyst that switches sustainability thinking from "Dematerialization" as a burden to "Immaterialization" as an opportunity:

- Dematerialization - optimising the design of products to do more with less resources, e.g.

reducing the weight and increasing the efficiency of the automobile.

- Immaterialization - fundamental changes to lifestyles that replace unsustainable activities with information intensive alternatives, e.g. downloading the times of trains from a website instead of buying a heavyweight timetable that consumed a small forest.

In this pair of examples the dematerialization burden is the increased traffic congestion resulting from the fact that more people can afford cars. The immaterialization opportunity is a substantial improvement in quality as the opportunities to introduce errors are almost eliminated. Maps and timetables do not contain data: they contain only analogues for data or copies of data, so immaterialization cuts out unnecessary analogues. In the same way, most non-material needs are fulfilled by material analogues which the Information Society has the potential to immaterialize: social satisfaction is one such issue, and within that, social travel is by no means trivial.

Other programmes, such the DG12 BRITE EURAM programme, address dematerialization, particularly in relation to industrial processes. Immaterialization has largely been ignored because the relevant technologies of shared virtual environments have only recently become effective enough to convince the sceptical non-engineer that immaterial replacements can be better than the real thing.

ASIS is unique in taking up the challenge of showing that ICT can be used to combine an increasing quality of life with sustainability. It does not follow the conventional environmental approach of proposing the reduction of the privileges of the North so that the whole planet can become sustainable. This switch in attitude is of immense importance because it may

The "Personal Information Environment" of tomorrow, a key element of the Information Society will differ markedly from today's ICT, and be more pervasive and deeply integrated in all areas of our lives

ICT can also act as a catalyst in the witch from 'dematerialization' (making more product with less raw materials) to 'immaterialization' (using information intensive alternatives to replace the product)

The ASIS Strategic Alliance encourages the participation of a wide spectrum of public and private organizations, working together, to envision and create the new patterns of work, entertainment and living which will ultimately comprise the foundations of a fully sustainable Information Society

Action Groups provide the most immediate forum for members to identify and discuss the opportunities ICT/IS offers for sustainable development and possibly to translate their commitments into consensus-based, concerted actions

bypass the conflict evident in Kyoto-style environmental initiatives.

Strategic Alliance

One of the main objectives of the ASIS project is to trigger and to promote a Strategic Alliance made up of a wide variety of organizations and people including industry, business, government, non-governmental organizations (NGOs), research, citizens/consumer organizations and individual citizens. This Strategic Alliance has the goal of contributing to worldwide sustainability by identifying and disseminating Information Communication Technologies (ICTs) and Information Society (IS) opportunities for sustainable development (SD); and by triggering specific possible actions within member organisations and in the outside world.

The Alliance approach was motivated by the fact that no single individual, organization, country or even continent - acting alone - can possibly hope to achieve the goals of sustainability effectively. A Strategic Alliance of influential member organizations - working together voluntarily while sharing their expertise and experience across a broad range of social and technological issues - is the only way in which requisite critical mass can be attained, and concerted action undertaken, towards achieving the goal of a sustainable world.

Forming such a broad-based Strategic Alliance involves creating a special climate of understanding and mutual commitment among its members. That is why the ASIS Strategic Alliance encourages the participation of a wide spectrum of public and private organizations, working together, to envision and create the new patterns of work, entertainment and living which will ultimately comprise the foundations of a fully sustainable Information Society - a society that

may be seen as the next step along the path to achieving a fair, fulfilling, prosperous and fully sustainable world.

The basic key requirement for membership of the Strategic Alliance is the commitment to taking practical action towards achieving a sustainable world demonstrated by becoming a signatory to the ASIS Statement of Intent. In particular this involves the following roles: (1) to define, through consensus agreement, the best route(s) to take to achieve a sustainable Information Society, (2) to take an active role in the work of one or more Action Groups and (3) to produce specific recommendations and plans of action that seem most appropriate to the findings of the Action Groups (e.g. indicators, best practice benchmarks, guidelines, memoranda of understandings, deals and agreements).

Action Groups

The Strategic Alliance will be concerned with many different issues and actions in many different fields. Clearly not all Strategic Alliance members could appropriately be involved in every single issue /action; different fields may need different types of action. The Strategic Alliance is therefore divided in a number of Action Groups. To date the following Action Groups have been initiated: sustainable communities, dematerialization of industrial and business processes, social inclusion, homes and workplaces of the future, mobility and transport, and climate change. Each of the Action Groups is moderated by two members of the ASIS consortium, one acting as a correspondent and the other as his/her deputy. In addition, each Action Group is headed by a chairperson from the Strategic Alliance.

Action Groups provide the most immediate forum for members to identify and discuss the

opportunities ICT/IS offers for SD and possibly to translate their commitments into consensus-based, concerted actions. By signing the Statement of Intent, each member commits him/herself to voluntary but positive involvement in, and a degree of responsibility for, one or more of these Action Groups and agrees to contribute to the creation of specific Memoranda of Understanding (MoU), benchmarks and guidelines within their specific areas of expertise. One can also become a (informal) member of one or more Action Groups by signing the Action Group interest form.

Benchmarks and guidelines will derive from members' knowledge and experience and be based on best practice for the benefit of a wider constituency outside the Strategic Alliance, providing advice to others about moving towards a sustainable Information Society. Benchmarks will identify objective standards in different areas, and guidelines will provide recommendations on how those standards might be best attained. Given the broad nature of the sustainability issue, benchmarks and guidelines will vary from case to case. But each will be based on sound methodology and visible evidence in order to achieve real-world impact. Members and a wider constituency of non-members are involved in sectoral actions based on consensus. MoU will serve, in many ways, as the external action plan for a sector Action Group.

Scenario Writing

ASIS is developing scenarios describing possible future developments in the area of ICT/IS/SD from a variety of perspectives. Some identify future risks for a sustainable Information Society while others project the opportunities for the sustainable Information Society. From the methodological point of view, varied approaches have been taken. One approach is quantitative

and includes modeling using a variety of tools. A further approach is more qualitative, considering more the issue of understanding what ICT driven sustainable development will actually mean for everyday life. Not only this but a variety of key areas from psychological and micro-sociological aspects, to geopolitics in a world in which ICT drives the evolution of society is considered. Currently the following scenarios have been drawn up:

- The "Eco-Cyber Lifestyle" and "Going down slow" scenarios present snap-shot images of two possible futures, with a selection of events leading up to each of them. The two possible futures are based on two different mentalities - the 'expanding mind' (the Eco-Cyber Life Style Scenario) and (ii) the 'minimalist mind' (Going Down Slow Scenario). These scenarios look at the interaction between cyber-space and sustainability and at different responses to general problems in the future Europe (such as education and immigration).

The two mentalities interact differently with cyber-space and ordinary life. In the Expanding Mind, the opportunities in cyber-space to share, interact, learn and grow are instrumental to creating and innovating, without necessarily using more resources. The emphasis is on effectiveness. In the Minimalist Mind, opportunities in cyber-space are taken as a given, and instrumental to achieving given ends and aspirations. The emphasis is on efficiency.

- In the "Telegentsia" scenario emphasis is placed on the initiative of actors such as citizens and SMEs. "Telegentsia" is written under the assumption that pure materialistic mechanisms can be overcome by value-driven citizens action, in particular that post-materialistic values will be taken up by "early adopters" found in the better off, more successful, more articulate business, academic and professional classes.

ASIS is developing scenarios describing possible future developments in the area of ICT/IS/SD from a variety of perspectives

In 1995 the European Commission decided to set up the Information Society Forum (ISF) as an independent advisory body. The idea of this initiative is to raise the issues of Sustainability and Information Society in policy debate and research

About the authors

Alois Frotschnig holds a doctorate in mechanical engineering from the Vienna University of Technology, where he also worked as a researcher in the field of robotics, artificial intelligence, and the social aspects of automation. He joined IPTS in 1995 as a scientific officer where he is in charge of Information Society related issues. His main research interests include Information and Communication Technologies and Web-based workgroup tools.

Mathias Ottitsch has been at the IPTS for almost a year working in the Technology – Employment – Competitiveness field. Before he joined IPTS he was responsible for the strategic management of Arsenal Research a 250-employee industrial research centre in Vienna. He holds a doctorate in technical sciences and has taken 'magisterexamens' in economics, international politics and sociology at the Fernuniversitaet Hagen. He took a one year post graduate management course as part of a three year MBA program at the Open University Business school.

- "The European Way" scenario takes a systems view and concentrates on highly aggregated, basic economic, social and environmental indicators such as worldwide GNP, equity, population dynamics and dematerialization. It tries to depict the major world-wide trends affecting sustainability under different framework conditions. ICT/IS/SD are included indirectly in this scenario by their relation to the selected indicators.

In order to monitor the internal consistency of the scenarios developed it is intended to model the key assumptions, trends and events with a Cross-Impact modeling tool. This is done mainly for the European way scenario (see the article by van Dijk, Prestel and Radermacher in this issue). Once the consistency has been checked the model can then be used to gain a deeper understanding of different policy actions believed to drive society towards sustainable development. Care, however has to be taken, since the direct impact of trends is often difficult to identify.


Other initiatives

In 1995 the European Commission decided to set up the Information Society Forum (ISF) as an independent advisory body. The idea of this initiative is to raise the issues of Sustainability and Information Society in policy debate and research. Also, believing that the new information and communication technologies must meet the needs of all citizens, as well as business, the Commission wanted opinions on policies and priorities from a broadly-based group of experts and representatives. The ISF was originally divided into six Working Groups whose reflections and analysis focused on

the following six themes [15]:

- impact on the economy and employment;
- basic social and democratic values in the virtual community;
- influence on public services;
- education, training and learning in the Information Society;
- the cultural dimension and the future of the media;
- sustainable development, technology and infrastructure.

The second report of the Working Group "Sustainability in an Information Society" describes the sustainability concept and its connection with the Information Society and arenas in which the European Commission is addressing these issues. It summarizes intensive discussions and ends with the question of how Europe should deal with these issues at the moment in terms of policy. The report closes with a long-term perspective, giving a first outline of a European Vision of global governance, a new social contract, sustainability and a better world.

With the 5th framework programme, the European Commission underpins the importance of the emerging Information Society and its technologies for Europe. One strategic objective of the 5th framework programme is to realize the benefits of the information society for Europe both by accelerating its emergence and by ensuring that the needs of both individuals and enterprises are met. Sustainable development pervade many parts of the 5th framework programme as a result of the programme's focus on key activities crucial for social well being, economic competitiveness in Europe and reduced consumption of natural resources. 

Keywords

information and communication technologies, information society, sustainable development, eco-efficiency, dematerialization, immaterialization

Note

1- ASIS: Alliance for a Sustainable Information Society: a project of the ACTS programme of the European Commission - DG 13. More information about ASIS can be found at <http://asis.jrc.es>, or an information package can be requested by email at: asis@jrc.es

Reference

- J. van Dijk, Pestel, R., Radermacher, F., *A European Way into the Global Information Society, The IPTS Report* issue 32, February 1999.

Contacts

Alois Frotschnig, The Institute for Prospective Technological Studies (IPTS)

Tel.: +34 954 488 245, Fax: +34 954 488 339, E-mail: alois.frotschnig@jrc.es

K. Tochtermann, FAW - Research Institute for Applied Knowledge Processing

Tel.: +49 731 501 500, Fax: +49 731 501 111, E-mail: tochterm@faw.uni-ulm.de

About the authors

Klaus Tochtermann

studied Computer Science (1985-1991) at Kiel University and Dortmund University (Germany). He has a diploma (1991) and Ph.D. (1995) from Dortmund University. He worked as an assistant professor in the fields of hypermedia and digital libraries at Dortmund University from 1995 to 1996. In 1996, he did research as a visiting scientist at the Center for the Study of Digital Libraries at Texas A&M University (USA). In 1997 he joined the FAW - Research Institute for Applied Knowledge Processing in Ulm, Germany, as deputy head of the Environmental Systems division and has been head of the division since 1998. He is also Project Manager of the EC-funded ASIS project. His fields of interest are hypermedia and telematics, geographical information systems, environmental information systems, sustainability and the information society.

Information Technology for Sustainable Societies-Public Policy Perspectives in Japan: The Case of Telework

Hitoshi Mitomo, *Senshu University* and Hajime Oniki, *Osaka University*

Issue: Telework and telecommuting (T/T) enable the reduction of environmental problems resulting from transport. In the case of Japan it is estimated that the net effect of T/T will be a reduction of about 2% of the Japanese carbon dioxide emission reduction target by 2008, as agreed in the Kyoto Protocol. The net impact of all IT-related activities as a whole will be about 7%. T/T will also benefit individuals by reducing public transport congestion - a positive externality irrespective of sustainability impacts.

Relevance: Apart from sustainability considerations, the fact that T/T is able to contribute towards benefits (from a 'public good' point of view) is sufficient justification for policies designed to support it. For instance, adequately designed tax instruments could be used to influence T/T behaviour.

IT can contribute to sustainability in several ways

Roles of Information Technology for Sustainability

Information technology (IT) is expected to play a wide range of important roles in societies pursuing sustainability. These roles may be classified into three groups:

- direct technological effects
- indirect contributions through changes in the behaviour of individuals and organizations
- promotion of the overall decision-making capability of a society.

First, direct effects arise from the increased efficiency of manufacturing and other activities through the use of various information systems. Examples include IT control of air conditioning equipment to reduce energy consumption,

energy savings in transport by the use of intelligent transport systems (ITS), etc.

Indirect contributions may arise through changes in lifestyle and working patterns enabled by use of IT. For example, telework/telecommuting (T/T) not only saves workers' daily commuting time but also the energy consumed in commuting. Other examples are the development of remote-sensing devices to monitor the state of the global environment, and the use of computerized bidding mechanisms for trading the right to emit carbon-dioxide (CO₂). These are but a few of the many examples of possible ways in which IT can contribute to sustainability.

There is one more way; ICTs can improve society's overall decision-making capacity to

implement public policies for sustainability. Collective decision making on public policies, however, is subject to political factors. In a democratic society, a collective choice which influences the majority can be sustained only with its consent. This means that the majority needs to understand the consequences of selfish patterns of behaviour in order to accept the consequences of public policies which are useful for the global community as a whole in the long-run, but may go against the direct short-term interests of individuals and communities (including the majority). In this sense the knowledge society is a prerequisite for sustainability, and IT can play a role in building such a society quickly; hopefully before it becomes too late to get on the path to sustainability.

Complex Relationships

When considering IT's contribution to sustainability, we need to take note of its causal relations. Take the case of T/T for example. The development of IT helps people telework, thus relieving them of physical commuting and decreasing atmospheric emissions of CO₂. This is

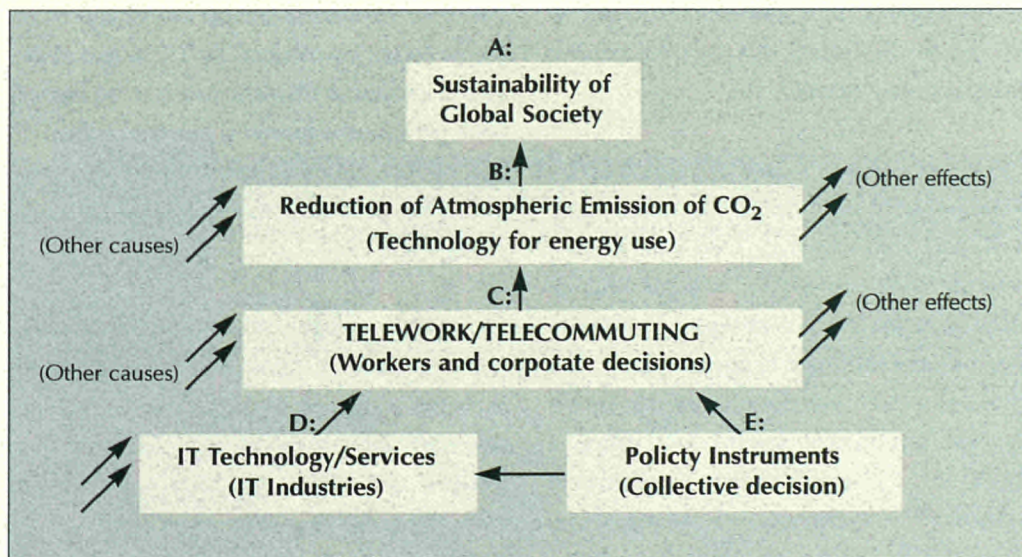
easy to understand at a glance, but the causal relations involved may be complicated, calling for careful attention when public T/T policies are formulated (see Figure 1).

The boxes and the arrows in Figure 1 describe schematically the causes and effects surrounding T/T. Each of the five boxes (marked A through E) represents an activity related to T/T, box C being T/T itself. The arrows in Figure 1 indicate the presence of the causes and/or the effects between activities. Observe that the arrow from C to B indicates that the promotion of T/T contributes to the reduction of atmospheric emission of CO₂, and the arrow from B to A indicates the effects of CO₂ reduction on sustainability.

The lower half of Figure 1 explains the socio-economic factors affecting T/T. First, the penetration of T/T depends on IT technology and services together with policy instruments (such as government subsidies), as indicated by the arrows from D to C and E to C, respectively. In addition, the arrow from E to D shows possible effects of policy instruments on IT technology and services.

ICTs can enhance decision making capability by ensuring access to information – essential if the public is to understand the need to change towards sustainability

Figure 1. Causes and Effects Involved in "Telework/Telecommuting"



The causal relationships involved are complex.

Government can influence T/T, but only indirectly

The COP3 climate change convention held in Kyoto had a significant impact on public awareness of the need for sustainability

Boxes B, C, and D have incoming arrows representing other causes. Consider box C, for example. The decision to take up T/T is made by workers and corporate management for private benefits, not for global sustainability. Likewise, the development of IT technology and services is a consequence of decisions made by IT industries, seeking corporate objectives. The government (or society as a whole) can influence T/T by means of various policy instruments, but it can do so only indirectly. Thus the government, in planning and implementing public policies for the promotion of T/T, needs to estimate the effects of its policies on the behaviour of workers and management.

Not shown in the figure is the fact that IT and T/T may contribute towards unsustainability, i.e. have a negative impact on the environment. There are several ways in which this can happen. For instance, the actual reduction in transport due to T/T is less than expected due an increase in other, non-commuting, travel, such as personal trips during the day, later trips to the office, increase in customized delivery to T/T personnel, and so on. This negative effect is more general for ICT than only for T/T, say through the increase of customized transport due to Internet shopping. When considering actual estimates of IT and T/T on sustainability, it is therefore important to consider the *net effects*, not only the positive effects (see more below).

The complexity of causes and effects of T/T explained above indicates the scale of the issue of IT and sustainability. One can imagine hundreds of interconnected diagrams each of which looks like the one in Figure 1. We can only look at a small part of the issue here. The following sections introduce an attempt by the Japanese government toward formulating a policy for T/T, and research work toward estimating the behaviour of individuals in relation to T/T.

Policies for Sustainability in Japan: the Case of Telework/Telecommuting

In the summer of 1997 the COP3 meeting (a United Nations Climate Change Convention) was held in Kyoto, Japan. This had a significant effect on promoting the Japanese people's understanding of the need for sustainability. In the Kyoto meeting, it was agreed that Japan, together with other advanced countries, would by the year 2008 decrease atmospheric emissions of CO₂ and other greenhouse gases to levels 6% lower than those in 1990. This translates into a decrease in emissions of 56.5 MTC (million tons of carbon) in a year in Japan.

The Japanese government recently formulated a set of policies for achieving this goal. As part of these initiatives, the Telecommunications Council in the Ministry of Posts and Telecommunications (MPT) submitted a Report in May 1998 toward this target in relation to the possible contributions of IT (MPT [1998], pp.74-76).

The MPT report gives a breakdown of Japan's target of 56.5 MTC into subcategories; T/T is projected to contribute by a decrease of 1.29 MTC, 2.28% of the total projected decrease. The report attempts to provide an explanation of this projected contribution by T/T in two steps: (a) a projection of T/T participation in the year of 2008 (which corresponds to box C in Figure 1), and (b) a projected reduction of CO₂ emissions in 2008 (which corresponds to box B). (See Tables 1 and 2).

As Table 1 shows, the report classifies the total workforce of Japan into four categories: managers and office workers, professionals and engineers, sales transport and communication workers, and others, the total workforce in 2008 being 63.38 million. The ratio of T/T participation to the total workforce is highest

(20%) among managers and office workers, and lowest (1 or 0%) among sales, transportation and communication workers and other workers. On the basis of these figures total T/T in 2008 is projected to be 4.19 million man/years, i.e. 6.6% of total work. Furthermore, 35% of these T/T man/years correspond to work at home, 15% to work at satellite offices, and the remaining 50% to work at spot offices (i.e. offices available on a temporary rental basis).

By using the data in Table 1, the Report calculated, as shown in Table 2, the gross and the net decrease in CO₂ emissions brought about by the introduction of T/T and the use of remote video meetings. As discussed above, although T/T will save energy otherwise expended in commuting it will nevertheless increase the consumption of energy at home and at satellite offices. The Report estimated the parameters needed to calculate the gross and net decreases in

Table 1

Estimated T/T Participation in 2008: Japan (by MPT) (Million Man/years)

Workers Occupation	Total Man/hours Composition (%)		T/T Man/hours Composition (%)		
			Percent of T/T		
Managers and Office workers	14.79	23.3	20	2.96	
Professionals and Engineers	11.13	17.6	10	1.11	
Sales, Transportation, and Communication	11.80	18.6	1	0.12	
Others	25.66	40.5	0	0	
Total	63.38	100.0	6.6	4.19	100
T/T Work at Home				1.47	35
Work at Satellite Offices				0.63	15
Work at Spot Offices				2.09	50

Table 2

**Projected Change in CO₂ Emission due to T/T in 2008:
Japan (by MPT) (1,000 tons of Carbon per Year)**

Source of Change: T/T	Change in CO ₂ Emission		
	Decrease	Increase	Net Total
Telework at Home	530	190	-390
Satellite Offices	20	0	
Sport Offices	30	0	
Video Meetings	940	40	-900
Total	1520	230	-1290

CO₂ emissions as the average distance of commuting per person (3100 kilometres per year for the case of commuting by train), and the amount of CO₂ emitted as a result of commuting (4.8 tons of carbon per million person kilometres

in the case of trains). The figures shown in Table 2 have been obtained by combining the data in Table 1 with the projected parameters. The total decrease in CO₂ emissions have been calculated to be 1.29 MTC per year.

Box 1

Impacts of ICT on Sustainability: The Japanese case

The Telecommunications Council, an advisory body of the Ministry of Posts and Telecommunications (MPT), released a report entitled "Addressing Global Environmental Preservation through Information Systems" on May 27, 1998. The report predicts the CO₂ reductions that might be attained through the use of information systems with the potential to reduce CO₂ emissions.

System (converted to equivalent CO ₂ amounts)	CO ₂ Reduction
1 <input type="checkbox"/> Telework	1.29 million tons
2 <input type="checkbox"/> Intelligent Transport Systems	1.10 million tons
3 <input type="checkbox"/> Reduction of paper consumption by using LANs	0.53 million tons
4 <input type="checkbox"/> Internet, etc.	0.50 million tons
5 <input type="checkbox"/> Building management systems	0.36 million tons
6 <input type="checkbox"/> Electronic publishing and electronic newspapers	0.25 million tons
7 <input type="checkbox"/> Distance learning, home education systems	0.03 million tons
Total reduction per year	4.06 million tons

Notes

- 1 Estimated by taking into account the reduction in CO₂ emissions achieved by reducing commuting, business trips and travel and the increase in CO₂ emissions resulting from the construction and operation of information/communications networks. The teleworking population (total number of people engaged in telework two or more times a month) in 2010 is estimated at 20.80 million people. Expressed in percentages, 4.2% of total aggregate working time takes the form of telework.
- 2 Estimated reductions achieved by the diffusion of enhanced car navigation systems, electronic toll collection systems and optimized traffic management systems, among the various subsystems making up Intelligent Transport Systems (ITS).
- 3 Estimated reductions achieved by reducing paper consumption, including the consumption of slips, forms and printer paper, through the installation of LANs.
- 4 Estimated through alternative access to work, reducing amounts of waste paper, decentralization of cities, etc.
- 5 Estimated reduction in energy consumption as a result of expanding the introduction of building management systems and associated introduction of heat-recovery air-conditioning systems and automatic lighting adjustment and on/off control systems by 2010.
- 6 Estimated on the assumption that 10% of the total volume of books, newspapers, etc. published the 1990 financial year will be switched to electronic publishing and electronic newspapers.
- 7 Estimated reduction in energy consumption as a result of reducing the use of transportation systems through substitution for travel.

Note: Only the seven activities above were estimated. Activities such as electronic commerce and other IT-activities will further reinforce sustainability.

Source: Compiled by the author based on

http://www.mpt.go.jp/policyreports/english/telecouncil/global_env_index.html

and MPT News Vol 8, No 19, Dec 29, 1997

The contribution of T/T explained above is only a small part of the Report; it contains other contributions of IT such as those brought about by the introduction of ITS (intelligent transport systems), high-performance displays for television and computers, etc. The main contribution to sustainability can be summarized as shown in inset Box 1.

Analysis of Telework/Telecommuting Behaviour in Japan

One of the important policy issues left unanswered in the Report is the actual choice of policy instruments. The Report presents a set of preconditions needed to achieve the target set in COP3; it does not deal with whether the preconditions will become reality, or, if not, what policy instruments should be used to put them into practice.

To deal with this issue systematically is a formidable task and something which can only really be tackled stepwise. Recently, H. Mitomo and T. Jitsuzumi [H. Mitomo and T. Jitsuzumi, 1998] made an attempt to approach this issue in relation to T/T. Their paper gives a forecast of

telecommuters in Japan in three scenarios for the period from 1995 to 2020 by using assumptions based on the growth curve represented by logistic functions (See Table 3). Scenario 1 is a conservative case, scenario 2 an intermediate case, and scenario 3 an optimistic case. For the conservative case, the percentage of telecommuters in the total workforce in 2005 is 9.16%, which is greater than the percentage used in the Report for 2008. The difference between the two estimates comes from the fact that different assumptions have been used. No estimate of telecommuters can avoid forecast errors so we should not be surprised at seeing differences of this kind.

In the second half of H. Mitomo and T. Jitsuzumi's paper, an attempt is made to estimate the value of T/T for telecommuters, and the value for non-telecommuters, in relation to train transportation in the metropolitan Tokyo area. Telecommuters receive direct benefits from T/T in terms of shorter commuting time (often zero) and avoidance of traffic congestion (in the Tokyo metropolitan area the underground is so crowded during the rush hour that passengers

Table 3

Estimated Number of Telecommuters in Japan (by Mitomo & Jitsuzumi) (Thousands)

Year	Scenario 1		Scenario 2		Scenario 3	
		(1)		(1)		(1)
1995	814	1.20	848	1.25	862	1.27
2000	2,943	4.24	2,934	4.23	2,931	4.22
2005	6,367	9.16	7,199	10.35	7,656	11.01
2010	8,490	12.47	11,290	16.58	13,400	19.68
2015	9,152	13.86	13,200	20.00	16,850	25.53
2020	9,421	14.52	13,970	21.54	18,370	28.31

Note (1): Percentage of telecommuters in the total workforce.

The direct personal benefit is a motivation for workers to become telecommuters. However, their action reduces congestion and so also favours non-telecommuters. This fact justifies the use of public policy instruments to provide further incentives to telecommute

are often packed into carriages with little space to move even their arms). Non-telecommuters (i.e. ordinary commuters) also benefit from the reduction in congestion brought about by T/T. Thus, T/T gives direct benefits to telecommuters, and indirect benefits to non-telecommuters; a clear case of positive externalities.

H. Mitomo and T. Jitsuzumi's article estimates the benefits of T/T with the aid of an assumption regarding the marginal elasticity of substitution between the level of congestion and the commuting time. As Table 4 shows, the direct benefit of T/T to telecommuters is somewhere between 197 and 253 yen per working day, whereas the indirect benefit of T/T to non-telecommuters for the intermediate scenario lies between 37 and 99 yens per working day.

These estimates give us some idea about the magnitudes of the *private benefit* of T/T to telecommuters and non-telecommuters. (Observe that these benefits do not include that of achieving global sustainability.) The estimated private benefit obtained in the Paper can be used for choosing policy instruments to promote T/T for sustainability. The direct private benefit is a motivation for workers to become telecommuters.

The indirect benefit is an external impact of T/T enjoyed by non-telecommuters. It is conceivable therefore that the government could impose a tax on non-telecommuters for not becoming telecommuters (e.g., in the form of environmental tax on transport), and to use the revenue from such taxes as a subsidy to telecommuters for becoming telecommuters, irrespective on impacts upon sustainability.

Conclusion

In this article we have discussed the possible contributions of IT to global sustainability, and considered a framework for formulating public policies promoting T/T. We have also looked at forecasts for T/T, and an analysis of how it may affect individual behaviour, in relation to possible contributions of T/T to sustainability.

In reality, needless to say, there are hundreds of such causes and effects generating direct and indirect benefits/costs in relation to an activity for promoting sustainability. To formulate a system of wide-ranging policies for sustainability is a difficult task. The work presented by the Report and H. Mitomo and T. Jitsuzumi's paper opens up a path towards such a system.

Table 4

Estimated Value of Telecommuting to Telecommuters and Non-telecommuters: Japan, Tokyo Metropolitan Area (by Mitomo and Jitsuzumi) (Yen per workday)				
Area Average	Telecommuters		Non-telecommuters	
	Model 1	Model 1	Model 2	Model 2
Scenario 1	197	253	29	77
Scenario 2			37	99
Scenario 3			44	115

Keywords

telework, CO₂ emissions, externalities, Kyoto protocol, incentives, sustainability

References

- Mitomo, Hitoshi and Toshiya Jitsuzumi, *Impact of Telecommuting in Japan: Implications for Mass-Transit Congestion*, submitted for publication, 1998. A previous version of this paper was presented by H. Mitomo at the 5th World Congress, Regional Science Association International, May 1996, Tokyo.
- Telecommunications Council (Japan), *Toward Sustainable Global Environment by means of Information and Telecommunication*, a report submitted to the Minister of Posts and Telecommunications in response to Investigation Order No.39 of 1997 (Japanese), May 1998.

Contacts

Hitoshi Mitomo, Senshu University

Tel.: +81 449 007 952, Fax: +81 449 007 952, E-mail: mitomo@isc.senshu-u.ac.jp

Hajime Oniki, Osaka University

Tel.: +81 668 764 512, Fax: +81 668 764 512, E-mail: oniki@iser.osaka-u.ac.jp

About the authors

Hitoshi Mitomo is

Professor of Telecommunications Economics at Senshu University and a guest research officer at the Institute for Posts and Telecommunications Policy in Japan. He holds a master's degree in Environment Science from University of Tsukuba and doctorate in Engineering from Toyohashi University of Technology. His current research focuses on externalities and pricing for telecommunications.

He is also interested in the social consequences of teleworking/telecommuting.

Hajime Oniki (Ph.D.) is a professor at Department of Economics, Osaka-Gakuin University, Osaka, Japan. His main research interests are in economics of information and communication. He served as editor of *International Economic Review*; he has been a member of the editorial board of *Information Economics and Policy*, *Economics of Innovation and New Technology*, and *Telecommunications Policy*.

He also served as a committee member of the Japanese governments including Ministry of Posts and Telecommunications, Ministry of Foreign Affairs, and the Economic Planning Agency.

Indicators of a Sustainable Information Society: Policy Analysis and Application

Robin Mansell, W. Edward Steinmuller, Uta Wehn, *SPRU*

Issue: To benefit from potential applications of innovative information and communication technology, policies must be set to coordinate the construction of both human and technological capabilities. Without a balance between the accumulation of new skills, the investment in equipment and infrastructure, and changes in organization compatible with local and regional conditions, the social and economic potential of information and communication technologies simply cannot be realized. Policy coordination and balance can only emerge from assessments of a country's current position and the trade-offs involved in advancing from that position.

Relevance: At the European, member state and regional levels, policy makers are seeking new ways to connect technological initiatives in information and communication technologies with users. The spirit of this search is to replace *ad hoc* inclusion of users as a part of 'demonstrations' or 'user forums' with more fundamental 'user-centred' technological development initiatives and more pro-active policies for supporting user skill and knowledge development. A significant problem lies in assessing priorities for action and in deciding whether the market should lead new developments. This paper reports the observations from a global study of experience in this area and summarizes the lessons for policy makers.

The UNCSTD study provides an approach to constructing indicators of progress towards the information society. Its lessons should be of interest to policy makers seeking to maximize benefits in their regions

Introduction

Studies of the impact of the extension of computing, telecommunication and software-based systems into industry and into the lives of citizens and consumers often draw their lessons from the experiences of the core regions of industrialized countries. This article is based on a detailed two-year study of the social and economic potential and impact of advanced information and communication

technologies in developing countries by the United Nations Commission for Science and Technology for Development (UNCSTD)¹. It highlights an approach to constructing indicators of progress toward the information society and demonstrates the crucial importance of policy coordination. The lessons from this work should be of interest to policy makers in Europe who are seeking ways of maximizing the potential social and economic benefits of these technologies for businesses and citizens in their regions.

Indicators for a Sustainable Information Society

Current indicators or benchmarks for assessing how information society characteristics in local areas or regions compare with other regions are insufficient. In particular, current methods are insufficient for assessing the balance of technological and human or social capabilities available for promoting the development and spread of new applications of information and communication technologies. There is no 'ideal' composite indicator of information society or knowledge-based development. Policy makers are often left in the dark about how their region is performing over time. The UNCSTD took some steps towards providing a framework that would be helpful to policy makers to address this problem. The framework was designed to use readily available data and to relate production and consumption (demand) strengths or weaknesses to other strengths and weaknesses in the areas of skills and capabilities.

The INEXSK (INfrastructure, EXperience, Skills, Knowledge) approach was developed to illustrate how varying combinations of technical

infrastructure, experience, and skills in different countries account for the development of distinctive information societies. The INEXSK approach allows the mapping of different 'starting positions' of societies or regions in the process of developing stronger knowledge generation and utilization capabilities, particularly as these capabilities involve the use of information and communication technologies. It also highlights potential imbalances among the factors supporting the improvement of these capabilities. The INEXSK approach links specific indicators to capabilities as shown in Table 1.

The data to implement the INEXSK approach are readily available for a large number of countries, and the approach can be tailored to regions by linking production and consumption indicators to the regional composition of output and income. It must be emphasized that improved indicators such as the actual use of advanced information and communication technologies and services or more sophisticated measures of user capabilities such as 'computer literacy' indicators would aid in policy analysis and formulation.

There is no 'ideal' composite indicator of information society or knowledge-based development. Policy makers are often left in the dark about how their region is performing over time

The INEXSK approach allows the mapping of different 'starting positions' of societies or regions in the process of developing stronger knowledge generation and utilization capabilities

Table 1

Indicators and capabilities	
Indicator	Capability or Potential
Educational attainment in mathematics and engineering	User and producer design abilities for new applications and artefacts
Internet hosts	User and producer design abilities for new services
Electronics, information technology and data processing service output	Producer production capability for new applications, services and artefacts
Literacy rates and the penetration of television sets	User abilities to engage with new services and technologies
User consumption of electronics, information technologies, data processing services, and penetration of telephony services	Demand potential for new technology and services

Source: adapted from Mansell and Wehn (1998)

The relationship between the indicators is represented as a 'footprint' showing how production and consumption and skills relate to each other

It is generally believed that information society developments are environmentally friendly, offering the potential of substituting information resources for physical resources

Targeted policies designed to strengthen skills and production or consumption capabilities will interact with the particular strengths and weaknesses that exist in each of these countries or in any given region

The relationship between these indicators is represented as a 'footprint' showing how production and consumption and skills relate to each other. As shown in Figure 1, for example, experience with production and consumption of information and communication technologies is assumed to 'push' the new technologies into roles in the creation of knowledge (see arrows in Figure 1). Neither production nor consumption alone, however, can bring infrastructure assets and experience into productive use in the creation of knowledge for social or economic applications. This requires 'pull' influences from the production or consumption skills. Policy makers face major difficulties in co-ordinating the 'push' of experience and the 'pull' of skills to achieve effective applications of information and communication technologies.

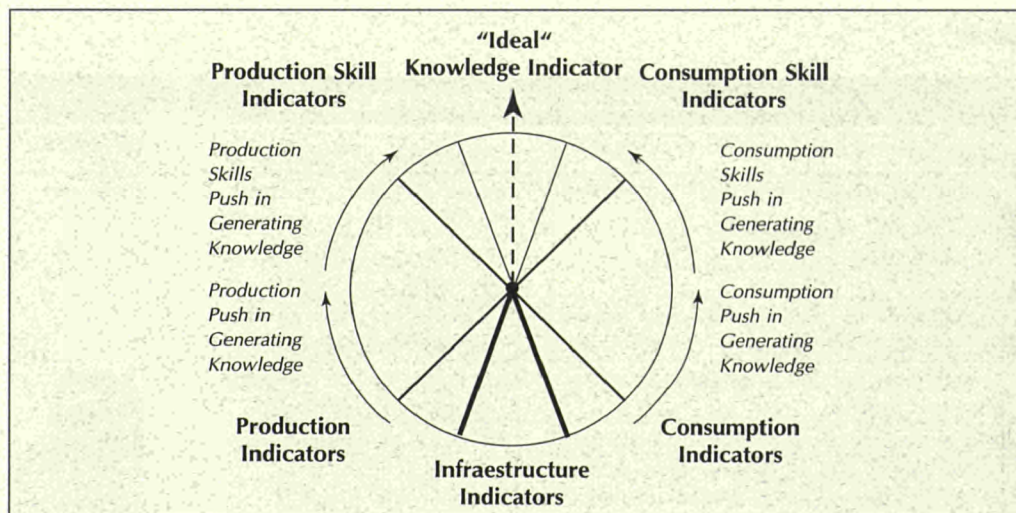
A key issue to be emphasized in Figure 1 is the potential for 'imbalance' between production and consumption abilities. Supporting actions promoting the development of sustainable society does not necessarily entail increasing productive

output, but it does require a means of 'adapting' and 'customizing' imported technologies to local conditions. In the absence of local production, greater attention must be focused on the processes supporting more effective use of available technologies. Effective use is particularly important at a social level, where effective mobilization of technologies for educational and political development is unlikely to occur without explicit promotional policies. It is generally believed that information society developments are environmentally friendly, offering the potential of substituting information resources for physical resources. For this potential to be realized, however, access must be sufficiently widespread to allow this substitution.

How Indicators Can Help Policy Makers

Identifying policy directions that are relevant for enhancing information society developments requires a comparative perspective. Learning from the experience of others will play a central role in this process. In general, it is not

Figure 1. Relationships between skills, production and use



Source: Mansell and Wehn (1998)

appropriate to attempt to transfer institutions or initiatives from areas with dramatically different capabilities. The INEXSK approach provides a method for identifying *which countries* policy makers should study in their efforts to craft appropriate policy. It also suggests ways to identify *key bottlenecks* that need to be alleviated to replicate experiences from other countries that are regarded as successful.

The indicator holds a message for policy makers. There is no single pathway to the information society. Targeted policies designed to strengthen skills and production or consumption capabilities will interact with the particular strengths and weaknesses that exist in each of these countries or in any given region. The investment priorities for entry into the information society are likely to differ considerably in each case. The important message for policy makers is that simply promoting investment in telecommunication infrastructure, for example, will have little effect unless the impact of this investment is considered together with other initiatives with respect to skills development.

A number of possible combinations of infrastructure, experience, and skills can provide a foundation for information society development. Clearly progress will depend upon the tensions and opportunities created by investment strategies and policies as a result of their interaction with the cultures and different modes of social organization within a region. This brings us to the second major lesson to be drawn from the UNCSTD work. Coordination of initiatives for information society policy across government departments and between stakeholders in the private sector and citizens is essential to reaping the potential social and economic benefits of information and communication technologies.

Example Case

Social cohesion and economic development depend increasingly on the capacity of new applications of information and communication technologies to serve social and economic interests. Investment in the technical infrastructure must occur in parallel with investment in social capabilities including generic skills and technical knowledge. This implies new policy approaches for education, job creation, cultural expression, the formation of community and regional networks, and market stimulation and development.

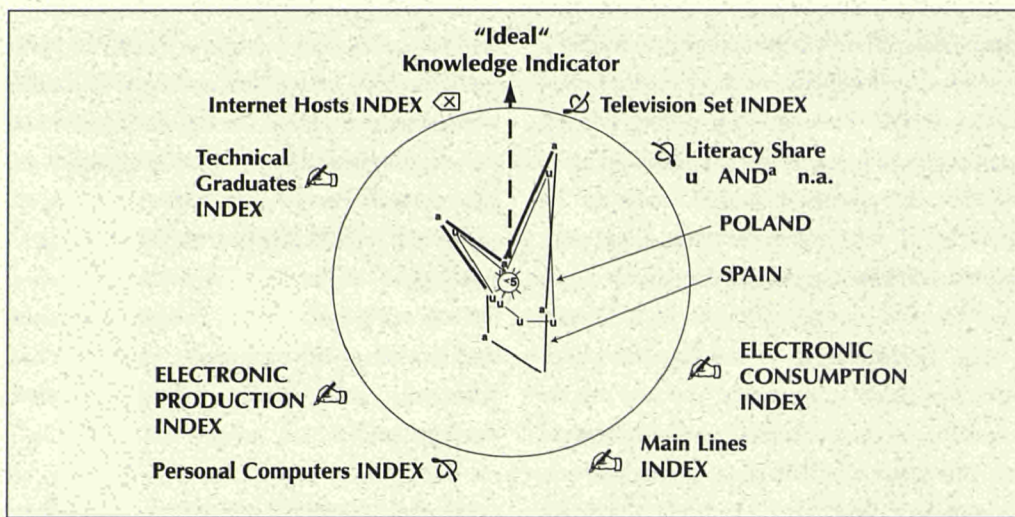
Success depends on factors including continuous investment in the technological and social infrastructure; in organizational change and flexibility to enable learning; and in the build up of capabilities to combine local experience with new applications that may have been developed initially for the core areas of Europe. Learning how to reconfigure existing technological and social capabilities and to restructure institutional arrangements to create incentives for continuous learning is the most crucial asset for effective information society policies.

UNCSTD's assessment of worldwide experience showed that it is essential to ensure that investment strategies that are encouraged and promoted by policy makers lead to the accumulation of the skills needed to modify technical applications to support the goals of localities and regions. If this capability-building process is not undertaken effectively, the full benefits of the new applications are not likely to be achieved. In some cases, the results may be negative for local economies in the Less Favoured Regions. The coordination problems are substantial. However, experience shows that when major efforts are made to improve co-ordination and when policy initiatives are integrated within government departments and

Progress will depend upon the tensions and opportunities created by investment strategies and policies as a result of their interaction with the cultures and different modes of social organization within a region

Learning how to reconfigure existing technological and social capabilities and to restructure institutional arrangements to create incentives for continuous learning is the most crucial asset for effective information society policies

Figure 2. Poland and Spain footprints



Source: Mansell and Wehn (1998), the INEXSK data are from ITU, UNESCO and Elsevier sources for 1995.

For the indicators in the 'footprint', the position of each country is shown relative a country that has achieved substantial performance and is taken to represent 100 or the outside of the circle

Despite uncertainty about the best mix of investment in infrastructure and skills and capabilities, it is clear that new kinds of specialized information and communication technology-related and generalized learning skills are essential to participation in the workforce and in civil society

private sector organizations, given resources and a high priority, then benefits can be expected.

Figure 2 illustrates the application of this framework to two countries in Europe, Poland and Spain². For the indicators in the 'footprint', the position of each country is shown relative to a country that has achieved substantial performance and is taken to represent 100 or the outside of the circle. The footprint provides a 'map' of the combinations of features within each of the countries and a basis for comparison with other countries that are performing well on these indicators.

For example, in 1995 both Spain and Poland had approximately 50% of the number of technical graduates produced by The Netherlands, the country taken as '100' which therefore forms the outer boundary of the circle. Both countries had a very low number of Internet hosts as compared to the benchmark country selected (Denmark) but the penetration of television sets was approaching that of the United

Kingdom. Spain and Poland differ, however, with respect to their relative performance on the production of advanced information and communication technologies, with Spain performing better (relative to Ireland, the country taken as 100). A similar relationship exists for personal computer penetration. Poland is better on consumption related indicators than in other areas, but not as good as Spain. This suggests that capabilities for using these technologies and services, i.e. penetration of telephony and consumption of electronics, information technology and data processing services can be strengthened and encouraged.

For the Less Favoured Regions of Europe, despite uncertainty about the best mix of investment in infrastructure and skills and capabilities, it is clear that new kinds of specialized information and communication technology-related and generalized learning skills are essential to participation in the workforce and in civil society. Without major efforts to invest in new skills, equipment, and organizational

change, the social and economic potential of the information society will not be realized. Among the most essential priorities for policy makers, the UNCSTD work singled out the following areas.

- **Capabilities for using information and communication technologies are paramount**

When investments in technical infrastructure and skills and human capabilities cannot be undertaken at the same time because of limited financial resources, investment in skills and the human aspects should receive a higher priority.

- **Applications must be integrated with local and regional social and economic goals**


Today's existing regional inequalities will be replicated if new applications are not consistent with the distinctive cultures, organizational styles, political apparatuses and economies of regions.

- **New measurement techniques and indicators are needed to guide policy makers**

There is an urgent need for new measurement techniques and indicators to monitor linkages between investment and changes in the skills base, the accumulation of experience in using information and communication technologies, and other selected features of economic and social activities related to the European information society. Policy initiatives at the national or European Union level to develop new indicators need to take the special features of the Less Favoured Regions into account if the results are to provide useful guidelines for policy makers.

Conclusion

New indicators of progress toward the European information society that reflect local, regional as well as national developments are needed urgently to provide an improved basis for assessing priorities for policy action. Useful indicators will need to draw upon easily accessible data sources and composite indicators must be constructed that relate developments in both the capabilities to produce and to consume or use new information and communication technology applications. This means that indicators of technology diffusion must be related to indicators of strengths or weaknesses in the skills base. Although there is no 'ideal' indicator of information society or knowledge-based development, this paper illustrates one approach that can be applied to give policy makers better insight into how their regions are performing.

Information-society related applications of new technology are often discussed as if a single form of 'best practice' for public services and businesses is likely to emerge. Here we have drawn attention to distinct patterns of information society development and to the major importance of coordinated policy initiatives that cut across the technological, organizational and social policy initiatives. The greatest challenge to decision makers is to create and implement policy frameworks that will encourage, support and mobilize people's capacities to use the new applications effectively in response to their own local and regional conditions. 

About the authors

Robin Mansell is Professor of Information and Communication Technology Policy at SPRU where she co-directs the Information, Networks & Knowledge research centre. Her research focuses on the social and economic implications of advanced technologies and institutional innovation processes in both industrialized and developing countries. She received her PhD from Simon Fraser University in Canada, worked for the OECD before joining SPRU and is the author of a large number of scholarly books and papers as well as policy reports.

About the authors**W. Edward Steinmueller**

is Professor of the Economics of Technical Change and Innovation at SPRU where he co-directs the Information, Networks & Knowledge research centre and is responsible for PhD student admissions. His research focuses on competitive market analysis involving complex technological products where issues of market definition and vertical market arrangements are important.

He received his PhD from Stanford University where he was Senior Research Associate, Center for Economic Policy Research, before taking up a Professorial post at MERIT, University of Maastricht in 1994 and moving to SPRU in 1997.

Uta Wehn is a doctoral student at SPRU. Her research focuses on the application of information and communication technologies in developing countries with a particular focus on Geographical Information Systems and the incentives for information sharing. She worked as a Researcher at SPRU where she co-edited a major report on Information Technologies for Sustainable Development for the UN Commission on Science and Technology Policy for Development. She completed her MSc (1996) at SPRU in Science and Technology Policy and was the winner of a major prize for her Master's dissertation.

Keywords

knowledge capabilities, information society indicators, benchmarking, less favoured regions, regional development

Notes

1- The full results of the Commission's work are published in UNCSTD (1997) 'Report of the Working Group on Information and Communication Technologies for Development', prepared for the 3rd Session, Geneva, 12 May, item n°. E/CN.16/1997.4, 7 March; R. Mansell and U. Wehn (eds) (1998) *Knowledge Societies: Information Technology for Sustainable Development*, Oxford University Press. A summary in English, French and Spanish is published as Credé, A. and Mansell, R. (1998) *Knowledge Societies ... in a Nutshell: Information Technology for Sustainable Development*. Ottawa: International Development Research Centre.

2- At the centre of the diagram, the value of each of the indices is zero and at the boundary of the circle the value is 100. The country taken as 100 for Personal Computers is New Zealand, for Main telephone lines is Sweden, for Electronics Production and Consumption is Ireland, for Technical Graduates is The Netherlands, for Internet Hosts is Denmark, and for Television sets is the United Kingdom. Literacy share is omitted in this footprint. In the centre of the diagram there is a small circle which is used as a means of graphing very low values (that is, less than five out of 100). See Mansell and Wehn, op cit. chapter 2 by Steinmueller, for a detailed methodological description.

References

- UNCSTD (1997) *Report of the Working Group on Information and Communication Technologies for Development*, prepared for the 3rd Session, Geneva, 12 May, item no. E/CN.16/1997.4, 7 March.
- Mansell, R., and Wehn, U., (eds) *Knowledge Societies: Information Technology for Sustainable Development*, Oxford University Press, 1998.

Contacts

Robin Mansell, SPRU

Tel.: +34 1273 678 165, Fax: +34 1273 685 865, E-mail: r.e.mansell@sussex.ac.uk

W. Edward Steinmueller, SPRU

Tel.: +34 1273 678 165, Fax: +34 1273 685 865, E-mail: w.e.steinmueller@sussex.ac.uk

Uta Wehn, SPRU

Tel.: +34 1273 678 165, Fax: +34 1273 685 865, E-mail: u.w.c.wehn@sussex.ac.uk

Sustainable Information Society Policies in Asia: Standing firm despite financial turmoil

Erik Bohlin, *IPTS*, with Izumi Aizu, *ANR*, T.H. Chowdary, *Center for Telecom Management & Studies*, Li Xiaodong, *Development Research Center of the State Council*, Hajime Oniki, *Osaka-Gakuin University*

Issue: So far the financial crisis in Asia seems to have had less of an impact on investments in information and communication technologies (ICTs) than in other sectors in key countries in the region. Expectations among Asian countries for long-term growth based on the Information Society remain strong though. Two countries that aim to become centres of growth in the 21st century – China and India – are looked at in more detail.

Relevance: The building of an Information Society rests on deeper foundations than short-term financial challenges, since it promises to be a core organizing and growth principle for future development. Crucially, ICTs provide some opportunities to deal with the increasing environmental challenges. The way this is addressed by economies likely to carry weight in the next century – such as China and India – can provide useful insights to European policy makers.

The Asian Financial Crisis

In the second half of the 1980s, most of the East Asian countries were enjoying continuous expansion of trade, production, and investment. One of the reasons for this expansion was the domestic boom in the stock and property markets in Japan. The bubble suddenly burst in the early 1990s, and Japan sank into a deep recession. This is believed to have triggered recessions in East Asian countries, through reduction of imports and the tightening of financial conditions. In the immediate aftermath of the initial financial downward trend, starting with the devaluation of Thailand's

currency in July 1997, data shows that the industrial sectors which have taken the hardest blows are real-estate development, construction, bank and financial services, followed by manufacturing for consumer goods such as automobiles and electrical appliances, retail, and heavy machinery industries.

What is taking place in the East Asian region is a matter of much debate, and this will probably continue to be the case. Explanations emphasize institutional, political, cultural and economic factors. As regards economic factors, there was massive over-investment during the boom in the second half of the 1980s, which brought about an

The events leading to the Asian financial crisis have been the subject of much debate

Japan's long-term future depends on its ability to resolve its structural problems

The figures show that the crisis has had some effect in the short term on the ICT sector in Asia

overvaluation of investment funds with high interest rates and overvaluation of currency, i.e. a high exchange rate against the US dollar. This overvaluation helped bring about the recent crisis and the concomitant exchange rate (over) correction.

The key country in any future wave of financial distress and recovery is Japan. Presently, Japan faces two short-term problems and one long term problem. One of the short-term problems is insufficient aggregate demand and deep recession. The other short-term problem is the shaky banking system and the amount of bad debt. In the medium term, however, the problems of bad debt and demand will be "solved" gradually as a consequence of the expansionary policy that the government is promoting, although inflation and an increase in public debt will occur instead. The long-run problem that Japan faces is far more difficult to solve. The Japanese system suited the needs of the economy during the recovery and "catching-up" period in the 1960s and 1970s, and it generated strong manufacturing sectors. In order for Japan to continue growing in the future it needs to develop comparative advantage in sectors other than manufacturing. Information and communications technologies (ICT) are obvious candidates, but it does not appear that Japan has developed comparative advantage in these sectors, nor is it predicted that it will develop it in the near future. The fate of the Japanese economy in the long run depends on whether Japan's long-term structural problems can be solved.

Impact on ICT investments: The short term

In the initial phase of the crisis, investments in information and communications technology (ICT) were not so much affected in Asia. The Malaysian

government expected its information technology (IT) industry to achieve 14.4% growth in 1998 in its budget plan published in October 1997. The Computer Industry Association of Malaysia (PIKOM) also projected 20% growth earlier in 1997, but modified that figure to around 10% in December 1997. This still looked too optimistic to observers, and thus in January IDC (International Data Corporation, a consulting firm) changed its forecast for Malaysian IT market growth in 1998 from its previous figure of 16.5% to 5.7%.

The actual results are less encouraging – see Table 1. As a whole, the Asia Pacific PC market (excluding Japan) recorded a 4.8% decline. In Japan, PC sales during 1998 showed a sign of recovery. In the first two quarters of 1998, the PC sales level continued to decline; but in the third quarter, from July to September, it recorded a 9% rise over the same period last year. It was spurred by the introduction of the new Windows 98 operating system, as well as newly introduced slim and small-sized notebook computers.

Local Area Network (LAN) and network business seemed to do better than the overall IT and PC market in Asia. In spite of the economic downturn, orders to install corporate networks have remained stable in the first quarter of 1998 (Table 2).

However, Asia's LAN markets finally showed the impact of the economic troubles in the second quarter. According to the IDC survey, an overall 12.6% decline in revenue was recorded for LAN markets in Asia (excluding Japan) in the second quarter of 1998 as compared with the same quarter of the previous year. Compared to the first quarter, the second quarter saw a decline of 10.1% in revenue terms, too. With the exception of China, Australia and India, all other markets showed negative growth rates in the second quarter.



Table 1

Asia Pacific (Except Japan) PC Sales in Second Quarter 1998 (Thousands of Units)					
Country	Q2-1997	Q1-1998	Q2-1998	Q2-1998 Q2-1997	Q2-1998 Q1-1998
Austria	413	391	462	12.0%	18.3%
Hong Kong	96	99	90	-6.2%	-9.0%
India	118	200	164	38.5%	-17.9%
Indonesia	125	21	12	-90.2%	-42.1%
Korea	460	281	275	-40.3%	-2.4%
Malaysia	112	64	78	-30.1%	21.5%
New Zealand	60	54	62	3.3%	15.3%
Philippines	55	39	37	-33.0%	-4.1%
China	776	806	994	28.0%	23.2%
Singapore	102	82	82	-19.2%	-0.5%
Taiwan	158	152	163	3.0%	7.4%
Thailand	93	42	39	-57.9%	-7.0%
Rest of Asia/Pacific	107	73	90	-15.8%	22.6%
Grand Total	2676	2305	2548	-4.8%	10.5%

Source: International Data Corporation

Table 2

Asia Pacific LAN Market in 1998 (US \$ million)		
Country	Q1-1998	Q1-1998 Q1-1997
China	151.52	68%
Australia	133.20	21%
Korea	65.67	-43%
Taiwan	50.98	17%
Hong Kong	41.30	10%
Singapore	38.16	-8%
India	23.67	28%
Malaysia	21.16	-22%
New Zealand	11.63	12%
Philippines	9.31	-14%
Thailand	8.16	-52%
Indonesia	6.80	-45%
Total	561.55	5%

Source: International Data Corporation

Significantly, despite the current recession in parts of Asia the IT industries, and particularly the Internet market, are still growing in the region.

The Information Society has been given a key role in both China and India as a part of their strategy to play a more important role in the 21st century.

China has also used information technology to improve the environment

The Indian government has set itself the goal of becoming an IT superpower by 2008

India also realizes that IT is a relatively environmentally-friendly industry and that it can gain leadership in this area because India possesses the third largest pool of science and technology personnel in the world

The Internet and Intranet market seems the least affected sector within the IT industry. Access Media International (AMI) reported that the number of Internet users in Asia will continue to grow, reaching 22 million in 1998, 34 million in 1999, and 44 million in 2000, doubling in 2 years. IDC also expects Internet users to grow by an annual rate of 63% from 1995 to 2001. Generally, Internet technology deployments are prioritized in most developing markets in Asia Pacific.

Fundamentals of the Asian Information Society

The future development of the Information Society is critical for both Japan and the rest of Asia. Fortunately, despite the current recession among many East Asian countries, the IT industries, and particularly the Internet market have not been heavily impacted. This is because IT's current state of development appears to place it at the middle of an "S-shaped" diffusion curve, indicating inherent potential for very rapid

Table 3

Asian Information Society Initiatives				
Country	Launching Time	NII Initiatives/ Time Frame	Steering Agency	Investment (billion US\$)
Singapore	April 1992	IT 2000-fibre to building/full-service cable network by 2005	National Computer Board	2.65
Taiwan, R.O.C.	August 1994	NII 2005-Broadband Infrastructure	NII Steering Committee	10
South Korea	1994	Korean Information Infrastructure (KII)- Broadband infrastructure installed by 2010	Ministry of Information and Communications	57.9
Japan	May 1994	National broadband Infrastructure by 2010	Telecommunications Council of the Ministry of Posts and Telecommunications (MPT)	330-550
Thailand	1995, IT year	IT 2000-Broadband access by 2002	National IT Committee	18
Malaysia	February 1991	Malaysian Information Superhighway-Fibre to the home by 2020	Ministry of Technology	30
China	1992, 1995	China NII-Broadband net delivering over a million telephone channels by 2020	MPT, Ministry of of Electronic Industries, etc.	200

Source: Wang, 1999

growth. The Internet may have just entered this growth stage. On a more fundamental level, since the early 1990s the Information Society has been targeted as central for future growth, exemplified by the wide range of initiatives – see Table 3. The early initiatives have been reformulated over time away from a single focus on installing fibre optic links to households, towards more general efforts to promote a viable information infrastructure. Liberalization and increased competition are increasingly seen as a critical vehicle to realize policy goals.

What, then, are some conditions for a viable Asian Information Society in the 21st century?¹ Primary challenges range from lack of qualified human resources to choice of proper technological architecture against the background of an extremely rapid pace of technology innovations showcased in Internet, to political control of telecommunications carriers and contents of the services, and significantly, viable corporate strategies. As Wang (1999) has shown, investments in science and technology capabilities have been a fundamental factor in achieving growth with ICT investments in Taiwan. Higher education is certainly emphasized in the advanced Asian economies, and there are arguably other institutional considerations of critical importance as well. Social capital and institutional arrangements are increasingly emphasized as central variables for growth, rather than technology per se.

The Case of China and India

In the context of the Asian financial crisis and the problems being faced by the Japanese economy highlighted at the beginning of the article, China and India are two particularly interested cases. They were not affected as badly by the crisis as much of the rest of the region, and both hope to play a leading role in the 21st

century. In particular, Information Society policies are central to both countries, and remain firm. The environmental challenges faced by these countries underscore the need to develop the Information Society.

In China, promotion of the Information Society has become a fundamental aspect of the modernization plans. The first long-term programme was issued in China's 9th 5-year plan and passed by the fourth session of the 8th People's Standard Congress in 1996. The programme was summarized as:

"The application of modern electronic information technology will result in significant progress in the field of national economy and society; the diffusion of information technology will promote advances in production, working and living conditions; the national information infrastructure (NII) will be primarily be supported by wide-band ISDN technology; and the national economic informatization level will be remarkably enhanced²".

To realize these goals, China has taken measures to promote ICT application in recent years, focusing on developing the information industry and strengthening traditional industries by using information technology, broadband networks, etc. Recently, the previous Ministry of Electronics Industries, the Ministry of Posts and Telecommunications with parts of the Ministry of Broadcasting, Film and Television, have merged into a new ministry, Ministry of Information Industries (MII) in order to reap the benefits of the converging ICT field. China is starting to allow competition in telecommunications, and it has engaged into a massive program of investments in the information infrastructure.

Moreover, since there are increasing concerns in China about environmental pollution (China has some of the worst polluted cities in the

About the authors

Erik Bohlin (Ph.D) is currently Visiting Scholar at the IPTS, and previously he has been a Visiting Scholar at Osaka University (1994), Osaka, Keio University (1997), Tokyo, and East-West Center (1997), Honolulu. He has also worked at the School of Technology Management and Economics at Chalmers University of Technology, Gothenburg. He has published in a number of areas relating to the Information Society but also in the general field of investment decision-making. He is a member of the Scientific Advisory Boards of *Communications and Strategies, Info and Telecommunications Policy*, and he holds the Publications Chair of the International Telecommunications Society (ITS).

Izumi Aizu is now principal of the Asia Network Research (ANR), Kuala Lumpur. He has been active in promoting information networking: in 1986 he co-founded the Institute of Networking Design in Tokyo, between 1987-1992 he served as Secretary General of the Japanese Networking Forum, in 1990 he organized the first Hyper Network Conference and has contributed extensively to the Hyper Network Society in Japan. He is currently Secretary General of the Asia Pacific Internet Society. He has published extensively in Japanese and contributed to the WIRED magazine. He received David Rodale Award from Electronic Networking Association in 1988; Plaque of Appreciation from EMPAL (Electronic Mail Pal) of Korea in 1990; and Award of Excellence from Telecommunications Advancement Foundation in Japan, and Best Author in 1996 by Japan's Information Processing Society Journal.

About the authors

Hajime Oniki (Ph.D.) is a professor at Department of Economics, Osaka-Gakuin University, Osaka, Japan. He conducts his research mainly in economics of information and communication. He has served as editor of *International Economic Review*; he has been a member of the editorial board of *Information Economics and Policy*, *Economics of Innovation and New Technology*, and *Telecommunications Policy*. He also served as a committee member of the Japanese governments including Ministry of Posts and Telecommunications, Ministry of Foreign Affairs, and the Economic Planning Agency.

Li Xiaodong (Ph.D) is Associate Researcher of Development Research Center of the State Council which is the key think-tank of Peoples Republic of China. He is also a member of the Chinese Economist Society, Washington DC; an advisor of CIED (Center for Information Infrastructure and Economic Development) of Chinese Academy of Social Science, Beijing; senior member of Chinese Technical Economics Association, Beijing; and recently research stay at the Center for Strategic and International Studies (CSIS), Washington, D.C. He has written a many papers and articles on China's information technology, industry and informatization. He continues to do research on the ICT field, especially on Chinese and international telecommunications, e-commerce and information industry development in the Development Research Center of the State Council.

world), policies have been formulated to promote information technology to improve the environment. For instance, it is reported that 50% of medium-sized cities have implemented computer control for running water, saving about 1.6 billion tons of water. Moreover, information technology is claimed to have increased the energy output efficiency by 4.7% per year between 1980-1995. Sustainability concerns has reinforced the drive for the Information Society.

Building the Information Society is central to India's vision of the future as well. This has been emphasized recently by the Federal (Union) government which has promoted the goal of making India an IT "super-power", by the year 2008. A National Task Force on Information Technology and Software Development (NTFIT & SD) has submitted a series of recommendations and action programmes all of which have been accepted by the Union Government and are being implemented right away. Among others, access to, and use of, Internet is seen to be essential for the Indian people and society, and the use of information and knowledge is seen as a strategic resource. To this end, all the nearly 100,000 high schools and 10,000 colleges in the country are to be equipped with PCs by the government on a large scale – 1 PC per 10 students in high schools and one PC for five students in colleges.

Moreover, and indicatively, in one of its states, Andhra Pradesh (population 75 million; area 310,000 sq km in south-central India), produced a document VISION 2020 sketching a vision of what the state and people would be in terms of human, economic and environmental development in the year 2020. The Andhra Pradesh State Government has decided to invest extensively as the largest spender in information and communications technologies (ICTs) and use them for efficient economic and effective

governance; for rapid extension and improvement of the quality of education; for delivering primary health awareness and care and to make available tele-medicine from the expertise concentrated in the cities to rural and remote areas; for banking, and commerce; and for public discourse to involve and empower people to govern.

India also realizes that IT is a relatively environmentally-friendly industry and that it can gain leadership in this area because the country possesses the third largest pool of science and technology personnel in the world. (India is educating over 50,000 information technology professionals a year.) For example, in order to decongest the cities, a new planning principle based upon the use of IT has been pursued in the state of Andhra Pradesh involving the construction of beltways linked by fibre optics. Software companies are being encouraged to locate along the new beltway in the hope of generating local employment and boosting the rural economy, although the (positive and negative) US experience with this kind of development needs to be kept in mind in this context.


Conclusions

The building of an Information Society (IS) is the one of the most critical aspects in the creation of well-being in the next century. Finding a path toward an Information Society that builds on the particular characteristics and competitiveness of a particular region will be germane to its future progress.

Short-term financial turmoil will not change these fundamentals. If the financial distress persist in the Asian region, the rate of investments in ICT will be impacted – as they already have to some extent –but the direction

of investment activity will not. Rather, policies need to be even more focussed on what will contribute to future growth.

The ambitious policies being implemented in India and China in order to attain global importance through the information society will make them interesting cases to watch over the

coming years. Moreover, there is a growing recognition in these countries that the Information Society can mitigate the environmental challenges, promote social cohesion, and infuse growth in their economies. Achieving a sustainable information society has been recognized by both China and India as a prime strategic goal for the next century. 

Keywords

financial crisis, Information Society, Asia, short-termism, sustainability

Notes

- 1- An extensive treatment of the future of the Information Society in East Asia is given in Bohlin et al (1999).
- 2- As quoted in "The 9th 5-year plan and long-range objective outline in 2010 of China's national and economic development", passed by the 4th session of the 8th People's Standard Congress in 1996.

References

- Bohlin, E., Aizu, I., Oniki, H., (1999), Special Issue on Convergence and Development in East Asia, Telecommunications Policy, Vol. 23, 1999.
- Wang, E., (1999), *The Impact of ICT on Taiwan's Economic Development*, in Special Issue on Convergence and Development in East Asia, Telecommunications Policy, Vol. 23, 1999.

Contacts

Erik Bohlin, Visting Scientist, IPTS, Seville, and Assistant Professor, School of Technology Management & Economics, Chalmers University of Technology, Gothenburg

Tel.: +34 954 488 444, +46 317 721 205, Fax: +34 954 488 326, +46 317 721 237

E-mail: Erik.Bohlin@jrc.es, erbo@indorg.chalmers.se

Izumi Aizu, Principal, Asia Network Research (ANR), Kuala Lumpur

Tel.: +60 37 808 738, Fax: +60 37 810 590, E-mail: izumi@anr.org

T H Chowdary, Director, Center for Telecom Management & Studies, Hyderabad

Tel.: +91(40) 784 6137/784 9966, Fax: +91 (40) 784 0058/781 4520, E-mail: thc@satyam.com

Li Xiaodong, Research Associate, Development Research Center of the State Council, Beijing

Tel.: +86 106 523 1226, Fax: +86 106 523 6060, E-mail: xli@drc.gov.cn

Hajime Oniki, Professor, Osaka-Gakuin University, Osaka

Tel.: +81 668 764 512, Fax: +81 668 764 512, E-mail: oniki@iser.osaka-u.ac.jp

About the authors

T.H. Chowdary is founder and director of the Center for Telecom Management & Studies, Hyderabad. He is Information Technology Adviser of the Govt of Andhra Pradesh has drafted its Information Technology VISION – 2020. He is also advising the Federal Govt of India, recently as a Member of the National Task Force on Information Technology and Software Development. He was Deputy Director General in the Department of Telecoms of the Govt of India. He was the first Chairman and Managing Director of VSNL, India's Overseas Telecom Corporation. He visited over forty countries as participant in ITU's and other international organisation's conferences as speaker, discussant, chairman and delegate. He was Governor INTELSAT, Washington and INMARSAT, London. He was UNO/ITUS Senior Expert in Guyana (1985) and Team Leader in Yemen (1990-1991), wrote the Green Paper for restructuring TELKOM, South Africa (1995).

IPTS publications

- ADEME; Perspectives de la biomasse pour l'énergie dans l'Union Européenne; EUR 17260 FR; Nov-96
- AG Consultores; Le transfert technologique dans la coopération inter-entreprises entre l'Europe et l'Afrique du Nord; Oct-95
- Aguado; Photovoltaic Energy - Technological Status and Trends Preliminary Analysis; Aug-94
- Aguado; Status and Prospective Analysis of the Photovoltaic Technology; EUR 16391 EN; Feb-96
- Allgeier (ed.); The IPTS Report; ISSN 1025-9384; Dec-95
- Bain; Research and Technical Prospects for Cork- Phase I Study; Jan-92
- Bonazzi; Euro-Mediterranean Policies and Olive Oil : Competition or JobSharing? - Agro-food technology transfers for sustainable development in the Mediterranean : a strategic approach for an environmentally sound food security; EUR 17270 EN; Sep-96
- Bonazzi; Il Mercato dei Diritti di Emissioni Inquinanti : Metodologie, stato dell'arte, Prospettive e una proposta per l'Italia; EUR 17269 IT; Oct-96
- Bonnaure; Les Autoroutes Electroniques et la Société de l'Information; Jun-94
- Bontoux, D. Papameletiou; Prospective technological study on materials/chemical-feedstock recycling and energy recovery from municipal plastics waste - Project 1.1 :Preliminary survey of current projects on chemical feedstock recycling from unsorted municipal plastics waste; Sep-94
- Bontoux, D. Papameletiou (eds.); Technology options for plastics waste management: Proceedings, Seville 20-21 November 1995; EUR 16460 EN; Apr-96
- Bontoux; Prospective technological study on materials/Chemical-feedstock recycling and energy recovery from municipal plastics waste - Project 1.1a: Preliminary survey of current projects on plastics recycling by chemolysis; May-95
- Bontoux; Survey of current projects for plastics recycling by chemolysis:Prospective technological study on materials/chemical-feedstock recycling and energy recovery from municipal plastics waste - Project i.1.a; EUR 16459 EN; Mar-96
- Bontoux; The recycling industry in the European Union : impediments and prospects; EUR 17271 EN; Dec-96
- Braganza; Market Based Instruments for Environmental Protection; Sep-92
- Braganza; Opportunities in Environmental Technology; Oct-91
- Braganza; Pollution prevention: exploiting the technical potential; May-92
- Braganza; Some technology options for dealing with environmental pollution; Jan-92
- Brossa; Prospective technological study on materials/Chemical-feedstock recycling and energy recovery from municipal plastics waste - Project 1.3: Preliminary survey of current projects on energy recovery from municipal plastics waste; May-95
- Cahill; Industrial Efficiency - A Literature Synthesis; EUR 16447 EN; Mar-96
- Canarelli; Application of Genetic Algorithms to Innovation-Related Issues; EUR 15821 EN; Jan-94
- Canarelli; Exploratory Study of the Technologies to Lessen Urban Transportation Drawbacks.; EUR 15947 EN; Jul-94
- Canarelli; Knowledge Extraction from Data Using Genetic Algorithms; EUR 16446 EN; Jan-96
- Canarelli; Neural Networks: a Tool for Analysing Real World Complex Systems; EUR 16445 EN; Jan-96
- Canarelli; The Method of Fuzzy Scenarios: Principle and Application to the Future of Congestion in Urban Centres; EUR 16444 EN; Jan-96
- Canarelli; Use of Genetic Algorithms as a Tool for Prospective Studies with Application to the Assessment of the Future of Urban Transport; EUR 16296 EN; Jan-95
- Castells; Input-Output Analysis as a forecasting tool for the Study of urban transport and Environment; EUR 15604 EN; Jan-94
- Cepeda, A.Soria; Energy Demand and CO₂ Emissions from the World Transport Sector : Past Evidence and Forecasts; EUR 17256 EN; Sep-96

- CEST; La coopération scientifique et technique dans la perspective de la coopération et de la sécurité euro-méditerranéenne; May-95
- De la Torre , M. González (eds.); Annual Report 1995. Institute for Prospective Technological Studies ; EUR 16405; May-96
- Demicheli, L. Bontoux; Survey on Current Valorization of By-Products from the Olive Oil Industry; EUR 16466 EN; Sep-96
- Fahrenkrog, D. Kyriakou; New technologies and employment: Highlights of an ongoing Debate; EUR 16458 EN; May-96
- Gameson, P. DiPietrogiacomio, P. Sørup (eds.); European research towards the XXIst century : IPTS workshop Sevilla, 29-30, August 1996; EUR 17257 EN; Nov-96
- Gómez*, M.L. Borra*, M. Aguado (eds.); Conclusions of the Forum "European Enterprises facing technical and legal barriers to renewable energy", Seville, 23/24 November 1995 (Organised by SODEAN, UNESCO, IPTS, ECD, BESEL; EUR 16390 EN; Mar-96
- Group of Bertino S.Gomez y Paloma; East-West Agro-Food Systems Toward the Third Millennium; ART 43171; Aug-96
- Group CM International; Technology Gaps & Sustainable Regional Development: an exploratory study - case of the agri-food sector in Andalucía, Ireland, South Brandenburg and Central Macedonia; EUR 17278; Nov-96
- Hardy; Politiques de développement territorial et investissements étrangers dans les pays du Maghreb; EUR 16419 FR; Apr-96
- Harvey (CEST); AGILE Manufacturing - A Scoping Study; EUR 16469 EN; Nov-96
- Heinemeier; On the scope of qualitative structural input-output analysis in the conceptualising of a technology based development strategy: the example of the Seville Technology Park; EUR 16303 EN; Jan-95
- Heinemeier; Transnational co-operation between small and medium-sized enterprises in the European Union: Exploration of the regional pattern in BRE and BC-NET Activities; EUR 16300 EN; Jan-95
- Henry; Climate Change Research and Policy: Updates (A Periodic Survey: N°5); Oct-93
- Henry; Climate Change Research and Policy: Updates (A Periodic Survey: N°4); Jan-93
- Henry; Climate Change Research and Policy: Updates (A Periodic Survey: N°2); Nov-91
- Henry; Climate Change Research and Policy: Updates (A periodic survey: N°1); May-91
- Henry; Climate Change Research and Policy: Updates (A Periodic Survey: N°6); Oct-94
- Henry; Climate Change Research and Policy: Updates (A Periodic Survey: N°3); Jun-92
- Henry; Science and the Greenhouse Effect; Jun-90
- Kleinknecht, D. Bain; New Concepts in Innovation Output Measurement; ISBN 0 333 58818 5; Sep-93
- Krebs ; A Prospective Assessment on the Role of Renewable Energies in Response to the CO₂ Problem.; EUR 16334 EN; Jan-92
- Krebs, M. Rogers, P. Pearson; A Critical Literature Survey on the Prospects for Thermonuclear Fusion Energy; Aug-90
- Krebs; Microgravity: A Future for the Space Industry? (Status and Trends); EUR 16344 EN; Sep-91
- Krol; Developing an environmental management strategy;; Mar-94
- Kyriakou; Sustainable Development: Towards a Synthesis Sustainability Accounting - a support document for preparation of the conference "Taking Nature into Account", Brussels, 31 May- 1 June 1995; EUR 16297 EN; Dec-94
- Lanza, C. Zanantoni; Nuclear Energy-Reprocessing and Recycling Are Key Issues; EUR 16319 EN; Jul-91
- Leone; Prospective technological study on materials/Chemical-feedstock recycling and energy recovery from municipal plastics waste -Project I.4a: Preliminary survey of current legislative activity in plastics waste management; Jun-95
- Leone; Survey of current legislative activity in plastic waste management (Focus on Economic instruments) - Second Interim report -; EUR 16467 EN; Oct-96
- Maghiros; Q2 Information System - Progress Report; Sep-92
- Maghiros; R&D Projects - Information Systems (Working Group on the harmonisation of data bases on research in progress - Brussels, 16.9.92); Sep-92
- Martin; Process of Innovation for Advanced Materials; Sep-91
- Mendoza; The Geographic Information Systems (GIS) for Urban and Prospective Research; Sep-94
- Moncada Paternò Castello; Studio di Pre-fattibilità di un "Agenzia Mediterranea in Sicilia per la Promozione delle Energie Rinnovabili e la Gestione Efficiente dell'Acqua"; EUR 17255 IT; Nov-96

- Naegele (Co-ordinator), P. Canarelli, H. Hernández, T. Amorelli, M. Nicolai, F. Scapolo, C. Heller; The Car of the Future, The Future of the Car; EUR 17277 EN; Jun-96
- Naegele, T. Amorelli,; The future of non-ferrous metals; Jan-95
- Nicolai; Prospective technological study on materials/chemical-feedstock recycling and energy recovery from municipal plastics waste - Project I.2: Preliminary survey of current projects on mechanical recycling of municipal plastics waste; Jan-95
- Papameletiou, M. Aguado, L. Bontoux; Opportunities in Environmental Technology - Synthesis Report; Dec-93
- Papameletiou; CO₂ Removal Technologies; Dec-94
- Papameletiou; Fuel Cells - Part I and II (Final Report); EUR 16321 EN; Jan-94
- Papin; Competitivité des industries spatiales européennes Annexe 1: General Overview of Space Activities and Systems * Rapport V. Panin (Consultant); Sep-91
- Ribeiro, B. Henry; Carbon Dioxide Disposal and Storage Technologies (WP 94-001); EUR 16320 EN; Jan-95
- Ribeiro; Desalination Technology: Survey and Prospects; EUR 16434 EN; Aug-96
- Rogers; Biotechnology - Risk Analysis and Genetically Manipulated Organisms: The Japanese Regulatory System; Jun-94
- Rogers; Biotechnology: Risk assessment and genetically modified organisms; EUR 16377 EN; Dec-95
- Rogers; Brainstorming workshop on the prospective for higher electrical voltage supply systems for the future European HST network; Nov-92
- Rogers; The Environmental Business - Corporate Case Studies Case Study One - End-of-Pipe Technology (Flue Gas Desulphurisation); EUR 16322 EN; Jun-94
- Rogers; The Environmental business - Corporate case studies: Case Study Two - Waste minimisation/Cleaner technology; EUR 16376 EN; May-95
- Rogers; The Environmental Business; EUR 16324 EN; Oct-93
- Rogers; The Inter-comparison of the three main European HST electrical supply systems by simulation of the network requirements for three possible high speed lines; Sep-92
- Rogers; The Japanese Technological Response to Global Environmental Problems.; EUR 16323 EN; May-91
- Rogers; The Strategic importance of high power GTO's (gate turn off) silicon controlled rectifiers (3000 amperes plus and 3000 volts plus) for the development of the future high-speed rail network; Jun-92
- Rogers; The Technological Response to Global Environmental Problems - California; EUR 16323 EN; Sep-91
- Sorup; Sustainability Accounting - A support document for the preparation of the conference "Taking Nature into Account", Brussels, 31 May - 1 June 1995; Apr-95
- Spiewak; Strategy for Solar-Thermal Energy Research, Development and Industrial Application; EUR 17276 EN; Dec-96
- Stamm'ler Jaliff, C.A. Jonsson, A. Ljungblad; Introduction of Modern Software Technology : a Case from Swedish Industry. Bilbao 26-28 September 1996; ORA/PRO 40168; Nov-96
- Weber, G. Fahrenkrog; Sustainability and technology: A framework for discussion; EUR 16457 EN; Sep-96
- Weber, M. Nicolai; The Ethical Dimension of Technology Watch and Assessment, proceedings of a seminar on 25 March 1996 at IPTS in Seville; EUR 17279 EN; Dec-96
- Weber; Innovation diffusion and political control in the energy sector: a conceptual approach and empirical evidence from the case of cogeneration in the UK; Sep-95
- Weber; Innovation, diffusion and political control: The politics, economics and technology of cogeneration (CHP) in the UK; EUR 16443 EN; Sep-96
- Weber; Technological change and energy policy in different national contexts ; Combined Heat and Power in the UK and Germany; EUR 17280 EN; Dec-96
- Zanantoni; Emission Inventories and Atmospheric Transport Models for Inter-regional Environmental Impact Assessment; Aug-93
- Zwick; Climate change - Analysis of causes, impacts and options; EUR 16402 EN; May-96
- Zwick; Climate change research and policy: Updates (A periodic survey: no. 7); May-95
- Zwick; Climate change research and policy: Updates - no. 8; Nov-95

A B O U T T H E I P T S

The **IPTS** is one of the eight institutes of the Joint Research Centre of the EU Commission. Its remit is the observation and follow-up of technological change in its broadest sense, in order to understand better its links with economic and social change. The Institute carries out and co-ordinates research to improve our understanding of the impact of new technologies, and their relationship to their socio-economic context.

The purpose of this work is to support the decision-maker in the management of change pivotally anchored on S/T developments. In this endeavour IPTS enjoys a dual advantage: being a part of the Commission IPTS shares EU goals and priorities; on the other hand it cherishes its research institute neutrality and distance from the intricacies of actual policy-making. This combination allows the IPTS to build bridges between EU undertakings, contributing to and co-ordinating the creation of common knowledge bases at the disposal of all stake-holders. Though the work of the IPTS is mainly addressed to the Commission, it also works with decision-makers in the European Parliament, and agencies and institutions in the Member States.

The Institute's main activities, defined in close cooperation with the decision-maker are:

1. Technology Watch. This activity aims to alert European decision-makers to the social, economic and political consequences of major technological issues and trends. This is achieved through the European Science and Technology Observatory (ESTO), a European-wide network of nationally based organisations. The IPTS is the central node of ESTO, co-ordinating technology watch 'joint ventures' with the aim of better understanding technological change.

2. Technology, employment & competitiveness. Given the significance of these issues for Europe and the EU institutions, the technology-employment-competitiveness relationship is the driving force behind all IPTS activities, focusing analysis on the potential of promising technologies for job creation, economic growth and social welfare. Such analyses may be linked to specific technologies, technological sectors, or cross-sectoral issues and themes.

3. Support for policy-making. The IPTS also undertakes work to support both Commission services and other EU institutions in response to specific requests, usually as a direct contribution to decision-making and/or policy implementation. These tasks are fully integrated with, and take full advantage of on-going Technology Watch activities.

As well as collaborating directly with policy-makers in order to obtain first-hand understanding of their concerns, the IPTS draws upon sector actors' knowledge and promotes dialogue between them, whilst working in close co-operation with the scientific community so as to ensure technical accuracy. In addition to its flagship IPTS Report, the work of the IPTS is also presented in occasional prospective notes, a series of dossiers, synthesis reports and working papers.

The IPTS Report is published in the first week of every month, except for the months of January and August. It is edited in English and is currently available at a price of 50 EURO per year in four languages: English, French, German and Spanish.

S.PI.99.02



The European Science and Technology Observatory Network (ESTO):

IPTS - JRC - European Commission

W.T.C., Isla de la Cartuja s/n, E-41092, Sevilla, Spain

tel.: +34-95-448 82 97; fax: +34-95-448 82 93; e-mail: ipts_secr@jrc.es

- ADIT - Agence pour la Diffusion de l'Information Technologique - F
- CEST - Centre for Exploitation of Science and Technology - UK
- COTEC - Fundación para la Innovación Tecnológica - E
- DTU - University of Denmark, Unit of Technology Assessment - DK
- ENEA - Directorate Studies and Strategies - I
- INETI - Instituto Nacional de Engenharia e Tecnologia Industrial - P
- ITAS - Institut für Technikfolgenabschätzung und Systemanalyse - D
- NUTEK - Department of Technology Policy Studies - S
- OST - Observatoire des Sciences et des Techniques - F
- SPRU - Science Policy Research Unit - UK
- TNO - Centre for Technology and Policy Studies - NL
- VDI-TZ - Technology Centre Future Technologies Division - D
- VITO - Flemish Institute for Technology Research - B
- VTT - Group for Technology Studies - FIN

GK-AA-99-002-EN-C