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ICT Research
The policy perspective

Climate change and ICT
An environment of change

European Commission
Information Society and Media

This brochure has been produced for the Information Society Policy Link (ISPL) by the ICT Results editorial service. ISPL is an important part of the Information Society and Media Directorate-General's goal to draw clear lines between policy, policy-making and European research in the field of information and communications technology (ICT).

ISPL publications and other news are available via the website:
http://ec.europa.eu/information_society/activities/policy_link/

ICT Results is an online editorial service established on behalf of the Information Society and Media Directorate-General.

The service's main aim is to:
- raise the visibility of ICT-funded research results
- support projects' access to markets and encourage uptake of innovations
- raise awareness of European ICT programmes and activities

ICT Results website: http://cordis.europa.eu/ictresults

Policy-making in a climate of change

In this report produced for the publication series ICT Research: The Policy Perspective, we examine how information and communications technology, or ICT, can help us to monitor and prepare for climate change and take steps towards more sustainable growth.

The recently published fourth assessment report of the Intergovernmental Panel on Climate Change (IPCC) makes it quite clear that climate change is real – and its consequences will have a global impact. Over the next 50 years, climate change will probably be the single-most disruptive factor on economic growth and development, from the poorest communities in developing nations to the most technologically advanced regions.

Europe is no exception. "Nearly all European regions are anticipated to be negatively affected by some future impacts of climate change," the report summarises, "and these will pose challenges to many economic sectors. Climate change is expected to magnify regional differences in Europe's natural resources and assets."

Given such dramatic forecasts, it is unsurprising that climate change is steering policy-making at every level of European administration. It is also widely accepted that ICTs have a crucial role to play. The Action Plan for Energy Efficiency, for example, calls for "special attention to be paid to the opportunities offered by information and communication technologies". In addition, the mid-term review of the European Transport Policy for 2010 places great emphasis on the environmental benefits of intelligent transport systems, and the ICT Programme Intelligent Car flagship initiative is working towards the development of smarter, safer and cleaner vehicles.

Sustainability must start today

In fact, ICTs may be the only technologies that will enable Europe to achieve its sustainability and climate change goals while maintaining economic growth. Stiff environmental goals related to climate change have been agreed and incorporated into EU policy. For example, the renewed Sustainable Development Strategy, adopted by the European Council in June 2006, sets targets for clean energy, sustainable transport, consumption, production and the conservation and management of natural resources, among others.

The *i*2010 initiative provides a framework for how the European Union will use ICTs to meet many of these objectives. *i*2010 promotes an open and competitive digital economy, research into information and communication technologies, as well as their application to improve the quality of public and personal well-being. But all this work takes place within the context of climate change, and sustainability cuts across many of its themes.

Sustainability and "green" issues feature most prominently in the *i*2010 priority "to foster inclusion, better public services and quality of life through the use of ICT."

The ICT promise

But the use of ICTs as tools to help achieve sustainability targets – by improving energy efficiency or monitoring the environment, for example – is not necessarily where their true potential lies. Perhaps more significantly, ICTs are the bridge between two of the most important pillars of the EU: sustainable development and the Lisbon Strategy to make Europe "the most competitive and the most dynamic knowledge-based economy in the world."

ICTs offer an enticing promise: a shift from an energy intensive, highly polluting, goods-intensive economy to a more dematerialised, knowledge-based economy.

We are still a long way from realising the full potential of ICTs. A systematic effort is currently underway to document the enabling role of ICTs in various sectors to make the public and decision-makers fully aware of it. The goal is to shape policy and especially drive R&D that will use ICTs in a way that decouples economic growth from increased industrial production and energy consumption. A new initiative on ICT for sustainable growth may be shaped in this direction to coordinate this process. In this way, ICTs may help to secure for Europe a future that is freed from the damaging consequences of climate change.

Meeting the challenges

Sustainable development, what is it?

Sustainable development is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The concept is found at the heart of the EU, enshrined with the Amsterdam Treaty and expanded upon in the Strategic Development Plan.

But the impact of climate change in Europe, coupled with the growing awareness of our dependency on imported energy, has recently changed the notion of sustainability. Today, people care equally about security – and climate change and energy security are among the top priorities of the EU.

A secure future

If Europe is to prosper, to support the welfare and development of its citizens – now and well into the future – then its economic growth must be secured.

The security of **energy** supplies and production are critical to a healthy economy. This does not mean shipping in oil, gas and coal under armed guard, but ensuring that Europe has enough energy to meet demand, and clean energy to power its growth.

ICTs have an important part to play in designing and controlling more energy efficient, smarter buildings, vehicles, industrial processes and enabling a future electricity grid composed of perhaps millions of micro-generators. Home-working, videoconferencing and mobile communications technologies provide opportunities to reduce travel and paper-based office activities, thereby saving natural resources and cutting emissions.

We also want to live in an environment that is secure from **disruption caused by the impact of climate change.** ICTs play a leading role in monitoring and alert systems for adverse weather conditions, flooding, drought and forest fires. And when a disaster strikes, ICTs are increasingly in the front line, helping authorities and rescue services to coordinate their actions.

Finally, Europe is blessed with only finite resources; these could rapidly disappear if we continue to exploit them and destroy habitats unchecked. We need to secure our **natural resources**, particularly through environmental conservation and monitoring. ICTs and Earth observation can provide important tools to analyse how we are using our resources and how best to protect our water and land from irreversible degradation. Systems can also help to coordinate clean-up and conservation activities, especially across borders.

Deep sustainability

In the longer term, the mitigation of climate change and the security of Europe's future will only be possible if economic growth can be decoupled from material production and consumption. ICTs can enable new working methods and new activities at home and in society with lower impact on the environment, while at the same time ensuring that economic growth continues.

Energising research

Societal priorities, such as employment, education or social welfare, depend as much on energy as manufacturing and transportation do. Energy powers every aspect of our society. A series of EU-funded projects seek to make our energy supplies more sustainable.

Approximately 80% of Europe's energy comes from fossil fuels. As they are burned, they in turn release more than 3.8 billion tonnes of carbon dioxide (CO_2) into the atmosphere each year, around 15% of the world's entire CO_2 emissions from energy. Moreover, despite the substantial and wide-ranging impacts that climate change threatens on Europe, our consumption of energy seems insatiable. We emit more CO_2 today than we did in 1990 and the demand for energy increases by 1-2% every year.

Faced with these worrying trends, the EU has set some stiff targets to cut CO_2 emissions. The Council of Europe declared in May 2007 that it "endorses an EU objective of a 30% reduction in greenhouse gas emissions by 2020 compared to 1990 as its contribution to a global and comprehensive agreement...". The Council also said that 20% of Europe's energy should come from renewable sources by 2020, compared to the present figure of 6.5% (which includes hydro sources). An important step in this direction, the European Commission's Action Plan for Energy Efficiency aims to reduce consumption by 20%, equivalent to €60 billion per year, or the present combined energy consumption of Germany and Finland.

No one denies that these are challenging goals. To secure this future, Europe must find ways to waste less energy, curb consumption and grow its capacity in renewable and cleaner energy sources.

Getting smart about energy

ICTs have an important part to play as a key enabling technology. At one level, they can provide important command and control functions that ensure that energy-consuming activities – industrial processes, electricity generation, domestic heating, lighting and appliances – run optimally. Much energy-focused research is funded through the Intelligent Energy Europe Programme and many of these research projects specifically address the role of ICTs in making our energy supplies more sustainable.

The i2020 initiative also addresses Europe's reliance on energy. New initiatives should aim towards driving research that could decouple economic growth from energy consumption.

In terms of research, the Seventh Framework Programme (FP7) specifically recognises the importance of ICTs in driving energy efficiency. The ICT Work Programme of FP7 highlights the challenge of "mobility, environmental sustainability and energy efficiency." Advances in ICT can help to improve efficiency in energy production and use, to modernise energy networks, and to foster the emergence of innovative energy efficiency services.

ICTs can provide distributed management systems for multi-source (including renewables) and co-generation in local power grids and interactive, real-time control and trading platforms for local power grids. These technologies would allow generators to adjust their supplies dynamically to better meet energy demand and consumption patterns. Software developments and integrated data networks allow more accurate life-cycle analyses of products and processes to be conducted in order to reduce their energy use and carbon footprint.

Energy security at a glance

Energy powers our society – it keeps the lights on, the computers working, etc. It gets us to work, on holiday and provides us with plentiful food in the shops. But the EU Action Plan on Energy Efficiency sets out to cut energy consumption by 20% by 2020. A number of EU-funded projects seek to show how ICTs can help Europe meet this challenge.

Projects in action

SoDa
OLLA

Targets set by EU leaders often seem far removed from daily life, but efforts to reduce energy consumption and reduce CO_2 emissions ultimately find their place in the home or at work.

One of the most inefficient technologies around are standard light bulbs. Currently, compact fluorescent tubes (CFLs) are the state-of-the-art for lighting at home and work, but the most efficient products only emit about 15% of their power into light (standard incandescent or filament light bulbs achieve only 5%). The rest of the energy is radiated as heat – a massive waste!

A European consortium of the world's leading lighting researchers from 24 universities, research institutes and industrial groups like Osram and Philips thought they could do better. Under the **OLLA** project, they came together to create high-brightness, organic light emitting diodes (OLEDs) for ICT and next-generation lighting applications. OLEDs use an organic layer to emit light, providing greater performance for less power.

Experts believe that OLEDs could go well beyond the upper limit of 110-125 lm/W that is theoretically possible with standard discharge tubes. Because they are flat, thin and light, they could be produced – using printing processes adapted from inkjet printing technology – on plastic or flexible substrates for ICT applications or even wallpaper.

The **SoDa** project demonstrated the power of ICTs to create value from information – and directly combat climate change at the same time. SoDa links more than 20 of the world's most important sunshine databases. These databases use all sorts of high-tech tricks like satellite observation, ground monitoring and sophisticated modelling to calculate the wattage of sunlight reaching each square metre of the Earth's surface.

SoDa provides the very best quantity and quality of solar radiation data, and this has endless applications in areas as diverse as renewable energies, agriculture, building design, meteorology, materials science and even human health. And with more than 27,000 users, it is turning a profit. It is being used to help design energy-efficient buildings that are optimally sited for heating, cooling and daylight-provision. Power companies use it to find the best sites and optimal orientation for solar panels.

One Swiss company uses SoDa to monitor domestic photovoltaics: if the panel is producing less electricity than it should, given the incident radiation, the company alerts the producer that there is a fault with the panel. By simply combining data, ICTs are helping Europe to make the most of the sun as an important renewable energy source.

More information

OLLA: http://www.olla-project.org/

SoDa: http://www.soda-is.com/eng/index.html

Climate change stories on ICT Results:
http://cordis.europa.eu/ictresults/
(enter search on 'climate change', 'sustainability' and/or 'energy')

DG Information Society and Media:
http://ec.europa.eu/information_society/index_en.htm

Climate change and ICTs EU-funded research projects:
http://cordis.europa.eu/ictresults/index.cfm?section=press&tpl=search&browsescope=browse&EditorialThemes=607

FP7, ICT for Sustainable Growth:
http://cordis.europa.eu/fp7/ict/sustainable-growth/

FP7, ICT Challenge 6, Mobility, environmental sustainability and energy efficiency:
http://cordis.europa.eu/fp7/ict/programme/challenge6_en.html

ISTweb: http://cordis.europa.eu/ist/

i2010: http://ec.europa.eu/information_society/eeurope/i2010/index_en.htm

Coping with the consequences of climate change

Despite our best efforts to cut CO_2 emissions, experts think that an increase in average temperatures of at least 2° C is almost inevitable. Advances in ICTs will provide essential monitoring services for environmental risks like forest fires and floods and help to coordinate better disaster and emergency management.

Climate change is not a scary prospect for the future. It is here now, and its impact is already being felt across the globe. Our efforts to curb the consumption of fossil fuels and reduce our greenhouse gases emissions are certainly important – as they intend to stave off the most extreme scenarios of climate change.

Experts suggest that, if we meet reduction targets, then the average increase in European temperatures may be limited to around 2° C. However, even a 2° C increase will have widespread consequences, so climate change is something we will all have to adapt to.

Activities within *i*2010, which look to improve the quality of life for European citizens, play an essential role in providing a long-lasting improvement in prosperity under such conditions.

ICT at the front line of risk management

In particular, ICTs are transforming environmental monitoring and early warning systems. These systems integrate numerous data sources to provide local authorities and statutory bodies with powerful tools. They will be able to assess the state of the environment in real-time or simulate worst-case scenarios for fire, flooding or other climate-related scenarios. ICTs are an indispensable tool for planners to take precautionary measures to avert the worst consequences of inclement climate – from flood defences to urban architecture.

Climate security at a glance

Mild winters, scorching summers, heat waves, floods. Experts tell us that climate change is a reality and unpredictable and extreme weather will continue to have a massive impact on the economy and society. Can ICTs help us to be better prepared for the changes?

Despite the best possible planning, sometimes the consequences of climate change will be unavoidable. But European citizens should be well protected during a crisis. The emergency services are gradually investing in similar integrated systems to access and visualise all the relevant information when they are out in the field. ICTs enable them to coordinate action, even across borders.

Research into the use of ICTs in environmental risk management was extensively funded through the Sixth Framework Programme (FP6). Applied IST research addressing major societal and economic challenges looked at environmental monitoring via open information architectures and sensor networks. It also developed ICT-enabled management systems for emergencies and natural and man-made disasters via early warning, alert and rapidly deployable telecommunications.

"When you are managing risks or dealing with any crisis you have to deal with a lot of information, coordinating a number of data providers, service companies and contractors," is how Christian Alegre, the coordinator of the Wide Information Network for Risk Management (WIN) project puts it. "When you move between different areas of risk management it takes a little while to develop the data models, but you don't change the general structure of data or the system's functionality. Good risk management still boils down to accessing data, having a systematic workflow, integrating with data providers and issuing alerts, reports and requests for information."

FP7 builds on this significant body of research, funding projects within the *i*2010 context. With the additional support of the Competitiveness and Innovation Programme (CIP), which aims to encourage better take up of novel ICT developments, ICT research will continue to work towards an integrated information space for the environment in Europe. These multilingual, cross-boundary systems will permit seamless collaboration, data sharing, and information exchange between many organisations.

In addition, the Public Safety Communication Europe Forum (PSC Europe) was launched to help coordinating identification of user requirements, reach consensus between the stakeholders involved in the emergency/disaster/crisis chain, and achieve technology convergence.

In the future, environmental protection and disaster management will be better coordinated and ensure that European citizens and businesses get the best possible protection from the consequences of climate change.

Projects in action

WIN
ORCHESTRA
EuroClim

The **Wide Information Network for Risk Management** (WIN) project is being pilot-tested across Europe. WIN's 'info-architecture' makes it easier for users to find, visualise and combine the environmental data they need, and to facilitate workflow between different actors and service providers. "It is like a switchboard," says WIN's coordinator Christian Alegre, "to all the available data and services that might be needed to manage a risk or deal with a crisis. It helps people quickly access up-to-date information and then make and communicate good decisions."

The platform can be adapted for any sector of risk or crisis management, from fire brigades to regional flood centres. In southeast France and in the Campania region of Italy, a feasibility study is currently being conducted, in liaison with WIN, into using the platform as the core system at a regional, multi-risk management centre that covers, for example, forest fires and landslides along with coastal risks.

WIN gets all this capability because it is built on carefully researched, open source software that meets a wide range of industry and international standards, for example in geographic information systems, data structuring and storage. Data feeds that are compliant with standards are simple to integrate, but WIN also incorporates a set of "connectors" that allow users to map non-compliant data into the standard data structures on a case-by-case basis.

Flexibility and compatibility have always been high on the WIN agenda. The partners have worked closely with many other related European projects. These having included risk management research projects (e.g. ORCHESTRA), DG Enterprise support actions on data harmonisation (e.g. RISE), the DG Environment INSPIRE initiative and various projects of the European Space Agency.

While WIN provides a functional system, the **ORCHESTRA** project has developed an IT architecture that defines how proprietary IT systems can interact within such a system. "You can't expect everyone to throw away their legacy systems and invest huge resources into a common IT infrastructure," explains José Esteban who coordinates this EU-funded project. "ORCHESTRA allows all these different systems to interoperate with the minimum of investment."

Esteban describes the project as a system of systems. "What ORCHESTRA specifies is a set of IT services that is independent of any computer hardware, software, operating systems. ORCHESTRA is not limited to a particular sort of technology or system.

At the moment, web services are the main enabling technology that allows remote interoperability between different systems. But if in ten years that all changes, the ORCHESTRA architecture will still be valid. It can be applied to any IT technology."

The ORCHESTRA architecture has been used in several risk management systems, for example a project by the Joint Research Centre (JRC) of the European Commission to analyse forest fire and flood risks at a pan-European level.

From fire to ice. Whereas fire is a serious risk in the Mediterranean, climate change in the Arctic is melting ice at a dramatic rate. And what happens to ice and snow at the poles will have a direct impact on Europe's climate in the future. The **EuroClim** project is, therefore, developing ICT solutions for producing accurate observations and climate scenarios based on existing and new data from satellites and weather stations.

The research has led to a distributed information system that should be fully operational in a few years. The EuroClim partners have delved into the archives of satellite and meteorological station data for the past 25 to 30 years. They calibrate it to ensure the readings are comparable and combine it with new data to feed into a vast, distributed information storehouse on climate change in Greenland, Scandinavia and the area around the North Pole. It will soon be possible for scientists, governments, NGOs and the public in general to access detailed climate-model data and predictions, and to see how melting icecaps could affect them within the next 50 to 100 years.

The project has also served as the basis of further endeavours to monitor the cryosphere – the area of the world covered by snow and ice – on an even wider scale. Among them is EuroCryoClim, a new initiative being discussed with the European Space Agency (ESA) to develop an operational system for advanced and accurate observations of both the north and south polar-regions. In turn, that system would feed data into larger Earth monitoring initiatives, such as the Group on Earth Observations (GEO) and Europe's Global Monitoring for Environment and Security (GMES).

More information

WIN: http://www.win-eu.org/

ORCHESTRA: http://www.eu-orchestra.org/

EUROCLIM: http://euroclim.net

RISE: www.eu-rise.org

INSPIRE: http://www.ec-gis.org/inspire/

GMES: http://www.gmes.info/

Climate change stories on ICT Results:
http://cordis.europa.eu/ictresults/
(enter search on 'climate change' or 'risk management')

FP7, ICT for Sustainable Growth:
http://cordis.europa.eu/fp7/ict/sustainable-growth/

Competitiveness and Innovation Programme:
http://ec.europa.eu/cip/index_en.htm

PSC Europe: http://www.publicsafetycommunication.eu

ISTweb: http://cordis.europa.eu/ist/

Protecting the planet, preserving resources

Unless we manage our natural resources carefully, Europe risks becoming a fouled landscape. We have to clean up our act – protecting the land, the air and the sea – so that future generations can benefit from the wealth of materials that nature supplies.

It is easy to think that Europe is a relatively clean, safe place to live and work. We do not necessarily see daily the effects of deforestation or the poisoning of rivers and stream. Thanks to stringent legislation, the worst offenders of environmental crime have been dealt with severely and industry has had to clean up its act.

Europe is rich in many natural resources, including farmland, forests, fisheries and fresh water. But unless these are sustainably managed, supplies could eventually run dry. Sustainability does not just focus on excessive consumption. Pollution can destroy our natural resources too, by destroying habitats, poisoning rivers and ruining agricultural land. The loss of natural habitat is also known to affect climate, at least at a local level.

Within the European Commission's current Sixth Environment Action Plan (EAP) the Thematic Strategy on the Sustainable Use of Natural Resources looks closely at these issues. ICTs form a backbone of the proposed actions. For example, the Strategy highlights "the need for a Data Centre for natural resources, a lead or central service to act as an 'information hub' bringing together all available, relevant information, to monitor and analyse it and to provide policy relevant information to decision makers."

Research and development at all levels can play a multiple role in developing and implementing the Strategy. Building on the wealth of research projects funded through FP5, FP6 and FP7 will place even greater emphasis on developing ICT tools for assessing environmental impacts. Projects such as E2SP, Marquis, SISCAL, DISMAR and many others.

Resources security at a glance

It is not only the fossil fuels that are running out. We have logged our forests, fished the oceans and farmed the land, sometimes to exhaustion. Sustainable growth requires ICTs to help us to better protect the world we live in by reducing pollution and monitoring and improving our natural environment.

This research is closely related to the integration of environmental risk management systems (see previous section). Interoperable ICT systems can pull data from multiple (and often transnational) sources, including Earth observation satellites. They can help environmental agencies and other governmental bodies get a much bigger, better picture on the quality of the natural environment.

However, many public administrations are not yet comfortable with this model of data access. "This type of service is totally new to public administrations," notes Mauro Cislaghi, coordinator of the E2SP project.

"They have little experience with the [Application Service Provider] business model... Before, they had to get data from many different providers, and then they bought software from other companies to analyse that data, and of course they had to buy computers to run the programs. We provide all that, so it significantly lowers the cost, and it makes it much easier to manage a service contract, because they are dealing with one service."

The ASP model, which delivers powerful, data-rich services and applications via the web, could transform the way in which our natural resources are monitored and managed. Indeed, the implementation of ICTs in this way helps to protect the environment in two main ways at once: reducing the need for organisations to purchase hardware and software (i.e. dematerialisation) while providing services designed for environmental protection.

Projects in action

E2SP
Marquis
SISCAL

The **Environmental Enterprise Service Provider** (E2SP) platform links dozens of air quality databases from monitoring stations across Europe. It also provides a suite of tools and decision-support systems, like data analysis, graphics and visualisation, forecasting and report generation.

Currently, there are two pilot service centres, in Italy and in Poland, but the E2SP project – funded by the eTEN market validation and implementation programme – will work on extending the service across Europe. Indeed, air quality is just the starter on a broad menu of possibilities. Ultimately, the same technology can be easily adapted to other forms of data, such as water and soil quality, or traffic monitoring. The potential applications are endless, and E2SP is keen to meet these demands.

Another EU-funded project could help to make air quality predictions as routine as weather forecasting. The **Marquis** system is unlike any other method to provide air quality information developed to date. It is the first to be able to supply pollution data over a wide variety of communications platforms, in multiple languages and to tailor the information specifically to the end-users' needs.

"Previous systems just provided raw data, which is not enough for most people. If I tell you the ozone level is 120 micrograms per cubic meter you might or might not know what I mean," says Leo Wanner, a member of the Marquis project. "What we did was convert that raw data into information that people can easily digest… by presenting it in a language and manner that they can readily understand."

The Marquis system takes raw data from air quality monitoring stations – so far covering five European regions – and uses advanced assessment and interpretation models incorporating artificial intelligence and machine learning to generate information and predictions on air conditions. That information is then adapted to meet the requirements of individual end users by changing the way it is displayed – from text to graphs and pictograms – and translating it into their language. Marquis is the first project in this field to use natural language processing.

From the air to the water, the **SISCAL** project has literally taken a global view on monitoring water quality. It taps into publicly available Earth observation databases and combines the satellite data on water surface temperature, chlorophyll-a concentration and sediment concentrations to provide maps of water quality for any location in the world.

An important aspect of the SISCAL service, which differentiates it from similar products, is its customisation: users can incorporate their local knowledge of the eco-system into the data processing and analysis. "The data coming from the space agencies is processed using global algorithms," explains Frank Fell, director of project partner Informus.

"[B]ut these are not always appropriate for smaller, localised geographic areas. We tailor SISCAL for each user and incorporate local algorithms that make the satellite data more accurate for each area under observation. SISCAL also renders the satellite data and combines it with the user's own data archive to make it available for GIS software," he adds.

The SISCAL tool is particularly appropriate for export outside Europe, to countries that do not have the extensive *in situ* monitoring networks that are required by law in Europe. However, it has significant benefits to users both inside and out of Europe, providing a "big picture" of water quality in a particular location.

All these projects show how ICT provides important tools on monitoring the quality of our natural environment, thus providing essential information on how to conserve and manage our resources more effectively.

They also demonstrate how ICTs can change working practices and make them more sustainable: access to data from across Europe, or even from around the globe provides near real-time monitoring and enables quick responses – sometimes without anyone having to leave the office.

More information

E2SP: http://e2sp.esaprojekt.pl/index.jsp

MARQUIS: http://www.marquisproject.net/

SISCAL: http://www.siscal.net/

DISMAR: http://cordis.europa.eu/ictresults/ (enter search on 'DISMAR')

Climate change stories on ICT Results: http://cordis.europa.eu/ictresults/ (enter search on 'air quality' or 'water monitoring')

Sixth Environment Action Plan: http://ec.europa.eu/environment/newprg/index.htm

FP7 ICT for Sustainable Growth: http://cordis.europa.eu/fp7/ict/sustainable-growth/

ISTweb: http://cordis.europa.eu/ist/

i2010: http://ec.europa.eu/information_society/eeurope/i2010/index_en.htm

What's inside?

Content for this publication was provided by the ICT Results editorial service, working to showcase breakthrough ICT research in Europe.

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