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Advanced Communications and Sustainable Development

A View from the ACTS Programme

Advanced communications technology and services (ACTS) provide the platform whereby the business, political, administrative and social communities communicate, organise and transact all of the important relationships and exchanges which form the socio-economic life of our planet. The increasing concern with sustainability of physical, social and business resources as a basis for continued development at a global scale identifies a number of concerns which implicate advanced telecommunications technologies and services as a key determinant of sustainability 'best practice'. This paper attempts to summarise the current sustainable-development debate and to position recent developments in the ACTS programme of CEC DG13 as exemplars of positive responses to need—both in terms of demonstrations of current good practice and guidelines for future practice.

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Introduction

At the World Conference on Environment and Development in Rio 1992, sustainable development was defined as the principle that current generations should meet their needs without compromising the ability of future generations to meet their own needs. The aims of sustainable development are so clearly valid that there can be few who would not, in principle, subscribe to them. Achieving a level of socio-economic development which allows all to move forward, while those lagging in development are enabled to catch up, and at the same time avoiding destroying the ecological and material resource inheritance of generations as yet unborn, is a set of aims with which industry, business, government, science and non-profit organisations can agree, as indeed can most citizens¹. This now widespread recognition that sustainable development is the responsible way forward is added to by the recognition that information and communication technologies (ICTs) are key drivers of socio-economic change and so have to be brought into focus as part of the equation. For example, Radermacher² points out that 'Modern information and communication technologies drive the worldwide economic system and the process of globalisation. In this process we see enormous growth worldwide with opportunities for overcoming poverty and promoting human rights but also with major threats to sustainability and to social justice. At the moment, our European citizens are witnessing that—in spite of economic growth and enormous wealth being generated by many companies and individuals—jobs flow away from us and unemployment is on the rise, social standards have to be given up and tax income from

global companies is shrinking considerably'. Taken together, these two perspectives demand that any collaborative initiative proposing to develop and consolidate aspects of the future European framework must also consider how the need for sustainable development can be taken into account.

The CEC DG-XIII ACTS programme is the focus of the European Union's collaborative research effort in advanced communications. Its aim is to support the early deployment and effective use of advanced communications services. Experts from all over Europe are working together on around 200 projects covering a wide range of novel technologies, applications and services, and groups of ACTS projects work together to produce guidelines on strategically important themes. A set of these guidelines explores how information and communication technologies (ICT) can contribute to 'sustainable development', and specific projects have been developed in ACTS and elsewhere to refine and promote the results embodied in these guidelines.

Information and communications technologies clearly have considerable potential to contribute to sustainable development by, for example, helping to:

- monitor the global environment;
- promote 'dematerialisation' by achieving results with reduced material consumption;
- encourage 'immaterialisation' by providing added value which does not require material consumption (primary knowledge);
- rationalise industrial production and organisational processes and structures to increase effective-

- ness, and to reduce redundancy, socio-economic imbalance, wasted effort, and environmental impact;
- substitute for travel through 'telework, teletravelling and telecooperation' (Mitchell³) or to manage it more efficiently;
 - match local production to global distribution;
 - facilitate social and economic inclusion by offering opportunity to all regardless of language, age, physical ability, geographical location; and
 - enable democratisation by increasing effective participation in political process requiring the aggregation of interests through representation mechanisms.

(Main themes adapted from Marsh⁴)

The above themes are wide-ranging and cannot be covered in detail here. However, the following subsections provide key examples of ACTS trials promoting approaches to sustainable development, and selected ACTS guidelines addressing relevant themes. Together they are offered to support the reader in examining how advanced communications applications might support sustainability, and to expose further detail of selected themes for consideration.

ACTS Trials Promoting Sustainable Development

ACTS trials demonstrate effective use of new technologies but do not promote consumption of technology per se. Rather, they recognise that while technology is part of the solution, it is also part of the problem and we must beware of 'rebound' effects. For example, solid-state electronics vastly reduced the quantity of materials and energy consumed by a computer but it was so successful that it made it possible to put a computer on everybody's desk. On a global scale, today's computers consume far more materials and energy than their ancestors of the 1950s and 1960s. So, ACTS trials seek to show how new applications, or ways of working more effectively and efficiently, can be achieved by technological evolution for larger social benefit.

A good general example is the integrated broadband communications on broadcast networks project (IBCoBN). Here the participants developed solutions to allow existing

(mature) cable circuits to be upgraded to full service networks so as to facilitate a new access network at minimal cost while preserving the investment and operational infrastructure of municipalities, cable companies and service organisations across Europe. As part of their trial they implemented applications such as remote care, whereby high-quality videotelephony was used as the access medium allowing 'on demand' attention and service between residential users (for example, the elderly) and service providers (for example, municipal authorities). Such technical developments along with their demonstrated applications show a number of interesting features for sustainable development. They show 'inclusion' of elderly people (and potentially many others), and also show rationalisation of service infrastructure whereby service staff save travel time to devote to service actions. This travel substitution also includes dematerialisation, and together these features show a wide range of benefits based on application of broadband to a remote service provision scenario. Further detail of this can be found in Descamps and Wilson⁵ and Wilson and Descamps⁶, as well as on the project web site at <http://www.ibcoba.nssl.co.uk>.

A powerful example of rationalisation (also including strong elements of dematerialisation, immaterialisation, and travel substitution) comes from the collaborative integrated communication for construction project (CICC). This project has developed a teamwork solution for distributed groups in the construction industry, and the approach has been trialed with success. The partners have produced advanced services including a 'people and information finder', and a three-dimensional project model. Furthermore, augmented reality and multimedia communications have been tested in a number of large distributed construction projects in Europe. This kind of project shows the application of virtual reality techniques to deliver distributed teamwork solutions where participants are allowed to feel part of a real enterprise despite distance. Architects have been able to really 'examine' the state of development of sites, and a number of companies have been able to present ideas, designs, and early 'build' work without travelling, yet the 'team'

formation required for such a project has been fully supported.

Indeed, rationalisation of business process has been a major theme in ACTS trials where the new advanced communications technologies have bitten deep into the heart of large-scale commercial activities. The combination of rationalisation of process has commonly been supported by transport substitution, and dematerialisation and this is strongly evident in project trials shown by:

- PRINTIT—where a distributed publishing service toolkit has been tested by means of three pilot services: the distributed printing of a newspaper; the production of personalised catalogues; and a web kiosk printing service.
- TEAM—where on screen collaborative working for concurrent engineering has been demonstrated by a group of car manufacturers and their component suppliers. This has involved large-scale interworking of corporate users plus their SME supply chain. They have used a common set of tools developed to meet their specific needs and have produced results to support uptake of the approach generally.
- TECODIS—where a teleworking model for distributed software development has been established, modules have been implemented, and the system applied in trials and demonstrations where it was evaluated. The application has been shown in a real commercial environment and has used extensive European broadband connections.
- COVEN—where a general platform for collaborative virtual environments (CVEs), including computational service for teleworking and virtual presence has been demonstrated. The project provides the facilities needed to support future cooperative teleworking systems and to demonstrate the added value of networked virtual reality for both professional and home users.

While the above have mainly benefited the business community and addressed sustainable development issues relevant to them, an exception (along with the preceding IBCoBN project) is using mobile

personal telecommunications innovation for the disabled in UMTS pervasive integration (UMPTI-DUMPTI) which aims to:

- develop proposals for meeting user requirements for applications and services;
- develop usability requirements, and non-conventional uses supporting social integration;
- specify common application programming interfaces to system services;
- develop applications and services using appropriate human-computer interfaces (HCI); and
- demonstrate the applications and services in a networked environment evolving towards a UMTS type network, using emerging technology and equipment, adapted where necessary.

This kind of approach to *inclusion* shows that even the most isolated communities (for example, the deaf) can be supported by a sustainable development approach.

The preceding examples show that ACTS trials include demonstration of dematerialisation, immaterialisation, rationalisation, travel substitution, social and economic inclusion. These have been demonstrated in realistic trials and show the way ahead, and other examples are also operational showing scope for environmental monitoring (through the many satellite projects), matching local production to global distribution (through extensions of the TEAM and CICC ideas), and democratisation (through initiatives such as EPRI-WATCH). Based on observation of this work, there are a number of sustainable development guidelines produced and in production, and the following section addresses these in detail.

ACTS Guidance for Sustainable Development

The ACTS programme, as part of its well-established concertation process, has supported a series of 'chains' whereby projects with shared interests work together to develop common guidelines. One such group of chains is concerned with generic access (GA) and includes a specialist sub-chain focusing sustainable development (GAD). The GAD chain is therefore a concertation mechanism for ACTS projects concerned with the potential impact of their

work on sustainable development, considered in its economic, social and environmental dimensions. Work has evolved within the framework previously described in terms of dematerialisation, immaterialisation, rationalisation, inclusion and democratisation. In parallel, special attention is paid to the so called 'rebound effect', whereby sustainability gains in a specific dimension are offset by negative effects in the same or other dimensions.

The key objectives have been to define the key issues, to experiment with impact assessment approaches, and to study how sustainability can be developed as an opportunity and a business case. For this reason the target audience has been wide and has included service and product developers, industrial decision makers, research activities and standardisation bodies.

The guidelines have been formed within the framework described to include:

- Conceptual clarifications and transitional scenarios for sustainable lifestyles (Reflective Guidelines):
 - ICT, the Information Society and Sustainable Development (GAD A1);
 - Balancing between Information and Materials (GAD A2);
 - Sustainability as a Business Case (GAD A3); and
 - Socially Sustainable Best Practice of Workflow Re-engineering (GAD A4).
- Sustainability Issues in ICT Application Sectors (Technical Guidelines drawing directly on ACTS trials results):
 - Residential Broadband Access (GAD B1);
 - Impact Assessment of ICT Applications (GAD B2);
 - Impact of ICT for the Empowerment of people with Special Needs (GAD B3).
- Sustainability Impact Assessment (Developed in collaboration between horizontal actions and ICT trials):
 - Procedures for Assessing the Impact on Sustainable Development of Applications Using Teleservices (GAD C1); and

—Assessing Sustainable ICT Application Scenarios (GAD C2).

From the above it can be seen that the GAD group has developed not only guidelines on specific sustainability issues, but also introduced techniques that developers can use to evaluate the medium-to-long-term impact of their applications. Cross-impact techniques have been developed to analyse the effects of possible technical solutions to the social and environmental problems of regions, nations or the world as a whole. These techniques are still at an early stage but they have already shown how there can be a positive environmental impact. In one example, the introduction of an intranet has made wine production economic in an area of Sicily where abandoned vineyards were creating a serious problem with soil erosion. In another example (concerning IBCoBN as described earlier) it has been shown how the region around Kortrijk in Flanders could gain significant general regeneration bounties by more widespread deployment of the full-service-network upgrade to mature cable television circuits (this work also supported the local analyses addressing Telnet Flanders).

The work of the GAD chain can be examined in detail at its web site at <http://www.epri.org/gad>

Summary Comments and Future Developments

The ACTS programme has included a wide set of project trials, many of which directly address, or at least contribute to, the sustainable development debate. It is clear that sustainable development is a well-accepted part of the global socio-economic and socio-technical agendas. The work on the sustainable development guidelines in ACTS, based on the activities in the trials and a wider consideration, have helped to progress two distinct domains of discourse and have provided a useful fusion of themes emerging from them. The traditional 'ecology' focus has related sustainable development to the economic and social dimensions, while the 'information society' debate has examined the relationship of ICT to the same social and economic dimensions. The ACTS GAD work has unified these by exposing and developing a clear view of how

advanced communications development has the potential to benefit and to unify the concerns present in social, economic and environmental spheres if dealt with appropriately, since, as Prof. Radermacher states 'Modern information and communication technologies drive the worldwide economic system and the process of globalisation'².

Stemming from, or at least benefiting from, the work of the GAD group in ACTS, a number of key actions for the future are emerging. First, the Alliance for a Sustainable Information Society (ASIS) is developing its charter and its working groups, including sustainable communities (AG1), dematerialisation of industrial and business processes (AG2), social inclusion (AG3), homes and workplaces of the future (AG4), and mobility and transport (AG5). At the same time the European Commission has launched its Fifth Framework Programme (see <http://www.echo.lu/fifth>) which includes a specific programme for sustainable development, yet also retains the focus on sustainable development issues for ICT development in its Information Society Technologies programme (IST).

There is a clear need to maintain the momentum generated by the ACTS trials and its GAD working group to ensure that the links between the IST and the sustainable development agendas are not lost. If we accept that ICTs are really driving the re-organisation of worldwide social and economic systems, then we must not lose sight of the need for continued harmonisation between the traditional view of sustainable development and the accelerating progress of the IST framework for the information society.

Detailed ACTS trials information can be obtained from the ACTS INFOWIN⁷, along with reports and detailed trials outputs offered for public access <http://www.infowin.org>. The briefings and guidance on using ACTS results from the ACTSLINE⁸ are at <http://www.actslines.org>. The GAD chain guidelines⁹ can be accessed via <http://www.epri.org/gad>.

References

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- 8 ACTSLINE dissemination actions—<http://www.actslines.org>
- 9 GAD Chain Guidelines—<http://www.epri.org/gad>

Biographies



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Frank Wilson is a human factors engineer and system designer. He worked with the Xerox Corporation as an interface designer for new products and then joined the London HCI Centre within the University of London as part of a UK initiative to promote technology transfer from research activities. He later joined the spin-off company Interaction Design Ltd which continues to promote research and innovation in human-technology integration, and which also supports EU collaborative projects where end-user issues and impacts on working life are important. He is currently chairman of the ACTS programme chain group on Generic Access (GA), and currently represents the Flexible Working and Sustainable Development focus in the ACTS project ACTSLINE.



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Dr Hill Stewart joined the UK Post Office (now BT plc) in 1972. Following research on optical communications technology and systems he moved to technology forecasting and strategic planning and managed BT research programmes on architecture and standards and network and service management. His final job with BT was producing the first release of an integrated architecture for the company's networks and systems. During his time with BT he was active in supporting the European Union activities in collaborative research and development and, since leaving BT, has worked as a consultant on European RTD. He is currently managing the ACTSLINE project for Italtel.