ITU Symposium on ICTs and Climate Change
London, UK, 17-18 June 2008
Supported and hosted by BT plc

Summary Report (4 July)

The issue of global warming needs to be tackled from a global perspective, because its impact affects the entire planet and it is growing more serious every year. Estimates from the Intergovernmental Panel on Climate Change (IPCC) showed that global greenhouse gas (GHG) emissions, the primary cause of global warming, have risen by 70 per cent since 1970. In Kyoto, in December 1997, the world took concrete steps to mitigate global warming with an international agreement to limit and reduce GHG emissions. The first commitment period set out in the Kyoto Protocol runs from 2008 to 2012 and a UN-led process is now underway to develop a successor agreement to limit and reduce GHG emissions.

In Kyoto, ITU and MIC Japan held the first international symposium on ICTs and Climate Change, 15-16 April 2008. This second ITU symposium, held in London, UK, from 17-18 June 2008, hosted and sponsored by BT plc, aimed to build on the outcomes of the first one. The London symposium was chaired by Mr. Tom Walker, Director, Europe and international Business Relations, Department for Business Enterprise and Regulatory Reform (BERR), UK with approximately 140 participants, plus a further 60 participating remotely, drawn from a wide range of organizations including the private sector, research institutes, international organizations and governments.

The timing of this symposium is also highly appropriate because global measures under discussion at the symposium can be forwarded for appropriate action at the G8 Summit, to be held at Lake Toya, Hokkaido Prefecture in July 2008 and to other relevant meetings. The opening ceremony featured the award to BT, by the Lord Mayor of the City of London, of Her Majesty the Queen's award for environmental sustainability.

The Symposium had six substantive sessions: "Climate change: ICTs to the rescue?", "Corporate responsibility: Towards a climate-neutral ICT Sector", "ICTs for monitoring climate change", "ICTs as a clean technology", "Towards a high-bandwidth, low carbon future" and "Adapting to climate change". Copies of all presentations, plus archived versions of the audio and video of the presentations can be found online at the event website at www.itu.int/ITU-T/climatechange.

Opening Ceremony

Participants were welcomed by **Sir Michael RAKE,** Chairman, BT Group, who outlined some of BT's achievements as a pioneer in the field of actions to mitigate climate change. A message from the UN Secretary-General. **Mr Ban Ki-moon**, welcomed the initiative of organizing these symposia and called upon the ICT sector to apply international standards to reduce GHG emissions. **Mr Malcolm JOHNSON**, the Director of the ITU Telecommunication Standardization Bureau said that if it is powerful technology that is underlying the threat of global warming, then is should also be technology that must provide a solution.

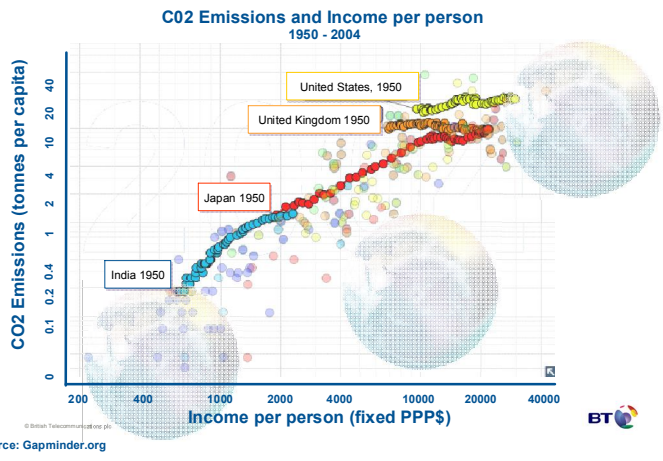


Figure 1: The challenge ahead of us
Source: Presentation by Mr Matt Bross (BT)

He handed over to **Mr Matt BROSS**, Chief

Technology Officer of BT Group who discussed the role of standards. "While we might be pleased with what has been achieved in terms of standards, we should by no means be satisfied", he said. He showed the role that standards organizations can play in working together to exploit the potential of ICTs. He described the challenge ahead of us as being that, if everyone in the world had the same average consumption as a US citizen, we would need the equivalent of three planet earths to sustain everyone. He showed the pattern of rising carbon dioxide (CO_2) emissions, which indicates that other countries are now converging on the US level (see Figure 1). Finally he concluded that the power to bring about the necessary behavioural and technical change was in the hands of the people.

The overall chairman of the event, **Mr. Tom WALKER,** Director, Department for Business Enterprise and Regulatory Reform (BERR), UK, welcomed everyone to London. He said that climate change, as well as being a bit of an obsession with the Brits because of their concerns over the weather, is also a massive priority for the British government; indeed one of the top five. He thanked the ITU for taking the initiative to organize the event and thanked Japan and BT for hosting the two symposia. He pointed out that technology has partly created the problem of global warming, but expressed his confidence that technology will also create a way out.

Mr Walker handed over the floor to **Alderman David LEWIS**, the Lord Mayor of the City of London, representing Her Majesty the Queen. He pointed out that the City of London is not only the pioneer in the trading of carbon permits and congestion charges, but is also committed to harnessing ICTs in the combat against climate change. He said that the role of BT in this area was incontestable, and to mark that fact, he awarded the Queen's award for Enterprise in the field of sustainable development, from April 2008 for a period of five years. Sir Michael Rake, receiving the award on behalf of BT, thanked the Lord Mayor, and expressed the view that, although much has been done, BT will continue to strive to improve its performance.

Session 1: Climate Change: ICTs to the rescue?

The Kyoto Protocol came into force in 2005 and has been ratified by more than 175 countries. However, the agreed limitations on greenhouse gas emissions may not be achieved by all parties and, in any case, they may be insufficient to reverse the effects of global warming without an additional technological contribution. This session will provide an overview of the role of ICTs in the wider context of the efforts by the international community to implement the Kyoto Protocol and to commit to more ambitious reductions as part of the Bali plan of action.

This opening session was moderated by **Dr Tim KELLY** (ITU-T), who noted that the session title had a question-mark because it was still far from clear whether ICTs were part of the problem of global warming or part of the solution. He hoped that this symposium could show that it was the latter.

Mr Masahiko FUJIMOTO, Director, Information Applications Promotion Office, Information and Communications Policy Bureau, MIC (Japan) presented on the outcomes of the Kyoto Symposium, which had been held from 15-16 April 2008 (see Figure 2). He went through the Kyoto programme, session by session, highlighting the main findings, as expressed in the chairman's report. He noted that the Symposium had proposed that ITU create a Focus Group on ICTs and Climate Change and that the TSB Director had invited proposals from participants on a possible terms of reference.

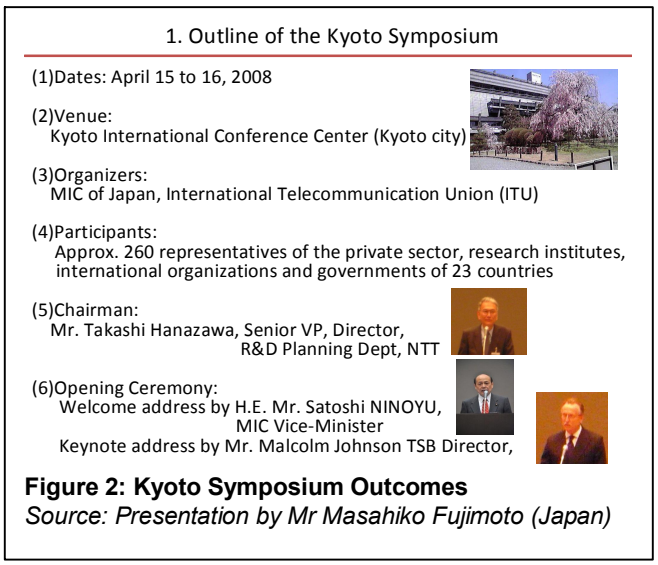


Figure 2: Kyoto Symposium Outcomes
Source: Presentation by Mr Masahiko Fujimoto (Japan)

Ms Donna YOUNG, Head of Environment and Climate Change, BT Group, presented on protecting our changing world. She outlined the contribution that BT is

making in reducing its own carbon footprint. Having already cut by 58 per cent between 1996 and 2006, BT now aims to reduce by 80 per cent by 2016, in the UK and by 80% intensity worldwide by 2020. She described a number of the strategies for achieving this, including:

- Purchasing energy from renewable sources (and in the longer term becoming a supplier, from its own wind farms);
- Improving its own internal energy efficiency, for instance by encouraging "homeshoring" (teleworking) for its customer relations management staff)
- Introducing flexible work practices with a greater reliance on video and audio-conferencing, which saved an estimated 97'000 tonnes of CO_2 in 2007 (see Figure 3).
- Using unified communications solutions;
- Through Field Force Automation;
- By placing data centres where renewable energy is most plentiful (for instance in Scandinavia).

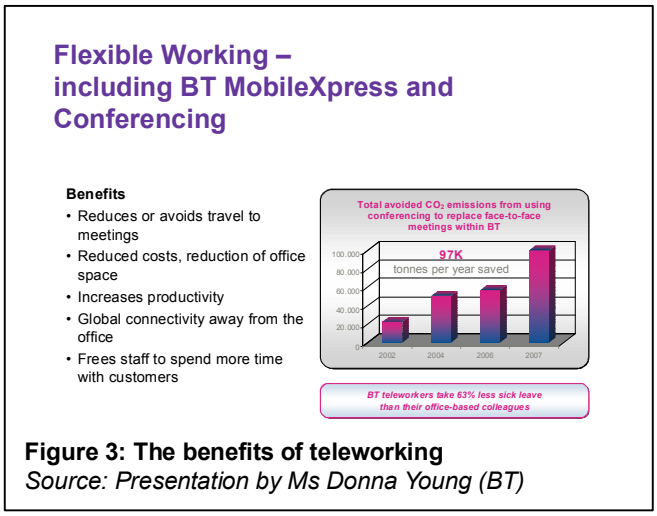


Figure 3: The benefits of teleworking
Source: Presentation by Ms Donna Young (BT)

However, the real potential for energy saving lies in products that are still in development. For instance, BT's 21CN next-generation network is expected to reduce energy consumption by around 30 per cent. BT aims to offer "always available" rather than "always on" services in future.

Mr Nigel HICKSON, Dept for Business Enterprise and Regulatory Reform (BERR), UK explained UK initiatives on climate change. He described how the UK has taken on its Kyoto commitments and is on a path to reduce its GHG emissions by 30 per cent by 2020 (according to the new Climate Bill being considered by Parliament) and by 60 per cent by 2050. The UK has already achieved a 15 per cent cut between 1990 and 2006. He went on to describe a number of important reports on the topic, including the Stern Review and the Intellect Report, and he showed how UK initiatives fit with those of the European Union.

Dr Luis NEVES, Head, Sustainable Development and Environment, Deutsche Telekom, spoke about the Global e-Sustainability Initiative (GeSI) and in particular the new report, entitled "Smart 2020: Enabling the low carbon economy in the information age" (see www.smart2020.org) prepared by McKinsey for GeSI and The Climate Group, which was published later in the week (and announced in the 20 June edition of *The Economist*). The report estimates that the current (2007) usage of ICTs contributes to some 0.83 gigatonnes of carbon dioxide equivalent ($GtCO_2e$), which amounts to some 2 per cent of the global total. This will increase to some 1.4 $GtCO_2e$ by 2020, as the use of ICTs grows, but ICTs will generate savings of 7.8 $GtCO_2e$, or five times the direct emissions. Together with other abatements (for instance from renewable energy, biofuels etc) this will enable a reduction in global GHG emissions to 25 per cent below 2002 levels (see Figure 4). The report identifies a number of drivers for this change and takes closer looks at four of them:

Figure 4: The Global Footprint and the enabling effect of ICTs
Source: GeSI report (see www.smart2020.0rg)

- Smart motors: application of ICTs in the automotive sector;
- Smart logistics: supply chain management;
- Smart buildings: building design, management and automation;
- Smart grid: integrating more advanced ICTs into the so-called energy Internet.

Mr Art LEVIN, Head, Corporate Governance and Membership Division (ITU) on the UN climate change process and the ITU background report for this event. He began by describing the UN process where the Kyoto protocol, agreed in 1992, came into force in 2005. The commitments made in Kyoto to limit and reduce GHG emissions run from 2008-2012 and work is currently underway to develop a successor agreement to cover the period after 2012 (see Figure 5). The "roadmap" for this process was laid out in Bali, in December 2007, and is due to culminate in Copenhagen in December 2009. Mr Levin went on to present the ITU background paper on ICTs and climate change (see: http://www.itu.int/dms_pub/itu-t/oth/06/0F/T060F0060080008PDFE.pdf). The report describes the ways in which ICTs impact on the climate, both directly (in the release of GHGs) and indirectly (for instance, through the carbon abatement impact of ICT-enabled applications like flexible working or video-conferencing). He concluded by presenting information on ITU's overall strategy in this area, including a commitment to become climate neutral within three years. This process had started with a carbon audit of ITU's premises the previous week.

Figure 5: Global Framework for climate change action
Source: Presentation by Mr Art Levin (ITU)

During this session, a range of different statistics had been presented, for instance on the contribution (directly or indirectly) of ICTs to global greenhouse gas emissions, on the reductions achieved by BT and on the UK targets for future GHG cuts. These statistics were generally consistent with the goal stated in the IPCC report of a reduction of 25-40 per cent in GHG emissions by 2020. This indicates that the solution is achievable but that delay will at least make a solution much more costly. The session showed that there are a number of new technologies that promise to cut GHG emissions, notably in the transition to next-generation networks (NGNs). But even more promising developments are on the horizon. It was also made clear that technology alone will not enable the emission targets to be met; there was a sense that behavioural and cultural change (across our working and home lives) was also an essential element. Investment in GHG-reducing ICTs can be seen as a "smart opportunity" in that it not only helps in saving the planet but also contributes to reducing costs and improving profitability. For instance, BT's own use of videoconferencing has saved an estimated £240 million.

Session 2: **Corporate responsibility: Towards a climate-neutral ICT sector**

It is estimated that the ICT Sector produces directly some 2-2.5 per cent of total emissions of greenhouse gases, and that this share will increase as ICTs make a larger contribution to the global economy. What can ICT companies – manufacturers, service providers, users – do to reduce their own carbon footprint? Which companies are showing leadership and exercising best practice?

This session was moderated by **Ms Sheridan NYE**, ICTandClimateChange.com and University of Sussex. She challenged delegates by suggesting that the ICT industry was too focused on the 2 per cent of global greenhouse gas (GHG) emissions, whereas the major opportunity lies in the other 98 per cent generated by other sectors of the economy

Dr Chris TUPPEN, Director, Sustainable Development, BT Group, presented on Setting a Global Climate Stabilization Intensity (CSI) Target. He proposed an

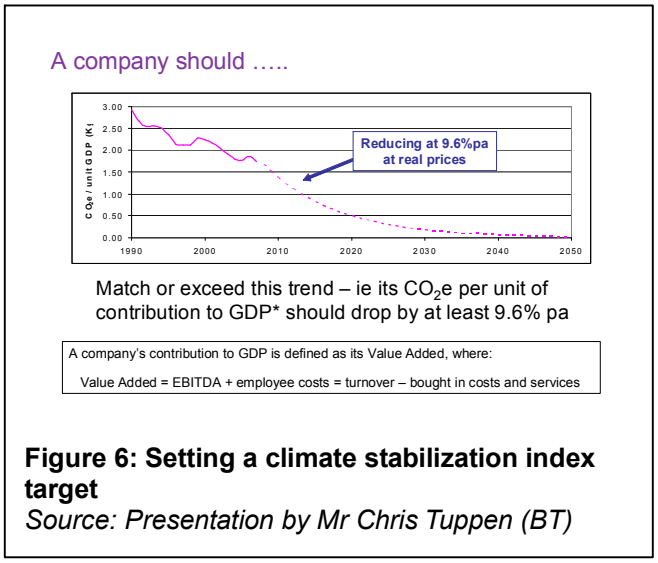


Figure 6: Setting a climate stabilization index target
Source: Presentation by Mr Chris Tuppen (BT)

innovative new metric designed to promote green growth for a low-carbon future. The Carbon Stabilisation Intensity model (CSI) is the ratio of GHG emissions (tCO_2e) to unit GDP contribution (that latter equivalent to 'value added'). Dr Tuppen explained that the metric is designed to incorporate the reality of economic growth, while setting goals to stabilise the volume of GHG in the atmosphere at the limits recommended by the IPCC. He calculates that a reduction of 9.6% in CSI per year is needed from the developed countries in order to have a chance of stabilising the climate by 2050 (see Figure 6). He urged widespread adoption of the CSI model to promote transparency and focus activity on the ultimate goal to stabilise climate change. Taking BT's own CSI figure as broadly representative of the sector, Dr Tuppen claimed telecom generates wealth at about ten times the efficiency of the worldwide average of 1.67kg CO2e/£GDP in 2008. Regulators in member states therefore have a vital role in ensuring an adequate supply of renewable energy. Dr Tuppen urged regulators to incentivize rather than impede the renewables market. BT is actually planning to become a producer of wind power, using its resources of high sites across the country.

Dr Jack ROWLEY, Director, Research and sustainability, GSM Association addressed Unwiring the Planet - Wireless Communications and Climate Change. Mobile communications contribute around 0.1 per cent of global CO_2 emissions. In a typical life cycle of a mobile phone about one-third of the GHG emissions comes from handset manufacture and the rest from their usage. Successive generations of mobile phone are tending to generate lower CO_2 emissions per subscriber as capacity increases with new technologies (see Figure 7). Over 80 per cent of mobile energy consumption occurs in masts, switching and handset chargers. Base station power is a growing area of concern as networks are increasingly extended to remote locations that lack grid electricity, notably in developing countries. Dr Rowley presented results of a wind and solar trial last year with Nambia's MTC to gauge the opportunity to reduce dependence on the grid and back-up diesel generators. In closing, he noted that more research is needed to understand barriers to the recycling of obsolete handsets which currently occurs at a disappointing rate.

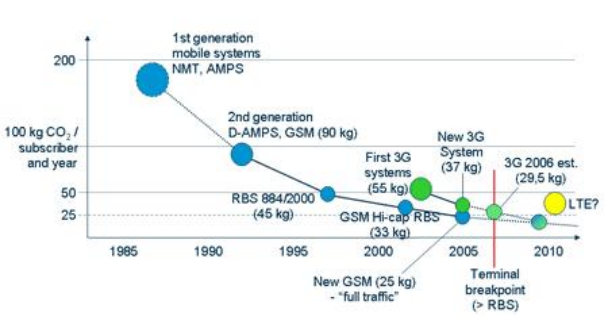


Figure 7: Reduction of CO2 emissions per subscriber in successive generations of mobile phone
Source: Presentation by Dr Jack Rowley, GSM Association

Mr Paolo GEMMA, ETSI Environmental Engineering Secretary**,** Senior Manager, Huawei Technologies Co. Ltd., reported on Broadband energy saving strategy. He explained how Huawei is addressing energy efficiency in its DSL equipment. Many opportunities are available such as traffic management, optical technologies in the access network, cooling of cabinets, power optimisation and availability of more efficient chip sets. Integration of access and backhaul networks is also an important contributor, greatly reducing the number of exchanges required.

Mr Paolo BERTOLDI, European Commission, DG JRC, reported on European policies for energy efficiency in ICTs. The European Union has adopted a number of targets for the use of renewable energy and has further adopted, in October 2006, an action plan for energy efficiency with the aim of achieving 20 per cent savings in annual primary energy consumption within the EU by 2020. There are a number of possible implementing measures, such as specific eco-design requirements, an eco-label (e.g., energy star), and energy label and voluntary agreements. For the ICT sector, a code of conduct has been

- Broadband equipment will contribute to the electricity consumption in European Community depending on the penetration level, the specifications of the equipment and the requirements of the service provider, a total European consumption of up to 50 TWh per year can be estimated for the year 2015.
- With the general principles and actions resulting from the implementation of this Code of Conduct the (maximum) electricity consumption could be limited to 25 TWh per year, this is equivalent to 5,5 Millions tons of oil equivalent (TOE) and to total saving of about € 7,5 Billions per year.

Figure 8: Why broadband was selected for the EU code of conduct
Source: Presentation by Mr Paolo Bertoldi, EU

introduced, which is based on voluntary commitments by companies. Targets can be expressed in terms of maximum power consumption per user and can be complemented by energy management strategies at the producer end. Work has been ongoing since 1999 and codes of conduct for broadband and uninterruptible power supplies were introduced in 2007. A code of conduct for data centres is in the pipeline. Broadband was selected for a number of reasons (see Figure 8) and the code of conduct covers all equipment offering transmission speeds greater than 144 kbit/s. Data Centres have been selected because their electricity consumption in Western Europe is projected to rise from 56 TWh in 2007 to 104 in 2020.

Mr Douglas JOHNSON, Senior Director, Technology Policy and International Affairs, Consumer Electronics Association (CEA) discussed Consumer ICTs: Industry initiatives and policy approaches for saving energy and reducing emissions. Initiatives in the consumer electronics industry to date have mainly been voluntary, market-oriented programmes, such as the "energy star" label. This can be shown to have achieved considerable savings in the field of carbon avoidance, especially for office equipment (see Figure 9). In 2007, CEA commissioned a study from TIAX with a focus on 16 product types. Taking a bottom-up approach, the study found that residential consumer electronics consumers around 12 per cent of electricity in US households, or 4.4 per cent of the total, but the trend is upwards. A further study looked at telecommuting and e-commerce and estimated that some 3.9 million telecommuters in the USA reduced its fuel bill by some 840 million gallons of petrol. Equally, a transition of half of all current DVD rental/purchase to online downloading would save the equivalent of 2.4 kWh per year.

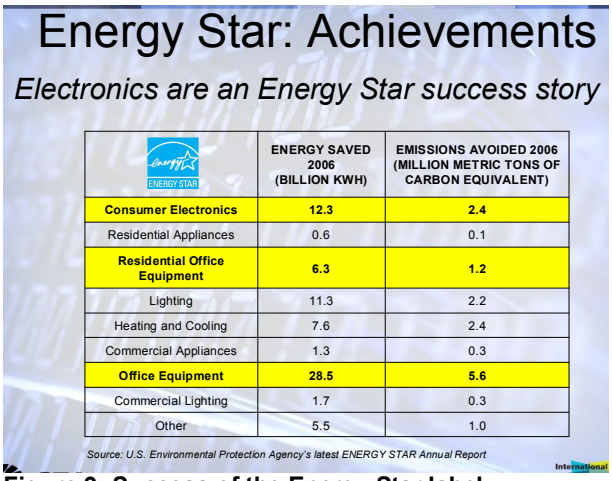


Figure 9: Success of the Energy Star label
Source: Presentation by Mr Douglas Johnson, CEA

Mr Martin EUGSTER, EMPA (Switzerland) presented on ICTs: from cradle to e-waste, in particular explaining the outcomes of a life cycle assessment (LCA) of desktop PC systems manufactured in China. He argued that it is important to see ICTs not only as part of the solution to global warming, but also as a significant part of the problem (see Figure 10). In the case of China, 81 million desktop PCs were manufactured in 2005 and the production process generated some 54'000 GWh of power while when in use they consume around 18'000 GWh per year. Other issues to be considered include the use of rare minerals in PC production. As the price of these commodities rises, the scope for recycling is also rising and this is creating new employment opportunities. However, when this process is simply outsourced to developing countries, it can be dangerous, for instance as a result of desoldering printed circuit boards or burning residues. It can also generate pollution. In conclusion, an LCA shows that the benefits of greater PC recycling are being gained mainly by developed countries whereas the costs are falling disproportionately on developing ones.

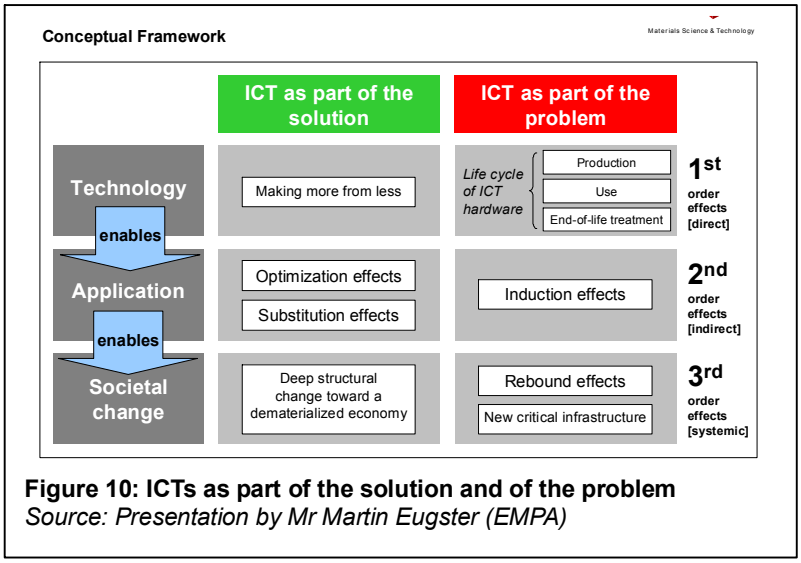


Figure 10: ICTs as part of the solution and of the problem
Source: Presentation by Mr Martin Eugster (EMPA)

Overall, this session emphasised the great potential of technical solutions to improve energy efficiency in ICT networks and equipment and the enthusiasm to seize some low-hanging fruit. Considerable interest was

expressed regarding approaches to life cycle assessment (LCA), suggesting that the sector is actively engaged in understanding the impacts of its products and services. However, further research is needed to understand the net benefits of these initiatives in their social contexts

The session opened with a challenge to address criticism that "the industry is spending 98 per cent of its time tackling 2 per cent of the problem", given the relatively small proportion of emissions directly due to ICT. Three responses emerged from the discussion:

- ICT's footprint is significant and growing and so steps must be taken to control direct emissions.
- Addressing the direct footprint is an opportunity to accumulate knowledge and experience and to stimulate activity in other sectors
- The ability to enable savings for customers critically depends on the credibility of the ICT sector to understand and control its own impacts.

Session 3: ICTs for monitoring climate change
The science of climate change is made possible by the use of ICTs, for instance in remote sensing, telemetry, supercomputers for climate modelling, etc. Large scale efforts to reduce emissions – for instance through reforestation, combatting desertification, protection of wetlands, etc. – will require new investment, from both the public and private sectors, in ICT-based monitoring systems. What are the tools available and what further standardization effort may be required?

This session was moderated by **Mr Bill THOMPSON**, Technology Writer, for BT Online and others. This session focused on the application of advanced information and communications technologies to counter climate change through more effective measurement and management of activities that contribute to carbon emission and for the effective monitoring of the environmental and meteorological impact of climate change.

Dr Michel SCHOUPPE, Research Programme officer in the field of ICT and the environment, DG Information Society, European Commission, presented on EU initiatives on ICT and the environment. He explained the interconnected projects that contribute to the development of SISE, the European Commission's plan to develop a Single Information Space in Europe for the Environment through the integration of sensor networks and the facilitation of technical interoperability between different tools and services. He outlined the main targets which the EU has set in this field (Figure 11) and provided a more in-depth look at three specific projects:

- Smart monitoring, based on ubiquitous sensor networks (USN);
- Collaborative information systems;
- Dynamic chaining of services, through supply chain management.

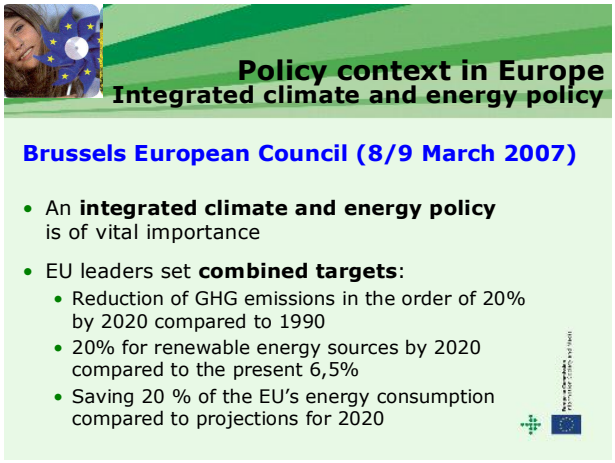


Figure 11: EU policy on climate change
Source: Presentation by Dr Michel Schouppe (EU)

Mr John HOWIE, Director, International Affairs, Trustworthy Computing Initiative, Microsoft, presented on Microsoft's programme for environmental sustainability, including its collaboration with the UNEP World Conservation Monitoring Centre. The need for monitoring to incorporate diverse sources providing vast amounts of data that must be stored for long periods of time was highlighted and Mr Howie called for standardization of data formats rather than the use of proprietary standards which preclude interoperability. Microsoft's work ranges from monitoring the impact of carbon dioxide levels on vegetation (Fluxnet), to improving energy management systems in PCs and to encouraging collaboration through shared services (Live Earth, SkyDrive, Office Live). Microsoft is working with UNEP to provide access to climate research (OARE), medical research (HINARI) and agricultural research (AGORA). It is also working with the

Clinton Foundation to build tools to assist cities in tracking their GHG emissions.

Mr Nangapuram VENKATESH, Study Group Counsellor, ITU-R, presented on ITU Radiocommunication Conferences and monitoring, mitigating and adapting to climate change. He described the World Meteorological Organization (WMO's) World Global Observation System and explained how ITU-R works to preserve certain portions of the spectrum used for science services free from interference. Climate Change has become a major focus of concern in ITU meetings, most notably at WRC-07, which attracted some 2'800 delegates. The conference extended spectrum allocation and adopted protection criteria for the services involved in climate monitoring. Recognizing that remote sensing provides a global systematic observation of the world's terrestrial carbon budget as well as other environmental parameters WRC-07 and Radiocommunication Assembly 2007 adopted several Resolutions on studies related to further development of these systems. Article 1 of the ITU Radio Regulations (RR) distinguishes between active and passive sensors. Other RR provisions and WRC-07 decisions provide relevant protection from interference for remote sensing radio applications with special attention to passive sensors.

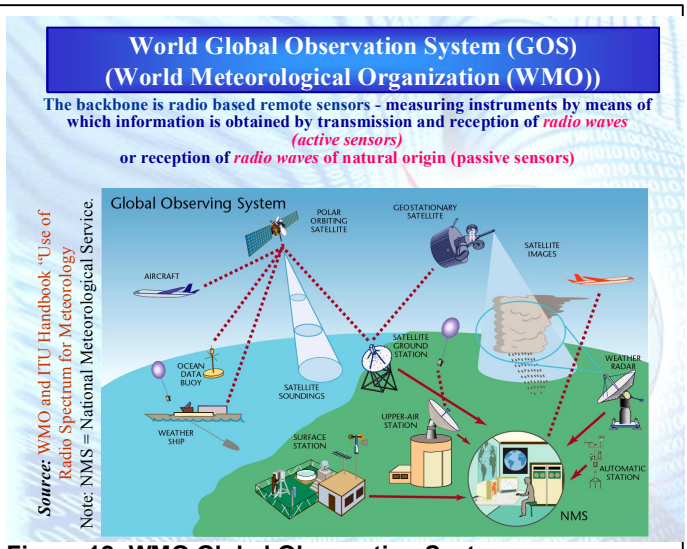


Figure 12: WMO Global Observation System
Source: Presentation by Mr Nangapuram Venkatesh, ITU

Mr Dave BERRY, National e-science centre (UK), presented on Achieving Carbon & Cost Accounting per Service or Task, through Data Collection and Simulation Modelling. He began by presenting the case for per-service accounting, arguing that, although much work has been done on data centre energy efficiency, the planned 50x increased in data centre power transmission over the next three years will mean that the problem will continue to grow. The second problem he addressed was how to measure efficiency; arguing that the key question to be addressed is "what is the marginal environmental or economic benefit of this IT system?" He then went on to look at why implementing this is hard, which is because an approach based on metering of usage generally fails with modern IT infrastructure. So, the proposed approach is based on simulation and grid computing. He presented the British Computer Society (BCS) data centre model for conducting this work.

The final presentation in this session was given by **Mr Pankaj BHATIA**, GHG Protocol Initiative, on Methodologies for measuring the carbon footprint. He argued that "what you can measure you can manage" and to this end he began by explaining what is meant by a carbon footprint, which might be considered as a series of different inventories and the relationships between them. These build up to create the GHG Protocol Corporate standard, which is the most widely used tool for measuring the carbon footprint (it is used, for instance, by ISO). He outlined the different stages to be followed in developing a GHG inventory, looking at both direct and indirect impacts. The GHG protocol provides a very useful set of tools for corporate

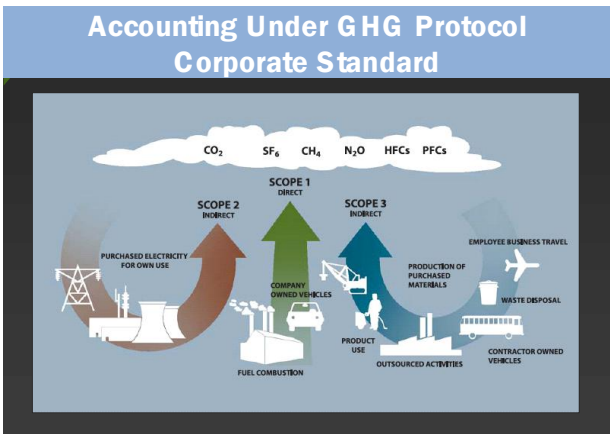


Figure 13: Tools for calculating carbon footprint
Source: Presentation by Pankaj Bhatia

accounting, which are available on the website at www.ghgprotocol.org (see Figure 13). For the ICT sector, it is likely that a package of tools will be necessary, customizing the basic GHG Protocol Model. He invited the ICT sector to become more involved in the work of future standards for carbon monitoring.

Mr Thompson thanked all their speakers for their positive approach. In discussion, the question of personal carbon trading was raised, which raises a number of privacy concerns. Also, it was shown how ICTs can help communities "on the ground" to cope with the challenges of climate change.

Day 2: Wednesday 18 June

Session 4: ICTs as a clean technology

Although ICTs contribute to global warming, they can also help in reducing the greenhouse gas emissions of other sectors. By replacing the need for travel, or by improving transport efficiency, ICTs help to reduce the carbon footprint of individuals and companies. With oil prices surging past US$130 per barrel and rising awareness of climate change, what opportunities does this create for using ICTs, especially telecommunications, for the abatement of carbon emissions in other sectors of the economy? This session also looks at the mitigation impact of ICTs on other sectors of the economy.

This session was moderated by **Mr Richard LABELLE,** Aylmer Group (Canada), who is the lead author of the ITU-D e-environment scoping study. The first two presentations, by Kidney and Szomolanyi, focus on a national level analysis of the impact of ICTs on climate change. The presentation by Ollivry discusses the impact of FTTH on energy consumption based on the use of life cycle assessment (LCA) methodology. The presentations by Valera Sanz and Jaffre focus on ICT based technologies and management practices to reduce energy use and greenhouse gas (GHG) emissions in the enterprise. The presentation by Dlay focuses on decision support tools for sustainability in the enterprise.

Mr Sean KIDNEY, Director of Science and Systems, Climate Risk Pty Ltd (Australia) presented on Telecom-based opportunities to reduce greenhouse gas emissions. This work originated in a study commissioned by Telstra, the incumbent public telecommunication operator in Australia. That study addresses some seven main opportunities for carbon abatement:

- Increased renewable energy;
- Real-time freight management;
- Personalized public transport;
- Decentralized central business district;
- Presence-based power;
- Remote appliance power management;
- High-performance video-conferencing.

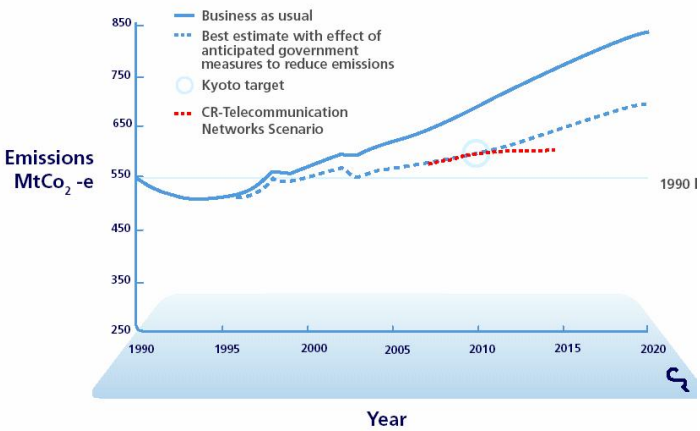


Figure 14: Possible effect of carbon abatement opportunities offered by telecommunications in Australia
Source: Presentation by Mr Sean Kidney, Climate Risk pty

The aggregate level of potential savings in CO2 emissions in Australia calculated by the study is some 27 million tonnes of CO2 equivalent. In the context of Australia's overall emissions, this would amount to around 5 per cent of the national total, which would be a major contributor to helping the country meet its commitments under the Kyoto Protocol (see Figure 14). The overall conclusion of the study is the need for a clear message that ICT can be a major player in carbon abatement, and the overall impact could be around 2-4 times greater in reductions.

Ms. Katalin SZOMOLÁNYI, European Telecom Network Operators' Association (ETNO) and Magyar Telecom (Hungary) presented on Saving the climate @ the speed of light, which is a joint study published in 2006 by ETNO and WorldWide Fund for nature (WWF). The report aims to develop a roadmap for GHG emissions in Europe based on ICT use. The report is based on a wide range of data, mainly from telecom operators and research institutes. The results are categorized as the direct, indirect and systemic effects of ICTs, with the latter having the biggest potential impact. The aim is to reduce EU emissions by 50 million tonnes of CO_2 per year. This comprises 24m tonnes from travel replacement, 22 million tonnes from sustainable community/city planning and 4 million tonnes from dematerialization. By contrast, the direct impact of increased use of ICTs generates less than 5 million tonnes, a saving/generation ratio of 10:1 (see Figure 15). The report also sets out a two-step strategy for achieving these reductions. The ETNO study is one of a number of similar ones, including from ETNO, HP and EICTO. In May, the European Union published a communiqué on the green role of ICTs.

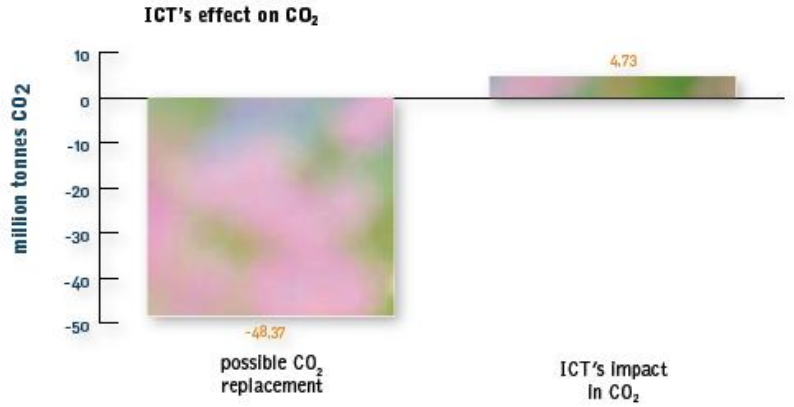


Figure 15: Ratio of savings to generation effects of ICTs
Source: Presentation by Ms Katalin Szomolanyi (ETNO)

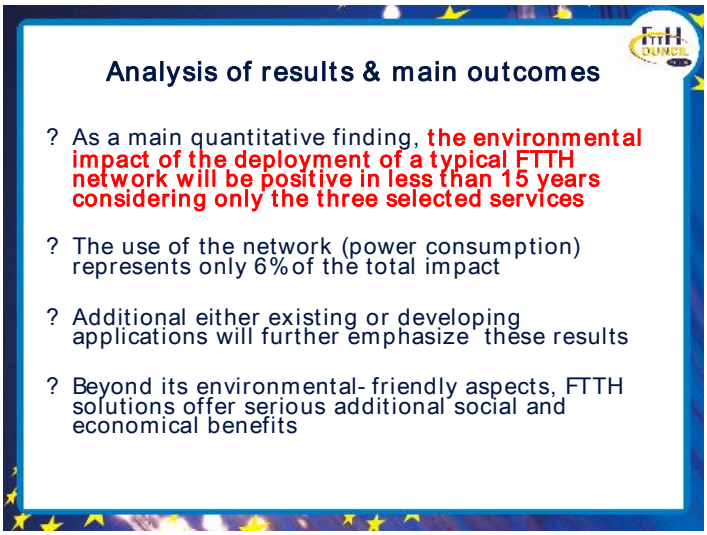


Figure 16: Results from FTTH sustainability study
Source: Presentation bv Mr Christian Ollivrv (FTTH)

Mr Christian OLLIVRY, FTTH Europe, presented on Fibre Optics and energy efficiency. In Europe, the greatest usage of fibre to the home (FTTH) is in Sweden, with over 350'000 users, while the biggest increase in the last twelve months has been in Norway. The forecast is to reach 15 million households in Europe by 2012. He reported on a sustainability study carried out jointly with PriceWaterhouseCoopers and based on a life cycle assessment (LCA) methodology, with an assumption of a fifty-year life span for infrastructure. The study looked in detail at two selected services: telework and telemedicine/home care. The results, summarized in Figure 16, indicate that the main impact of FTTH (almost 80 per cent) comes from its initial deployment. This means that, the longer the life span, the lower the unit impact. Overall, the impact is overwhelmingly positive because of the fact that fibre optic facilitates many new low-carbon applications.

Figure 17: Critical levers for energy efficiency in smart buildings
Source: Presentation by Mr Jose Alberto Varela Sanz (Telefonica)

Mr José Alberto VARELA SANZ, Telefónica, Large Companies and Public Administration (Spain) presented on Building automation for energy efficiency. He identified a number of critical levers in controlling energy efficiency in smart buildings, including presence management, lighting and air heating/cooling (see Figure 17). Telefónica's studies show that optimization through the use of ICTs can save up to 27 per cent of the annual energy consumption of a typical branch office, in southern Spain. This is equivalent to 3.3 tonnes of CO_2 avoided annually. He went on to show the benefits that could be gained by applying centralized control to the management of a branch network. In Telefónica's case, this amounts to 500 branches, giving a saving of some 1'600 tonnes of CO_2; equivalent to a small forest of more than 1'600 trees. Building automation also brings other benefits in terms of quick detection of failures, better planning and maintenance savings.

Mr Sukhdev DLAY, Communications, Media and Entertainment, SAS Institute (Belgium), presented on Optimal decision-making in the sustainability agenda. He described the value chain in sustainability management as moving from measuring what happened (e.g. by using key performance indicators), to explaining why it happened (establishing causal relationships) to predicting what will happen next (scenario building) and finally developing a strategy for what should happen (a green strategy). Applying this to climate change gives a value chain such as that shown in Figure 18. He demonstrated how this could be developed as a common decision-support platform, using computer-based modeling tools. He concluded with a case study of how these tools had been successfully implemented in a leading ICT company.

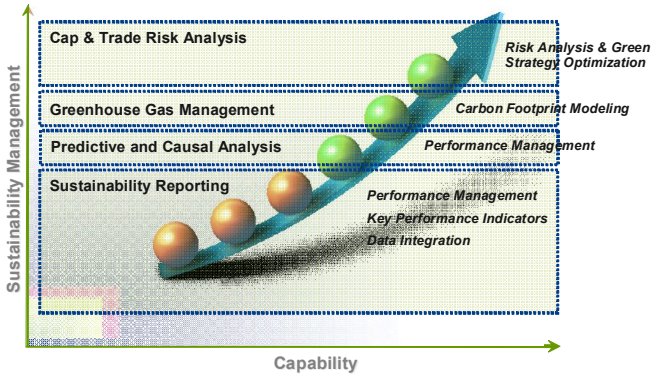


Figure 18: Value chain for climate change action
Source: Presentation by Mr Sukdhev Dlay (SAS)

Dr Fabrice SAFFRE, Principal Researcher, BT Group presented on Enabling energy micro-management through ICT. His presentation highlighted the need for the telecoms sector to reduce the need to travel and to transport goods and went on to focus on demand-side management strategies to optimize load management and energy efficiency. He used examples from the US energy information administration and the UK national grid to illustrate how this could be achieved. Opportunities for ICTs include smart metering and billing to create incentives for off-peak energy usage. He also showed how demand management could be applied at the micro-level to individual businesses, as they become generators as well as consumers of power. Again, application of ICTs is the key.

Session 5: Towards a low-carbon, high-bandwidth future

This session was intended to follow on from session 4 and examine what level of carbon abatement might be achievable with greater use of ICTs. The specific focus is on the ICT industry itself and what can be done to put its own house in order. In particular, this session examined what kind of targets might be established for the reduction in greenhouse gas emissions that could be achieved through the implementation of ITU standards and treaties. It also asks what might be the role of regulatory bodies.

This session, which was chaired by **Mr James MACFIE,** Nortel (Canada), focused on standards-making and was intended to provide advice to the ITU's standardization sector (ITU-T) on future work in this area.

Mr Peter INGRAM, Chief Technology Officer, OFCOM (UK), presented a regulator's view, specifically from the UK regulator. He briefly described OFCOM's duties, and then went on to look at halting the trend towards greater energy consumption by ICTs and national, regional and international levels (see Figure 19). He estimated current (2007) ICT power consumption in the UK to be 12 TWh in the domestic sector and 22 TWh in the non-residential sector, amounting to around 4 per cent of total UK electricity use. He emphasized, though, the positive effects that ICTs can have in reducing power consumption and gave a list of examples (22 in total) where ICTs could substitute for travel or movement of goods. He argued that, although OFCOM's regulatory duties do not directly cover environmental issues, this could nevertheless be considered consistent with the broader duty to further the interests of consumers and citizens.

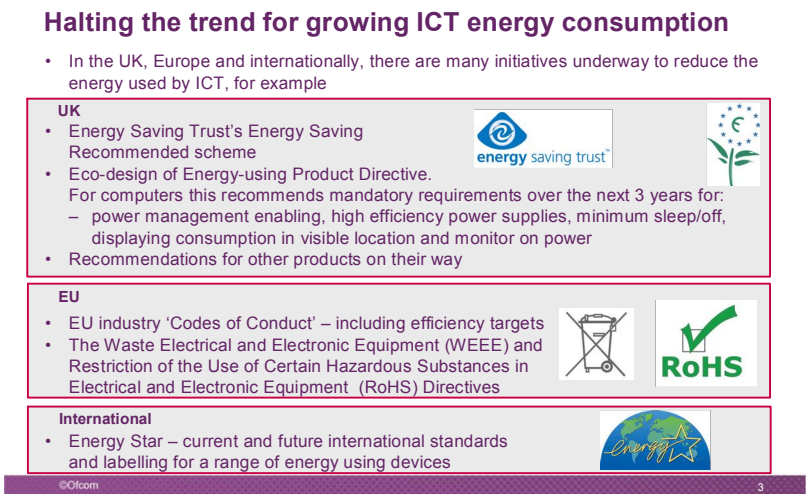


Figure 19: Actions on ICT energy consumption at different levels
Source: Presentation by Mr Peter Ingram (OFCOM)

Mr Bernard DUGERDIL, Freescale Semiconductor and ETSI Board Member; presented on the ETSI Green Agenda. Like other presenters, he used the life cycle assessment methodology (LCA) and presented a case study of the calculation for mobile networks. He showed how mobile energy consumption has fallen over time (see Figure 8). ETSI was one of the pioneers of moving to paperless meeting (since 1999) and, like ITU-T, it has recently introduced a checklist approach for reviewing standards. ETSI makes use of remote participation facilities and is also striving to be compliant with ISO 14001 and 14004 on environmental management standards. A new work item deals with environmental engineering (EE), with a number of work items on reduced energy consumption of ICT equipment, use of renewable energy sources, defining energy consumption targets, energy efficiency parameters for wireless services, optimized power consumption for xDSL and requirements of outdoor plant. Other relevant activities include intelligent transport systems (ITS) and e-health. He concluded with a "magic formula" to convince users that it is financially beneficial for them to "go green" (see Figure 20).

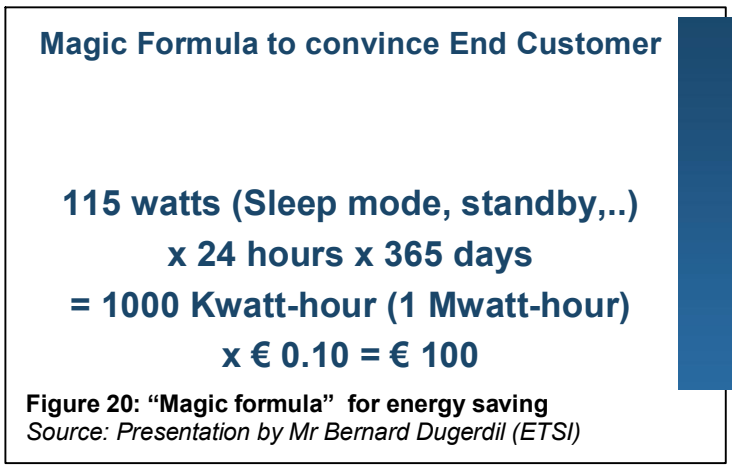


Figure 20: "Magic formula" for energy saving
Source: Presentation by Mr Bernard Dugerdil (ETSI)

Mr Yoichi MAEDA, Chair, ITU-T Study Group 15 (Optical and other transport network infrastructure), presented on the Energy Efficiency Checklist developed for ITU-T by Study Group 15. This checklist originated from a request by TSAG to conduct a systematic review of all existing and future ITU-T Recommendations in the light of

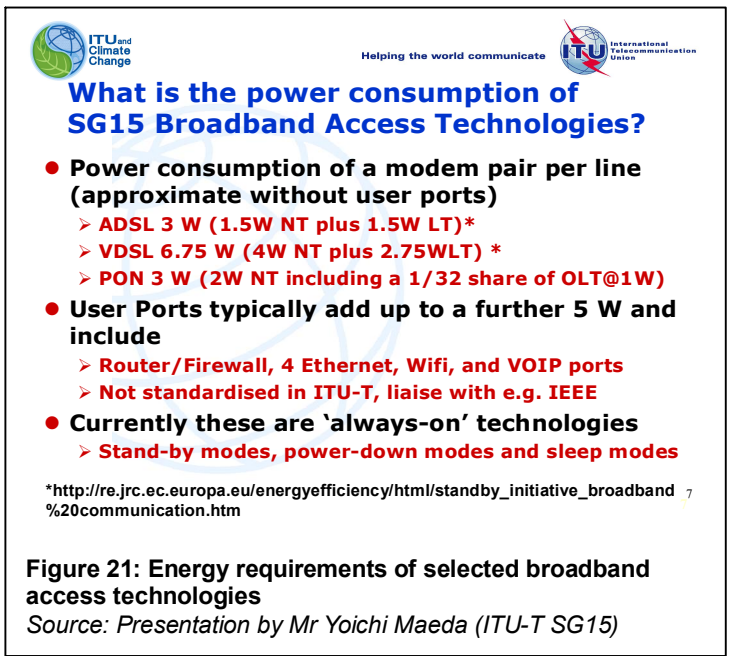


Figure 21: Energy requirements of selected broadband access technologies
Source: Presentation by Mr Yoichi Maeda (ITU-T SG15)

climate change (liaison statement #30), and it provides a series of questions that help to estimate the implications of the topic covered by each Recommendation (technical standard). He showed the typical energy requirements of some of the broadband access technologies that are standardized in SG 15 (see Figure 21) and showed how, although the natural tendency is for power consumption to rise as energy rises, this could be counter-acted by using newer technologies (e.g., passive optical networks replacing digital subscriber line technologies) and by smart standardization work (e.g., replacing always on with always available modes of working).

Dr Yuji INOUE, President and CEO, Telecommunication Technology Committee of Japan, presented some Proposals for ITU standardization activities on ICTs and Climate Change. He reiterated a point that he had made earlier at the Kyoto symposium, namely that ICTs can potentially contribute to reducing Japan's CO_2 emissions by 38 million tonnes by 2012, equivalent to 3 per cent of Japan's total 1990 emissions (a significant chunk of the reduction commitments Japan made under the Kyoto Protocol). But who believes such a claim and can it be submitted to the UNFCCC? That is why a common methodology is needed, and why ITU-T should establish a Focus Group on this issue. He expressed his satisfaction for the support expressed by the ITU-T Director, Mr Malcolm Johnson, for creating a Focus Group on ICTs and Climate Change and proposed a generalized approach for the work (see Figure 22). He called on TSAG to create the Focus Group in July so that it can start its work before WTSA-08 in October.

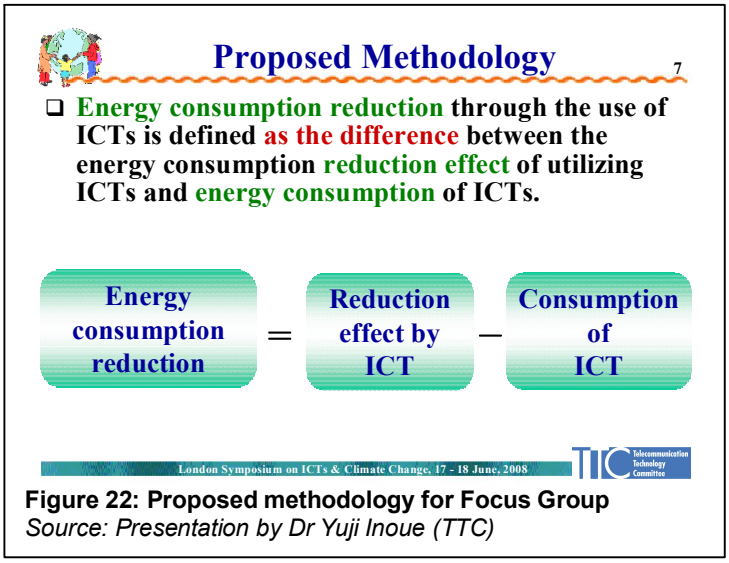


Figure 22: Proposed methodology for Focus Group
Source: Presentation by Dr Yuji Inoue (TTC)

Mr Dominique ROCHE, France Telecom Group, Infrastructure and Transmission Standardization Manager and **Mr Flavio CUCHIETTI**, Telecom Italia presented the new Energy Efficiency Inter-Operator Collaboration Group on ICTs and efficient broadband. The membership of the EE IOCG has an annual energy consumption in their networks that is roughly equivalent to that of Switzerland! The goals of the new group include sharing views, defining high-level strategic actions (especially in the field of standardization), and undertaking analysis to support each operator's strategy. The group has defined a number of areas and sub-areas for its work (see Figure 23). They illustrated scenarios (with and without intervention) from Telecom Italia and NTT to show the scope for reducing a typical operator's energy consumption. They concluded that the rising price of energy will enforce such changes even if it is not done voluntarily.

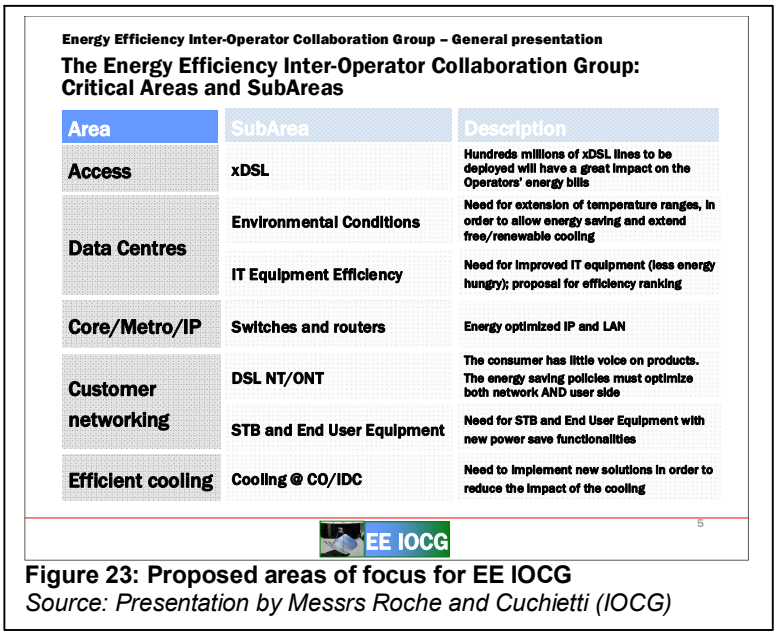


Figure 23: Proposed areas of focus for EE IOCG
Source: Presentation by Messrs Roche and Cuchietti (IOCG)

Finally, **Mr James MACFIE**, Nortel, reported some Views From The ICT Standards Advisory Council of Canada (ISACC). ISACC was founded in 1991 as an industry/government initiative. At its most recent plenary meeting (28 January 2008), a number of different presentations were made on themes relevant to this symposium. He identified two broad areas in which standards development organizations (SDOs) can contribute to environmental standards:

- By reducing power requirements for equipment;
- By developing end-of-life recycling of ICT products and materials disclosure standards.

This latter area has been particularly neglected, but Canada has developed an initiative by creating Electronic Products Stewardship Canada as a not-for-profit initiative. Mr Macfie also introduced the Next Generation Internet initiative to Reduce Global Warming (see Figure 24), developed by CANARIE, and espoused the virtues of Canada as an ideal location for zero carbon data centres (e.g., availability of cheap, renewable energy and lower costs for air cooling). He concluded with some suggestions for further research and standards development.

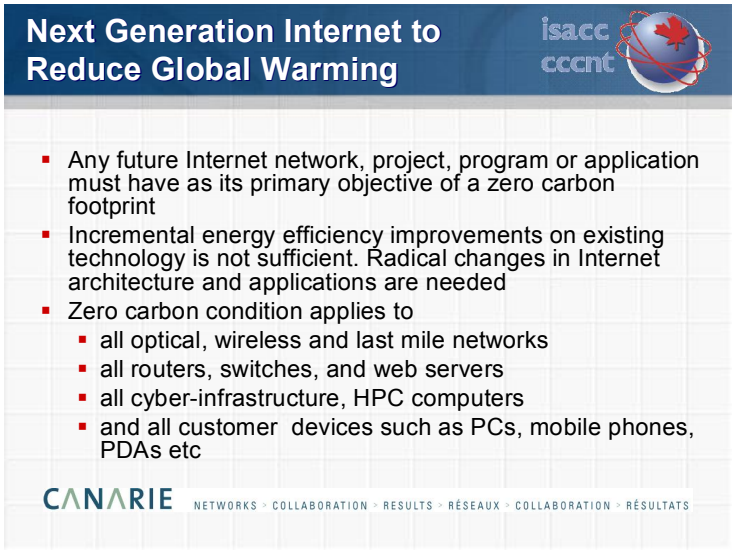


Figure 24: Next Generation Internet Initiative
Source: Presentation by Mr James Macfie (Canada)

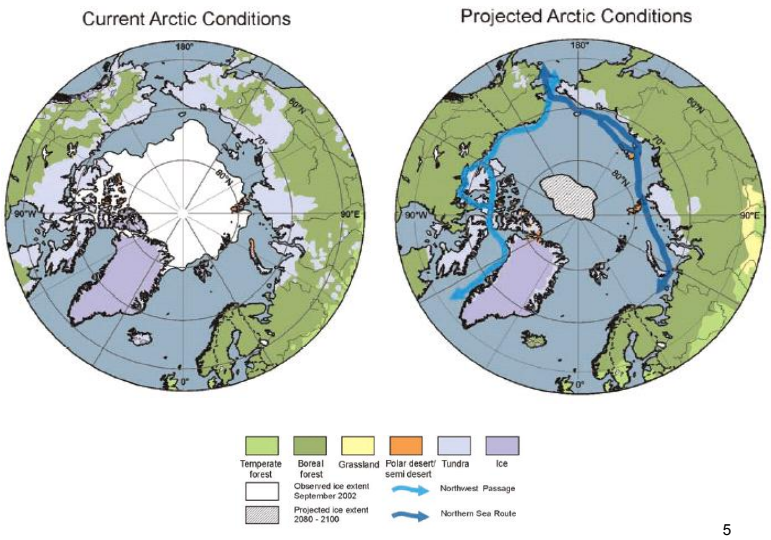
During discussion, a number of items were raised. There is need, for instance, for investigation of the reasons why the various estimates of the contribution of ICTs to global GHG emissions vary so much. It was also proposed that the new ITU-T Focus Group on climate change should actively reach out to the work of other standards development organizations (SDOs) to try to ensure better coordination and division of labour amongst the different organizations. It is worth studying in more detail the likely costs and benefits of implementing climate-neutral standards. There were also some more detailed questions about the ITU-T energy-saving checklist .

Session 6: Adaptation to climate change

Even if the Kyoto protocol commitments to limit emissions of greenhouse gases are met in full, there may still be a rise in global average temperature of up to 2° by 2020 with a consequent rise in sea levels and in the occurrence of extreme weather events. Developing countries, especially small island developing states, are literally in the eye of the storm. How can ICTs help in adapting to the new environmental challenges? How can ICT-based projects for sustainable development, which generate carbon credits, be registered under the Clean Development Mechanism of the Kyoto Protocol?

The final substantive session of the symposium was moderated by **Mr Bruce STANFORD,** Managing Director, Major Programmes, BT Wholesale, who acts as one of the champions for this issue within BT.

Mr Don MACLEAN, Associate, International Institute for Sustainable Development (Canada), presented on ICTs, adaptation to climate change, and sustainable development at the edges. He noted that, while the costs of adaptation to climate change are likely to be measured in terms of billions of US dollars, the cost of failing to adapt would amount to trillions. Taking the example of the Arctic he showed that while there may be some benefits from global warming (for instance, the opening up of new northern sea routes) the net effect would be disastrous, especially for local communities and wildlife. The IPCC forecasts a drastic reduction in the area of northern hemisphere snow cover (see



Source: IPCC, Climate Change 2007: Impacts, Adaptation and Vulnerability.

Figure 25: The shrinking Arctic ice cap
Source: Presentation by Mr Don Maclean (IISD)

Figure 25). He showed how the impacts can be analyzed at international, national and local levels and reported on a study conducted by the IISD on successful adaptation strategies. He showed the linkages between adaptation issues and ICTs. For instance, adaptation at the national level might require roll-out of broadband networks, intelligent infrastructure and e-government services while at the local level, the availability of local content was likely to prove key.

Prof Naoko IWASAKI, Assistant-Director, ITU-Waseda ICT Centre (Japan) on behalf of Prof. Toshio OBI, presented on Disaster preparedness and the global environment. In particular, she focused on the potential role that could be played by Chief Information Officers (CIOs) in the areas of global e-governance, human resources development and disaster-preparedness education. She illustrated some of the initiatives that Japan has taken in this field and proposed a new University for Green IT. She also highlighted the need for standardization of a new benchmark on the relationship between the environment and disaster issues.

Dr Neena SINHA, University School of Management Studies (India: *Remote presentation*) reported on An integrated framework for ICT-supported disaster preparedness in India. She focused on two specific areas where India is seeing the impact of climate change, namely in the area of increasing scarcity and unreliability of water resources and in the increased incidence of natural disasters in coastal areas. In global terms, India falls into the highest category of incidence of natural disasters during the period 1975-2001 (see Figure 26). She described the government of India's structure for natural disaster management, its system of cyclone monitoring and mitigation and how mobile phones can be used at the local level for alert service. She concluded with a description of the India Disaster Resource Network (www.idrn.gov.in).

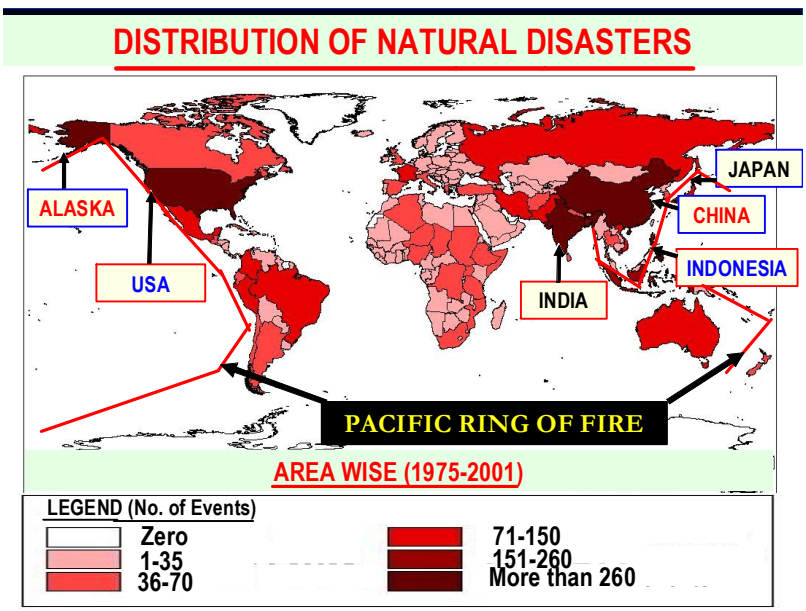


Figure 26: Distribution of natural disasters
\Source: Presentation by Ms Neena Sinha (India)

Dr Thomas DOWNING, Executive Director, Stockholm Environment Institute, Oxford office, described Technological paths to sustainability. He prophesied that all current efforts to mitigate global warming, however well-intentioned, will fail, so adaptation is inevitable. He showed that the challenges of climate change adaptation are only poorly understood, and therefore there is a need to leverage ICT-based techniques – such as wikis, social networks, diffusion of best practice examples – to support technology transfer. The Swedish Programme for ICT in Developing Regions (SPIDER) provides a good example in this respect, in providing a link to poverty reduction strategies. Adaptation strategies need to be scale-free, and ICT offers the best way of delivering this. He illustrated the presentation with a number of other case studies, including AWhere (www.awhere.com) for providing spatial information, the Agricultural Strategic Information Service, developed in Thailand, and the weADAPTwiki.

Ms Kerstin LUDWIG, Project Officer, ICT Applications and Cybersecurity Division, ITU-D, presented the scoping study on ICTs for e-environment (the report is available at: http://www.itu.int/ITU-D/cyb/app/docs/itu-icts-for-e-environment.pdf). The report was commissioned in mid 2007 from the Aylmer Group (Canada) to look at ways of implementing ITU's commitments under Resolution 35 (Kyoto, 1994) on e-Environment applications, as well as responding to ITU's role as a co-facilitator of WSIS action line C7 (e-environment). A simple view of the ICT role distinguishes between:

- first order effects (e.g. negative impact on use of resources and carbon emissions of the ICT sector itself);

- second order effects (e.g. efficiency gains from ICT use and structural benefits);
- third order effects (e.g. behavioural adaptation).

The report lists over 140 ICT environmental applications, some 900 different multilateral and 1'500 bilateral agreements in the environmental area. It also looks at the implications for developing countries (see Figure 27). Opportunities identified for ITU include awareness-raising, capacity-building, strengthening activities related to disaster communications and assisting developing countries in elaborating e-Environment strategies.

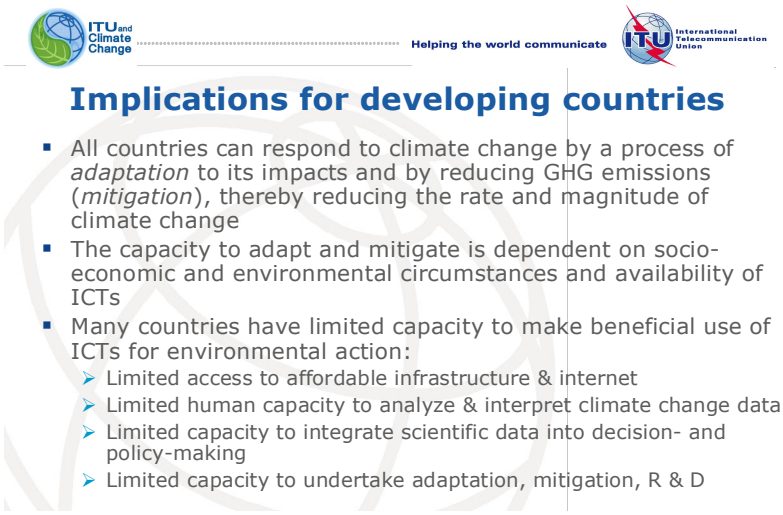


Figure 27: Implication of climate change for developing countries
Source: Presentation by Ms Kerstin Ludwig (ITU)

In the final presentation, **Prof. Shoichiro ASANO**, National Institute of Informatics and **Dr. Susumu YONEDA**, Softbank Telecom Corp. Lab (Japan) presented on an approach based on networked ID systems to prepare for Global Environmental/Health Concerns. The presentation noted that, in the increasing times of emergency and environmental stress that will undoubtedly follow on from global warming, the ability to establish identity will be critical. This will require standardization work. They explained the ITU work on identity management, both in the Joint Coordination Activity (JCA) on the networked aspects of ID and in the Global Standards Initiative (GSI) on Identity Management.

Review and wrap-up session

The overall and wrap-up session was chaired by the overall Symposium chair, **Mr Tom WALKER**, with the participation of moderators from the six substantive sessions who provided a brief report on their sessions. Mr Walker then proceeded towards adoption of the chairman's report, with changes proposed by participants being incorporated into this revised document. He invited further comments on the version posted on the ITU website by 27 June 2008.

Close of meeting

Mr Malcolm JOHNSON (ITU-T) took the floor to close the meeting, with some reflections on the discussion and a vote of thanks for the speakers and moderators, the participants, the hosts, and BERR who hosted a reception on the first day. Mr Johnson said "There seems to be three order effects to address:

- Energy consumption of ICT equipment;
- Efficiencies to be gained through the use of ICTs in other sectors;
- The need for a behavioural change – both for businesses and consumers.

I believe ITU has a role to play in all three areas. We will study the Chairman's excellent summary of this symposium to adapt our future work programme accordingly." He also expressed confidence in taking the Kyoto proposal to establish a Focus Group forward to TSAG now it had received the endorsement of this meeting.

Mr Bruce STANFORD (BT) echoed his words and thanked ITU, as the organizer, for bringing such diversity to the event. He note that the gestation of the event had taken less than six months, and there was a need now to take time to digest the very rich material presented. BT will continue to try to lead in this field, he said, but it is never possible to do enough. **Mr Tom WALKER** closed the meeting noting the words from Ms Ludwig's presentation that ICTs can be either heroes or villains in the coming combat against climate change, and ensuring that we make sure it is the former.