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STUDY GROUP REPORT

Report from Study Group on ICT Policy for Addressing Global Warming

Introduction - Global warming and ICT

With the problem of global warming becoming more serious year after year and this fiscal year being the starting point for the first commitment period for the Kyoto Protocol, there have been more and more discussions worldwide on what kind of countermeasures can be taken globally. In addition global warming was taken up as a major topic for discussion at the Hokkaido Toyako Summit in July and levels of interest in global warming issues are now higher than they have ever been, with the seriousness of the issue becoming broadly recognized.

Against this background, the Study Group on ICT Policy for Addressing Global Warming (chair: Professor Emeritus TSUKIO Yoshio, the University of Tokyo) was established in September 2007 to study how the ICT field should respond to the issue of global warming, and has held a series of discussions ever since. The study group has now compiled its report which is introduced in this article.

The volume of CO2 emissions and the effectiveness of reducing CO2 in the ICT field

Assessment method

When assessing the effectiveness of reducing the environmental burden through ICT, two approaches are possible, of either the volume of CO2 emissions produced by the use of ICT or the reduction in CO2 emissions in various fields through the effective use of ICT.

Since it is a fact that the use of ICT produces CO2 emissions, it is necessary to pursue energy saving in ICT. On the other hand, through the effective use of ICT it is possible to bring about enormously enhanced efficiency in production, consumption and business activity and to reduce CO2 emissions through alternative communications and a reduction in traffic congestion. ICT can also make a contribution in environmental measurements and forecasting.

Power consumption and CO2 emission volumes in the ICT field

In order to grasp quantitatively the relationship between ICT and global warming, Japan's CO2 emissions resulting from ICT use (mainly growth in electric power consumption) as well as the effectiveness of reducing CO2 emissions by effective use of ICT were estimated through 2012.

First of all, with regard to CO2 emissions resulting from ICT use, electric power consumption for the ICT field as a whole, totaling the communications field and the broadcasting field, was used as a base of the calculation (see Figure 1). As a result, it was estimated that Japan's ICT field as a whole would consume a total of 73 billion kWh and emit 30 million tons of CO2.

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International Policy Division, International Affairs Department, Telecommunications Bureau, Ministry of Internal Affairs and Communications (MIC)
1-2, Kasumigaseki 2-chome, Chiyodaku, Tokyo 100-8926, Japan
Fax: +81-3-5253-5924
Tel: +81-3-5253-5920

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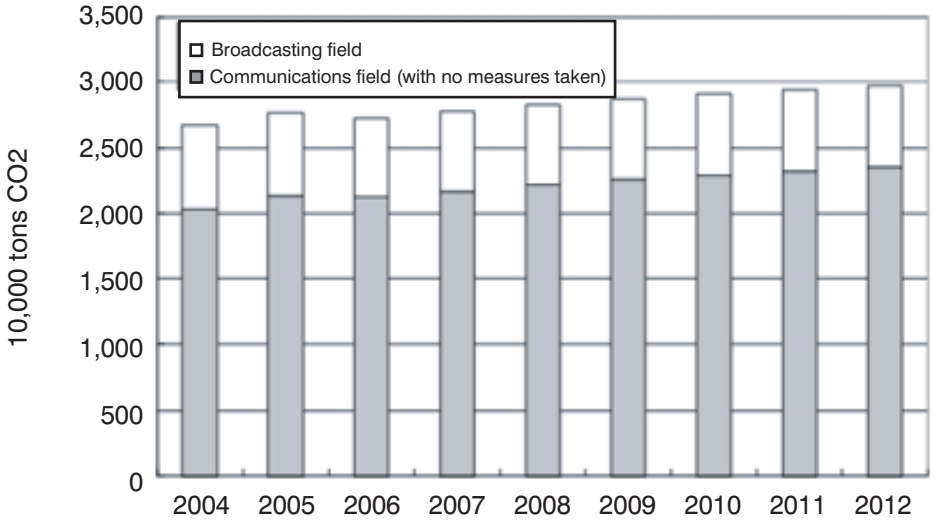
Figure 1: CO2 emission volume for the ICT field as a whole



Effectiveness of reducing CO2 emissions through effective use of ICT

In order to estimate the effectiveness of reducing CO2 emissions through effective use of ICT, 7 fields and 19 ICT usage scenarios were used, as shown in Chart 1.

In concrete terms, estimates were made for fields such as electronic commerce, the shift to informatization of materials, movement of people, intelligent transport systems, electronic government and municipalities, energy control etc. and for each of these usage scenarios, by forecasting penetration rates until 2012 using statistical data, estimates were arrived at on the extent to which CO2 emissions would be cut.

Chart 1: Effectiveness of CO2 reduction through effective use of ICT

Assessment field	Usage scenarios	Fiscal 2006		Fiscal 2010		Fiscal 2012	
		10,000 tons CO2	Percentage	10,000 tons CO2	Percentage	10,000 tons CO2	Percentage
Electronic commerce for consumers	Online shopping	198	0.1%	542	0.4%	712	0.5%
	Online issuing of air tickets	2	0.0%	5	0.0%	6	0.0%
	Purchase of tickets at convenience stores	31	0.0%	60	0.0%	64	0.0%
	Putting in place of ATMs	261	0.2%	291	0.2%	319	0.2%
Electronic commerce for corporations	Online trading	527	0.4%	767	0.6%	836	0.6%
	Supply-chain management	532	0.4%	1,839	1.4%	1,839	1.4%
	Re-use market	577	0.4%	1,154	0.8%	1,197	0.9%
Shift to informatization of materials	Music-related contents	35	0.0%	114	0.1%	133	0.1%
	Image-related contents	15	0.0%	21	0.0%	25	0.0%
	PC software	11	0.0%	53	0.0%	61	0.0%
	Newspapers and books	4	0.0%	91	0.1%	95	0.1%
Movement of people	Telework	30	0.0%	50	0.0%	63	0.0%
	TV conferencing	105	0.1%	194	0.1%	305	0.2%
	Remote management	5	0.0%	5	0.0%	5	0.0%
Intelligent transport systems	ITS	308	0.2%	370	0.3%	401	0.3%
Electronic government and municipalities	Electronic bidding	0	0.0%	2	0.0%	2	0.0%
	Electronic applications (tax return filing)	0	0.0%	8	0.0%	8	0.0%
	Electronic applications (online reception)	0	0.0%	1	0.0%	1	0.0%
Energy control	BEMS/HEMS	468	0.3%	730	0.5%	730	0.5%
Total		3,110	2.3%	6,297	4.6%	6,802	5.0%

NB-1: The percentage figure shows the percentage of Japan's fiscal year 2005 figure for greenhouse gas emission volume.
NB-2: With regard to telework, ITS, BEMS and HEMS, the CO2 reduction volume was taken from the Kyoto Protocol target plan.

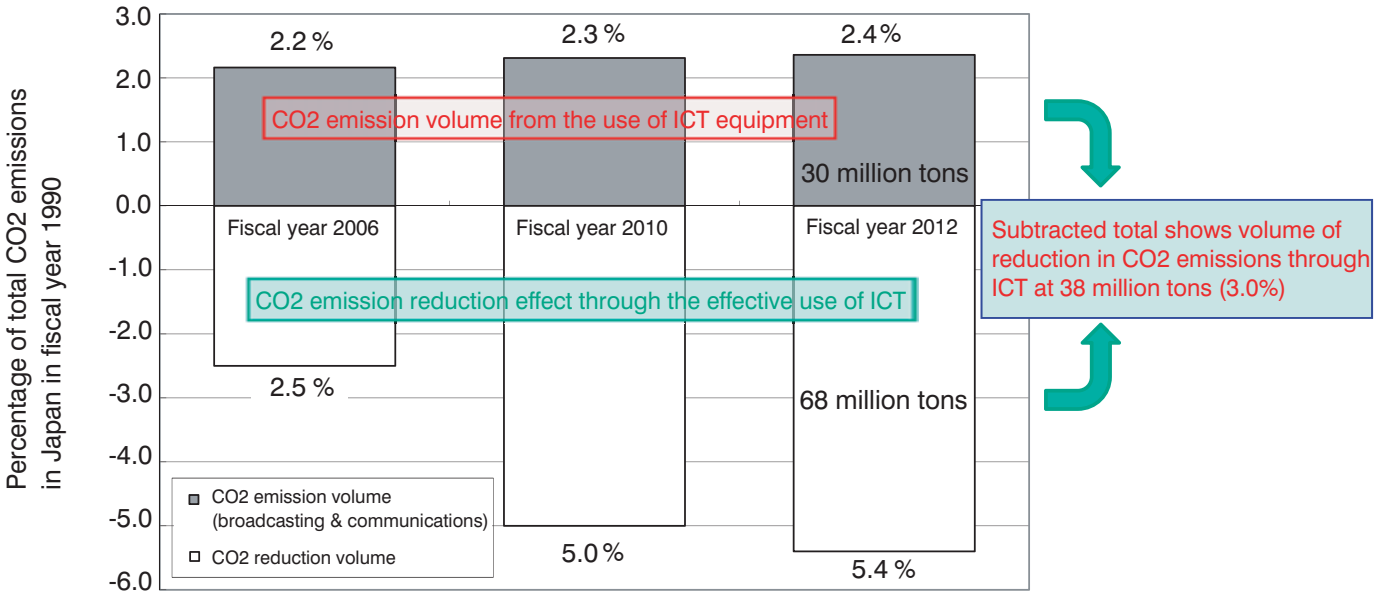
Figure 2 shows the total of CO2 emission volume from the use of ICT minus the reduction in CO2 emissions through the effective use of ICT.

Due to power consumption for ICT equipment, 30 million tons of CO2 will be emitted in 2012, but there will be a reduction of 68 million tons in CO2 emissions through the effective use of ICT, so that the overall cut will be of 38 million tons.

This is equivalent to 3% of Japan's total CO2 emissions in 1990, which makes it evident that ICT is having a significant impact in reducing CO2.

It can be said from the above that, if the penetration of effective use of ICT continues, it will be able to contribute positively to the problem of global warming.

Figure 2: CO2 emission volumes and CO2 reduction effect in the ICT field



In addition, the study group looked for actual examples of reductions in the environmental burden through ICT, and carried out a quantitative assessment of their CO2 reduction effects. With regards to the 39 actual examples that were received, the quantitative assessment showed a reduction of 270,000 tons per annum in CO2 volume (reduction rate: 93%).

Furthermore, MIC decided to put in place a prize category for environmental contribution through ICT usage for general users, as part of this fiscal year's "u-Japan Grand Prize." The purpose for this includes the broadening of education among general users, so it will be continued after next year as well, with dissemination and commendations as best practice examples.

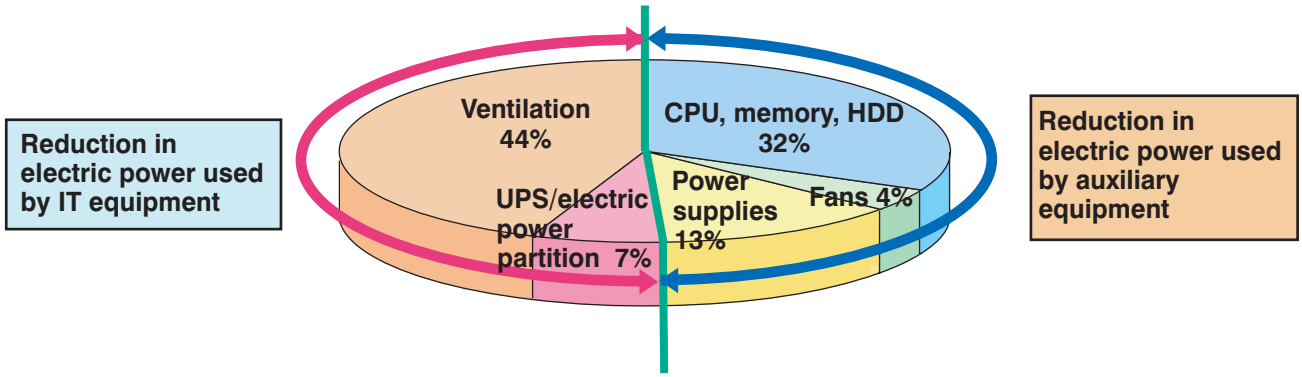
Measures for further reductions in CO2 emissions using ICT

Implementation of measures that take the environment into consideration with regard to data centers, ASP and SaaS

If indices were displayed that permit energy efficiency comparisons in cases of data centers, ASP, or SaaS usage, it would be possible for users to select operators for data centers or for ASP or SaaS based on such indices.

By doing this, it would become possible for the user to evaluate the approach towards the environment of the business operators, and service providers could make their consideration for the environment into PR, which means that it would function in a beneficial fashion for both sides.

Figure 3: Data center electric power consumption



Source: Produced by NEC based on "Powering Computing Platforms in High Efficiency Data Centers" (Intel Developer Forum, fall 2006)

Promotion of energy-saving in very large-scale information management

With the advances in ICT and the digitization of information, the volume of data generated increases sharply each year. For archive data for which usage levels are noticeably low, attention is being given to making a positive contribution to the problem of global warming by shifting to storage methods which use little electric power such as optical discs. In addition, optical discs are a Japanese technology and domestic companies hold many intellectual property rights in this field, and manufacture many products, so this approach is a beneficial one from the perspective of increasing Japan's international competitiveness.

Promoting ICT approaches that take the environment into consideration

In order to make a contribution to becoming a low carbon footprint society, the following approaches would appear to be beneficial.

- Providing incentives for companies and households
- Promotion of shift to ICT for social systems/Building a low carbon footprint urban model through the effective use of ICT
- Putting in place a simple method for assessing CO2 emission reduction results, and promoting international standardization
- Promoting penetration and enlightenment

ICT research and development topics for contributing to the reduction of CO2 emissions

In the past, ICT research and development was carried out with the aim of improving services, bringing about greater business efficiency, cutting costs and the like, all of which ultimately resulted in reductions in CO2 emissions, but such results until now have basically been secondary effects and were not necessarily adopted from the perspective of dealing with the problems of global warming.

The study group took into consideration the target years for the objectives to improve energy usage within the Asia-Pacific region set at the September 2009 meeting of APEC (Asia-Pacific Economic Cooperation) heads of state, and the arguments in the fourth IPCC (Intergovernmental Panel on Climate Change) report, and set the target date for the research and development topics to be investigated at 2030. It divided the life of people in that year through various scenarios, including (1) production, distribution and transport scenario, (2) office and retail scenario, (3) average household scenario, and (4) shared effective use of ICT, giving a society image for each scenario, and drawing out the ICT systems needed to realize such a society. The results obtained can be seen in Figure 4.

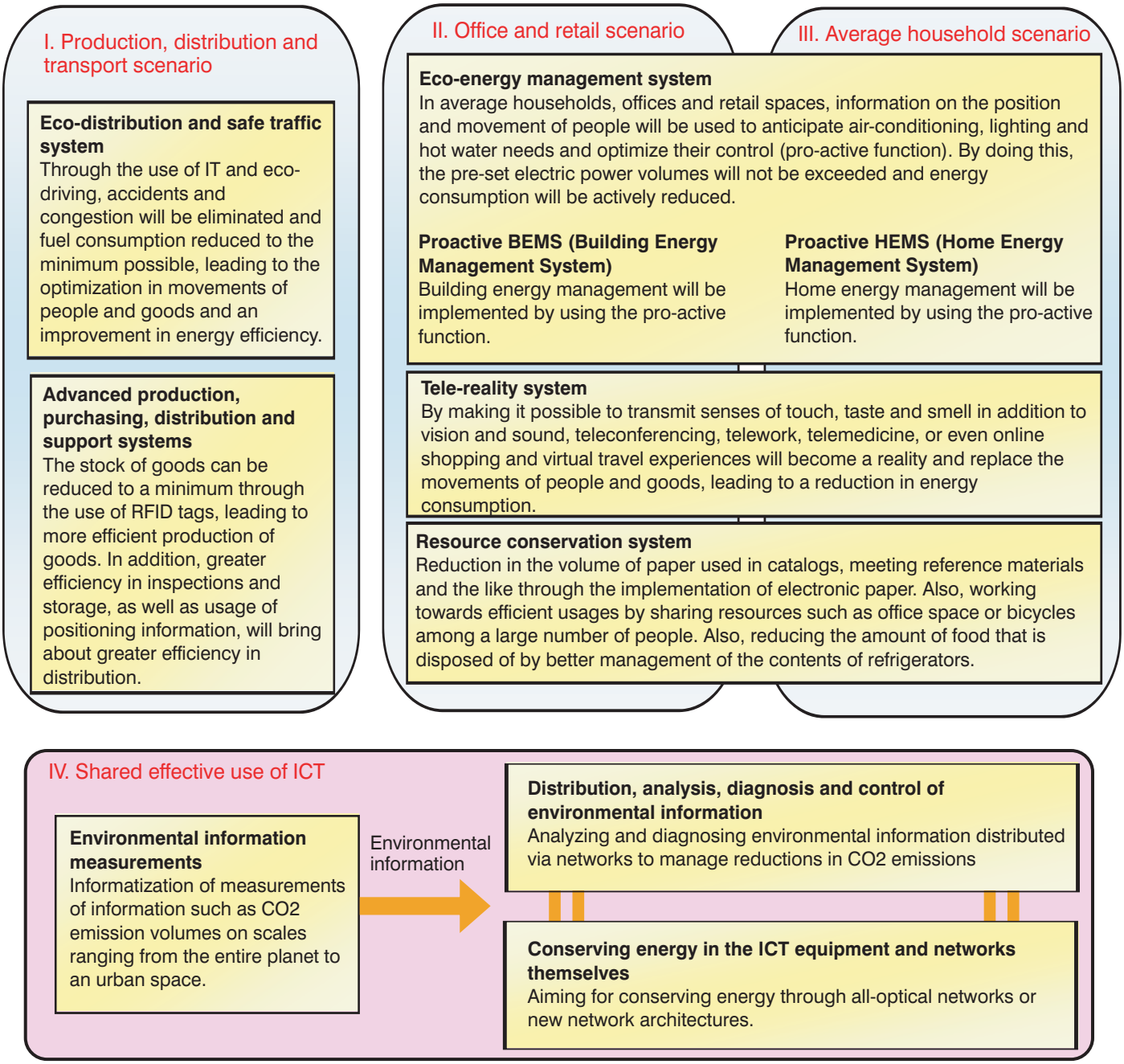
In order to realize a society in which CO2 emissions have been reduced, it is necessary to bring about the following 5 ICT systems.

- Eco-distribution and safe traffic system
- Advanced production, purchasing, distribution and support systems
- Eco-energy management system
- Tele-reality system
- Resource conservation system

It is necessary to carry out research and development in the future, aiming for the realization of these systems. In particular, the "eco-energy management system is a system for the management of reductions and supplies of electric power through informatization of energy flow and would be mainly implemented in offices, retail spaces and households. It is estimated that it would bring about a significant reduction in CO2 emissions at approximately 31.5 million tons of CO2 per annum.

In addition, it is also necessary to promote research and development on the "energy conservation in the ICT equipment and networks themselves" through the move to all-optical networks and energy reductions for ICT equipment, as well as "environmental information measurements" which will enable measurements of CO2 emission volumes.

Figure 4: Required ICT systems for the realization of the 2030 society system



Recommendations - Conclusion

First of all, the concept of "ICT can contribute positively to the problem of global warming while going after economic growth and increased convenience" should be aggressively spread both domestically and overseas, with the aim of increasing its levels of recognition.

Also, it seems necessary to put in place international methods for assessing the effectiveness of CO2 emission reductions using ICT, and to pursue their standardization. By doing this, companies will be able to do quantitative counts of their own efforts to reduce CO2 emissions through the use of ICT.

Additionally, it is conceivable that a reduction in CO2 emissions through the use of ICT could be used for the CDM (Clean Development Mechanism) of developing countries, and so investigations should also be started on this type of approach.

On the other hand, along with promoting research and development of the 5 ICT systems including the eco-energy management system that manages consumption and supply of electric power through the informatization of energy flow, there is a need to promote research and development of new-generation network architectures that would be common to them, the move to reduce energy consumption of ICT equipment and networks themselves, and research and development of technology to measure CO2 emission volumes.

MIC organized, in coordination with the International Telecommunication Union (ITU) the Symposium on ICTs and Climate Change in Kyoto on April 15 and 16. At the symposium, MIC presented input from this study group's results, and the ITU presented a chairman's report on its standardization activities with regard to assessment methods for the effectiveness of reductions in CO2 emissions through ICT.

The ITU held a follow-up symposium in London in June, and started full-scale standardization activities from July, expecting a contribution from Japan.

MIC will continue to develop various measures along the lines of the recommendations made by the study group.

(1) The concept of "ICT can contribute positively to the problem of global warming while going after economic growth and increased convenience" should be aggressively spread both domestically and overseas, with the aim of increasing its levels of recognition.

(2) From the perspective of realizing low-carbon footprint society through the use of ICT, the shift to ICT of social systems in a variety of fields should be promoted, along with the greater penetration of social systems such as electronic government and electronic municipalities that have already shifted to ICT. In addition, the building of a low-carbon footprint urban model using ICT should be encouraged.

(3) It is necessary to put in place international methods for assessing the effectiveness of CO2 emission reductions using ICT, and to pursue their standardization.

(4) A mechanism should be put in place to enable companies to include CO2 emission reduction volume in their environmental approach such as independent action plans. Also, there should be an investigation into approaches towards CDM related activities in developing countries.

(5) Measures that take the environment into consideration should be encouraged for data centers, ASP and SaaS. For archive data, there should be promotion of measures to reduce CO2 emissions in information management, such as encouraging a shift to storage methods that consume little electric power, such as optical discs.

(6) The putting in place of support measures should be investigated in order to encourage the likes of approaches at corporations that take the environment into consideration through the use of ICT, and the "visualization" of electric power consumption in households.

(7) Information should be disseminated on best practices through actual examples of reductions in the burden placed on the environment using ICT, and a prize system put in pace, promoting it across society.

(8) There is a need to promote the research and development of "eco-energy management systems" which manage consumption and supply of electric power by informatizing energy flow, as well as a "resource conservation system" that will bring about a paperless society, "energy conservation for ICT equipment and networks themselves" and "measurement of environmental information."

(9) There is a need, along with promoting research and development of technology elements such as the new-generation network architecture that is common to all of the above, to promote in the future technology elements that will need to be studied anew within the ICT field from the perspective of reducing CO2 emissions.