R&D Spirits

Environmental Management in the NTT Group Toward a Sustainable ICT Society

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There is a strong demand for today's corporations to adopt effective environmental measures, especially toward the reduction of CO_2 emissions. In response to this need, NTT has been developing environmental impact evaluation technology for use in the NTT Group. Faced with an urgent need for even a few environmental measures, how is NTT progressing in these efforts and what future issues must it address? We put these questions to research engineer Takeshi Origuchi, a member of the Environmental Management & Provisioning Project and a key figure in the promotion of NTT Group environmental measures.

Promoting environmental measures in the NTT Group and participating in Ministry of the Environment projects

—*Mr. Origuchi, could you give us a brief description of the Environmental Management & Provisioning Project?*

Our project aims to determine the impact of information and communications technology (ICT) services on the environment, taking into account both positive and negative factors, and to assess that balance using life cycle assessment (LCA) techniques. For example, if the use of videoconferencing were to expand significantly, many business trips would become unnecessary, meaning less use of transportation facilities and a corresponding reduction in the environmental load. On the other hand, if videoconferencing systems were to be introduced but only used infrequently, then the environmental load associated with system maintenance would outweigh any load-reduction effects from less movement of people. Our objective is to quantify these factors and contribute to the building of a sustainable society by proposing a direction for society as a whole that can reduce the environmental load.

The mission of the Environmental Management & Provisioning Project is to promote environmental management in the NTT Group through R&D efforts centered on environmental-measures studies and environmental impact assessment technology. The NTT Group Vision for Environmental Contribution aims to achieve a reduction of 10 million tons of CO_2 emissions for fiscal 2010, and we are working on various measures to meet that goal (**Fig. 1**).

—*What specific themes are you working on now?*

One is the development of a system for assessing the environmental impact of ICT services (**Fig. 2**). This system is intended to be used not just by specialized researchers like ourselves but by general users too. It can assess the environmental impact of a wide variety of ICT services and calculate the environmental effects of implementing more efficient business operations. The system consists of an environmental impact assessment database and an algorithm for calculation purposes. This algorithm is one that I myself created. Another important theme that we are now working on is an environmental accounting system. The idea here is to quantitatively determine the cost and the effect of environmental protec-
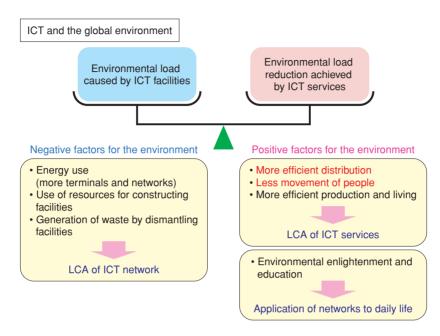
Fig. 1.   Environmental impact of ICT.

Kankyo Shiro, a system for assessing the environmental impact of ICT services

Development objective: Fulfill the NTT Group vision for environmental contribution by providing an environment in which anyone can perform environmental impact assessments.
System overview: Targeting assessment of networks including fixed, IP, and mobile networks and ICT services such as videoconferencing and e-learning offered over those networks, this system calculates environmental impact in terms of CO_2 emissions for all stages from production to use and disposal.
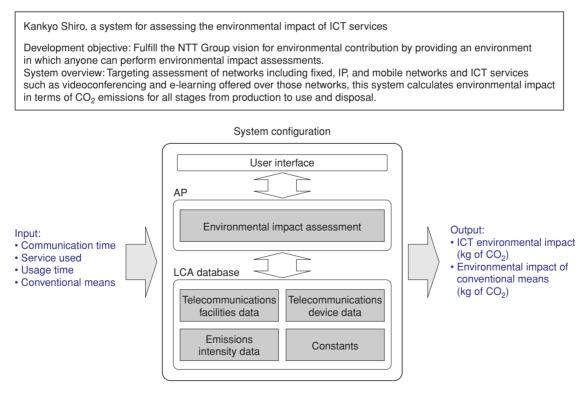

Fig. 2.   Development of an environmental impact assessment tool.

tion in business activities to promote more efficient and effective measures. This system was initially introduced in the NTT Group in fiscal year 2000. I am currently serving as the secretariat of the Environmental Accounting Consolidated Compilation Project, for which I have introduced depreciation calculations and developed and introduced logic for calculating risk-aversion effects.

Also, in terms of outside activities, I am participating in a project of the Ministry of the Environment's called "Japan Low Carbon Society Scenarios toward 2050." Recognizing that CO_2 emissions must be reduced by 60–80% to keep global warming under 2°C and thereby achieve a sustainable society, this project aims to research and survey ways of achieving that target. Here, as a member of the IT (information technology) team headed by the University of Tokyo, I survey and study the use of supply chain management techniques that have been adopted by industry to make business operations more efficient. I am also involved in the preparation of industry standards and guidelines for the environmental-impact assessment of ICT services at the Japan Forum on Eco-Efficiency. Although these are not official ISO standards, they are attracting attention as the world's first unified set of standards on environmental impact assessment.

By the way, LCA is also being researched at NTT Energy and Environment Systems Laboratories. Their approach, though still based on LCA, is a more fundamental one while we take a more practical approach. One of our policies is therefore to make practical use of techniques developed by NTT Energy and Environment Systems Laboratories whenever possible.

—*What does this R&D mean for NTT and society?*

A ubiquitous broadband society overflowing with ICT can create much value. But if such a society is not sustainable, it can hardly be called ideal even if it has produced a high degree of economic development. In such a situation, our assessment technology has much meaning. Determining how to interpret assessed items and what actions to take provides useful guidelines. By striving to view an ICT service in a comprehensive way, we can accurately determine its effects and problems, and by extracting undesirable elements, we can contribute to the building of a sustainable society. This, I think, is the meaning of our R&D.

—*What do you see as future issues and how do you plan to deal with them?*

To begin with, there is a ripple effect in relation to total LCA of an ICT service. For example, there is no denying that substituting videoconferencing for traditional meetings can reduce the environmental load. However, a person that does not make such a trip must of course perform other activities during the

time that would have been used for making the round trip to the meeting. Those activities might even increase the environmental load. This is called the ripple effect. How should we go about assessing it, and how wide should the range of assessment be? These are important topics for research in the future. I personally think that topics like the increase in non-face-to-face communications, such as email, and the effects of IT-related crime should be pursued too. This will require studies involving the social sciences, but we are still far from that point.

A leading authority in CO_2 quantitative techniques in a field of diverse research

—*Mr. Origuchi, what are some R&D trends in LCA in Japan and overseas?*

In Japan, LCA research related to IT services is quite active, as reflected by the number of corporate members of the Japan Forum on Eco-Efficiency. NTT is known to be an especially devoted member in this area.

Overseas, LCA is flourishing in Europe. Carriers in the UK, France, and Germany are quite enthusiastic about LCA techniques. Environmental impact assessment is being pursued, in particular, at the Global e-Sustainability Initiative (GeSI), a European non-profit organization consisting of ICT corporations centered on BT, and at the European Telecommunications Network Operations Association (ETNO). Organizations such as these that involve Europe on the whole can be very powerful in the field of LCA. But at the same time, the trend of LCA research in Europe is not restricted to environmental elements. That research also addresses impact on supply chains as well as issues surrounding corporate social responsibility such as compliance and employment problems and social welfare. Conceptual aspects of LCA are consequently stronger than technological aspects in Europe, and I believe that Japan excels in terms of quantitative techniques. Meanwhile, in the USA, there is much research targeting the Internet involving, for example, the calculation of total power consumption by ICT. At any rate, there seems to be a growing trend there to view the environmental load generated by ICT services as more of a problem than their impact on other aspects of society.

As far as Asia is concerned, there is a lot of research on eco-efficiency in Korea, where there are also LCA-related activities on a national level. In a similar manner, other countries like India are taking an

approach based on environmental load in relation to gross domestic product. And as for China, I had the opportunity to spend about six months there two years ago to provide some training and conduct environmental surveys. At that time, a software company that received some practical training from me showed interest in my research. Also, at a presentation that I once gave at the Alliance for Global Sustainability (AGS) international conference at the University of Tokyo, a number of invited researchers from China's national research laboratories were quite interested in my research. But in truth, when their thoughts are dominated by considering how to provide the energy required for rapid economic development, I think it's a bit premature to hold discussions about the environmental impact of ICT services in China.

—Are you involved in any information exchange on the international level?

Well, I attend surveys and international conferences quite often, and this gives me the opportunity to exchange ideas and opinions with researchers from around the world. The year before last, for example, I held discussions with members of the GeSI at a Japan-Europe roundtable, and just last November I gave a presentation at the EcoBalance international conference held in Tsukuba.

—How do you think NTT is viewed based on your experiences at international conferences and elsewhere?

As I just mentioned, the work that we are doing here at NTT is naturally a topic of discussion at various sites where I interact with other researchers, and I believe that there is genuine interest on the basis of those discussions. However, there are times when some doubt is expressed about our research, which tends to be focused on CO_2. For example, while I was holding discussions with a certain company in Germany for a survey I was conducting, I was asked "Why do you look only at energy and CO_2?" In other words, they were saying that there are various kinds of environmental impact in addition to CO_2 such as the problem of e-waste from ICT products. The feeling was that, while quantitative techniques are good, shouldn't the problem be viewed in a more comprehensive manner? Of course, a lot of this has to do with different approaches, but I have to admit that viewing LCA from a broad perspective has merit. I think that, in the future, it will be necessary for us to think along

these lines.

Taking on environmental management beginning with the recycling of telephone directories

—How did you develop your technical expertise and why did you enter NTT?

Being a great admirer of Einstein, I studied theoretical physics at university and my thesis was on relativistic quantum mechanics (field theory). But I also had a desire to try my hand at experimentation, so for my master course, I entered the materials-chemistry research laboratory, where I researched the construction of magnets from organic materials. When asked why I entered a research laboratory specializing in information communications after researching materials chemistry in graduate school, I am sometimes at a loss to explain, but one reason is that I wanted to research a field with many future possibilities like IT. I was also attracted to NTT Laboratories because of its wide range of research fields, its technical prowess, and its role as a national flagship.

—How did you get started in your current R&D activities?

Soon after entering NTT Laboratories, I began work on the development of microporous material (MPM), which is made from the sludge produced by the paper-recycling process (**Fig. 3**) [1]. NTT uses a huge amount of paper for telephone directories, and while most of the used directories that are collected are used for producing recycled paper, some of it is unsuitable for recycling and is consequently incinerated and turned to ash. We developed a process of converting this ash, which includes ink and clay from coating agents, into MPM. This MPM can be used to improve water quality and absorb organic materials like nitrogen and phosphorus. After it has been used to purify water, the used MPM can then be used as a nutrient soil dressing in fields. This return to nature creates a closed loop, thus achieving "total recycling."

While working on this theme, I had the opportunity to visit Germany and Sweden, where environmental measures are permeating society. I was deeply impressed with what I saw, and I became a firm believer in the idea that "It's not just a question of developing environmental technologies; it's also important to consider how they can be implemented
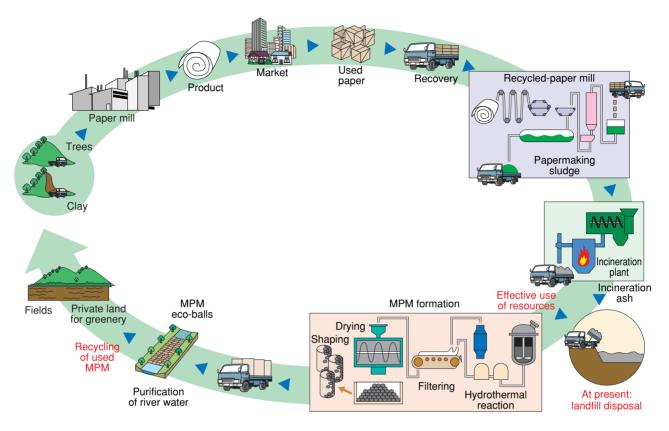
Fig. 3.   Total recycling of paper.

in society." It was then that I expressed a desire to participate in the Environmental Management & Provisioning Project that was just starting up, and my request was approved. I really felt that, after many twists and turns, I had arrived at my destination. Although it was a path that I had never thought of while studying theoretical physics, it was nevertheless exactly what I wanted to do.

—What is the motivation for performing R&D for you personally?.

I want to move "big things" with my own ideas. Before, when researching materials chemistry, I would sometimes be the first in the world to discover certain phenomena. You would think that that would be a wonderful thing, but in the end, it did not make me all that excited. Also, while developing MPM, although I did experience a sense of accomplishment, I felt that it was just one of many environmental protection measures based on one type of technology, and I could not really feel all that satisfied with my accomplishments. My current line of work, in contrast, is different from what came before in that I feel

much more motivated. It is not an easy thing to manage the entire NTT Group, but the challenge makes my work all the more worthwhile. Though I might sound a bit presumptuous in saying this, I pursue my work based on the motto: "If I can move NTT, I can move Japan, and if I can move Japan, I can move the world."

Addressing environmental issues in the era of "30 million optical fiber subscribers"

—Mr. Origuchi, please give us your outlook for the future.

To begin with, we will have to develop measures to meet the 2010 CO_2 reduction target of 10 million tons. I would like to solidify policies within the next two to three years, especially in regard to meeting this total target through the actual services provided by each of the group's carriers. The year 2010 that we consider to be just one period delimiter in our work is also the year for which the NTT Group has established a target of 30 million optical fiber subscribers. Additionally, it is the year that genuine next-genera-

tion network (NGN) operations are scheduled to begin. The environmental load that will accompany these services is naturally a factor in the issues that we deal with, so we will soon have to start research on the particular kind of environmental impact generated by these 2010 services.

The culmination of these efforts should result in the formation of a "sustainable ICT society." On a personal note, I'd like to mention that my first son was born in April of last year. More than ever, my desire is to work with unshakeable confidence for the benefit of all of our children, who will take on the responsibilities of the next generation.

—*What do you think is your direction from here on as a researcher and developer?*

I would like to pursue the work of an environmental specialist with all my energy. And not just technology: I also want to include environmental management and corporate social responsibility (CSR) in my work. To perform work that moves not only the NTT Group but, in the future, Japan as well, I must deepen my knowledge of various topics.

—*What is it like personally for you to work at NTT Laboratories?*

NTT Laboratories deals with a wide array of themes from basic to applied research in the role of a national flagship unrestricted by the constraints of a single company. There are not many research laboratories in Japan, and I take great pride in the major contributions that NTT Laboratories makes to the ICT society. Here, it is not just R&D for profit purposes—NTT Laboratories makes a great effort in making Japanese technology into world standards. Of course, it is natural to expect a business-oriented attitude and profit-making results in R&D, but NTT Laboratories also allows research in the pursuit of truth. While pursuing technical innovation, there is a high awareness here of social problems such as those of the environment. I believe NTT Laboratories is an amazing research site that achieves a balance between a wide variety of research themes. However, it has never really been adept at promoting these great features. I think that it could do with some improvement in this regard.

—*Mr. Origuchi, please leave us with a message for young researchers.*

Gladly. I would like all young researchers to think about the impact that their research will have on society. This is something that I am always telling myself too. Einstein is said to have deeply regretted the part he played in the development of nuclear weapons. He also said that "Once technology gets out into society, there is no taking it back. It will be used to the utmost." Researching something that one enjoys is, of course, not a bad thing. But as creators of technologies, I think we should be more concerned and more responsible about the impact that our research has on society. It is idealistic to be sure, but I am always telling my subordinates to care about the impact of their work on society while taking great pride in being a member of NTT, the leading company of the ICT society. Also, I would ask young researchers who are not directly involved in environment-related research and work to give at least some consideration to the environment in their R&D pursuits.

Reference

[1] Y. Ninomiya and T. Aoki, "NTT Group's Activities to Reduce Environmental loads," NTT Technical Review, Vol. 3, No. 3, pp. 28–31, 2005.

Interviewee profile
■ Career highlights
Takeshi Origuchi received the B.S. degree in physics from Nihon University, Tokyo, and the M.S. degree in materials science from the University of Tokyo, Tokyo, in 1995 and 1997, respectively. He joined NTT Access Network Service Systems Laboratories in 1997. He is currently engaged in R&D concerning the life cycle assessment of ICT services, the effects of using ICT on reducing environmental burdens, the social effects of using ICT, and environmental accounting for promoting environmental management in the NTT Group. He is a member of the Institute of Life Cycle Assessment, Japan.