Special Feature

Environmental Impact Assessment System for ICT Services—Development and Application

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Abstract

NTT Group companies provide a wide range of information and communications technology (ICT) services that are expected to have the potential to reduce environmental burdens, but it is crucial to precisely evaluate this potential. We have developed a system for assessing the environmental impact of NTT's ICT services by constructing a life cycle assessment database containing essential data about networks and communication equipment used in ICT services and designing an algorithm for quantifying the environmental burden (CO_2 emissions) of ICT services. This article presents an overview of the environmental impact assessment system and introduces several examples of its use.

1. Introduction

Since the Kyoto Protocol took effect in February 2005, a number of national projects have been set in motion to mitigate the effects of global warming. We are beginning to see the emergence of a new global awareness where individuals are more concerned with how their everyday lives and activities affect the global environment, and the people of the world as a whole are showing far greater awareness of the environment.

The NTT Group took steps well before many other companies through TPR (total power revolution) activities and other initiatives to conserve energy to help curtail global warming. However, NTT's emissions of greenhouse gases (CO_2) have continued to increase with each passing year. Taking 1990 as the base year with emissions of 1.69 million tons, NTT Group emissions in 2004 had climbed to 3.19 million tons, an increase of about 1.9 times.

On the other hand, many of the information and communications technology (ICT) services provided by NTT Group companies have the potential to reduce the environmental burden (the amount of CO_2 emissions) of our customers. Indeed, it is projected that Japan's domestic energy consumption will be reduced by approximately 3.9% in the year 2010 due to the overall deployment of ICT services according to the NTT Group's Environmental Report [1]. Some of the more environmentally progressive companies such as NEC [2] and Fujitsu [3] have developed systems for assessing and calculating the environmental impact reduction effects of using their ICT services and products and conspicuously highlighted them in their sales promotional literature in addition to their other proactive initiatives.

Thus, it is essential to develop a method for precisely quantifying the environmental impact reduction effects of various ICT services provided to our customers, and disseminating this information to the public and to the world will become increasingly important as time goes on. This consideration led us to develop an assessment system for quantifying the environmental burden reduction effects of ICT services by using the life cycle assessment (LCA) method. The main feature of our system is that it possesses essential LCA data about wired, IP (Internet protocol), and mobile networks obtained with the

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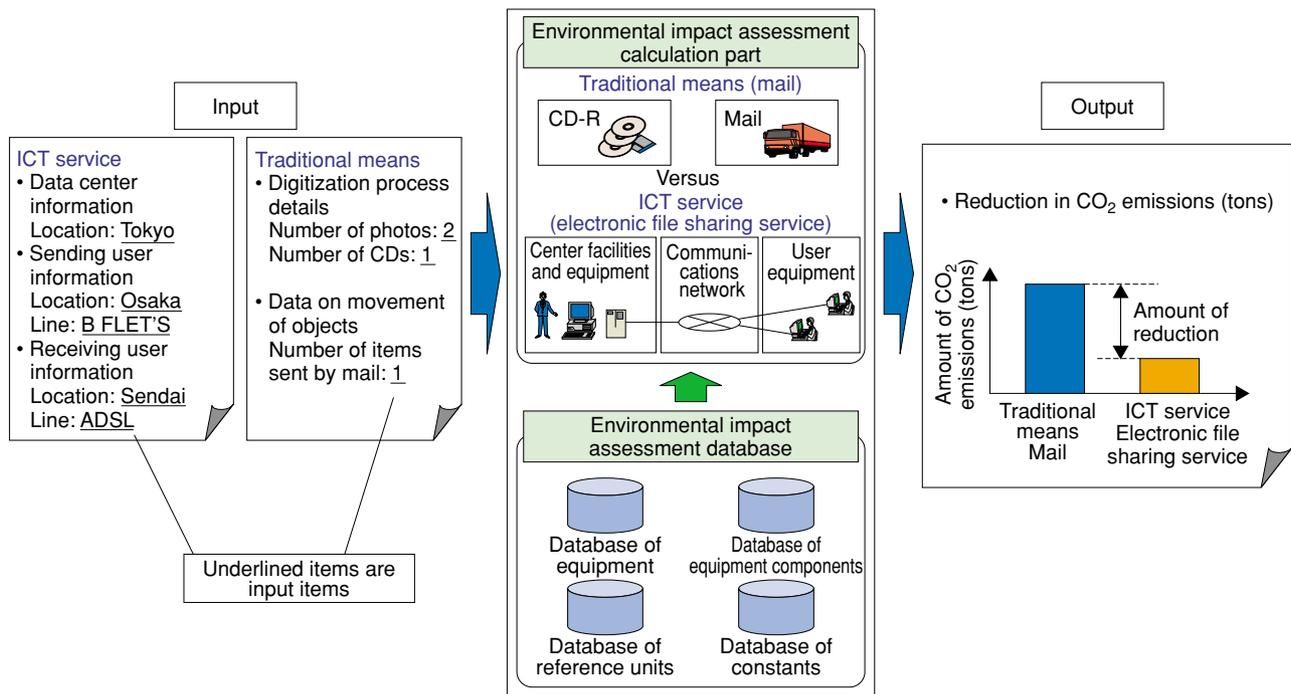
Fig. 1. Schematic overview of an environmental impact assessment system for ICT services (e.g., an electronic file sharing service).

process-sum method*, whereas the conventional method has only statistically obtained data. The use of this system will promote better environmental management throughout the NTT Group and will also enhance the value of the Group.

2. System overview

2.1 Assessing environmental impacts

An overview of an environmental impact assessment system for ICT services is shown in **Fig. 1**. The system consists of an environmental impact assessment calculation part and an environmental impact assessment database. The calculation part is implemented using a predetermined algorithm. The database contains all the essential data needed for calculations including environmental-impact-related data at the manufacturing and disposal stages of terminals, telecom cables, and other communications equipment, as well as data about the power consumption of equipment and facilities in service. Essentially, the system calculates the environmental burdens of an ICT service and of the most similar traditional method of performing the same function and then

determines the difference between them. To make such a comparison, it is necessary to define the general configuration and usage conditions of the ICT service in advance. For the alternative traditional method, it is also necessary to define what objects and what movements of people/objects are involved. Once these conditions have been defined, they are entered into the system via the input screen. As an example of an ICT service, Fig. 1 shows an electronic file sharing. In this case the obvious traditional alternative is to deliver the same content by ordinary mail.

To assess the environmental burden of this ICT service, we enter basic information that describes the service: information about the data center implementing the service (e.g., service locations and the number of servers), information about the sending user (e.g., location and type of transmission line), and information about the receiving user. To deliver the same content in the traditional way, one would first copy the digital file onto a CD (compact disc) and then mail it to the receiver. So in this case, we select the system "CD" as the object used and "mail" as the means of actually moving the object from sender to recipient and then enter the number of CDs used and the number of items sent by mail.

The environmental burdens of the two modes are

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* Process-sum method: The method of gathering inventory data in each process of the life cycle of products and services.

then calculated based on the entered information. The output results are then displayed in the form of a graph showing the environmental impact (CO_2 emissions) of the traditional physical delivery by mail versus the environmental impact (CO_2 emissions) of the ICT service delivery by electronic file sharing. In addition to this graphical representation, the system can also manipulate data using spreadsheet software by downloading numerical data.

Since this system possesses LCA data about wired, IP, and mobile networks, it can calculate the environmental impacts of any ICT services using these kinds of networks.

2.2 Calculating environmental effects of operating efficiency improvements

In addition to assessing the environmental impacts of ICT services, our system can quantify the environmental effects of introducing a new measure to improve operating efficiency. Such a measure usually affects only part of the company's integrated system, so it is very difficult to isolate its environmental effects. Moreover, it is not easy to quantify in absolute terms the environmental burdens before and after its introduction. We addressed these problems by focusing on all the changes that occur when a new business system is introduced—deployment of new equipment, disposal of old equipment, and changes to the network—so that even if we cannot get a comprehensive grasp of the overall system and network configuration involved in executing operations, we can still assess the environmental effects of introducing the system by quantifying the differences before and after its introduction.

3. Application sites and deployment effects

The sites where the system will be used in the NTT Group and the effects of using it are summarized in **Table 1**. We envision that three particular areas will benefit most from the system.

First, in marketing and sales, the system could be used to assess environmental impact reduction effects on the customer's side as a result of using ICT services provided by NTT Group companies and the Group's environmental contributions could be highlighted by presenting these results in public relations pamphlets and through other sales activities. Some of the more progressive companies in the world have already started to incorporate these beneficial environmental effects in their sales and marketing activities, and the NTT Group should also use this approach to highlight and publicize the environmental advantages of its own products and not lose an important business opportunity.

The second area involves ISO 14001 activities. More than 100 sites within the NTT Group have received ISO 14001 certification and are actively involved in environmental management system (EMS) activities. The standards were revised in 2004 to reinforce management activities even over areas that affect the environment only indirectly, and NTT is making progress in assessing the environmental effects of ICT services and solutions that it provides to its customers and in meeting environmental targets that are now quantifiable.

The third area that will benefit from the environmental impact assessment system is environmental public relations activities. An increasing number of companies are starting to publicize the quantitative impacts of their environmental activities, including BT in the telecom sector, Toyota (a major car manufacturer), and NEC (an electronics manufacturer). These and other companies are emphasizing how their products help to reduce the impact on the environment. Moreover, public relations information is now being keenly scrutinized by the public to ascertain how well companies are fulfilling their responsibilities to society and the world. Therefore, the NTT Group would also benefit from quantifying the

Table 1. Application sites and deployment effects.

Application sites	Applications and business activities	Deployment effects
Sales dept.	Sales activities	Boost solution sales by stressing environmental impact mitigation effects
ISO 14001 promotion dept.	Environmental management activities	Deal with new ISO 14001 EMS standards activities and more efficient operations
Environment/CSR dept.	Environment/CSR public relations activities	Improve environmental management and environmental presence

CSR: corporate social responsibility

effects of its ICT services in reducing environmental loads and making the results public.

4.   Assessment examples

Some examples of environmental impact assessments using the system are shown in **Figs. 2** and **3**. Figure 2 shows the input screen and Fig. 3 shows the output results for a videoconferencing system. The assessment in this case is a comparison of 1) a videoconferencing service, in which two people in Tokyo and two in Sapporo (in Hokkaido) meet four times a month and 2) the traditional alternative of getting together in person by traveling on public transportation. The environmental burden for videoconferencing is substantially less than for physically traveling to meetings, so the environmental impact reduction effect is quite large in this case. Of course, the results will depend on how the customers use the service, but with a good quantitative grasp of the variables involved, we could advise customers about the best configurations and conditions for minimizing their environmental loads and help them move toward more environmentally aware business methods.

5.   Conclusion

We have developed an environmental impact assessment system that calculates the potential of ICT services to reduce environmental impacts. This system possesses essential data about wired, IP, and mobile networks obtained with the process-sum method, rather than just statistically obtained data. It will be utilized by many NTT Group companies including NTT
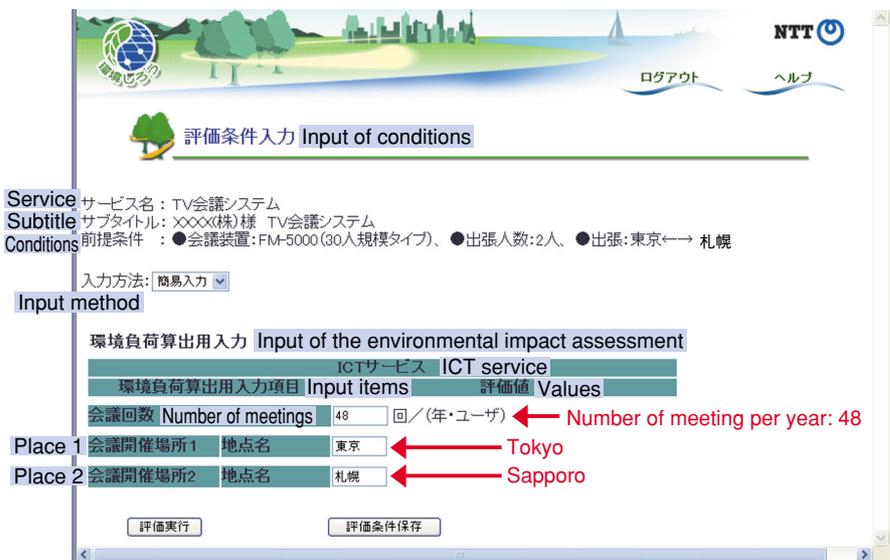

Fig. 2.   Assessment example: input of conditions.
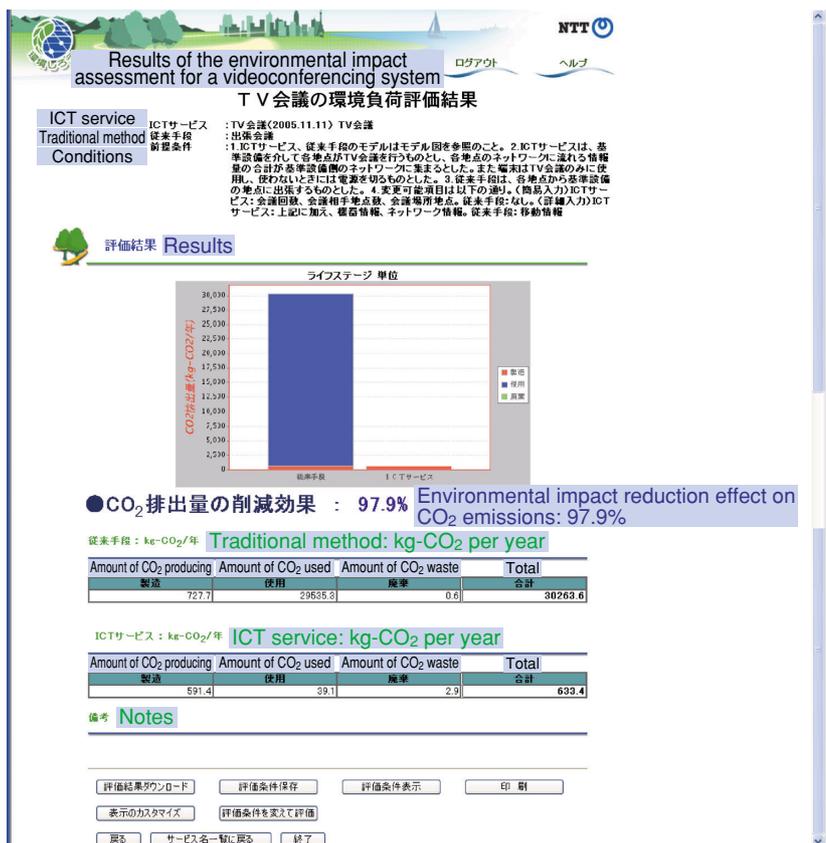
Fig. 3.   Assessment example: output of results.

East, NTT West, NTT Communications, NTT DoCoMo, and NTT DATA. The examples we gave showed that the NTT Group is making good progress in environmental management through marketing, ISO 14001 promotion, and environmental public relations activities, which will further enhance the NTT Group's value and image as a company that takes the global environment seriously.

References

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