S-3 Low-Carbon Society Scenario toward 2050: Scenario Development and its Implication for Policy Measures

4. Integrated Measures of Technologies and Lifestyles against Global Warming - Ecodesign of ICT (Information Communication Technology) Society -

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Key Words Ecodesign, Information communication technology, Lifestyle, Global warming, Rebound effect

1. Introduction

Industry tries to manufacture highly functional goods cheaply and in large quantities. Consumers then purchase a comfortable lifestyle supported by large re-source consumption. Against this background, symptomatic treatment of the individual conditions of environmental problems would not produce any demonstrable results with respect to either the environment or the economy. We should instead tackle a causal approach and reform industrial activities and lifestyles, which are the root cause of the problem, by transforming them into new activities and lifestyles whose environmental loads are smaller.

With the development and diffusion of information and communication technologies (ICT), we can obtain various benefits in all aspects of society. In industry, we have obtained efficiency improvements in materials supply, physical distribution, and office work, and achieved the globalization of business. In daily life, we have obtained many benefits from novel approaches to communication with other people, information acquisition for hobbies and entertainment, and the purchase of commodities. These changes are expected to accelerate with increasing communication capacity and simplified access to networks in the future. Great structural changes in society will occur (i.e., an ICT revolution).

As the consumption of resources depends on social structure, the ICT revolution will make it possible to apply a large influence on the environmental load of society. At present, as we start moving toward an ICT revolution, adding environmental consciousness will lead to the causal treatment of environmental problems, which will in turn reform industrial activities and lifestyles through more sustainable approaches. This is our research perspective.

2. Research Objectives

We have been studying the influence of ICT diffusion on environmental problems. From previous study's results, we selected three important ICT applications. These are a "SCM

(Supply Chain Management) system", which reduces resources used in the industry sector, "advanced traffic utilization system & teleworking", which increases energy use efficiency and decreases the frequency of traffic use, and "Eco-life guidance system", which changes people's actions to becoming more environmentally conscious one. We investigated these effects on environmental loads in more detail. In addition to these, we drew a clear vision of a network society, which many people desire strongly, under the condition of achieving low carbon emissions in the year 2050.

3. Results and Discussion

(1) Eco-life guidance system

In FY2004, we proposed the concept of eco-lifestyle navigation systems that offer appropriate environment-related information to help consumers make environmentally-conscious decisions. Existing technologies that relate to this eco-navigation system are HEMS (the Home Energy Management System)[1-2)] and eco-drive support system[3)]. According to our survey, HEMS reduces about 2 to 7% of home electricity and gas use, and eco-drive support system improves fuel efficiency of small cars by 6%. HEMS automatically controls home appliances. In addition, by showing the information on energy use, especially power consumption, HEMS stimulates consumers' consciousness to energy saving. Energy saving of this process is also supposed to be significant. However, the relation between environment consciousness and environmental protection action of consumers has not been clarified yet.

In FY2005, we definitely estimated the environmental load reduction in 2050 by extrapolating the existing research results that have been obtained by offering environment-related information to consumers. In addition, we demonstrated the eco-lifestyle navigation system that uses CO2 household account book and extracted the problems from the observation of this demonstration.

We focused on HEMS (the Home Energy Management System) as an eco-navigation system, and referred to the existing research results about the effect of HEMS. Some research results concerning the CO2 reduction effect of HEMS in the whole of Japan focus on the year 2010. In general, it is said that the energy saving effect of the home-use energy management system is small and the improvement of the consciousness of consumers is the main effect. One of the purposes of this research is to estimate the possibility of the effect of the environment consciousness improvement generated by showing environmental information to consumers in 2050.

In this research, the reduction effect when diffusion rate of the HEMS becomes 100% is considered as the possibility of the information presentation effect. Estimation value was calculated by broadening the spread degree assumed in Outline for Promotion Effects to Prevent Global Warming. When assuming the diffusion rate in 2020 to be 60 %, the CO2 reduction effect of HEMS was estimated to be 5.8 Mt-CO2. This assessed value is the same as the value in the report in the last fiscal year which was prepared to estimate the CO2 reduction of eco-navigation system in 2020. If the diffusion rate of HEMS in 2050 is assumed to be 100%, the CO2 reduction

is estimated to be 9.7Mt-CO2.

(2) Advanced traffic utilization system & teleworking system

The aim is to construct an eco-designed movement model that will contribute to achieving a low-carbon society.

We propose a real-time secure traffic system that would automatically generate and adjust an individual's mode of transportation and schedule based on their personal schedule and the traffic situation[4-6]. Through a real-time secure traffic system and a distributed satellite office system, our ICT eco-designed movement model helps give shape to regional community, which is the basic sphere of everyday life. Based on fluctuations in transportation demand in the community, our model facilitates the expansion of public transportation infrastructure and the use of different types of car sharing and pooling.

When using multiple transportation facilities as an alternative to commuting by private automobile, people want to have a seamless solution to complicated transfers. In the near future, it is likely that advances in ICT will enable a remarkable increase in the number of people who telework. When Internet shopping people want ICT to give them a more realistic sense of the material and the quality of an item viewed from the screen display. In addition, people want ICT to be used toward advanced security systems to protect their personal privacy. On the other hand, people demand low cost items and fast service.

From our web survey results, we assess the substitutability of movement using ICT for each type of lifestyle scene and then the potential CO2 reduction by 2050. For people who commute by private automobile, we estimate a modal shift rate of 25.5%, which results in a CO2 emission reduction of 5.1 million tons per year. In addition, we estimate a teleworking rate of 68% of the working population, which results in a CO2 emission reduction of 5.8 million tons per year. Finally, if 80% of all daily shopping is made over the Internet, it is possible to reduce CO2 emissions originating from automobile exhaust by 52.1 million tons per year.

(3) SCM system

Last year (FY2005) we investigated the environmental impact of using ICT in production and distribution management systems such as SCM, in the food, textile, medicine, and cosmetics industries. This study has suggested that the reduction of environmental loads was about 3.9million t-CO2, corresponding to more than 10% of the amount of total CO2 emissions in these industries[7].

This year, we investigated how much influence the reduction of the environmental burden had when information sharing progressed by using ICT in the industrial sector. This study was approached from the point of view of stock of products using ICT in production and distribution management systems such as SCM systems brought about by the reduction of dead stock. The reduction of dead stock led to the reduction of unnecessary production through supply chains. Finally the reduction of unnecessary production brought about reduction of CO2 emissions. We have to distinguish dead stock from necessary stock, and so we applied methodology of the estimation of the reduction of CO2 emissions up to 2050 from the point of

view of transition benchmarking each industry, called “Benchmarking Method”. We have investigated and analyzed rotation periods of stock from financial reports of 1,180 manufacturing companies, and assumed that the rotation periods of stock in each industry shifted to the better ones of companies by using ICT. 3EID (Embodied Energy and Emission Intensity Data for Japan Using Input-Output Tables) was adopted for the estimation of the reduction of CO2 emissions.

The transitions of rates of the rotation periods of stock each industry was assumed to have the following; (The rate of unnecessary production in stock is 20% by our last year’s study.)

-The transition number in 2010 was assumed by the average number of 50% higher ranks of the rotation periods of stock in 2003 each industry.

-The transition number in 2020 was assumed by the average number of 20% higher ranks of the rotation periods of stock in 2003 each industry.

-The transition number in 2030 was assumed by the highest rank of the rotation periods of stock in 2003.

-The transition number in 2050 was assumed to be compressed into the rate which was the highest between the highest rank of the rotation periods of stock in 2003 in manufacturing companies and the average (It’s electric machine industry).

The result of this calculation is shown to Fig. 1. Benchmarking Method indicated that the effect of CO2 reduction of unnecessary production by using ICT in production and distribution management systems such as SCM systems were approximately 37 million t-CO2.

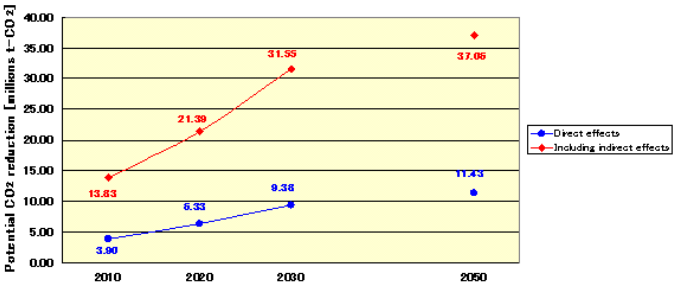

Fig.1 The estimation of effects of potential CO_2 reduction by Benchmarking Method

(4) Image of a future-desired IT society

It is difficult to imagine an IT society for 2050, because of the rapid progress of IT. However after understanding the dreams and desires of people regarding future society, it is possible to understand how to utilize advanced IT in such a society. And so we can imagine how IT is to be developed and utilized towards realizing man’s wishes and desires. 1000 citizens were surveyed on 11 categories: ex. eating-style, working-style, living-style in 2050. Information on future life style was gathered by examining SF-films and animation, and consulting over ten well-known people and two research groups. These ideas were then brainstormed in order to construct an image of a future-desired IT society. We examined by how much it would be possible to reduce CO2 and still maintain such a desired-society. This result shows that a future-desired IT society could potentially reduce the CO2 emissions by 40 percent of Japan’s total emissions.

4. Summary

We described the influence of ICT diffusion on environmental problems. There is no doubt that ICT can make a large contribution to the solution of environmental problems. In particular, we take notice of their two contributions. The first, ICT enable people to get a concrete image about environmental problems from various points of view. This would lead people to an environmentally conscious life. The second, ICT removes the restriction about "distance". This would cause large changes in an urban structure. It may be possible to make a new society which minimizes movement of goods, resources and people.

A future-desired IT society social image was drawn with the text and the illustration focusing on the lifestyle in 2050 using the brainstorming method. And it was shown that the CO2 emissions of the household origin in the future-desired IT society can be reduced about 40 percent of Japan's total emissions in the year 2000. These results suggest that it would be compatible in drastic greenhouse gas reduction and a comfortable life.

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