The NTT Group Faces Through Service

We Believe That the IT Revolution Can Benefit Environmental Preservation

http://www.ntt.co.jp/kankyo/e/2001report/1/111.html

The relationship between the IT revolution and environmental preservation holds an important meaning for the NTT Group with its activities in information sharing. It is believed that the benefits that IT gives us hold many things which will work to the advantage of environmental preservation. What kinds of changes in our lives and beneficial effects on the environment can we imagine once the IT revolution is a reality?

What is the IT Revolution?

The Internet has grown explosively in Japan with the development of computer and network technology. The growth of information sharing with the IT revolution will change our quality of life as well. For example, virtual reality*. This is generally translated in Japanese as "temporarily conceived reality" and signifies a virtual world just like reality made using computers. From the standpoint of computer games, one can experience a virtual world for a certain period of time and then return to the "real" world. However, in the world that the IT revolution realizes, the virtual world will approach the real world and gradually we will lose sight of the line separating the two. (Fig. 1) With the IT revolution, it will be possible to talk and hold meetings with someone far away as if they were right in front of you by using a videophone. In addition, we can imagine using IT in home appliances. You can check the contents of your refrigerator with your cellular phone before going shopping on the way home, start recording a video from outside the home, and ignore distances which until now you could not shorten.

***Virtual reality**
To experience by using physical devices the sensation of really moving around a place.

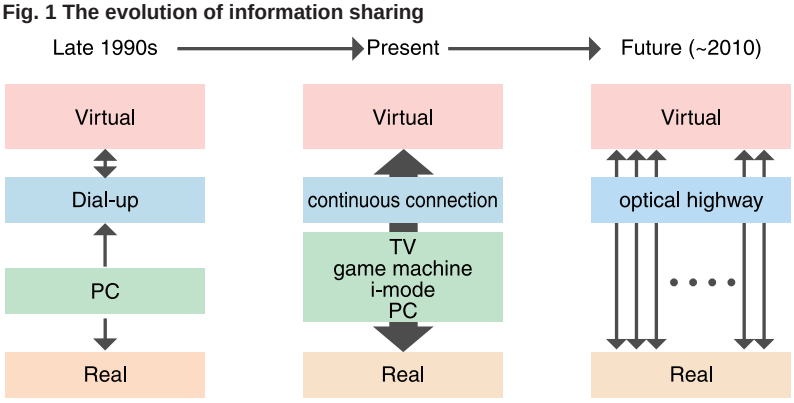
***INS concept**
Abbreviation of Information Network System. The concept put forward that the digitalization of all electric communication networks will become the basis for electronic communication networks in the advanced information society of the future.

***broadband**
Generally, the ability to share information at over 500kbps.

Facing IT

In 1979, with privatization close at hand, the NTT Group published the INS concept*, completely digitized many kinds of information, and wrestled with inventing technology which would exchange information through a net-

Fig. 1 The evolution of information sharing



Information from the virtual world will penetrate our real world environment and form a new social base.

Chart 1 Opticalization of access networks (from "Information NTT 1999")

Area		Coverage			
		1998	1999 (estimated)		2010
		All Japan	East Japan	West Japan	All Japan
Government-designated city or cities at the level of prefectural government seats	main area	92%	95~97%	90~92%	approx. 100%
	all areas	44%	62~64%	49~51%	
Cities with populations over 100,000	main area	69%	77~79%	85~87%	
	all areas	22%	34~36%	25~27%	
Other		8%	12~14%	9~11%	
Overall		27%	approx. 41%	approx. 29%	

Note: The coverage rate shown is the opticalization of wiring up to the feeder point.

Environmental Problems and Technology

work. Since 1994 we have advocated "conversion from phone to multimedia" and have driven the spread of the Internet and conversion to broadband* networks. At NTT, we have two goals for information sharing services to challenge us as we face the beginning of the 21st century. The first is HIKARI-Soft service, which realizes "whatever, whenever" using optical networks and large-capacity memory. The other is Ubiquitous* Service, which realizes "wherever" using wireless technology. With HIKARI Service, we are aiming to be able to use an optical network from nearly all regions by 2010. (Chart 1)

However, the NTT Group cannot create these conditions alone. If attractive services increase, customers increase. And if customers increase, service increases as well. If we can create this kind of cycle, new business chances will open up and, through that feedback, will spur the preparation of optical networks. (Fig. 2)

We are developing FOMA*, which began testing in 2001, and the third-generation of cellular phones which will be able to use high-speed telecommunications.

The Influence of the IT Revolution on the Environment

The advancement of information sharing through IT lowers the amount of energy we use and holds the promise of reducing the burden on the environment. This is because IT has three major effects:

- •People and materials do not move unnecessarily. (Fig. 3)
- •It is possible to use space efficiently. (Fig. 4)
- •It is possible to digitize* materials and use them. (Fig. 5)

In this way, the development of telecommunication technology has the effect of greatly reducing energy consumption.

Of course, sometimes energy consumption grows with the development of technology.

Therefore it is necessary to look comprehen-

Fig. 2 Service categories for HIKARI-Soft service

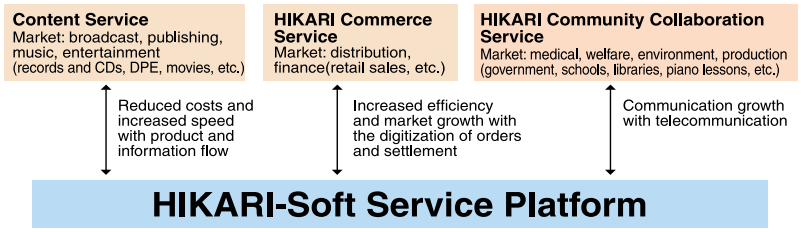


Fig. 3 People and materials do not move unnecessarily

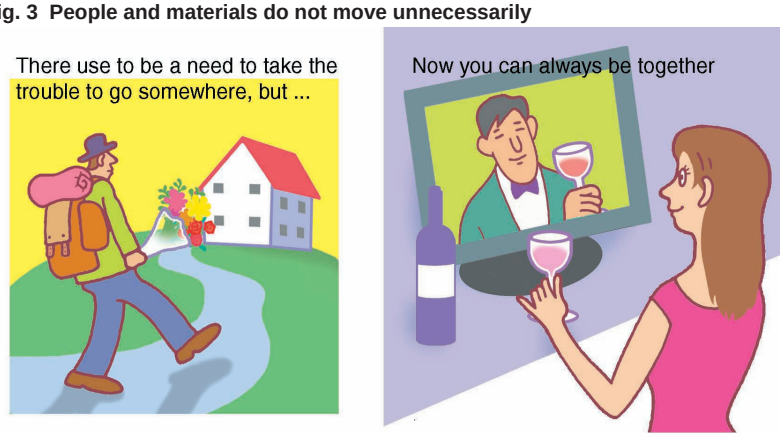


Fig. 4 It is possible to use space efficiently

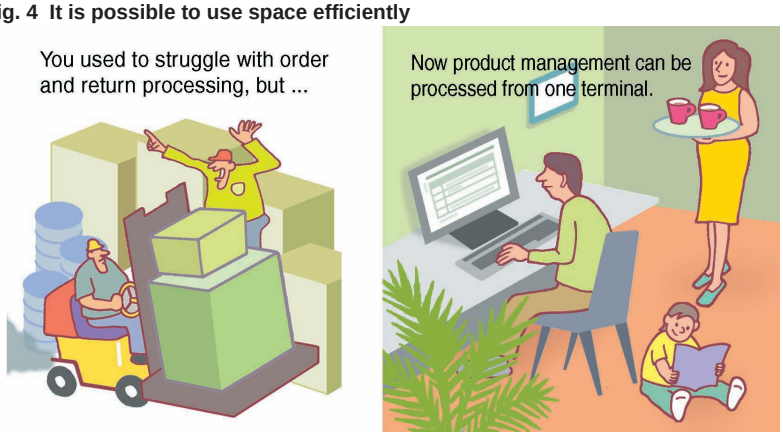
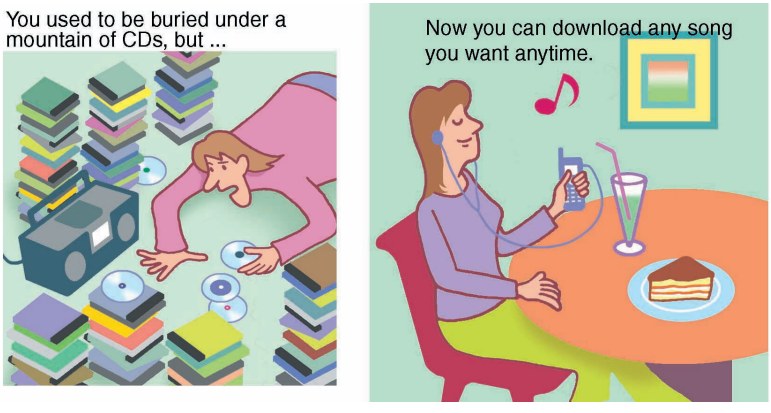


Fig. 5 It is possible to digitize materials and use them



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***HIKARI**
"HIKARI" is the Japanese word for "light." We have used it to suggest "optical" and "photonic." HIKARI also implies the concept of "forefront""hope," and "innovation" as we propose a new life style to consumers.

***Ubiquitous**
The property of being at many locations at the same time.

***FOMA**
Next generation cell phones. Testing began in 2001 in Tokyo and Yokohama.

***digitalization**
Using data without media.

sively at the amount of energy consumption and judge whether IT will really benefit the environment.

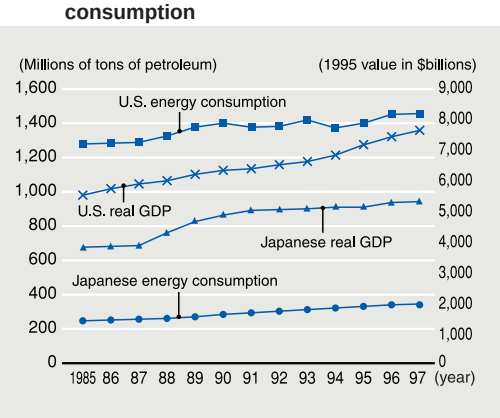
So now in addition to thinking about the change in total energy consumption, we look at the movement of real GDP and energy consumption of IT-advanced America and Japan. (Fig. 6)

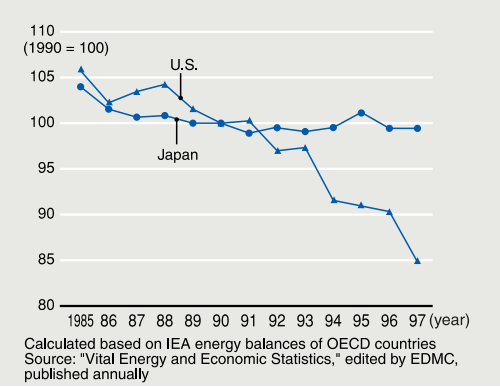
Both countries' energy consumption and real GDP rise, but we see that among the four trends, the growth of America's real GDP is strong. Therefore when we chart the change of energy consumption with GDP as in the figure below, we see that America's energy consumption by GDP decreases strikingly. The IT revolution which was made real in America in the last half of the 1990s is considered as one of the primary factors for this. From this fact, it is possible that IT decreased the overall social energy consumption in America.

Information Sharing Society and Global Warming

There is a group called the "Center for Energy and Climate Solutions (CECS)" among American environmental think tanks. CECS presented a report in December 1999 titled "The Internet Economy and Global Warming."

Fig. 6 Trends of U.S. and Japanese energy consumption





Calculated based on IEA energy balances of OECD countries
Source: "Vital Energy and Economic Statistics," edited by EDMC, published annually

CECS analyzed three areas; construction facilities, production and shipping. In order to save energy and make the largest profits for the environment, they proposed using environmental e-commerce.

We propose the following seven areas for reducing energy consumption through IT use (Fig. 7) :

1. Business-to-consumer e-commerce
2. Business-to-business e-commerce
3. Turning resources into electronic information
4. Managing production flow
5. Telecommuting, videoconferencing, remote management
6. Use of information communication technology in recycling
7. Intelligent Transportation Systems (ITS)

Number 1, business-to-consumer e-commerce lets consumers connect with corporations and perform transactions. By using the Internet, the need for wholesalers and retailers disappears and the flow of goods between them and the flow of returned goods is cut back. Furthermore, because it is close to order production, it is possible to control unnecessary production. (Fig. 8) There will be a new need for energy for small package shipping and warehouse operation with e-commerce, but overall we can expect a great reduction in energy consumption. When we put in detailed numbers and calculate, energy reduction by 2010 will become 98.60 PJ, 0.6% of the nation's energy.

Number 2, business-to-business e-commerce, is carried out between companies like makers and retailers, so reductions in business meetings, personnel movement, wholesale-related energy consumption, and accounting-related energy consumption, as well as more efficient physical distribution can be expected. (Fig. 9) Through this, the energy reduced will be 57.28 PJ, or 0.4% of all energy in 2010.

Number 3, turning resources into electronic information, is easily understood through the following example: not selling music and video using media (CD or DVD) but distrib-

uting the data as-is using the Internet. By selling books, newspapers, videos, CDs, and computer software as "electronic information," media production and printing, physical distribution, and stock management will become unnecessary, and a reduction in related energy consumption is expected. The reduction from this effect will be 32.27 PJ, or 0.2%.

Number 4, the managing of production flow, seeks to increase distribution efficiency, reduce physical distribution and control surplus production by using the Internet in production flow. Physical distribution management systems, like POS* and others, apply to the increased efficiency of this production distribution. This will reduce energy 200.20 PJ, or 1.3%.

There are three main points to Number 5. First, a reduction in vehicle use with the growth of at-home workers and a reduction in office use. Second, a reduction in vehicle use by holding meetings, which were in remote locations, through videoconferencing instead. Finally, increased efficiency of shipping with remote management of vending machines. Through this, the expected amount of energy reduction will be 43.97 PJ, or 0.3%.

Number 6 reduces the energy of parts production by using recycling markets on the Internet for parts procurement for automobiles, electronic devices and others items. Once recycling is used in the fields of automobile parts, electronic devices, production equipment and others, a reduction of energy consumption of 110.85 PJ, or 1.3%, is expected.

Finally, number 7 mainly relates to traffic using automobiles. Currently in Japan eleven

Fig. 7 Reduction in energy consumption through the utilization of IT

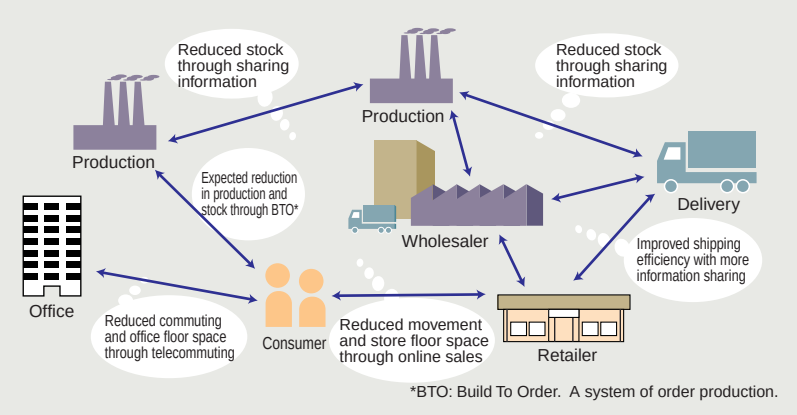


Fig. 8 Business-to-consumer e-commerce

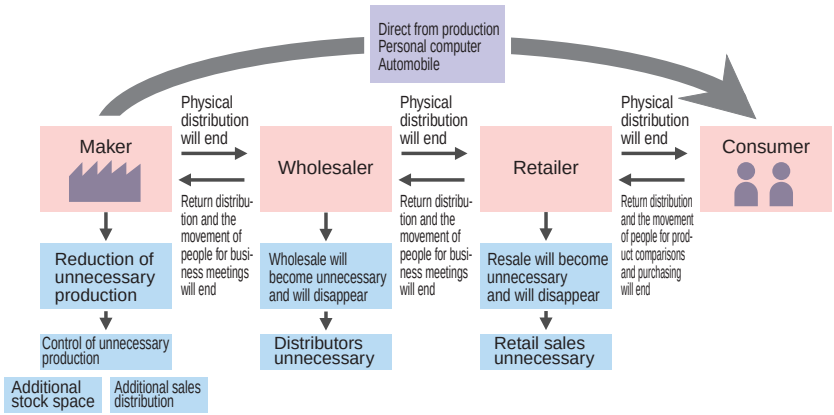


Fig. 9 Business-to-business e-commerce

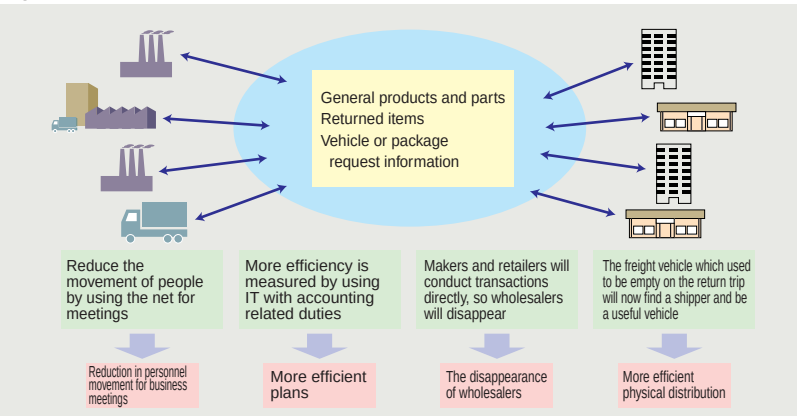


Chart 2 The effects of the reduction of energy consumption through the use of IT

	The amount of reduction of energy consumption (PJ)	Percentage of reduction of energy consumption
1 Business-to-consumer e-commerce	98.60	0.6%
2 Business-to-business e-commerce	57.28	0.4%
3 Digitization materials	32.27	0.2%
4 Production distribution management	200.20	1.3%
5 Telecommuting, teleconferencing, remote management	43.97	0.3%
6 Use of information sharing technologies with recycling	110.85	0.7%
7 Intelligent Transport System (ITS)	19.05	0.1%
Total	562.21	3.6%

Corresponds to 3.6% of Japan's total energy consumption

*Does not estimate economic growth or other causes and effects.

***POS**
Abbreviation of Point Of Sales (managing information at the time of sale). Item management information such as how many of what items were sold.

percent of energy consumption by automobiles is wasted in delays. By measuring a reduction of road delays with VICS*, a reduction in wasteful energy consumption is expected. There is also a factor that the infrastructure preparation and production of vehicle parts increases energy consumption, but 19.05 PJ, or 0.1% of energy consumption will be cut back.

When we combine the effects of the reduction of energy consumption in the above seven areas, it becomes a reduction of 3.6% of energy consumption across all Japan. (Chart 2)

Predictions of the Amount of Electricity Consumption

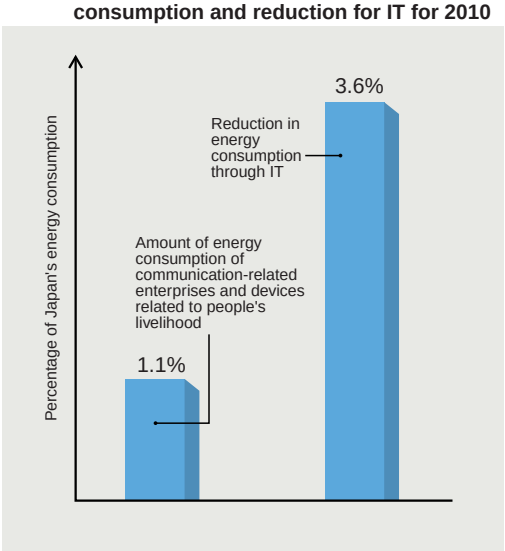
In order to evaluate the reduction in energy consumption through IT, we must predict the growth in the amount of electricity consumption and compare the amounts of growth and reduction.

Here, we assume two cases, one where Japan's IT change advances rapidly and optical networks and cellular information terminals spread widely. The other where the IT change advances gradually at the same speed as it has until now. We have estimated the amount of electricity consumption by taking the value from those two. According to that estimate, it is predicted that in 2010 consumed energy related to IT through users, communication networks and others will be 1.5 times of current levels, and will correspond to 1.1% of the amount of energy consumption for all Japan.

***VICS**
Abbreviation of Vehicle Information and Communication System. As a link to Intelligent Transport Systems (ITS), it will be a new traffic information communications system introduced throughout the country in the future.

*** Individuals' lifestyles will change**
For example, with the spread of cellular phones, the time watching TV or the time riding in an automobile will be reduced.

Fig.10 The predicted effects of energy consumption and reduction for IT for 2010



IT's Energy Consumption Reduction Effect

Now we can compare the amount of energy consumed and the effects of reduction related to IT. (Fig. 10)

In addition to the elements estimated just now, it is thought that individual lifestyles will change* with communication technology, and will shift from activities which consume more electricity to things which use less electricity. We cannot get into those points here.

According to this estimate, the controlling effect of energy consumption through the IT revolution is large. And even estimating the growth of the amount of electricity consumption, from the standpoint of environmental preservation, we can see a large effect. Giving specific numbers, in 2010 a reduction effect of 3.6% of energy consumption across Japan is expected. In other words, the IT revolution makes our lives more convinient and confortable while at the same time reducing the energy burden on the global environment in which we live.

In this way the NTT Group believes IT can face global environmental problems. For the IT revolution to be realized, we are aiming to make information sharing more simple, fast, convenient, secure, and comfortable, and to increase our efforts into the future.

We are certain those efforts will always be useful in helping to solve the global environmental problems that people face today.

Conclusions:

- The NTT Group has a large environmental impact and must work to reduce that impact.
- We can expect that information sharing services will reduce environmental burdens throughout the world.
- For that reason, it is necessary for the NTT Group to work to expand information sharing services which lower environmental impact.

NTT is Tackling Environmental Issues With an Expanded Use of IT

http://www.ntt.co.jp/kankyo/e/2001report/1/121.html

The NTT Group is looking to decrease burdens on the environment by various IT-based activities. Here, we will present a more in-depth look at the activities presented on the preceding page.

Activities and Contributions to the Environment by NTT

NTT's role is not only working hard to build a foundation for an IT revolution, but also working to make IT an important part of solving environmental problems. (Fig. 1)

NTT DoCoMo e-billing

This is a service for cellular phone customers who pay their bills automatically by bank transfer. It is a service to provide information and billing via the Internet, instead of monthly "advanced notice and receipts," formerly delivered by surface mail. Customers who want to use this service first register for e-billing. Next, they log-on to e-billing by using i-mode*, mopera* (informational terminal unit) and the Internet. When they input their password, they can access their monthly invoice. If customers register for the e-mail service, NTT will e-mail their invoice. NTT DoCoMo has used this service since April, 2000 for i-mode and mopera customers only. Since October, customers can access information through our web-site. As of April, 2001, registration for e-billing has exceeded 500,000 customers. We believe the adoption of electronic invoicing and banking will actualize and enhance our settlement of accounts.

e-bidding

In Japan, an "electronic government" is to be atopted by the year 2003. As information exchange will be increasingly done online, there will be fewer paper documents, with the possibilities for decreased consumption of paper resources.

NTT Service Integration Laboratories is paying attention to on-line bidding for local government contracts in its drive to increase use of the Internet among local governments. Local governments currently require bidders to file standard forms as part of the bidding process. But an e-bidding system provides an Internet-based server and maintain all electronic records of the bidding process for the public record. By filing these documents on a server, we can decrease documents and the flow of people. It means our system is effective for decreasing burdens on the environment.

Eventually, we are going to work toward an "electronic government" model by further improvements to our system and using the security technology of the Information Sharing Platform Laboratries to expand electronic applications.

Internet *TOWNPAGE*

NTT group is taking several measures to care for the environment by developing our *TOWNPAGE**,

Fig. 1 The adaptation of IT technologies to preserve the environment

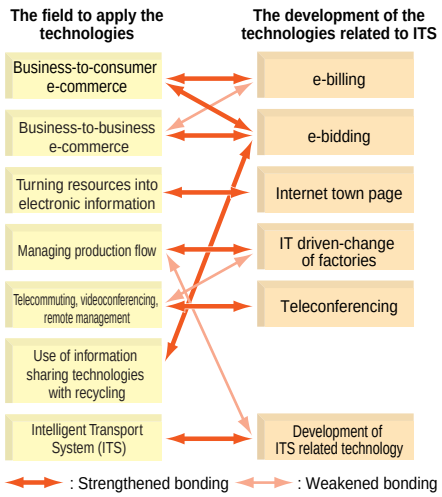
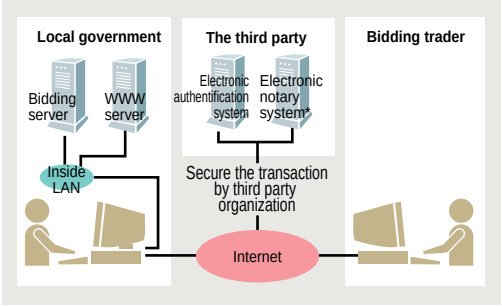


Fig.2 The electronical bidding system



***i-mode**
The wireless communication standard for cellular phones, with which you can access the web, and send and receive e-mails for only ¥1.

***mopera**
Portable terminal unit, from which you can receive e-mails and information services.

***Electronical public notification system**
A system to record and verify the transmission of a document on the network via a third party.

TOWNPAGE
Internet address is, http://english.itp.ne.jp/

***Advanced navigation**
A navigation system to show the present location and directional support while driving.

***Automated toll collection system**
The system for driving through toll highways without stopping to pay at toll booths.

***Safe driving support**
Usage of electronic signals to guide vehicles, thus decreasing burdens on drivers.

a multimedia telephone directory to be used side by side with the traditional printed directory. (Fig. 3)

Also we have just completed a trial CD-ROM which contains names of corporations listed in the 23 wards of Tokyo, and the city of Osaka. The target is for these CD-ROMs to be used regularly after 2001. This CD-ROM is an option, and although not generally used as a supplement to the published directory, will eventually be a service which will lead to a saving of paper resources.

IT Driven Factory Changes

Factory facility maintenance is generally divided into regularly scheduled and emergency work. In both cases, staff need to be transported. In the case of an emergency, a factory needs to arrange and send in parts to be exchanged and frequent transportation of these parts is needed. To decrease necessary energy consumption and to conserve and inspect a factory, NTT Cyber Solution Laboratories is developing a maintenance system to supervise and regulate a factory facility from a remote area.

This system will accumulate and provide an operation record, sensing information, supervised screen information and sound information which are necessary to maintain the facilities. (Fig. 1) We are going to develop a prototype of this system in 2001.

Fig.3 The effect for saving energy by IT driven change of telephone number reference

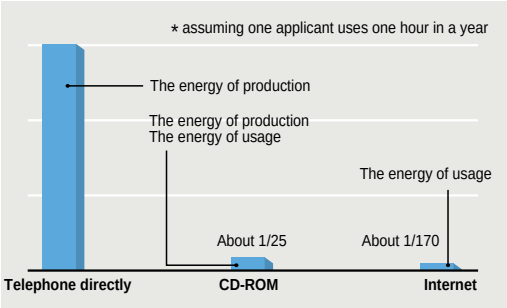


Fig. 4 IT driven factory changes

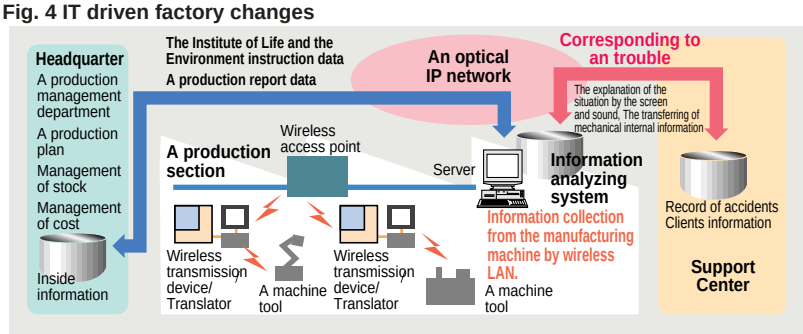
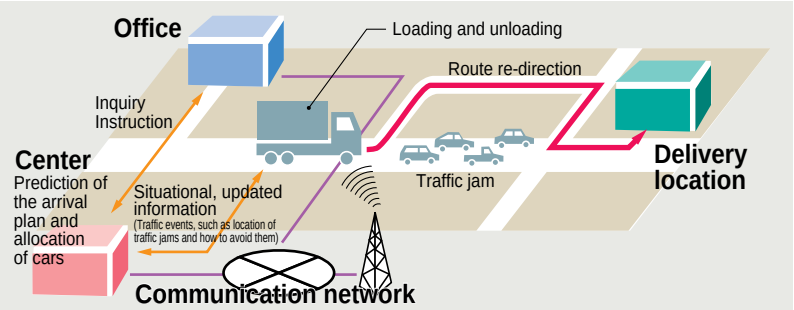


Fig. 5 Simulated physical distribution system



Videoconferencing

NTT Lifestyle and Environmental Technology Laboratries performed a simulation to find out how much we can contribute to decrease burdens on the environment; the conditions we used for simulation are as follows.

- The total numbers (1657) of the videoconferences NTT (holding company) had in the past year.
- Assuming the length of a conference is two hours and calculating the burden on the environment by the amount of the energy consumption from the tools they used for the videoconference.
- Calculating the burden on the environment from various transportation systems assuming two persons join the conference from each area for each two hour conference.
- Comparing the environmental burdens between a business trip and videoconferencing.

As a result, we found that videoconferencing can save about 85% of the CO_2 exhaust and 74% of the energy consumption compared to a business trip conference.

Intelligent Transport Systems (ITS)

NTT Service Integration Laboratories is trying to actualize a seamless service which connects a person, a vehicle and a road through a network by researching ITS or Intelligent Transport Systems.

Usually, ITS consists of developing fields such as "advanced navigation*", "automated toll collection system*" and "safe driving support*". The NTT Group is researching and developing a car navigation system using a cellular phone network. This system can be used to provide the location of parking lots and gas stations and simulate a physical distribution system and, the parking reservation system. (Fig. 5)

NTT R&D Pursues the Most Advanced Technologies and Focuses on Environmental Education

http://www.ntt.co.jp/kankyo/e/2001report/1/131.html

In the R&D field, we are developing systems which decrease the burden on the environment. The educational aspects are a necessary to increase children's interest in the environment.

R&D Diminishes Environmental Burdens

Polymer Electrolyte Fuel Cell System

In December 2000, NTT started the field test for our co-generation* system which uses a Polymer Electrolyte Fuel Cell (PEFC), widely considered a potential candidate as a leader among the next generation of fuel batteries. This work is being done in cooperation with Ebara Corporation and Ebara Ballard Corporation.

A fuel battery directly converts chemical properties of the fuel into electric energy. It is expected to be a clean and highly efficient power generator. The PEFC used for this test has a lower temperature for the operation than the Phosphoric Acid* type and the Solid Oxide* type and it is easy to start and stop. Thus, it is attracting attention as a fuel battery for the next generation and is expected to be in wide demand as a power line for automobiles and as a power generator system for home use. As it can be used for automobiles, it is expected to be mass-produced and predicted that the cost will go down rapidly.

Feasability test will be performed for two years from December, 2000. As a system, it will provide power, which is generated by a fuel battery in the center, and it will make use of the exhaust heat by air conditioning equipment. (Fig. 1) As a co-generation system, it will evaluate the stability and conservancy of the system through the general efficiency and long use of the system which includes a lower temperature absorbing freezer. Furthermore, it will develop various operation technologies such as peek-cut operation* which makes use of the special quality of the orbit and the stop of PEFC.

Building Evaluation/Investment Simulation System

As an environmental countermeasure in the architectural field, "Green Design Guideline for Buildings*" predicts the burden on the environment from the construction, operation, repair, dismantling and waste at the stages of building and is considered a very efficient system.

NTT Facilities has developed a "Building Evaluation/ Investment Simulation System". In this system, when you choose and input the content of the environmental technologies and countermeasures introduced for the building, it will output the data of an environmental index, a chart for each case which introduces an environmental technology and comparison the environmental quality and economic quality. (Fig. 2)

Fig.1 The construction of the system for the co-generation

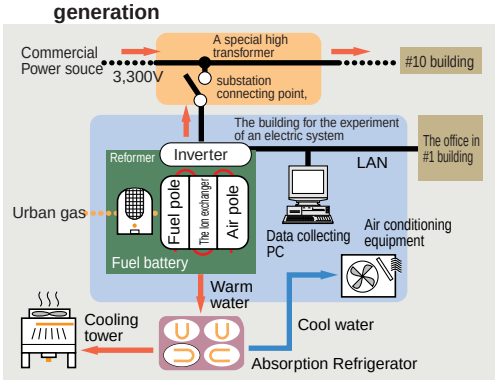
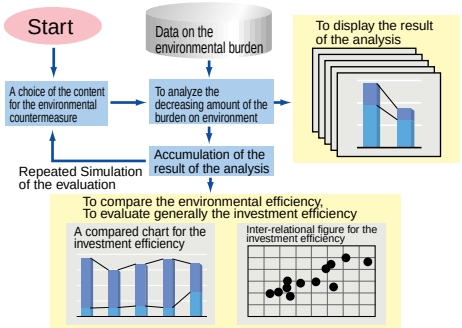


Fig.2 Building Evaluation/ Investment Simulation System



***Polymer Electrolyte Fuel Cell System**
It makes use of a high polymer film for electrolyte. The power generating efficiency 40-50%, Operating temperature 80℃, It is sufficient in the quality of starting up and stop as the operation temperature is low.

***Co-generation**
A system which makes use of the exhaust heat which occurs when a gas turbine and diesel engine generate power.

***Phosphoric Acid Fuel Cell (PAFC)**
It makes use of a phosphoric acid solution for electrolyte. The power generating efficiency is 40%, the operating temperature 200℃. More than 100 systems are operated now in the world and we must continue to lower the costs.

***Solid oxide fuel cell (SOFC)**
It makes use of a ceramic for electrolyte. The power generating efficiency is 50%, operating temperature 1,000℃. As it operates with high temperature, the heat usage is easy and highly efficient.

***Peek-cut operation**
The method which operates to provide power only when the electrical usage is high.

***Green Design Guideline for Buildings**
See page 23.

Environmental Education Using Informational Technologies

WebAngel

There is much information about environmental issues on the Internet.

NTT Cyber Solution Laboratories has developed a system called "WebAngel" which gives limits to surfing on the Internet to a student and also navigates how to surf on the Internet.

A 5th grade classroom at N elementary school in Mitaka City, Tokyo, had a lesson about "Whose is the blue earth?" in February and March, 2001 using WebAngel. (Photo 1) Acid rain, air pollution, desertification and waste problems were chosen as themes and students researched the issues using WebAngel and presented reports about their research including their opinions.

Electronic Field Notebook

To record data for environmental research and field observation, precise location data is necessary.

NTT Lifestyle and Environmental Technology Laboratories has developed a Field Notebook system, which matches a GPS* locator in a portable computer system with data input on a map. In this system, there is software not only to find your present location but also to input the data of your research content. For the research of the water quality of a river, you can input the data for 'clearness of a river' and 'speed of a stream' in addition to an observation spot and it will work as an electronic filed notebook. Also by hosting collected data on a server, you can publicly provide an environmental map of your research.

Usually, field research was considered as a job for experts, but by using this new electronic field notebook, children can easily do field research. This will increase interest in environmental issues for children interested in personal computers.

Cherry Blossom Research

In 2002, "general study time" will be held for an environmental study which received huge attention last year. In spring 2000, as a part of "Iwate-UNU-NTT Environmental Network* Collaboration Project", research for a cherry blossom event was held using the Internet. From April 10 to May 31, 74 elementary schools, 26 middle schools, 1 school for the blind and 3 special education schools from Iwate prefecture participated in this research.

The data which was gathered with the collaboration of the students was sent to a data center hosted by the Ecology Community Plaza in the Iwate Branch of NTT EAST. This data was used to create a cherry blossom front map of Iwate prefecture and is presented to the public on the homepage. (Fig. 3,4)

We will continue to increase the use of this kind of technology for various research projects.

***GPS**
Global Positioning System. The system which the Department of National Defense in the United States has developed. It is a system to locate a specific spot by using an electronic wave which is sent from 24 artificial satellites and is used as a car navigation system.

***Iwate-UNU-NTT Environmental network**
Iwate prefecture, United Nations University. The environmental information network by NTT.

Photo. 1 The children who research the theme of their choise

Fig.3 The flow of data for cherry blossom blooming research

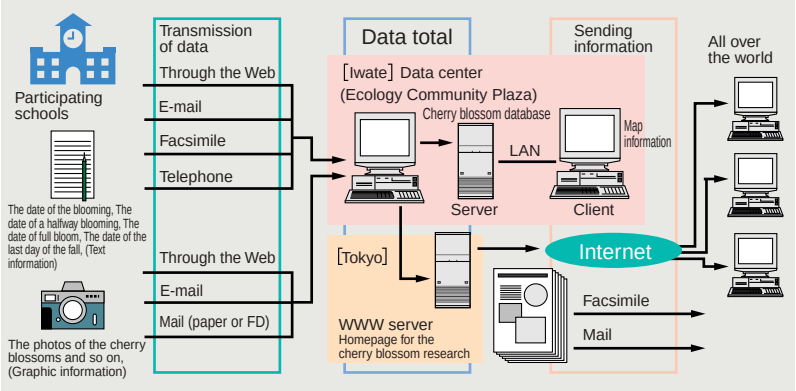


Fig.4 Web page for cherry blossom research
http://ecology.mcon.ne.jp/edu/sakura/