The NTT Group utilizes state-of-the-art information sharing technologies to contribute to a better global environment.

A Message from the President

As symbolized by the phrase, 'IT (information technology) revolution,' society and industry are currently undergoing a major transformation. The market environment for the global information sharing industry in particular is changing more rapidly than we could possibly have anticipated. Increases in the number of mobile communications subscribers and the spread of the Internet have been nothing short of spectacular. In the midst of this unprecedented change, the NTT Group will continue our contribution to the economic and social IT revolution through our efforts to provide faster, more economical and diversified IP-based service networks, both wireless and wired.

From the standpoint of the global environment, there are two sides to the IT revolution. One is that it generates new environmental loads. To maximize the benefits of IT, we need energy and resources to install and operate new networks, servers and terminals. On the other hand, implementation of IT can enhance the efficiency of production and distribution, thus reducing the overall amount of energy and resources consumed. By sharing environmental information, we can foster a common perception of the importance of the environment through various educational and awareness-building activities. As a leading member of the global information sharing industry, we at the NTT Group consider it our social responsibility as well as our business to contribute to the widespread dissemination of environmental information.

The NTT Group has been making concentrated efforts to actively address global environmental issues. In 1991, we established the NTT Global Environment Charter, introducing measures to save paper resources and reduce CO_2 emissions. To coincide with the reorganization of the NTT Group in July 1999, we established the comprehensive NTT Group Ecology Program 21, which outlines our basic policies on environmental protection. The program encompasses the NTT Global Environment Charter, targets for action plans for the entire NTT Group, the establishment of NTT Group Ecology Community Plazas, and research and development of state-of-the-art environmental technologies.

In the course of our business activities, the NTT Group consumes a great amount of paper and energy and generates a huge volume of waste. The NTT Group Ecology Program 21 establishes targets for specific action plans to address these and other pressing environmental concerns. Our NTT East Iwate Branch and NTT West Shiga Branch have established Ecology Community Plazas to work with citizens in each region in promoting environmental awareness. Each group company is also working to reduce environmental loads through effective implementation of IT. Prior to our 1999 reorganization, we established two dedicated research laboratories—the Lifestyle and Environmental Technology Laboratories and the Telecommunications Energy Laboratories—which continue to support our R&D efforts at the holding company level.

This report provides an overview of our ongoing efforts to address environmental issues, with a focus on our activities during fiscal 1999. We hope it will help you to gain a better understanding of our activities. We welcome your comments and opinions.

Jun-ichiro Miyazu
President, Nippon Telegraph and
Telephone Corporation

Corporate & Group Profile

● Profile of Nippon Telegraph and Telephone Corporation (as of March 31, 2000)

Corporate name: Nippon Telegraph and Telephone Corporation (NTT)
Headquarters: 3-1, Otemachi 2-chome, Chiyoda-ku, Tokyo 100-8116 Japan
Established: April 1, 1985
Capital: ¥795,600,000,000
Employees: 3,475
URL: http://www.ntt.co.jp/

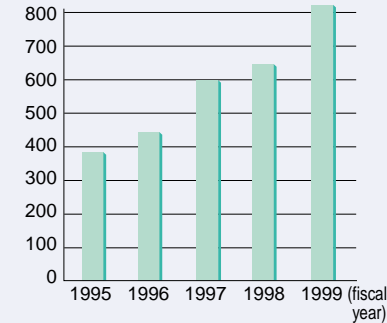## ● Consolidated Profile (as of March 31, 2000)

Employees: 224,000
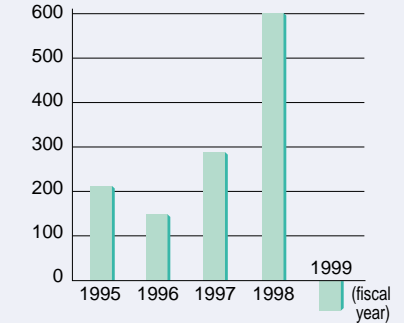Number of companies: 56 (refer to organizational chart, page 5)

Consolidated Data
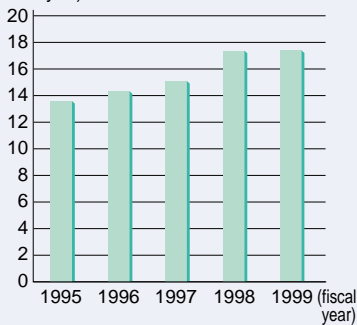
Operating revenues
(trillion yen)
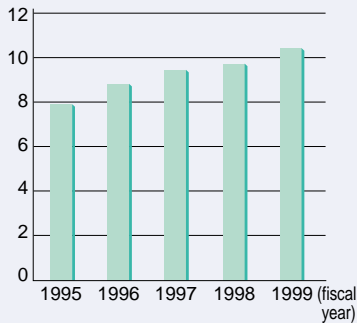
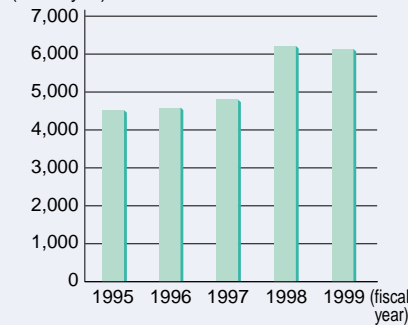**Operating income**
(billion yen)

Net income
(billion yen)
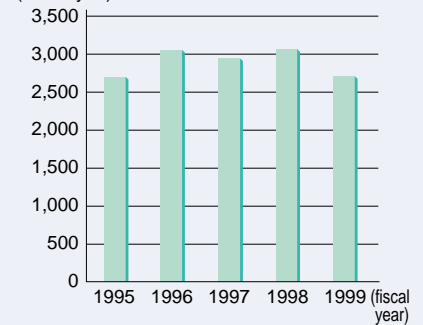

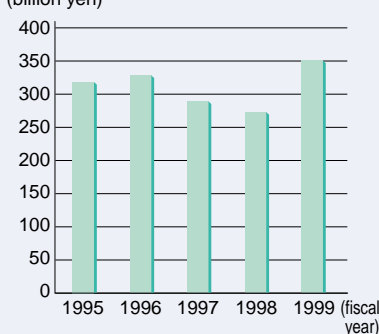**Total assets**
(trillion yen)

Share capital
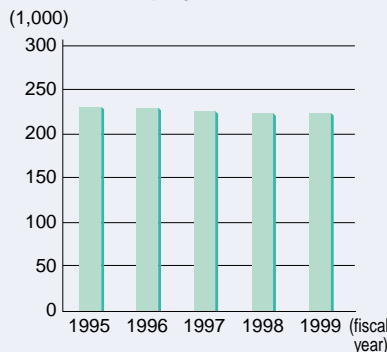(billion yen)

Capital investments
(billion yen)

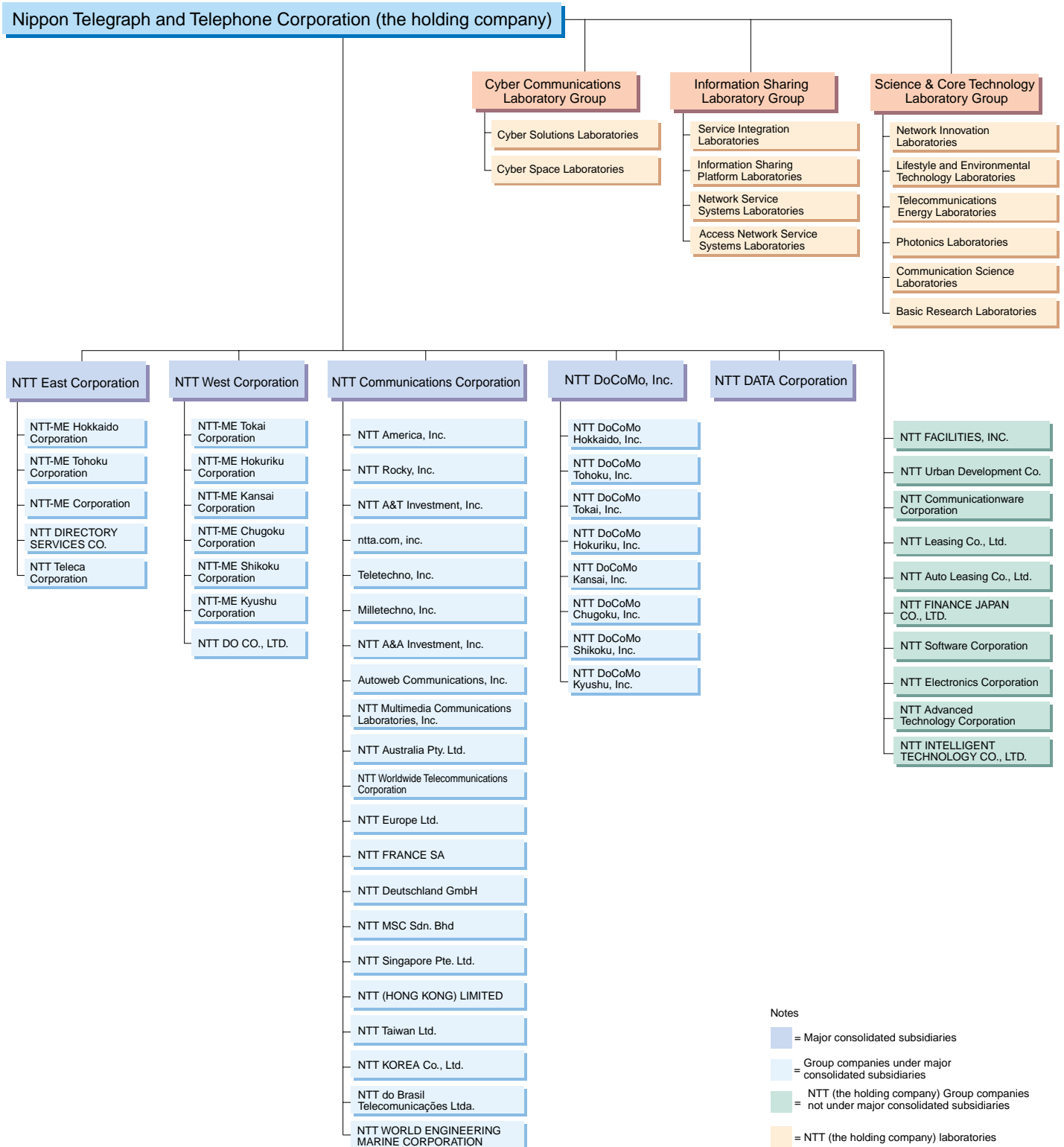
R&D expenditures
(billion yen)

Number of employees
(1,000)

Billion = 1,000 million
Trillion = 1,000,000 million

Structure of the NTT Group

The NTT Group, organized under a holding company structure with NTT (the holding company) at the core, offers a wide range of customer services through wholly-owned subsidiaries NTT East, NTT West, NTT Communications, NTT DoCoMo, and NTT DATA. Group companies such as NTT Communicationware, NTT-ME, and NTT Facilities maintain resources for the entire group, including software, communication facilities, power facilities and buildings. Each subsidiary actively explores new business possibilities and endeavors to expand its business domains. These efforts are supported by two types of research and development: basic R&D, centralized at the holding company level, and specific application R&D engaged in by each subsidiary. While it is unusual for a holding company to operate its own R&D department, NTT considers R&D a driving force for the management and development of the NTT Group today and into the future.

Nippon Telegraph and Telephone Corporation (the holding company)

Cyber Communications Laboratory Group
- Cyber Solutions Laboratories
- Cyber Space Laboratories

Information Sharing Laboratory Group
- Service Integration Laboratories
- Information Sharing Platform Laboratories
- Network Service Systems Laboratories
- Access Network Service Systems Laboratories

Science & Core Technology Laboratory Group
- Network Innovation Laboratories
- Lifestyle and Environmental Technology Laboratories
- Telecommunications Energy Laboratories
- Photonics Laboratories
- Communication Science Laboratories
- Basic Research Laboratories

NTT East Corporation
- NTT-ME Hokkaido Corporation
- NTT-ME Tohoku Corporation
- NTT-ME Corporation
- NTT DIRECTORY SERVICES CO.
- NTT Teleca Corporation

NTT West Corporation
- NTT-ME Tokai Corporation
- NTT-ME Hokuriku Corporation
- NTT-ME Kansai Corporation
- NTT-ME Chugoku Corporation
- NTT-ME Shikoku Corporation
- NTT-ME Kyushu Corporation
- NTT DO CO., LTD.

NTT Communications Corporation
- NTT America, Inc.
- NTT Rocky, Inc.
- NTT A&T Investment, Inc.
- ntta.com, inc.
- Teletechno, Inc.
- Milletechno, Inc.
- NTT A&A Investment, Inc.
- Autoweb Communications, Inc.
- NTT Multimedia Communications Laboratories, Inc.
- NTT Australia Pty. Ltd.
- NTT Worldwide Telecommunications Corporation
- NTT Europe Ltd.
- NTT FRANCE SA
- NTT Deutschland GmbH
- NTT MSC Sdn. Bhd
- NTT Singapore Pte. Ltd.
- NTT (HONG KONG) LIMITED
- NTT Taiwan Ltd.
- NTT KOREA Co., Ltd.
- NTT do Brasil Telecomunicações Ltda.
- NTT WORLD ENGINEERING MARINE CORPORATION

NTT DoCoMo, Inc.
- NTT DoCoMo Hokkaido, Inc.
- NTT DoCoMo Tohoku, Inc.
- NTT DoCoMo Tokai, Inc.
- NTT DoCoMo Hokuriku, Inc.
- NTT DoCoMo Kansai, Inc.
- NTT DoCoMo Chugoku, Inc.
- NTT DoCoMo Shikoku, Inc.
- NTT DoCoMo Kyushu, Inc.

NTT DATA Corporation

- NTT FACILITIES, INC.
- NTT Urban Development Co.
- NTT Communicationware Corporation
- NTT Leasing Co., Ltd.
- NTT Auto Leasing Co., Ltd.
- NTT FINANCE JAPAN CO., LTD.
- NTT Software Corporation
- NTT Electronics Corporation
- NTT Advanced Technology Corporation
- NTT INTELLIGENT TECHNOLOGY CO., LTD.

Notes
- ■ = Major consolidated subsidiaries
- ■ = Group companies under major consolidated subsidiaries
- ■ = NTT (the holding company) Group companies not under major consolidated subsidiaries
- ■ = NTT (the holding company) laboratories

NTT Group consolidated companies

1. The above are consolidated subsidiaries as of March 31, 2000. Company names are current as of April 1, 2000.
2. Cyber Communications Laboratory Group, Information Sharing Laboratory Group and Science & Core Technology Laboratory Group belong to NTT (the holding company).

Foreword

- The period of statistics included in this report covers the fiscal year 1999 (April 1999 to March 2000); company names are current as of April 1, 2000.
- Data for the NTT Group for the fiscal year 1999 include NTT (the holding company), NTT East, NTT West, NTT Communications, nine NTT DoCoMo companies, NTT DATA, NTT Facilities, and NTT Communicationware. Data up to the year 1998 are mainly taken from the former NTT prior to its reorganization. Please refer to the appendix for details.
- Starting with Report 2000, the volume of CO_2 emissions is expressed in CO_2 equivalent weight.
  CO_2 equivalent weight is obtained by multiplying by 3.67 the volume of CO_2 emissions expressed in C (carbon) equivalent weight in previous reports up to 1999.
- Information on NTT Group environmental activities is also available on the Internet.
  http://www.ntt.co.jp/kankyo/e/index.html

Overview of each Chapter

Chapter 1 is a summary of NTT Group environmental protection activities, focusing on the NTT Group Ecology Program 21.

Chapter 2 describes basic policies which are shared by all NTT Group companies.

Chapter 3 describes NTT Group responses to specific environmental issues.

Chapter 4 explains various research and development projects for environmental protection.

Chapter 5 describes internal and external communication activities.

Chapter 6 introduces the Group's social contributions related to environmental protection.

Environmental Issues Affecting the NTT Group

The NTT Group provides a wide range of advanced information sharing services through operations including telecommunications, mobile telecommunications, data communications, Internet services, etc. We are well aware that such business activities may have a significant effect on environmental issues, such as air, water, resources, waste, soil, local communities, etc. The image below is a conceptualization of the relationships between NTT Group business activities and the environment. We have identified paper resource management, CO_2 emissions, and waste treatment as primary areas which have a significant impact on the environment, established targets for our main action plans, and are engaged in the development of effective measures to deal with these problems.
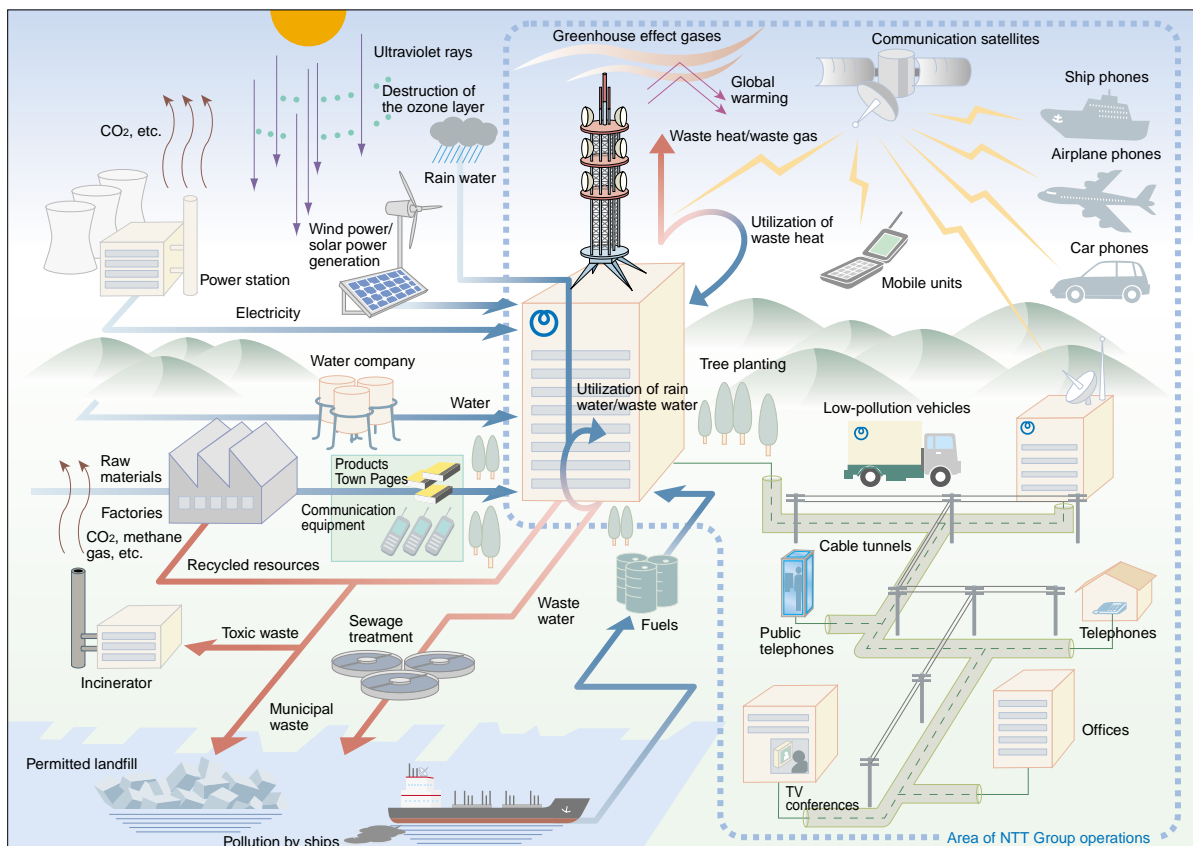
Conceptualization of environmental issues affecting the NTT Group

The NTT Group's
Basic Approach to Environmental Protection

1. NTT Group Ecology Program 21

http://www.ntt.co.jp/kankyo/e/2000report/1/111.html

The NTT Group recognizes environmental preservation as a major issue to be tackled on a global scale. The NTT Group Ecology Program outlines our basic strategy for environmental protection activities and forms the framework for our efforts to contribute to the formation of a global ecology community.

Three Main Components of the NTT Group Ecology Program 21

2
Contribution to local communities

The NTT Group will promote the development of a wide range of diversified local community-based environmental protection activities.

NTT Group Ecology Community Plazas will be established as bases to contribute to the creation of environmentally aware communities. These Community Plazas will serve as hubs for the dissemination and exchange of information on environmental issues. We plan to establish model branches where we will implement a diverse and varied range of environmental activities. Based on assessment of the effects of these activities, we hope to extend them to other branches throughout the country.

1
Unified awareness within the Group

We shall establish a basic unified stance to promote environmental awareness within the NTT Group. Based on targets established in major action plans (basic policies), we shall carry out coordinated efforts as a responsible business enterprise to efficiently manage paper resources and reduce CO_2 emissions and waste volumes, with 2010 as the target year.
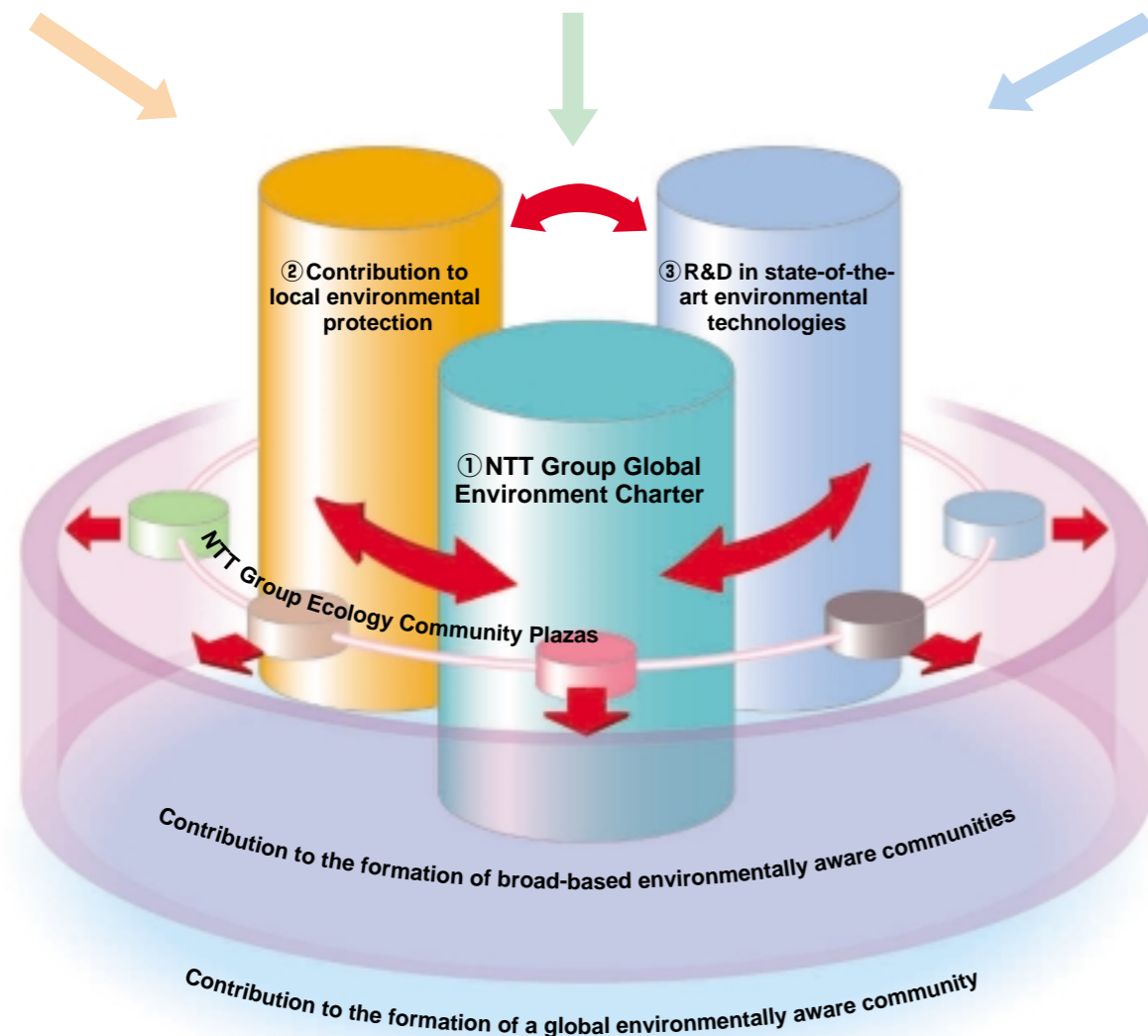
3
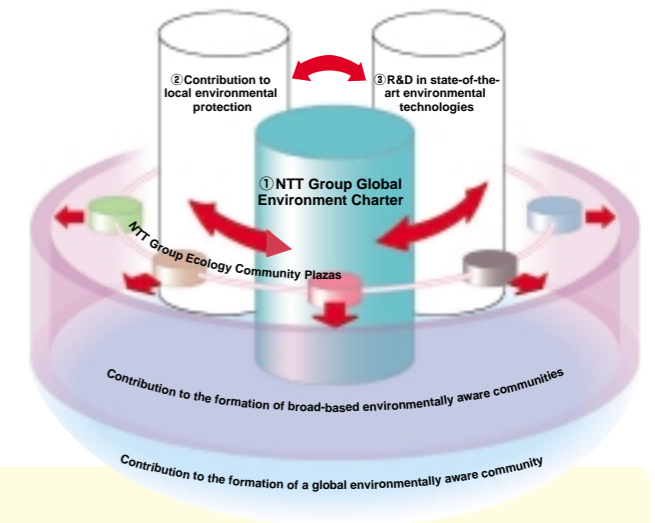### Contribution through state-of-the-art information sharing technology

As a corporate group involved in the information sharing industry, we shall pursue reduction of environmental impact through state-of-the-art technologies, while simultaneously conducting R&D to contribute to the development of new and more rewarding lifestyles.
(Examples of R&D projects)
●Ecology networks ●Nitrogen dioxide monitoring systems ●Electronic commerce ●Intelligent transport systems (ITS) ●Odor-based water quality monitoring systems ●Long-life nickel metal hydride batteries ●Stand-alone photovoltaic power systems ●Recycling of plastic using supercritical water

②Contribution to local environmental protection

③R&D in state-of-the-art environmental technologies

①NTT Group Global Environment Charter

NTT Group Ecology Community Plazas

Contribution to the formation of broad-based environmentally aware communities

Contribution to the formation of a global environmentally aware community

NTT Group Global Environment Charter

②Contribution to local environmental protection

③R&D in state-of-the-art environmental technologies

①NTT Group Global Environment Charter

NTT Group Ecology Community Plazas

Contribution to the formation of broad-based environmentally aware communities

Contribution to the formation of a global environmentally aware community

NTT Group Global Environment Charter

We need to recognize the extent and gravity of current environmental issues, including global warming, ozone layer depletion, destruction of the tropical rain forests, desertification, acid rain, and contamination of the oceans.

We must also recognize the degree to which these issues are the direct result of current societal systems, which are intimately linked to corporate activities. As a business enterprise, we have a responsibility to dedicate ourselves to harmonizing our business activities with global efforts to protect the environment in order to realize sustainable growth and to eliminate problems for future generations. Based on this fundamental recognition, we here establish the NTT Group Global Environment Charter to clarify our basic policies and actions taken concerning these issues.

Basic Principle
To ensure the harmonious co-existence of people with nature and to achieve sustainable growth, the NTT Group will do our utmost to protect the global environment in all our corporate activities.

Basic Policies
1. Compliance with laws and regulations and fulfillment of social responsibilities
   ● To observe all laws and regulations regarding environmental protection issues and to carry out our responsibilities as global corporate citizens.
2. Reducing environmental loads
   ● To establish action plans for energy conservation (reduction of greenhouse gas emissions), resource conservation (conservation of materials such as paper), and waste reduction, and to strive to make continuous improvements.
3. Establishing and maintaining environmental management systems
   ● To establish an environmental management system enabling each business unit to pursue voluntary environmental protection activities.
4. Developing environmental technologies
   ● To contribute to the reduction of environmental load through various areas of research and development, including multimedia services.
5. Social contribution efforts
   ● To promote daily environmental protection efforts in coordination with citizens and government agencies.
6. Disclosure of environmental information
   ● To enhance both internal and external communications through the disclosure of environmental information.

NTT Group's Targets for Major Action Plans (refer to page 12)

1. NTT Group Ecology Program 21

Contribution to Local Environmental Protection

"Contribution to local environmental protection" is the second pillar of the NTT Group Ecology Program 21.

As declared in the Basic Policies of the NTT Group Global Environment Charter, our emphasis lies in activities implemented in close liaison with local residents and government agencies.

The NTT Group is in the process of establishing model branches, housing Ecology Community Plazas. Our aim for these Plazas is to provide locations for the development of networks to address global environmental issues on the local level and to provide and exchange information on the environment.

In addition, Group companies are making efforts to contribute to society by voluntarily participating in environmental protection activities and raising funds for environmental incentives.

More concrete examples of these activities are explained in detail in Chapter 6.
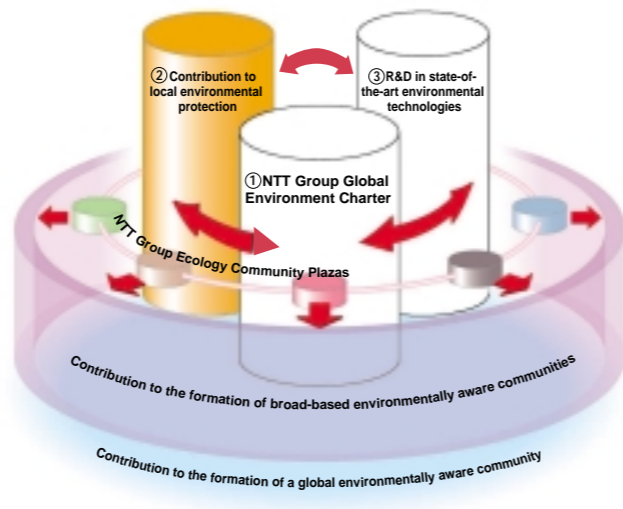
R&D in State-of-the-Art Environmental Technologies

The NTT Group is making special efforts in R&D into environmental technologies.

Established in January 1999, the Lifestyle and Environmental Technology Laboratories and the Telecommunications Energy Laboratories serve as the focal point for these research efforts, with Group companies as well as each branch also pursuing their own R&D in various areas related to the environment. R&D projects are largely classified into two categories: establishing a structure for a sustainable society by maximizing the potential of information technology and specific R&D to contribute to the reduction of environmental loads.

The first area of research includes the establishment of ecological networks, development of nitrogen dioxide monitoring systems, simulations in the reduction of environmental loads via communication services such as TV conferencing, experiments on model electronic commerce, and development of intelligent transportation systems (ITS).

The latter includes development of long-life nickel metal hydride batteries and stand-alone photovoltaic power systems, study of plastic recycling technology using supercritical water, and development of fuel modification facilities.

Details of these efforts are described in Chapter 4.
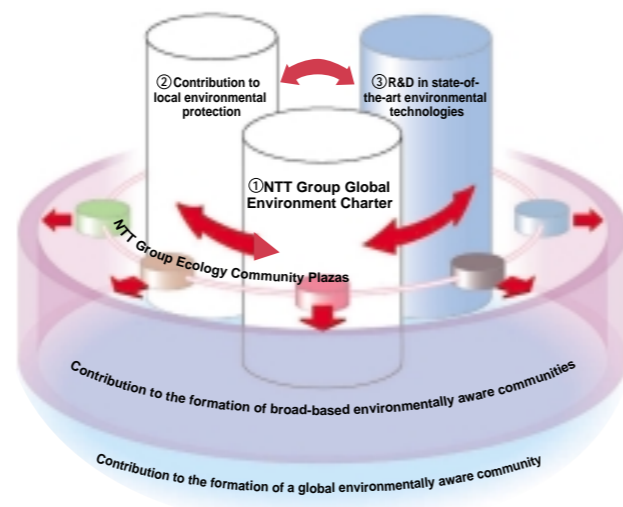
2. Our Organization for Promoting Environmental Protection

http://www.ntt.co.jp/kankyo/e/2000report/1/121.html

The NTT Group has established an organization to enable each group company to recognize and confirm the concepts of NTT Group Ecology Program 21 and take appropriate action to promote environmental protection as a group. (Fig. 1.2-1)
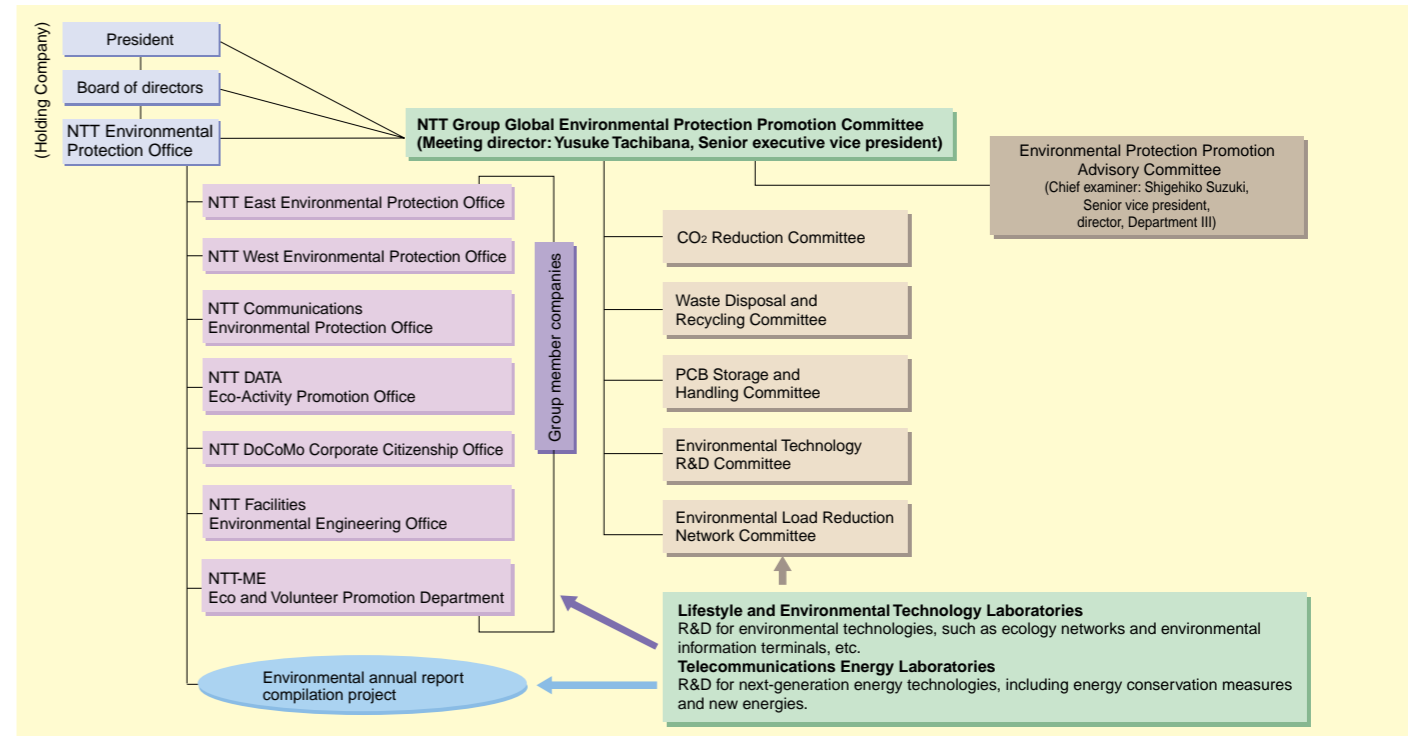

Fig. 1.2-1 NTT Group organization for promoting environmental protection

NTT Group Global Environmental Protection Promotion Committee

As the supreme decision-making body of NTT Group's global environmental protection promotion activities, the committee is comprised of directors responsible for environmental issues at main Group companies and division heads of NTT (the holding company). This committee prepares basic environmental policies, establishes targets for action plans, and evaluates achievements for the entire group. (meets twice)
Meeting director: Yusuke Tachibana, Senior executive vice president of NTT (the holding company); chairperson: Shigehiko Suzuki, Senior vice president, director, Department III (R&D Strategy Department) of NTT, head of NTT Environmental Protection Office

NTT Group Environmental Protection Advisory Committee

This committee makes inquiries on environmental policies and specific measures and provides advisory opinions to the NTT Group environmental protection promotion committee. (meets three times)
Chief examiner: Shigehiko Suzuki, Senior vice president, director, Department III, NTT

NTT (the holding company) Environmental Protection Office

This office serves as the secretariat for various Group-wide committees. It also oversees various offices and divisions of the NTT Group companies responsible for environmental protection promotion. The Environmental Protection Activity Report is compiled and published by a project team drawn up by this Office.

CO₂ Reduction Committee

To achieve the goals of reducing CO_2 emissions adopted at the Kyoto Conference on Prevention of Global Warming of December 1997 (3rd Conference of Parties of the United Nations Framework Convention on Climate Change), the committee is responsible for devising basic policies, including new measures and reduction goals, to allow the NTT Group to fulfill its corporate responsibilities. (meets three times)

Environmental Technology R&D Committee

This committee is assigned the task of establishing systems capable of collecting and distributing environmental information through multimedia networks, to allow active use of telecommunications technologies for environmental protection. (meets eight times)

Waste Disposal and Recycling Committee

This committee draws up basic policies on waste reductions, recycling and green procurement, promoting protective measures from the time of procuring materials and components. (meets twice)

Environmental Load Reduction Network Committee

The mission of this committee is to reduce negative environmental impact of overall network facilities and the way they are operated, and to study the possibility of introducing environmental accounting. (meets twice)

PCB Storage and Handling Committee

As a major user of equipment which involves PCBs, the committee drafts basic policies for proper storage of wastes and chemical treatment to neutralize PCBs. (meets twice)

3. Targets for Major Action Plans

Targets for Major Action Plans and Achievements for 2000

In 1991, the NTT Group set targets for major action plans including paper resource management, prevention of global warming, waste management, and protection of the ozone layer, to be met by fiscal 2000. Actual results of our efforts are disclosed below.

Targets for Action Plans

Items	Targets for action plans (set in 1991)	Results in 1999
Paper resource management	To reduce total virgin pulp consumption to 1990 levels by 2000.	Total virgin pulp consumption is reduced by approx. 28% from 1990.
Prevention of global warming	To reduce CO_2 emissions to 1990 levels by 2000.	Total volume of emissions increased by approx. 35% from 1990; however, steadily improving eco-efficiency has resulted in stabilization.
Waste management	To reduce the amount of waste to 1990 levels by 2000.	The amount was reduced by approx. 64% from 1990 level.

Items	Targets for action plans (set in 1991)	Results in 1999
Protection of ozone layer	Use of CFCs to be totally banned in 1995.	Completed in 1995.

Regarding protection of the ozone layer, the use of CFCs in new equipment was completely banned in 1995.
Regarding paper resource management, prevention of global warming and waste management, target figures have been reviewed and revised targets were included in the 1999 NTT Group targets for major action plans to demonstrate our continuing efforts.

Paper Resource Management

(Unit: 1,000 t)

Fig. 1.3-1 Virgin pulp consumption

Waste Management

(Unit: 1,000 t)

Fig. 1.3-2 Waste volume

Prevention of Global Warming

(unit: 1,000 t – CO_2)

Fig. 1.3-3 Volume of CO_2 emissions

Prevention of Global Warming

(sales of 1 million yen/CO_2 emission in tons)

Fig. 1.3-4 Environmental efficiency (eco-efficiency)

As of fiscal 1999, the amount of CO_2 emissions exceeded the target set for the year 2000 (at the 1990 level). (Fig. 1.3-3) One of the factors for this is the expanded business range of the NTT Group. However, sales per unit of CO_2 emission, an indication of environmental efficiency (eco-efficiency) show yearly improvement and have stabilized at around ¥4.74 million/t-CO_2 since 1996. (Fig. 1.3-4) The NTT Group has thus been making continuous progress in reducing the volume of CO_2 emissions since 1991. For 1999, CO_2 emitted by NTT Facilities and NTT Urban Development were included in the figure, thus the increase compared to the previous year.
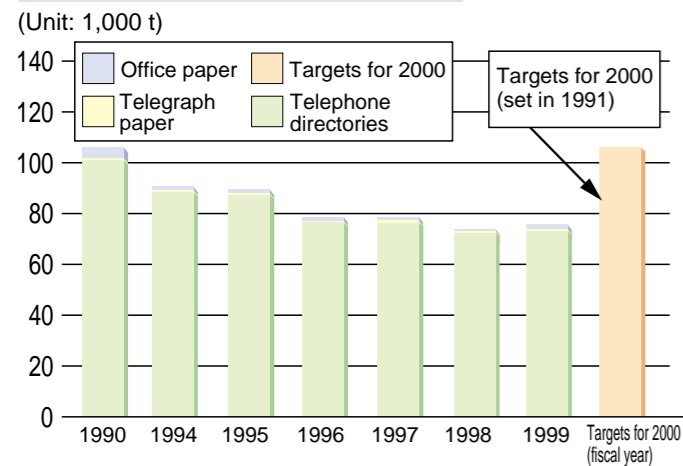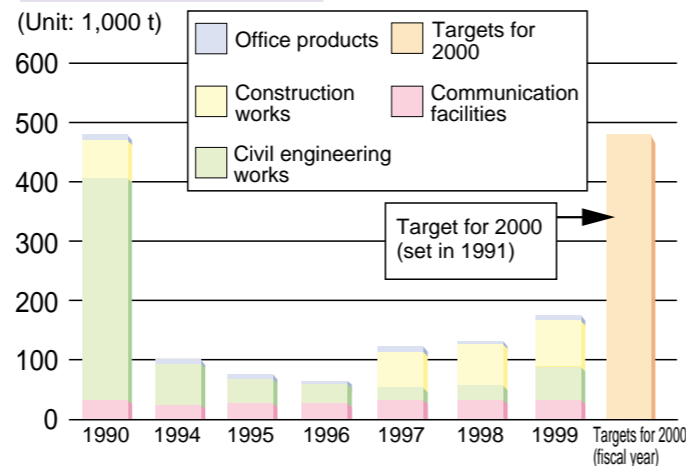
Setting New Targets for 2010

In March 2000, the NTT Group reviewed and revised the targets for major action plans including paper resource management, prevention of global warming and waste management.

Targets for Action Plans

Items	Targets for action plans (set in 1999)
Paper resource management	Total virgin pulp consumption to be reduced by more than 20% from 1990 levels by 2010.
Prevention of global warming	CO_2 emissions to be reduced below 1990 levels by 2010.
Waste management	Volume of waste to be reduced by more than 85% of 1990 levels by 2010.

4. PDCA for Promotion of Environmental Protection

http://www.ntt.co.jp/kankyo/e/2000report/1/141.html

In order to establish Group-wide management systems and to identify tangible results of our activities, the NTT Group has implemented a PDCA (Plan-Do-Check-Action) cycle for environmental protection activities.
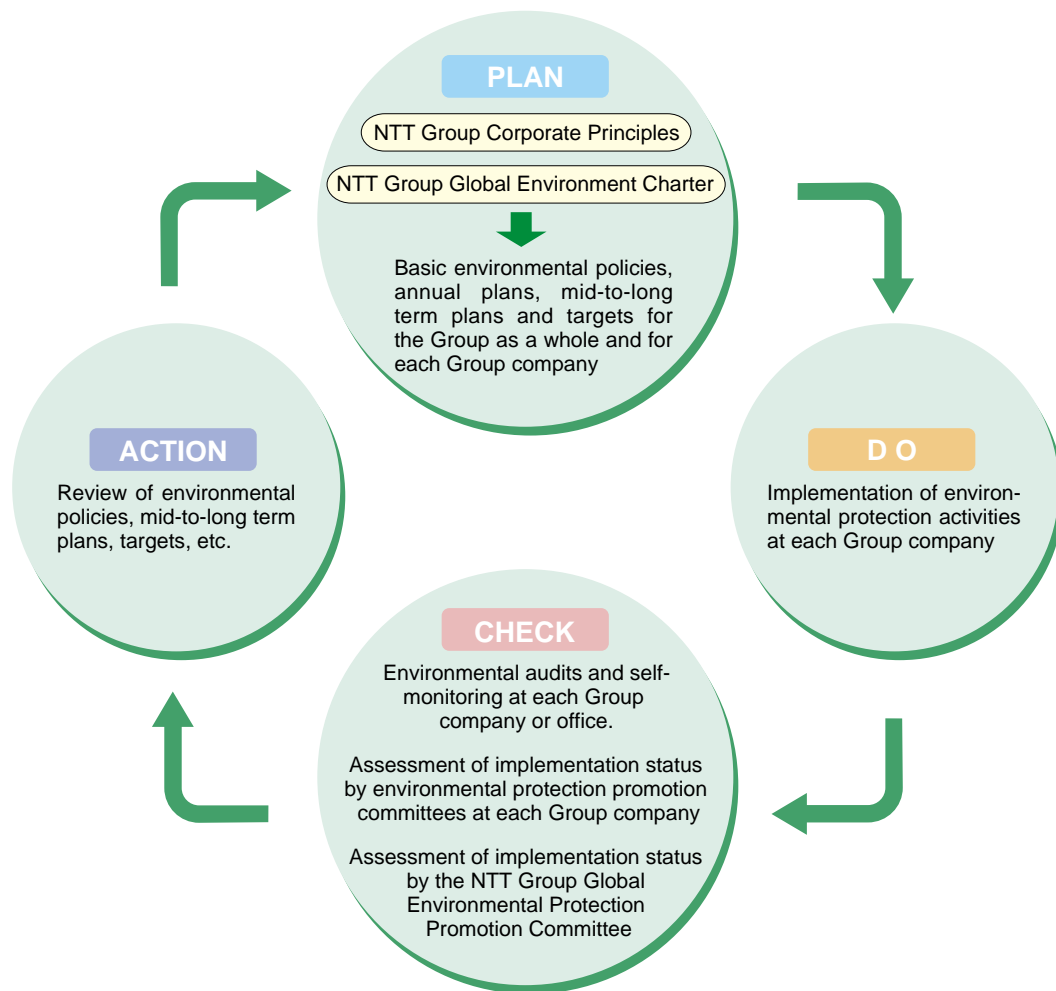
PLAN

NTT Group Corporate Principles

NTT Group Global Environment Charter

Basic environmental policies, annual plans, mid-to-long term plans and targets for the Group as a whole and for each Group company

ACTION

Review of environmental policies, mid-to-long term plans, targets, etc.

D O

Implementation of environmental protection activities at each Group company

CHECK

Environmental audits and self-monitoring at each Group company or office.

Assessment of implementation status by environmental protection promotion committees at each Group company

Assessment of implementation status by the NTT Group Global Environmental Protection Promotion Committee

Fig. 1.4-1 PDCA for promotion of NTT Group environmental protection activities

PLAN In keeping with the NTT Group Corporate Principles and the NTT Global Environment Charter, the NTT Group global environmental protection promotion committee dictates the following:
●basic environmental policies ●mid-to-long term plans ●annual plans ●targets.
Based on the above, each Group company or office maps out plans for implementation with detailed programs.

D O Each Group company or office implements environmental protection activities based on detailed programs.

CHECK Each Group company or office conducts self-monitoring and environmental audits by internal environmental protection promotion organizations. Each Group company also works with the NTT Group Global Environmental Protection Promotion Committee to monitor implementation status.

ACTION Results are reflected in basic environmental policies, mid-to-long term plans, annual plans and targets for the coming year and for the years to follow.

2

Basic Policies Shared by NTT Group Companies

1. Environmental Management

Establishment of Environmental Management Systems

The NTT Group is actively promoting the establishment of ISO 14001-compliant environmental management systems based on the NTT Group Global Environment Charter.

Each Group company and department must establish and implement its own voluntary environmental management systems to promote efforts to reduce environmental impact in keeping with operational conditions, even if they do not obtain official ISO 14001 certification.

To effectively and efficiently promote these voluntary initiatives, the NTT Group provides environmental consultation to support the establishment and implementation of environmental management systems.

Examples of ISO 14001 Certification

The former NTT Material Procurement Department was first to obtain ISO 14001 certification in November 1997, with 26 organizations certified as of March 2000. (Fig. 2.1-1)

Entities which have acquired certification include three for NTT (the holding company), two for NTT East, four for NTT West, and eight for NTT DoCoMo.
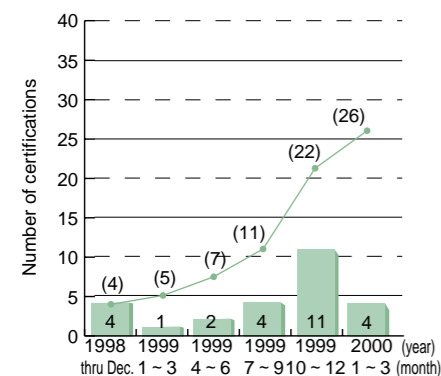
Table 2.1-1 ISO 14001-certified organizations within the NTT Group

	Registered entity	Registered department	Registration number	Registration date
1	Nippon Telegraph and Telephone Corporation	Material Procurement Department (former)	JSAE026	1997.11.20
2	NTT DoCoMo	Procurement and Supply	JSAE078	1998.11.27
3	NTT (the holding company)	Access Service System Laboratories	JSAE080	1998.12.21
4	NTT West	Komatsu Branch	EC98J1113	1998.12.24
5	NTT Learning Systems	Multimedia Division	EC98J1136	1999.1.26
6	NTT DoCoMo Tokai	———	JMAQA-E053	1999.6.16
7	NTT DoCoMo Hokkaido	———	EC99J1022	1999.6.30
8	NTT DoCoMo Kansai	Procurement and Supply	EC99J1042	1999.7.28
9	NTT DATA Corporation	Headquarters and Branches (Tokai, West Japan, Chugoku, Kyushu)	EC99J1048	1999.7.28
10	NTT Logisco	Headquarters and Kansai Office	NQE-9809007A	1999.8.30
11	HALO DEN·IN	———	JSAE150	1999.9.29
12	NTT DoCoMo	Yamanashi Branch	JUSE-EG-029	1999.10.7
13	NTT Electronics	Ibaraki Office	EMS99002	1999.10.20
14	NTT East	Materials Procurement Center	JSAE157	1999.10.28
15	NTT West	Procurement And Supply Center	JSAE163	1999.10.28
16	NTT West	Hokuriku Engineering And Technology Support Center	JSAE160	1999.10.28
17	NTT Communications	Procurement Department East Japan Network Facilities Center Network Business Division	JSAE164	1999.10.28
18	NTT West	Nagoya Branch	JQA-EM0587	1999.11.12
19	NTT (the holding company)	Science & Core Technology Laboratory Group, Atsugi R&D Center	JSAE178	1999.12.22
20	NTT DoCoMo Kyushu	Product and Supply Department	EC99J1134	1999.12.27
21	NTT Advanced Technology Corporation	Materials Development & Analysis Division	EC99J1152	1999.12.28
22	DoCoMo Engineering Kyushu	———	EC99J1160	1999.12.28
23	DoCoMo Service	Toda Products Center	JMAQA-E087	2000.1.27
24	NTT-ME Hokuriku	———	EC99J1180	2000.2.10
25	NTT HOKKAIDO ESPACE	———	JQA-EM0712	2000.2.10
26	NTT East	Kanagawa Branch	EC99J1239	2000.3.29

Fig. 2.1-1 ISO14001 certifications within the NTT Group (as of March, 2000)
Figures in brackets are cumulative totals.

Environmental Audits and Self-Monitoring

To fulfill the expectations of society and our responsibilities as a corporate entity, the NTT Group has identified the establishment and maintenance of environmental management systems as one of the basic policies of the NTT Group Global Environment Charter. Internal environmental audits are essential to ensure that these environmental management systems are properly implemented. As shown in Fig. 2.1-2, the NTT Group implements environmental audits on three levels.

Level 1 comprises initial audits, including performance audits to ensure compliance with laws and regulations. The NTT Group endeavors to comply with all laws and regulations, local ordinances and agreed reference values relating to environmental protection. Regular reports of performance audit results are made to local authorities.

Level 2 comprises environmental management system audits based on ISO 14001 guidelines.

Level 3 comprises more sophisticated environmental audits reflecting LCA[1] and environmental accounting practices.

[1] LCA
Life Cycle Assessment. A method for comprehensive assessment of the cumulative environmental impact of a product at every stage, from procurement of materials and production through usage and disposal. A method called LCC (life cycle cost) can be implemented for cost analysis.

■ Self-monitoring

Since 1995, all NTT Group business offices have conducted self-monitoring at least once a year in order to ensure that all applicable laws and regulations, ordinances, agreed reference values, internal rules and standards are observed. On-site inspections, document inspections and interviews are carried out according to environmental check sheets, and results are reported to the departments in charge of environmental activities. An example of an environmental check sheet is shown in Fig. 2.1-3.

■ Environmental audits

Departments in charge of environmental activities audit each business office every three to four years to ensure that all items on the check sheets are properly observed in keeping with the results of self-monitoring.

■ Compliance with laws and regulations

Atmospheric management

In compliance with the Air Pollution Control Law, boilers with heating surface area of over 10 square meters have been installed at NTT Group companies. A total of 138 business offices have been equipped with such boilers. No business office is in violation of any applicable laws or regulations.

Wastewater management

Substances regulated under the Water Pollution Control Law include copper, zinc and mercury, which are used in NTT laboratories. No business office has ever discharged wastewater exceeding levels set by laws, regulations and ordinances.

Waste management

Industrial waste generated by the NTT Group consists primarily of dismantled communications facilities such as telephone poles and switchboards, and concrete and asphalt used for construction and civil engineering projects. In 1997, a manifest system[2] for proper management of industrial waste products was introduced. For special industrial waste, such as asbestos used in buildings and bridges and infectious waste generated from medical facilities, specific individuals are designated to ensure proper management of waste disposal in keeping with the manifest system.

[2] Manifest system
A system that enables tracking and management of the flow of industrial wastes consigned to third parties for treatment and disposal. As of December 1, 1998, the manifest system has been applied to all industrial wastes.
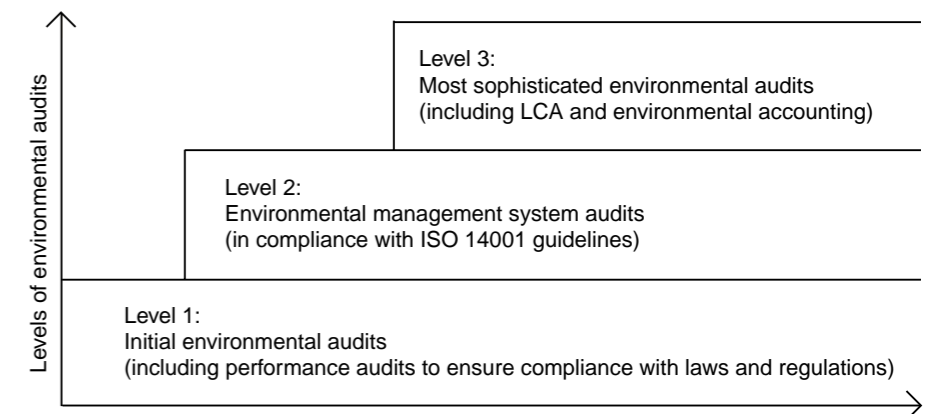
Fig. 2.1-2 Levels of environmental audits

Level 3:
Most sophisticated environmental audits (including LCA and environmental accounting)

Level 2:
Environmental management system audits (in compliance with ISO 14001 guidelines)

Level 1:
Initial environmental audits (including performance audits to ensure compliance with laws and regulations)

Levels of environmental audits

Categories	Items
Environmental management	Organization for promoting environmental protection
Paper resource management	Office paper management measures
Measures for prevention of global warming	Measures for compliance with revised energy conservation laws, implementation of daily energy conservation activities, power-receiving systems, telecommunication power sources, air conditioning facilities, lighting facilities, gas, oil, boilers, small boilers, oil tanks, low pollution vehicles
Waste management	Office waste, obsolete communication facilities, medical wastes, PCBs (stored and currently used), others (bridge asbestos, construction asbestos, etc.)
Protection of ozone layer	Turbo freezers, halon fire extinguishers
General issues	Water, septic tanks, office supply procurement

Fig. 2.1-3 Example of an environmental check sheet

1. Environmental Management

Environmental Risk Management

NTT Group environmental protection efforts are primarily focused on reduction of existing environmental impact and elimination of factors which cause ongoing negative impact. In the process, however, of pursuing our business activities, we sometimes have no choice but to utilize facilities and materials which could have harmful effects on the environment. Under these circumstances, we must make special efforts to minimize risks. Environmental risk management is one of the areas the NTT Group has targeted for special emphasis. Thanks to these efforts, no penalties or fines regarding the environment were imposed on the Group or any of its member companies in 1999.

■ Prevention of soil contamination

The NTT Group has underground tanks which store fuel for auxiliary generation at some 1,500 switchboard facilities and other strategic installations across the country. These facilities are so-called lifelines, indispensable for securing communication in emergencies. Leaked fuels from these underground tanks could, however, contaminate soil and water, seriously affecting the quality of life of local residents.

The NTT Group has made a thorough study of the potential environmental impact of these storage facilities. As the first preventive measure against leakage of fuel and other hazardous substances, we have introduced and reinforced an automatic oil leakage detection system for underground tanks. This system allows for monitoring of fuel levels and flow rates in existing underground tanks, and constant remote surveillance and reporting of leakage in surrounding areas to detect and prevent leakage in advance.

We are also implementing installation of new underground tanks with a double wall structure. From January 1999 to March 2000, new tanks were installed at a total of 110 NTT East locations and 140 NTT West locations.

■ PCB storage and harmless processing technologies

Until 1972, PCB (polychlorinated biphenyl) was widely used at NTT for transformers, condensers, and stabilizers for fluorescent lamps. Following the legislative ban on PCB production and restriction of its usage, NTT ceased new application of PCBs. Even before the ban, the company had initiated a storage program for used PCBs.

In April 1998, NTT established new internal guidelines for PCB storage, stipulating the proper facilities and methods for safe storage of this potentially hazardous substance.

Due to possible deterioration of facilities in the 28 years since storage began and the considerable time required for complete decomposition of PCB waste, we have recently implemented additional risk management measures for PCB storage. Small objects containing PCB are stored in containers, while large objects, such as transformers, are stored in facilities protected by stainless steel trays.

The NTT Group as a whole is aware of the group's responsibility as a PCB-holder to further implement risk management measures.

Introduction of Environmental Accounting

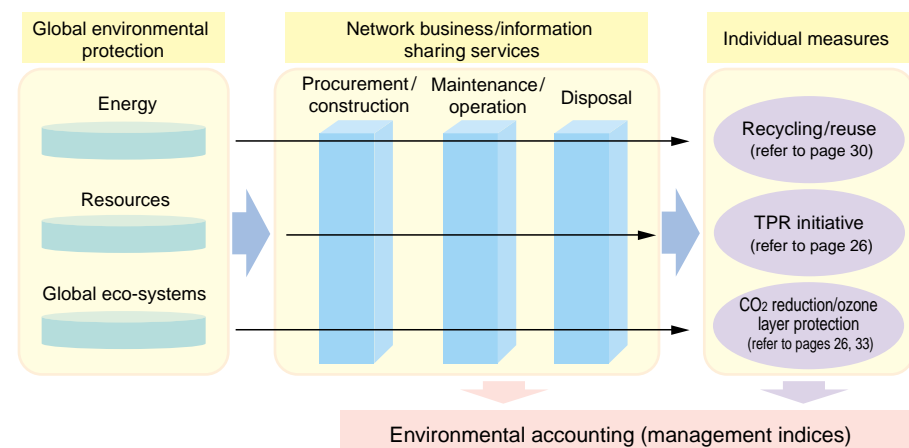The NTT Group began the introduction of environmental accounting from fiscal 1999 as part of our efforts to quantitatively grasp the scope and nature of our own environmental initiatives (internal management) and to positively disclose measures adopted to reduce environmental impact and other environmental efforts initiated as a leading information sharing business (external disclosure). Environmental accounting provides an effective means for quantitative analysis of information sharing services and business management from the viewpoint of energy, resources and global eco-systems, essential elements of global environmental protection. It also permits these results to be reflected in management decision-making. (Fig. 2.1-4) The NTT Group is currently making the following efforts in environmental accounting: (1) calculating environmental costs and their effects as risk management of environmental costs to NTT Group companies and (2) conducting ongoing studies of the social value of information sharing services and their effect on the future welfare of the environment.

NTT Facilities initiated trial calculations of environmental preservation costs at their headquarters in 1998. NTT (the holding company), NTT East, NTT West, and NTT DoCoMo Hokkaido are making calculations based on environmental accounting for 1999. The NTT Group plans to disclose environmental accounting results for major companies for the fiscal year 2000. We also intend to promote an ongoing environmental agenda by drawing up specific environmental accounting guidelines within the NTT Group.

Fig. 2.1-4 Overview of environmental accounting

2. Guidelines for Procurement, Design and R&D

http://www.ntt.co.jp/kankyo/e/2000report/2/221.html

The Guidelines

The NTT Group has established the following guidelines to promote the development of environmentally aware business activities. (Fig. 2.1-1)
① Green Procurement Guidelines (established in 1997)
② Green R&D Guidelines (established in 2000)
③ Green Building Design Guidelines (established in 1997)
These three sets of guidelines reflect three unique characteristics of the NTT Group.

■ Characteristic #1

Because the NTT Group has no manufacturing divisions, it is necessary to purchase products from suppliers. Environmental impact associated with procured products can have a direct influence on the environmental viability of our business activities. We have therefore targeted procurement of environmentally friendly products (Green Procurement) and outlined the concept in our Green Procurement Guidelines, which are being actively implemented by our procurement divisions.

■ Characteristic #2

The NTT Group maintains its own R&D divisions, engaged in research and development of services, systems and products related to the businesses of the Group. When newly developed products are consigned to manufacturers for production, we require designs which maximize environmental considerations. Our Green R&D Guidelines were established to clarify such requirements and promote environmentally friendly research and development.

■ Characteristic #3

The NTT Group is engaged in businesses on a nationwide scale, and owns a huge number of buildings. By incorporating environmentally friendly building design from the initial stage, it is possible to achieve a considerable reduction in environmental impact at later operational stages. From this viewpoint, we have established our Green Building

Design Guidelines for application to NTT Group buildings.

■ How the Guidelines are implemented

We have established steps to ensure systematic development and implementation of these environmental guidelines.

Green Procurement Guidelines are to be implemented in three steps: Step 1: Indication of direction; Step 2: Supplier assessment; Step 3: Full-scale implementation. (Fig. 2.2-2)

Green R&D Guidelines are implemented by: Step 1: Trial implementation; Step 2: Actual implementation; Step 3: Full-scale implementation. (Fig. 2.2-3)

Green Building Design Guidelines are implemented in three steps: Step 1: Announcement of basic policies; Step 2: Group development; Step 3: Actual implementation. (Fig. 2.2-4)
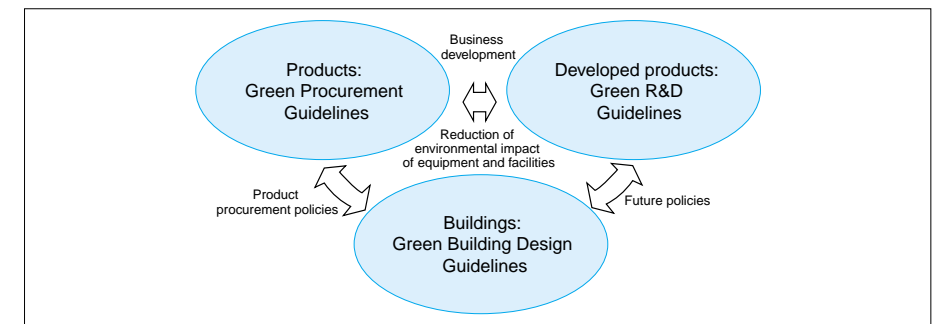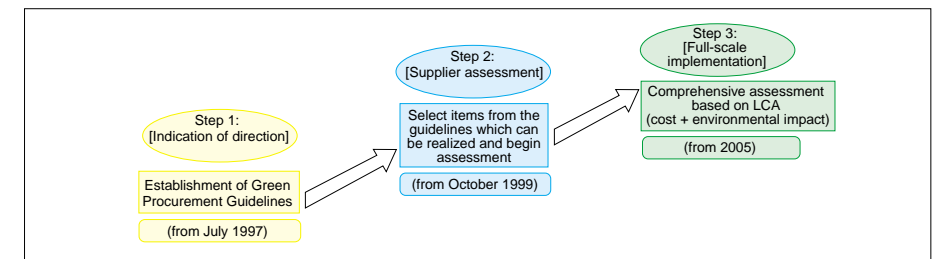

Fig. 2.2-1 NTT Group environmental guidelines

Fig. 2.2-2 Steps for implementation of Green Procurement Guidelines
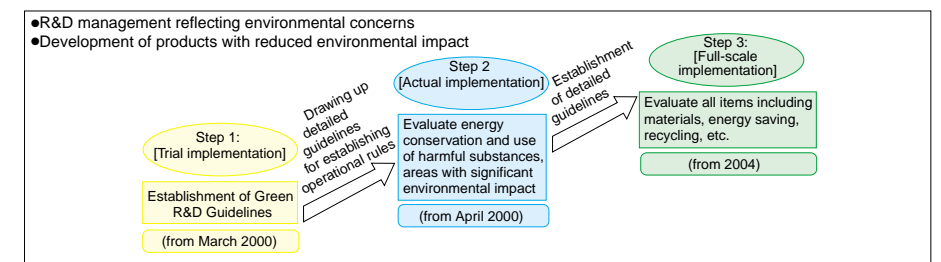

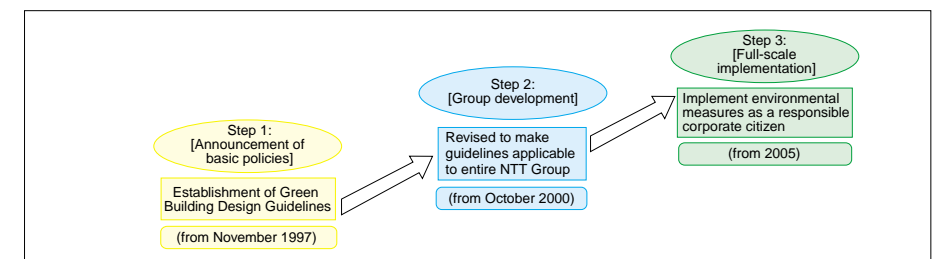Fig. 2.2-3 Steps for implementation of Green R&D Guidelines

Fig. 2.2-4 Steps for implementation of Green Building Design Guidelines

Green Procurement Guidelines

Green Procurement Guidelines were established in 1997 and revised as shown in Fig. 2.2-5. Step 1 of the implementation process is already completed and procurement standards have been reinforced. The guidelines adopted as standards today were revised in August 1998 and are applicable to NTT (the holding company), NTT East, NTT West, NTT Communications, NTT DoCoMo, NTT DATA and NTT Facilities, companies engaged in activities which generate greater environmental loads compared to other companies in the Group. The full text of the guidelines can be viewed on our website and is available for downloading.

http://ontime.ntt.co.jp/07/index07.html
http://ontime.ntt.co.jp/english/kanren/index.html

We are currently working on Step 2 of the implementation process. Supplier assessment was initiated in October 1999, a minimum start based on reasonable items selected from the guideline categories. The NTT Group as a whole procures approximately 100,000 specific items, and we have asked approximately 250 suppliers who provide basic items to cooperate in the initial supplier assessment phase.

Supplier assessments are based on "corporate policy" and "product assessment". (Fig. 2.2-6)

Corporate policy assessment is applicable to all suppliers. Regarding product assessment, different products require different approaches. We have therefore identified two important areas for assessment: clear indication of specific plastic materials contained in the product and energy conservation. We will also require reports on the amounts of harmful substances contained in products as data becomes available. Other items in the guidelines will be individually checked to determine if they are applicable, depending on the characteristics of each product.

An overview of corporate policy and product assessments is shown in Fig. 2.2-7. For product assessment in particular, we have developed different time lines for assessment of new procurement contracts versus existing ones.

As of February 2000, we have conducted corporate policy assessments of 40 companies. Product assessment was conducted on approximately 10 new procurement products, while assessments of spec sheets[1] for approximately 20 existing products were conducted when their specifications were revised. We have also received approximately 20 cases for assessment to coincide with VA proposals[2].

We plan to move on to Step 3 (comprehensive assessment based on LCA) to coincide with the disclosure of data on environmental effects of materials and parts.

[1] Spec sheet: Specifies technical requirements and conditions necessary for purchasing telecommunication facilities and materials/components.
[2] VA proposals: Proposals for improvements from suppliers including price reductions, improved functions, etc., for materials/components and articles which we purchase on a continuous basis.
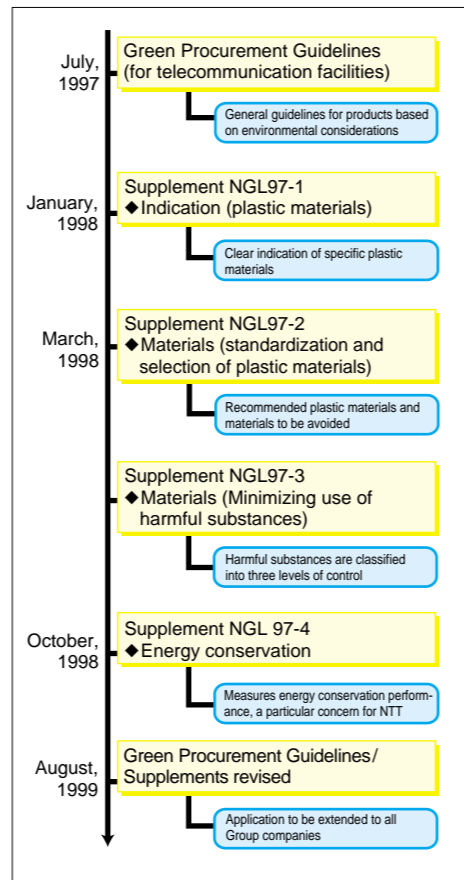

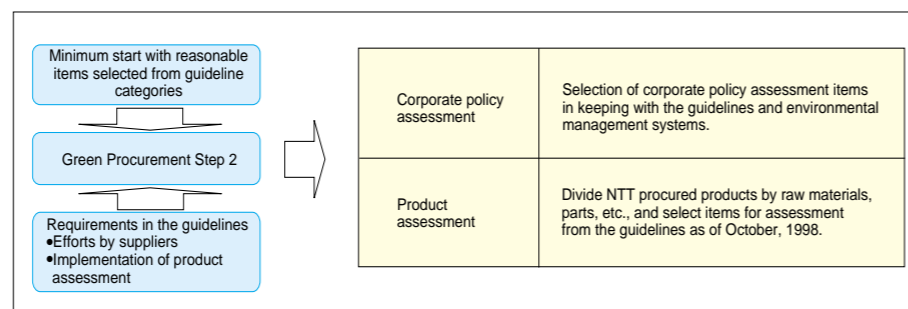Fig. 2.2-5 History of revision of Green Procurement Guidelines

Fig. 2.2-6 Implementation of Green Procurement Step 2

Fig. 2.2-7 Overview of Green Procurement Step 2

Green R&D Guidelines

In March 2000, the NTT Group adopted Green R&D Guidelines for research & development of new services, systems and products as a step toward reducing environmental loads as stipulated in the NTT Group Global Environment Charter.

These guidelines are our response to the emergence of a "recycling-based society." The guidelines are based on the principle of reducing environmental impact by saving resources, minimizing energy consumption and controlling harmful substances through efficient utilization of products throughout their entire life cycle and through promotion of recycling. The Basic Law for Promoting Establishment of a Recycle-based Society which came into effect in June 2000 requires businesses to reduce environmental loads by (1) reducing, recycling and properly treating wastes generated through business activities; (2) improving product durability; and (3) improving designs and indicating materials and components. Our Green R&D Guidelines meet all these requirements.

The Green R&D Guidelines are to be implemented in three steps as outlined on the previous page. Energy R&D guidelines, detailed guidelines for harmful substances, detailed guidelines for indication of material names and detailed guidelines for saving resources will be drawn up successively, with the process scheduled for completion by 2004.
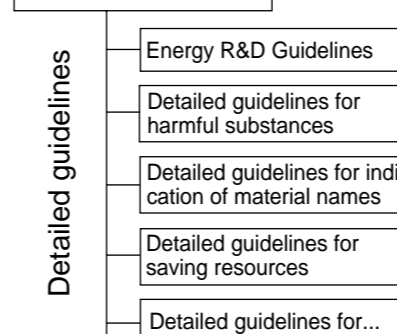
In developing our Green R&D Guidelines, we identified the following categories for consideration.
● Assessment categories for R&D results: Restriction of materials to be used; saving resources; ease of dismantling; indication of materials for separation; energy conservation; ease of waste disposal; restriction of manufacturing processes; and methods of recycling and disposal.
● Assessment categories for R&D activities and methods: Control of use of harmful substances; saving resources; energy conservation; recycling and disposal methods; and green purchasing.

In assessing R&D results, we do not directly regulate specifications for individual materials/components. Rather, by following these guidelines from the initial stages of R&D, we aim to develop products which reflect strategic environmental concerns, including reducing wastes and promoting recycling.

In assessing R&D activities and methods, we aim for reduction of environmental impact by limiting the amount of harmful substances and chemicals and reducing the amount of energy used in various facilities.

control and improvement of our overall business activities including construction and maintenance of facilities. In order, however, to counter expected increases in energy consumption, it is essential to reduce the amount of energy consumed by newly developed communication facilities. Adoption of energy-saving measures from the initial stages of R&D is a vital portion of our environmental agenda.

Our Energy R&D Guidelines have been established in view of such needs, with the aim of promoting reduced energy consumption and lessening the environmental impact of R&D throughout the NTT Group.

The guidelines require individuals in charge of R&D to implement energy assessments at respective planning and decision-making stages. These energy assessments aim at promoting enhanced awareness, and consist of three stages: fact-finding; setting targets; and self-assessments. These stages are necessary to determine the validity and performance of energy assessment targets.

We have also explained concrete examples of energy assessment methods to make it easier for individuals in charge of R&D to follow the guidelines.
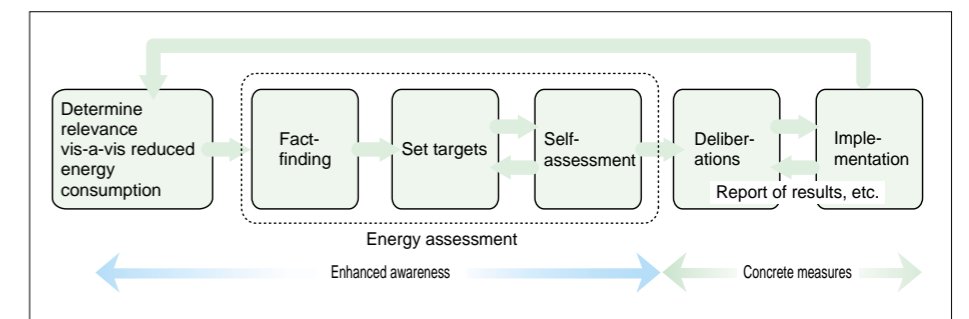
■ Energy R&D Guidelines
Energy R&D Guidelines, the first of a series of detailed guidelines, were established in March 2000.

The NTT Group has made significant progress with energy conservation efforts through on-site measures such as quality

Fig. 2.2-8 Structure of Green R&D Guidelines

Fig. 2.2-9 Basic flow of R&D for reduced energy consumption

2. Guidelines for Procurement, Design and R&D

Green Building Design Guidelines

The NTT Group owns approximately 30,000 buildings throughout Japan. Significant amounts of energy are consumed and waste generated in the process of construction, demolition, refurbishment and repair.

In November, 1997, NTT established Green Building Design Guidelines which outline our concepts for environmentally sound building design and summarize items to be considered in developing those concepts in more concrete terms. These guidelines reflect basic considerations for the design and planning stages of construction projects, with the objective of reducing the impact on the global environment throughout the entire life cycle of the building.

The Green Building Design Guidelines define the following seven strategic concepts for NTT building design. (Fig. 2.2-10)

(1) Extending building life:
Emphasizing flexibility, maintainability, renewal and durability

(2) Restricting use of halon and CFCs:
Banning the use of equipment containing halon or specified CFCs, removal of materials containing CFCs

(3) Restricting use and removal of harmful substances:
Restricting the use, removal and disposal of harmful substances

(4) Conservation of resources and energy
Conserving resources and energy during construction, conserving energy during use of facilities, effective use of natural energy sources, improving efficiency of energy utilization

(5) Reduction of waste:
Reduction of excess materials, reduction of generated waste

(6) Promoting reuse and recycling:
Promotes use of reused and recycled materials, reuse and recycling of by-products,

(7) Consideration for local environment:
Understanding environmental characteristics, reducing loads on local environment

Green Purchasing

In line with our policy to prioritize environmentally friendly materials and components, the NTT Group makes an effort to take environmental impact into consideration when purchasing office supplies such as copy paper, stationery and office equipment.

Within the NTT Group, each Group company and office has established its own policies to actively promote green purchasing. NTT (the holding company), NTT East, NTT West, NTT Communications, NTT DoCoMo, and NTT DATA participate in the Green Purchase Network (GPN)[1], adopting GPN product guidelines to promote procurement of environmentally friendly office supplies.

Organizations within the NTT Group which are aiming for ISO 14001 certification are also actively involved in green purchasing as a part of their efforts to obtain certification.

[1] Green Purchase Network (GPN)
A nationwide network of consumers, businesses, and government agencies who voluntarily promote priority purchasing of environmentally friendly products and services. Established in February, 1996.
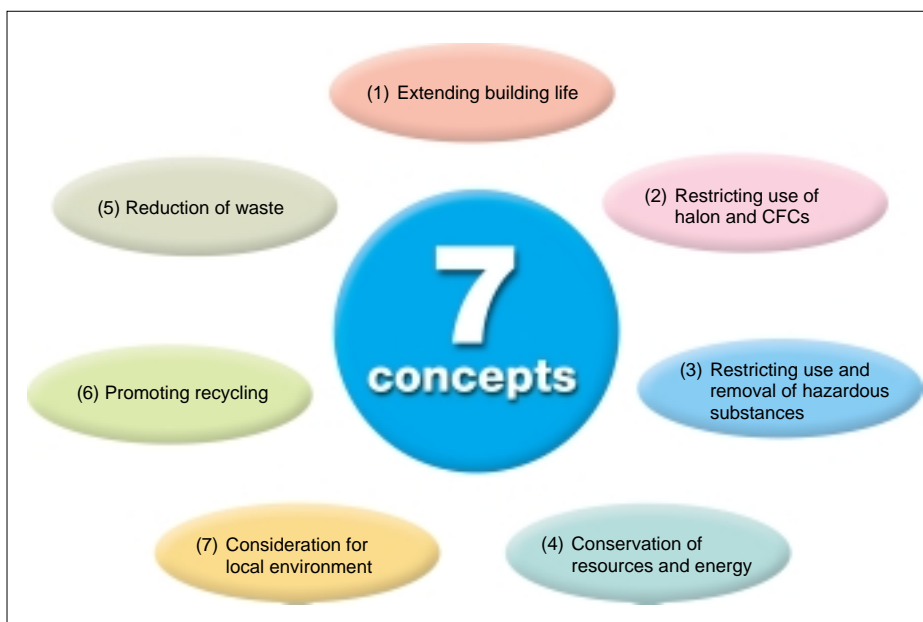
http://www.wnn.or.jp/wnn-eco/gpne/index.html

Fig. 2.2-10 Green Building Design Guidelines

Specific Global Environmental Issues and Our Response

1. Paper Resource Management

http://www.ntt.co.jp/kankyo/e/2000report/3/311.html

Protection of forests is an agenda of special priority where environmental issues—including biosphere preservation, prevention of global warming, and control of air pollution causing acid rain—are concerned. NTT Group is making a significant effort to minimize consumption of paper resources, making an effective contribution to protecting our valuable forests.

Use of Recycled Paper for Telephone Directories

■ Reduction of virgin pulp consumption

NTT Group issues some 120 million telephone directories a year, consuming approximately 140,000 tons of paper. (Fig. 3.1-1 and Photo 3.1-1)
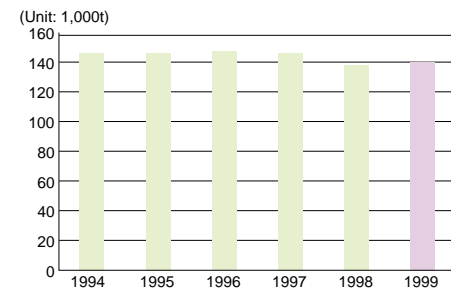
Although this extensive circulation indicates the need for telephone directories, the resulting massive consumption of paper underlines the importance of our mission to develop and implement sustainable operations with the protection of forests in mind. Reduction of virgin pulp consumption in particular is of primary concern. To achieve these goals, NTT Group is making a concentrated effort to minimize paper consumption by reducing the total number of telephone directories in circulation as well as promoting the use of recycled paper.

To optimize the circulation of telephone directories, the NTT Group is working to inquire and estimate how many customers will need their directories to be renewed. Publication of telephone directories in CD-ROM format is also being pursued. (Photo 3.1-2: Trial publication of CD-ROM corporate telephone directory for the 23 wards of Tokyo.)

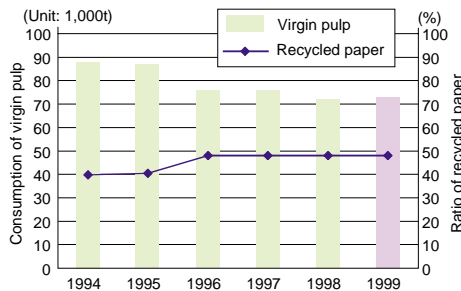The use of recycled paper is being implemented through various measures, resulting in the publication of our Eco-Challenge Telephone Directory[1], featuring a higher ratio of recycled paper.

Through these efforts, consumption of virgin pulp in fiscal 1999 was successfully reduced to 73,000 tons, far below our initial target. (Fig. 3.1-2)

[1]Eco-Challenge Telephone Directory:
The "Eco" prefix symbolizes our dedication to environmental protection.

Fig. 3.1-3
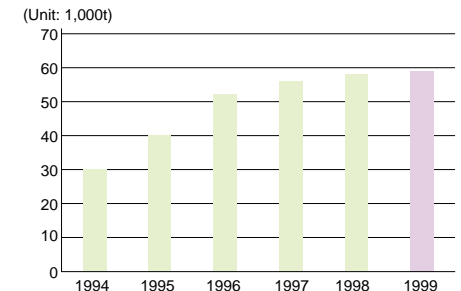This logo mark identifies our Eco-Challenge Telephone Directory

■ Saving paper via the Internet

In addition to providing customers with traditional printed telephone directories, the NTT Group also provides a variety of services utilizing electronic media.

Services include our "*i*" Town Page, an Internet version of Town Page, and Angel Line, an on-line service for Hello Page. These services were developed to expedite telephone number searches as well as to reduce the amount of paper consumed. (Fig. 3.1-5)

Angel Line is a service in which customers with PCs equipped with communications functions can directly access NTT's Telephone Number Information Center, enabling them to look up the telephone numbers they need for themselves. (Fig. 3.1-6)

■ Recycling old telephone directories

The NTT Group collects old telephone directories (Fig. 3.1-4) and recycles them as materials for products such as cardboard boxes, internal company publications, invoices and envelopes.

In February 2000, we replaced yellow paper with yellow ink on white paper to facilitate the recycling of our Town Page directories. This is an important step in our plan to introduce closed loop recycling[1] for telephone directories by the year 2001. (Fig. 3.1-7)

This closed loop recycling system aims to utilize old telephone directories, rather than old newspaper, as the recycled paper component in the production of telephone directories. The success of this innovative recycling system depends on the efficient collection of old telephone directories.

With this goal in mind, the NTT Group is striving to collect as many old telephone directories as possible. For customers who are not at home at the time of collection, a toll-free phone number is printed on the back of the directory, enabling them to contact us for free-of-charge collection at their convenience.

We will continue our focus on collection of used telephone directories and implementation of closed loop recycling as part of our ongoing efforts to maximize paper resources.

[1]Closed loop recycling:
A recycling system in which a certain product is recycled in the production of its replacement in an effort to minimize the waste of natural resources.

■ Green procurement

The closed loop recycling system, in which new telephone directories are produced using old ones, is a sign of the demands of our times. In order to implement such programs without adversely affecting humans and the surrounding environment, it is essential to choose materials which do not contain harmful chemical substances when procuring raw materials.

The NTT Group recognizes our responsibility to provide customers with telephone directories they can use with confidence, and constantly aims to practice green procurement, with harm-free materials a top priority.

(Unit: 1,000t)

Fig. 3.1-1 Paper consumed in production of telephone directories

(Unit: 1,000t)   (%)

Virgin pulp
Recycled paper

Fig. 3.1-2 Virgin pulp and recycled paper in production of telephone directories

(Unit: 1,000t)

Fig. 3.1-4 Collection of used telephone directories

Photo 3.1-1 Telephone directories

Photo 3.1-2 Telephone directory in CD-ROM format

Fig. 3.1-5 "*i*" Town Page home page
http://english.itp.ne.jp/

Fig. 3.1-6 "Angel Line" home page, NTT West Japan
http://www.ntt-west.co.jp/angel

"Angel Line" home page, NTT East Japan
http://www.ntt-east.co.jp/angel

Old telephone directories

Old telephone directories collected and sent to paper manufacturing company

New telephone directories

Treated for use as recycled material component of new telephone directories

Printed and bound by printing company

Fig. 3.1-7 Closed loop recycling of telephone directories

2. Preventing Global Warming

With the steady progress of global warming, it is feared that rising sea levels could affect the biosphere in the not-so-distant future. As part of our wide-ranging efforts to prevent global warming, the NTT Group is involved in projects to reduce emissions of greenhouse gases, such as carbon dioxide, generated by our business activities.

The NTT Group TPR Initiative

The amount of electricity consumed by the NTT Group is expected to increase due to the proliferation of the Internet, mobile phones, and other advances as society becomes increasingly reliant on information sharing technology.

Beginning in October 1987, the NTT Group has made continuous efforts to reduce electricity consumption. In October 1997, as an extension of these efforts, we launched our Total Power Revolution (TPR) initiative, detailing our commitments to cope with power-related issues from the earliest stages of R&D.

In February 1998, we announced our Vision for the Reduction of Electricity Requirements toward 2010 to ensure the success of the TPR initiative and to fulfill our responsibility to respond to environmental issues. (Fig. 3.2-1)

■ Three pillars of the TPR initiative
The TPR initiative targets three major areas:
- Energy reduction through R&D
- Energy reduction at departments using communications facilities
- Energy reduction at departments that maintain and manage power-generating equipment

In fiscal 1999, the NTT Group purchased approximately 5.4 billion kWh of electricity, which translates into CO_2 emissions of approximately 2.06 million tons.

CO_2 emissions in fiscal 1999 were originally expected to increase by about 18% year-on-year. By virtue, however, of the TPR initiative, the increase was contained at about 11%. This means an effective reduction of

◆ Step 1: To develop energy-efficient components and parts, such as LSIs
◆ Step 2: To efficiently introduce communications equipment that incorporates achievements from Step 1.
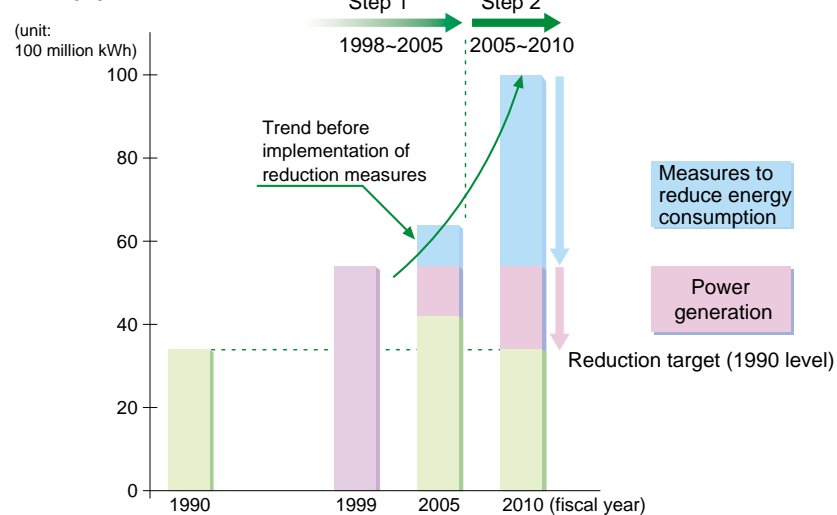◆ To improve the self-sufficiency ratio of electricity from 4% (estimated) in 2000 to 30% in 2010.

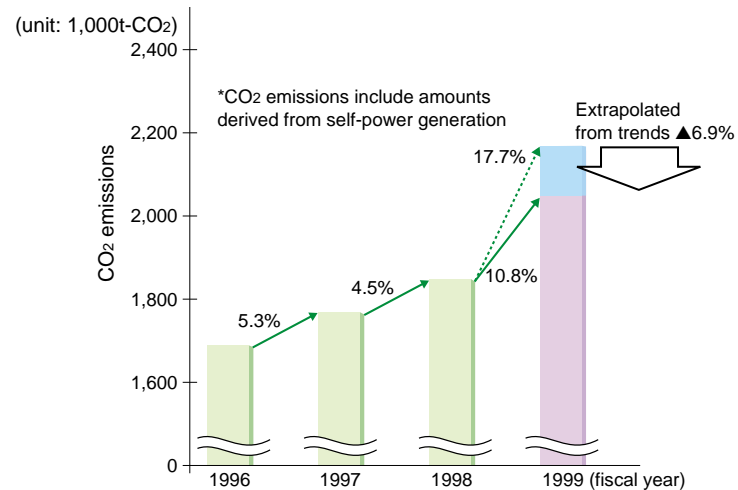Fig. 3.2-1 Vision for the reduction of electricity requirements toward 2010

Fig. 3.2-2 CO_2 emissions produced in connection with NTT Group electricity consumption and power generation

approximately 130,000 tons of CO_2. (Fig. 3.2-2)

With our TPR initiative as the base, the NTT Group will continue to provide solutions to energy issues in the communications field through active involvement in energy-related R&D. At the same time, we aim to reduce energy costs in addition to working to suppress CO_2 emissions—the primary cause

of global warming—thus contributing to building the infrastructure for the information sharing society and preserving the global environment.

Clean Energy Facilities

■ Introduction of solar and wind power generation systems
In March 1996, the NTT Group introduced a 555 kW photovoltaic power generation system—the largest roof-top installation of its kind in the world—at the present East Japan Training Center in Chofu City, Tokyo. By March 2000, we had installed 50 photovoltaic power generation systems (approximately 1.3 MW) and 4 wind power generation systems (approximately 0.2 MW) in various areas of Japan. These facilities supply approximately 2 million kWh of electricity annually, which translates into a reduction of some 740 tons of CO_2 emissions.

■ Introduction of hybrid and stand-alone power systems
In March 1998, we introduced a hybrid system which combines 230kW wind power generation and 20kW photovoltaic power generation at the NTT Kume-jima Radio Relay Station in Okinawa. This facility utilizes technology to regulate fluctuations in voltage and frequency of electricity generated by wind power, and represents a new level of harmony with natural energy sources.

We have also been introducing stand-alone photovoltaic power generation systems, the first of which went into operation in December 1999 at the Chihokutoge Wireless Station of NTT DoCoMo Hokkaido. In designing the system, we analyzed historical meteorological data and verified reliability of supply using simulations, overcoming the inherent instability of natural energy resources and creating a highly reliable power generation system.

Musashino R&D Center— Built to Conserve Energy

Opened in November 1999, the NTT Musashino R&D Center was designed to conserve energy and reduce environmental impact in line with our Green Building Design Guidelines. After thoroughly analyzing specific requirements and conditions for operation as a R&D center for the NTT Group, the building incorporates a number of the latest technologies.

Photo 3.2-1 NTT Musashino R&D Center

■ Design plan
- The building is positioned laterally, east to west, reducing the surface area to minimize heat load from the sun.
- In view of year-round energy consumption from cooling facilities, research rooms with energy-consuming computers and servers are located on the north side of the building.

■ Structural components and functions
Double-glazing
Double-glazing, adopted for the windows in the community corner on the south side of the building, is an energy-conservation system that effectively utilizes natural energy. While maximizing the transparency and light penetration of glass, this system serves to alleviate strong sunlight in the summer, insulate in winter, and provide natural ventilation in other seasons. (Fig. 3.2-3).

Solar power louvers: 36 kW
Louvers to transform solar light into clean electric energy are installed on the south side of the building. Serving the dual function of building materials as well as power genera-

tors, these highly efficient louvers are equipped with vents for temperature control. (Fig. 3.2-4)
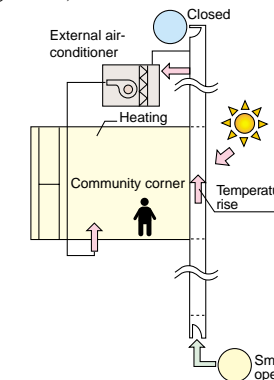
Example: In the winter mode, vents at the bottom of the double-glazing are opened, transforming the internal space into a heat collector that delivers warm air to the air-conditioner. Insulation effect also reduces heat load.

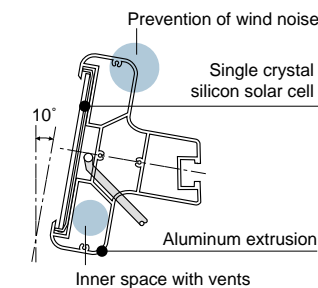Fig. 3.2-3 Functions and effects of double-glazing

Fig. 3.2-4 Structure of photovoltaic power generating louver

■ Building facilities
CGS (Co-Generation System): 750 kW x 2 units

This system generates electricity from clean city gas. Hot water and steam generated during power generation are utilized for air-conditioning, heating and hot water supply. At the main building of Musashino R&D Center, one third of the electricity is provided by co-generation, resulting in a reduction in costs and in CO_2 emissions, one of the primary causes of global warming.

Fuel cell system: 200 kW
The building is equipped with a multi-type fuel cell system which operates with either city gas or LPG. Total energy efficiency of 80% has been achieved with a combination of newly developed single- and double-layer absorption refrigeration machines. The advantages of this system include clean emissions, low noise, and minimal vibration.

2. Preventing Global Warming

Minimizing CO₂ Emissions from Company Vehicles

As of the end of fiscal 1999 the NTT Group owned approximately 44,000 vehicles, which together emit approximately 88,000 tons of CO_2.

As part of our ongoing efforts to reduce CO_2 emissions, we are introducing low-pollution vehicles, promoting an anti-idling campaign (nicknamed 'TAKO Zero'—keep the tachometer at zero) for all company vehicles, and seeking to reduce the total number of vehicles in our fleet.

Based on CO_2 emission targets set forth in the action plan established in 1991, we have been working to stabilize vehicle CO_2 emissions at 1990 levels in and after 2000. Subsequently, we will continue to gather and analyze data in an attempt to achieve even further reductions in CO_2 emissions.

We also plan to introduce a greater number of low-pollution vehicles in line with cost considerations and technological developments in the field.

New Shipping Network System

NTT Logisco, the logistics arm of the NTT Group, does not own any delivery vehicles. In addition to the need to control delivery costs, increasingly varied consumer needs and requirements for sophisticated logistic services, including more frequent, small-lot deliveries, make the reduction of environmental impact an important concern. In April 2000 we initiated a New Shipping Network System with the aim of improving truck loading efficiency. Replacing the conventional route-based shipping system, the new system is based on zones in which all goods for delivery within a predetermined area can be delivered by a joint delivery system. (Fig. 3. 2-5)

This New Shipping Network System permits the optimal dispatch of vehicles, based on day-to-day fluctuations in volume and destinations. The new system contributes to lessening the environmental impact of our logistics operations through the combination of more efficient joint delivery and a reduction in the overall number of trucks.
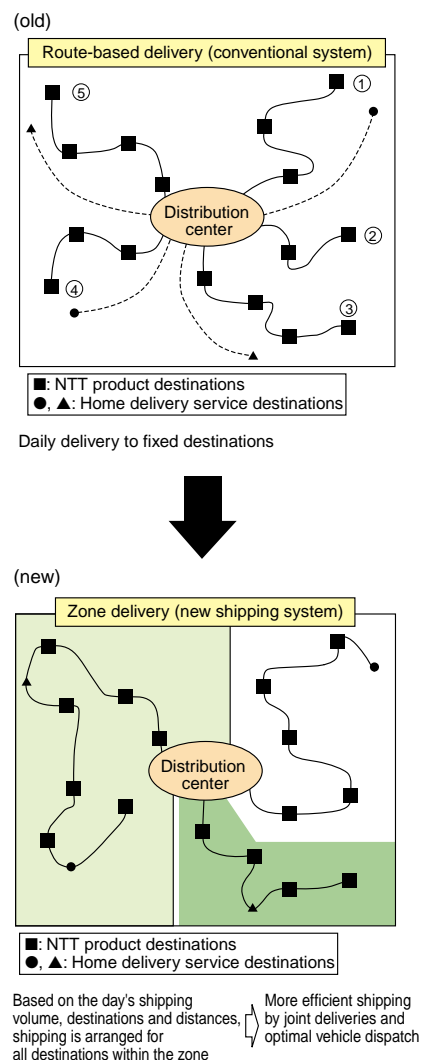
(old)

Route-based delivery (conventional system)

■: NTT product destinations
●, ▲: Home delivery service destinations

Daily delivery to fixed destinations

(new)

Zone delivery (new shipping system)

■: NTT product destinations
●, ▲: Home delivery service destinations

Based on the day's shipping volume, destinations and distances, shipping is arranged for all destinations within the zone ⇨ More efficient shipping by joint deliveries and optimal vehicle dispatch

Fig. 3.2-5 Schematics of old and new shipping systems

Photo 3.2-2 Low-pollution vehicles and "TAKO Zero" anti-idling campaign mark

3. Waste Management and Proper Disposal

Effective waste management efforts result in the reduction of loads at processing facilities, which in turn leads to reductions in harmful emissions, global warming and slower depletion of limited resources. At the NTT Group, we make active efforts to reduce the volume of waste generated in the course of our activities and to ensure efficient and proper disposal of the waste products generated.

Disposal of Dismantled Communications Facilities

The NTT Group utilizes a wide range of facilities and equipment, including communications cables and switchboards. In 1999, communications facilities removed for renewal totaled approximately 250,000 tons. (Fig. 3.3-1) The environmental impact of such a large volume of waste is significant, and we make every effort to actively promote not only appropriate disposal, but also reduction of waste volume, reuse and recycling.

■ Promoting proper disposal and developing Internet database of disposal results

In 1997, manifests were introduced to track and manage disposal of removed communications facilities. In conjunction with the introduction of manifests, we also initiated a new system to monitor the progress of each shipment and accumulate data on disposal results via our internet networks. This system enables us to monitor the waste disposal process from start to finish, while the database has the potential to serve as an important tool for reducing wastes and promoting recycling. (Fig. 3.3-2)

■ Reducing waste volume and promoting recycling

The NTT Group currently recycles copper used in cables, reuses concrete telephone poles for roadbed materials and reclaims discarded batteries for reuse.

In procuring communications facilities, we prioritize green procurement by endeavoring to purchase materials and components with a high percentage of recyclable materials and items that generate lower environmental impact when disposed as waste.

■ Introduction of electronic manifest system

NTT East introduced an electronic manifest system in the Metropolitan area in July 2000. The electronic manifest is managed by the Japan Industrial Waste Technology Center,

as stipulated in Article 12, Section 4 of the Law concerning Waste Disposal and Cleaning and as designated by the Minister of Health and Welfare. The main advantages of the electronic manifest system include:

● Paper manifests required storage and management for five years. The electronic manifest is centrally managed at information processing centers, streamlining and increasing the efficiency of paperwork.
● Automatic notice is given when collection, transportation or disposal of industrial wastes becomes overdue.
● Each year, information processing centers compile reports to local governments containing manifest information which must be submitted by waste-generating enterprises
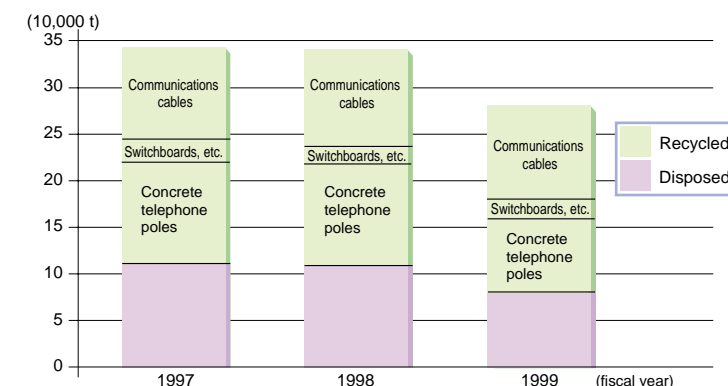
(10,000 t)

Communications cables / Switchboards, etc. / Concrete telephone poles

Recycled / Disposed

1997   1998   1999   (fiscal year)

Fig. 3.3-1 Discharge, recycling and disposal of removed communications facilities

Database on processing of removed communications facilities

Intranet

Compilation of processing results / Compilation of processing results

Data input

Web browser / Web browser

Office / Office

Manifest slips

Subcontracted for processing
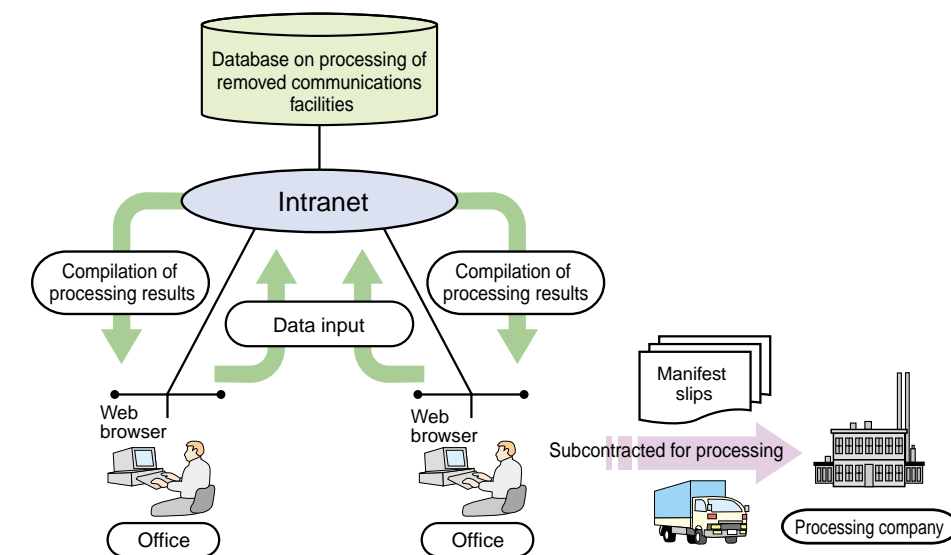
Processing company

Fig. 3.3-2 Intranet system for managing waste processing data

4. Promoting Recycling

Recycling is the primary focus of our efforts to protect the global environment. At the NTT Group, we consider development of more effective recycling systems one of our most important tasks, and aim for total recycling of communications facilities, office supplies, and even kitchen trash from our cafeterias.

Promoting Reuse of Dismantled Telecommunications Facilities

The NTT Group actively promotes the 3Rs for removed communications facilities and other industrial waste:
- Reduction (of waste volume)
- Reuse
- Recycling

■ Promoting reuse and recycling

Information on reusable items such as communications cables, telephone poles, and public telephones is registered on our internal LAN to encourage reuse at appropriate locations.

We also promote collection and recycling of copper, iron, and precious metals used in cables and other equipment, recycling of concrete telephone poles for roadbed material, and reclamation of used batteries.

■ Recycling plastics

Plastics present a major dilemma for recycling due to problems related to market development, grading and separation, and cost effectiveness. At NTT, we are committed to improving the efficiency of plastic recycling, and are making steady progress, a step at a time.

Fig. 3.4-1 illustrates our approach to plastics recycling.

Connection terminal boxes[1] (made of polypropylene) and support line guards (made of polyethylene) are examples of material recycling (NTT-closed system). (Fig. 3.4-2)

Support line guards (Photo 3.4-1) formerly displayed a sticker indicating recycle status, but the marking has now been integrated into the material during the molding process (Photo 3.4-2), eliminating the need to remove the stickers and achieving 100% recycling of the material.

These and other plastic recycling efforts generated 530 tons of repellets[2] in 1999. (Fig. 3.4-3)

Removal and replacement of optical fiber cables is expected to increase, and we are currently implementing thermal recycling, using them as raw materials for cement production.

[1] Connection terminal boxes:
Housings that cover connections between cables and also between cables and subscribers' service lines.

[2] Repellets (recycled pellets)
Plastic waste transformed into uniform granules for recycling

[3] Spiral sleeves
Wrappings that protect cables

[4] External line clasps
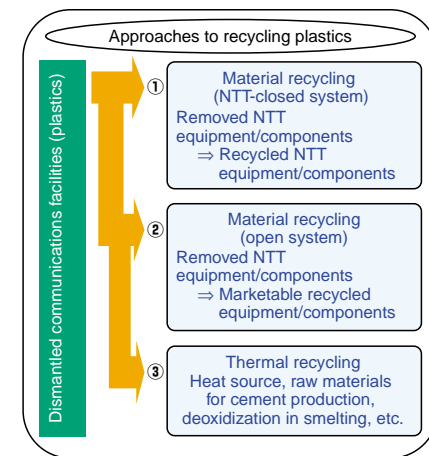Fixtures to fasten external lines leading to subscribers' homes

Fig. 3.4-1 Priority of plastics recycling methods

Photo 3.4-1 Support line guards

■ Promoting recycling through green procurement

We will continue to strengthen our recycling efforts by implementing our Green Procurement Guidelines (see page 20), standardizing and clearly indicating the materials used in our equipment, selecting easy-to-recycle materials, minimizing harmful substances, and purchasing items with easy-to-recycle and easy-to-dismantle designs.

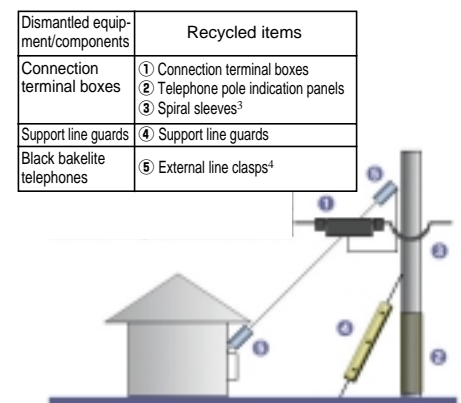| Dismantled equipment/components	Recycled items
Connection terminal boxes	① Connection terminal boxes ② Telephone pole indication panels ③ Spiral sleeves[3]
Support line guards	④ Support line guards
Black bakelite telephones	⑤ External line clasps[4]

Fig. 3.4-2 Example of plastic materials recycling

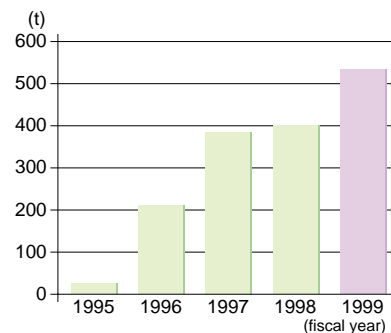Photo 3.4-2 Improved recycle status marking

Fig. 3.4-3 Volume of repellets produced through material recycling

Recycling of Cellular Phones, PHS Units and Batteries

The NTT DoCoMo Group is also actively engaged in the collection and recycling of used products in order to reuse them effectively as resources.

Used products collected by DoCoMo shops, such as DoCoMo battery packs, battery chargers, cellular phones, and car phone units, are separated at recycling factories to be incinerated or crushed. Metal content of batteries is separated and melted into nickel, cobalt or cadmium ingots. Precious metals such as gold and silver from cellular phone boards are extracted and recycled. Recovered nickel ingot is used for stainless steel while cobalt is reused for magnets in speakers and motors.

Table 3.4-1
Collection of used cellular phones, batteries, etc. by NTT DoCoMo Group

Items	Fiscal 1999
Cellular phones and PHS units	approx. 5.9 million units
Batteries	approx. 4.9 million units
Chargers and accessories	approx. 1.4 million units

Photo 3.4-3 DoCoMo Come Back poster

Improvements in Product Packing and Packaging Materials

In 1990, approximately 257 tons of polystyrene was used annually as protective packing for communications equipment sold by the NTT Group. While polystyrene has excellent characteristics as a packing material, protecting products from shock, moisture and humidity, it has a negative impact on the environment as it does not decompose easily under natural conditions.

In accordance with increasing awareness of global environmental issues, we have been gradually switching from polystyrene to cardboard, a renewable resource. We now use cardboard for packing new models of cordless phones and facsimile machines for home use.

For heavier items, such as facsimile machines for office use, internal switchboard equipment, and other precision instruments for which there is no suitable substitute, we are reducing volume by using thinner layers of polystyrene packing. (Fig. 3.4-4)

In 1996, we achieved our initial target figure of 70 tons of annual consumption (roughly one quarter of 1990 levels). In 1999, we reduced the volume to some 29 tons, less than half of the 1996 level. (Fig. 3.4-5) For cordless phones and fax machines for home use we have completed a 100% switch to cardboard packing material.
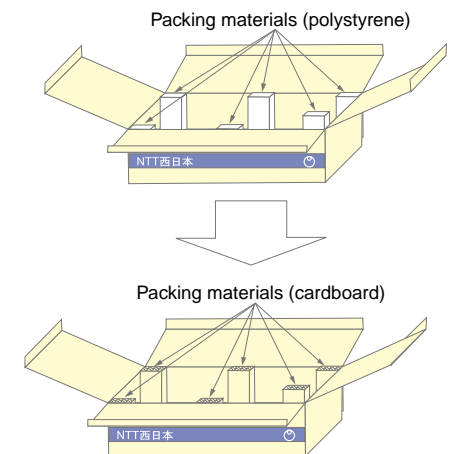

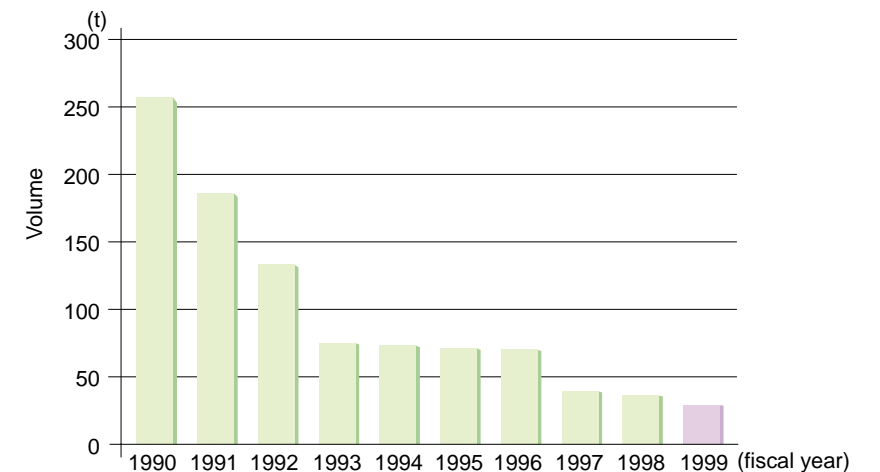Fig. 3.4-4 Use of packing materials (example: NTT West)

Fig. 3.4-5 Volume of polystyrene used as packing material for communications equipment

4. Promoting Recycling

Zero Kitchen Garbage

The NTT Group has initiated a Zero Kitchen Garbage campaign, an effort to recycle kitchen garbage generated at approximately 600 employee canteens nationwide.

In April 1999, we introduced garbage fermentation equipment to recycle kitchen garbage at canteens mainly in the Metropolitan area. An example of a Zero Kitchen Garbage zero emission[1] recycling loop utilizing high-speed garbage fermentation processors is outlined below. (Fig. 3.4-6)

① Garbage is biologically decomposed using aerobic bacteria[2] with no sawdust, chips, ceramics, etc.

② Compost generated through decomposition is transported to fertilizer facilities and mixed with other organic components, such as oil cake, fish meal and bone powder. This process transforms the compost into a convenient organic fertilizer.

③ This organic fertilizer is used to cultivate agricultural products such as vegetables, which in turn become foodstuff on our tables.

In this way the recycling loop is completed, achieving our Zero Kitchen Garbage goal.

[1] Zero emission:
A recycling system which generates no wastes
[2] Aerobic bacteria:
Bacteria which thrive in air with oxygen.

Website for details of high-speed kitchen garbage fermentation processor:
http://www.ntt-me.co.jp/bio/

Recycling Box for Confidential Documents

At NTT Logisco, we have developed a recycling system for confidential documents to encourage effective management of paper resources and minimize the use of paper shredders.

NTT Group departments in charge of customer services generate a large amount of paper-based customer data, consuming an enormous amount of time, labor and electricity as well as generating a huge volume of waste. The recycling box offers a solution to this problem.

Since trial introduction in 1994, we have made significant improvements to the system, resulting in full-scale implementation in 1997. As of 1999, some 2,000 boxes have been installed, collecting approximately 3,000 tons of paper per annum.
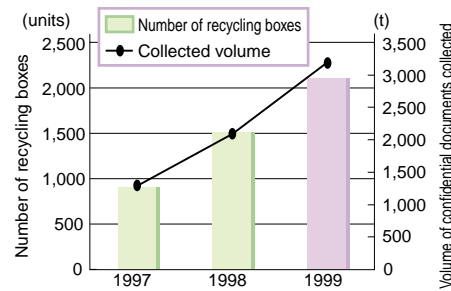

Fig. 3.4-7 Number of recycling boxes and volume of confidential documents collected

Photo 3.4-4 Recycling box

Website for details of recycling boxes
http://www.ntt-logisco.co.jp/integ/index06.htm

Fig. 3.4-6 Zero Kitchen Garbage recycling system

5. Protecting the Ozone Layer

http://www.ntt.co.jp/kankyo/e/2000report/3/351.html

The ozone layer is an important natural barrier that blocks harmful ultraviolet rays, protecting all living creatures on Earth. The NTT Group is making all-out efforts to reduce our use of CFCs which cause deterioration of the ozone layer, so that people can live without fear of harmful UV radiation.

[1]CFCs (Chloro Fluoro Carbons)
Chemically stable, nonflammable and non-toxic substances composed of fluorine, carbon and chlorine. With these traits, CFCs are widely used as coolants in turbo freezers, foaming agents for insulators, and cleaning agents for electronic parts. Due to their chlorine content, CFCs have a high ozone-depleting factor.

[2]Heated steam reaction method
A method to destroy CFCs by decomposing them with steam heated to approximately 650°C. After CFCs are hydrolyzed, they are neutralized and cooled with calcium hydroxide solution. This method offers the advantages of a high decomposition rate (more than 99.99%) and the ability to treat large volumes of CFCs.
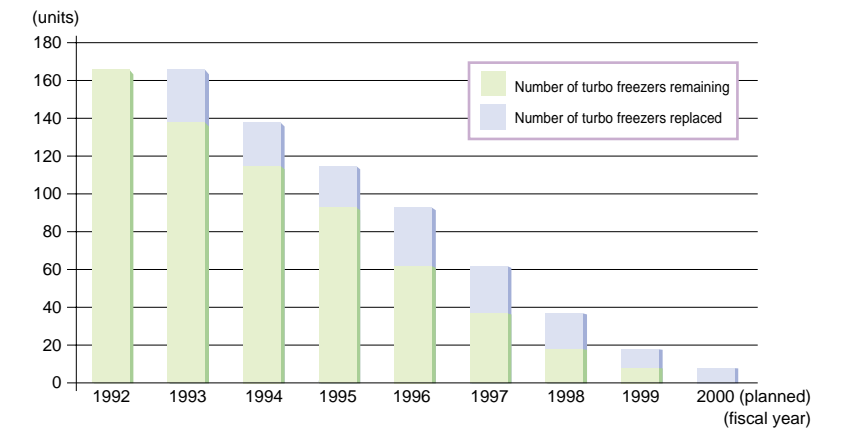
Replacement of Turbo Freezers and Maintenance of Internal CFC Banks
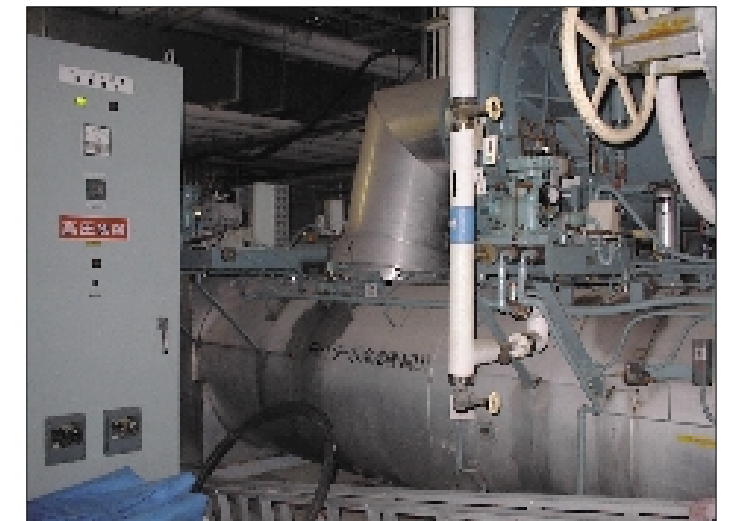
■ Number of turbo freezers removed/remaining

In 1992, the Fourth Conference of the Parties to the Montreal Protocol set forth a schedule for elimination of specified CFCs[1]. Following this, in Nov. 1992, the former NTT Group Global Environmental Protection Promotion Committee determined a basic policy for the Group to cease installation of new turbo freezers using specified CFCs, with a schedule to replace the majority of existing turbo freezers by the year 2000. As of the end of fiscal 1992, 166 turbo freezers required replacing. In fiscal 1999, 10 freezers were replaced, leaving a total of 8 freezers in operation. This replacement ratio of 95% indicates that the program is progressing on schedule. (Fig.3.5-1)

■ Internal CFC banks

Since July 1994, the NTT Group has maintained internal CFC banks for effective management of specified CFCs. Replacement of turbo freezers is progressing on schedule, and destruction of specified CFCs is being contemplated for fiscal 2000. We currently maintain CFC banks at five locations, where approximately 46 tons of specified CFCs are stored under proper control. After careful consideration of cost, time, and documented results, we have selected the heated steam reaction method[2] and combustion method of decomposition as outlined in CFC Decomposition Guidelines prepared by the Air Quality Preservation Bureau of the Environment Agency. (Photo 3.5-1)

Fig.3.5-1 Turbo freezer replacement schedule

Photo 3.5-1 Turbo freezer

6. Minimizing Environmental Risks

http://www.ntt.co.jp/kankyo/e/2000report/3/361.html

As a leader in the field of information sharing services, the NTT Group has a responsibility to research, analyze, and actively develop measures to minimize environmental risks.

Effects of Radio Waves upon Humans

The proliferation of radio transmissions, as characterized by mobile phones, has led to mounting concerns about the effects of radio waves upon humans. When considering such effects, we need to separate physiological effects from the effect of electromagnetic interference upon electronic medical equipment such as pacemakers.

■ Compliance with global directives

Research on how radio waves affect human health is being carried out worldwide. In cooperation with the World Health Organization (WHO), the International Commission on Non-Ionized Radiation Protection (ICNIRP) has assessed research results and presented basic restriction values as safety guidelines for using radio waves. These values are far below those which are presumed to affect humans. Based upon various countries' recommendations including ICNIRP guidelines, the Telecommunications Technology Council (an advisory organization to the Ministry of Posts and Telecommunications) has submitted reports outlining guidelines for protecting humans when using radio waves in Japan since 1990.

At NTT DoCoMo, in addition to implementing R&D on methods to precisely estimate the strength of radio waves relating to this issue, we make it our policy to utilize radio waves strictly in compliance with these guidelines. Radio base stations are constructed and operated with due consideration of possible effects on the surrounding environment. Mobile phones are designed so that electromagnetic power absorbed by human users is well below the guide values regarding SAR (Specific Absorption Rate).

■ Surveys and R&D

In response to requests from medical equipment manufacturers and medical institutions,

NTT DoCoMo has made active efforts to ensure that our mobile phones do not adversely affect medical equipment such as pacemakers.

With regard to possible interference with other medical equipment, we are conducting surveys and experiments in cooperation with related organizations, and contributing to developing new medical equipment, which is able to withstand radio interference. As part of these efforts, we have conducted research to develop testing equipment (Photo 3.6-1) and measurement methods to accurately assess the effect of radio waves, and analyzed the characteristics of all types of pacemakers available in Japan.
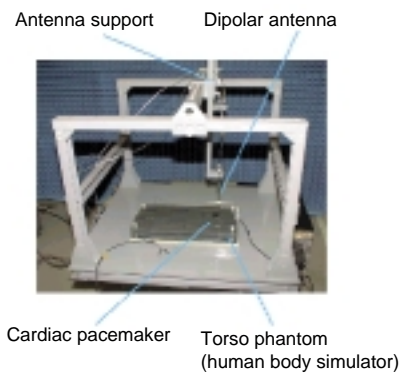

Antenna support   Dipolar antenna

Cardiac pacemaker   Torso phantom (human body simulator)

Photo 3.6-1 Testing equipment

EMC (Electro-magnetic Compatibility)

Telecommunications units can affect the electro-magnetic environment by emitting electro-magnetic waves and interference, while they in turn also can be affected by such interference. This phenomenon is predicted to become more prevalent as telecommunications technology continues to proliferate. (Fig. 3.6-1) Thus, our focus on electro-magnetic compatibility (EMC) technology. EMC technology controls noise emissions from telecommunications units, prevents deterioration of quality due to incoming interference, and improves immunity to malfunctions caused by such interference.

Since joining the VCCI[1] in 1989, the NTT Group has taken various active positions, such as establishment of internal standards,

in order to maintain an electro-magnetic environment conducive to efficient communications. At the same time, it will soon become necessary to widen the application of the EMC regulations in response to ever-advancing communications technologies.

At NTT (the holding company), staff are dispatched to international and domestic standardization organizations, contributing actively to drawing up or recommending standards. Furthermore, we are promoting R&D to respond to new types of communications, including investigation into the mechanism of breakdown occurrence, development of technology and parts for communications systems design, assessment of electro-magnetic environments, and development of technology to control and manage the electro-magnetic environment.

[1]VCCI (Voluntary Control Council for Information Technology Equipment):
A world organization involved in developing standards to govern interference generated by electronic devices
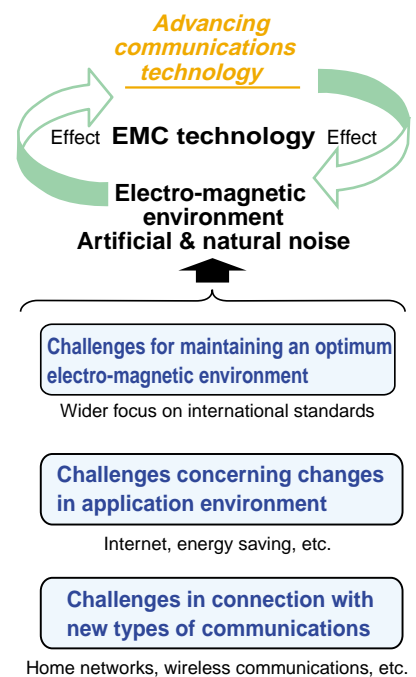

Advancing communications technology

Effect **EMC technology** Effect

Electro-magnetic environment Artificial & natural noise

Challenges for maintaining an optimum electro-magnetic environment

Wider focus on international standards

Challenges concerning changes in application environment

Internet, energy saving, etc.

Challenges in connection with new types of communications

Home networks, wireless communications, etc.

Fig. 3.6-1 EMC-related activities

R&D to Promote Environmental Protection

1. Contributing to a Sustainable Society through IT

The rapid development of information technology (IT) has fostered radical changes in business models and business styles, making a significant contribution to reduced environmental impact in a variety of fields. Specializing in IT, the NTT Group aims to maximize the potential of information technology for the benefit of society and the environment.

Ecology Networks

■ Significance of environmental information sharing systems

Environmental issues are global concerns that go beyond the mere collection of information or isolated local efforts. Environmental information sharing systems can be an effective way to promote environmental activities on a global scale. Ideally, such systems can be constructed to enable the following:

● Understanding not only of the present but of past environmental conditions;
● Communication of a variety of relevant information covering social economies, history and culture, as well as the natural environment, to generations to come;
● Cooperation and exchange beyond the boundaries of local communities, promoting enhancement of environmental awareness and unity;
● Broad- based support for environmental initiatives, ranging from individual households and local communities to international efforts.

■ Ecology networks defined

An ecology network is a typical example of a lifestyle environmental information sharing system. Environmental information reported by private individuals as well as information gathered by various sensors is accumulated into databases at regional environmental information centers. This information is made available to the public, providing support for a wide range of environmental activities.

Specifically, ecology networks are expected to play a role in disclosure of envi-

ronmental information by local governments, in general environmental education, and in environmental research at universities and other institutions.

Today, a great deal of effort is required for quantitative definition, comprehensive evaluation, and appropriate disclosure of the potential relationship between environmental, lifestyle and business information when dealing with environmental protection issues. Research to develop solutions to these and other environmental concerns is being conducted through ecology networks.

■ IWATE-UNU-NTT Environmental Network Joint Project

Launched in September 1998, the IWATE-UNU- NTT Environmental Network Joint Project is a collaboration between Iwate Prefecture, the United Nations University (UNU), and NTT Group. The project is involved in monitoring air and water quality and studying potential applications of the resulting information in environmental education programs. The environmental education programs are conducted jointly with Ecology Community Plazas established by the Iwate Branch of NTT East.

IWATE-UNU-NTT Environmental Network Joint Project

↑ http://www.ias.unu.edu/ecology/

Ecology Community Plazas at Iwate Branch

↑ http://eco.iwate.isp.ntt- east.co.jp/

Nitrogen Dioxide Monitoring System

The NTT Lifestyle and Environmental Technology Laboratories have been engaged in R&D on atmospheric monitoring technologies since fiscal 1991. This research has resulted in the successful development of equipment capable of easily measuring airborne nitrogen dioxide concentrations, a significant step toward improving the atmospheric environment. (Fig. 4.1- 1)

Monitoring of nitrogen dioxide is particularly important because nitrogen dioxide is:

● Inadequately controlled by existing environmental standards;
● Exhibits fluctuations in density depending on time and place, thus requiring multiple, simultaneous measurements;
● Often generated by unpredictable occurrences such as traffic congestion.

The NTT system features compact terminals for ease of transportation and installation, while enabling remote operation and simultaneous measurement at multiple locations via telephone networks. The easy-to- operate terminals can also be used as Internet tools for environmental education.

Results of measurements taken at Sendai City Museum of Science and other educational facilities in Miyagi Prefecture:
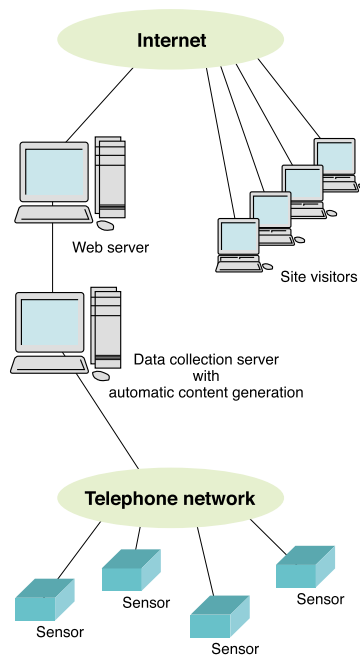
↑ http://sendai- no2.mcon.ne.jp

Fig. 4.1-1 Sample system configuration

Multimedia Communications Services for Teleconferencing

■ Advantages of multimedia communications services

The NTT Group provides a variety of multimedia communications services through its nationwide networks. Multimedia communications enable people to exchange information from remote locations, minimizing the need to transport people and equipment and thus reducing energy consumption and exhaust emissions.

■ Desktop simulation of teleconferencing

The Lifestyle and Environmental Technology Laboratories has conducted desktop simulations to determine the effectiveness of teleconferencing (Fig. 4.1-2) in minimizing environmental impact. At a teleconference, participants in remote locations can interact as if they were present in the same meeting room by exchanging images and voices over a network. As teleconferencing is targeted as an important multimedia communication service, the simulations were structured as follows:

● A total of 1,657 teleconferences were held at NTT (the holding company) during a single year (limited to conferences recorded in the multi-location connector);
● Environmental impact was calculated based on power consumption of system equipment (monitors, cameras, speakers, etc.) and telephone networks used for each teleconference (assumed to last for two hours);
● Hypothetical environmental impact of various means of transportation (trains, buses, planes) was estimated, assuming that conferences had been held on-site with actual attendees (each conference assumed to require two attendees from each remote office and last for two hours);
● Environmental impact of on-site conferences vs. teleconferences were compared and evaluated.

As a result, it was evaluated that teleconferencing reduces CO_2 emissions by approximately 85% and energy consumption by approximately 74% compared to on-site conferences. (Fig. 4.1-3)
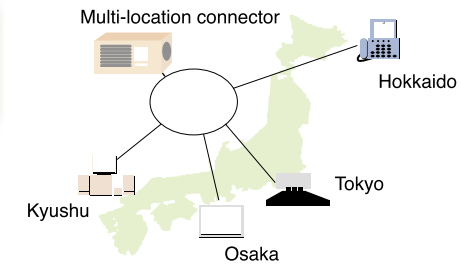

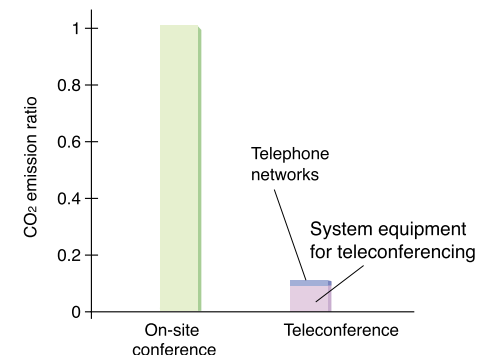Fig. 4.1-2 Teleconference system

Fig. 4.1-3 Reduction of environmental impact by teleconferencing

The initial simulation evaluated operational aspects only. Further study based on LCA (Life Cycle Assessment) is planned to evaluate the environmental impact of teleconferencing equipment from initial production to final disposal.

Electronic Commerce

In 1999, the number of Internet users in Japan increased from 17 million to 27 million. This increase has been accompanied by a surge in Internet- based trading (electronic commerce). The value of B2C (business- to-consumer) transactions grew from ¥170 billion to ¥350 billion, while B2B (business-to- business) transactions grew from ¥2 trillion to ¥14 trillion.

■ Network-based information distribution

Traditionally, trucks and other forms of transport have played the major role in the physical distribution of goods. With the introduction of electronic commerce, intangi-

ble information-based products such as music and games have become available through network-based distribution. This eliminates the need to maintain stocks or to rely on media (CD-ROMs, etc.) for distribution of goods. Offering significant reductions in energy consumption, network-based information distribution shows great potential for environmental protection. Digitally recorded music, for example, can be distributed through networks quickly and with much less impact on the environment. On the other hand, as digital data can be copied easily, with no deterioration in quality, certain types of network-based distribution could conceivably interfere with the fair sale and distribution of goods.

■ Overcoming technical difficulties

Electronic commerce requires effective measures against unauthorized data copying. The NTT Group has solved this problem by developing a technology that locks the memory card to which purchased music is originally downloaded and makes it impossible to read any other memory card to which the music is copied. This technology paves the way for widespread network-based music sales.

Payment systems pose another security problem for electronic commerce. Secure and efficient systems for exchanging money and goods are essential for promoting conversion of physical distribution into network-based information distribution.

The NTT Group has developed technologies for electronic cash secured by codes. Reliability and convenience of this technology were tested in actual experiments in cooperation with participants from the public at large, successfully demonstrating the security of electronic cash.

The NTT Group will expand its focus to include development of technologies for authentication and network security as we continue our research into applications for electronic commerce.

1. Contributing to a Sustainable Society through IT

Intelligent Transport Systems (ITS)

The traffic situation in Japan can be characterized by the following two facts:
- The national economy incurs a loss of about ¥12 trillion annually from traffic congestion;
- Approximately 11% of automobile fuel consumption is wasted in congested traffic conditions.

Intelligent Transport Systems (ITS) based on advanced information communication technology are under development with the aim of creating transportation solutions in which environmental impact is reduced safely and efficiently by maximizing the synergy of people, automobiles and roads. (Fig. 4.1-4)
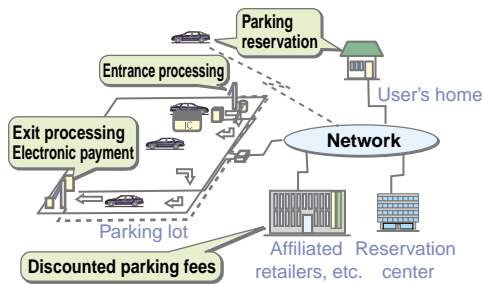
Fig. 4.1-4 Sample ITS system (Intelligent Parking System)

The NTT Group provides and supports a wide range of information for car navigation systems through mobile telephone networks. This useful information includes:
- Optimized reports on road conditions;
- Useful information for drivers (location of parking lots and service stations, etc.);
- Automatic reports of accident locations to emergency centers (rapid rescue systems);
- Reports on obstacles and impediments to traffic flow (advance warning systems).

The Group is also engaged in research and development of:
- IC card-based parking reservation systems;
- Intelligent parking systems for entry and exit from parking facilities;
- Simulators for design and evaluation of communication technology-based ITS services.

Congestion-caused air pollution should be significantly reduced as these and other technologies to smooth the flow of traffic become implemented.

Odor-based Water Quality Monitoring System

Oil and chemical spills are not only sources of environmental pollution but can also cause serious damage to purification plants producing and supplying water for daily use. Measures to minimize pollution damage at the approximately 4,000 purification plants in Japan include early detection, oil fences, and shutdown of water intakes. Water intakes were shut down 32 times in 1998, 2.3 times more frequently than the previous year.

■ Crystal oscillator odor sensor system

The Lifestyle and Environmental Technology Laboratories have developed a crystal oscillator odor sensor system, which can detect petroleum gases at extremely low ppb[1] concentrations. Performing the function of the human sense of smell, the system permits on-line, permanent monitoring of abnormal water odors.

In developing the system, it was necessary to achieve stable environmental conditions for precision performance by controlling fluctuations in temperature and humidity that easily affect the delicate sensor. Another challenge was to ensure effective gasification of pollutants by efficient intake of surface water, where pollutants tend to be concentrated.

■ Characteristics of the system
- Ability to detect petroleum gases at extremely low ppb concentrations in dry atmospheric conditions;
- Automated operation, from sampling of river water to output of measurement results;
- Continuous on-line monitoring.

The basic configuration and an example of kerosene-polluted water detection are outlined below.

Measurement of kerosene-polluted water is indicated by the response of odor sensor output along a time line. Frequencies indicated on the vertical axis correspond with the volume of odor molecules detected by the sensor (1ng/1Hz). Fig. 4.1-6 shows the increase in the volume of odor molecules detected by the sensor with the passing of time.
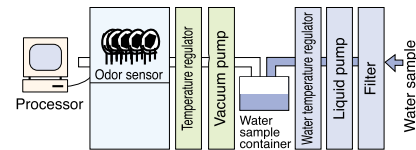

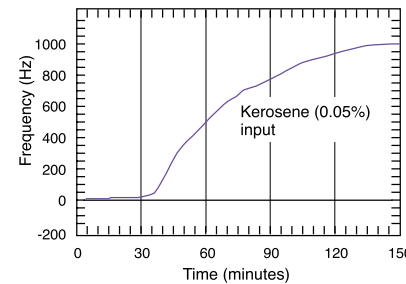Fig. 4.1-5 Odor-based water quality monitoring system

Fig. 4.1-6 Measurement of kerosene-polluted water

Further development is underway to achieve higher sensitivity and improve precision in identifying types of pollutants by lowering the regulated humidity requirements.

[1]ppb
Parts per billion. Indicates pollutant concentrations as low as 1/1 billion.

2. R&D to Promote Reduction of Environmental Impact

In addition to adopting specific programs to reduce environmental impact, the NTT Group also emphasizes R&D on new energy sources and state-of-the-art technologies. Our goal is to reduce consumption of limited natural resources and develop equipment, systems and products that can be put to use with minimal impact on the environment.

Long-life Nickel Metal Hydride Batteries

To ensure the reliability of communications systems, information communication services utilize various types of batteries, including back-up batteries, which function as life lines in case of power outages. Although sealed lead-acid batteries are typically used as back-up batteries at present, a new generation of light-weight, high-capacity batteries will be needed in the future, when every home is provided with advanced services through optical fiber cables.

■ Nickel-cadmium batteries

Nickel-cadmium batteries are marketed as compact, light-weight back-up batteries to replace sealed lead-acid batteries. The effective life of a nickel-cadmium battery is normally less than three years. By introducing new constituent materials and other innovations, the NTT Telecommunications Energy Laboratory has developed nickel-cadmium batteries with a life span of ten years, making them suitable for use as back-up batteries for optical access networks.

■ Nickel metal hydride batteries

Currently, research is underway to extend the life span of nickel metal hydride batteries, which are compact, lighter and free from poisonous cadmium. Nickel metal hydride batteries currently on the market are designed to be repeatedly charged and discharged for reuse. With a life span of approximately 1.5 years, these batteries are not suitable for back-up use. This is due to the difficulty of maintaining a full charge for emergency use. By devising new materials

and new charging methods, the NTT Telecommunications Energy Laboratories have succeeded in extending the life span of nickel metal hydride batteries to approximately eight years. (Fig. 4.2-1) Plans are underway to develop nickel metal hydride batteries with a life span as long as the equipment that they power.
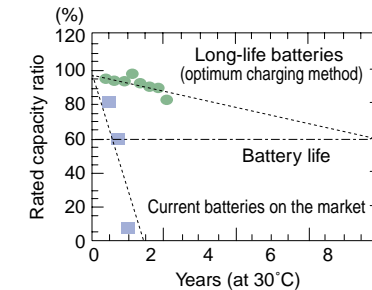

Fig. 4.2-1 The life span of nickel metal hydride batteries

Stand-alone Photovoltaic Power Systems

The NTT Telecommunications Energy Laboratories are developing compact and economical photovoltaic power systems for use as stand-alone power sources for outdoor telecommunications equipment. Solar cells are clean power generators that do not produce CO_2 emissions.
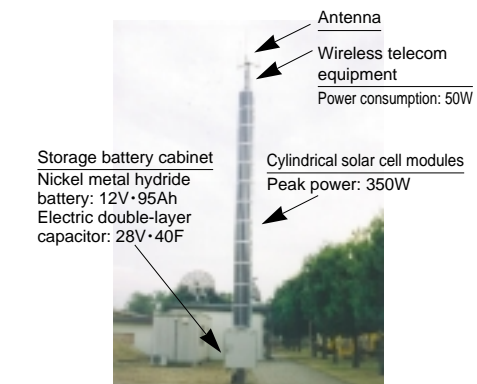

Photo 4.2-1 Stand-alone photovoltaic power system

Conventional stand-alone photovoltaic power systems use flat solar cells and lead-acid batteries. These require a large installation area and a concrete base. To reduce both installation area and cost, we developed a system that uses cylindrical solar cell modules and nickel metal hydride batteries. (Photo 4.2-1)

■ Cylindrical solar cell modules

Newly developed cylindrical solar cell modules can be mounted directly on a telecommunications pole. Maximum power point tracking control (MPPT)[1] increases the efficiency of the cylindrical solar cell modules by 15%. Large-capacity nickel metal hydride batteries are installed as storage batteries. An intermittent charging unit using an electric double-layer capacitor was developed to enhance charging efficiency of the nickel metal hydride batteries by more than 85%. Compared with conventional systems, this new system can reduce installation area by 90% and installation cost by 20%.

Reliability of the system is being verified through field tests in preparation for commercial use.

[1]MPPT: An automated control method that can optimize output power from the solar cell in consideration of solar irradiation and the solar cell temperature.

2. R&D to Promote Reduction of Environmental Impact

Recycling of Plastic Using Supercritical Water

The volume of waste recycled by the NTT Group is increasing year by year. Plastic wastes, however, are difficult to recycle due to their massive volume and the wide variety of materials used in their manufacture. To deal with this dilemma, the NTT Lifestyle and Environmental Technology Laboratories are currently developing a new recycling technology to decompose plastics using water. (Fig. 4.2-2)
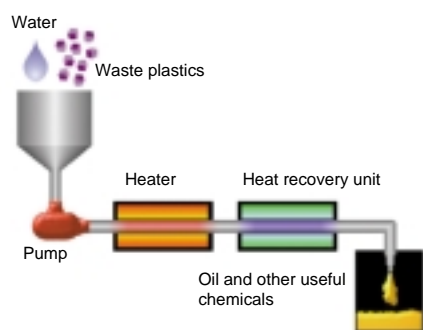
Fig.4.2-2 Conceptual diagram of plastic recycling technology

The plastic recycling technology is based on the properties of supercritical water. Water, when heated to temperatures in excess of 374°C and pressurized to over 218 atm, reaches a supercritical state with properties that can effectively liquefy oil-based plastics. The plastic recycling process in the above diagram can be explained as follows:

(1) Water and crushed and fragmented plastic are mixed as shown in Fig. 4.2-2.
(2) The mixture is compressed by a high-pressure pump and sent into the tube.
(3) The mixture is heated at the halfway point of the tube until the water reaches the supercritical state. Part of the energy generated by the heat is recovered for later cooling of the mixture.
(4) Oily residues, the raw materials of plastic, are collected at the end of the process as illustrated in Fig. 4.2-2.

A prototype of the system was tested using various kinds of plastics from optical fiber cables, with the system successfully recovering recyclable organic substances.

By liquefying plastics with water instead of organic solvents, minimizing the generation of volatile toxic substances, requiring shorter reaction time and enabling heat recovery, this system shows significant potential as a recycling technology of the future.

Fuel Modification Equipment

Since 1999, NTT Auto Leasing has been engaged in development of fuel modification equipment to reduce black smoke and carbon dioxide emissions from diesel-powered vehicles.

Fuel modification equipment drastically reduces the black smoke, NOx, and other air pollutants generated by fuel combustion, simultaneously reducing the overall volume of CO_2 emissions by improving fuel efficiency.

Efficiency is being field-tested from April 2000, with installation of the devices on large-sized vehicles with diesel engines (trucks: 2 units, buses: 5 units).

Multifunctional Rapid Disposal Vehicle for Sewage and Sludge

Since 2000, NTT Auto Leasing has been engaged in development of a multifunctional rapid disposal vehicle to provide a leasable system incorporating combined technology for use against the worldwide spread of river and ocean pollution caused by sewage and sludge.

Today, most of the run-off from construction sites and dye works is not properly disposed of, but simply diluted with huge volumes of water and discharged into rivers and oceans, accelerating the pace of river and ocean contamination. This can be attributed to the huge costs that are involved in the construction of treatment facilities.

NTT Auto Leasing seeks to develop a solution by providing businesses lacking their own treatment facilities with mobile effluent treatment systems mounted on vehicles.

The multifunctional rapid disposal vehicle is equipped to recycle effluent and sludge from construction sites or stock farms through rapid simultaneous solid/liquid separation and deodorization. With its ability to travel to various sites, this mobile treatment system will promote cost reduction and make a significant contribution to environmental protection.

Communication

1. Collection and Disclosure of Information

Environmental Awards

The NTT Group's environmental protection efforts have earned recognition and awards from various organizations. Chart 5.1-1 lists commendations awarded to the NTT Group in fiscal 1999.

Commendations for Global Environmental Activities

NTT Group member companies are presented with President's Awards for global environmental protection activities. President's Awards presented in fiscal 1999 are listed in Chart 5.1-2.

NTT Technology Journal

Environmental activities are regularly featured in the in-house *NTT Technology Journal*. The November 1999 issue included a special feature on "Energy in The Era of Emissions" to report the involvement of the information sharing sector in energy-related and air pollution prevention measures, waste reduction and recycling, as part of the larger trend toward an environmentally aware society.

Chart 5.1-1 Environmental awards (fiscal 1999)

Award title	Sponsor	Recipient
Successful Cases of Conservation 1999 "Agency of Natural Resources and Energy Director-General's Prize"	The Energy Conservation Center	NTT (the holding company)
The 19th Green City Award	Urban Greenery Foundation and the Yomiuri Shimbun	NTT Musashino R&D center
The 9th Environmental Advertisement Contest "Special Prize for Posters"	Japan Eco-Life Center and the Nihon Keizai Shimbun	NTT DoCoMo
The 26th Japan Society of Refrigerating and Air Conditioning Engineers "Technical Prize"	Japan Society of Refrigerating and Air Conditioning Engineers	NTT Facilities
Detection of Spilt-Petroleum Gas at ppb Levels by Crystal Oscillator Sensor	Japan Society for Environmental Chemistry	NTT Lifestyle and Environmental Technology Laboratories

Chart 5.1-2 President's Awards for global environmental protection activities (fiscal 1999)

Company	Activity	Recipient
NTT (the holding company)	Development of a water purifier using MPM, a new material recycled from telephone directories and other used paper	NTT Information Sharing Laboratories
NTT West	Attainment of ISO14001 certification	Komatsu Branch (former)

Photo 5.1-1 *NTT Technology Journal*

Ecology Portal Site

"*kankyou-goo*" is a web-based portal site specializing in environmental information operated by NTT-X. Launched on August 4, 1998, *kankyou-goo* has been serving as an information dissemination and retrieval site to support environmental communication and highlight the activities of environmental businesses.

Fig.5.1-1 Top page of "*kankyou-goo*"

http://eco.goo.ne.jp

The site is characterized by:
- "*kankyou-goo* Search", a search engine utilizing the same technology used by Japan's leading portal site "goo";
- "*kankyou-goo* News" providing up-to-date environmental information;
- "*kankyou-goo* Business" to support corporations dedicated to environmental protection;
- "*kankyou-goo* Communication Square" a forum for corporations, NGOs and consumers.

Registering as many as 280,000 page views per month at the time of its initial launch, the site broke the one million page view mark in March 2000. The site currently has 20,000 individual subscribers to its environmental information e-mail service.

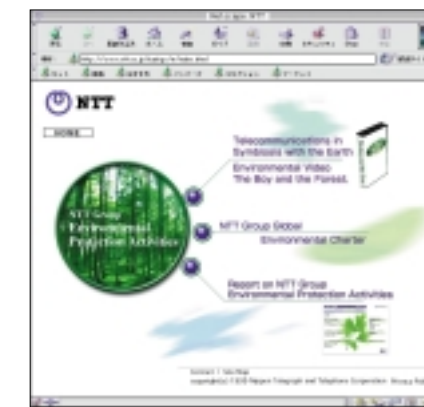As an extension of its activities, *kankyou-goo* sponsored a symposium on "Considerations for NGO/Corporation Partnerships" in June 2000. The site will continue to support various environmental initiatives and contribute to building a sustainable society by offering a venue for consumers, corporations and NGOs to share environmental information.

Environmental Website

An NTT Group website, Telecommunications in Symbiosis with the Earth—NTT Group, was launched in 1995. The content of this environmental site was entirely renewed to coincide with the publication of the NTT Group Environmental Protection Activity Report 1999 and the adoption of the NTT Group Global Environment Charter in 2000. The environmental website also provides information in English.

Fig.5.1-2 NTT's environmental website

http://www.ntt.co.jp/kankyo/e/index.html

World Bird Count

NTT-ME sponsored The 5th NTT-ME World Bird Count (WBC), the world's largest birding event, from October 1 through 31, 1999. The World Bird Count aims to highlight the importance of nature and environmental protection through this annual event, in which people all over the world participate in a tally of wild birds, an essential index for assessing

Photo 5.1-2 Poster for The 5th NTT-ME World Bird Count

prevailing environmental conditions.

The 5th World Bird Count focused on the theme of "Neighborhood Birds". Reports of wild bird sightings were received via the Internet, e-mail, fax and telephone from all over the world.

The 5th WBC event generated the following statistics:
- Participating nations and regions   99
- Number of participants   192,482
- Number of species reported   5,560

Detailed results can be viewed on the World Bird Count website.

http://www.wnn.or.jp/wbc/wbc_e/

The 3rd WBC, with 5,935 species reported from 183,476 participants in 88 nations and regions, is listed in the Guinness Book of Records as the world's largest birding event.

NTT-ME contributes ¥1,000 per species to Bird Life International, a leading international conservation organization for wild birds. The total budget for contributions is ¥5,000,000, and the money is utilized in developing the world's largest natural environment database.

2. Employee Education and Related Programs

The NTT Group endeavors to promote awareness of the environment and environmental protection activities through internal publications and seminars for Group employees.

Working Toward ISO Registration

Since August 1997, the NTT Group has worked on selection of model offices to promote the establishment of environmental management systems in compliance with ISO 14001 guidelines. *The Road to Establishment of Environmental Management Systems—Working Toward ISO Registration*, featuring case studies for the establishment of environmental management systems, on-going programs, the NTT Group's environmental protection activities, and other reference on environmental management systems, was compiled and distributed to all employees in June 1999.

Photo 5.2-1 *The Road to Establishment of Environmental Management Systems —Working Toward ISO Registration*

Environmental Brochure: NTT Group Ecology Program 21

A brochure introducing NTT Group Ecology Program 21, the Group's guidelines for environmental protection efforts in the 21st century, was distributed to all employees.

In this publication, Mr. Miyazu, president of NTT (the holding company), states his executive view of environmental issues and vision for the NTT Group's future direction.
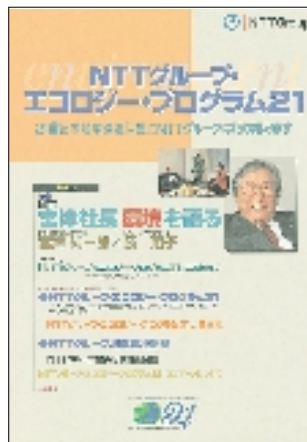
Photo 5.2-2 *NTT Group Ecology Program 21*

Report on NTT Group Environmental Protection Activities

In December 1999, the NTT Group published its first official environmental report. *NTT Group Environmental Protection Activity Report 1999* mainly highlights environmental protection activities undertaken during fiscal 1998.

Photo 5.2-3 *NTT Group Environmental Protection Activity Report 1999 (Japanese/English)*

http://www.ntt.co.jp/kankyo/e/1999report/index.html

External Cooperation

The NTT Group participates in, supports, or cooperates with the following environmental protection organizations.

Chart 5.2-1 NTT participation in environmental protection organizations

Organization	Activities
Green Purchasing Network (GPN)	Established in 1996 for promotion of Green Purchasing. A nationwide network of consumers, corporations and administrative organizations, GPN promotes priority purchase of goods and services with less impact on the environment.
The Keidanren Nature Conservation Fund	Renders active support to domestic and overseas NGOs' nature conservation projects, while developing Japanese human resources for international activities and promoting seminars for better understanding of nature conservation.
World Business Council for Sustainable Development (WBCSD)	Founded in 1995, WBCSD is a coalition of approximately 150 international corporations, united by a shared commitment to sustainable development and advocating closer cooperation between business, government and other organizations concerned with the environment and sustainable development.
Global Environmental Action (GEA)	Established in 1991 for the purpose of solving environmental issues and contributing to sustainable development. In 1999, the United Nations Environmental Project (UNEP) awarded this NGO a Global 500 Prize for its long contribution to global environment and sustainable development.
Global Environmental Forum (GEF)	Engaging in scientific and political research and study of environmental issues and sharing results and global/local environmental information with society at large. GEF's extensive support and cooperation for domestic and international environmental protection is expanding the network of individuals and organizations involved in environmental issues.
Japan Environmental Education Forum (J.E.E.F)	Founded in 1987 as "Kiyosato Forum," this organization was renamed in 1997. Activities for the promotion of environmental education include the establishment of Nature Schools, open seminars, and support for developing countries.

Social Contributions
to Environmental Protection

1. NTT Group Ecology Community Plazas

http://www.ntt.co.jp/kankyo/e/2000report/6/611.html

"Contribution to local environmental protection" is one of the three main components of the NTT Group Ecology Program 21. As part of our efforts in this direction, the Shiga Branch of NTT West and the Iwate Branch of NTT East have been designated as model branches for establishment of NTT Group Ecology Community Plazas. These Community Plazas promote close contact with their local communities through dissemination and exchange of information on a wide range of environmental issues.
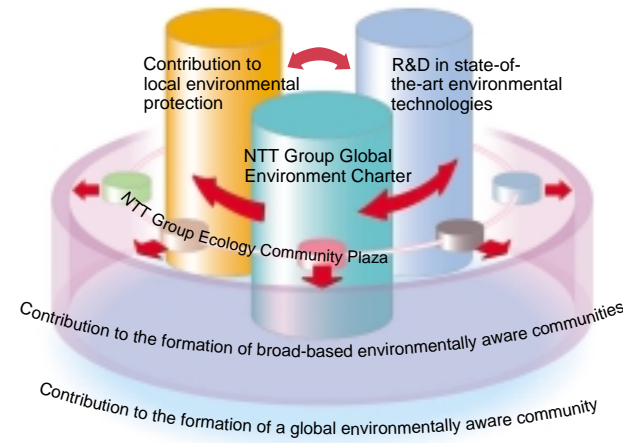
Fig. 6.1-1 Three main components of NTT Group Ecology Program 21

Ecology Community Activities at Shiga Branch, NTT West

■ Promotion of environmental protection in close contact with local communities

Shiga Prefecture, home of Lake Biwa, Japan's largest freshwater lake, has established a reputation as a local government with an active environmental agenda. Having hosted the G8 Environmental Summit in 2000, the prefecture now attracts worldwide attention as an environmental information center.

The Shiga Branch of NTT West has been involved in organizing a reed-cutting program in cooperation with citizens of Otsu. Reeds grow wild on lakesides, riversides and marshes all over Japan. Mowing the reeds reduces eutrophication and contamination caused when methane gas is generated by overgrown reeds as they die and decompose. The Shiga Branch also exhibited environmental technology at the second annual Shiga Prefecture-sponsored "Kankyo Business Messe," an environmental trade fair held in Nagahama City in 1999. More than

190 corporations, universities and institutes participated under the theme of "A Message from Lake Biwa: Creating Environmental Businesses".

The Shiga Branch of NTT West is working to forge close ties with the local community through its ongoing environmental efforts. From 2000, the NTT Science & Core Technology Laboratory Group and Shiga Prefecture have initiated a joint project to create an environmental information network with the participation of local citizens.
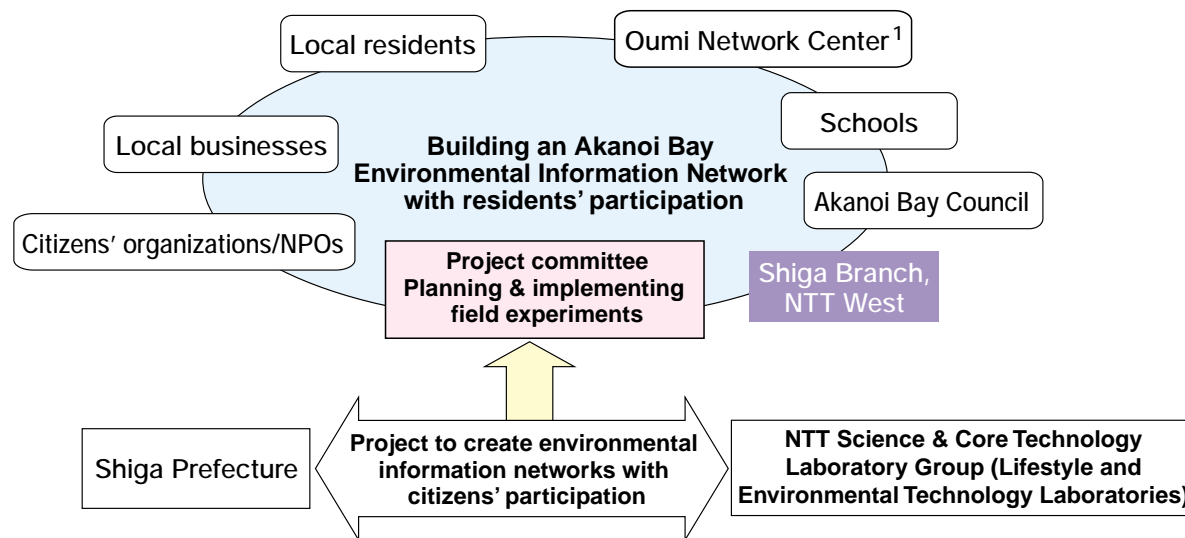
1 Oumi Network Center
Established in April 1997 with funding from Shiga Prefecture and local municipalities. Operated by the Oumi Culture Promotion Foundation for the purpose of providing general support to citizens' voluntary and non-profit social activities.

Fig.6.1-2 Activities of Shiga Branch, NTT West

Ihatov Ecology Community Plazas, Iwate Branch, NTT East

http://eco.iwate.isp.ntt-east.co.jp/

■ Supporting environmental activities in the local community

Designated an NTT East model branch, Iwate Branch and its five offices in Iwate Prefecture actively support environmental education as part of an ongoing program conceived to insure that the natural environment of Iwate can be preserved for generations to come. Ihatov[1] Ecology Community Plazas at Iwate Branch offices also provide space for a variety of activities, including the dissemination and exchange of information to promote formation of an environmentally aware regional community.

■ Specific activities at the Ihatov Ecology Community Plazas

Providing space for activities

Iwate Branch provides space at Ihatov Ecology Community Plazas for various environmental activities, including children's organizations such as "Kids' Eco Club" and "Young Supporters of the Forest". PC-based teleconferencing and other multimedia equipment is also available for meetings and activities.

Support for implementation and management of environmental education programs

Through the Environmental Network Joint Project (Iwate Prefecture, The United Nations University Institute of Advanced Studies and NTT Science & Core Technology Laboratory Group), the NTT East Iwate Branch is involved in implementation and management of environmental education programs and also supplies a range of essential communication equipment.

Creating environmental information databases

Environmental information from all over Iwate Prefecture is accumulated in databases which will be accessible to the public via a website.

Support for collection and dissemination of environmental information

To maximize public interest in environmental issues, the Iwate Branch assists environmental education organizations by providing support for active dissemination of information. Internet training sessions and website production workshops are also held at Ihatov Ecology Community Plaza sites.

Building human ecology networks

The Iwate Branch participates in inter-organizational exchanges utilizing teleconferencing facilities at Ihatov Ecology Community Plaza sites. The branch is also training local environmental activity coordinators to assist in building human ecology networks.

The Iwate Branch will also invite local businesses that have taken an environmental stance within the prefecture to play a broader and more active role in environmental programs initiated by citizens' organizations and schools nationwide, with Ihatov Ecology Community Plazas serving as the nucleus of these expanded activities.

[1]Ihatov
Poet and author of children's books, Kenji Miyazawa, created this nickname, meaning 'Dreamland', for Iwate Prefecture.
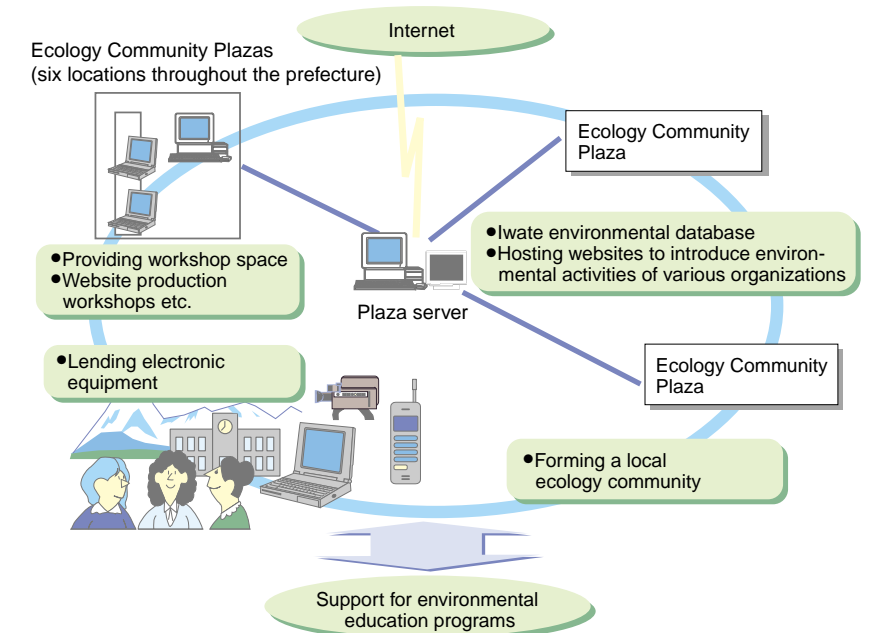

Fig. 6.1-3 Ihatov Ecology Community Plaza support for environmental activities

Chart 6.1-1 Major initiatives

Event	Description
Sanriku Virtual Diving (September 1999)	Provided technical staff for interactive classrooms in which schools were connected via the Internet to ocean-based cameras transmitting live underwater film. (Ofunato)
Kitakami River Governorship in 99 (October 1999)	Provided staff to follow course of river and collect real-time water quality data. (Ichinoseki)
Environmental Education Forum 21 (December 1999)	Set up a corner for viewing environmental websites and provided support for open classrooms based on teleconferencing and the Internet.
Eco-exploration in the City (March 2000)	Lent digital cameras to Kids' Eco Club, etc. for an environmental exploration of the city. Findings were reported in a website produced by the children. (Morioka)
Environmental Seminar (March 2000)	Conducted an Internet workshop and an environmental Internet seminar for Kids' Eco Club and other organizations. (Kamaishi)

2. DoCoMo Forests and DoCoMo Volunteers' Club

http://www.ntt.co.jp/kankyo/e/2000report/6/621.html

DoCoMo Forests

Since 1999, the NTT DoCoMo Group has sponsored DoCoMo Forests, a nationwide tree-planting program supported by the voluntary participation of DoCoMo employees. Volunteers learn about forestry through participation in projects such as planting native species, clearing undergrowth, thinning forests for sunshine, constructing forest walks, and bridging streams.

Based on the Green Fund system of the National Land Afforestation Promotion Organization and the Corporate Forests program of the Forestry Agency, DoCoMo Forests are scheduled to be planted in two regions a year for a total of nine different regions (each home to one NTT DoCoMo Group member company) over the next five years.

DoCoMo Forests

⬆ www.nttdocomo.co.jp/corporate/me
sena/100/mori.html

Photo 6.2-1   Participants gather for a commemorative photo during the first DoCoMo Forest event

Chart 6.2-1   DoCoMo Forests tree-planting programs

The 1st DoCoMo Forest		
Date:	Saturday, May 15, 1999	
Place:	Namerayama National Forest Tokuji-cho, Saba-gun, Yamaguchi Pref.	
Area:	2.8ha	
Planted species:	Japanese red pine, fir, wild cherry, Japanese walnut, zelkova, beech, and oak; total 250 seedlings	
Participants:	Approx. 45 employees from NTT DoCoMo and NTT DoCoMo Chugoku	

The 2nd DoCoMo Forest		
Date:	Saturday, October 23, 1999	
Place:	Yozuku National Forest Yamakitamachi, Ashigarakami-gun, Kanagawa Pref.	
Area:	2.87ha	
Planted species:	Wild cherry, zelkova, maple, and beech; total 200 seedlings	
Participants:	Approx. 50 employees from NTT DoCoMo	

DoCoMo Volunteers' Club

NTT DoCoMo employees established the DoCoMo Volunteers' Club in 1996 to encourage participation in community service programs by providing a platform for information exchange, motivating employees to participate, and offering company support. The Volunteers' Club is engaged in a range of activities, including dissemination and exchange of information via its website and volunteers' meetings. The Club has published a handbook summarizing employees' activities, such as participation in Operation Clean Environment and the DoCoMo Forests program. The scope of the club's activities is expanding to include recognition of volunteer leave, establishment of president's commendations and other in-house programs.

■ Basic policies
  ● Voluntary participation
  ● Volunteer activities as a source of happiness rather than a sacrifice
  ● Participation at a sustainable level

■ Activities
  ● Providing information through website and e-mail
  ● Holding Volunteers' Club meetings
  ● Implementation of field programs
  ● Promotion of cooperation with local communities
  ● Participation in volunteer seminar programs
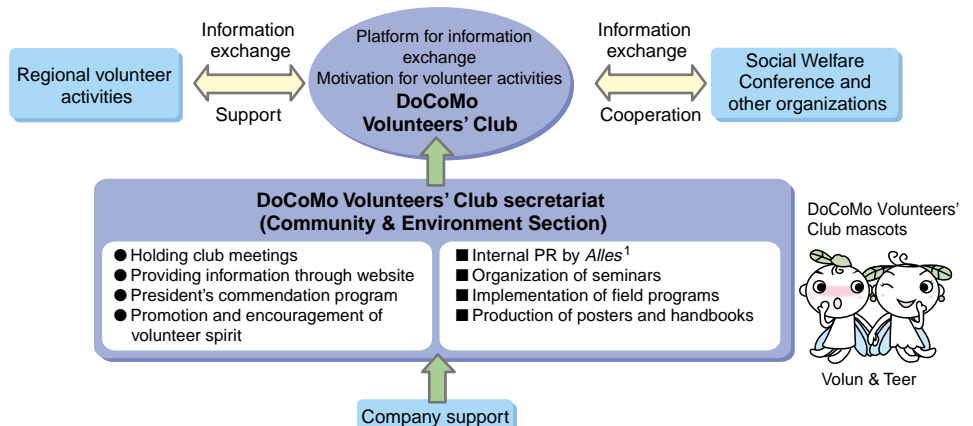
[1] *Alles*
"Alles" is a Dutch word for "all", and the name of the in-house monthly magazine of the NTT DoCoMo Group. The magazine, based on the concept that all readers are its editors, provides coverage of topics, trends, executive introductions, reports, technological information, and social contributions.

Fig.6.2-1 Diagram of volunteer activities

NTT Group Information

NTT Group Environmental Protection Activity Report 2000

The NTT Group published the *NTT Group Environmental Protection Activity Report 1999*, the first report detailing the Group's environmental activities, in fiscal 1999.

This 2000 version of the report was edited based on the reaction of readers—both positive evaluations and criticisms—to the 1999 report.

There may still be much room for improvement, and we welcome readers' opinions and comments concerning this report.

Items announced in the 1999 report

Item	Result	Refer to page
To reduce the number of printed copies, future issues will be provided primarily on the Internet.	By updating the content of our environmental website and reducing the number of copies distributed internally, the total number of printed copies has been reduced by 80%. Website: http://www.ntt.co.jp/kankyo/e/index.html	43
Results of our environmental accounting project will be released as soon as they are finalized.	Currently under consideration	18

Activities covered in the 1999 report that are not included in the 2000 edition

The 2000 edition focuses on activities initiated in fiscal 1999, while some ongoing activities from fiscal 1998 were omitted to save space.

Action plan	Page number in 1999 edition	Item	Current status and reason for omission	URL
Paper Resource Management	15	Introduction of recycled paper into telegram paper; use of environment-friendly materials	Ongoing	http://www.ntt.co.jp/kankyo/1999report/e/env/04/04index.html
	15	Introduction of recycled paper into bills and other documents	Ongoing	
	15	Activities in office paper recycling: Kanazawa	Ongoing	
	16	Paperless office through use of the internal intranet system	Ongoing	
	16	Lightning Fax	Ongoing	
Global Warming	18	Low-power devices	Ongoing	http://www.ntt.co.jp/kankyo/1999report/e/env/04/0402index.html
	19	Water purification system based on solar power generation	Ongoing	
	20	Fuel cell	Ongoing	
Waste Management	21	Proper disposal of soil removed from civil engineering work sites and other construction waste products	Ongoing	http://www.ntt.co.jp/kankyo/1999report/e/env/04/0403index.html
	21	Proper disposal management of construction-related waste products (construction waste and removed soil)	Ongoing	
	22	Proper disposal of medical waste products	Ongoing	
	22	Disposal of general office and industrial waste products	Ongoing	
	23	PCB storage and harm-free processing technologies	Ongoing	
	23, 24	Asbestos replacement (buildings/bridges)	Ongoing with goal of total elimination in fiscal 2000	
Promoting Recycling	25	Handling of nickel-cadmium batteries	Ongoing	http://www.ntt.co.jp/kankyo/1999report/e/env/04/0404index.html
	27	New materials derived from papermaking sludge produced in the paper recycling process	Ongoing	
	27	Recycling soil removed from construction sites	Ongoing	
Protecting the Ozone Layer	28	Elimination of CFCs used for cable gas leakage detection	Completed	http://www.ntt.co.jp/kankyo/1999report/e/env/04/0405index.html
	28	Elimination of CFCs used for washing crossbar switch contacts	Completed	
	28	Elimination of CFCs used for washing semiconductors	Completed	
	30	Elimination of specified halon used as fire-extinguishing agent	Ongoing	
Preventing Soil Contamination	31	Measures to prevent soil contamination (automatic oil leakage detection system for underground tanks at communication power sources)	Ongoing	http://www.ntt.co.jp/kankyo/1999report/e/env/04/0406index.html
Information Sharing	32	Environmental monitoring/sensing technologies	Ongoing	http://www.ntt.co.jp/kankyo/1999report/e/env/05/05index.html
	33	Participation in research on migration paths of migratory birds with ultra-small position transmitters	Ongoing	
	33	Automated Meteorological Data Acquisition System (AMeDAS™)	Ongoing	
	33	Ecological survey of albatrosses	Ongoing	
	33	Meteorological survey experiments at the Shiragami mountains, a World Heritage site	Ongoing	
	34	Information processing system for greenhouse gases at the Japan Meteorological Agency	Ongoing	
	34	Regional air pollution monitoring systems	Ongoing	
	34	Telecommuting (Tele-work)	Ongoing	

■This report is scheduled to be updated and issued annually in 2001 and beyond.
Annual Environment Report Publication Project   Environmental Promotion Office, Nippon Telegraph and Telephone Corporation

1. Anti-idling campaign

A movement to encourage drivers to turn off the engine when cars are stopped. The purpose of the campaign is to minimize emissions of carbon dioxide and nitrogen oxide, reduce noise, and save energy. The NTT Group is promoting participation in the campaign by affixing stickers to all company cars and distributing leaflets to employees. This campaign was awarded an Effort Prize at the 1st Eco-Drive Contest in 1998.

2. CFCs

Compounds of methane or ethane in which chlorine or fluorine substitutes for hydrogen. Offering chemical stability and cleansing power and originally considered harmless, CFCs were widely used in various products until their use was internationally restricted in 1987 due to their destructiveness to the ozone layer. The NTT Group completed the elimination of CFCs used for cable gas leakage detection and washing crossbar switch contacts in 1995.

3. Cogeneration

Utilization of waste heat emitted by gas turbine or diesel power generators as a heat source for heating, air conditioning or refueling. Due to waste heat and losses during power distribution, electric energy typically available from a power plant is only about 35% of the fuel energy used in power generation. With cogeneration, which captures 20-30% of electric energy and 40-50% of thermal energy, 60-80% of fuel energy becomes available.

4. Ecology Community Plaza

A platform for building regional ecology communities through dissemination and exchange of information on environmental issues. The Iwate Branch of NTT East and Shiga Branch of NTT West have been designated model branches with Ecology Community Plazas serving as bases for the NTT Group's environmental protection activities, which are diversified and based on local needs.

5. EMC (Electro-magnetic Compatibility)

The ability to properly function in an electro-magnetic environment without causing electromagnetic interference affecting other machines, equipment or systems.

6. Environmental management systems

A set of systems and procedures to identify the environmental impact of a company's businesses, goods and services, and to aim to continuously improve the environment by establishment of goals, inspections and review. The NTT Group is promoting environmental management systems compliant with ISO 14001 guidelines.

7. Environmental monitoring

The process of gathering objective data on environmental conditions and making decisions based on a scientific approach to protect human health and living environments. Since 1991, the NTT Group has been engaged in R&D on environmental monitoring technology to safeguard against air and water pollution.

8. Green Building Design Guidelines

Guidelines established in 1997 to minimize energy consumption and waste in the construction and operation of buildings. The guidelines require that buildings be designed to minimize environmental impact throughout their life cycle.

9. Greenhouse gases

All the gases in the atmosphere including carbon dioxide and vapor that cause global warming by absorbing infrared energy radiated from the earth and converting it into heat. Dozens of pollutants, including carbon dioxide, CFCs and methane, are emitted from industries and households. COP6 has set targets for reducing six kinds of greenhouse gas.

10. Green Procurement Guidelines

Established in July 1997 (revised in August 1999), these guidelines place priority on procurement of products designed to minimize environmental impact. Restriction of harmful materials, encouragement to indicate composition/disposal instructions, and proposals for ways to recycle/dispose are covered in the guidelines.

11. Green R&D Guidelines

Guidelines established in March 2000 for R&D of new services, systems and products in response to the emergence of a "recycling-based society." Detailed Energy R&D Guidelines were also established in March 2000 to realize minimum consumption of energy.

12. Hybrid cars

Vehicles powered by a combination of gasoline or diesel and electricity, with advantages of each power source generating high efficiency. Although further improvement is needed in terms of cost and production processes, hybrid cars are low-pollution vehicles with low fuel costs and high environmental viability.

13. Industrial waste

Ordinance-designated waste generated in commercial operations, including cinders, sludge, waste oil, waste acid, waste alkali, and waste plastics are called industrial waste. Among these, "controlled industrial wastes" are explosive, poisonous, infectious, or those with any other property that is defined by ordinance as harmful to human health or the environment.

14. Intelligent Transport Systems (ITS)

Systems for realizing a safe, smooth and environmentally friendly transportation environment by maximizing the advantages of sophisticated information sharing technologies. The NTT Group provides car navigation systems through mobile telephone networks and support systems that enable quick response to emergencies.

15. Material recycling

A typical process for recycling plastic: waste plastic is crushed into pellets, which are then heated and reformed. In material recycling, it is important to ensure that plastics are sorted by type. Recycled plastic products employed by the NTT Group include connection terminal boxes (made of polypropylene) and support line guards (made of polyethylene).

16. Municipal waste

Waste and sewage produced in the course of daily living. Municipal waste is classified into two categories: household wastes and waste from shops, offices and factories which is not specified as industrial waste.

17. NGO (Non-governmental Organization)

Non-governmental, international organization formed by individual citizens or citizens' groups. NGOs are engaged in a wide range of activities including environmental protection, development assistance, and population issues, advocating citizens' voices at UN and other international authorities.

18. Nickel-cadmium batteries

Secondary batteries that can be recharged hundreds of times and can withstand large variations in temperature. Among other advantages, nickel-cadmium batteries are characterized by high recyclability. As part of efforts toward more efficient recycling of resources, the NTT Group is marking products with indications for separate collection and providing recycling boxes.

19. Nickel metal hydride batteries

Able to be recharged approx. five hundred times, these recyclable and resource-saving batteries are much more economical than conventional dry-cell batteries. Nickel metal hydride batteries are widely heralded as a solution to environmental and waste issues, and as an answer to recent needs for batteries with larger capacity.

20. PCBs (polychlorinated biphenyl)

Synthetic organic compounds, PCBs were used in various applications due to their nonflammable, heat-resistant, refrigerant, and electric insulating properties. PCBs, however, are extremely poisonous and tend to accumulate, causing environmental pollution, and production and sale were banned in 1972.

With the cooperation of local governments, the NTT Group plans to dispose of stockpiled PCBs as early as possible, utilizing the alkali catalyst decomposition (BCD method).

21. PDCA (Plan-Do-Check-Action)

Environmental protection activities within the NTT Group are planned and then carried out at the divisional level. Each activity is checked by internal audits and the results are reflected in plans and objectives for subsequent fiscal years.

22. Supercritical water

Supercritical fluids are characterized by liquidity that melts objects and, at the same time, with a gaseous nature that exhibits excellent diffusion. Among these, supercritical water is particularly effective as a reaction agent and is used for extraction, disposal and removal of pollutants within effluent, as well as disposal and recycle of waste plastics.
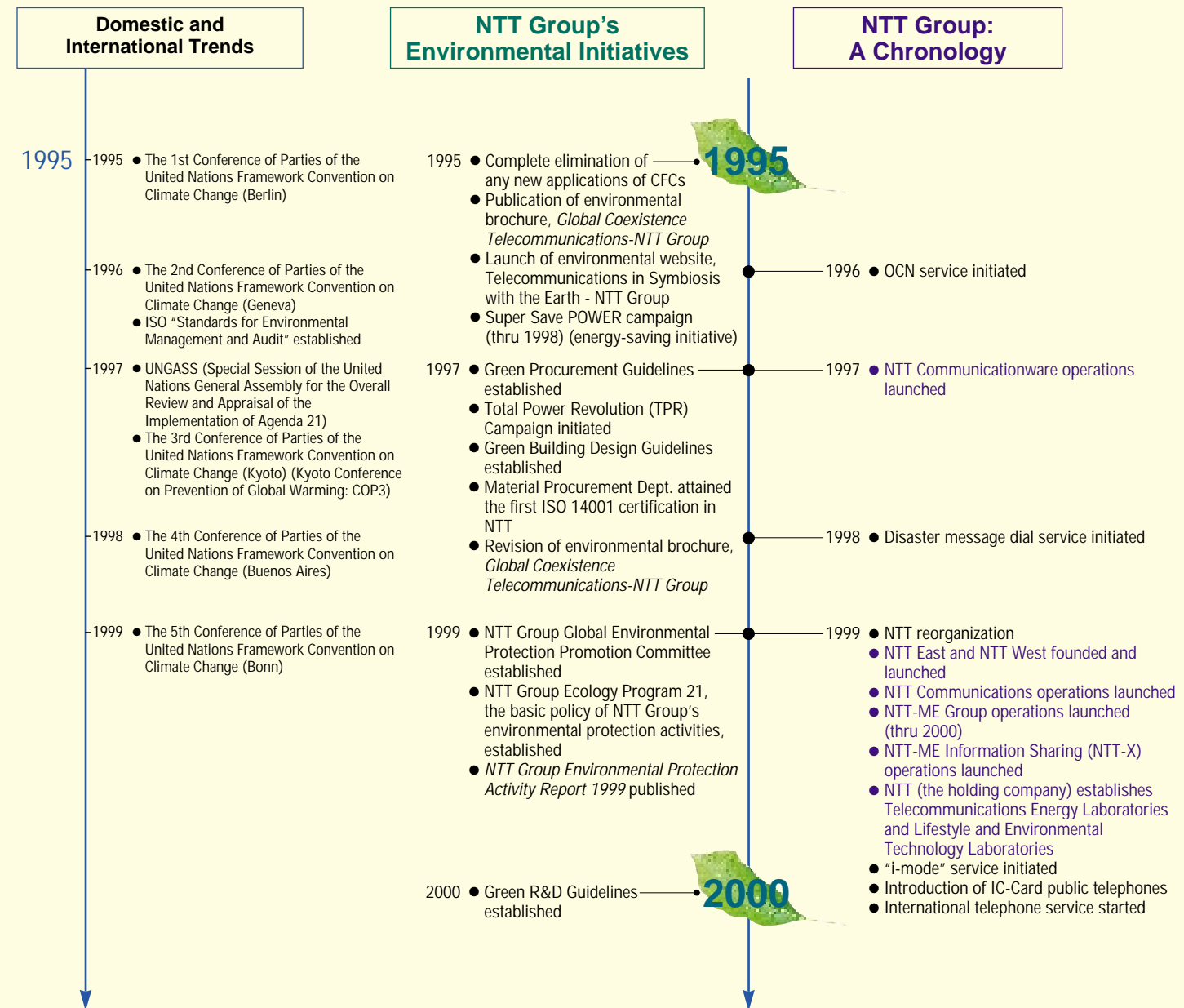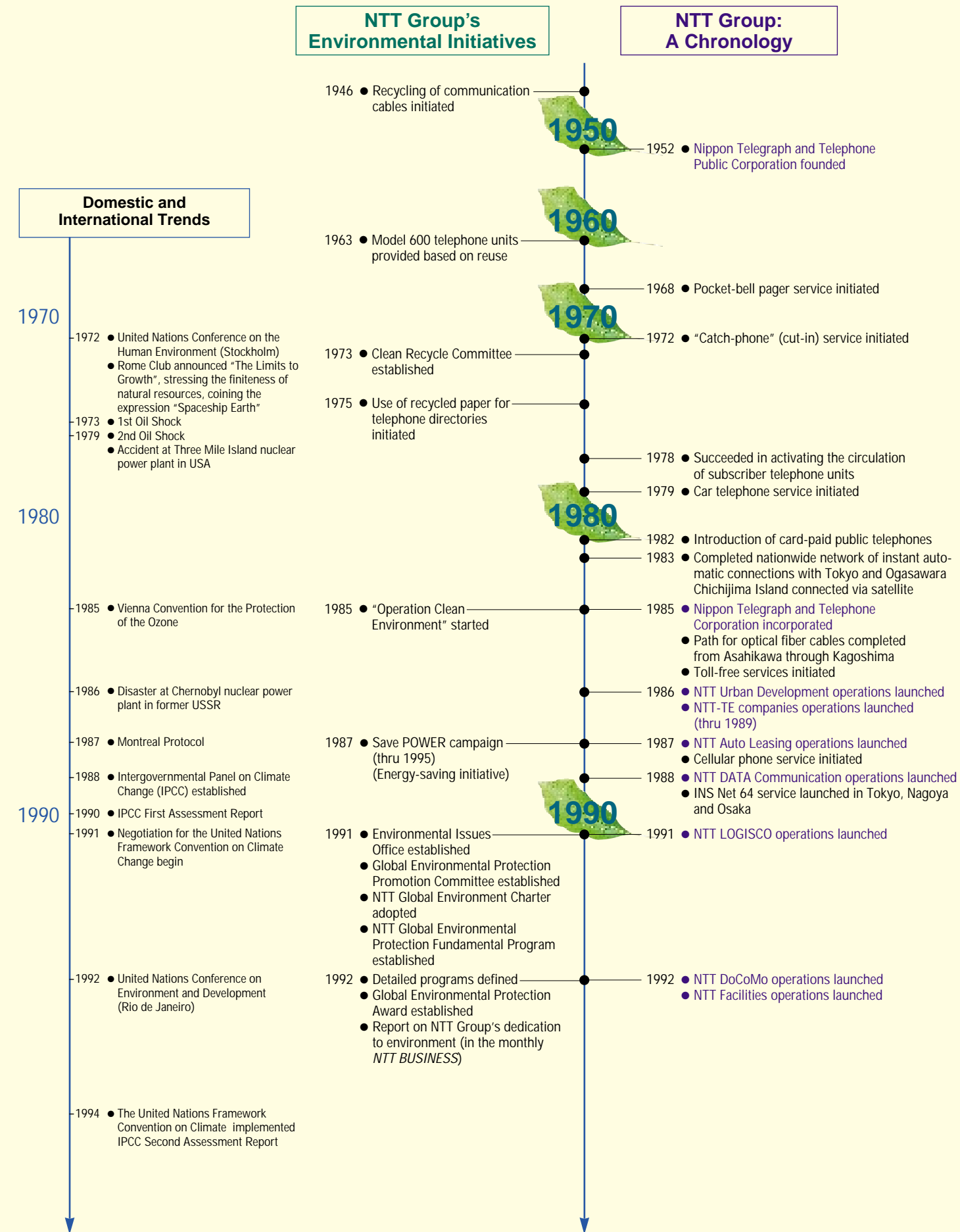
23. Thermal recycling

A method to utilize the energy of heat and vapor emitted from incineration of waste and municipal garbage. In practice, energy can be used not only for simple combustion, but can also be used in pyrolysis to create fuel; in furnaces as fuel/reducer; or as fuel in producing cement. Ash can also be recycled into cement.

24. TPR initiative

The NTT Group approach to electric power issues bears the title, TPR (Total Power Revolution) Campaign. Power consumption is expected to increase with advances in information sharing technology. Since 1997, the NTT Group has implemented its TPR Campaign to accelerate reduction of daily power consumption and approach power issues at the R&D level.

NTT Group's Environmental Initiatives / NTT Group: A Chronology / Domestic and International Trends

1950

1946 ● Recycling of communication cables initiated

1952 ● Nippon Telegraph and Telephone Public Corporation founded

1960

1963 ● Model 600 telephone units provided based on reuse

1968 ● Pocket-bell pager service initiated

1970

1972 ● "Catch-phone" (cut-in) service initiated

1973 ● Clean Recycle Committee established

1975 ● Use of recycled paper for telephone directories initiated

1978 ● Succeeded in activating the circulation of subscriber telephone units

1979 ● Car telephone service initiated

1980

1982 ● Introduction of card-paid public telephones

1983 ● Completed nationwide network of instant automatic connections with Tokyo and Ogasawara Chichijima Island connected via satellite

1985 ● "Operation Clean Environment" started

1985 ● Nippon Telegraph and Telephone Corporation incorporated
● Path for optical fiber cables completed from Asahikawa through Kagoshima
● Toll-free services initiated

1986 ● NTT Urban Development operations launched
● NTT-TE companies operations launched (thru 1989)

1987 ● Save POWER campaign (thru 1995) (Energy-saving initiative)

1987 ● NTT Auto Leasing operations launched
● Cellular phone service initiated

1988 ● NTT DATA Communication operations launched
● INS Net 64 service launched in Tokyo, Nagoya and Osaka

1990

1991 ● Environmental Issues Office established
● Global Environmental Protection Promotion Committee established
● NTT Global Environment Charter adopted
● NTT Global Environmental Protection Fundamental Program established

1991 ● NTT LOGISCO operations launched

1992 ● Detailed programs defined
● Global Environmental Protection Award established
● Report on NTT Group's dedication to environment (in the monthly *NTT BUSINESS*)

1992 ● NTT DoCoMo operations launched
● NTT Facilities operations launched

Domestic and International Trends (left column)

1970

1972 ● United Nations Conference on the Human Environment (Stockholm)
● Rome Club announced "The Limits to Growth", stressing the finiteness of natural resources, coining the expression "Spaceship Earth"

1973 ● 1st Oil Shock

1979 ● 2nd Oil Shock
● Accident at Three Mile Island nuclear power plant in USA

1980

1985 ● Vienna Convention for the Protection of the Ozone

1986 ● Disaster at Chernobyl nuclear power plant in former USSR

1987 ● Montreal Protocol

1988 ● Intergovernmental Panel on Climate Change (IPCC) established

1990

1990 ● IPCC First Assessment Report

1991 ● Negotiation for the United Nations Framework Convention on Climate Change begin

1992 ● United Nations Conference on Environment and Development (Rio de Janeiro)

1994 ● The United Nations Framework Convention on Climate implemented IPCC Second Assessment Report

Domestic and International Trends (right column)

1995

1995 ● The 1st Conference of Parties of the United Nations Framework Convention on Climate Change (Berlin)

1996 ● The 2nd Conference of Parties of the United Nations Framework Convention on Climate Change (Geneva)
● ISO "Standards for Environmental Management and Audit" established

1997 ● UNGASS (Special Session of the United Nations General Assembly for the Overall Review and Appraisal of the Implementation of Agenda 21)
● The 3rd Conference of Parties of the United Nations Framework Convention on Climate Change (Kyoto) (Kyoto Conference on Prevention of Global Warming: COP3)

1998 ● The 4th Conference of Parties of the United Nations Framework Convention on Climate Change (Buenos Aires)

1999 ● The 5th Conference of Parties of the United Nations Framework Convention on Climate Change (Bonn)

NTT Group's Environmental Initiatives / NTT Group: A Chronology (right)

1995

1995 ● Complete elimination of any new applications of CFCs
● Publication of environmental brochure, *Global Coexistence Telecommunications-NTT Group*
● Launch of environmental website, Telecommunications in Symbiosis with the Earth - NTT Group
● Super Save POWER campaign (thru 1998) (energy-saving initiative)

1996 ● OCN service initiated

1997 ● Green Procurement Guidelines established
● Total Power Revolution (TPR) Campaign initiated
● Green Building Design Guidelines established
● Material Procurement Dept. attained the first ISO 14001 certification in NTT
● Revision of environmental brochure, *Global Coexistence Telecommunications-NTT Group*

1997 ● NTT Communicationware operations launched

1998 ● Disaster message dial service initiated

1999 ● NTT Group Global Environmental Protection Promotion Committee established
● NTT Group Ecology Program 21, the basic policy of NTT Group's environmental protection activities, established
● *NTT Group Environmental Protection Activity Report 1999* published

1999 ● NTT reorganization
● NTT East and NTT West founded and launched
● NTT Communications operations launched
● NTT-ME Group operations launched (thru 2000)
● NTT-ME Information Sharing (NTT-X) operations launched
● NTT (the holding company) establishes Telecommunications Energy Laboratories and Lifestyle and Environmental Technology Laboratories
● "i-mode" service initiated
● Introduction of IC-Card public telephones
● International telephone service started

2000 ● Green R&D Guidelines established

2000

(1) Group member companies covered in this report

FY	Item	NTT (the holding company)	NTT East	NTT West	NTT Communi-cations	NTT DoCoMo Group	NTT DATA	NTT Facilities	NTT Urban Development	NTT Communi-cationware	NTT-ME Group
Data collected											
Thru fiscal 1998	NTT Group data										
	Data on measures against global warming										
Fiscal 1999	NTT Group data										
	Data on measures against global warming										
Current status of shared policies											
Fiscal 1999	TPR (Total Power Revolution) Campaign										
	Green Procurement Guidelines										
	Green R&D Guidelines										
	Green Building Design Guidelines										
Targets for major action plans											
Fiscal 1999	Paper resource management										
	Telephone directories										
	Telegram paper										
	Invoices and other documents										
	Waste management										
	Communication facilities										
	Civil engineering sites										
	Construction sites										
	Offices										
	Prevention of global warming										
	Electricity consumption										
	Gas/fuel consumption										
	Use of company vehicles										
	Protection of the ozone layer										

*Application of Green Building Design Guidelines has been expanded to 10 companies as follows: NTT (the holding company), NTT East, NTT West, NTT Communications, NTT DoCoMo, NTT DATA, NTT Facilities, NTT Urban Development, NTT Communicationware, and NTT Business Associates.

(2) Management of paper resources
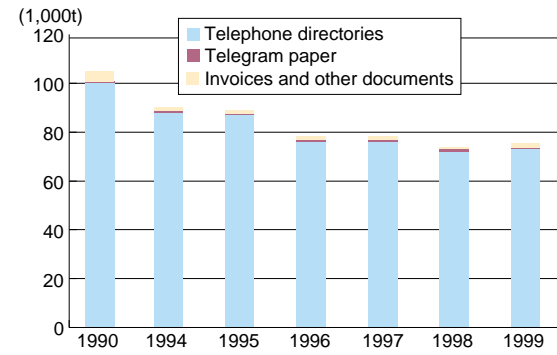
Fig.1 Consumption of virgin pulp
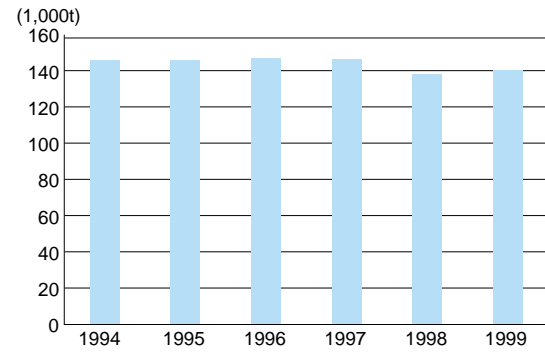
Fig.2 Paper consumed in production of telephone directories
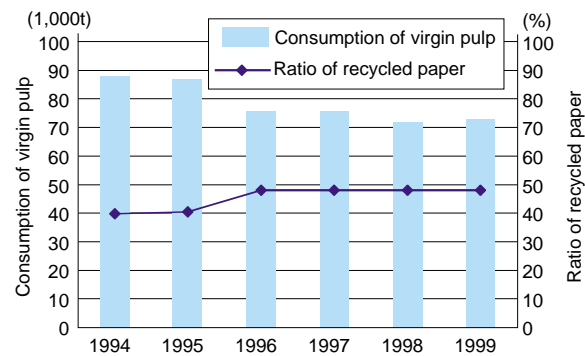
Fig.3 Ratio of virgin pulp and recycled paper in production of telephone directories
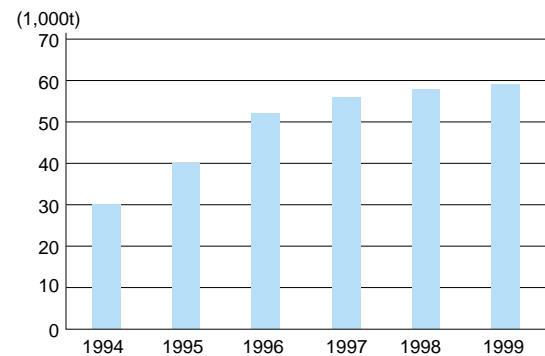
Fig.4 Collection of used telephone directories

(3) Prevention of global warming
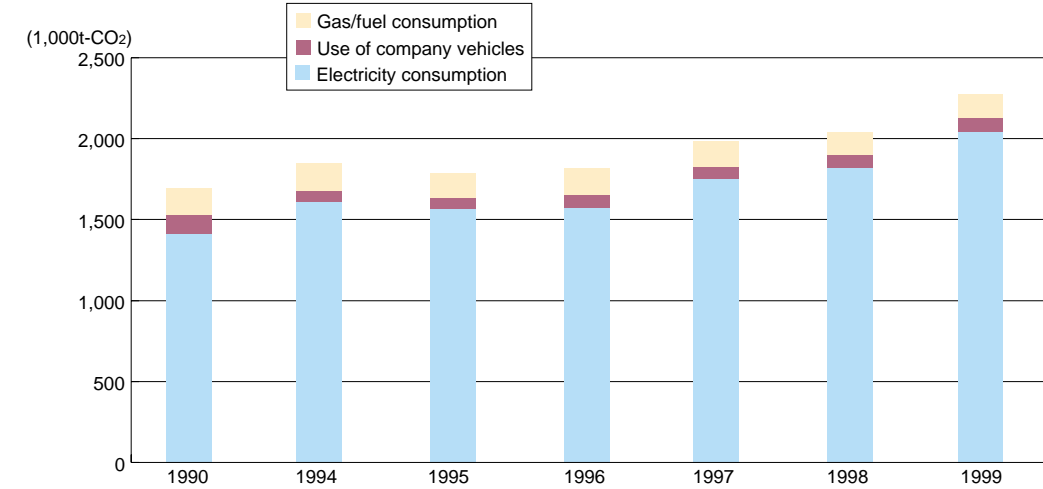
Fig.5 CO_2 emissions
*CO_2 emissions from gas/fuel consumption and company cars partially estimated by sample surveys.
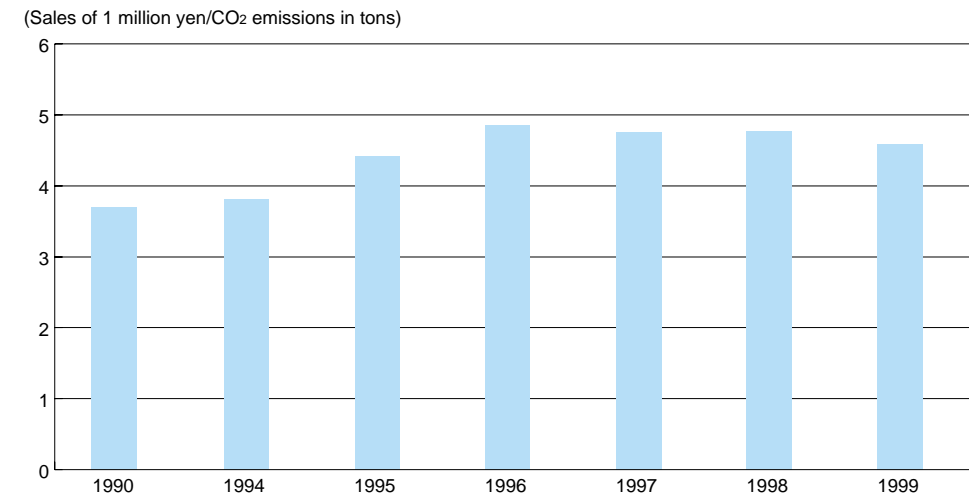
Fig.6 Eco-efficiency
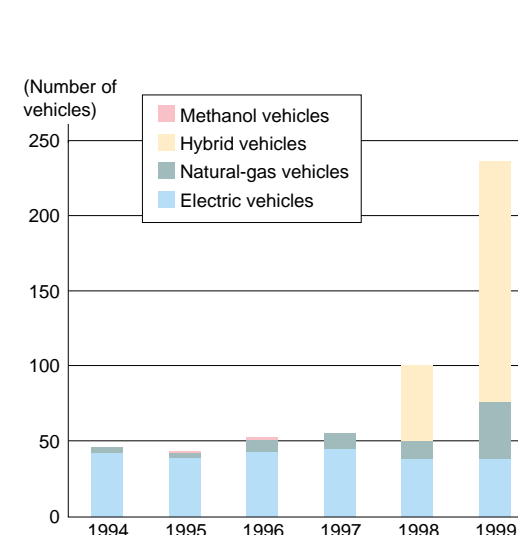
Fig.7 Number of low-pollution vehicles
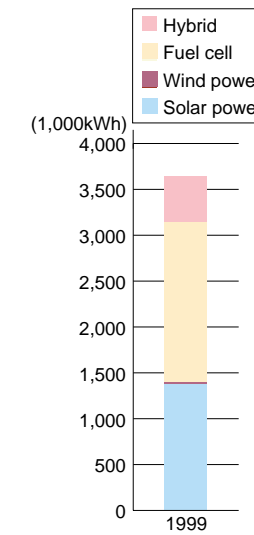
Fig.8 Power generation by clean energy
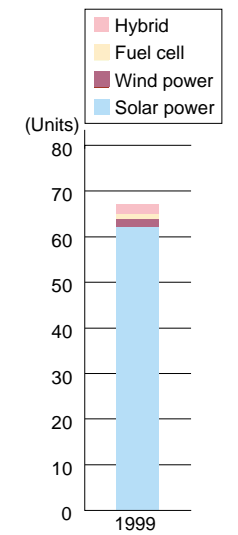
Fig.9 Clean energy equipment

(4) Waste management
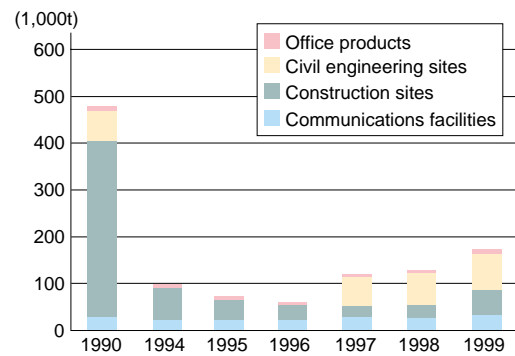
Fig.10 Volume of waste products
*Volume of waste products partially estimated by sample surveys.
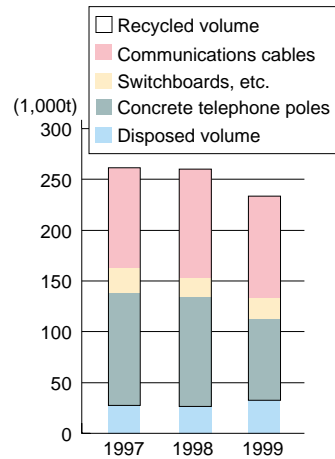
Fig.11 Volume of emissions/recycling/disposal of dismantled communications equipment
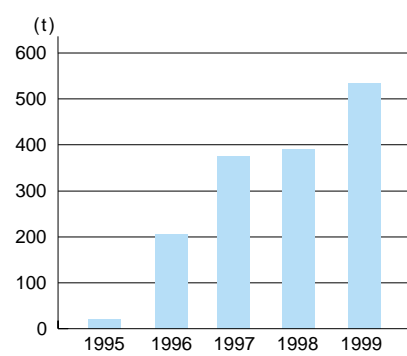
Fig.12 Volume of material recycled repellets

Fig.13 Collection of used communications equipment, batteries, etc.
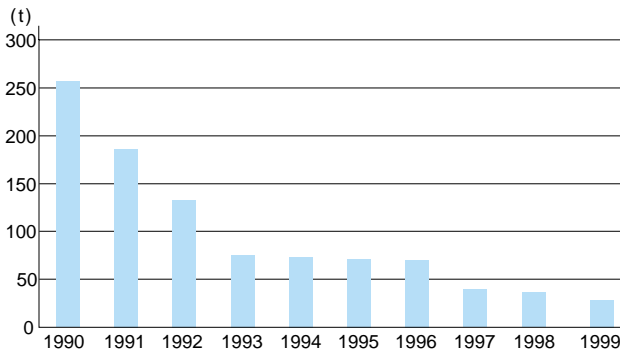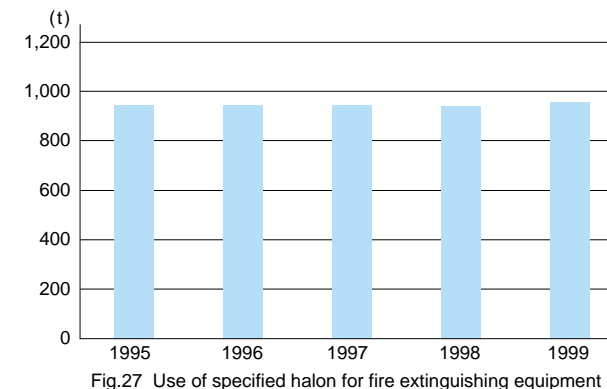

Fig.14 Use of polystyrene
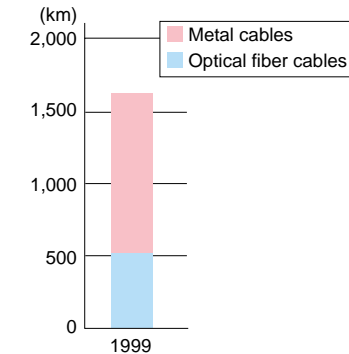
Fig.15 Reuse of cables

Fig.16 Waste from construction sites
*Volume of waste partially based on estimation.
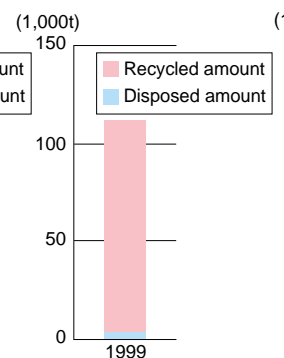
Fig.17 Removed soil from construction sites
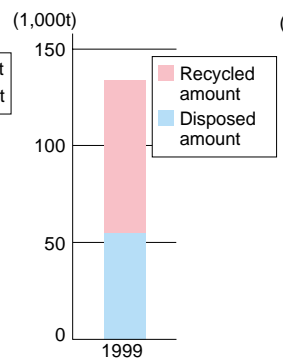
Fig.18 Waste from civil engineering sites
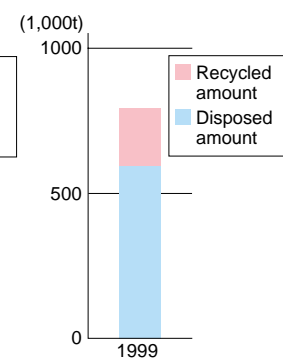
Fig.19 Removed soil from civil engineering sites
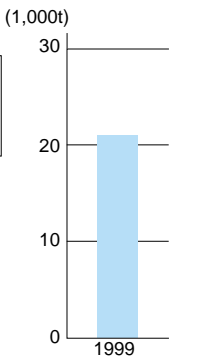
Fig.20 Disposal of municipal wastes
*Disposed volume partially estimated by sample surveys.

Fig.21 Asbestos emissions
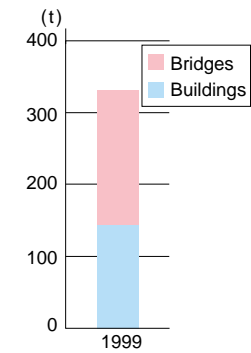
Fig.22 Remaining asbestos (to be eliminated by end of fiscal 2000)
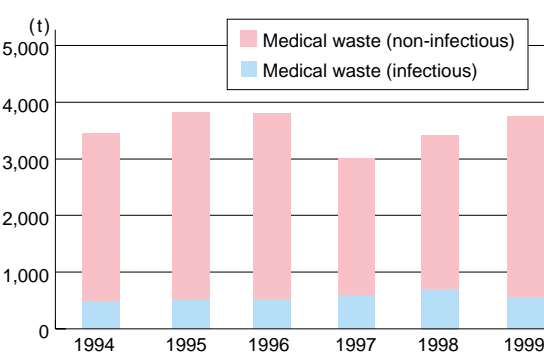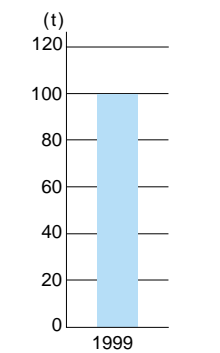

Fig.23 Volume of medical waste

Fig.24 Use and storage of PCBs

(5) Protection of the ozone layer; other activities

Fig.25 Electricity consumption

Fig.26 Fuel for company vehicles

Fig.27 Use of specified halon for fire extinguishing equipment

Fig.28 Amount of specified CFCs for air conditioners

Fig.29 Turbo freezers/dismantled units

Fig.30 ISO14001 certification for NTT Group
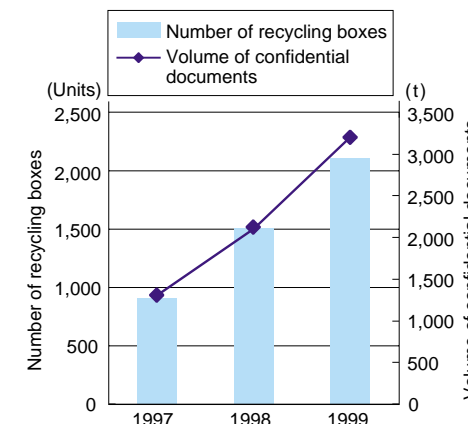
Fig.31 Recycling boxes installed/volume of confidential documents

Fig.32 Number of participants in Operation Clean Environment