NTTGroup

NTTGroup Environmental Protection Activity Report 1999

Guidelines for NTT Group activities concerning environmental protection issues for the 21st century

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NTT GROUP ECOLOGY PROGRAM

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NTT Group Environmental Protection Activity Report 1999

Message from the President

At the NTT Group, we recognize that the major global environmental disruptions of the 20th century have primarily been the result of economic activity, particularly mass production, mass consumption, and mass disposal, as well as the single-minded pursuit of convenience to the detriment of environment. If we ignore these issues, current conditions will soon lead to environmental damage that will take generations to repair, if they can be repaired at all. Prompted by a keen awareness of the Earth's limited resources and the responsibility of each company, individual, and public organization, the NTT Group established "The NTT Global Environment Charter" in 1991. Since then, we have systematically worked to promote global environment actions based on systematic environmental planning and through specific programs at each business unit.

Our activities have steadily yielded results, including more efficient use of paper resources, reduction of use of global warming substances and waste management. When NTT reorganized effective on July 1, 1999, we implemented more assertive steps to help to our part in the creation of a sustainable society. We reaffirmed our commitment to the NTT Group Global Environment Charter based on unified environmental protection policies adopted across the entire Group. We also adopted "NTT Group Ecology Program 21", a strategy for Group-wide global environment protection actions for the 21st century, which specifies the establishment and implementation of major environmental objectives, emphasizing more flexible and more creative community-centered environmental protection action and proactive research and development for environmental protection.

This booklet provides a summary of our environmental protection activities for fiscal 1998. We would appreciate your attention and welcome your opinions.

Jun-ichiro Miyazu

**President,
Nippon Telegraph And Telephone Corporation**

宮津 純一郎

Corporate Profile

Corporate Mission

The NTT Group uses its world-class research and development capabilities to provide customers with the highest-quality, highest-reliability service to create a productive information-based society.

Management Vision

Global Information-sharing Corporate Group

Developing information-based commerce
To launch efforts to build information-based commerce, including various platforms, content, and terminals, based on the requirements of the emerging information economy.

Enhancement of international operations
To develop information-sharing businesses throughout the world using a seamless and comprehensive network of fixed/mobile/data and IP services.

Innovative group management through a financial holding company
Leveraging holding company R&D capabilities and synergistic Group effects to develop comprehensive group operations and maximize enterprise value.

Corporate and Group Profile

◆**Profile of Nippon Telegraph and Telephone Corporation (as of July 1, 1999)**

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:	¥795.6 billion
Employees:	ca. 3,600 (3,200 at research institutes, etc.)

◆**Consolidation Profile (as of the end of March 1999)**

Employees:	ca. 224,000
Number of companies:	34 (former NTT (parent)*1 and consolidated subsidiaries*2)

Operating results in FY 1998

Consolidated operating profit:	¥9,729.6 billion
Consolidated pretax recurring profit:	¥648.6 billion
Consolidated net income:	¥602.6 billion *Amounts less than ¥100 million are rounded off.

*1: The former NTT (parent) has been reorganized into the following four companies as of July 1, 1999; NTT<holding company>, NTT East, NTT West, and NTT Communications.

*2: Consolidated subsidiaries; NTT Data, nine NTT DoCoMo companies, six real estate developers, NTT Facilities, eleven NTT-TE companies, NTT-DO, NTT Teleca, NTT Communicationware, NTT Leasing, and NTT Auto Leasing

As of April 1, 1999, the number of real estate development subsidiaries was reduced to one, while mergers reduced the number of NTT-TE companies to nine.

Introduction

This environmental report can be summarized as follows.

Chapter 1 describes the NTT Group's basic approach toward environmental issues, focusing on NTT Group Ecology Program 21, a new strategy for environmental protection actions taken up by the entire Group. NTT Group Ecology Program 21 was formulated on July 1, 1999, upon the reorganization of NTT.

Chapter 2 summarizes the NTT Group's overall environmental goals and achievements, primarily for fiscal 1998, describing improvements in use of paper resources, activities to prevent global warming and protect the ozone layer, and to reduce industrial wastes.

Chapter 3 explains the basic measures common to all Group companies.

Chapter 4 describes major and characteristic environmental goals and their status of implementation at Group companies.

Chapter 5 describes contributions to environmental protection activities made through our information-sharing services.

Chapter 6 describes our social contribution efforts for environmental protection and environmental awards presented to NTT Group for its environmental activities.

The data in this report (primarily drawn from fiscal year 1998) for the overall environmental goals and achievements have been taken from the former NTT, prior to its reorganization (currently, NTT East, NTT West, NTT Communications, and NTT <holding company>). Information on prevention of global warming also includes data for NTT DoCoMo, NTT Data, NTT-ME, NTT-TE (Telecom Engineering) companies.

Summarizing environmental protection promotion activities at the NTT Group for the fiscal year 1998 (from April 1998 through March 1999), this report is the first environmental annual report issued by the NTT Group and contains an overview of activities in previous years. Due to the reorganization of the NTT Group in July 1999, the report may contain certain irregularities in methods of calculation and applicable ranges. We ask the reader to be awared of these inconsistencies.

1 NTT Group Ecology Program 21

◆ *NTT Group Ecology Program 21*

In July 1999, the NTT Group was reorganized into NTT <holding company>, NTT East Corporation, NTT West Corporation, NTT Communications Corporation, NTT Mobile Communications Network, Inc. (NTT DoCoMo), and NTT Data Corporation in a group management system, with NTT <holding company> serving as the headquarter. In an effort to adapt environmental protection activities to the new system, a basic strategy for 21st century environmental protection activities was drawn as the NTT Group Ecology Program 21.

NTT Group Ecology Program 21 is composed of the following three main components:

* *The NTT Group Global Environment Charter (*)*
* *Active participation in community-centered environmental protection*
* *R&D for advanced environmental technologies*

To achieve the objectives set up in the program, a system for promoting NTT environmental actions was also established. *(For more information, please refer to p.3.)*

> (*) The basic principle of the new NTT Group Global Environment Charter is similar to the charter established in 1991, with policies on paper resource management, prevention of global warming, and substantial reductions in environmental impact through waste management. The principle also embraces establishment of an environmental management system, social contribution, and disclosure of environmental information.

The three main components of the NTT Group Ecology Program 21 are described in detail below.

◆ *NTT Group Global Environment Charter*

[Foreword]

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 to 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 (reduced greenhouse gas emissions), resource conservation (conservation of materials such as paper), and waste reductions, and to strive to make continuous improvements.

3) Establishing and maintaining an environmental management system
  * Establishing an environmental management system enables each business unit to pursue voluntary environmental protection actions.

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.

Fig. 1.1-1: The NTT Group Global Environment Charter

The above figure shows "The NTT Group Global Environmental Charter", a manifesto of the NTT Group's basic philosophy on environmental protection. *(Fig. 1.1-1)*

The charter pledges the complete compliance to relevant laws and regulations and fulfillment of social responsibilities. It covers the following issues.

* *Preventing global warming and energy conservation*
* *Conservation of resources such as paper*
* *Alleviation of various environmental impacts, including waste reductions*
* *Establishment and maintenance of an environmental*

management system
* *Research and development into environmental technologies*
* *Social contribution*
* *Disclosure of environmental information*

Based on this charter, we have established action plans to be implemented by 2010 in the areas of paper resource management, prevention of global warming, and waste reductions. All NTT Group companies will participate in coordinated efforts to achieve these goals.

◆*Active participation in community-centered environmental protection efforts*

The NTT Group will promote extended and diversified environmental protection activities based in each community.

The NTT Group Ecology Community Plaza will be established as a hub for the distribution and exchange of information on environment issues, being a measure to contribute to the creation of an environmentally active community.

In the beginning, several model branches will carry out diverse community-based environmental protection actions, the effects of which will be reviewed subsequently before the system is expanded throughout Japan.

◆*R&D activities taken as an information-sharing corporate group for advanced technology in environmental load reduction*

As a corporate group intimately involved in the information industry, we undertake research and development into advanced technologies primarily involving low-power telecommunication devices, very-low-power-consumption LSI, single-electron devices, low-power-consumption mounting methods, clean energy, nondestructive processing technologies for PCB, optical fiber recycling, and plastics recycling. Moreover, our research and development activities cover environmental sensing networks and meteorological forecast

technologies, aiming at reduction of environmental negative impacts. At the reorganization of January 25, 1999, we established two new research labs. These include a Telecommunications Energy Laboratories and a Lifestyle and Environmental Technology Laboratories within NTT <holding company>, which will undertake the preceding research and development challenges. The following figure *(Fig. 1. 1-2)* illustrates the relationship between the three components of the NTT Group Ecology Program 21.
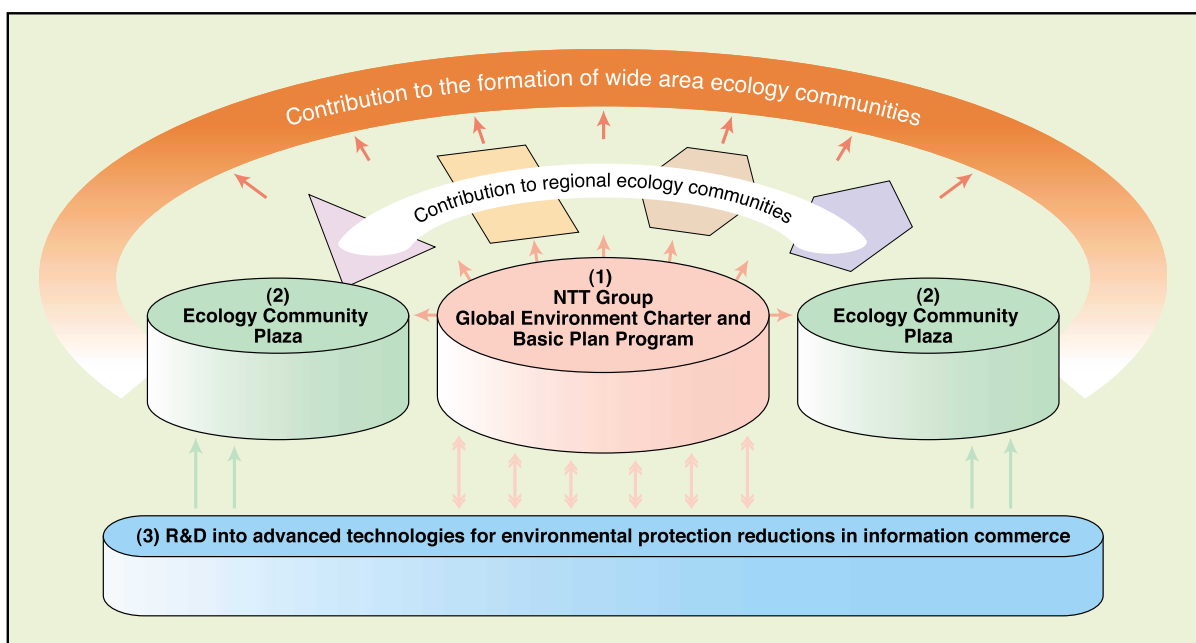
Fig. 1. 1-2: Relationships between the three components of the NTT Group

Based on the NTT Group Global Environment Charter, we will establish NTT Group Ecology Plaza as a private/public liaison. This center will serve as a liaison between NTT and specific communities, while laboratories within the holding company will serve as centers of R&D efforts dedicated to advanced technologies.

Our Group-wide environmental protection efforts date back some 50 years, when we began recycling telecommunication facilities, including the Model 600 black telephone units, communication cables, and switchboards. In 1991, we issued our NTT Global Environment Charter, on the basis of which we developed a basic action program and various environmental policies. We take pride in the successes made possible by these efforts, which include initiatives to save energy and paper and to eliminate CFCs, etc. In addition, each office and branch has established an environmental protection promotion committee, carried out internal environmental audits, and gave presidential awards to recognize outstanding efforts.

2 System for promoting environmental protection

◆NTT Group system for promoting environmental protection

* NTT Group environmental protection promotion committee

(Meeting director: Yusuke Tachibana, Senior executive vice president of the <holding company>; chairperson: Shigehiko Suzuki, Senior vice president executive director, department Ⅲ (R&D strategy department) of the <holding company>)

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 the main Group companies and division heads of the holding company. This committee prepares basic environmental policies, establishes goals, and evaluates achievements for the entire Group.

* NTT Group global environmental protection promotion advisory committee

(Chief examiner: Shigehiko Suzuki, Senior vice president executive director, department Ⅲ (R&D strategy department) of the <holding company>)

This committee proposes basic policies and specific measures and provides advisory opinions to the NTT Group environmental protection promotion committee.

* Environmental Promotion Office: NTT <holding company>

This office serves as the secretariat for various Group-wide committees, overseeing the various offices and divisions responsible for environmental protection promotion functions at NTT Group companies.

Within the NTT Group environmental protection promotion committee, we have established the following committees, which are in charge of specific functions, to respond to challenges shared by the entire Group and to develop basic policies.

Fig. 1.2-1 provides an illustration of the system for promoting environmental protection issues at the NTT Group.
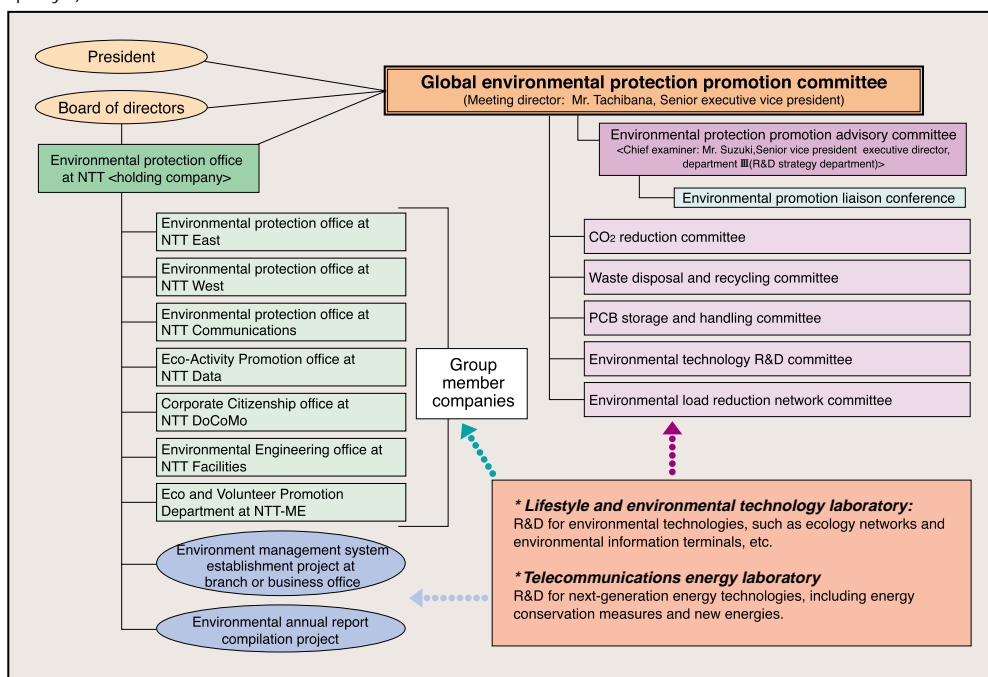
Fig. 1.2-1: NTT Group environmental promotion system

1) CO$_2$ reduction committee

To achieve the goals adopted at the Kyoto Conference of December 1997 (Third Conference of the Parties to the United Nations Framework Convention on Climate Change), the committee is responsible for developing basic policies, including new measures and reduction goals, to allow the NTT Group to fulfil corporate responsibilities. More specifically, it establishes basic policies for reducing CO$_2$ emissions from electricity generation for communication facilities and offices, company vehicles, building-related sources, and work-related tasks. The committee supervises and promotes the TPR (Total Power Revolution) initiative, which is designed to reduce power-consumption and CO$_2$ emissions, and anti-idling initiatives for employee vehicles and company cars. *(For more information, please refer to p.17.)*

2) PCB storage and handling committee

Since we are major users of equipments, which involve PCBs the committee develops basic policies for proper storage and chemical treatment to neutralize the PCBs. With the enactment of the Revised Waste Disposal Act on June 17, 1998, which allows PCB to be rendered harmless by chemical decomposition methods, the committee has been encouraging on-site PCB decomposition, reducing off-site environmental contamination risks. The committee has adopted the BCD (Base Catalyzed Decomposition) process as the most promising of chemical processing methods, and examined the technical details with the group companies before implementing actual processing. *(For more information, please refer to p.23.)*

3) Waste disposal and recycling committee

This committee develops basic policies on waste reductions, recycling, and green procurement. It also undertakes studies to improve qualitative data for wastes. In accordance with green procurement guidelines, the committee classifies hazardous materials found in products as banned, restricted, and self-controlled. The committee has requested materials suppliers to respect this classification. *(For more information, please refer to p.9.)*

4) Environmental load reduction network committee

The mission of this committee is to reduce environmental negative impacts throughout overall network facilities and to take practical actions for that purpose. These will be done from the viewpoint of environmental risk management, including the potential for soil contamination and electromagnetic effects.

The committee also carrys out life-cycle assessments of telecommunication facility system services to identity totalfinancial costs. The committee is intending to use environmental accounting as a management tool.

5) Environmental technology R&D committee

This committee is assigned the task of establishing systems capable of collecting and disseminating environmental information through multimedia networks, to allow active use of telecommunications technologies for environmental protection. It also develops green R&D guidelines on the issues such as energy conservation, resource management, disposability, and recyclability of our products. *(For more information, please refer to pp.11 and 32.)*

Other activities include publication of environmental reports and establishment of an ISO 14001-compliant environmental management system at each Group company. We have selected model offices in order to identity appropriate environmental management systems for our operations and are currently applying the findings and achievements to some offices and divisions.

3 PDCA for NTT Group system for promoting environmental protection issues

◆ PDCA for NTT Group system for promoting environmental protection issues

As indicated in *Fig.1.3-1*, NTT Group implements the PDCA (Plan-Do-Check-Action) cycle for promoting environmental protection actions.

Based on the NTT Group's corporate mission and global environment charter, the NTT Group global environment protection promotion committee establishes the followings, on the basis of which each Group company develops action plans or detailed division-specific programs for implementing environmental protection activities.

* *Basic environmental policy*
* *Annual plans*
* *Mid-to-long term plans*
* *Action goals*

Each Group company or office performs environmental self-monitoring and undergoes environmental audits carried out by an internal environmental protection promotion organisation. Implementation status is further assessed by the global environmental protection promotion committees of each NTT company and the Group. The result of the audit is take reflected to the improvement of environmental policies, annual plans, mid-to-long term plans, and action goals.

Plan

Corporate principle of the NTT Group

Global Environment Charter of the NTT Group

Annual plans and detailed programs for mid-to-long term plans for the entire NTT Group and for each Group company

Action

Review of environmental policies, mid-to-long-term planning, and goals, etc.

Do

Implementation of environmental protection activities at each Group company

Check

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

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

Assessment of the implementation status by the Group global environmental protection promotion committee
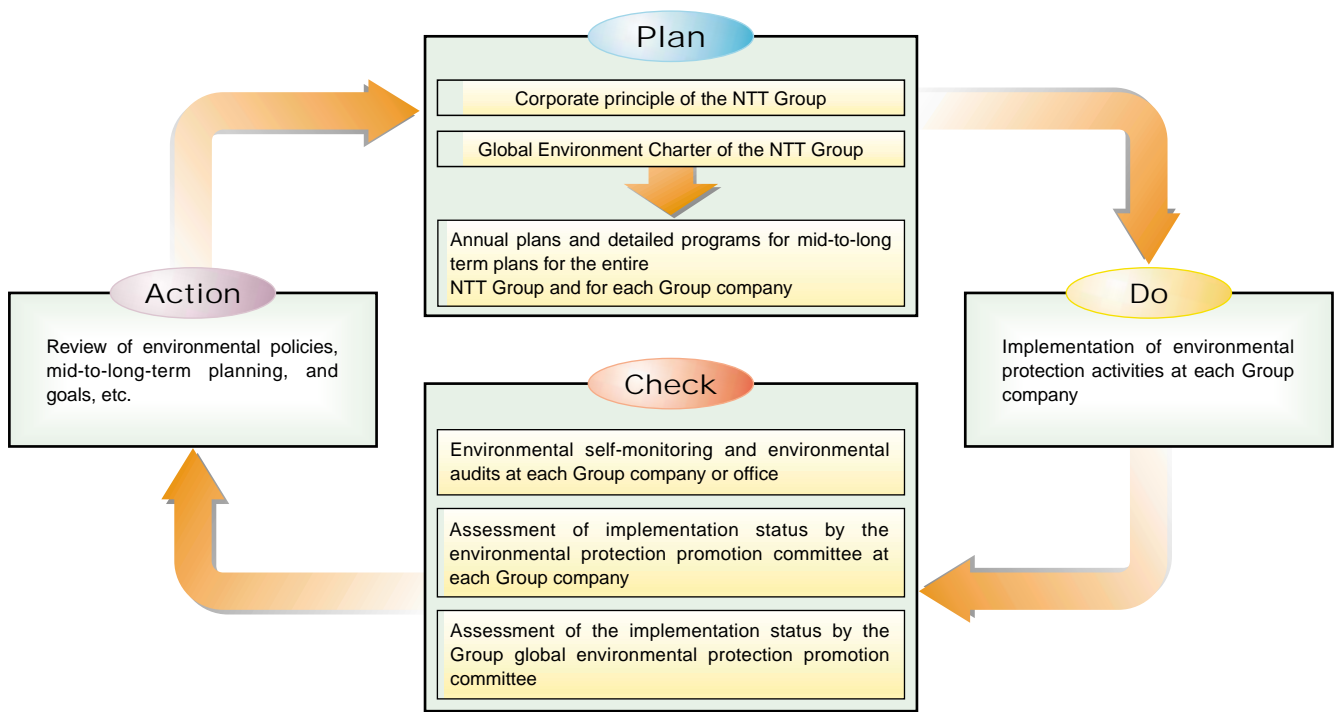
Fig.1.3-1: PDCA (Plan-Do-Check-Action) for NTT Group system for promoting environmental protection issues

5

1 Major action goals and achievements

This chapter describes the goals to be met by fiscal 2000, as established in 1991, as well as recent data on paper resource management, prevention of global warming, waste management, and ozone layer protection. The figures provided in this chapter have been taken from the former NTT, prior to its reorganization. Data for CO_2 emissions include figures for NTT DoCoMo and NTT Data.

◆ *Paper resource management*

Over 95% of paper resource consumption at NTT Group is accounted for by telephone directories. The paper resource management for telephone directories is carried out primarily by increasing the ratio of recycled paper. The ratio in fiscal 1990 was 34%, increasing to 48% in fiscal 1998. Despite the technical difficulty, it has become feasible to increase the recycle paper rate for extremely thin paper, as in Telephone directries. It is due to the cooperative efforts of paper manufacturers. In 2001, we plan to introduce a closed loop system that will produce new telephone directories from used directories. We are also working on reducing office paper consumption (primarily copying paper) by promoting a paperless environment (e,g,relying on projectors at conferences and e-mail) and by using both sides of copy paper, reducing paper consumption to one fourth of 1990 levels. Total pulp consumption has been reduced about 20% since fiscal 1990, achieving the target set in 1991.

(For more information, please refer to p.14.)
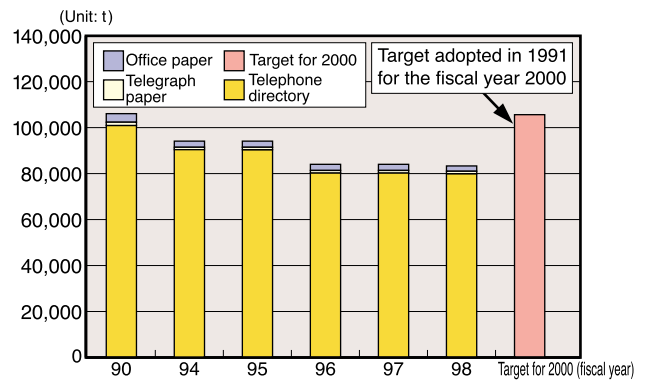
Fig. 2.1-1: Historical development of pure pulp consumption

◆ *Preventing global warming*

Approximately 80% of CO_2 emissions attributed to the NTT Group comes from consumption of electricity purchased from electric power companies. Most power consumption occurs at telecommunications facilities, such as switchboards. To cope with the rapid increase in demand for cellular phones and internet access, we are currently involved in significant upgrades of our telecommunications facilities. We successfully reduced CO_2 emissions by some 6,000 t in fiscal 1995 through energy conservation campaigns and other efforts. From 1997, Group-wide initiatives including Total Power Revolution, which encourage the development of energy-efficient equipment from early R&D stages, have hold CO_2 emission increases to minimum levels, as indicated in *Fig. 2.1-2*. About 5% of CO_2 emissions derive from 40,000 company vehicles. These levels have been reduced 15% from 1990 levels.

Fig. 2.1-3 shows the level of energy conservation (CO_2 emission/sales). Energy consumption per sales exhibits a decreasing trend, demonstrating the progress of energy conservation actions.

The target figure adopted in 1991 was to reduce emissions below 1990 levels by 2000. Rapidly increasing telecommunications demands has made achieving this goal fairly difficult, but we continue to strive for meeting this target by the next fiscal year.

(For more information, please refer to p.17.)

Fig. 2.1-2: Historical development of CO_2 emissions
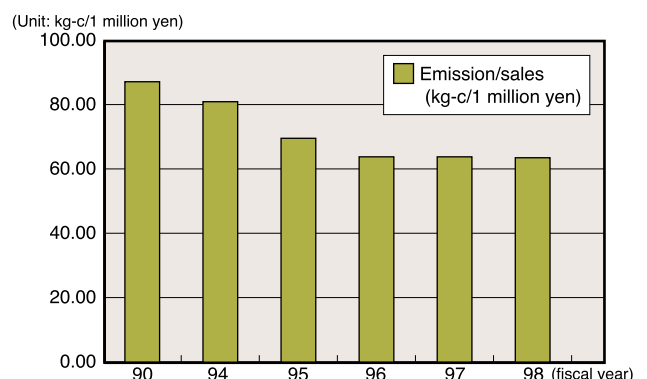
Fig. 2.1-3: energy consumption per sales

◆Waste management

Industrial wastes generated by NTT Group operations mainly originated from communication facilities and equipment, civil engineering projects, construction projects, and offices. Industrial post-recycling wastes that require final disposal amount to about 120,000t. As indicated in *Fig.2.1-4*, over 70% of this waste is made up of material from civil engineering and construction projects. Including these figures, the volume requiring final disposal has been reduced to 27% of 1990 levels, due to improved recycling ratios and other factors. This achievement exceeds the target adopted in 1991 by a factor of nearly three. *(For more information, please refer to pp.20 and 25.)*

(Unit: 10,000 t)

Legend:
- Office waste products
- From construction works
- Target for 2000
- From civil engineering works
- From communications facilities

Target adopted in 1991 for the fiscal year 2000

X-axis: 90, 97, 98, Target for 2000 (fiscal year)
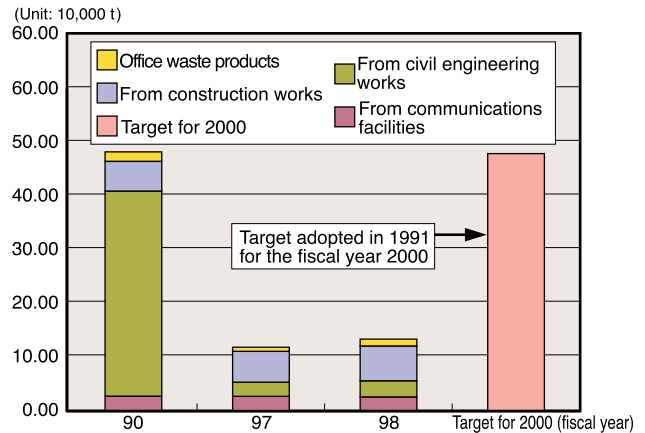
Fig. 2.1-4:
Historical development of waste products put in final disposal

◆Protecting the ozone layer

In order to realize the complete elimination of first-time use of ozone depleting substances such as CFCs, as prescribed in the Montreal Protocol, we have ceased the use of CFCs for the detection of cable gas leakage, washing crossbar switch contacts, and washing semiconductors. By the end of fiscal 1994, we achieved complete termination of first-time CFC use. We are currently working for further reduction of CFC use by replacing CFC-reliant turbo refrigerators. *(For more information, please refer to p.28.)*

1 Establishment of an environmental management system

◆*Establishment of an environmental management system*

NTT Group is currently working to establish environmental management systems.

There are generally two options; the establishment of an environmental management system in compliance with ISO 14001, and the acquisition of official certification of, or registration to, ISO 14001.

Unlike acquisition of ISO 14001 certification, voluntarily establishing an environmental management system does not require registration. Since official certification for 14001 requires auditing and registration, which involve considerable time and cost, we should be thoroughly prepared, before deciding to go far the process.

The NTT Group intends to establish voluntary environmental management systems compatible with ISO 14001. We believe that each Group companies should establish and implement an environmental management system suitable for their operational conditions, even if they do not acquire official certification. Each company is also expected to maintain proper awareness of environmental issues.

Cases of ISO 14001 certification

The following gives a brief introduction to several cases involving acquisition of environmental or ISO 14001 certification by NTT Group organizations. The registered entities are merely examples of existing certification and do not include accounts of entities currently working toward certification, or those scheduled for certification in fiscal 1999.

Table 3.1-1: Examples of ISO 14001 certification cases within the NTT Group (as of December 1999)

Registered entity	Registration date	Registered department	Remarks
NTT Material Procurement Dept.	November 20, 1997	Material Procurement Dept.(former)	* First registered NTT department
NTT DoCoMo	November 27, 1998	Materials Dept.	* First registered mobile communications operator
NTT <holding company> Access Service System Laboratory	December 21, 1998	Tsukuba and Tokai location	* Development of facilities and products with minimumenvironmental impact * Elimination of small incinerators
Komatsu Sales Office, NTT West	December 24, 1998	NTT Komatsu branch (former)	* First registered NTT branch
NTT Learning Systems	January 26, 1999	Document System Dept.,Multimedia Division	* First instance of registration within the publishing industry in Japan
NTT DoCoMo Tokai	June 16, 1999	DoCoMo Tokai, DoCoMo Engineering Tokai, DoCoMo Service Tokai, DoCoMo Mobile Tokai	* Simultaneous registration for four group companies
NTT DoCoMo Hokkaido	June 30, 1999	Headquarters (excluding branch offices)	* First communications carrier registered in the Hokkaido region
NTT DoCoMo Kansai	July 28, 1999	Materials Dept.	* First mobile communications carrier registered in the Kansai region
NTT Data	July 28, 1999	Toyosu Bldg. and Shinagawa Bldg.	* Promoting recycling external environment-related businesses and internal grass-roots environmental protection activities
NTT Logisco	August 30, 1999	Toranomon Mitsui Bldg. (Headquarters) and Sakai Center (Kansai Office)	* Provision of physical distribution services * Simultaneous registration with ISO 9002 (first of its kind in Japan)
NTT DoCoMo	October 7, 1999	Yamanashi Branch	* First registered DoCoMo branch
NTT Electronics	October 20, 1999	Ibaraki Office	* Manufacture of wavelength multiplexing optical communication devices
NTT East	October 28, 1999	Materials Procurement Center	* Registered for materials procurement operations for telecommunications facilities
NTT West	October 28, 1999	Materials Procurement Center	* Registered for materials procurement operations for telecommunications facilities
NTT Communications	October 28, 1999	Network Business Division, Materials Dept. of East Japan Facility Network Center	* Registered for materials procurement operations for telecommunications facilities
Hokuriku General Technology Center, NTT West	October 28, 1999	All departments of the Center	* Registered for overall construction of telecommunications facilities
Nagoya Branch, NTT West	November 12, 1999	Toyohashi Sales Branch area	* Telecommunications industry operations
NTT <holding company> Science & Core Technology Laboratory Group	December 22, 1999	Atsugi R & D Center	* Basic R&D involving telecommunications

* "former" indicates an earlier entity prior to the NTT reorganization or an earlier departmental designation before reorganization within a Group company.

2 Guidelines for procurement, design, and R&D

◆ Green Procurement guidelines

Actions for Green Procurement

Since the NTT Group has no manufacturing divisions, the environmental impacts associated with the products we procure could affects the environment-friendliness of our operations. Since fiscal 1997, we have worked on Green Procurement, which prioritizes the purchase of products with less environmental impact.

In July 1997, we established the NTT Group Green Procurement Guidelines, as indicated in *Fig. 3.2-1* (revised August 1999), requesting the cooperation of our suppliers.

Actions taken by suppliers

Environmental policy
(Each supplier develops its own environmental policies.)

Environmental management system
(Each supplier establishes an environmental management system.)

Implementation of product assessment
(Precautions for product development/design)

Materials (promoting consistent and compatible materials; minimizing the use of hazardous substances)

Resource-conservation (promoting use of recycled materials; reducing first-use materials; extending product life)

Easily disassembled or decomposed (promoting the use of recyclable parts and structures that facilitate disassembly by material type)

Marking (promoting clear indications of material identity and correct disposal information)

Energy conservation (minimizing electricity and fuel consumption)

Packaging materials (clear indication of material names; promotion of structures that facilitate recycling; reducing first-use materials)

Disposability (consideration for disposal safety)

Recycling and disposal methods (requesting proposals for recycling and disposal methods)

Fig. 3.2-1: NTT Group Green Procurement Guidelines

In January 1998, the NTT <holding company>, NTT East Corporation, and NTT West Corporation also established the following <Supplementary> Green Procurement Guidelines, as indicated in *Fig. 3.2-2* (revised August 1999), and we have continued to call for the cooperation of our suppliers.
Green Procurement at the NTT Group is implemented based on the schedule shown in *Fig. 3.2-3*.

Also, each NTT Group company is working on Green Procurement of individual products.

Standardization and selection of plastic materials

Recommended plastic materials
(polyethylene, polypropylene, polystyrene, polyester)

Clear indication of specific plastic materials

Material symbols
(promoting the indication of JIS-specified symbols)

Minimizing the use of hazardous substances

Banned substances (30 items)
Restricted substances (24 items)
Self-managed substances (based on PRTR)

Energy conservation

* Performance complying with applicable laws and regulations (based on laws rationalizing energy use and the international energy star program*)

* Items to be reduced (minimizing average power consumption, caloric values, maximum power consumption)

Fig. 3.2-2: <Supplementary> Green Procurement Guidelines

Fig. 3.2-3: Development schedule for Green Procurement

* Energy Star Program

This is a voluntary registration system approved by the governments of U.S. and Japan for energy-saving office equipment. The Energy Star logo may be granted to products through registration, which indicate the fulfillment of specified requirements.

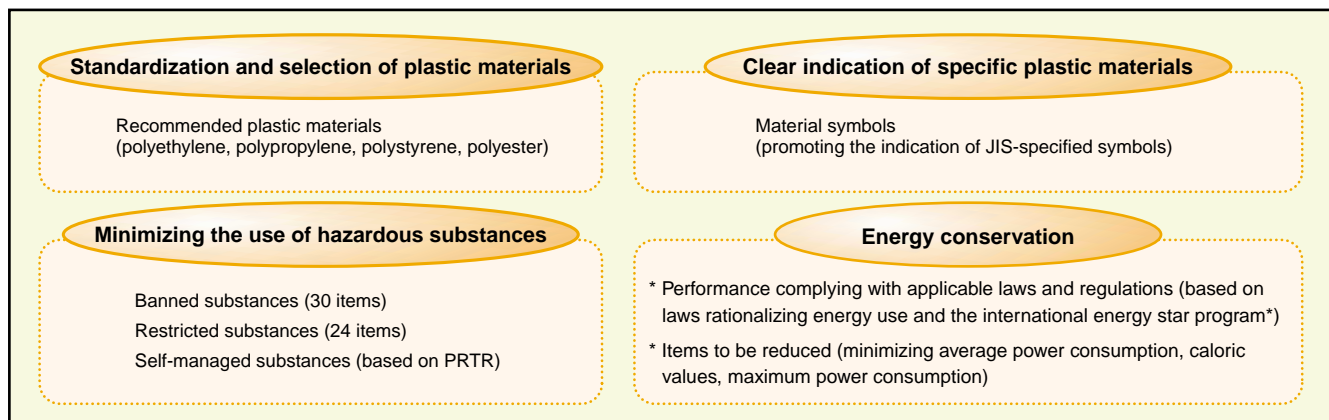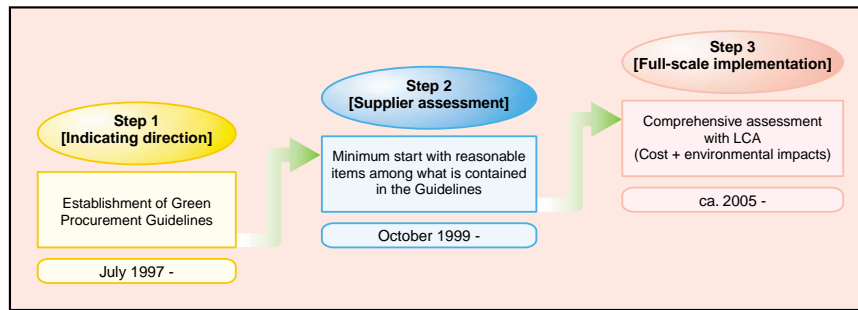Green Design Guidelines can be obtained in PDF file from the following URL.

(URL: http://ontime.ntt.co.jp/kanren/index.html)

◆*Building Green Design guidelines*

The NTT Group owns some 30,000 buildings nationwide, which contain a total floor area of nearly 16 million square meters. These facilities consume significant amounts of resources and energy and they have considerable environmental implications.

Since July 1996, NTT has promoted long-term building improvement planning based on the Building Grand Design*. Since the anticipated demolition, relocation, and construction work will increase environmental impacts. It is particularly crucial to support Green Design, which minimizes environmental impact through strategic environmental planning of these buildings.

In November 1997, NTT established the Green Building Design Guidelines to promote building design that takes environmental aspects into consideretion.

The Green Building Design Guidelines calls on designers to consider the environmental impact of their designs and demands their cooperation for environmental protection. Specifically, it establishes seven strategic issues for NTT building design. *(Fig.3.2-4)*
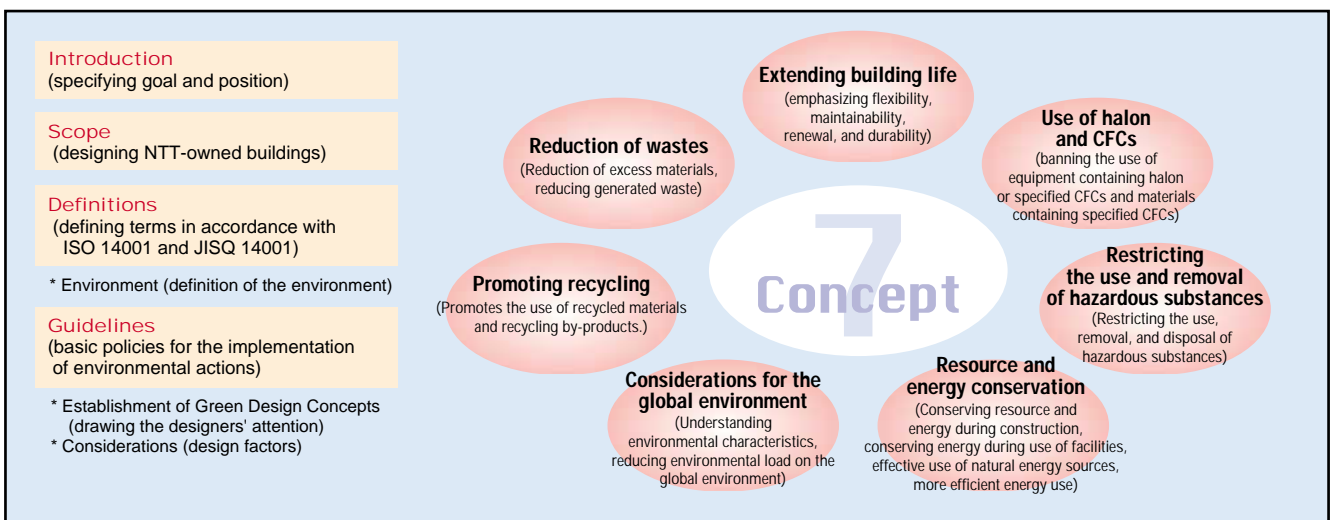

Fig.3.2-4: Green Building Design Guidelines

* Building Grand Design

Intended to allow accurate assessment of environmental changes around a building and land, ultimately reducing total costs for both building and land. Buildings are segmented by use, the particulars of which are then reflected in building improvement planning and design.

Buildings designers are to consider the environmental impact of the above seven issues throughout the entire life-cycle of the building, including construction, use, and disposal.

To implement Green Designs for buildings effectively, we must specify evaluation methods for the environmental effects of buildings, and evaluation targets based on use, size, location, and other building characteristics.

We are currently working on a Green Design Building Evaluation Method that will allow the objective evaluation of buildings constructed according to the Green Design system.

In the Green Design Building Evaluation Method, the design of a proposed building is evaluated against the seven issues specified in the Building Green Design Guidelines to produce "environmental points", or EPs. These are scored according to a technique which assigns certain weights to various factors to produce a comprehensive evaluation index for a building's environmental performance. Environmental points (EPs) are granted in accordance with separate evaluation standards* (criteria), enabling objective evaluations. The quantitative indexes can also account for qualitative characteristics such as visual impacts.

In future, we plan to standardize the environmental performance of NTT Group buildings based on experience with the Green Design Building Evaluation Method, refining the Green Building Design Guidelines and ultimately establishing numerical targets for environmental performance, which can then be used as requirements for building design in order to reduce the environmental negative impact involved in building construction.

* Evaluation standards
These are summarized in an evaluation sheet that defines evaluation standards for various environmental considerations. There are three separate standards for new offices, renovations of offices, and renovations of communications equipment rooms.

◆ Green R&D guidelines

The cycle of mass production, mass consumption, and mass disposal, and the use of hazardous substances have had profound effects on the global environment, as well as local communities. Given these circumstances, businesses must evaluate environmental impact and try to reduce unnecessary environmental effects throughout the entire life cycle of products and services. The Environment Basic Law enacted in November 1993 established the environmental responsibilities of national and local governments, business enterprises, and individual citizens, requiring each party to fulfill their responsibilities.

In research and development on new services, systems, and products, NTT will be faithful to its Green R&D Guidelines, which summarize various environmental considerations from the first stages of research and development.

The Green R&D Guidelines require the incorporation of strategic environmental considerations into our R&D activities. For example, during R&D, products are to be designed to enhance thier recyclability and decomposability. The Guidelines require minimizing the energy consumption of NTT systems and equipments. It further demands energy efficiency of equipments for the R&D activities.

Overall, the Green R&D Guidelines is aiming to raise our environmental awareness through compliance with the Guidelines.

◆ Green Procurement Network

When purchasing daily office supplies (copy paper and stationery, etc.), NTT Group has long given considerations to environmental aspects well as price and quality. Since 1996, the NTT <holding company>, NTT East Corporation, NTT West Corporation, NTT Communications, NTT Data, and NTT Mobile Communications Network (DoCoMo) have participated in the Green Procurement Network (GPN), adopting Network product guidelines to back the procurement of environment-friendly office supplies. Established February 1996, the Green Procurement Network is a voluntary network of companies, government bodies, and consumers. Some 2,000 companies and organizations nationwide are currently members on an equal status.

(URL: http://www.wnn.or.jp/wnn-eco/gpn/)

3 Environmental audits and self-monitoring

◆ Observance of laws, regulations, and internal standards

Based on the NTT Group Global Environment Charter, the NTT Group has complied with all laws and regulations on environmental protection, including local ordinances and reference values specified by various agreements. The Group also regularly report to local governments as to its regulatoly implementation.

* Self-monitoring

Since 1995, all business offices have conducted self-monitoring at least once per year to ensure proper compliance with laws and regulations (including ordinances, agreed-upon reference values, and internal regulations and standards), through using environmental check lists, on-site inspections, document inspections, and hearings. The results are reported to the NTT departments in charge of environmental protection.

* Audit

Based on the self-monitoring, the appropriate NTT departments in charge of environmental protection conduct audits every three to four years for all business offices to confirm proper observance of all the relevant issues.

* Observance of laws and regulations
Atmospheric monitoring
The number of offices equipped with boilers that have heating surface areas of over 10 square meters under the Air Pollution Control Law is as follows: three in NTT, 93 in NTT East Corporation, 101 in NTT West Corporation, 5 in NTT Communications. No business office is in violation of any applicable law or regulation.

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

Waste management
Industrial waste generated by the NTT Group consists primarily of old communication facilities (such as telephone poles and switchboards) and concrete and asphalt used for construction and engineering projects. A manifest (management chart) system *(see p.20)* was introduced in 1997 to ensure proper management of these waste products. For special industrial waste, including asbestos and infectious waste, generated from medical facilities, we have designated personnels to ensure proper management of those wastes through the manifesto system.

4 Training and awareness

We provide environmental training and educational programs through internal publications and seminars to improve each employee's environmental understanding and awareness.

* Environmental brochure
At NTT, the provision of telecommunications services capable of contributing to protection of the global environment is known as Global Coexistence Telecommunications. We established the NTT Global Environment Charter in 1991 to proclaim the basic principles and policies for the entire NTT Group. In 1995, we issued an environmental brochure that summarizes NTT Group's activities for Global Coexistence Telecommunications. This was subsequently revised in 1997.

* Environment-related internet site
Telecommunications in Symbiosis with the Earth-NTT Group
In 1995, we produced an environmental brochure entitled Telecommunications in Symbiosis with the Earth-NTT, currently available on the NTT URL site. It focuses on the following five categories of the issues. Forests and NTT, The Sky and NTT, The Earth and NTT, Wildlife and NTT, and People and NTT.

Report on NTT Group Environmental Protection Activities
Detailed information is available by accessing the Internet home page of the NTT Group Promotion Activity for Environmental Protection.
Downlording as a PDF file is also possible.
(URL: http://www.ntt.co.jp/kankyo/index.html)

"Environmental goo"
Since 1999, NTT-X has provided "Environmental goo" as an environmental information site, covering environmental news and events. *(For more information, please refer to p.35.)*
(URL: http://eco.wnn.or.jp/index.html)

WNN (World Nature Network)
Since 1995, this site has provided up-to-date information on issues such as the global nature, environment, leisure, society, and traditions. The site provides four menus concerning the environment: Environmental goo, Clean energy, The Kids' Eco-Club, and the World Bird Count. From 1999, NTT-X began offering a total of 21 menus.
(URL: http://www.wnn.or.jp/menu.html)

*** NTT Business and NTT Technology Journal
(internal magazine)***

Since 1992, NTT Business has distributed monthly news about the NTT Group's environmental activities. The publication is now divided into NTT East Business and NTT West Business. Both offer information, primarily on environmental activities, at the corresponding companies. NTT Technology Journal features outstanding environmental protection activities.

*** Environmental CD-ROM***

In 1998, we issued a CD-ROM entitled "Global Co-Existence Telecommunications NTT" summarizing NTT's environmental protection systems, our activities for establishing environmental management systems, and other information on environmental issues. This was distributed to all employees as an internal training material.

*** The Road to the Establishment of an Environmental
Management System—Working Toward ISO
Registration***

Since August 1997, the NTT Group has worked on selection of model business offices prior to the establishment of ISO 14001-type environmental management systems. The case studies for the establishment of environmental management systems, and the NTT Group's environmental protection activities, were compiled in this booklet, which was distributed in June 1999 to all employees.

*** Internal Seminars***

Particularly to the business offices preparing for environmental management systems, we invite experts to lecture on various issues involving ISO 14001 certification and registration.

1 Paper resource management

◆ Telephone directory: for environment-friendly telephone directories*

The NTT East and NTT West issue some 125 million telephone directories annually, manufactured from some 150,000 tons of paper, which account for approximately 0.5% of Japan's total annual paper consumption.
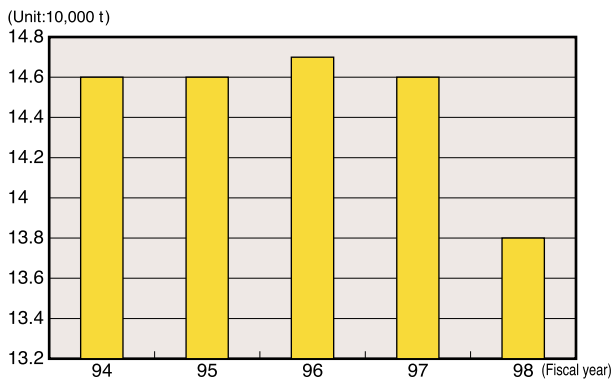
(Unit:10,000 t)

Fig.4.1-1: Paper consumption for telephone directories

[Reduction of virgin pulp consumption]

The NTT has taken the following measures to reduce paper consumption:

* *Dividing listed regions through the publication of various area-specific telephone directory editions, and reducing publication frequency*
* *Using more accurate calculations regarding the proper number of copies to be distributed*
* *More thorough checking of customer requests for telephone directories*
* *Development of multimedia directories, such as CD-ROM directories and Internet Town Pages**

We are also reducing the virgin pulp content of the paper used for telephone directories. *(Fig. 4.1-2)*

The current content ratio for recycled paper (recycled pulp) is approximately 50%. We plan to increase this ratio in near future.
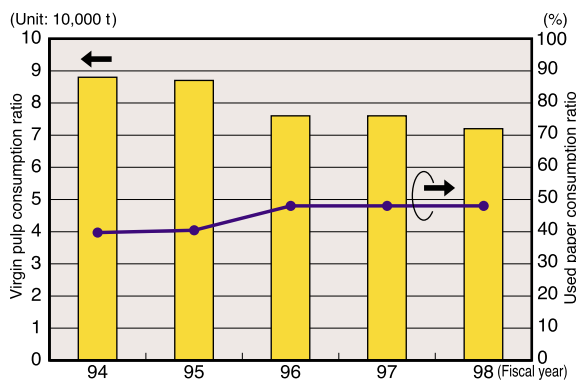
(Unit: 10,000 t)   (%)

Fig. 4.1-2:
Virgin pulp and recycled paper consumption ratios in telephone directories

[Handling of facilitating collection of old telephone directories]

Both NTT East and NTT West have established a coordinated system for collecting old telephone directories when new ones are delivered. Thorough training is provided in advance to delivery personnel to ensure that they collect old directories. Even if a customer is not home at the time of delivery, the delivery personnel will visit again to collect the old telephone directories free of charge at the customer's request. The delivery notice and contact number are printed on the polyethylene bag containing new directories. These and other measures have dramatically increased the amount of old directories collected *(Fig. 4.1-3)*.

Most of the collected directories are recycled into corrugated medium or cardboard. They are also made into materials used internally as magazines, invoices, envelopes, flowerpots, and toilet paper, as well as auxiliary construction materials and water purification agents.

(Unit: 10,000 t)
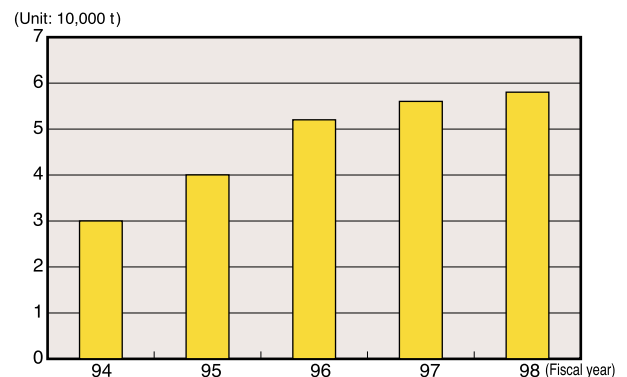
Fig. 4.1-3: Weight of collected telephone directories

The current Town Page* paper is tinted yellow, with adhesive agents used for the covers, making it difficult to recycle. In 2000, to make recycling technically easier, we plan to use white paper. We also plan to request paper manufacturers to soon introduce recycling facilities capable of completely removing the adhesive agents. Once these obstacles are cleared, currently planned for 2001, we are able to have a circulatory recycling system in which old directory paper is used to produce new directories—closed loop recycling for telephone directories.

[Development and introduction of environment-friendly materials for telephone directories (Green Procurement)]

We introduced the Green Procurement system in June 1996. This system is scheduled for expansion to cover procurement of ink and adhesive agents.

◆Introduction of recycled paper into telegram paper; use of environment-friendly material

In fiscal 1998, the total number of telegrams handled by NTT East and NTT West was 36.18 million, all of which were carefully packaged on mounting cardboard for delivery to recipients.

There are approximately thirty types of mounting cardboard, made of paper, cloth, or paper and cloth for different social occasions, such as celebrations and condolences.
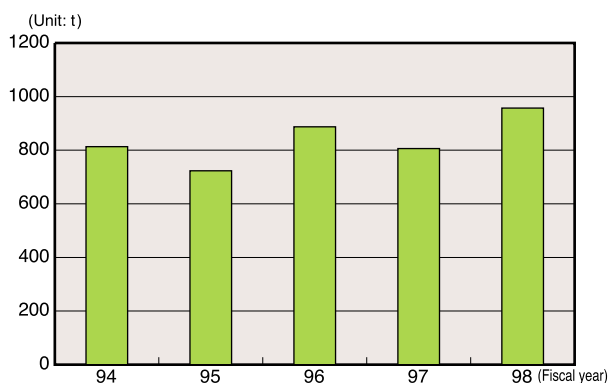

Fig. 4.1-4: Virgin pulp consumption for telegram-related paper

As a paper resource management measure, we have actively promoted the use of recycled paper in place of virgin paper. Currently there are ten of the thirty types of telegram mounting boards, as well as for message output paper. We have increased the rate of recycled paper used for the telegram message output (for condolences and for general use). As a result, in fiscal 1998, the content ratio of the recycled paper reached approximately 50%. Overall consumption in fiscal 1998 increased slightly, despite efforts to reduce the consumption of virgin pulp from fiscal 1991, due to increased sales of the mounting boards.

In the future, we plan to increase recycle paper use in the mounting cardboard, especially for congratulatory telegrams, which to date have not incorporated recycled paper. We will also promote the use of recycled paper and other environmentally preterable materials for new mounting board designs.

◆Introduction of recycled paper into bills and other documents

Paper consumption for invoices and other business correspondences sent to NTT East and NTT West customers amount to about 10,000 tons annually. Since 1991, we have promoted the use of recycled paper for invoices and other documents; the current content ratio of recycled paper for them is 50% (3% of which is provided by recycled telephone directories), and that for envelopes stands at about 40%. These have reduced the use of virgin pulp to about 6,000 tons annually.

Although some technical diffuculties have prevented the reduction of invoice paper, we plan to increase the recycled paper content of other paper materials, such as envelopes, which do not require technical complication.

We also send a single invoice to customers even when they use multiple telephones. We are further working on reducing the numbers of bills and envelopes by recommending that customers receive these documents on magnetic format, with free of change.

◆Activities in office paper recycling: Kanazawa (Kanazawa Branch, NTT West)

"Office paper recycling: Kanazawa" is a voluntary club of companies (offices and building maintenance companies), waste recovery companies, wastepaper wholesalers, paper manufacturers, and paper wholesalers, etc. in and near Kanazawa City. It was established in order to contribute to global environmental protection activities including prevention of global warming and reduction of waste in the Kanazawa region, under the initiative of the Kanazawa Branch of NTT West. With a Branch secretariat established in October 1995, the club began with 42 member companies. The number of participating companies has steadily increased since, to a current membership of 85.

The main objective of the club is to establish a recycling circle, or implement 'locally completed recycling systems' through the seperate collection of wastepaper from offices, and to produce100%-recycled toilet paper and other products under the club's brand name. These products are then purchased and used by club members. Its activities have been well-received, winning a prize from the Minster of International Trade and Industry in October 1997.

In future, the club plans to recycle shredded and incinerated confidential documents through a confidential document recycling system, and to develop new club-branded products, such as file-holders and letter files. We plan to expand the market for club-brand products, currently used by members only, to the general public.
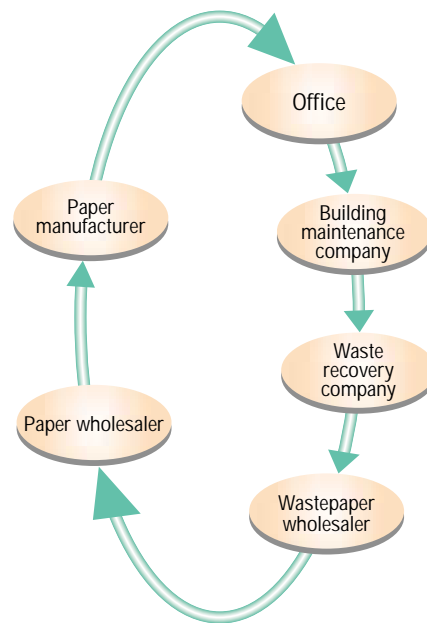

Fig. 4.1-5: Recycling circle (locally completed recycling system)

◆Paperless office through use of the internal intranet system (Miyagi Branch, NTT East)

The Miyagi Branch of NTT East (formerly the Sendai Branch) began work on establishing an internal intranet system in fiscal 1995, and has since worked on BPR(Business Process Reengineering) throughout its entire business operations from beginning to end by using PCs. As a result, various BPR tools have been developed and deployed. For example, a BPR tool called SO-^ was introduced in July 1997 to contribute to a paperless environment. This BPR tool directly inputs data for area construction instructions and communication line testing instructions into PCs to facilitate paperless constructions and improve operational efficiencies. These documents were formerly output on hard copy from our integrated customer information system (CUSTOM). This system has achieved a reduction of 2,000 papers per day, or 480,000 papers annually, reducing paper output from CUSTOM by 25% and achieving an overall 2.5% reduction of paper consumption at the Miyagi Branch.

Other operational initiatives include the following.

NetStep 98 System
A series of operations, from customer applications to actual construction, can be performed on the intranet, eliminating paper use.

Net Authorization System
All internal materials are shared over the intranet to expedite approval and authorization.

Paperless Conference
All conference materials are entered into shared servers connected through the intranet, then used in actual conferences with projectors, without paper-based output.

◆Lightning Fax

NTT began offering systems promoting the paperless office from September 1997. Since July 1999, NTT-ME has offered Electronic Fax as a next-generation service.

Electronic Fax connects fax machines, PCs, and LANs, enabling clients to send and receive fax messages on their PCs. The fax documents are stored and maintained in servers in the form of electronic data, enabling a paperless office environment.

In a conventional fax system, both sending and receiving ends are paper-based. In contrast, Electronic Fax enables a sender to send messages directly from a PC. Since messages are received and stored by servers, a receiver can check the contents of the message on-screen and choose to print only those documents that are necessary.

Introducing Electronic Fax to the marketing department reduced fax paper consumption by an average of 250 pages (A4 size) per day per PC.

2 Preventing global warming

◆ Total Power Revolution (TPP) campaign involving the entire NTT Group

In fiscal 1998, electricity purchased by the NTT Group amounted to 5.2 billion kWh (¥71 billion), which translated to 510,000 t-C (*) in CO_2 emissions.

(*) t-C* is a unit for which the weight of all greenhouse gases, including carbon dioxide and methane, is converted to that of carbon (C). For example, *100t-C** indicates a carbon-converted weight of 100 tons, or approximately 367 tons in carbon dioxide (CO_2) (multiplied by 44/12).

Power consumption is expected to increase due to the widespread use of multimedia and ISDN services, as well as other information technology advances, such as the use of optical fiber cables. If energy consumption continues to grow at the present rate without efforts to curb our requirements, the amount of electricity purchased in 2010 will reach 10 billion kWh. At this level, the NTT Group would emit approximately three times the carbon dioxide (CO_2) of the 1990 level.

The NTT Group has taken up initiatives to reduce electricity consumption. In October 1997, NTT launched the Total Power Revolution (TPP) to cope with electricity-related issues from the early R&D stages.

In February 1998, we established "the Vision for Reducing Electricity Requirements Toward 2010" to ensure the success of the TPR initiative. *(Fig. 4.2-2)*

To achieve these goals, the TPR initiative has been targetting with the following four major areas.

1. Energy reduction measures through R&D
We are currently involved in technical development of reduction of power consumption so that lower operating voltages of LSI-comprising communication facilities could be achieved. By 2000, power consumption is scheduled to be reduced to 1/5 the
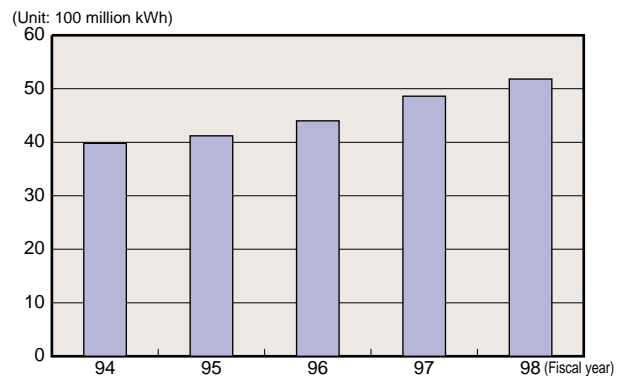

(Unit: 100 million kWh)

Fig. 4.2-1: Electricity purchased

current level, then to 1/25 by 2005.

With the use of the low-voltage LSI, we plan to develop communications equipment requiring only 2/3 of the current level of electrical consumption in 2000 and 1/3 by 2005.

2. Energy reduction measures at departments that use communications equipment
In order to achieve energy consumption reduction, it is important to introduce the appropriate technology to the right department. NTT is committed to do so, based on a various assessment, such as on geographical location of a building, degree of efficiency of communication equipment installed, etc.

3. Energy reduction measures at departments that maintain and manage power-generating equipment
Ensuring proper management of power consumption at each building requires voluntary and self-initiated cost management activities in daily operations. Energy management personnel are appointed and allocated throughout the country to promote more meticulous TPR activities.

4. Establishing the most appropriate energy system for efficient use of NTT resources

* Development of low-power devices and parts, such as LSI, in the first step toward 2005
* Efficient introduction of communications facilities equipped with the results of the first step by the end of 2010, in the second step
* Improving the self-supply ratio of electricity from the current 2% to 10% by 2005 and 30% by 2010 through private power generation
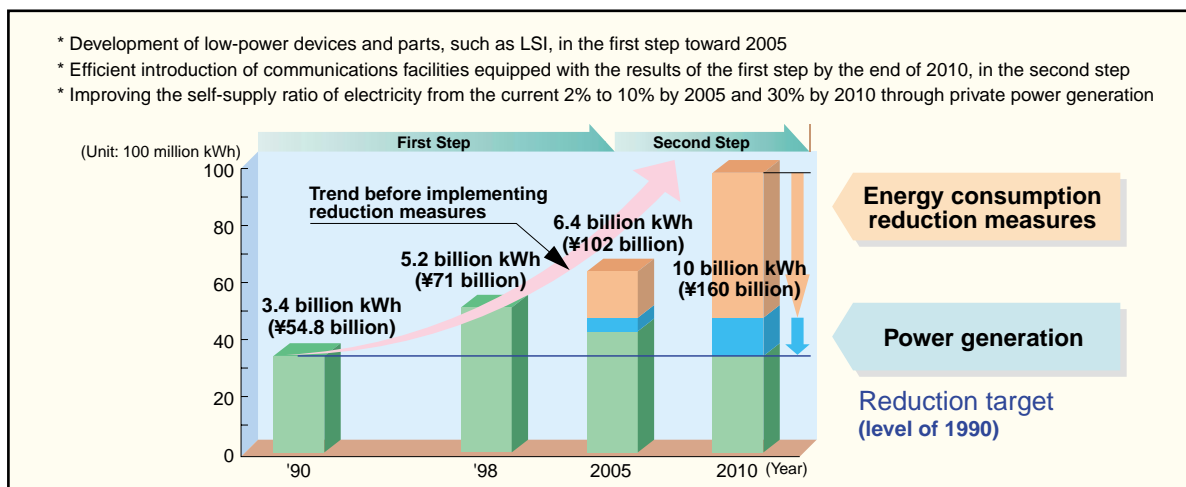
Fig. 4.2-2: Electricity purchased

In certain cities, we have worked on self-power generation with the co-generation system (CGS) and photovoltaic power generation. We also plan to increase the self-supply ratio through self-power generation from the current 2% to 10% in 2005, and 30% by 2010, reducing our costs and reducing peak power consumption loads. As future R&D targets, we plan to study the possibilities of using fuel cells and solar cells.

Through these four measures, we managed in 1998 to reduce the amount of electricity purchased by the entire Group by 210 million kWh (¥3.6 billion), compared to a case in which no countermeasures were taken. This result translated to a reduction in CO_2 emissions by 22,000 t-C.
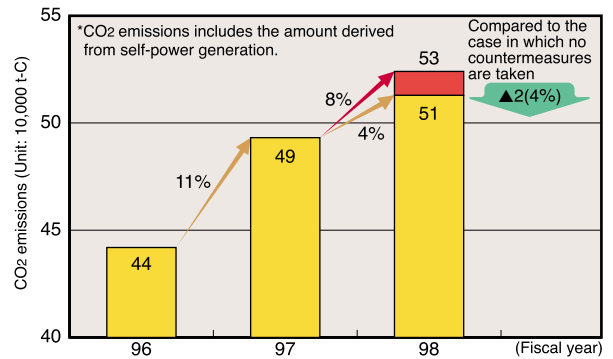
Fig. 4.2-3:
CO_2 emissions produced by generating electricity purchased by the NTT Group

◆Low-power devices

As an option to reduce power consumption, NTT <holding company> is conducting research on low-power communication devices, especially technologies to reduce LSI power consumption in communications equipment.

Conventional LSI operates at about 5 V of source voltage. LSI power consumption changes proportionally to the square of the power of the source voltage. NTT <holding company> plans to reduce LSI power consumption by developing low-power LSI with a source voltage of 2 V by 2000, further reducing this voltage to 1 V by 2005. Using the low-power LSI will reduce the power consumption of newly developed communications devices to 2/3 of current levels in 2000, and to 1/3 of current levels by 2005.

In addition, we are carrying on our research to produce LSI capable of operating at very low source voltage, about 0.5 V. This will allow clean mobile terminals capable of operating from solar cells.
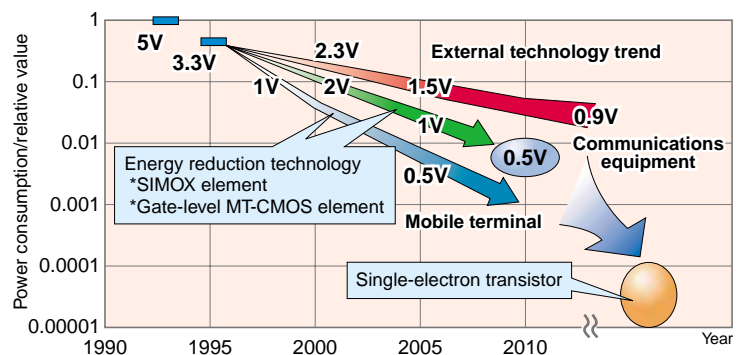
Fig. 4.2-4: Development of research activities for lower-energy LSI

◆Development and introduction of clean energy (solar light and wind power) facilities

The NTT Group built and began operating a 555-kW photovoltaic power generation system (the largest outdoor installation of its kind in the world) at the NTT East Training Center (Chofu city, Tokyo) in March 1996. After taking this first step, we established 38 photovoltaic power generation systems (about 1.2 MW) and four wind power generation systems (0.2 MW) in a varios areas of Japan as of March 1999, providing a total power generating capacity of about 1.4 MW. Approximately 1.9 million kWh of electricity annually can be obtained from cleaner sources of energy, such as solar and wind, which translates into about 2,000 drums of oil. These contribute to reductions in carbon dioxide emissions of about 320 t-C annually.

More specific operations include technologies for more efficient energy use, such as changing the angles of installed solar cells and use of reflected light, the evaluation of promising

amorphous solar cells, establishment of more economical systems by reducing the size of framing (using angled framing and block framing), and data analyses and technical verifications performed with data collection equipment.

In March 1998, at Kume Island, Okinawa Prefecture, we constructed a hybrid system that combines wind power generation of 230 kW and photovoltaic power generation of 20kW. This facility makes use of a fluctuation-reduction technology capable of absorbing fluctuations in voltage and frequency of electricity, generated by a wind power generator. We believe this represents an effective use of energy in harmonious with the environment.

In future, we plan to realize an optimal energy system* based on long-term perspectives as a preparatory step for the advent of a full-fledged clean-energy age.

◆ *Water purification system based on solar power generation*

The NTT Group constructed a photovoltaic power generation system for water purification in Mitsugi Park, Itabashi-ku, Tokyo, in May 1998 (currently operated as part of the NTT Facilities). This photovoltaic power-generating system for water purification is based on a floating body with power storage functions. It is capable of purifying water without damages to the ecosystem. It also can operate withought external power supply in case of emergency.

This system is a disc-floating structure with 10 m in diameter, mounting solar cells capable of generating 5 kW electricity It efficiently utilise solar energy, regardless of the direction of the disc. The water purification system has the following four processing functions:

* Aeration
To improve dissolved oxygen concentrations and to reduce hydrogen sulfide

* Filtering
To remove suspended solid matter in water

* Phosphor absorption process
To prevent algae proliferation through phosphor removal

* Pressurization
To reduce algae propagation

These functions can be chosen and combined in accordance with water quality and contamination levels of the pond or lake in which the system is installed.

This system also allows the general public, particularly children, to embark on it, so that they can acquire hands-on experience with aquatic environment mechanisms. With this use in mind, thorough safety precaution measures have been taken for this facility.

◆ *Promoting low-pollution vehicles*

Reduction of carbon dioxide emissions from automobiles

As of the end of fiscal 1998, the NTT Group owned approximately 44,000 company vehicles, which annually produce approximately 24,000 tons of carbon dioxide. Carbon dioxide emissions increased slightly from 1996 to 1997. However, due to large-scale introductions of vehicles for high-lift tasks at NTT-TE companies to promote safer and more efficient operations, CO_2 levels are far below 28,000 tons, the level for fiscal 1990, which is the action plan target for the entire NTT Group (*). To reduce CO_2 emissions from these vehicles, the NTT Group has promoted the introduction of low-pollution vehicles, anti-idling campaigns, and reductions of vehicle numbers.

As of the end of 1998, the number of low-pollution vehicles introduced within the NTT Group was 130 *(Fig. 4.2-6)*, indicating a steady increase from 1994 levels. We plan to introduce more low-pollution vehicles with technical advances in this field in our mind.

* NTT Group Action Plan Target is:
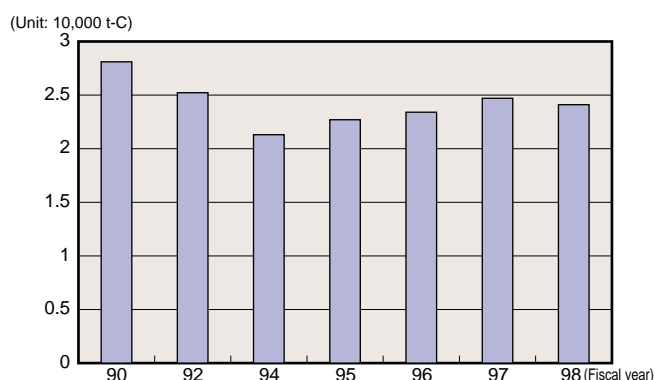To maintain CO_2 emissions at 1990 levels in and after 2000.*

(Unit: 10,000 t-C)

Fig. 4.2-5: CO_2 emissions from company vehicles
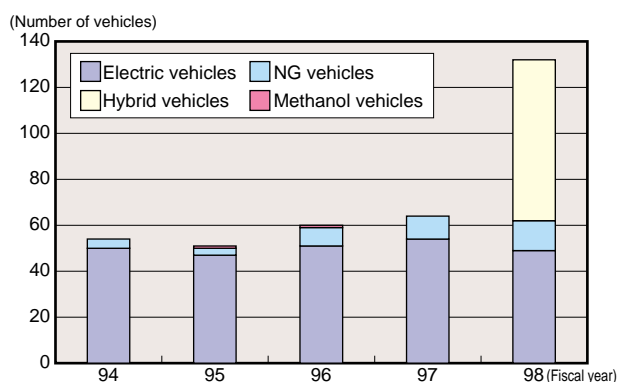
(Number of vehicles)

Fig. 4.2-6: Number of low-pollution vehicles introduced

◆Promoting anti-idling campaign

The NTT Group has promoted an anti-idling campaign for all company vehicles to reduce emissions of carbon dioxide and nitrogen oxide, noise, and fuel consumption. Stickers were placed on all company vehicles and a brochure distributed to all employees to raise awareness.

In December 1998, these actions were recognized by an Effort Prize in the first Eco-Drive Contest.

* Eco-Drive Contest
Reducing vehicle emissions by reducing engine idling and promoting environment-friendly driving, held under the sponsorship of Transportation Ecology Mobility Foundation and supported by the Ministry of Transportation

◆Fuel cell

Fuel cells provide an environment-friendly clean-energy system with low noise and a high total energy efficiency of about 80% (twice the levels achieved by thermal power generation). Since 1986, the NTT Group has consistently promoted R&D activities on fuel cells, ranging from materials and parts to entire systems. In fiscal 1999, following a system introduced to NTT East Training Center, a second system (a multi-fuel cell system with an output of 200 kW) was introduced to Musashino R&D Center. In all, two systems are currently being operated.

The multi-type fuel cell system, developed by NTT, is equipped with backup capabilities to ensure operations even in emergencies. If the city gas supply is suspended due to disaster or accidents, the fuel supply system is automatically switched to

LPG, the contingency fuel, prepared in advance. Power generation is maintained, ensuring stable supply of electricity and heat to the appropriate facilities. The switching from city gas to LPG is made instantaneously and causes no fluctuation in power supply to facilities.

By 2000, we will further push R&D activities to develop high-molecular fuel cell systems expected to realize cost reductions, as well as solid-electrolyte fuel cell system, which are expected to improve overall power generation efficiency. These will allow extensive introduction of fuel cell systems.

3 Waste management and proper disposal

◆Proper disposal of dismantled communication facilities and equipment (Maintaining an industrial waste database and promoting recycling, etc.)

The NTT Group employs a wide variety of communications facilities and equipment, including communications cables and switchboards. The replacement of old equipment generates about 250,000 tons of waste each year, representing a significant potential environmental impact. Rather than merely disposing of such facilities as waste materials, we promote waste reductions through recycling.

* Promotion of proper disposal and creation of database of disposal results on the Internet

Since 1997, we have introduced and managed manifest/statement systems to promote the proper disposal of removed communications facilities. Concurrently with the introduction of these statements, we have established and maintained systems that manage manifest/statement processes and collect data on disposal results entered through the internet.

This system manages the completion of waste disposals and provides the database with disposal results, which can then be
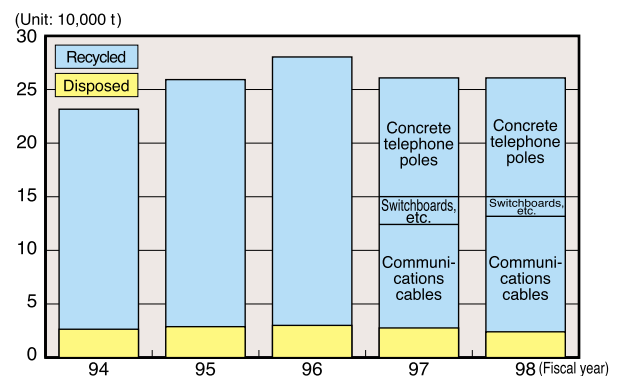

Fig. 4.3-1: Historical development of discharge, recycling, and disposal of removed communications facilities

used as an important tool for further waste reduction and recycling.

* Manifest/statement

When using external disposal companies, this system enables us to track and manage the flow of waste, with access to

information listed on the manifest/statements such as names, quantities, and qualities of waste materials, the names of collection and transportation agents and disposal companies, and instructions on waste handling.

* Reduction of wastes and promotion of recycling
We are promoting waste reduction by recycling the copper in removed communications cables, using concrete telephone poles as roadbed materials, wooden poles as chips, and battery recycling. However, we continue to face the challenge of

recycling plastics and optical fiber cables, the removal of which is expected to increase. We are currently studying various recycling methods. In the procurement of communications facilities, we are currently developing the Green Procurement system *(for more information, please refer to p.9.)*, in which priority is given to purchase items containing less hazardous substances and more recyclable items, so that procured items, when disposed, have lower negative environmental impacts.

◆*Proper disposal of soil removed from civil engineering work sites and other construction waste products*

To reduce the amount of soil discarded from construction projects involving pipe conduits and tunnels, we established a manual for their disposal in May 1993. The basic policies guiding this manual include the reduction and reuse of waste materials, and thorough implementation of proper final disposal.

The replacement of conventional excavation methods with the ACE mole method introduced in 1985 has successfully reduced the surface area of excavations and the amount of soil displaced from construction sites. In the new method, a special machine automatically excavates the ground, simultaneously laying pipes, thus contributing to improved safety and cost reductions.
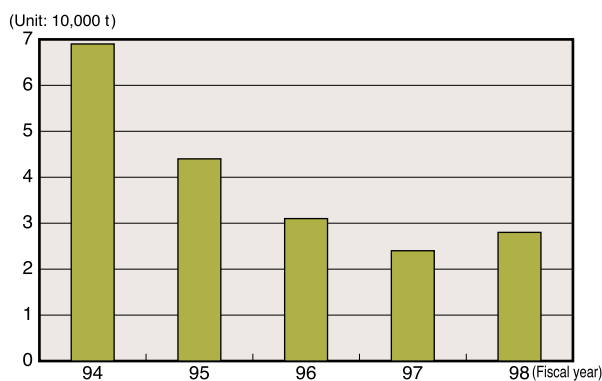
(Unit: 10,000 t)

Fig. 4.3-2:
Discharge of industrial waste materials (in civil engineering projects)

◆*Proper disposal management of construction-related waste products (construction waste products and removed soil)*

Construction byproducts, or materials generated from construction projects, are divided into soil displaced from construction and construction waste materials. Traditionally, these have been disposed at seaside landfills and inland disposal sites. However, as the pace of urban development accelerates, it has become more and more difficult to secure environmentally appropriate disposal sites, with generated amounts increasing year by year.

The Ministry of Construction has established a construction recycling plan to implement a three-pronged basic policy consisting of reduction and, reuse of wastes, and proper disposal for construction waste materials and displaced soil, at each stage of planning, design, and construction. To realize these goals, the Ministry has also prepared action plans.

In 1999, the NTT Group adopted a new action plan target of reducing waste materials to less than 65% of 1990 levels by 2010, and has since promoted construction byproduct management by systematizing waste disposal plans, promoting the use of recycled resources, and curbing waste generation.

NTT promotes reductions and reuse of construction byproducts

through sludge disposal management, reduction of excavated soil, reuse of concrete waste materials, and reductions in frame materials made of plywood.

Industrial waste materials (including specially-controlled industrial waste materials) generated from construction sites are to be reported by the original contractors, or construction companies, to which we have contracted the projects, to relevant local governments. Given the social responsibilities of the ordering parties, we provide instructions to our contractors and check that waste materials are properly disposed of by confirming manifests.

To ensure future waste reductions, we have established recycling targets and promoted the recovery of resources, including concrete waste materials. The recycling targets for 2000 are 80% for construction waste materials and 60% for soil displaced from construction sites. The final disposal amounts in the NTT Group as of 1998 were approximately 70,000 tons for construction waste materials and 80,000 tons for soil displaced from construction sites. We are now actively promoting waste reduction policies to maintain levels at about 1990 levels.

◆*Proper disposal of medical waste products*

Medical facilities in NTT East and NTT West (hospitals and healthcare centers) produced 3,399 tons of medical waste in fiscal 1998, of which infectious waste amounting to 698 tons were carefully controlled so that proper labelling is ensured as infectious waste. It is done by separating these products in specified containers with universal bio-hazard mark, according to specific characteristics (sharp edges, such as injection needles and scalpels, and solid matter). It is to protect public hygiene and to prevent the dispersion of pathogenic microorganisms.

To eliminate the possibility of accidental infections, storage facilities are tightly locked to prevent the entry of unauthorized personnel. Disposal of these waste products are contracted out to specialized disposal companies authorized by local governments. The disposal process from collection and transportation to final disposal are rigorously controlled with manifests/statements to ensure proper disposal to be carried out.
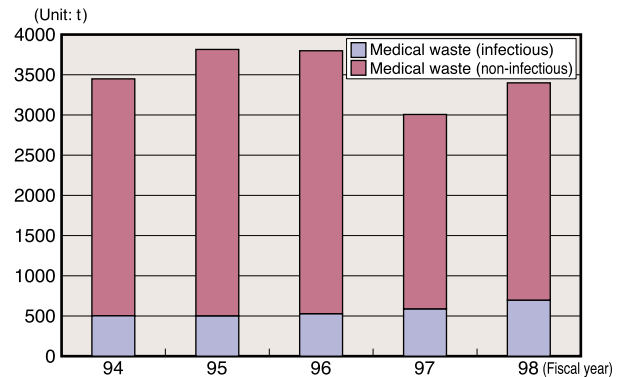

Fig. 4.3-3: Amount of industrial waste materials (medical)

◆*Disposal of general office and industrial waste products*
   (Recycling confidential documents and recycling box, etc.)

The NTT Group promotes the proper disposal of waste materials generated from offices and works to reduce waste brought for final disposal (incineration and landfill disposal). These efforts help realize a society that recycles as much as possible, and in which waste disposal is minimized.
Our offices implement thorough separation of waste collection

To assess proper waste disposal, we use a manifest/statement system to confirm that all industrial waste materials (desks, lockers, and Styrofoam materials) generated from offices are properly treated and disposed of, thus coping with such problems as inappropriate disposal (illegal dumping) and accidents within the disposal process.
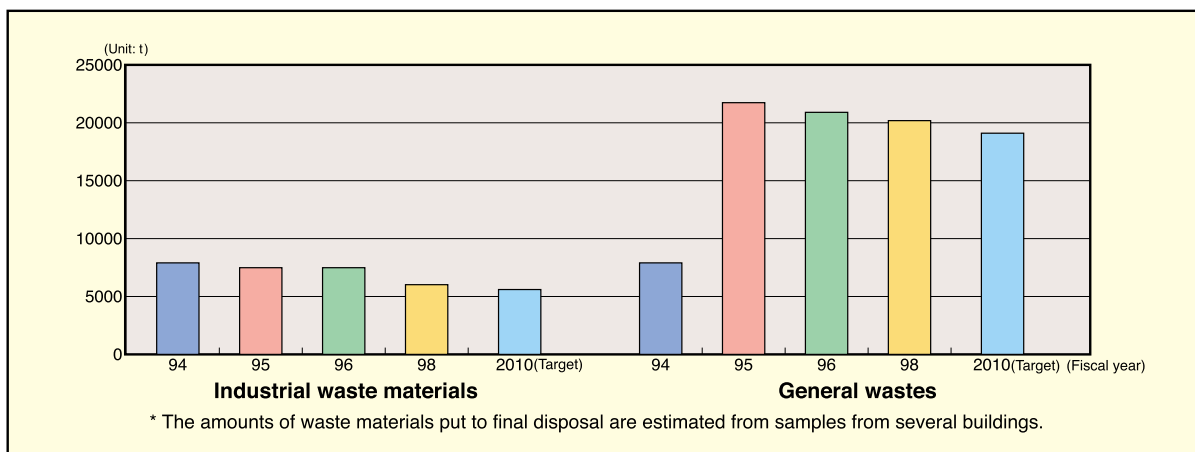
Fig. 4.3-4: Amounts put to final disposal (incineration and landfill disposal)

through the distribution of recycled paper recycling boxes, dust bins for incinerable waste and others for non-incinerable waste, and through the recycling of paper (copy paper, discarded documents, and newspaper, accounting for 70% of office waste) and non-incinerable wastes (bottles and cans). In 1998, the recycling ratio of recycled paper was 85.2%, representing a reduction of about 27,500 tons of final disposal waste. In the near future, we plan to improve our separated waste collection routes, which is the key factor in recycling.

* Separately collected waste materials are categorized as follows:

Copy paper and fine-graded paper used in internal magazines; newspaper and magazines; cardboard; paper waste other than the above; non-incinerable wastes generated from offices; cans; paper cups.

◆PCB storage and harmless processing technologies

PCBs (polychlorinated biphenyl) offers excellent chemical stability, heat resistance, insulation capacity, and resistance to flammability, and was widely used as an insulation material for transformers and capacitors, as well as for thermal catalyzers and pressure-sensitive paper. But in 1972, due to its toxicity, its production was banned and the use is restricted. Since then, PCB waste has been stored by manufacturers and users, with no definitive disposal measures implemented. With prolonged storage periods, many of the storage facilities have become deteriorated. In the event of a fire at these facilities, highly toxic substances such as dioxin will be released into the atmosphere. The treatment and disposal of PCB currently represents a major problem.

In November 1997, the NTT Group established a PCB storage and disposal committee under the global environmental protection promotion committee to study methods of internal processing of the PCB, which is stored at our facilities.

In June 1998, with the enactment of the Revised Waste Processing Law (law governing the disposal and cleanup of waste materials), it became legal to render PCBs harmless through chemical decomposition. In response to this regulatory change, the NTT Group chose to processe PCB through safe decomposition at current storage facilities (on-site), eliminating the risk of contaminating the off-site environment.

In order to expedite processing, we will establish processing methods based on the BCD (Base Catalyzed Decomposition) process, regarded as most suitable for the NTT Group and our goals, embarking on actual processing with administrative assistance from local governments.

Four main NTT companies possess some 100 tons of PCB, in the form of various electric facilities, such as transformers, capacitors, and fluorescent lamp ballast, of which about 20 tons are still in use. Considering the risks resulting from the obsolescence of storage facilities (over 27 years have passed since PCBs were first stored at these facilities) and the time required for complete decomposition of PCB waste, we have re-examined the deterioration status of the storage facilities. Prior to these examinations, we established PCB storage guidelines in April 1998 for proper storage of PCB waste. We then applied the required countermeasures against facility deterioration and are now implementing further appropriate storage management.

For equipment currently in use (fluorescent lamp ballast), we began replacement operations in fiscal 1998 in order to alleviate environmental pollution due to disposal of obsolete units.

* BCD (Base Catalyzed Decomposition) Process:
A method of applying hydrogen to an organochlorine compound, adding a carbonaceous catalyzer and alkali, heating to 300˚ to 350˚C C at normal pressure in an ambient atmosphere of nitrogen, to achieve dechlorination. This method is capable of decomposing even highly concentrated PCB (initial concentrations should be less than 15% in the reaction chamber).

◆Asbestos replacement (buildings)

Asbestos was used for many years as a construction material due to its excellent noise-absorption and fire-resistant capabilities. However, its fibers were found to be highly hazardous to human health, leading to lung cancer through accumulation within the body. Sprayed asbestos, which is most likely to produce this hazardous dust, was introduced for construction in Japan around 1955, and widely used in NTT Group buildings, since NTT's expansion coincided with the popularization of asbestos use. Sprayed asbestos was banned by "the 1975 revisions to the Ordinance on the Prevention of the Hazards due to Specified Chemical Substances", based on the Labor Standard Law.

In the 1980s, the NTT Group established a manual for preventive measures against dispersion of asbestos dust from existing facilities and has since implemented removal operations, as well as the identification of asbestos quantity and scheduled monitorings. The removal of asbestos is conducted in
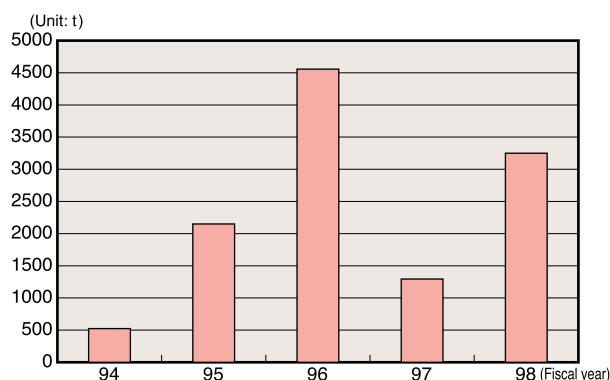

Fig. 4.3-5: Discharged amounts of specially controlled industrial waste (sprayed asbestos for construction use)

accordance with a safe and secure method approved by the Japan Construction Center.

Construction materials currently in use for new buildings and renovation projects have been asbestos-free since 1990, in accordance with general construction specifications.

In May 1994, we recognized the asbestos problem as a health and safety issue, and established the target of complete asbestos removal by 2000. Accordingly, we reestablished feasible planning targets for each region, and established basic policies to implement action at the global environmental protection promotion committee in May 1994.

We are currently pushing our efforts to achive the target, as indicated in *Fig. 4.3-6*.

◆Action plan target◆
Completing the feasible elimination of all asbestos by 2000*
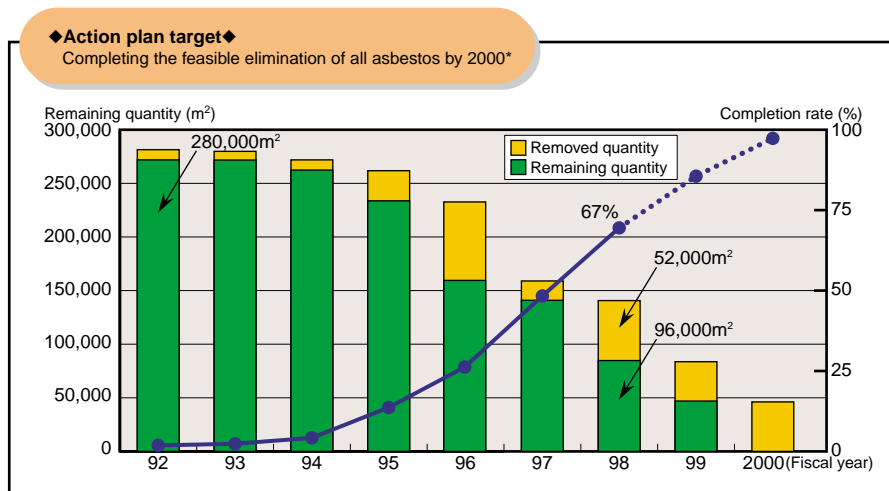
Fig. 4.3-6: Asbestos removal plan

◆*Asbestos replacement (bridges)*

The NTT Group used fireproof asbestos in refractory facilities (pipes and container cables) attached to bridges to protect against possible fires beneath the bridges.

However, in 1982, asbestos was designated as a specially controlled industrial waste due to its hazardous qualities. From 1983 to 1997, we used the rock wool method in place of asbestos for refractory facilities attached to bridges. Since 1997, we have used the pre-cast method, which realizes insulating and armoring functions simultaneously, to permit more economical replacement.

We are now proceeding with the systematic replacement of old fireproof facilities (bearing asbestos) that have deteriorated or suffered damage. The replacement of all entire asbestos facilities is scheduled to be complated in 2000.

Fig. 4.3-7:
Removal and replacement of asbestos and completion rate

4 Promoting recycling

◆ Promoting recycling for dismantled communication facilities and equipment
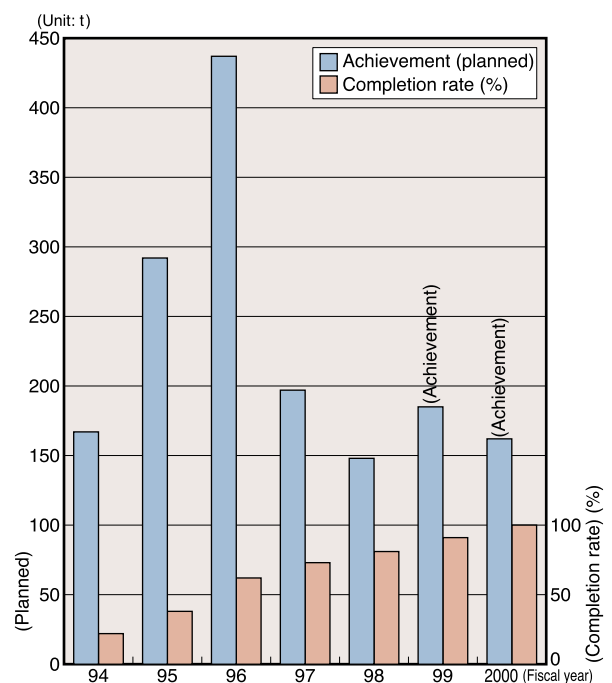
We at the NTT Group are promoting the reuse and recycling of removed communications facilities to reduce waste materials.

* Promotion of reuse and recycling

We are currently promoting the reuse of communications cables, telephone poles, and public telephones by sharing information through LANs and by using them at the appropriate business offices.

We are also promoting the recycling of copper, steel, and precious metals contained in communication cables and facilities through collection and recycling. Concrete telephone poles are used as roadbed materials, wooden poles are made into chips, and batteries are recycled.

* Promotion of plastic recycling

Regarded as a bottleneck and key point in our waste reduction efforts, plastic recycling has been stymied by problems involving markets development, separate collections, and financial costs.

We plan to work on plastic recycling in the following order.
(1) Material recycling (NTT closed):
    Removed NTT items -> Recycled NTT items
(2) Material recycling (open):
    Removed NTT items -> Recycled NTT items
(3) Thermal recycling
    Cement materials used as reducing agents in blast furnaces

Cases of material recycling (NTT closed) include connection terminal boxes (made of polypropylene) and branch line guards (made of polyethylene).
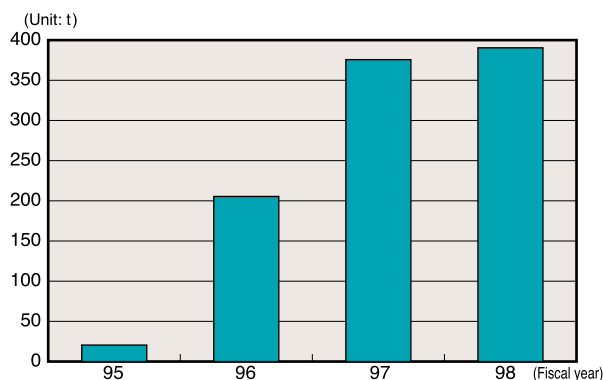
(Unit: t)

Fig. 4.4-1: Amounts of material recycling (repelletization)

Branch line protection materials formerly displayed stickers indicating recycled status, but the marking has been integrated to the materials from the molding process, eliminating the need to remove the stickers and realizing a 100% recycling of the material.

Through these efforts, the amount of recycled products has been increased year by year.

* Promotion of recycling through the Green Procurement system

We intend to strengthen our efforts in recycling through the Green Procurement system, which promotes the procurement of recyclable items, through more consistent use of materials, selection of materials that can be recycled easily, reducing hazardous materials, and adopting designs facilitating disassembly.

◆ Handling of nickel-cadmium (Ni-Cd) batteries

Recycling Nickel-Cadmium (Ni-Cd) Batteries
Unlike non-rechargeable primary batteries (such as common dry-cell batteries), nickel-cadmium types are secondary batteries that can be discharged and recharged repeatedly. These economical and high-performance Ni-Cd batteries are used in NTT-Group cordless telephones. However, these high quality batteries do not last forever and must eventually be discarded or recycled. The nickel and cadmium in these batteries can be extracted and used again.

Since the Ni-Cd batteries were designated as recyclable by the Recycling Act in June 1993, they have been designed to be easily removed from equipment and are explicitly marked to show that they are a recyclable resource for separate collection.

To contribute to efforts to conserve limited resources and to promote Ni-Cd battery recycling, the NTT Group has
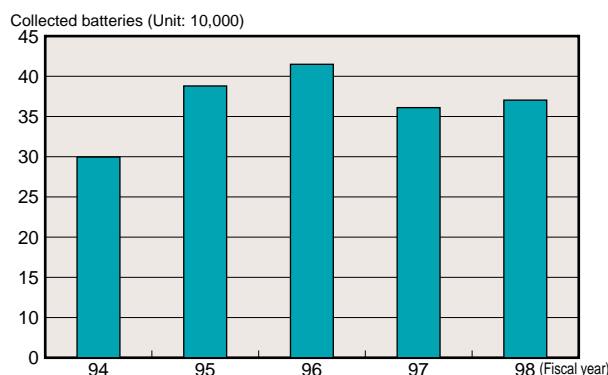
Collected batteries (Unit: 10,000)

Fig. 4.4-2: Historical development of collection of nickel-cadmium batteries

implemented the following three actions primarily for cordless phones equipped with Ni-Cd batteries:
(1) To ask customers to recycle batteries, by inserting a statement in user's manuals and on the battery pack itself.

(2) To provide recycling boxes for Ni-Cd batteries at sales offices, etc.

(3) To deliver used battery packs collected from users to recycling companies

In 1997 and 1998, the NTT Group collected 350,000 and 360,000 battery packs respectively through our sales and affiliated offices.

In order to minimize the number of Ni-Cd battery types, we are developing technology that allows a small number of models to be used in a wide variety of cordless telephones.

◆Recycling cellular phones/PHS units and batteries

To protect the global environment and to recycle resources, NTT DoCoMo has undertaken "the Return Your Battery Campaign" to collect used battery packs since February 1996.

Since July 1998, the items collected have been expanded to

cover portable phones and PHS units and chargers in the company-wide DoCoMo Return* campaign. We collected 2.1 million units in fiscal 1998 and will continue similar efforts during the current fiscal year.

◆Improving packing and packaging materials

In 1990, about 257 tons of Styrofoam were used as cushioning material (to protect precision devices from shock during transportation) in packaging for communication products sold by NTT East and NTT West.

Styrofoam (polystyrene) has excellent packaging characteristics in protecting products from shock, moisture, and humidity, but is difficult to decompose under natural conditions, making it necessary to promote recycling after use to reduce environmental impact. An advantage of the material (its light weight compared to its bulk) becomes a negative factor (high cost) for recycling.

NTT East and NTT West have changed the cushioning material for cordless phones or fax machines for domestic use from Styrofoam, which is most likely to be discharged as domestic waste, to cardboard, which has a lower negative environmental potential than Styrofoam, phasing out the use of Styrofoam for new products.

For heavy items, such as fax machines for office use and internal switchboard equipment, and precision equipment that do not allow the use of replacement materials, we are reduceing
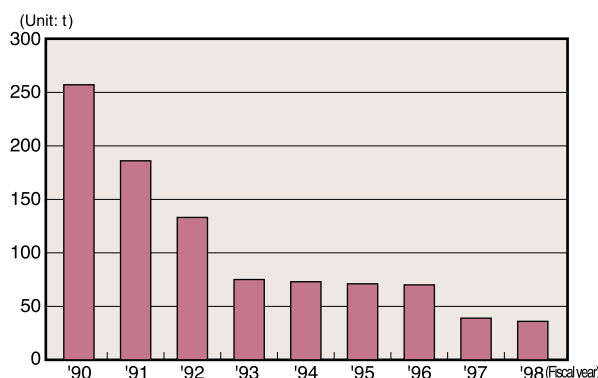

Fig. 4.4-3:
Use of Styrofoam used as a packing material for communications products

amounts used by making the Styrofoam cushioning material thinner.

In 1996, we achieved our initial target of 70 tons of annual consumption (about one-fourth of 1990 levels, or 257 tons), further reducing consumption to 36 tons in 1998. The cushioning material for cordless phones and fax machines for domestic use has been 100% cardboard.

◆Eliminating kitchen garbage output

The NTT Group operates approximately 600 dining halls for employees, generating some 3,000 tons of kitchen garbage per year. Since April 1999, we have established a recycling system to reduce waste product levels to zero, launching model operations in the Tokyo metropolitan area.

(1) Recycling starts with biological decomposition of garbage generated from each dining hall with aerobic fermentative bacteria.

(2) Next, the generated compost is carried to fertilizer facilities and mixed with organic components such as oil cake, fishmeal, or fish bone for proper composition adjustment. This process enables the compost to be used as ordinary organic fertilizer. (If the compost is to be used directly as fertilizer, certain additional treatments are required for different types of vegetation that a fertilizer is applied.)

(3) Finally, the produced organic fertilizer is used for vegetations

which are then used as foodstuffs, completing the recycling circle and achieving zero emissions of kitchen waste.

The NTT Group has already established a system up to the second preceding stage, indirectly completing the recycling loop by leaving the last stage to the general market. We have introduced large garbage processing machines at three dining halls that provide over 500 meals a day in the Tokyo metropolitan area. Along with other dining facilities equipped with similar processing machines, the system was launched in April 1999.

The NTT Group also has many small dining facilities that provide fewer than 200 meals a day. For these facilities, we developed a small garbage processing machine capable of handling approximately 20 kg of waste daily (the actual introduction date has yet to be determined). We have succeeded in miniaturizing the system by improving heating and mixing mechanisms to one-third of the volume of comparable models.

◆ New materials derived from papermaking sludge produced in the paper recycling process

The NTT Group has developed technologies to recycle papermaking sludge by dehydrating and pelletization processes as a mudding agent for the construction of communications tunnels, and as PMF (Paper Micro Fiber), which can be used as a soil improvement agent for soft ground conditions. PMF offering water-absorbing functions and connecting functions effective for soil particles, both of which are realized by the pulp fiber contained in the papermaking sludge, has been in use since 1991.

Papermaking sludge contains coating materials, such as kaolinite and calcium carbonate to create a smooth paper surface. When this sludge is incinerated at 950°C to 1100°C, these minerals can be extracted in the form of combustion residue (ash). Ash is melted during incineration and made into hyaline (amorphous substance). It was found that amorphous aluminum silicate reacts with alkali to crystallize into a mineral called zeolite.
Based on this knowledge, we have discovered that incinerated ash of papermaking sludge placed in hydrothermal synthesis reaction in water solution changes into a porous material.

This material filled with minute pores is called MPM (Micro Porous Material). MPM has the cation exchange function and can be formed into various shapes due to its large specific surface area. Offering these specific qualities, it can be used as a water-purifying agent for domestic wastewater, as an absorbing agent for various types of gases, and as a supplementary material for producing concrete highly resistant to acid rain.

After field tests with domestic wastewater drains as a water purification agent, the results have revealed that nutrient salts, such as nitrogen and phosphor, both of which are water contaminants, are reduced by 30% and 70% respectively, and that up to 90% of BOD, indicating the organic substances contained in water, can be removed. The MPM used as a water purification agent can be used in ordinary soil. When MPM is used as a gas absorbent, it is capable of absorbing formaldehyde, which causes sick house* syndrome, reducing concentrations from 68 ppm to 13 ppm within 30 minutes. Similar effects have been confirmed for other gases, including carbon dioxide. We are currently working on various research and development activities to explore the possibility of MPM application in a wide range of fields from 2001.

◆ Recycling soil removed from construction sites

The NTT Group has promoted recycling of construction-displaced soil.

To recycle this, we have adopted the soil recycling (SR) system and the fluidized back-filling technique.

The SR system improves soil by adding lime to enhance its land support and endurance capabilities, enabling it to be used as a

back-filling material. This technique is now in a trial and scheduled for full introduction before long.

The SR technique is recognised as an excellent technology by a public organization, which is authorized by the Construction Minister in June 1995.

The fluidized back-filling method, is to mix construction-

displaced soil with water and solidifying agents. It can be used to fill the gaps around the pipes, and is scheduled to be introduced in 2001.

This method does not require rolling compaction of soil for back-filling and is capable of realizing ground strength sufficient for traffic in a short period. It is expected to be most effective in cases where buried facilities are intricately layered.

5 Protecting the ozone layer

◆Elimination of CFCs used for cable gas leakage detection

The underground cables used by the NTT Group always contain dry air (gas) to prevent the infiltration of water. Since 1981, we have used a system to detect the level of internal gas pressures. We were using mixed CFCs in the cables for this purpose.

However, we have stopped using CFCs since 1994, introducing an alternetive detection technology with helium gas.

◆Elimination of CFCs used for washing crossbar switch contacts

As for CFC-based cleaning agents, a specified CFC (CFC-113) used for metal connection points was eliminated by the end of 1995 in accordance with the CFCs Control Law and the NTT Global Environmental Charter. Instead, we have used cleaning agents containing a CFC substitute (CFC-225). However, the NTT Global Environmental Charter pledged the elimination of CFCs for cleaning wire-spring (*1) relay connections, and we have suspended the use of cleaning agents containing the CFC substitute, and disposed of these agents. (liquid cleaning agent disposed: ca. 6000 kg, and cleaning agents in spray cans: ca. 1800 cans)

After disposing of CFC-based cleaning agents used to clean metal connection points, we are using pure alcohol, which has no negative effects on other components and was once used in the past. Following the last crossbar (*2) switch removal in June 1997, we have used no CFC-based cleaning agents.

*1 Wire-spring
A type of relaying device in crossbar switch.
*2 Crossbar
A switchboard that adopts the hard-wired logic for controlling circuit switching.

◆Elimination of CFCs used for washing semiconductors

Laboratories at NTT <holding company> have eliminated the use of ozone-depleting CFCs since 1992. CFCs were widely used to clean semiconductor materials. Our laboratories also used CFCs for R&D involving semiconductor LSI. Ozone layer depletion due to CFCs was first pointed out by American scientists in 1974, and the phenomenon was studied at various international organizations. In 1992, the Fourth Conference of the Contracting Parties to the Montreal Protocol scheduled the total elimination of CFCs and other ozone layer-depleting substances by 1996. Prior to this, in 1991, the NTT Group had pledged the total elimination of CFCs used for research purposes by the end of the fiscal year. Led by Atsugi Laboratory, our R&D center for LSI at the time, we promoted

the conversion to substitute materials*. As of March 31, 1992, we had accomplished the total elimination of CFCs. We have also prohibited the use of cleaning agents considered to be carcinogenic, such as trichloroethylene and carbon tetrachloride.

* CFC substitutes:
A cleaning agent, Diflon™, was replaced by Fluorinert™ and Solfine™. We have also used alcohol, acetone-related substances, and simple water cleaning in its place.

◆*Removal of CFC-using turbo refrigerators and proper storage at internal CFC banks*

In the Fourth Conference of the Contracting Parties to the Montreal Protocol in 1992, the elimination schedule for specified CFCs was established. The production of specified CFCs (*1), which is associated with extremely serious consequences to both ozone depletion and global warming, was banned at the end of 1995. At NTT, where we used turbo refrigerators using large amounts of the specified CFCs, it was imperative to replace these devices.

In November 1992, the NTT Group adopted a basic policy of no further installation of turbo refrigerators using specified CFCs, with replacement of the existing pool of turbo refrigerators by 2000 at the global environmental protection promotion committee. We are thus promoting the replacement of these machines with non-CFC devices, such as those using air-cooled heat pumps and absorption refrigerators.

As of the end of 1992, the NTT Group had 166 turbo refrigerators requiring replacement. This number was reduced to 18 units as of the end of fiscal 1998. Most of the replacement has progressed as scheduled. *(Fig. 4.5-1)*

Since July 1994, the NTT Group has established an internal CFC-bank system and promoted effective management of specified CFCs. This system recycles specified CFCs used for the existing turbo refrigerators. Excess CFCs can be stored, and used at necessary sites. When the use of specified CFCs is finally completed, they must be decomposed into harmless substances. Several CFC decomposition methods have already been developed, including the rotary kiln and cement kiln methods. NTT continues to investigate methods for rendering the stored CFCs harmless.

For new air-conditioners for communications equipment rooms, introduced since May 1998, we have adopted the HFC (*3) coolant in place of HCFC (*2).
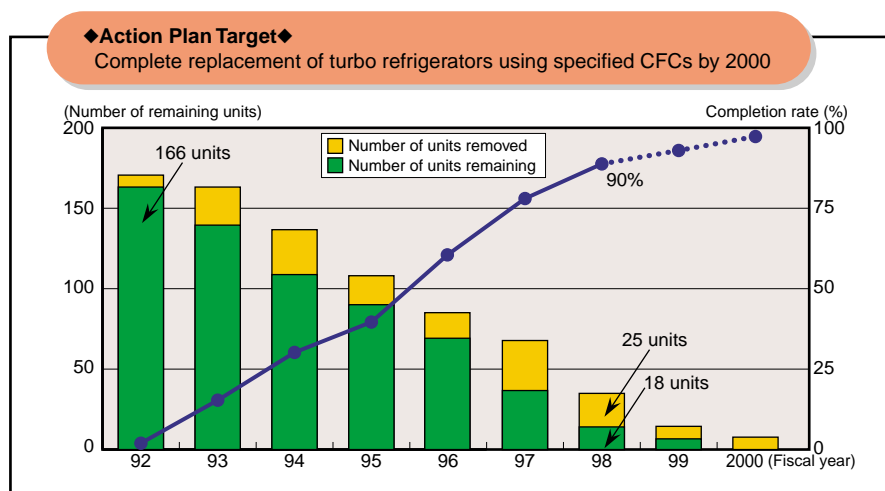
◆**Action Plan Target**◆
Complete replacement of turbo refrigerators using specified CFCs by 2000

Fig. 4.5-1: Turbo refrigerator replacement plan
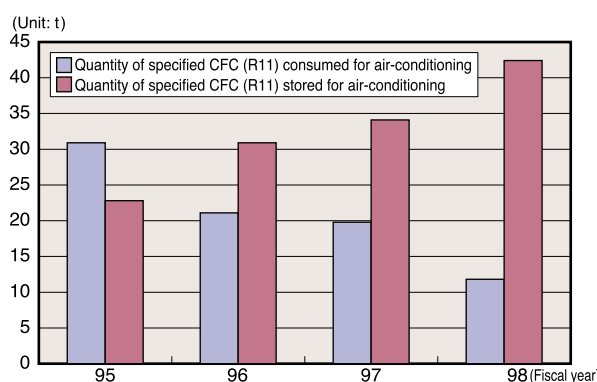
Fig. 4.5-2:
Quantity of specified CFC (R11) consumed and stored for air-conditioning

*1 CFC (Chloro Fluoro Carbon)

A chemically stable, nonflammable, and non-toxic substance composed of fluorine, carbon, and chlorine. Due to its excellent traits, it was widely used as coolant in turbo refrigerators, foaming agents for insulators, and cleaning agents for electronic parts. Due to its chlorine content, it has a high ozone-depleting factor.

*2 HCFC (Hydro Chloro Fluoro Carbon)

A substance made by replacing a part of the chlorine in CFC with hydrogen, reducing ozone-layer depleting potential

*3 HFC (Hydro Fluoro Carbon)

A substance made by replacing chlorine in CFC with hydrogen, completely removing ozone-layer depleting potential

◆Elimination of a specified halon used as a fire-extinguishing agent

For halon used as a fire-extinguishing agent, the Fourth Conference of the Contracting Parties to the Montreal Protocol held in 1992 concluded that production would be prohibited after January 1, 1994, except for some exceptional cases.

The halon gas used as a fire-extinguishing agent is primarily halon-1301.
Due to its excellent fire-extinguishing capabilities, high insulation performance, low toxicity, and high damage-resistant quality, the NTT Group has used it widely for fire-extinguishing facilities at communications equipment rooms, computer rooms, and power rooms. Overall, the NTT Group possesses some 900 tons.

In November 1992, in response to international regulations governing halon use, the NTT Group adopted a basic policy: A ban on new installation of halon-based fire-extinguishing facilities, with smaller fire-limits in communications equipment rooms, and continuing investigations and research on post-halon fire-extinguishing facilities at the global environmental protection promotion committee.

In July 1993, to promote more effective use of halon and to prevent its release into the atmosphere, we participated in the Halon Bank Promotion Forum established at the national government level. The director of the NTT real estate planning office became a commissioner of the Forum to lead halon recycling and global environmental protection efforts.

In July 1997, we established a new fire extinguishing/preventing system, aiming at the implementation of investigation and research into domestic and overseas developments on halon-substitutions as well as development of early detection system for overheating of communications equipment and cables. In accordance with this policy, we have been systematically working on the introduction of safe and reliable fire-extinguishing systems.

Halon-substitution for fire-extinguishing systems uses new environment-friendly fire-extinguishing agents that provide high fire-extinguishing performance, safety, without the risk of emitting ozone-depleting substances. We have decided to use three fire-extinguishing agents: NN100 (*1), Inergen (*2), and FM200 (*3).
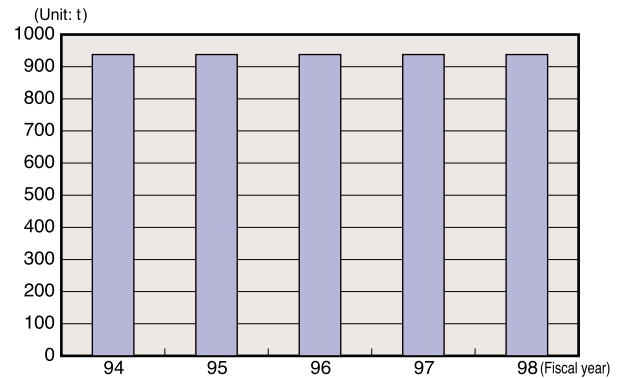
Fig.4.5-3:
Quantity of retained specified halon gas for fire extinguishing facilities

*1 NN100:
Inert gas-based fire-extinguishing agent composed of nitrogen gas. Both its ozone-depleting and global-warming potentials are zero.

*2 Inergen:
Inert gas-based fire-extinguishing agent composed of a mixture of N2, Ar, and CO_2 gases. Both its ozone-depleting and global-warming potentials are zero.

*3 FM200:
Fluorine-based fire-extinguishing agent with limited release time. There will be fewer cylinders than with NN100 and Intergen, since FM200 can be stored as a liquid. Its ozone-depleting potential is zero, but its global-warming factor is 2050.

6Preventing soil contamination

◆*Measures to prevent soil contamination (automatic oil leakage detection system for underground tanks used as communication power sources)*

Several leakage accidents at underground fuel filling and storage facilities occur annually throughout Japan. Leaked fuels and hazardous substances contaminate soil and water, seriously affecting the life of local residents. NTT Group has underground tanks to store fuel for auxiliary power generators at some 1,500 switchboard buildings and other major buildings across the country. Switchboard buildings provide –48 V of direct currency to customers. These auxiliary facilities ensure reliable communications services in case of emergencies.

The NTT Group has worked on this issue based on the 1998 decisions of the global environmental protection promotion committee, and has since introduced and improved an automatic oil leakage detection system for underground tanks. This is comprised of monitors for oil levels and flow rates and continuous remote surveillance and recording systems for oil leakage detection results around tanks.

◆Ecology Network

About ecology networks

An ecology network is an environmental information-sharing system that uses multimedia communications technologies to cope with global environmental problems.

In addition to general environmental information acquired through various sensors, the ecology network collects information on industrial waste and domestic recycling, which is then stored in regional ecology centers and accumulated into databases. This information is then made available to the public to help their environmental conservation actions. Our environmental information is also used for environmental education and academic and other research. We believe that the cooperation between government, industry, and private citizens will help realize a zero-emissions (*1) society – a society based on efficient resource use and minimal environmental loads, and that the ecology network would serve for that purpose.

The IWATE-UNU-NTT environmental network joint project

Inaugurated in September 1998, the IWATE-UNU-NTT environmental network joint project – a cooperation involving Iwate Prefecture, the United Nations University, and NTT – will promote research and development in the ecology network.

This project will monitor the water quality of the Mabechi River, which flows through the northern Iwate Prefecture. It will also involve environmental monitoring for acid rain, carbon dioxide, nitrogen dioxide, and suspended particulate matter (*2), as well as the potential applications and evaluation of the monitored information.

The joint project information is available at:
(URL: http://ecology.mcon.ne.jp)

*1 Zero-emissions
A concept supported by the United Nations University for use of waste products from one industry as raw materials in another, to reduce wasteful uses of resources and environmental loads, with the ultimate goal of realizing a society capable of recirculating its resources.

*2 Suspended particulate matters
These minute airborne particles, which damage lungs and tracheae when present for extended periods in high concentrations, are monitored at various sites around the country.

◆Environmental monitoring/sensing technologies

Since fiscal 1991, NTT <holding company> has engaged in research and development on environmental monitoring technologies for water and air.

In addition to serve for drinking, agricultural, and industrial purposes, surface water such as river, lake, and pond is essential to ecosystems that embrace countless flora and fauna. Preserveing such ecosystems must involves continuous monitoring of their conditions. We have started research and development on water-quality sensing network systems that are linked to visual equipment such as cameras, and water-quality sensor modules capable of being operated remotely. The network systems have already undergone field experiments at the Shimanto and Mabechi rivers, and are even scheduled to be marketed from the end of fiscal 1999.

In July 1996, NTT <holding company> initiated research and development on equipment capable of easy measurement of airborne nitrogen dioxide concentrations. This equipment is now scheduled to be available by December 1999. Conventional equipment that measures nitrogen dioxide concentrations has been relationely large and expensive. The equipment developed by NTT is small, light, and inexpensive, enabling easy transportation and installation, and is better-suited to local or spot measurement of nitrogen dioxide than the conventional equipment. This hardware is also capable of remote measurement through telephone networks and of simultaneous measurements at multiple locations.

◆Participation in research on flight paths of migratory birds with ultra-small position transmitter

At the request of the Wild Bird Society of Japan and BirdLife International, we have developed and provided ultra-small position transmitter to help detect migratory birds. We need to ensure their breeding and intermediary migration spots in order to protect the migratory birds. The wintering sites have been studied and are well-known, but information on other sites is so far largely unknown.

Since migratory birds travel long distances, we adopted a satellite-based location detecting system to track their flight paths. Called ARGOS (Automated Research and Global Observation Satellite), this system was originally developed jointly by the U.S. and France to collect information on the global environment.

By incorporating our wireless and materials technologies into ARGOS, NTT Group had by 1990 reduced the weight of a transmitter (Argosat) from 150 g to 40 g, then to 25 g by 1992, and finally to 15 g in 1997. Weighing only one-tenth of the initial model, Argosat currently holds the world record for lightweight transmitters.

These transmitters have made it possible for researchers to track the flight paths of large migratory birds, such as cranes and whistling swans, and comparatively smaller birds, such as the black-faced spoonbill and Australian curlew.

In 1991, the Department of the Interior of the U.S. presented the NTT Group with the Wildlife Stewardship Award in recognition of achievements in a research project involving migratory birds within the U.S. NTT was the first Japanese organization, and indeed, the first private company in the world, to receive this honor.

◆Automated Meteorological Data Acquisition System (AMeDAS™)

Since February 1993, NTT Data has provided a regional meteorological observation system that automatically acquires environmental data from 1,300 observation stations across the country 24 hours a day and 365 days a year, including data on precipitation, wind direction, wind velocity, temperature, degree of sunshine and snowfall. Every hour, this system automatically transmits the data to a center through telephone lines, then processed and transmitted to the Japan Meteorological Agency. Called AMeDAS*, this system provides quick and accurate assessment of constantly changing weather patterns through a world-leading fine-grid observation network.

The meteorological data collected through AMeDAS is widely used by the Meteorological Agency, local governments, and media. AMeDAS plays an important role in providing us with crucial information, such as on meteorological disasters.
* AMeDAS is a registered trademark of NTT Data.

◆Ecological survey of albatrosses

As a part of the environmental conservation efforts, NTT DoCoMo (Mobile Communications Network) has participated in research to prevent the extinction of albatrosses on Tori island, Izu Archipelago. The image transmission capabilities, made possible by mobile communications services, enabled a remote surveillance system that links the 600 km lying between the island and a mainland laboratory. In the future, we plan to introduce a Mobile View capable of providing clearer images.

◆Meteorological survey experiments at the Shiragami mountains, a World Heritage site

In the Shiragami Mountains in the Tohoku region – designated a World Heritage site for its rich natural environment – NTT DoCoMo has taken part in an academic meteorological research. NTT contribute to the project by providing observation systems, which is capable of operating in heavy snowfall without external power supplies.

Equipped with satellite portable phones, cordless phones, image transmission cameras, and PCs, the unmanned observation system are to operate over a very long period– even decades –through continuous upgrading of equipment.

◆ An information processing system for greenhouse gases at the Japan Meteorological Agency

Global levels of greenhouse gases such as carbon dioxide (CO_2) and methane (CH_4) continue to increase. An accurate assessment of their status is essential to forecasting future meteorological changes. It is also very important for taking appropriate actions against global warming. NTT Data administers greenhouse gases data provided by the World Data Center for Greenhouse Gases, the World Meteorological Organization (WMO). Since March 1997, NTT has made this data available to the relevant organisations as "the Meteorological Agency Information Processing System for Greenhouse Gases". This system enables statistical processing and visual display of accumulated data for evaluations, analyses, and distribution of information on global warming.

◆ A regional air pollution monitoring system

As of the end of 1997, local governments throughout the country started to operate 2,135 fixed-point observation stations for the legally prescribed air pollutants such as nitrogen oxides and sulfur dioxide. They are directly Harmful to human health, and the potentially dangerous by e.g forming photochemical smog. These substances require continual monitoring.

These stations constantly monitor the condition of pollutants, providing data that is sent to central surveillance centers, where it is statistically processed. Carrying out this process requires the wide deployment of information communications networks.

Some 40 air pollution surveillance systems of this kind are currently at work around the country. Since 1995, the Saitama Branch of NTT East has provided assistance to improve the prefectural system.

By connecting 50 unmanned monitoring stations in the prefecture and the central surveillance station with a ISDN link, NTT enabled the rapid collection and accurate assessment of the data. Some external pollution data is provided by other prefectures and the final information is displayed on maps to allow pollution conditions to be monitored and forecasted.

When smog incidents occur, warning messages are issued through broadcast fax messages to municipal offices, schools, and residences, while an automatic response system provides necessary information. Twelve warnings were issued in fiscal 1998, and the availability of the right information is recognised to contribute to mini mising potential risks of the smog incidents.

In addition to regulatory uses, this kind of data can be incorporated into multimedia technology to serve for environmental learning and education activities.

Recently, the NTT Group has provided similar assistance to Nagasaki, Mie, Akita, and avenue prefectures, in addition to Saitama Prefecture.

◆ Telecommuting (Tele-work)

Information technology are now beginning to affect not just industrial activity, but individual lifestyles. Unlike conventional work arrangements, in which many people go to work at one location, telecommuting takes advantage of information technologies such e-mail and groupware, in some cases providing even greater productivity compared to traditional communication tools such as the telephone and fax.

The commuting time saved can be used for leisure or recreation, enhancing our quality of life. Although this orientation is eventually expected to take hold in Japan, the new work style has been slow to win the general acceptance, largely due to reservations on virtual work environments, data security concerns, and an established work culture that emphasizes person-to-person encounters.

To make telecommuting a reality, the NTT Group is promoting information-intensive home environments and corporate information systems with ISDN and optical fiber network services, as well as teleconference and information security technologies. NTT is working toward a computer-based information society in which both employees and companies can benefit.

◆ Multimedia services, including teleconferencing, etc.

Multimedia services, such as teleconferences, add visual information to audio information. And it could make our communications more expenssive. Ordinary conferences require a host to prepare a site, and the invitees to physically travel to the conference hall. Using multimedia services, resources such as electricity and fuel required for travel (as well as the energy expenditures required to the host) can be saved. Since no automobiles are required, levels of air pollution will be inevitably reduced. In the conference itself, use of electronic images enable a paperless working environment, conserving paper resources.

◆ Promoting environmental information-sharing through the Internet: Web site "Kankyo (environmental) goo"

NTT-X operates the environmental information WWW site "Kankyo (environmental) goo." As environmental conservation efforts intensify in the 21st century, the demand for efficient retrieval of environmental information will rise accordingly. In response, NTT-X has developed sophisticated environmental information query/retrieval services that offer state-of-the-art capabilities.

In addition to information query/retrieval services, the site provides environmental news and information on environmental books and events. It also offers further information services, including links to other major environmental databases, as well as a glossary of key words. This site attracts more than 800,000 hits per month. Its e-mail information service has more than 14,000 subscribers.

(URL: http://eco.wnn.or.jp)

◆ Electronic commerce

Electronic commerce in Japan is expected to exceed the ¥7 trillion by 2003. The expansion of the network-based trading will contribute to environmental conservation in terms of paper conservation, protection of the ozone layer, and promoting recycling.

The average number of invoices sent to a household or a company exceeds 130 annually. Providing this information over the Internet could result in significant paper savings. Sending a direct mail on the Internet could also result in significant resource savings, with increased effectiveness.

Exchanging large amounts of data such as engineering drawings and high-resolution photos can now be performed across networks, rather than relying on physical transportation, conserving energy and reducing pollution.

These information services provides some examples of what the NTT Group is doing in partnership with various industry groups.

◆ Intelligent Transport System (ITS)

NTT supports a system that provides real-time traffic and other useful information, such as available parking and location of gas stations, through cordless telephone networks to car navigation systems. This system is also capable of automatically reporting the location of an accident to an emergency center. Called the Intelligent Transport System (ITS), the system is designed to realize a safe and smooth traffic environment.

We have also developed simulators to realize the best driving conditions through communications technologies for evaluation and research on various ITS services.

To date, the NTT Group has promoted the community environmental activities summarized below:

Table 6.1: Examples of environmental conservation efforts (the branch names used are those applicable in 1998)

Environmental protection activities involving local companies	Office paper recycling	Kanazawa Branch; Fukui Branch
Local Volunteer Planning and Activities	Maintenance of Dragonfly Natural Park	Tosa-Nakamura Branch
	Reed-cutting at the Lake Biwa	Shiga Branch
	Introduction of kitchen garbage-processing machines	Tokyo-South Branch, etc.
	Planning of contests and other events	Kanto Office
	Cleanup campaigns	Multiple sites
	Recycling campaigns	Batteries: Kanto Office
		Prepaid telephone cards: Nagano Branch
		Disposable chopsticks: Shimane Branch; Kurashiki Branch
Each Company's Nationwide Planning	Operation Clean Environment	Number of participated operations in 1998: 1778 Number of sites involved: 436
	DoCoMo Returns (portable phone recovery and recycling)	NTT DoCoMo (1998: 2.1 million)
	Participation in locally-planned cleanup and recycling activities	Supporting numerous activities

◆Operation Cleaning Environment

As part of its contributions to protecting the natural environment, NTT East and NTT West branches have conducted "Operation Clean Environment" across the country. These activities were initiated in 1988 by a group of young employees at the Niigata Branch, who launched the "Clean the Japan Sea" project to clean up the coastal areas of the Japan Sea. These efforts subsequently spread throughout the country.

A wide range of people participate in these activities, including employees, employee families, and former employees, in collaboration with local residents, governments, and organizations. From fiscal 1988 through 1998, some 480,000 people took part in cleanup activities at 4,300 locations.

The actual projects are performed independently by each branch in accordance with local conditions. Locations include riversides and flood plains by rivers, seacoasts, parks, sightseeing spots, national highways, hiking trails, and areas surrounding office buildings. Also included in some cases are areas designated by the Ramsar Convention, the Convention on Wetlands of International Importance, Especially as Waterfowl Habitat.

◆DoCoMo Forests

As part of its natural environmental conservation efforts, NTT DoCoMo has carried out an initiative, "DoCoMo Forests."

The objective of this project is to reduce CO_2 emissions to prevent global warming, achieve harmonious coexistence with local communities, and to improve employee awareness of environmental issues. Based on the Green Fund system of the National Land Afforestation Promotion Organization and using "Corporate Forests" of Forestry Agency, tree-planting projects are carried out by NTT DoCoMo employees throughout the country.

Trees were planted in the Namera Yama National Forest in May and in the Yozuku National Forest in October 1999. The tree-planting campaign is scheduled for expansion to nine locations across the country in five years.

◆ Presentation of environment-related awards

NTT Group's environmental conservation efforts have won recognition and awards from various organizations, including the followings:

Table 6.2: Examples of environmental conservation efforts (the branch names used are those applicable in 1998)

Awarded year	Award title	Sponsor	Awarded party
Fiscal 1991	"Wildlife Stewardship Award"	The U.S. government	NTT (former)
Fiscal 1996	Award for Recycling Promotion Effort "International Trade and Industry Minister Award (for recovery of nickel-cadmium batteries)"	Recycling Promotion Association	NTT (former)
Fiscal 1998	Eco-Drive Contest "Effort Award"	Transportation Ecology Mobility Foundation	NTT (former)
Fiscal 1998	Award for 21st Century-Type New Energy Equipment/ System and Application "New Energy Vanguard 21; International Trade and Industry Minister Award"	New Energy Foundation	NTT (former)
Fiscal 1999	The "Nineteenth Green City Award"	Urban Greenery Foundation and the Yomiuri Shimbun	NTT Information Sharing Laboratories
Fiscal 1999	The Ninth Environmental Advertisement Contest "Special Prize for Posters"	Japan Eco-Life Center	NTT DoCoMo

◆Commendation for global environment protection activities

Since 1993, we have awarded President's Awards for internal inventions, ideas, and activities contributing to efforts to protect the global environment. So far, awards have been awarded for the following issues:

Table 6.3: List of President's Awards for global environmental conservation efforts

Year	Awarded issue	Awarded party (former)	Category
1993	Development of an oil treatment reagent using "paper-making sludge"	Field System Research and Development Center	Recycling
	Achievements involving the development and introduction of efficient energy use systems contributing to global environmental conservation	User System Dept, Service Production Division	Preventing global warming
	Achievements involving "global environmental conservation through the reduction and recycling of construction by-products resulting from civil engineering works"	Facility Construction Platform Center, Tohoku Office	Recycling
	Artificial fishing banks made of removed concrete telephone poles	Hokuriku Material Control Center, Hokuriku Office	Recycling
	A new CFC-free gas leakage detection method	Technical Cooperation Center, Interdisciplinary Laboratory	Ozone layer protection
1994	Recycling of removed communications equipment (connection terminal box covers)	Material Procurement Dept.	Recycling
	Community-based environmental conservation efforts	Kawasaki North Branch, Kanto Office	Community supports
	Achievements involving recycling of soil displaced from construction sites by development of the SR (Soil Recycling) system	Access Network Systems Laboratory	Recycling
1995	Recycling of removed communications facilities (branch line guards)	Kansai Material Procurement Center	Recycling
	Achievements involving the development and trial introduction of the Shimanto River water quality monitoring center system, which contributes to environmental conservation	Interdisciplinary Laboratory, Tosa-Nakamura Branch	Telecommunications services
	Development of a computer room air-condition system	Real Estate Planning Dept.	Preventing global warming
	Achievements involving global environmental conservation through the promotion of an efficient method for replacing asbestos occurring in old, fireproofed facilities	Tokai Facility Technology Center, Tokai Office	Asbestos removal
1996	Activities involving "Office Paper Recycle; Kanazawa"	Kanazawa Branch	Recycling
	Achievements involving the recovery of nickel-cadmium batteries	Gunma Communications Equipment Marketing Branch	Recycling
	Introduction of a photovoltaic power generation system compatible with the multimedia age	Multimedia Business Development Dept.	Preventing global warming
1997	Achievements of significant reductions in power consumption through low-power equipment (reduction of CO_2 emissions)	Facility Planning Dept.	Preventing global warming
1998	Achievements involving acquisition of ISO 14001 certification	Material Procurement Dept.	Environmental management system
	Achievements involving thermal recycling of removed optical cables	Kansai Material Procurement Center	Recycling

Inquiries (comments and opinions)
NTT Group Environmental Protection Activity Report 1999

We welcome your comments and opinions concerning this report.
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[Question 1] Please give us your impressions concerning NTT's environmental conservation efforts.

❏ Very impressed　❏ Impressed　❏ Vaguely impressed　❏ Not impressed　❏ Don't know　(❏ Check one of the boxes below)

Please elaborate.

[Question 2] Please list some of the topics on which you would like to have more information.

Page	Item (things that you would like to know; please be specific)

[Question 3] Please let us know what you would rate highly.

Page	Item (please be specific)

[Question 4] Please let us know anything that you find difficult to understand in this report.

Page	Item (things you found unclear or difficult to understand; please be specific)

[Question 5] Please give us your overall impression of this report.

❏ Design (A B C D)　❏ Verbal expression (A B C D)　❏ Graphical expression (A B C D)
❏ Numerical expression (A B C D)　　　　　[A : Excellent　B : Good　C : Average　D : Bad]

(Please elaborate your impressions.)

[Question 6] Please relate any other opinions, impressions, or suggestions.

Please provide your details (optional).
This information will be used only internally to improve our future environmental communications, and will not be disclosed to others.

Name		Age	
Occupation/position (multiple answers are acceptable)	❏ Working at private firm　❏ Public organization　❏ Student　❏ Environmental organization　❏ Customer of NTT Group　❏ Financial institution　❏ Media　❏ NTT Group employee/family　❏ Shareholder　❏ Other ( )		
Address (or workplace)			
Contact	Telephone:	Facsimile:	

Thank you very much for your time.

Schedule for the next issue

◆This report is to be revised and issued in 2000 and afterward.

◆To reduce the number of printed copies, future issues from 2000 on will be provided primarily on the Internet. However, we still plan to issue and distribute reports in a booklet format every three years, or as required.

◆The year 2000 version of this report is scheduled to have the updates of NTT Group's new environmental conservation efforts and progress on various activities. We are also working on establishing our environmental accounting scheme. The results of the environmental accounting project will be released as soon as they are prepared.

Information requests

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NTTGroup

While the publication of this booklet entailed a significant quantity of paper and ink, the following measures have been taken to protect the global environment:
 / The first two marks are used in Japan only.

Certification mark		Certifying body	Used material	Explanations on the used materials
	Paper	Japan Environment Association	Paper certified to the "ecology mark"	Manufacturing paper from recycled paper reduces energy consumption to one-third that required to make virgin paper from lumber, and obviates the pulp-producing process required for the latter process.
	Composition of paper used	Waste Reduction Promotion Committee	Recycled paper with 100% of recycled paper mixture ratio and 70% of brightness	In the paper used by NTT, 5% of the composition is from recycled telephone directories; and the rest (95%) is produced from recycled paper.
	Printing ink	The American Soybean Association	Ink made from soybeans	Soybean ink is made by replacing part of the petroleum solvent in printing ink with soybean oil. Compared to ordinary printing ink, soybean ink produces less VOCs (Volatile Organic Compounds), which are air pollutants. It can be disposed of and separated from paper more easily, facilitating recycling.