

Eco-Towns in Japan

-Implications and Lessons for Developing Countries and Cities-

June, 2005



Global Environment Centre Foundation

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[Appendix] Further information

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Acronyms

3R: Reduce, Reuse and Recycling

CSR: Corporate Social Responsibility

EMS: Environment Management System

EST: Environmentally Sound Technology

ISO: International Organization for Standardization

METI: Ministry of Economic, Trade and Industry

MoE: Ministry of the Environment

NOx: Nitrogen Oxide

NPO: Nonprofit Organization

PDCA: Plan, Do, Check and Assessment

PET: Polyethylene Terephthalate

PR: Press Release

SME: Small and Medium-sized Enterprise

SOx: Sulfur Oxide

1. Introduction

Eco-Towns in Japan were developed in the last seven years by utilizing regional technologies and industries in Japan. Eco-Towns have a number of key features such as (a) strong legislation, shifting the market towards a sound material-cycle society, (b) national and local governments are spearheading the drive to bring together industry clusters to be more sustainable, (c) increasing product research and development – in both public and private sectors, including universities, (d) large and rapidly expanding eco-business market, domestically and internationally, (e) strong focus on environmental technologies and ESTs, and innovative/cutting-edge solutions to solve environmental problems, and (f) focus on energy conservation, material development and integrated waste management are also features of Eco-Towns.

Eco-Town concepts have recently expanded to include the 3R (Reduce, Reuse and Recycling) concepts and building an economy based on the life-cycle approach as well as accumulation of recycling facilities. The target of the 3R concept is to achieve sustainable consumption and production by means of information access, market creation and networking, policy and strategy development, application and implementation of ESTs, regional corporation, and building sustainable commitment (fig. 1-1). In addition to the 3R, Eco-Town concepts also involve green procurement, green consumerism, industrial ecology, extended producer responsibility, socially responsible investment, integrated waste management, green labeling, global reporting initiative, corporate social responsibility, EMS and ISO 14001. “Eco-Town” therefore becomes a defined area, a laboratory, where various different eco-concepts can be developed and implemented.

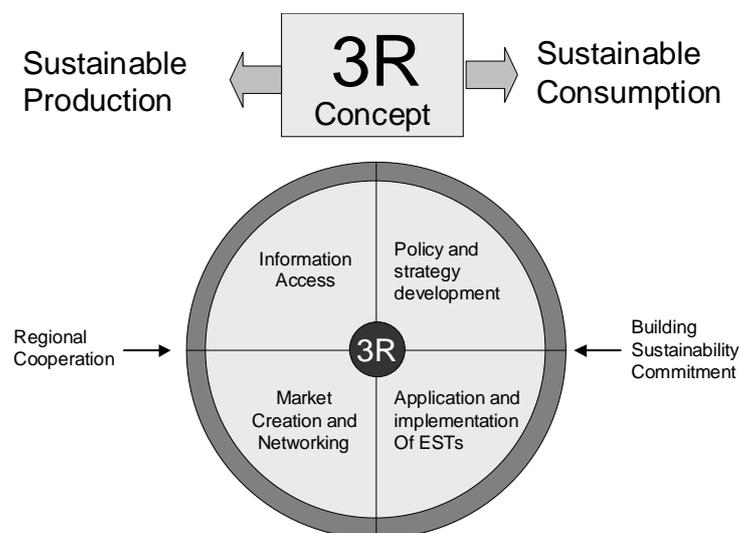


Fig.1-1. 3R Concept

Figure 1-2 shows the relationship between the Eco-Town concept and other similar concepts (Eco-Industrial Parks, Industrial Symbiosis and Eco-City concept: refer to table 1-1). The Eco-Town concept, which originally focused on the individual systems related to 3R, have now expanded to include Eco-Industrial Parks and Industrial Symbiosis to focus on collective areas, and become part of the Eco-City concept, to focus on overall urban planning and urban ecosystems, civil society and greening of cities.

A number of developmental objectives have been simultaneously achieved in eco-towns. It has helped to stimulate the local economy and secure employment as well as to dispose waste in an environmentally sound manner and protect air and water resources. A number of lessons have been learnt in the setting up of such eco towns in Japan, not only within these eco towns, but also in the cities where they are located. This report focuses on identifying the key lessons learnt in the setting up of the eco towns (through four case studies). These lessons will help in the development of step-by-step guidelines for local and national governments in developing countries to set up eco-towns in their countries.

Chapter 2 provides an overview of the Eco-Towns in Japan, focusing on the roles of stakeholders. Chapters 3 to 6 introduce four distinguishing Eco-Towns in Japan (Kawasaki, Kitakyushu, Minamata and Naoshima Eco-Town), and presents case studies of those Eco-Towns. The case studies give an outline of the features of the projects, municipal support, environmental activities, and partnerships among stakeholders. Chapter 7 presents some of the lessons learnt from the case studies, including prerequisites for the establishment of an Eco-Town, drivers and tools, and triple bottom lines benefits, and suggests a step-by-step flowchart.

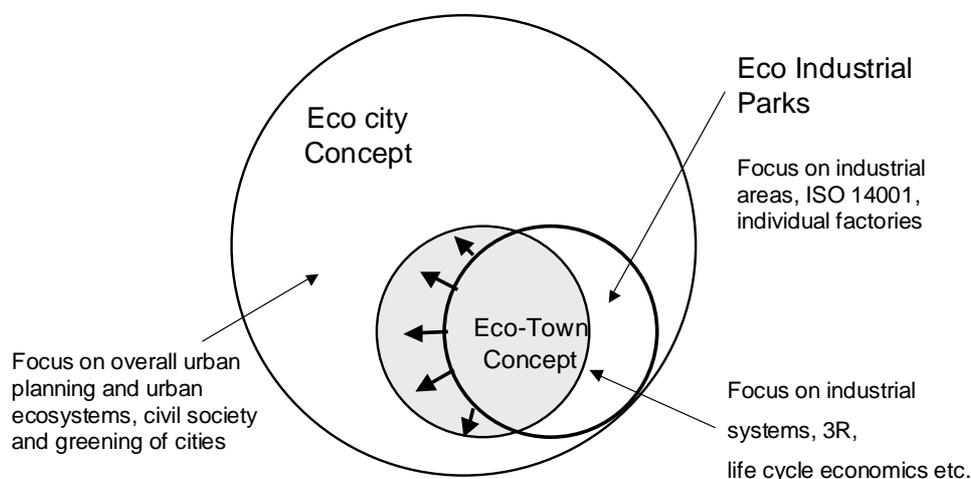


Fig.1-2. Eco-Town concept and other similar concepts

Table 1-1: Concepts and definitions similar to Eco-Towns

Concepts	Definitions	Reference
Eco-Industrial Park	An eco-industrial park is a community of manufacturing and service businesses seeking enhanced environmental and economic performances through collaboration in managing environmental resource issues, including energy, water and materials	(*1)
Eco-Industrial Park	The goal of an EIP is to improve the economic performance of the participating companies while minimizing their environmental impacts. Components of this approach include green design of park infrastructure and plants (new or retrofitted); cleaner production, pollution prevention; energy efficiency; and inter-company partnering. An EIP also provides benefits for neighboring communities to assure that the net impact of its development is positive.	(*2)
Industrial Symbiosis	Industrial symbiosis, as part of the emerging field of industrial ecology, demands resolute attention to the flow of materials and energy through local and regional economies. Industrial symbiosis engages traditionally separate industries in a collective approach to competitive advantage involving physical exchange of materials, energy, water, and/or by-products.	(*3)
Eco City	The path to sustainability lies in transformation of our cities to restore the patterns and processes of sustainable ecosystems and to achieve ecological balance, healthy communities and viable economies within the bioregions.	(*4)

(*1) Lowe, Ernest, Moran, Stephen, and Holmes, Douglas, Fieldbook for the Development of Eco-Industrial Parks, prepared for U.S. EPA under a cooperative agreement with Research Triangle Institute.

(*2) Lowitt, Peter. 2004. Sustainable Devens. Presentation at Partnership for the Future: 2nd Annual Conference and Workshop for Eco-Industrial Development, Eco-Industrial Estates Asia Network, Bangkok, Thailand March 11-12, 2004.

(*3) Chertow, M. Industrial symbiosis: Literature and taxonomy. Annual Review of Energy and Environment, 2000

(*4) CASE Monograph-Draft; p3. , 2002

2. Overview: Eco-Towns in Japan

2-1 Background and Framework

Eco-Towns in Japan originated through a subsidy system established by METI (Ministry of Economy, Trade and Industry in Japan) and MoE (Ministry of Environment in Japan) in 1997. Around that time, Japan was confronted by a serious shortage of dump yards and the necessity to revive local economy. On the other hand, positive momentum was rising for implementation of the Zero-Emission concept in Japan. The national government established Eco-Towns to solve garbage problems and assist companies in declining industries such as steel, cement by the Zero-Emission concept.

The Zero-Emission concept call for industries and companies keep the amount of wastes generated by their activities to a minimum, and should properly recycle such wastes, in collaboration with other industries, thereby establishing an appropriate recycling system. The concept of Zero-Emission was formulated by United Nations University in 1994, and has evolved around the world and become the goal of the enterprises and municipalities conscious of environmental issues in Japan. Zero Emission aims at:

- 1) Gross input equals gross output (getting the waste close to zero);
- 2) Reduction in green-house gases and environmental burden, and promotion of energy-saving measures;
- 3) Collaboration among the collective industries in various fields, and among administrative districts beyond their borders.

The “Zero-Emission” implemented in Eco-Towns are urban planning and environmental management efforts where industries located in the designated Eco-Towns area practice resource recycling within their manufacturing process, and in between the industries. They are developed in pursuit of synergies derived from combined efforts in waste treatment, environmental preservation, and promotion of industrial development.

Several stakeholders commit to developing their Eco-Towns (see. fig2-1). The national government supports Eco-Tows by not only establishing the legislative system, but also by designing the subsidy system. A local government first creates an “Eco-Towns Plan” that takes advantage of the region’s local characteristics. Then, if the basic concept and concrete projects incorporated into the plan are judged by METI and MoE as meeting a certain standard of originality and innovativeness, and judged to have the potential to serve as a model for other local governments, the two ministries jointly approve the plan. They then provide financial support for projects to be implemented

by local governments and private organizations to improve physical recycling facilities, and to implement “soft” (institutional/organizational) projects that can contribute to the realization of a sound material-cycle society

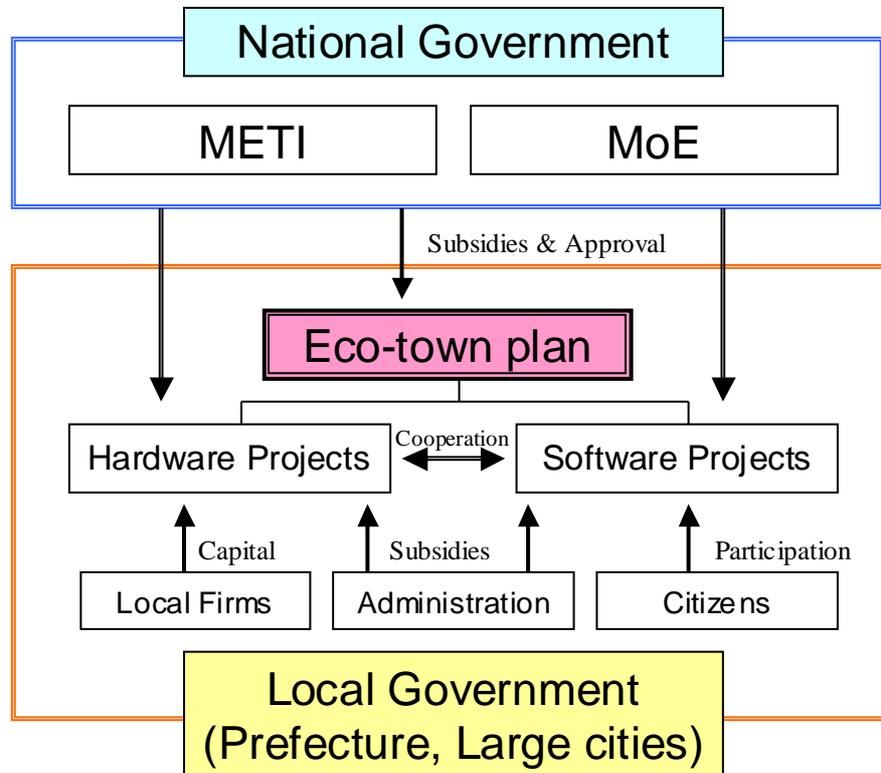


Figure 2-1. Framework of Eco-Towns in Japan

2-2 Support Systems of the National Government

It is necessary that an appropriate system for input, facilities and output should be established in order to succeed in reuse/recycling businesses and by-product exchange that will be a key part of Eco-Towns. Regarding inputs, legal systems and regulations should be reviewed to ensure certain amount of material waste and sales outlet. Regarding facilities, subsidy systems for technology development and capital investment will be necessary. Regarding outputs, proper treatment of waste and sales outlet for eco-friendly products should be expanded.

Support system was established mainly by the national government in Japan, Eco-Town project was set out in 1997, and the subsidy system for facilities was established. When the later, a framework concerning the issue of input was created by the formulation of laws to promote effective utilization of resources based on the “Basic Law for Establishing the Sound Material-Cycle Society”, enacted in 2000. As for the output issue, the government

enacted the “Law on Promoting Green Purchasing” to institutionalize the purchasing standards of business entities, and has promoted the rising concern over Corporate Social Responsibility (CSR) among consumers and enterprises. The government has also strengthened and eased regulations for proper treatment of waste.

2-2-1 Subsidy Systems

METI, with the support from MoE, establish the subsidy system for Eco-Town projects in 1997. Kawasaki City, Iida City (Nagano Prefecture), Kani City (Gifu Prefecture), and Kitakyushu City were approved as Eco-Towns in the first year, and various recycling facilities were built in the cities. Since then twenty three cities have been approved as Eco-Towns by March 2005 and received subsidies (see table.2-1, fig.2-2). There are two types of subsidy schemes of Eco-Towns -hardware projects subsidy and software projects subsidy. Hardware projects subsidies are applied for effective and stable recycle or reuse projects in Eco-Towns. One-third of the cost (half of the cost when the project is particularly innovative) is subsidized. Software projects include Eco-Town planning, mesena projects, regional information projects and so on. Software projects subsidies are below one half of the total construction costs. The total budget for Eco-Town projects amounts to JPY 1.54 billion in 2004. (See Table 2-2, 2-3.)

Table.2-1 Eco-Towns in Japan

FY1997	Iida City (Nagano Prefecture), Kawasaki City, Kitakyushu City, Gifu Prefecture
FY1998	Oomuta City (Fukuoka Prefecture), Sapporo City, Chiba City/Chiba Prefecture
FY1999	Akita Prefecture, Uguisuzawa Town (Miyagi Prefecture)
FY2000	Hokkaido, Hiroshima Prefecture, Kochi City (Kochi Prefecture), Minamata City (Kumamoto Prefecture)
FY2001	Yamaguchi Prefecture, Naoshima Town (Kagawa Prefecture)
FY2002	Toyama City (Toyama Prefecture), Aomori Prefecture
FY2003	Hyogo Prefecture, Tokyo, Okayama Prefecture
FY2004	Kamaishi Town (Iwate Prefecture), Aichi Prefecture, Suzuka city (Mie Prefecture)

2. Overview of Eco-Towns in Japan

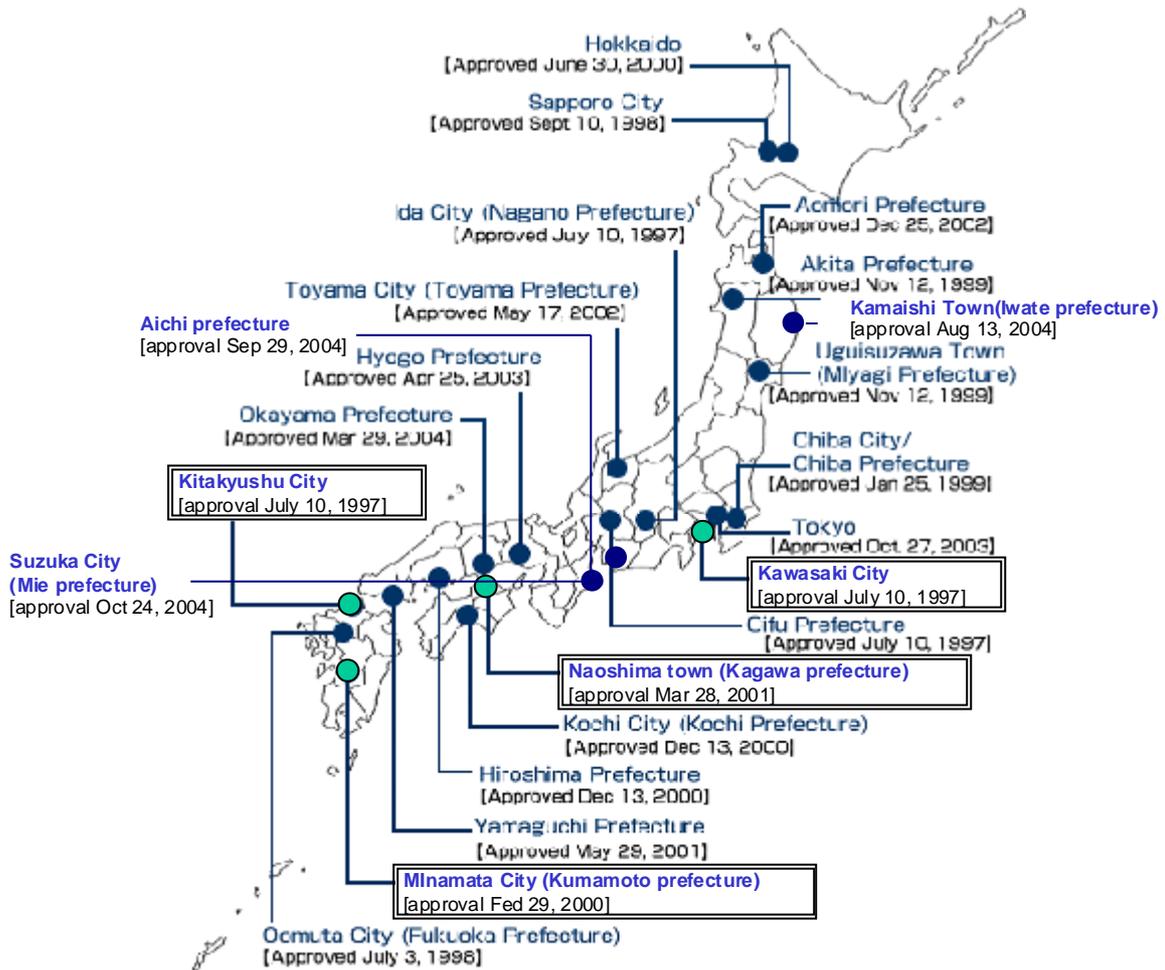


Fig.2-2 Eco-Towns in Japan

Table 2-2 Eco-Town scheme for hardware projects subsidies in Japan

Applicable projects	Effective and stable recycle projects with maximum utilization of regional resources
Applications	Made by local governments
Number of projects to be adopted	Around three to five projects (every years)
Subsidy amount for a project	300~500 million yen
Primary amounts of a subsidy	One third of the total project cost (One half of the total project cost for high originality and leading projects)
Total amount	JPY 1.43 billion (2004) JPY 2.61 billion (2003)

Table 2-3 Eco-Town scheme for software projects subsidies in Japan

Applicable projects	<ul style="list-style-type: none"> ● Planning for the Eco-Towns ● Massena projects ● Regional information projects ● Creation of business promotion model in the scheme of the creation of the sound material-cycle society
Applications	Made by local governments
Number of projects to be adopted	Around twenty ~ thirty projects (every years)
Subsidy amount for a project	3~5 million yen
Amounts of subsidy	Less than one half of the total project cost
Total amount	JPY 110 million (2004) JPY 70 million (2003)

2-2-2 Legislative Systems for Eco-Towns

Fundamental policies related to the promotion of Eco-Towns are those designated in the “Basic Law for Establishing the Sound Material-Cycle Society” enacted in 2000. The sound material-cycle society that we are aiming at is a society based on the principles to reduce the amount of resources that are removed from nature as much as possible, and to reduce the amount of wastes that are finally discarded in nature as much as possible by inputting things once used in society as recycled resources (MoE). Numerical targets are as follows:

1. Input : resource predictability (=GDP/natural resources + products) should be JPY 390,000 per ton by 2010.
2. Circulation : reuse and recycling resource usage ratio
(=reuse and recycling resource usage / reuse and recycling resource usage +virgin resource usage) should be about 14 percent by 2010.
3. Output : final disposal amount should be about 280 million ton per year.

Based on the Basic Law for Establishing the Sound Material-Cycle Society, the Law for Promotion of Effective Utilization of Resources (2000) and other laws such as the Container and Packaging Recycling Law (1995), Construction Material Recycling Law(2000), Food Recycling Law(2000), Electric Household Appliance Recycling Law(2001), and Automobile Recycling Law(2002) were enacted. These laws have made it possible to ensure certain amount of wastes used as materials and sales outlet in reuse/recycling businesses and by-product exchange. The market of reuse/recycling businesses and by-product exchange has steadily expanded along with the increase in waste covered by the laws (see fig.2-3).



Fig.2-3 Law system concerning 3R in Japan

2-3 Policymaking by Local Governments

The Eco-Town Concept is incorporated into local governments' measures by formulating their own Eco-Town Plans. Since Kawasaki City, Iida City, Gifu Prefecture and Kitakyushu City were approved as Eco-Towns in 1997, 23 cities and towns in Japan have promoted Eco-Town Plans with the approval from the national government. Eco-Town Plan includes the plan to promote recycling facilities (planning, operating body, finance, management horizon, raw material etc.), and projects to enlighten the citizens and provide information by exhibitions, events etc. There are industrial, social and regional varieties in Eco-Town Plans depending on the regional features of each city or town, but the Eco-Towns in Japan can

generally be categorized into four types as follows:

1. Promotion of establishment of a sound material-cycle society by regional industrial infrastructure
[Example; Kawasaki Eco-Town]
2. Promotion of establishment of a sound material-cycle society by attraction of enterprises policy
[Example; Kita-Kyushu Eco-Town]
3. Promotion of establishment of a sound material-cycle society by citizens' involvement
[Example; Minamata Eco-Town]
4. Waste management and town planning
[Example; Naoshima Eco-Town]

2-4 Projects by Industrial Sectors

Many projects have been implemented based on Eco-Town Plans. The biggest concern of the enterprises is whether reuse/recycling businesses and by-product exchange are remunerative. The enterprises in Eco-Towns are acknowledged to receive subsidies up to half of the initial investment (construction cost) by the government. However, there are many enterprises doing their business in Eco-Towns without receiving any subsidy. Although they do not receive subsidy, they benefit from being located in an Eco-Town communities such as business opportunities and information sharing. METI categorizes the projects of the Eco-Town projects succeeding in their businesses as follows:

(1) Categorized by business needs of recycling facilities

1. Implementation of Laws concerning 3R
2. Response to sound waste management and recycling needs of general waste and refuse incineration ash
3. Response to sound waste management and recycling needs of hard-to-treat refuse
4. Response to recycling needs of local products (such as fishery products and wood)

(2) Categorized by local resources

1. Utilization of existing facilities
2. Utilization of existing commercial distributions

3. Recycling industrial complex
4. Citizens' involvement

(3) Categorized by recycling product types

1. Existing products
2. New products

3. Case study1: Kawasaki Eco-Town

3-1 General Information of Kawasaki City

Kawasaki City, located in the Tokyo Metropolitan Area where a third of the country's population lives, has a population of about 1.3million, ninth most populous in Japan.

It is located approximately 50 kilometers from Narita International Airport, the gateway to Japan, and can be accessed from the world's major cities (Fig. 3-1, 3-2). It also adjoins Haneda Airport, the major airport for domestic airlines, providing easy access from major cities in Japan. The area is also easily accessible from various places in the country by railway, highways and international and domestic ports. Those land-sea-and-air transportation provide the City great access to domestic areas and worldwide.



Population (2004): 1.3 million
Area: 144 k m ²
GDP (2000): 4.6 trillion yen
Shipment Value : 3.5 trillion yen
Cargo Volume (1996 : 105 millions tons
Percentage of R&D Researchers (2002) : 4.73%
(23 thousands)

Fig.3-1 Location of Kawasaki city1

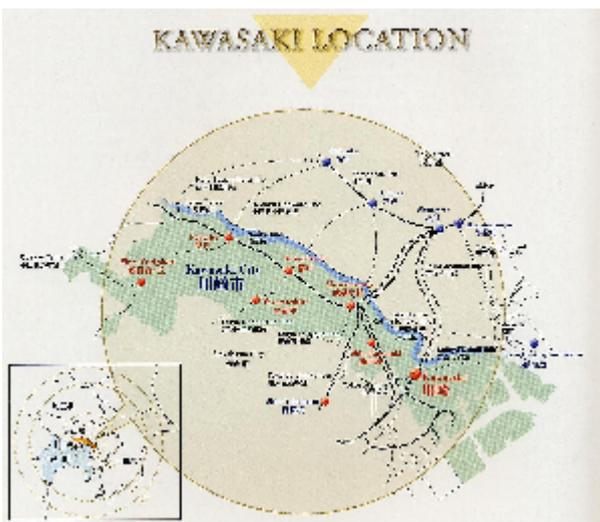


Fig.3-2 Location of Kawasaki city2

3-2 Overview of Kawasaki Eco-Town

Kawasaki Eco-Town was approved in 1997 as one of the first Eco-Towns in Japan. The target region has an area of 2,800ha in Kawasaki Coastal Area, and 71 entrepreneurs are located here whose site area is 0.9ha or more (2003). Five facilities (Waste Plastics Recycling System for Use as Raw Material for Blast Furnace, NF Board for Concrete Forms Manufactured from Recycled Plastic, paper recycling facility, PET-to-PET recycling facility and Waste Plastics Recycling System for Use as Material for ammonia) have been approved as Eco-Town hardware projects. About JPY 25 Billion in total is provided as a subsidy from the national government and Kawasaki City. Besides, several recycling facilities have been set up, such as home appliances recycling facility and cement manufacturing with recycling process. (see table 3-1)

Kawasaki Eco-Town Plan targets an area broadly defined to include almost the entire stretch of the Kawasaki coastal area, and aims at creating a resource-recycling society, and revitalizing the coastal area. This concept envisions that the industrial companies that will be located in the area will minimize their operations' impact on the environment. More specifically, to concretize the concept, it intends to develop a zero-emission industrial park. The individual companies within the industrial park not only will reduce their own emissions, but will also effectively utilize or recycle the emissions from other facilities located there into usable resources. Other recycling facilities will also be built around the industrial park in order to promote cooperation, in terms of resource recycling with the existing companies.

Based on the geographical advantages, Kawasaki Eco-Town employs four developmental steps. The first step is to promote environmental measures at the company level. All industrial firms in the Eco-Town strive reduce all types of impacts on the environment throughout the entire spectrum of their activities, from manufacturing of their products to eventual disposal of such items as waste. The second step is to promote environmental measures at the recycling zone level through cooperation among companies. For this purpose, Kawasaki City establishes environmental targets and regulates recycling zone environmental statements. The core concept of environmental measures at the recycling zone level is the Kawasaki Zero Emission Industrial Park (see box in following page). This includes a forward-looking approach to ISO14000 series certification of all businesses and positive efforts in joint recycling and use of recycled products. The third step is on ways to research to realize sustained growth in the Environmental Recycling Zone based on the environment. Examples of research include cascade use of factory waste heat to realize effective energy use, and product recycling systems that recycle resources from the Environmental Recycling Zone as materials for various businesses. The fourth step is to

contribute to society and developing nations through information on results at the company and recycling zone levels. The results of the Eco-Town Project is translated into information resources, including results of business-level environmental measures, recycling zone-level environmental measures, and research on sustained growth. This information is then disseminated to foreign countries as well as other parts of Japan.

The Kawasaki Zero Emission Industrial Park

The Kawasaki Zero Emission Industrial Complex was constructed as part of the planning of a resource recycling-type community, aiming at sustainable development for the future. It is a new type of industrial complex that tries to reduce the volume of materials and wastes discharged from industrial activities to the least possible level, and at the same time minimize environmental loading through the reuse and recycling of resources and circulatory utilization of energy.

There are 15 enterprises in the complex (metal-processing, paper, plating, forging, and stamping enterprises) as of October 2004. Together they operate the Kawasaki Zero Emission Industrial Complex Association in cooperation. Conditions applied to enterprises in the complex are:

- (1) Each participating enterprise should have its own basic environmental policy and agree to the goal of the complex.
- (2) Each enterprise should challenge a higher goal (zero emission) than just emission standards in reducing its environmental load.
- (3) Each enterprise should deal with the issue efficiently through linkage with other enterprises that constitute the complex.
- (4) Each enterprises should internalize environmental loading factors within a process of manufacturing (forming a complex) as much as possible through collaboration among enterprises.

Total zero emission should be attained through jointly linking with circulatory function in adjacent areas when zero emission cannot be achieved within the complex.

3. Case study1: Kawasaki Eco-Town

Table 3-1. 3R facilities in Kawasaki Eco-Town

	Eco-Town hardware projects			
	1	2	3	4
facilities	Waste plastics recycling plant for use as raw material for blast furnace	Manufacturing plant of NF boards for concrete formwork	Hard-to-recycle paper recycling plant	Waste plastics recycling plant for raw material for ammonia
companies	JFE Steel Co.	JFE Steel Co.	Corelex Co., Ltd	Showa Denko
technologies	The system to chemically recycle 100% of waste plastics for material for blast furnace	By using waste plastics as source materials, boards for concrete formwork (NF board) are produced. The boards are used as substitutes for wooden plywoods. Used boards are collected and recycled as materials for steel making.	Collected papers include various kinds of paper such as classified documents and magnetic train tickets for automatic ticket examiners. Contaminated substances removed from paper sources are also recycled.	Plastics out of general wastes and industrial wastes are processed in a gasification/pyrolysis and melting furnace and completely recycled as chemical materials.
capacities	Waste plastics: 1996.10.	Waste plastics:20,000t/y 2002.9.	Waste paper : 81,000t/y 2002.11.	Waste plastics:65,000t/y 2003.4.
costs	2.8 billion yen	2.6 billion yen	10.6 billion yen	7.4 billion yen
subsidies (by National government)	1.37 billion yen	1.30 billion yen	2.10 billion yen	3.70 billion yen
subsidies (by local government)	13.7 million yen	13.0 million yen	0	37.0 million yen
	Eco-Town hardware projects	Other projects		
	5	6	7	8
facilities				
companies	Recycling plants from used PET bottles to usable PET bottles	Recycling system for waste home appliances	Cement manufacturing plant from industrial wastes	Stainless steel manufacturing plant from recycled wastes
technologies	PET Rebirth Co., Ltd	JFE urban recycle Co.	DC Co., Ltd.	Yakin Kawasaki Co.,
capacities	To chemically recycle waste plastics and provide PET resin of the same quality as the virgin PET resin for PET bottles manufacturers.	To collect chlorofluorocarbon from used home appliances, crush and sort those appliances, and recycle the iron and nonferrous metal for iron-making process, and plastics for blast furnace materials.	To recycle industrial wastes and by-products with the high-temperature burning (over 1450) technology in the cement manufacturing process.	To recycle the waste metals such as chrome, nickel, and steel produced in the stainless steel manufacturing process. Slag and other materials produced within the facility are also recycled at the reduction
	Waste PET bottles:27,500t/y 2004.4.	Weate home appliances : 1,300,000units / y 2001.4.	Total throughput of industrial wastes (sludge, residue etc.) : 250,000t/y. Total throughput of waste plastics (termal use) : 60,000t/y -	Automobile scraps, pressed cans, stainless wastes, used pinball machines etc. -
costs	8.0 billion yen	2.0 billion yen	N/A	N/A
subsidies (by National government)	4.00 billion yen	0	0	0
subsidies (by local government)	40.0 million yen	0	0	0

3-3 Background

3-3-1 Socio-Economical Background

(1) Development of Keihin Industrial Area

Land reclamation of the Kawasaki Coastal Area began in Meiji Period (1868-1919), and the area began to be industrialized with the full-scale reclamation in 1913. The policies to invite industries since Meiji Period made rapid progress in heavy chemical industry, such as steel, machineries, electricity, oil or shipbuilding, which concentrated in the area.

In 1950s, after the World War II, Japan enjoyed high economic growth, and Kawasaki Coastal Area was not an exception; large-scale industrial plants became more and more concentrated in the area.

On the other hand, accelerated industrialization of the coastal area resulted in a phenomenal increase in fuel and industrial water consumption, and also caused air and water quality degradation due to the discharge of pollutants from factories. The air pollution caused by smoke and soot discharged from factories was especially serious; sulfur oxide concentrations of 0.09ppm was observed, which threatened the health and living environment of the public.

In such a situation, popular protests against industrial pollutions became common in the coastal area as well as all around Japan. The national government hesitated to initiate bold actions on pollution issues, however, because of its priority to pursue further economic growth. Meanwhile, being at the center of the problem, the municipalities who could reflect the needs of the citizens more easily than the national government began to launch various measures to solve the issues ahead of the national government. The Kawasaki City Ordinance for Pollution Prevention was formulated in 1972. Kawasaki deployed progressive approaches such as setting the environmental targets stricter than those used nationally, or introducing a new system of regulation of total emission. The industries in Kawasaki kept developing innovative technologies to deal with these regulations, which resulted in a considerable decrease of the pollutants discharge (See fig.3-3). Going through the history described above, Kawasaki City established a basis for cleaner and safer technologies, strong awareness of the public and administration, and public-private partnerships.

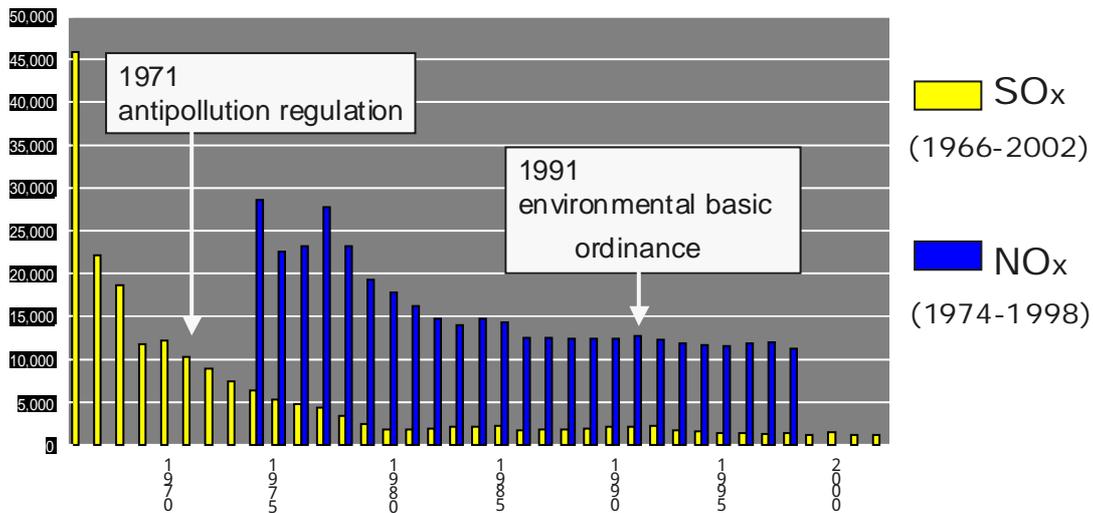


Figure 3-3. Secular change in air pollutants in Kawasaki

(2) Breaking of the Bubble Economic and Global Environmental Issues (1990s)

Japan faced two serious problems in 1990s: global environmental issues and breaking of the bubble economy. Further degradation of the global environment required responding in ways more complicated and effective than ever, and breaking of the bubble economy required a response to the hollowing out of Japanese industries caused by transfer of factories overseas.

Citizens, enterprises and administration in Kawasaki strove to bring change in the city. The administration focused on the environmental administration, including formulation of the “Basic Environmental Ordinance” in 1991, presidential to the national law, the “Basic Environmental Law” in 1993. Kawasaki New Comprehensive Plan, which is still in the process of formulation, will promote the efforts based on the realization of a sustainable society, which will differ from the conventional measures based on economy growth and the increase of tax revenues. Regarding the businesses in Kawasaki, there is an increase in companies engaging in environment-friendly management, due to requests to deal with environmental issues, and the harsh competition among businesses. Moreover, civil activities centered on Kawasaki for the realization of a sustainable society have also been quite active.

3-3-2 Local Initiatives

Large heavy-chemical companies have played an important role in developing the Kawasaki Eco-Town. In 1990s, Kawasaki Coastal Area faced structural changes, and the necessity to change its industries was urgent. During two decades from 1980 to 2000, the number of factories decreased by 52 percent, the number of employees to 53 percent, and total amount of shipment by 40 percent. The companies in the area underwent a major restructuring, thorough energy saving and development of cleaner technologies in order to address the downward trend.

Many companies emerged in the environmental sector, such as waste treatment or recycling. For instance, NKK (JFE of today) found the possibility to use waste plastics as the blast furnace fuel. The exploration of waste plastic recycling plant for blast furnace began in 1992, and they succeeded in making commercializing the recycling in 1996. These companies also pressured the local government to support the environmental industries such as waste treatment or recycling to keep the businesses successful.

3-3-3 Local Technological Infrastructure

One of the local technological infrastructure is the clustering of various companies possessing manufacturing technologies in the Eco-Town. They have cultivated over time the process to develop facilities and technologies to recycle emissions and by-products from neighboring companies by using it as raw material. They have pipelines, transportation and information networks. Another characteristic is the geographic closeness to Tokyo and Yokohama, from where waste generated can be used in the recycling facilities in the coastal area.

3-4 Approval for Eco-Town Project

The Zero-Emission Concept that United Nations University advocated in 1994 gave a huge impact on the industrial policies in Japan. In that year, the Ministry of International Trade and Industry (Ministry of Economy, Trade and Industry of today) propounded “the Basic Concept for Project to Make Kawasaki City Environmentally Harmonious”, in which the concept is applied to improve industrial parks. Kanto Regional Bureau of International Trade and Industry, branch office of the Ministry, launched the project to investigate the feasibility of industrial park harmonized with the local environment to achieve environmental well-being and collaborating with local community, and to eventually actualize the Zero-Emission

Concept. Ohkawa-Machi Industrial Park in Kawasaki City was selected as a venue for the two-year investigation to be a coastal model.

Tokyo Electric Power Company was operating its thermal power plant in Ohkawa-machi, the area reclaimed in Taisho Period (1892-1925), which later became empty lots. Kawasaki City purchased the lots, created industrial park there, and clustered SMEs in the industrial park in order to solve the chaotic mix of residence and industries, and to reinforce an economic infrastructure for SMEs. The industrial park later became the Ohkawa-Machi Industrial Park. In Kawasaki City, many large enterprises are located along the coastal area, and SMEs in the inland area. The relationship of these enterprises is such that large enterprises in the coastal area subcontract to SMEs in neighboring Ohta-ku in Tokyo, and these SMEs subcontract to smaller SMEs in Kawasaki City. The inland area, which used to be a farming area, turned into a chaotic mix of residences and industries, as factories expanded into the area from Ohta-ku, and more and more houses were built from 1960s. So, the increased noise, traffic and pollution attributed to the factories became social issues, which Kawasaki City had to solve.

Research done by Kanto Regional Bureaus of International Trade and Industry suggested that, although Ohkawa-Machi Industrial Park was formed as an environment-conscious park without intending to be so, the Industrial Park should introduce various environmental methods including waste reduction, recycling, effective use of energy, pollution prevention, traffic reduction by efficient physical distribution system, attractive landscape, and local disaster preparedness. Kawasaki City, developing “Kawasaki 21 Industrial Strategic Action Project” (which was the plan for industrial policy at that time), incorporated the development of an environmentally-friendly industrial park into their main projects upon the results of the investigation. This investigation would later lead to the establishment of Eco-Town Projects.

When the Ministry of International Trade and Industry invited the applications for Eco-Towns from municipalities in 1996, more than 50 municipalities submitted their Eco-Town Plans. Kawasaki City was one of them, who planned to develop a “community factory project**” to solve the chaotic mix of residence and industries based on the result of the investigation “environmentally-friendly industrial park” and submitted their plan. The Ministry conducted hearings to choose five municipalities among those that applied for Eco-Town Plans. The result of these hearings was that approval for the Kawasaki City plan would be difficult because the industrial park Kawasaki City would only start five years later.

The METI created Eco-Town Projects in April 1997, and conducted official hearings based on the hearings of the previous year. The subsidies for the Eco-Town Project were quite

attractive to Kawasaki City, so the city made a plan to reflect directions that the Ministry had proposed. First, they expanded the “community factory project” to “Zero-Emission Industrial Park,” in which the clustering of recycling facilities operated by large enterprises was incorporated. The area covered by the Industrial Park was also expanded to 2,800 ha. The contents of this plan are approximately consistent with the current situation of Kawasaki Eco-Town. The city then submitted the plan named “The Basic Concept to Make Kawasaki City Environmentally Harmonious” to apply for the Eco-Town Project.

The plan submitted on July 8th was approved on the following day, July 9th. Thereby Kawasaki City, along with Gifu Prefecture, Iida City and Kitakyushu City, became the first set up Eco-Towns in Japan. These four cities were given the task to formulate Eco-Town Concepts utilizing subsidies for software projects. Kawasaki City began to develop “The Basic Concept for Project to Make Kawasaki City Environmentally Harmonious” in 1998 utilizing the subsidies. Kawasaki City then went on to actualize the concept. They first developed a scenario that Zero-Emissions are achieved by cooperation among enterprises, and invited enterprises in the industries they selected. In 1999, Zero-Emission Industrial Park Cooperative Association was founded by 15 enterprises that agreed to participate in the industrial park. Japan Environmental Corporation (former Environmental Restoration and Conservation Agency) purchased the vacant lots where NKK (former JFE) used to be, and began the construction of the Zero-Emission Industrial Park in 2000. Some of the factories in the park started to operate in 2003, and all the factories there started their operations by 2002.

JFE’s waste plastic recycling facility for blast furnace was the first to be built, and other facilities were sequentially constructed in the coastal area. All the projects in the Eco-Town Plan began to operate by 2004.

*Community Factory Project

This was the name given to the Kawasaki Eco-Town Plan in the earlier stage. This project became the basis for the Eco-Town Plan, in which Eco-Town Concepts of the national government were incorporated.

3-5 Features of Projects

(1) Utilization of By-Products Generated in Existing Manufacturing Processes

Since the main recycling business of Kawasaki Eco-Town is recycling of wastes from by existing manufacturing infrastructures (steel, nonferrous metal, cement, chemistry, paper etc.), most of the wastes trucked to Kawasaki Eco-Town are manufactured within the Eco-Town. On the other hand, at many other Eco-Towns, wastes are transported from other areas, recycled and sold as materials to other areas.

(2) Material Flow among Enterprises in Kawasaki Eco-Town

Mutual use of by-products and emission matters as raw materials has been promoted in the newly-built recycling plants and existing companies in Kawasaki Eco-Town. Showa-Denko (Chemical) provides ammonia produced in the manufacturing process for other enterprises around. Corelex Co. Ltd. (paper) provides the incinerated ashes generated in the process of manufacturing toilet papers from used papers for other cement companies as cement raw material. Corelex also uses the surplus electricity of JFE (steel) and the recycled water treated in a municipal wastewater treatment plant. Nihon Yakin uses the materials generated by JFE in the electric appliance recycling process as raw material for special alloy. As these examples show, industrial symbiosis is well underway in Kawasaki Eco-Town.

3-6 Municipal Support

(1) Feasible Study of Kawasaki Eco-Town

Kawasaki City implemented a feasibility study of "Kawasaki Eco-Town" in cooperation with an environmental consultant after the national government approved the Kawasaki Eco-Town in 1997. The national government subsidized the study as an eco-town software project. In the feasibility study, Kawasaki City proposed the possibility of hardware facilities, but not on software projects, for Kawasaki City at this point focused only on individual recycling businesses (although industrial symbiosis and cooperation with the citizens are included in the goals of the Eco-Town Plan).

(2) Subsidies for Business Sector

The national government subsidized 99 percent of the hardware project costs, and Kawasaki City subsidizes one percent of it at Kawasaki Eco-Town. The former has subsidized JPY12.5 billion and the latter JPY 103 million so far. (see Table.3-1)

(3) Provision of Treatment Water from the Sewage Center in Kawasaki

Kawasaki City provides advanced treatment sewage water for the facilities that recycle hard-to-recycle waste paper through exclusive pipelines.

The city had a plan to recycle paper discharged from the metropolitan area, as a core business of the Zero Emission Industrial Park. However, it was concerned that the cost competitiveness of Kawasaki Eco-Town would be markedly lowered if they used industrial water at the Eco-Town since paper manufacturing demands a huge amount of water. The city provided advanced treatment sewage water to solve the problem and support recycling businesses of hard-to-recycle waste paper.

3-7 Environmental Activities

Kawasaki Eco-Town Project has affected fields outside the business sector as well. Below is a description of the efforts implemented at schools and citizens' organizations in Kawasaki.

(1) Energy Saving Efforts in Local Schools

Schools subcommittees consist of principals, vice-principals and the Parent-Teacher Associations (PTAs) in Kawasaki. The subcommittee examined and conducted projects on the conservation of global environment and environmental education at local schools in order to promote the Action Plan. One of the main characteristics of Kawasaki projects is this schools subcommittee, which was set up based on the perspective that we can popularize environmental efforts in the community by starting with efforts in schools.

The main project is to install an energy saving navigation; "An energy saving navigation" is an instrument to show the amount of electric power consumption at each school and to let the students and teachers know how much electricity they saved. The Navigation made it possible to see how much electricity the school has consumed and to compare the rate of

this year with that of last year. Since the Navigation shows a concrete numerical target, such as “10% reduce”, the students began to be interested in energy saving proactively. Not only did they actively start to save energy, but they began to voluntarily engage in projects such as making and plastering posters.

All the 38 elementary schools and junior high schools in Kawasaki-Ward installed the navigation in 2000, and all seven junior high schools in Tama-Ward in 2001. 44 elementary and junior high schools in Kawasaki have Navigation at present.

These kind of projects have now spread beyond schools too. Shincho Elementary School is the first school that declared the “Commitment to Build the Republic of Energy Saving”. The Republic of Energy Saving is a network of schools, merchants’ associations, families, workplaces and communities that engage in everyday energy saving activities. Now the Republic has spread throughout the country, and 130,000 people from 88 organizations participate in the Republic. It is worthwhile mentioning that Shincho Elementary School is the very trigger of the Republic itself.

(2) Citizens’ Activities

In 1990s, when pollution worsened and popular protests against industrial pollution became very active in Kawasaki, organizations working on global and regional environmental issues were set up, and they engaged in significant activities and projects. Kawasaki City formulated “Kawasaki City Guidelines to Support Civil Activities” and regards supporting and promoting civil activities as an important issue on the grounds that citizens will play an important role in revitalizing communities and thus is a key factor in the social system.

Among these activities, three organizations engaging unique activities and projects are introduced below:

1. The Japan Association of Environment and Society for the 21st Century
(<http://www.neting.or.jp/eco/kanbun/index.html>)

The Japan Association of Environment and Society for the 21st Century (JAES21) was established in September 1993. The objectives of the JAES21 involve exploring the ways in which we can maintain and improve our society through extensive studies of the relationship between environment and society. These aims are based on the understanding that the world’s major environmental problems are closely associated with

human society's economic activities, culture, and lifestyle. The activities of JAES21 include research on the relationship between environment and society, publication of a monthly bulletin, workshops and conventions on environment and society, and dissemination of findings of such activities to other countries. Recent projects include environmental education seminars for business persons, eco-tour to Hasemura Village (Nagano Prefecture), and green economy study group.

2. Kawasaki Citizens' Group to Think about Waste Problems

This group is an organization that specializes in waste problems, and consists of 20 groups in Kawasaki City established in 1992. Their projects include giving proposals for waste treatment in sound material-cycle ways and issuing a leaflet "If we change, then the stores will change" for stores and supermarkets in 1994 and 1997. They carried out the project to draw up citizens' plans to prevent from generating and burning waste from 1997 to 1998, and completed the plan in March 1999. This plan enjoyed high popularity among citizens and municipalities all around Japan.

They have continued their projects to promote the citizens' plan since 1999. There are three projects: the council to make use of the plan with Kawasaki City Environment Bureau, issuing a handbook to recommend composting of raw garbage and holding the workshops, and drawing up the handbook to spread green consumer.

3. Japan For Sustainability (http://www.japanfs.org/index_j.html)

Japan For Sustainability (JFS), established as a non-profit organization in August 2002, is a platform for environmental communication. JFS provides a variety of information on the environment and sustainability, covering not only current developments but also traditional wisdom, craftsmanship and practices of day-to-day life as well as local activities, from Japan to the world via web site and e-mail magazines. The organization puts about 30 articles in English on their website every month and sends out a digest of these articles every week. There has been a sharp increase of access to their website from 7300 in August 2003 to 19000 in June 2004. It also circulates the JFS Newsletter every month. The number of subscribers to receive the monthly JFS Newsletter has increased from 2260 in August 2003 to 5020 in August this year. The number of the countries to which JFS Newsletter is sent has also increased from 117 in August 2003 to 164 in August this year.

3-8 Partnership among Stakeholders

"The Liaison Center for Revitalizing Kawasaki Coastal Area" set up in 2001 is the basis of

partnership in Kawasaki Eco-Town. This center consists of local industries, public administrators, and academic experts, and aims at promoting new urban planning and clustering of new industries for the 21st century, based on the ability to create things and infrastructure in order to contribute to revitalization of Kawasaki Coastal Area. The center formulated an action programme for revitalizing Kawasaki Coastal Area and established a “Committee for Revitalizing Kawasaki Coastal Area” to actualize the program. The partnership among industry, municipality, academia and citizens was established since some citizen representatives joined the committee. The committee’s projects include formulating a plan concerning industrial symbiosis, proposal of transportation and relaxation program of regulations system, and finding local resources for tourism industry.

Some enterprises participating in the committee (with the interests in revitalizing industries by setting up new businesses concerning environmental issues), founded a nonprofit organization (NPO) called “Liaison Center for Creation of Industry and Environment”. The objective of this NPO is to promote activities to contribute to activating industries and creating solutions against energy and environmental issues by collaboration among stakeholders (industries, government, researchers and citizens). There are three working groups in the NPO, () focusing on waste heat and electricity recovery in Kawasaki coastal area among industries and urban areas, () creating the industrial symbiosis model and quantitative analysis on eco-efficiency and () redesigning the regulation in Kawasaki coastal area as a special district to activate industries concerning energy and environmental issues.

3-9 Discussion

Kawasaki Eco-Town, mainly the large enterprises in the material industry, has so far achieved the following results:

- 1) It became one of the leading area where recycling facilities are clustered since Eco-Town Project was approved in 1997,
- 2) By-product exchange among business entities,
- 3) A non-profit organization (NPO) consisting mainly of large enterprises, was established to promote the planning and operation of the Eco-Town. The companies in the Eco-Town respectively developed and commercialized environmental technologies before, but now the NPO is the basis to comprehensively develop material flows, energy use and land use of the whole Eco-Town.

On the other hand, following problems also emerged:

- 1) The trend to be spread from large enterprises to SMEs:
Many SMEs not located in Zero Emission Industrial Park are not concerned with the Eco-Town and its actualities. There needs to be a framework to promote reduction of environmental burden and participation in the network of by-product exchanges among SMEs.
- 2) Stakeholders' involvement
Citizens and NGOs are not yet fully involved with Kawasaki Eco-Town Projects. Companies should actively hold site-tours and other events to promote information disclosure and opinion-exchange with citizens and NGOs.
- 3) Promotion of recycling of wastes discharged by urban activities
A new model of industrial symbiosis is to be established by utilization of wastes discharged by urban activities (offices, commercial facilities, homes, schools, hospitals etc.) in the manufacturing industry, and its reverse direction, that the heat generated from the industry is utilized by urban activities.

4. Case study2: Kitakyushu Eco-Town

4-1 General Information of Kitakyushu City

Kitakyushu City, located in the north part of Kyushu area with 485 square km areas, has a population of about one million (figure 4-1). Shipment value of industries is JPL 1.92 trillion (primary industry; 0.1 percent, secondary industry; 32.5 percent and third industry; 67.4 percent, 2001).

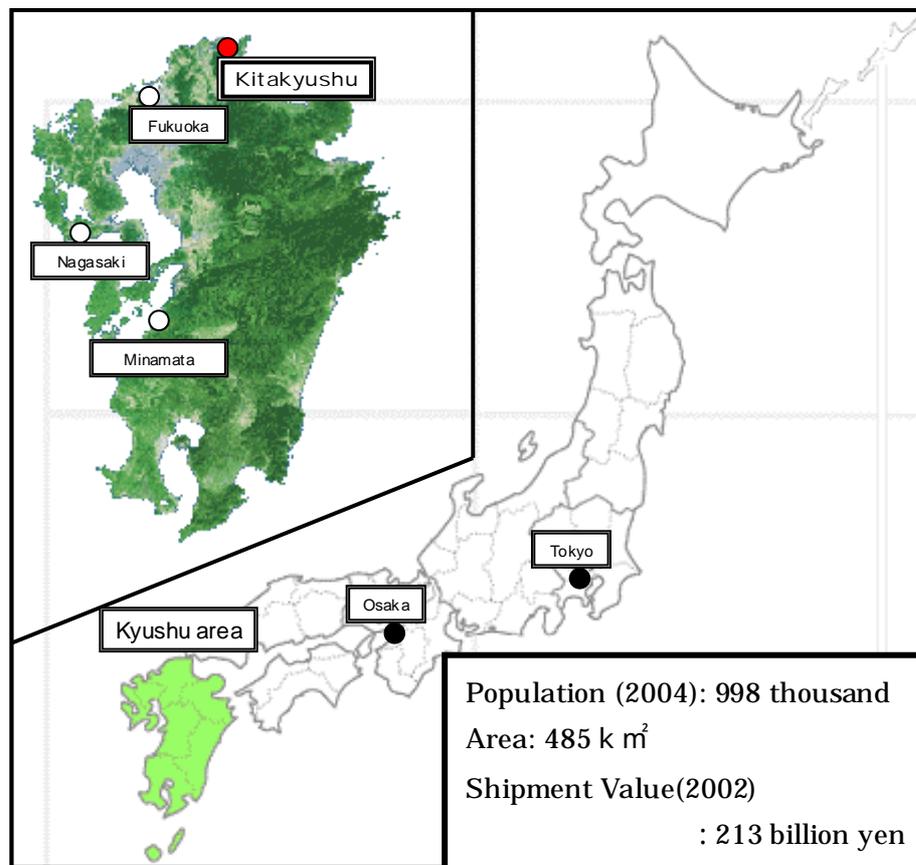


Fig.4-1 Location of Kitakyushu City

4-2 Overview of Kitakyushu Eco-Town

Kitakyushu Eco-Town is the first Eco-Town in Japan that was approved as an Eco-Town Project by the government in 1997. The Eco-Town Center, Hibiki Recycling Complex and Comprehensive Environmental Complex were at first the only targeted areas of the Eco-Town Project. Kitakyushu City then applied for a change in their Eco-Town plan so that the area could be expanded into the whole Hibikinada area (2000 ha) in 2002, and into the

whole Kitakyushu City (48,500ha) in 2004. The expansion intended to invite new recycling business and incorporate the existing industries.

Kitakyushu Eco-Town aims to be “Asia’s International Resource-Recycling and Environmental Industry Base City.” The “vein industry” had been clustered as a unique regional development measure to integrate environmental conservation with industrial promotion in the first phase of the plan (1997~2002). Kitakyushu City formulated the second phase of the Eco-Town Plan in 2002 (2002~). The city has chosen the following items as priority areas: to enrich the experimental study areas, to invite reuse and rebuild industries, to strengthen capacity building, to develop the businesses based on the existing infrastructures, and to create next-generation environmental industries with new energy technologies and nano technologies.

Kitakyushu Eco-Town has embarked on three strategies to promote environmental industries: 1. basic research and human resource development, 2. experimental studies, 3. commercialization. Although each of the three operates in isolation at present, the collaboration in the feasibility of the results of basic research and human resource activities, is verified by practical research and commercialized within the Eco-Town, is expected to be materialized in the future.

The area called the City of Academic and Research is responsible for basic research and human resource development. Many institutions are located in the same campus: the university of Kitakyushu, Kyushu institute of technology, Waseda university, Fukuoka university, Cranfield university (UK), German National Research Center for Information Technology (Fraunhofer-Gesellschaft). They have promoted research on the environment and information.

The experimental study area (6.5 ha) is the venue to implement the experimental research of results produced by researches to commercialize them. The institutions related to 3R and waste treatment are clustered in the area, and they have implemented experimental studies particularly on technologies related to the final disposal sites, recycling and detoxification of toxic substances. The clustering of research institutions related to the environment is expected to create new environmental businesses since the experimental studies have an important role in the creation of new businesses. The city also constructed the Eco-Town Center in the area. The center is expected to be the hub of the information disclosure and the citizens’ involvement with the Eco-Town Plan. Kitakyushu Eco-Town

requires all companies and institutions in the Eco-Town to open their facilities for the citizens in order to facilitate the understanding of citizens for the Eco-Town.

The target area of the first period of the plan was limited to the Comprehensive Environmental Complex and Hibiki Recycling Area, but the area was expanded into part of the Hibikinada Area. Kitakyushu City constructed the Comprehensive Environmental Complex in the site where the facilities related to iron manufacturing were located in the first period (1997~2002). Eight projects (see table 4-1.) are in operation in the area, and the whole area of the 20 ha is now filled up in 2005.

Moreover, the city has promoted development of the Hibiki Recycling Area (5.5ha) to locate SMEs. Automobile recycling facilities and recycling companies of cooking oil, organic solvent, used papers and cans are located in the area. Multiple Core Facility was also constructed in the area by the city to treat residues discharged from the Eco-Town and other areas and provide heat generated in the treatment for the Eco-Town, thereby no wastes are generated from the area. Wind power generation has been in operation in Hibikinada area from 2003.

Kitakyushu Eco-Town emphasizes information disclosure as a software project. All the companies in the Eco-Town must open their facilities for the citizens in order to cast aside the public distrust, anxiety and discomfort for wastes. Kitakyushu Eco-Town Center was established in 2001 to publicize the Eco-Town Projects and guide the visitors to the Eco-Town. The annex to the Eco-Town Center was established in 2003 to introduce the industries related to the environment in the whole area and provide trainings. By 2004 approximately quarter million people had visited the center. Those who have visited the center include those from foreign countries as well as from cities and other parts of Japan. Children, housekeepers, the elderly, administration and assembly officials have visited the Eco-Town.

4. Case study2: Kitakyushu Eco-Town

Table 4-1. 3R facilities in Kitakyushu Eco-Town

	Eco-Town hardware projects			
	1	2	3	4
facilities	Plastic PET bottle recycling project	Office equipment recycling project	Automobile recycling project	Home appliance recycling project
companies	Nishi-nippon PET bottle recycle Co., Ltd.	Recycle tech Co., Ltd.	West japan auto recycling Co.	Nishinihon consumer recycle Co., Ltd.
technologies	Based on the "law for recycling of containers and packaging", plastic (PET) bottles are sorted by municipals and recycled. The resin produced from recycling can be used to create materials for textiles and other products.	Discarded office equipment (copies, fax machines, printers, computers) is dis-assembled and sorted into categories. High-quality parts and materials are recovered for reuse.	In line with the used automobile recycling initiative of the METI, this project promotes improving recycling efficiency and the proper treatment of oil and freon gas. High-quality iron scrap, recycl-able materials, and parts are salvaged for reuse.	Based on "law for recycling of specific kinds of home appliances", discarded electric household appliances such as air conditioners, televisions, refrigerators, and washing machines are disassembled and sorted into categories.
capacities	Waste PET: 11,000t/y	Office equipment: 5,400t/y	Automobiles : 12,000 units/y	
	1998.10.	1998.12	2000.2	2000.4
	Eco-Town hardware projects	Other projects		
facilities	5	6	7	8
companies	Fluorescent tube recycling project	Medical wastes recycling project	Construction waste recycling project	Construction waste recycling project
technologies	Japan recycling light technology & system	Aso mining Co.,Ltd.	Hibiki ecosite	Yakin Kawasaki Co., Ltd.
capacities	Separating used fluorescent light tubes, glass, and metallic fluorescent substances mainly from office waste and recycling those materials. Also, involvement with the manufacture of recycled fluorescent tubes.	Used medical instruments are pulverized, sorted after being treated at a high frequency, and made into collection vessels. They are also recycled into solid fuel and concrete materials.	Waste discarded from construction sites is sorted by hand or machine and recycled into materials such as concrete, wood and metals. Waste wood is shredded and recycled into board-manufacturing material.	To recycle the waste metals such as chrome, nickel, and steel produced in the stainless steel manufacturing process. Slag and other materials produced within the facility are also recycled at the reduction furnace.
	Waste fluorescent tubes :5,270t/y	Medical wastes : 6,600t/y	Construction waste: 130,000t/y	Construction waste: 66,600t/y
	2001.1	2002.9	2002.11	2002.8

4-3 Background

4-3-1 Local Initiatives

The main driving forces in the formation of Kitakyushu Eco-Town are administrative and political leadership, survival strategies of companies in heavy industry, and cooperation with research institutions.

Kitakyushu City's environmental measures have enjoyed a high reputation overseas as well as at home. The city received UN's Global 500 Award in 1990 and UNCED Local Government Honours in 1992 based on their activities, such as the transfer of environmental technologies to developing countries and support for Dalian Environmental Demonstration Zone Project implemented by Kitakyushu International Techno-Cooperative Association (KITA). Koichi Sueyoshi, the Mayor of Kitakyushu City, received "Earth summit 2002 Sustainable Development Award" at Johannesburg Summit. The Mayor's leadership in environmental measures and high administrative capacities gave a great impetus for formation of the Eco-Town.

Secondly, private companies in heavy industry played a key role in forming the Eco-Town. Companies in the city faced the necessity to change the course of their business even before the Eco-Town Projects began. Nippon Steel Corporation, one of the main companies in the formation of the Eco-Town, suffered deteriorating competitiveness caused by the policy to prop up the value of the yen since the Plaza Accord in 1985. They transformed the direction of their business from heavy industry to a complex industrial structure in order to solve the problem of unused lands and excessive production capacity. They launched a committee with Mitsui & Co., Ltd. to study environmental industry, and Nishi-Nippon PET-Bottle Recycling Co., Ltd. in cooperation with some other companies in the city to commercialize the business to recycle PET bottles. Private companies emerged from stringent circumstances by seeing the situation as a chance to rejuvenate their operations and taking risks to invest in the new industries at that time.

Third, cooperation with research institutions is an important factor in forming the Eco-Town. Fukuoka University was adopted as a Science and Research Frontier Project of the Ministry of Education in March 1997, and Fukuoka University Institute for Resource and Environmental Pollution Control System was established as substantiation of the Frontier Project. Kyushu University, Kyushu Institute of Technology, Saga University, and nine private

enterprises participated in the research projects at the Institute. The objective of the institute is to implement research on waste management, recycling, and pollution control technology with the cooperation of industry, academia and government. Fukuoka University had begun research on wastes from 1966, long before the Eco-Town Project was launched. Their researches are based on on-site research should be done on site, not at the desk. The institute has the actual waste disposal site, which has 100 tons of wastes, to implement on-site research. Such enthusiasm made possible, the cooperation between research institutions and other entities including private enterprises and government.

4-3-2 Local technological infrastructure

The history of Kitakyushu Industrial Zone began when Yahata Iron Works (Nippon Steel Corporation of today) was established in Kitakyushu City in 1901. Heavy industry was developed there with the ports adapted to import raw materials such as coal and iron ores from China. However, heavy material industry, including steel, chemical, ceramic and cement industry, gradually declined, as the countries from which materials were imported, and to which the products were exported, changed from China to Australia and the US in 1955~65, and it became very difficult to perform production operations with material from neighbors because of the energy revolution (the transformation from the shift in energy from coal to oil).

Current industries clustered in the industrial zone are steel industry (e.g.; Nippon Steel Corporation Yahata, Sumitomo Metal Industries, Ltd.), chemical industry (e.g.; Mitsubishi Chemical Kurosaki) and ceramic industry (e.g.; TOTO LTD.) along the Kanmon Channel, and automobile industry (e.g.; Nissan Motor Kyushu Co., Ltd., Daihatsu Diesel Mfg, Co., Ltd.) and cement industry (e.g.; Mitsubishi Material Kyushu) along the sea of Subo. The inland area is a major producer of cement and the facilities of Toyota Motor Corporation Kyushu and Toshiba LSI Package Solutions Corporation.

Technological infrastructure best suited to environmental and recycling industries was set up in the industrial area.

- Technologies and human resources of clustered and existing industries are available
- Ports have functioned sufficiently to utilize physical distribution networks home and abroad, and to develop an environmentally-friendly mass transport system,
- It is possible to develop independent recycling businesses in the area based on controlled type landfill site, which enables the stable and long-term treatment of

residues,

- Infrastructural conditions are sufficient to develop industries.

4-4 Approval to Eco-Town project

Kitakyushu City and the companies in the city sought industrial promotion and environmental conservation measures focusing on the “vein industry” before the Ministry of Economy, Trade and Industry launched Eco-Town Projects in 1997. Kitakyushu City at that time aimed at the promotion of vein industry as a development objective of the Hibikinada reclaimed area, which was a vast unused land. Private companies were already in action to commercialize environmental industry; some companies, Nippon Steel Corporation playing the main role, launched Nishi-Nippon PET-Bottle Recycling Co., Ltd.(a PET bottles recycling company).

The industry-government-academia partnership and the system for industrial promotion and environmental conservation were being developed as projects and plans by the city and companies. The city welcomed the government’s move towards a sound material-cycle society and the launching of Eco-Town Projects.

Reclamation development of the Hibikinada Area, where the Eco-Town facilities are clustered, has a long history. Nippon Steel Corporation Yahata Iron Works began to reclaim the area in 1912. The reclamation continued with the slag discharged from the factories in Kitakyushu City and the dredged soils from gateway sailing routes and ports. Nippon Steel Corporation, Mitsubishi Chemical Corporation and some other enterprises established “Hibikinada Development, Ltd.,” and developed and managed the area with cooperation from the city. The city at that time had a plan to effectively utilize the Hibikinada Area to invite factories and enterprises to the area. The development of the area was nowhere in sight, however, and the more than 2000ha of land remained unused. The city set up a study group to explore the way to effectively utilize the area in 1989. The study group suggested a “vein industry” as an industry to fully utilize the technologies, human resources and industry-academia-government-citizens networks developed in the process of conquering pollution in the city. Little progress was made for few years since then, but in 1994 the group began to consider a development plan of the Hibikinada Area based on the vein industry as a core project.

Private enterprises began to pay attention to environmental and vein industries to set up new businesses. Nippon Steel Corporation, one of the main companies in the formation of

the Eco-Town, suffered deteriorating competitiveness caused by the policy to prop up the value of the yen since the Plaza Accord in 1985. They formulated a restructuring plan to transform the direction of their business from heavy industry to a complex industrial structure in order to solve the problem of unused lands and excessive production capacity. They sold the unused lands and expanded their business to new industries such as information and telecommunication industry and biotechnology. One of the new industries set up was the environmental industry, which they regarded as the industry to fully utilize their potentialities. In 1994 they launched a committee with Mitsui & Co., Ltd. to study the environmental sector, and Nishi-Nippon PET-Bottle Recycling Co., Ltd. in cooperation with some other companies in the city to commercialize the business to recycle PET bottles.

4-5 Features of Projects

Three features below are introduced as unique to the Kitakyushu Eco-Town, compared with other Eco-Towns in Japan.

1. Clustering of environmental/recycling industries

One of the main objectives of the Kitakyushu Eco-Town is to promote the clustering of environmental and recycling industries in the Eco-Town. Various types of recycling projects were already in operation in the Comprehensive Environmental Industrial Complex, including plastic PET bottles recycling, office equipment recycling, automobile recycling and home appliance recycling. Each recycling project is operated by a private enterprise. The complex has the largest number of the types of recycling projects among the Eco-Towns in Japan.

2. Thorough information disclosure

Kitakyushu Eco-Town emphasizes information disclosure as a “software” project. All the companies in the Eco-Town must open their facilities to citizens in order to cast aside public distrust, anxiety and discomfort for wastes. Kitakyushu Eco-Town Center was established in 2001 to publicize the Eco-Town Project and guide visitors to the Eco-Town. An annex to the Eco-Town Center was established in 2003 to introduce industries related to the environment in the whole area and provide trainings. By 2004 approximately quarter of a million people had visited the center. Those who visited the center include those from foreign countries as well as from cities and other parts of Japan. Children, housekeepers, the elderly,

administration and assembly officials have also visited the center.

3. Collaboration among basic research, practical research and commercialization

Kitakyushu Eco-Town has embarked on three strategies to promote environmental industries: ()basic research and human resource development, ()experimental studies and ()commercialization. Each of the three operates in isolation at present. The area called the city of academic and research, contains many research institutions such as Kitakyushu University, Advanced Research Institute for Science and Engineering of Waseda University and Cranfield University (UK), and is responsible for basic research and human resource development. These institutions promote research on the environment and information. An experimental study area (6.5 ha) is used to implement results produced by research, to commercialize them. The institutions related to 3R and waste treatment are accumulated in the area, and they have implemented experimental studies particularly on technologies related to final disposal sites, recycling and detoxification of toxic substances. Although the three areas operate in isolation at present, collaboration on the feasibility of basic research results and human resource activities, and verification by practical research and commercialized within the Eco-Town, is expected to be materialized in the future.

4-6 Municipal Support

Koichi Sueyoshi, the Mayor of Kitakyushu City, summarized the city's role in the Eco-Town Projects with the following four points:

1. To develop hard infrastructure, including sewage, road construction and securing the sites for lease;
2. To support the software side of the projects, such as subsidies and PR activities;
3. Coordination and support, including appealing for waste segregation to other cities and towns, holding meetings, providing waste as material for research activities, briefings for the citizens;
4. "One-Stop Service" to achieve speedier procedures.

4-7 Environmental Activities

There are only a few citizens' environmental actions directly related to the plan since

Kitakyushu Eco-Town is located away from commercial and residential areas. This section will introduce citizens' actions and efforts related to the Eco-Town.

(1) Kitakyushu Committee to Think about Wastes and Recycling

Kitakyushu City, as well as other cities in Japan, had the problems increasing volume of wastes, and quality of wastes had diversified due to mass production, mass consumption, and mass disposal. The city set up the Kitakyushu Committee to Think about Wastes and Recycling in order to consider waste reduction and recycling of wastes, and the committee proposed a radical change of waste treatment from the conventional way that placed emphasis on "treating" wastes to "recycling" wastes.

First, a scheme for separation of cans and bottles began, based on a recycling system of that had already been established. Afterwards, collection of PET bottles in addition to cans and bottles began since the Containers and Packaging Recycling Law was enacted, and PET bottle recycling plants were constructed in the Eco-Town. Fluorescent tubes also began to be collected.

In Kitakyushu, wastes are first separated into seven kinds at home, and separated again into more than ten kinds at the city's facilities. They are finally recycled at the recycling plants in the city. Kitakyushu citizens began to understand the necessity of waste separation and thoroughly separate the wastes by visiting the Eco-Town. This is the only project funded by the city, because the wastes are predominantly separated by the citizens.

(2) Environment Museum and Environment Volunteer

Kitakyushu City held the "Kitakyushu Expo 2001" as a hundred year anniversary of the Hachiman Governmental Ironworks, and as a first step to the new town planning. The citizens played an active role at various exhibitions and events related to the environment, such as the "Environment Museum". Environmental volunteers, who had received one-year training on environmental education, drew up their own environment programmes and presented them. Zero-emission tours that introduced how waste segregation and intermediate treatment are implemented at the recycling centers, was also organized. The "Environment Museum" has continued to operate as an environmental learning center after the expo.

Visitors can learn from the history of pollution and about various environmental issues occurring now at the center. Environmental volunteers, who played an active role at the expo, continue to support with environmental education activities for a wide range of the public from children to adults Eco-tour programmes implemented by the Kitakyushu school board, also the Environment Museum and Eco-Town area.

4-8 Partnership among Stakeholders

There are various types of partnerships, including small study meetings and business projects, in the Kitakyushu Eco-Town Project, since the project is promoted under strong partnership among industry, government and academia.

This chapter introduces partnerships from the viewpoint of industry-government-academia reactors:

- (1) Partnership within the Hibiki Recycling Complex,
- (2) Partnership within the integrated environmental complex,
- (3) Projects of the Eco-Town Center,
- (4) Partnership within the Kitakyushu Eco-Complex.

(1) Partnership within the Hibiki Recycling Complex

Kitakyushu City develops and leases land in the Hibiki Recycling Complex to local SMEs for a long period of time in order to support expansion of SMEs' business into the environmental field. The complex is, in other words, a made-to-order industrial complex for lease, and the acreage and plots of land are determined by surveys of local companies' needs and public offerings and briefings in 1999.

The complex is divided into two zones -a vehicles-recycling zone and a frontier zone. There are some partnerships in both zones.

1) Partnership within the vehicles recycling zone

Seven companies scrapping old cars moved into the complex from the urban area, and established "Kitakyushu ELV Cooperative" to fully utilize their technologies and effectively engage in the vehicles recycling business. Common facilities among the facilities within the complex are "Press Factory" to process the vehicles, "Joint Storage and Logistics Center" to store used parts, and "Cooperative Organization Center" to manage tasks of the union. The organization processes vehicles at the Press Factory in cooperation, and sells valuable

metals such as steel and aluminum at the Joint Storage and Logistics Center. Other projects in cooperation include conveying disused cars, sales tasks for general users and research activities on automobile recycling.

2) Partnership within the Frontier Zone

Local SMEs and venture companies utilize their original and pioneering technologies and ideas to develop various recycling businesses. Although there are almost no partnerships among these companies now, they have sought partnership with citizens to recycle cooking oil in addition to waste oil from food factories. The companies have considered utilizing cooking oil collected at supermarkets for their recycling business.

(2) Partnership within the Integrated Environmental Complex

Most companies in the complex were established by investment from large corporations. Partnerships among the facilities include followings:

- 1) Making aging engines ingot at the aluminum fusion furnace of the West-Japan Auto Recycle Co., Ltd,
- 2) Separating home appliances, business machines and automobile wirings into copper and films by nugget processing machine of the West-Japan Auto Recycle,
- 3) Recycling cathode-ray tubes of computers discharged from Recycle-Tech Co., Ltd. at Nishinohon Kaden Recycle Corporation,
- 4) Recycling polystyrene used as packing materials in the area at the Nishinohon Polystyrene Recycle Corporation.

Moreover, "Multiple Core Facility" accepts industrial wastes from some companies. The function of the facility is to properly treat industrial waste discharged from companies in the Eco-Town, such as residues and shredder dusts of automobiles, and to achieve zero-emission in the area.

It is quite difficult to establish partnerships among companies in the Eco-Town. Ties built with companies outside the Eco-Town cannot be easily severed, and the style of the business management is such that economic merits are always prioritized, and hence partnership can be anticipated in the near future. The amount of waste that can be brought into the Multiple Core Facility is in fact limited, and some companies treat wastes at their own facilities.

Despite these difficulties, Kitakyushu City mediates with companies to have a liaison committee meeting once a month for information exchange, and lists the

environment-related technologies of the companies in the Eco-Town. Besides, various study groups have been set up, such as the study group to create projects to utilize biomass as materials, to commercialize the auction of used automobiles and heavy-construction-equipments, to rebuild semiconductor manufacturing equipments and automobiles.

(3) Eco-Town Center

The Eco-Town Center in the Kitakyushu Eco-Town is the only public facility among the facilities there, and is the venue to interact with the citizens. The objective of this center is for citizens visiting the center can have a better understanding of the Eco-Town. The Eco-Town requires companies and research institutions there to disclose their facilities and information.

The center provides opportunities for visitors to learn about the Eco-Town, and environment-related companies in the city. The number of visitors not only from within the city but abroad as well to the center has recently increased. The number of local elementary and junior high school students has especially increased. The center is operated by Kitakyushu City and companies in the Eco-Town in cooperation- the center belongs to the Kitakyushu City, but the companies provide the operating funds.

(4) Kitakyushu Eco Complex Concept

The Kitakyushu Eco Complex Concept has begun to expand the area of the Eco-Town and shift optimization of resources and energy from “within a factory” to “within a community.” A committee has been set up to discuss how partnerships should be established to materialize the concept. The committee consists of 17 large corporations, Kitakyushu City and academics.

5. Case study3: Minamata Eco-Town

5-1 General Information of Minamata City

Minamata City, located in the southern part of Kyushu with 163 square km areas, has a population of about 30,000 (figure 5-1). It has been a trend of population decrease after having reached more than 50,000 in 1950's. And the population is becoming older, with 27.9 percent as for the ratio of 65 years or older.

Shipment value of industries is JPY 72.6 billion (primary industry; 5.6 percent, secondary industry; 33.0 percent and third industry; 61.2 percent, 2001).

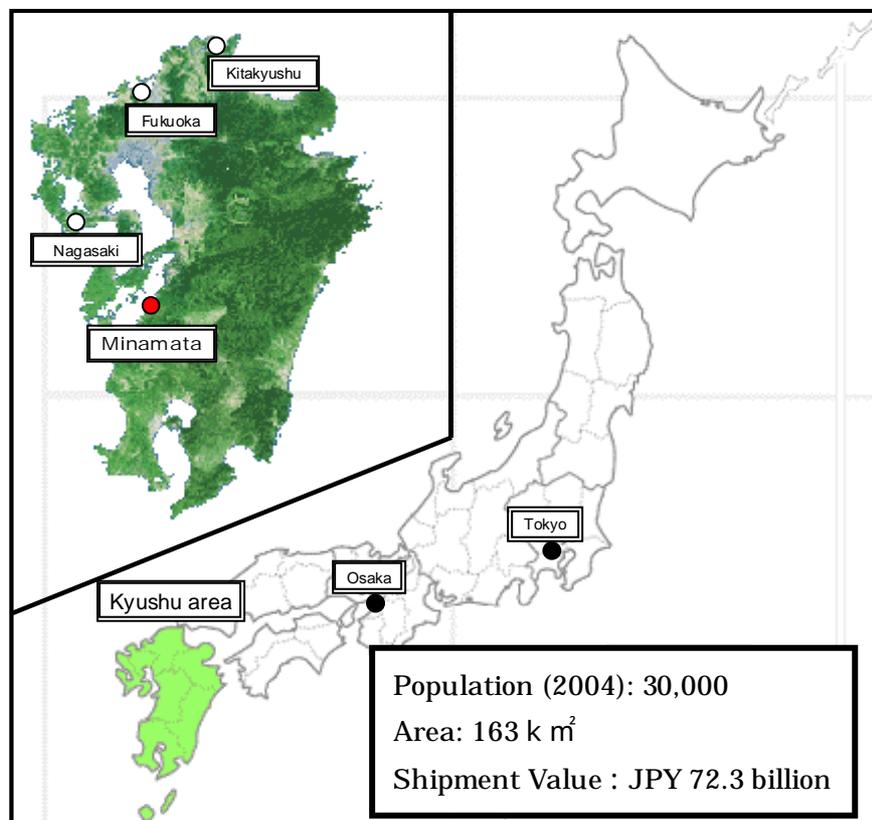


Fig.5-1 Location of Minamata City

5-2 Overview of Minamata Eco-Town

In 2001 Minamata Eco-Town was approved as the tenth Eco-Town in Japan. The targeted region is 16,300ha of the entire Minamata City. Two facilities (bottle reuse and recycle facility, and waste plastic compound resin recycling facility) have been approved as Eco-Town “hardware” projects. About JPY one billion in total has been provided as subsidy, from the national government (JPY 844 million) and the municipality (JPY 156 million) (See Table.3-1). Moreover, Minamata Eco-Town has promoted environmental “ISO” for offices, households, schools, kindergartens and hotels. It has also promoted the exchange and spread of information on the Eco-Town, and environmental education as the Eco-Town “software” project.

Minamata Eco-Town plan targets three concepts below.

1. "Multi-stakeholders involvement" in which administrations, industries and citizens are in unity to aim at creating sound recycling society and harmony with environment
2. "Community based approach" to achieve 4R (refuse, reduce, reuse and recycling) by utilizing first-hand materials and technologies
3. "Model for middle scale cities" which differs from conventional styles such as complexes in big cities

Table 5-1 Facilities in Minamata Eco-Town

	Eco-Town hardware projects		Other projects
	1	2	3
facilities	Bottle Reuse & Recycle Project	Waste Plastic Compound Resin Recycling Facility	Household Appliance Recycling Facility
companies	Tanaka-Shoten Co. Ltd.	Repla-Tec Co. Ltd	Act B Recycling Co. Ltd
technologies	This project involves the collection, washing, and inspection of currently circulated "one-way" bottles and selling them back to manufacturers with added value. Through the implementation of this project, disposable "one-way" bottles may be reused, waste output may be reduced, and effective use can be made of limited resources. From the standpoint of the manufacturer, reused bottles can be purchased at a lower price than new ones, while actively promoting their image as an environmentally-conscious company.	Based on the "Container & Packaging Recycling Law", recycled waste plastic is used as a raw material in the following procedure: shredded plastic powder pellet. Through this process, compound recycled resin pellets can be manufactured with the same quality as virgin pellets, and can be used to make secondary products such as U-shaped frames, exterior walls for buildings, rice-paddy liner sheets, agricultural nursery boxes, plant pots and so on	Based on the "Home Appliance Recycling Law" enacted in April, 2002, the company collects four types of used electronic household appliances (televisions, refrigerators, washing machines and air-conditioners), processes them to a high degree through separation and sorting techniques, and yields reusable parts to be used again in manufacturing, aiming to increase the effective use of resources and reduce harmful effects on the environment.
capacities	Reusable Bottles: 3,000,000 bottles/v	Waste plastics : 12,000 t/y	Waste household appliances: 40,000 units
operation	2001. 11.	2003. 4.	2001. 4.
costs	348 million yen	1.43 billion yen	510 million yen
subsidies (by national government)	149 million yen	700 million yen	0
subsidies (by local government)	49 million yen	10 million yen	50 million yen
	other projects		
	4	5	6
facilities	Human Waste Recycling	Used Tire Recycling Project	Oil Recycling facility
companies	RBS Co. Ltd.	Southern Kyushu Tire Recycling Co. Ltd.	Kiraku Mining Co. Ltd.
technologies	This project involves the production of fertilizer from human waste collected from the Minamata/Ashikita region. The fertilizer produced is used in park gardens, rice paddies, onion and other vegetable fields, tangerine and other fruit orchards, tea plantations, golf courses and so on, establishing an intra-regional resource cycle.	Used tires from cars and trucks are collected, crushed and ground into fine rubber pellets that can be made into reusable rubber, permeable elastic tiles, weeding sheets, permeable sheets, etc. The goal of this project is to promote the reduction of environmental pollution by processing used tires which would otherwise create a large amount of	Used oil from automobiles, gas stations, etc. is filtered and treated and made into a recyclable product to be used in paper mills, forging processes, secondary aluminum alloy smelting and various types of thermal-use heavy oil, in an attempt to apply effective resource allocation and reduce the burden on the environment.
capacities	Raw sewage treated:34,000 kl/year	Used tires : : 840 t/year	Used oil : 1,000 kl/y
operation	2001. 10.	2002. 1.	2002. 3.
costs	1.4 billion yen	140 million yen	400 billion yen
subsidies (by national government)	0	0	0
subsidies (by local government)	0	47 million yen	0

5-3 Background

5-3-1 Socio-Economical Background

(1) Minamata Disease

Minamata City, with a population of 30,000, is a well-known city compared with other cities of the same size and population in Japan because of the unprecedented and serious industrial pollution, which brought about the well-known “Minamata disease” among people around the city. The cause of the disease is Chisso Co. Ltd., which built factories in Minamata village with hydraulic power plants, a harbor and only 3,000 populations, and began to produce carbide in 1908. Since then, the economy of Minamata village largely depended on the Chisso, and the village began to be influenced by the company’s performance, which in turn was influenced by the changing social and economic situations.

Chisso factory in Minamata began to produce acetaldehyde in 1932. They used inorganic mercury in the manufacturing process as catalytic substances, and discharged the wastewater containing methyl mercury, the by-product of the process, into the port in Minamata harbor. The company was the first in Japan to produce vinyl chloride in 1941, and discharged methyl mercury into the port again without any treatment. Mercury has the nature to be attached to protein by methylation and to be easily taken in by living organisms. The abnormalities occurred first in animals and plants. Methyl mercury first destroyed the algae in Shiranui sea, then fish and shellfish, and the birds eating the fish and shellfish fell down from the sky, and cats died with severe convulsions. Then the abnormalities occurred in people as well. This was called the “Minamata disease”-methyl mercury poisoning caused by the mercury taken into human body by eating fish and shellfish, which mainly affects the brain and nerves. The symptoms include palsy, trembling, hyposthenia, tinnitus, and constriction of visual fields, deafness, and convulsions. Quite a few were fetal Minamata disease sufferers, who were contaminated as a fetus in the mother’s womb.

People suspected of Minamata disease already existed in 1932. Many Minamata sufferers began to be seen in fishing villages along the Minamata port in 1953. The doctors at the hospital affiliated to the Chisso reported four people with brain damage of unknown cause to Minamata health center, which is regarded as the first official acknowledgment of Minamata disease. University of Kumamoto Medical School traced the disease to the organic

mercury contained in the fish and shellfish in the Minamata port in 1959. However, the Ministry of the Environment acknowledged the cause as the organic mercury, but not the causal linkage between the disease and the wastewater from the Chisso factories. Chisso almost monopolized the manufacturing of acetaldehyde at that time. Since acetaldehyde was the raw material for plasticizer of chloroethene, whose demand was rapidly increasing, the national government sided with Chisso, and scholars patronized by the government kept denying the causal linkages between Minamata disease and organic mercury.

It was in 1968 when the government acknowledged that the cause of Minamata disease was the wastewater discharged from the Chisso factories, containing methyl mercury produced in the manufacturing process of acetaldehyde. Thirty six years has passed since Chisso began to discharge the wastewater containing methyl mercury. Twenty years since Minamata disease was officially acknowledged and nine years since the cause of the disease were identified. Chisso kept discharging the wastewater containing organic mercury to Minamata port without any treatment, which expanded the damage during the period.

The Minamata disease sufferers had to go through dual hardships of the disease and were also forced to live in isolation from other people who tried to protect their local economy which depended on the Chisso, and attacked and prejudiced the sufferers.

Minamata disease polluted the Shiranui harbor that used to be rich fisheries, and affected the people living around the harbor. Minamata community itself was split over the Minamata disease issue, and people there suffered considerable psychological damage. The economy of Minamata City was also affected because Chisso, which was leading the economy there, ran into financial difficulty.

(2) Industrial Decline

Minamata City was a typical “one-company” town whose economy depended on Chisso and its affiliated companies. Chisso, playing a core role of the economy of the city, continued its operation to pay compensation, but faced huge financial problems. In 1999, the government decided to pay out of the general account to assist Chisso.

The number of the employees of Chisso and affiliated companies in 1999 was 2,700 and still had a large impact on the economy and community of Minamata. Moreover, since Shinnihon-Kagaku (a chemical company) withdrew from Minamata in 1995, increase in the employment in Minamata City became an important issue. The population of Minamata City continued to decline by 300 every year from 1956 when its population reached a peak, 50,461. It was only 32,052 when the city applied for the Eco-Town approval.

5-3-2 Local Initiatives

The citizens with the leadership of the Mayor have made efforts to recover from the community rift and negative feelings caused by the experience of Minamata City in 1990s. The main efforts, “Moyai-Naoshi” movement and the declaration for “Environmental Model City”, have contributed to making the community more confident and activated. These efforts are local initiatives of Minatama Eco-Town.

(1) “Moyai-Naoshi” Movement

In 1992, 40 years after the outbreak of Minamata disease, Minamata City began to revive the shattered community. A series of efforts called “Moyai-Naoshi”. “Moyai” means roping up the boats, and “Naoshi” means mending something, so “Moyai-Naoshi” is to holding together the Minamata sufferers and other citizens, and victims. Minamata City defines the “Moyai-Naoshi” as “the generic term for all the efforts to understand the Minamata disease to create a community in which people talk to and respect each other, and for which they can have pride and affection”. The city has engaged in activities such as constructing and running “Moyai-Naoshi Center,” holding the events “Promotion of Seeding Forests,” “Minamata Hearty Festival,” and classes on Minamata disease at schools.

In 1998, they built “Moyai-Naoshi Center” to disseminate lessons of Minamata disease to prevent industrial pollution, and to develop various efforts aiming at the Environmental Model City to revive itself from the damage of Minamata disease.

(2) The Declaration for “Environmental Model City”

In the same year, Minamata City declared itself as an “Environmental Model City” and its city assembly passed a “Town Planning Focusing on the Environment, Health and Welfare” in order to shift its industrial activities into those that care about all creatures, to address the way society should be, and to create the municipal administration which focuses on the environment. Since then, the city has developed various efforts to revive and conserve the environment. The lives and health lost because of the environmental damage can never be regained, but Minamata citizens have, however, tried to heal the wounds of the Minamata disease and mend ties of the community by engaging in efforts for conservation of the environment.

Minamata City has provided information through environmental education trips, by which people can learn about the Minamata disease, and their efforts for conservation of the

environment, and accepted foreign trainees, especially those from developing countries where the economy is rapidly growing, through Japan International Cooperation Agency (JICA) to provide opportunities to learn about the Minamata disease and their efforts.

5-3-3 Local Technological Infrastructure

Local technological infrastructure in Minamata Eco-Town do not focus only on clustering of Environmentally Sound Technologies (ESTs) in local companies, but also on garbage segregation that citizens started in 1993. One of the characteristics of the Minamata Eco-Town is to utilize household garbage as material rather than waste exchange among companies. Waste segregation has been essential to the success in the Minamata Eco-Town Project.

An immediate cause for citizens to separate garbage was the explosion of the crushing processing facilities that occurred in 1992. The cause of the explosion was the mixing of propane gas cylinders with household garbage, which was segregated into only two types at that time.

The citizens then began to discuss how they should discard wastes through various events. Based on repeated discussions concerning the waste problem, they concluded that the citizens would have to change their lifestyle in which they throw away anything, to one that leads to the creation of a sustainable society. Garbage segregation by citizens was implemented as a concrete action in 1993. There were 20 categories of waste that were segregated by the citizens (this is now 23 classifications). As a result, the rate of recycled wastes reached 42 percent in 2003.

5-4 Approval for Eco-Town Project

Minamata City Land Development Corporation established by Minamata City purchased the old factory site where Shinnihon-Kagaku (a chemical company) used to be, to construct the “Minamata Industrial Park,” and began to sell the land in lots in 1996. The city spent JPY 2.21 billion on purchasing the land and constructing the park. Minamata City and the Land Development Corporation had to attract new plants and companies to the industrial park and to bring those scattered in the city together to the park.

The Ministry of Economy, Trade and Industry (Ministry of International Trade and Industry at that time) worked out the Eco-Town Concept in 1997. Minamata City began to look into the feasibility of applying for an Eco-Town on the grounds that subsidiaries would be an incentive to attract companies. The city established “Minamata Eco-Town Promotion Office”

within the city office in June 1996, which examined the form of Minamata Eco-Town such as what companies should be invited.

The outcome of the examination was that the goal should be to create a recycling business hub, where the waste collected from all around the community is recycled based on their continual efforts of garbage segregation and promotion of recycling, and on their geographical advantage that it takes only two hours to Kagoshima, Kumamoto and Miyazaki by a land route and high-speed vessel connects Shiranui harbor with other coastal areas. The plan was given the name “integrated recycling center.” The recycling businesses that Minamata City was trying to call to the Eco-Town were bottle reuse and recycle facility, waste plastic compound resin recycling facility, home appliance recycling plant, oil recycling plant, human waste treatment and manure production plant, tatami recycling plant and organic wallpaper production by organic waste plant.

Minamata City planned to apply for the Eco-Town focusing on the home appliance recycling project by Act-B Recycling Co., Ltd and the city presented bids of a consulting firm to which the city commissioned the feasibility study. However, the plan could not be approved because home appliance recycling had already been in practice in Kitakyushu city, which was approved in 1997. So the city changed their main business to bottle reuse and recycle project by Tanaka-Shoten Co.,Ltd. in 2000, and began to approach the METI. The METI first rejected Minamata’s plan to recycle bottles because it lacked novelty, but Minamata City and Tanaka-Shoten claimed its novelty that it was not recycling but reuse. They finally gained the approval of Eco-Town in 2001.

Minamata Eco-Town was welcomed by the citizens as the environmental business closely related to their everyday life, for its main business was the reuse and recycling of bottles by Tanaka-Shoten. Moreover, it brought about the effect to promote a thorough garbage segregation among the citizens and recycling of bottles.

5-5 Features of Projects

The characteristic of Minamata Eco-Town is the cooperation between citizens and enterprises in that enterprise in the Eco-Town reuse and recycle domestic wastes which citizens sort out into 20 kinds. The Eco-Town has developed an urban planning system which enables comprehensive environmental learning based on cooperation, which is in fact rarely seen. For most other eco-towns, it is critical simply to attract recycling business companies for the sake of industrial promotion, and recycle wastes collected, without instituting efforts to reduce wastes or waste segregation by citizens.

1. Bottle Reuse and Recycle Project (Tanaka-Shoten Co.,Ltd.)

Tanaka-Shoten Co., Ltd. has taken a major role in recycling glass bottles of Minamata City. They are engaged in separating bottles since the city began domestic waste separation into 20 kinds (currently 23 kinds) in 1993. Tanaka-Shoten collects, washes and recycles all reusable bottles discharged from homes in Minamata City. It also opens its bottle reuse and recycle facility to the public, and accepts 1,923 visitors a year (2004) so that Minamata citizens, as well as those in other cities, can learn how bottles they use are reused and recycled. Moreover, it has also suggested recycling ways closely related to citizens' life, such as making unrecusable bottles into glass cullet and used as pavement materials.

2. Waste Plastic Compound Resin Recycling Facility (REPLA-TECH Co., Ltd.)

The disposal capacity of Waste Plastic Compound Resin Recycling facility is 12,000 tons per year, which is the world's largest capacity. REPLA-TECH Co., Ltd. accepts all waste plastics discharged from Minamata City. The waste discharged from the city has high commercial value; because the wastes are thoroughly sorted out (the yield rate is 55 percent, higher than that of other cities). Therefore this is a good case that citizen's awareness on waste separation that directly leads to a high business efficiency.

5-6 Municipal Support

(1) Feasible Study of Minamata Eco-Town

Minamata City implemented a feasibility study of Minamata Eco-Town jointly with an environmental consulting firm from 1999 to 2000. The city proposed in the study an overall picture and directions of the Minamata Eco-Town Plan, feasibilities of hardware facilities as a core project, and software projects based on research of geographical characteristics and needs and results of environmental industries. The city formulated the Minamata Eco-Town Plan and applied for Eco-Town programme of the government.

(2) Subsidies for Business Sector

Minamata City provides Eco-Town subsidies (JPY 10 million maximum) for business projects approved by the national government, and corporation "attraction" subsidy (JPY 10 million maximum) for other business projects. Specific amount of the subsidies are shown

in figure 3-1.

(3) Relaxation of Regulations

As a result of Minamata City's active efforts to attract plants and companies, 35 companies set up themselves within the 40 sites of 19.5ha in the Minamata Industrial Park, but five sites of 1.9ha was still vacant . Minamata City and the Land Development Corporation devised a plan to lease the sites instead of selling them in order to reduce the burden of initial investment of the companies coming to the park.

In 2002, Minamata City proposed "Minamata Environment Recycling Business Special District" to ease regulations on public land that could be sold but not leased, and set the leasehold, which was approved in March 2004. Thereby Tanaka-Shoten、REPLA-Tech、Minamata Environment Techno-Center leased the sites, and one site was sold to a local company as a warehouse. In that way all the sites of the Minamata Industrial Park came to be occupied by companies

(4) PR Activities

The approval of Minamata Eco-Town defined the direction of the movement of industrial promotion measures in Minamata City, towards industrial promotion focused on environmental industries to create a sound material-cycle society based on thorough waste segregation by the citizens. The city has promoted the formation of Eco-Town with measures, including added subsidies for enterprises in the Eco-Town. Now that all the areas of the Eco-Town have been occupied by enterprises, and it can be said that Eco-Town has been formed, the focus is now on popularization of the Eco-Town in cooperation with the Minamata Eco-Town Committee consisting of enterprises in the Eco-Town.

Minamata Eco-Town has held an "Eco-Town Festival", in which the citizens visit various Eco-Town facilities as a PR activity for citizens, to give them the opportunity to learn more about the Eco-Town. This has led to enhance citizen's awareness about the environment, and resource value of the wastes they sort out in their everyday-life. Other activities to popularize the Eco-Town in other cities and improve the Eco-Town's image include participation in the Environmental Business Fair and holding Eco-Town Summits. As a result of the aggressive PR activities, the number of visitors has increased from 3,875 in 2002 to 4,942 in 2003.

5-7 Environmental Activities

Minamata City, aiming to be an “Environmental Model City,” has developed projects for the environment by the administration, citizens and enterprises. This chapter introduces two types of projects: one is a software project for which Eco-Town subsidies are provided, and the other is an environmental activity by Minamata City and its citizens.

5-7-1 Software Projects Covered by Subsidies

Minamata Eco-Town spends most of the subsidies on disseminating information on the Eco-Town. They hold “Minamata Eco-Town exhibition”, “Seminar on eco-business in Minamata”, “Event for exchange of information in Minamata Eco-Town” in 2002, and “1st Minamata Eco-Town festival” in 2003 and “2nd Minamata Eco-Town festival” was continuously held in 2004. Also, they participated in Shiga International Environmental Business Exhibition 2003, Environmental and Welfare Business Fair in Kumamoto, to disseminate efforts of the Minamata Eco-Town.

The above projects have contributed to raising citizens’ and enterprises’ awareness on the environment, and enforcing environmental activities such as trash separation. In addition, they have provided the opportunities to mobilize enterprises with interests in Minamata City’s industrial policy and Minamata Eco-Town for Minamata City, and to share information and cooperate with other enterprises in the Minamata Eco-Town.

5-7-2 The Projects Not Covered by Subsidies

Students at all elementary and junior high schools in Minamata City have classes on the Minamata disease from either 3rd or 4th grade, and continue to have the classes in integrated study periods to enhance understanding of the disease when in 5th and 6th grades, and junior high schools as well. They visit either the Minamata Eco-Town or Clean Center (a public waste management facility) when in 3rd or 4th grade. The enterprises in Minamata Eco-Town open their facilities to those who visit Minamata City for environmental learning trips or site tours of environmental administrations, and presenting their businesses.

Minamata City has continued to work on the projects aiming at an “Environmental Model City.” These projects include garbage segregation, promotion of Eco-shops by “Women’s Waste Reduction Committee”, establishment of “Minamata Environment Award”, district

environmental agreements, acceptance of educational tours (school excursions) and environmental ISO in offices, households, schools and hotels. These projects, except for trash separation, have contributed to the enforcement of a “brand image” of Minamata Eco-Town indirectly, although they are not directly related to the Eco-Town Project.

Below are the descriptions of “Environmental ISO for Schools” and “Environmental Master Program.”

(1) Environmental ISO for Schools

Minamata City obtained ISO14001 certification in 2000 to reduce environmental burdens associated with service businesses for citizens. In addition to the support for companies to obtain ISO, the city drew up an office, home, preschool and hotel version of ISO, that is assessed and certified by the city, and has promoted them to enable various agencies to engage in environmental activities.

All of the 16 elementary and junior high schools in the city work on the school version of ISO to achieve the following goals:

- To conserve and pass on to the future generations the beautiful sea, mountains, rivers and air of Minamata
- To grow the spirit to be proud of our home Minamata
- To cooperate in family and community activities

Teachers and students at the First Minamata Elementary School implemented the school version of environmental ISO from 2000, conduct themselves according to the respective action plans, record their conducts in the “Dekita-Kana card” (memo sheets to record their progress), and reflect on their conduct once in two weeks, to achieve a lifestyle by which they can conserve and improve the environment.

The school aims to make the actions for environment as common practices in everyday life, saying “We would like to bring up children in the way that they can take action rather than talk about the ideas and principles, though the obvious idea that one must conserve the environment often precedes an action.”

Other activities include voluntary activities by the students such as ISO club to bring the trash separated into 23 kinds at the school to waste collection points every Wednesday and to trim flowers at the school.

(2) “Environmental Meister Program”

Seafood and agricultural products from Minamata have been shipped labeled as coming from Kumamoto, not Minamata for 40 years since the occurrence of Minamata disease because Minamata products were refused by markets. The fishermen and tea farmers began to move towards production of safe foods and protect their health all the more since they experienced the Minamata disease.

In 1998 Minamata City set up an original certification system to support producers, which is the “environmental meister program”. Although many other cities have set up the meister programme, they are restricted mostly to traditional craftworkers or agriculture. On the contrary, “Environmental Meister Programme” of Minamata covers production of things in general which focuses on the environment and health, without regard to the fields.

Minamata City assesses eight items such as how long the producers have engaged in its production, use of chemical products and waste prevention by ranking based on the assessment criteria of each field when producers apply for the programme. The producers take programmes by storytellers with Minamata disease and receive a certification when they pass the assessment. So far, the total number of those who have been certified is 23 in four fields of agriculture (tea, rice, oranges and vegetables) and five fields of artifice (trempang, Japanese paper, tatami, soup and woodwork)

5-8 Partnership among Stakeholders

Minamata City, enterprises, Minamata Eco-Town Committee and Minamata Environment Techno Center, Ltd. work in cooperation with each other to energize the Minamata Eco-Town. This section introduces the main projects of Minamata Eco-Town Committee and Minamata Environment Techno Center, Ltd.

(1) Minamata Eco-Town Committee

In October 2002, eight enterprises located in the Minamata Eco-Town established Minamata Eco-Town Committee as a private organization to reinforce cooperation and information sharing among them. The secretariat is at the Minamata City. The committee usually holds a meeting once a month on every third Wednesday, These enterprises are trying to develop awareness for the environment by sharing the information on the environment as well as on each enterprise, and reinforce cooperation among them. Moreover, they have held the

“Eco-Town Festival” in which they invite citizens to their facilities and present their projects since 2003 to implement PR activities together to gain an understanding of their projects.

Minamata Eco-Town Committee will be dissolved in May 2006 and incorporated as a non-profit organization in order to reinforce the cooperation with research institutions, create new environmental businesses and provide a venue for environmental learning.

(2) Minamata Environment Techno Center

Minamata City founded Minamata Environment Techno Center, Ltd. in 1999 to create new environmental businesses in cooperation with industries, Minamata City and academia with a capital JPY 15.2 million from 13 local enterprises. The facilities of the center were built with a subsidy (not related to those of Eco-Towns) of the METI. The center consists of 11 employees, the president (Deputy Mayor), director and deputy director (Minamata City Officials), and two research managers (Chisso). The center has engaged in various activities including various researches on the environment, technology developments, and technology transfers to local enterprises, in order to create new environmental businesses in the community. Other activities are establishment of network among industries, Minamata City and academia, proposals for cooperation of businesses among Eco-Town enterprises, environmental seminars for local enterprises, and support to obtain ISO certifications. Also the Minamata Eco-Town Committee meetings are held at the center.

The first activity of the center when just founded in 2000 was the research on endocrine-disrupting chemicals. This 5-year research has brought about an improvement of research skills in the center and expansion of networks to various fields.

The Techno Center succeeded in developing the basic technology of a fermentation system which treats liquid biomass such as distilled spirit waste, soybeans broth, orange processing waste and animal husbandry waste (adopted as one of the grant-aided projects by the Ministry of Education, Culture, Sports, Science and Technology in 2001), and is now working towards its practical application.

The center is also engaged in algae cultivation that absorbs eutrophication substances as a cause of red tides in Yatsushiro Sea, and sought to extract physiologically active substances from the cultivated algae since 2001.

These two researches on liquid biomass and algae were adopted as “the construction of biomass circulation system both on land and sea for environmental conservation” by the Ministry of Education, Culture, Sports, Science and Technology in 2002, and the center has promoted the development of technologies to extract, separate and refine extract physiologically active substances.

The center is planning to propose the establishment of a database of the needs of Minamata enterprises and concrete cooperation with enterprises, since Minamata Eco-Town targets the whole area of the city.

5-9 Discussion

The companies in Minamata Eco-Town reuse and recycle domestic wastes sorted out into 23 kinds by the citizens, and they have established a framework in which the citizens can learn about the relationship between their daily life and 3Rs through site-tours. It is expected to expand the business to reuse and recycle domestic wastes and increase the number of examples of local recycling.

Followings are the problems to be addressed:

1) Enhancement of cooperation with the “consumption” sector:

While Minamata citizens are familiar with garbage separation, which has greatly contributed to the local recycling, their environmental consciousness must be expanded from waste disposal to consumption patterns. Sustainable consumption in the community will lead to sustainable production and consumption.

2) Enhancement of cooperation among companies:

Most wastes that companies in Minamata Eco-Town reuse and recycle come from households in Minamata City and other cities around Japan. Next step should be to explore the possibility of material flow among local companies. Minamata Eco-Town Committee and Minamata Environment Techno-Center need to play an active role to promote the cooperative relationship among companies.

3) Industrial wastes final disposal site:

A civil organization has opposed the construction plan of industrial wastes final disposal plan. This plan is designed to construct the inert type and controlled landfill site at the 952,000 m² site in the mountainous Yude/Nagasaki Ward in Minamata City to landfill four million m³ of

the industrial wastes discharged from Kyushu area including Minamata Industrial Park. A group of some construction companies that proposed the plan is now seeking an approval by the city to launch the plan in 2007. Minamata City, while promoting the Eco-Town Projects, has shown the possibility to approve the plan despite the citizens' fierce resistance against the plan.

6. Case study 4 : Naoshima Eco-Town

6-1 General Information of Naoshima Town

Naoshima is an island in the Seto Inland Sea, located approximately 13 kilometers north of Takamatsu City, Kagawa Prefecture and two kilometers south of Tamano City, Okayama Prefecture (Fig 6-1). Naoshima Island has a land area of 8.13 km² and a population of about 3,600 people (2003). The main industries are metal refineries by Mitsubishi Materials, travel industry (43,000 visitors per year) and fishing and cultivation of marine products such as yellowtail and seaweed. Naoshima's employed population by industries consists of the primary industries 8.6 percent, secondary industries 8.6 percent and tertiary industries 46.3 percent (2000).



Fig 6-1 Location of Naoshima

6-2 Overview of Naoshima Eco-Town

Naoshima Eco-Town gained approval as the 15th Eco-Town in Japan in March 2002. Incinerating and melting plant of recycle waste and washing treatment plant of fly ash from incinerators were built as “hardware” project of the Eco-Town Projects. A subsidy of JPY two billion has been spent on the project. Software projects include promotion of waste recycling and greening, introduction of new energy, and establishment of committees.

Naoshima Eco-Town aims at:

- 1) Creation of environmental education fields based on local resources (Fig 6-2),
- 2) Involvement of multi stakeholders in town planning,

3) Smooth implementation of the waste treatment project in Teshima.

Local resources of Naoshima Town include the beautiful natural scenery of Seto-Naikai, accumulation of cultural facilities located at the Southern part of the island, Mitsubishi Material's Smelter & Refinery Naoshima (hereinafter referred to as Mitsubishi Material Naoshima) and its affiliated companies that have the Asia's leading refining plants located at the Northern part of the island. One of the goals of Naoshima Eco-Town is to combine those local resources with environmental education. The approaches to achieve the goal are establishment of recycling system with refining technologies and education programs utilizing the facilities, review of local nature and culture, courting eco-tours etc.

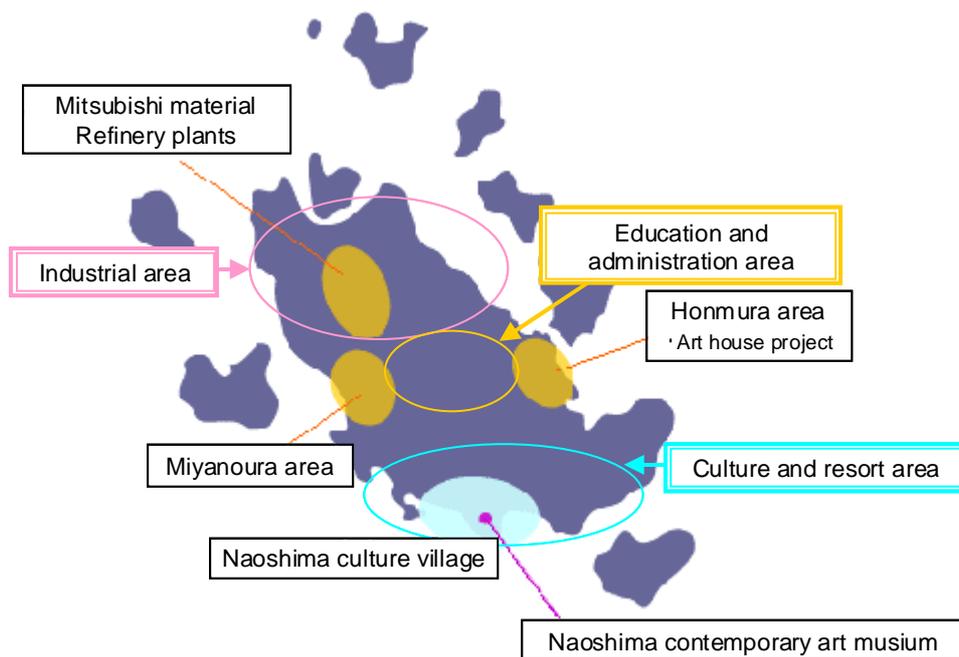


Fig 6-2 local resources of Naoshima

6-3 Background

6-3-1 Socioeconomic Background

(1) Illegal dumping at Teshima Island

About 3,000 Islands of various sizes exist in Seto-Naikai, the inland sea surrounded by Honshu (mainland), Shikoku and Kyushu. The quiet inland sea Seto-Naikai and islands were designated as the first national park in Japan because of their beautiful scenery in 1934.

Kagawa Prefectural Teshima Island is one of the scattered islands in Seto-Naikai, and the name "Teshima" means an abundant island. In this island, (population is only 1,500), the incident, which would ultimately bring about one of Japan's worst illegal dumping of industrial wastes, dates from 1975, when Teshima Sogo Kanko Kaihatsu Co., Ltd. in Teshima Island applied to Kagawa Prefecture for a permit to store industrial waste specified as toxic conductor in the Northwestern part of the island possessed by the company. The islanders launched protest campaigns such as submitting signatures against the Prefecture's permitting it and filing a lawsuit with the Kagawa District Court. However, Kagawa Prefecture, afraid of the violence by Teshima Sogo Kanko Kaihatsu, mollified the islanders and changed the description of the business from treating industrial waste specified as toxic to transporting and treating organic industrial wastes to breed earthworms, and granted the company permission in 1978. The battles of the Islanders against industrial wastes had continued for 25 years since then.

Teshima Kanko began to bring in unpermitted Automobile Shredder Dust (ASD) and various other harmful industrial wastes to the national park of the Teshima Island, and to burn them in a field and landfill them. Birds, fish, shellfish and other wildlife around the island were seriously affected, many islanders suffered from asthma and other respiratory diseases. When the islanders who took the situation seriously resumed protests, Kagawa Prefecture directed the company to take permission of metal wastes quotient, and connived at the continuance of illegal dumping.

Hyogo Prefectural police department, instead of Kagawa Prefecture, raided Teshima Kanko, and arrested its owner in 1990. Their investigation revealed that the total industrial wastes illegally dumped amounted to 560,000 tons and 49.5 cubic meters, which expanded the island by 130 meters from the original shore line. Moreover, the industrial wastes contained toxic substances such as organochlorine, heavy metals and dioxin for examples, and the wastewater reached not only to the soils but even to bedrocks.

In 1993, about 500 Teshima islanders made pollution litigations against Teshima Kanko and its owner, Kagawa Prefecture and its officials who failed administrative guidance, and the dealers discharging wastes and consigning their treatment. The arbitration was finally reached in 2000 after 35 trials over 7 years, and Kagawa Prefecture governor made an apology to the islanders for the first time.

Teshima islanders had always demanded to remove the illegally dumped industrial wastes and restore the nature of the island throughout the campaigns and trials. So, Kagawa Prefecture inaugurated a technical committee for the restoration of Teshima to find out the way to remove those waste in 1997, when the interim agreement was reached by the

pollution litigation. The technical committee submitted three reports, and suggested the intermediate treatment by melting in the first and second report, which the islanders accepted.

Kagawa Prefecture proposed an intermediate treatment plan to Naoshima Town based on their report in 1999, and Naoshima Town accepted it in 2000. Thereby it was decided that the industrial wastes in Teshima are treated in Naoshima Town, and planned to be removed by March 2015, costing about JPY 50 billions over 10 years.

The amount of industrial wastes illegally dumped in Teshima was more than that of those wastes illegally dumped at other parts of Japan at a time when the Teshima incident attracted attention from Japanese citizens. However, the Ministry of the Environment reports that currently 1.27 billion tons of industrial wastes are illegally dumped all around Japan. About 500 battles over these industrial wastes are occurring in Japan now.

After the Teshima incident, the Ministry of the Environment (MoE) amended the waste management and public cleaning law in 2000 to charge not only those who actually dumped the wastes but also the waste generators themselves. Yet it is not functioning because the conditions to apply the law are rigid. Mr. Ishii, who conducted protests and later became a Kagawa Prefectural assembly person, claims that the current legal systems are not enough to prevent illegal dumping.

The Ministry also enacted a law concerning special measure against industrial waste with a 10-year term limit in 2003 to bear from one-half to one third of the costs in removing and treating industrial wastes (since a huge amount of industrial wastes was illegally dumped in the border between Aomori and Iwate Prefectures). It is the Japanese citizens who have to pay the costs, and there are even no measures to prevent illegal dumping before it happens.

(2) History of Naoshima Town

Naoshima Town in Kagawa Prefecture, consisting of 27 islands, is located in the southwest part of Teshima and had pursued economic development by attraction of enterprises outside the island. Naoshima village invited Mitsui Engineering & Shipbuilding Co., Ltd. focusing on the shipbuilding industry thriving at that time. It was not realized, however, because they could not cordon the land enough to build shipyard.

Afterwards they invited Mitsubishi Materials Corporation, whose business was copper refining. Mitsubishi saw Teshima as the first choice for the place to build copper refinery since they were planning to build it in one of the islands in Seto-Naikai. However, Naoshima became their first target because of the protests of Teshima islanders.

Mitsubishi Material Corporation's refinery factory in Naoshima launched their operation in the fleet located in the north of Naoshima in 1918. Japan was the world's leading producer of copper at that time, and Mitsubishi was bringing in copper ore from the mines around the country such as Yoshioka mine in Okayama Prefecture, and refining the copper ore. They later began to refine royal metals such as gold and silver, and became the Asia's leading producer of gold.

Mitsubishi's copper refinery expanded its business to occupy approximately 20% of the land area of Teshima Island and labor of the island. At its peak, during 60s and 70s nearly half of the islanders, 7,000 of them engaged in the works related to the refinery such as discharging and carrying of cargo. However, Japan turned to an importer after the end of the war since cheap copper began to enter the Asian market from the United States. Naoshima copper refinery and its affiliated companies had to downscale their business.

The population of Naoshima Town gradually decreased from the peak year 1959 (7,842), and is now 3,705. The employed population by industries consists of 8.6 percent of primary industries, 45.1 percent of secondary industries and 46.3 percent of tertiary industries. Among the percentages, that of the secondary industry is quite high compared to the average for Kagawa Prefecture: 29.2%. The secondary industries are the basic industries of the town, and Mitsubishi Material and its affiliated companies still have a huge impact on the economy of the town. Yet it has been a long time since the metal refining industry in Japan lost its international competitiveness, and Mitsubishi Material Naoshima had to consider the withdrawal from Naoshima. The decline of employment in the town due to the company's rationalization policy overshadows the economy of the town.

Naoshima Town received a proposal from Kagawa Prefecture to build an intermediate treatment plant of illegally dumped industrial wastes in Teshima, and accepted the proposal to bail out Mitsubishi Material Naoshima and to spur the creation of jobs. Naoshima Town also demanded administrative measures to revitalize the town as a compensation for building the treatment plant.

6-3-2 Local Initiatives

Kagawa Prefecture formulated an Eco-Town Plan based on the national subsidy for software Eco-Town Projects due to Naoshima Town's strong demand for administrative measures to revitalize the town in compensation for treating the industrial wastes from Teshima. Naoshima Eco-Town is the outcome of the Eco-Town Plan, and without Teshima incident, the Eco-Town would have not come into existence; it is an exceptional case that an enormous amount of illegally dumped industrial wastes outside the town was a catalyst for planning and establishing the Eco-Town in the town.

On the other hand, Naoshima Town's acceptance of Teshima intermediate treatment plant is attributed to the necessity to bail out Mitsubishi Material Corporation. Naoshima Town expected to maintain Mitsubishi Material Corporation and revitalize the town's economy by siting recycling industries in the town.

It can be said that the initiatives of Naoshima Eco-Town come from both inside initiative (bailout of Mitsubishi Material Corporation) and outside initiative (Teshima incident).

6-4 Approval for Eco-Town Project

Naoshima Town accepted the proposal from Kagawa Prefecture in March 2003. Thereby the pollution litigation between Teshima Islanders and Kagawa Prefecture was reached in June 2003, and Kagawa Prefecture launched a Teshima waste treatment project.

The construction of provisional measures for the conservation of the environment at Teshima was completed in March 2003, and the intermediate holding and packaging plant and special pre-treatment plant were built in March 2003. In April of the same year, the wastewater treatment plant was built, from when the shipment of wastes to Teshima began. The intermediate treatment plant built in Naoshima began its operation in September 2003 right after the completion of its construction.

In Teshima's waste treatment project, JPY 20.7 billion was spent on construction of the plants only. In addition, operation of the plant is estimated to cost JPY 2.7-2.8 billion per year and will be JPY 27-28 billion 10 years later. The total will be about JPY 50 billion without considering personnel costs. The Ministry of the Environment enacted the law concerning special measurement against industrial waste with a 10-year time limit in 2003 to bear from one-half to one third of the costs in removing and treating industrial wastes. Also, since 70% of the Prefectural bond is paid by tax allocation grant, 60% of the project expenses are

paid by government subsidies (*these subsidies are different from Eco-Town subsidies). However, the expenses are estimated to be more than it was planned because of inflating oil prices.

Kagawa Prefecture began to consider measures to revitalize Naoshima Town while promoting the treatment of wastes in Teshima. Thus Kagawa launched the assessment committee of Naoshima Eco-Town to adopt a subsidy for software projects in December 2000. This would later give birth to Naoshima Eco-Town.

Mitsubishi Material Naoshima, which was also seeking for a new business and considering the possibility of utilizing the Eco-Town Projects before Kagawa Prefecture's movement towards Eco-Town, was conferring with the government concerned on the issue. This conference did not lead to applying for the projects, however the Eco-Town projects were surely attractive to them, since it would enable them to launch new business with subsidies. Kagawa Prefecture, Naoshima Town and Mitsubishi Material Naoshima established the concept of "Naoshima Eco-Town Plan", in which hardware facilities such as washing treatment plant of fly ash from incinerators, and incinerating and melting plant for recycling waste, assimilating the technologies of Mitsubishi Material Naoshima are combined with the software projects to revitalize Naoshima Town. Fly ash, a by-product from the intermediate plant of industrial wastes in Teshima, is put into the washing treatment plant of fly ash from incinerators.

6-5 Municipal Support

Kagawa Prefecture plays an important role in Naoshima Eco-Town Projects such as promoting wastes treatment in Teshima, popularizing the Eco-Town, supporting civil activities based on the creation of a sound material-cycle society in Naoshima Town as a software project, and planning and promoting environmental learning tours in Naoshima and "Naoshima, Teshima and Shodoshima Eco-Tour".

(1) Waste Management of Teshima Illegal Dumping Area

Teshima wastes treatment projects is discussed in detail in section 6-3 "Intermediate Treatment Plants," but Kagawa Prefecture has promoted safe operations and prevention of misunderstanding by regular environmental monitoring of about 50 treatment plants, and disclosure of information through internet and monitors set up in Tamano City, on the other

side of Naoshima, (based on measures recommended in the third report submitted by the Third Technical Study Committee for the Restoration of Teshima).

(2) Measurements Against Misunderstandings

Marine products industry is the major industry of Naoshima next to the secondary industry, and dried laver seaweed and yellow tail farm industry is particularly popular, with a yield of about JPY 5 billion. So only the Federation of Fisheries Cooperative Association of Naoshima opposed the treatment plan in Naoshima when Kagawa Prefecture proposed to build an intermediate treatment plant in Naoshima.

Teshima Islanders organized intensive PR activities to gain public support when they were working towards pollution litigation, and succeeded in making the seriousness of illegal dumping known to the public, and gained their support. These PR activities, however, were also damaged on Teshima's agriculture and fisheries. Although the wastes were dumped only Ushirotohisaki located on the westernmost part of the island, the rumor spread that they were dumped all over the island. These rumors caused serious damage- some fisherpeople were forced out of the yellow tail farm business, and markets could not accept marine and agricultural products of Teshima. Naoshima Fisheries Cooperative Association, afraid of recurrence and damage from similar rumors, demanded that Kagawa Prefecture take appropriate measures against rumors attributed to Naoshima waste treatment projects.

Kagawa Prefecture enacted the "Regulation against harmful rumors" in Naoshima in June 2002, and established the "harmful rumor control funds" for Naoshima Town to thoroughly take care of the environment around the plants, prevent rumors from occurring, and prevent the damage from rumors should they occur. The amount of funds, JPY 3 billion, was determined based on yields from Naoshima per year, but the foundation covers not only fisheries but also business activities such as eco-tours. The ordinance on measure against harmful rumor will be effective until the waste treatment is completed.

The compensation for harmful rumors is paid upon the approval of the investigation committee of harmful rumors consisting of ten people, including academic experts, since rumors could occur regardless of what is actually happening. JPY 500 million of the emergency lending has also been set up besides the foundation as a temporary loan.

The ordinance on measure against harmful rumor has attracted attention because it is the first ordinance in Japan that prevents damages due to rumors accompanied by municipal

industrial waste treatment, and prescribes compensation for the damage. Kagawa Prefecture has received a number of inquiries and visits by other municipalities planning to have industrial wastes landfill sites.

(3) The Measurement for Transboundary Movement of Industrial Waste

A critical volume of wastes needs to be secured, and the operation rates to be enhanced in order to make the recycling businesses located in the Eco-Town projects succeed economically. Mitsubishi Material Naoshima also needed to procure wastes from outside Kagawa Prefecture as well as within the Prefecture to secure shredder dust of abandoned vehicles and waste household electrical appliances, copper melted sludge, and other such materials. However, since the shipment of industrial wastes beyond Prefectural borders was banned by the ordinance of Kagawa prefecture, easing regulations was the foremost task.

Kagawa Prefecture drew up measures to approve the shipment of industrial wastes from outside the Prefecture only in case where treatment is thoroughly completed. It enacted an ordinance on wastes coming from outside the Prefecture in December 2001. This ordinance enabled the enterprises that wanted to bring in industrial wastes from outside to confer with Kagawa Prefecture, go through necessary procedures, and bring in the wastes approved by the Prefecture.

A council consisting of four Prefectures in the Shikoku area of Japan was set up to formulate recycling systems, foster recycling businesses in Shikoku, and carry out research on the shipment of industrial wastes.

(4) PR Activities

Kagawa Prefecture created videos and brochures about their projects, and accepted visitors to Naoshima Intermediate Treatment Plants in order to disseminate proper information on Naoshima Eco-Town.

(5) Eco-Island Naoshima Promotion Committee

Naoshima Town has an active and important role as a main agency in “Eco-island Naoshima promotion committee” consisting of Naoshima Town, Kagawa Prefecture, Mitsubishi Materials Inc. and Benesse Corporation that are key companies for Naoshima Town. This

committee was set up on approval of the Naoshima Eco-Town Plan in 2004.

The main projects of the committee are related to waste reduction and promotion of recycling. In Naoshima they started to segregate and recycle seven items among domestic wastes in 2001, and the number increased to nine items in 2002 and ten items in 2003.

The town office itself began to work to gain ISO14001 certification to reduce environmental burdens generated by the office's services for citizens. Thus, they formed a project team in 2001, and gained the certification in 2002. Moreover, in 2002 they provided bags for all houses in town to prevent generation of wastes and promote "My-Bag Campaign" in order to decrease the use of plastic shopping bags.

Greenery Promotion Committee and Acorn Network Naoshima Land were also established in 2001 for reforestation of forests damaged by fire and acid rain caused by gases emitted by Mitsubishi Material Naoshima. Kagawa Prefecture, Naoshima Town, Greenery Promotion Committee and Acorn Network Naoshima Land have held events in cooperation, to plant trees in the areas devastated by fire in 1998. In 2002, about 500 volunteers planted 2,600 seedlings in the event. The effort to plant trees has continued over the years.

6-6 Environmental Activities

Kagawa Prefecture, Naoshima Town, Naoshima Town people and Mitsubishi Material have engaged in various environmental activities in Naoshima Eco-Town. They established "Eco-Island Naoshima Promotion Committee" in 2004, and launched software projects including PR activities for the Eco-Town, promotion of environment-conscious urban planning, creation of environmental education sites, and improvement of facilities.

There was no organization based on the citizens' voluntary action, and no civil activities were going on when the Eco-Town was approved. However, Kagawa Prefecture and Naoshima Town relegated the task to hold a workshop to strongly appeal to Naoshima and recruit volunteers from the citizens to a consulting firm because of the necessity to promote community-based town planning, harmonized with environment, that was incorporated in the Eco-Town Plan.

About 16 people applied for the recruitment in 2002 and 14 in 2003. Kagawa Prefecture and Naoshima Town tried to foster the awareness of the participants by holding workshops once

a month, in which the employees of a consulting firm served as facilitators along with the plan the firm formed, invited urban-planning lecturers, and conducted inspections of advanced regions.

The participants worked on the formulation of vision and action plans over two years. However, because they had no experience in urban planning, the consulting firm had to first work on showing them what the involvement of citizens in urban planning means, and how the involvement effects urban planning, to foster fundamental awareness underlying urban planning.

The participants of the second year (2003) changed the title of workshops to “WE LOVE NAOSHIMA,” and went on to finalize the results of the workshops under the slogans “We’ll make our island a place we are proud of”. They proposed 27 projects based on 10 proposals in March 2004.

“WE LOVE NAOSHIMA” is now separated into two groups “Nature Group” and “Exchange Group,” implementing projects included in the proposals. The projects they have so far implemented in 2004-2005 include planting trees, eco-tours in Naoshima, setting up a website, swap shops and rental system of bicycles assisted by electric power.

6-7 Partnership among Stakeholders

Kagawa Prefecture, municipal government, Mitsubishi Material and residents, which are stakeholders of Naoshima Eco-Town, established “Eco-Island Naoshima Promotion Committee” as a main body to promote environment-conscious urban planning in May 2002. The committee consists of Naoshima Town Mayor as chairperson, Kagawa Prefecture, Mitsubishi Material, Benesse Corporation, and some other organizations. According to the convention, the committee has more than one meeting a year, and had four meetings in 2004.

“Eco-island Naoshima Promotion Committee” has organized environmental symposiums and participated in exhibitions concerning environment and technology (including those of the Japan Society of Waste Management Experts to disseminate the information on Naoshima Eco-Town. In addition, the committee has recruited citizen volunteers to develop their leadership ability over two years from 2002, and implemented various projects to promote environment-conscious urban planning.

Other projects include site-tours of the intermediate treatment plant and recycling facilities in Mitsubishi Material and other types of site-tours for environmental learning concerning the nature and culture in Naoshima. The committee attempted an environmental learning tour under the slogan “Visit the Island, and Learn the Island”, exchanged opinions with travel agencies, and invited schools in the Prefecture for school trips in 2002. The projects in 2003 include site-workshops by lecturers in charge of environmental education and setting up an information center guided by environmental learning experts.

6-8 Discussion

The essence of Naoshima’s project to support Mitsubishi Material’s factories in Naoshima and expand employment in order to revitalize local economy, is and support its initiation of new business.

However, the projects to revitalize the citizens’ daily life brought some concepts such as “Zero-Emission” and “Sound Material-Cycle Society” to Naoshima’s urban planning. Naoshima’s urban management was not environmentally friendly, but began to promote environmentally friendly urban planning and management with subsidies for software projects urban Eco-Town Projects. The Eco-Town Project transformed a municipality to take up environmentally-friendly administrative management.

The results of the Naoshima Eco-Town are that the whole town began to move towards environmentally friendly urban planning rather than just focusing on Mitsubishi Material succeeding in recycling business. The management of the town is, however, made possible by national and Kagawa Prefectural subsidies. It is now necessary for Naoshima to establish a management system without assistance from the national government and town hall.

7. Lessons from Eco-Towns in Japan

7-1 Conditions on establishing “Eco-Towns”

There are some points common to the four case studies (please refer to table 7-1).

First, all the four cities, Kawasaki, Minamata, Naoshima and Kitakyushu, have over a century, promoted industrial infrastructure such as electricity, water, distribution channels and pipelines to establish the status as a production base. Moreover, they have built a fundamental capacity towards the creation of a Sound Material-Cycle Society, including technological innovation by private companies such as cleaner production, administrative regulations and policy-supporting, enhancement of citizens’ environmental awareness, environmental pollution researches by experts, and establishment of the partnership among stakeholders. Such capacity building became the basic infrastructure for formation of the Eco-Towns.

A sense of crisis was prevailing in those cities in 1990s because of the down-turn of the local economy resulting from the changes in global industrial structures, hollowing out of manufacturing industries and depression. It was beginning to be acknowledged in those years that global environment was at stake. The sense of crisis and global environmental issues drove each entity to pave the way for Eco-Town formation. Private companies invested funds and labor in technological development, management innovations and environmental management, in order to survive. The national government gave the highest priority to environmental issues. Municipalities were required not only to foster new industries but to address waste management and global warming. The environmental awareness of citizens was rising to a level that they voluntarily initiated their own activities, in addition to calling for measures and efforts from the government and private companies. Researchers attained some progress in research on technological and social systems related to 3R, material flow analysis, life cycle assessment and integrated waste management.

“Eco-Town” was one of the solutions that the cities chose under such circumstances. Each Eco-Town developed in their own way according to the changes in regional characteristics and social conditions, although they at first lacked clear policy objectives and management schemes. Each Eco-Town entity played an important role in the formation process of Eco-Towns, and now has new roles towards further development. Stakeholders have

committed themselves to the Eco-Town formation because each stakeholder benefited from the commitment (please refer to section 7-2). Formation of an Eco-Town has brought great benefits to the cities.

On the other hand, it should be recognized that there were barriers and challenges regarding the Eco-Towns in Japan. It would be difficult to transfer the process of the Eco-Town formation to developing countries and cities because of lack of funds, differences in the social and industrial structures, and low environmental consciousness. However, the generalization of the process and the roles played by each stakeholder in the Eco-Town formation will help the local and national governments to set up Eco-Towns in developing countries. Section 7-3 shows the step-by-step flow chart of the Eco-Towns in Japan. The chart can be used as guidelines for each stakeholder in planning and actual formation of Eco-Towns.

Table 7-1 Summary of four case studies

		Kawasaki Eco-Town	Kitakyushu Eco-Town	Minamata Eco-Town	Naoshima Eco-Town
Overview	Year of Approval	1997. July 10.	July 1997 (First to be approved)	2001 Feb. 6	2002 Mar. 28
	Targeted Area	Kawasaki coastal area(2800ha)	All the Kitakyushu City area (48,500ha) : since 2003	Minamata city(16,300ha)	Naoshima island (1,400ha)
	Population (City)	1.30 million	990 thousand	31 thousand	3.60 thousand
	Shipment value	JPY 3.50 trillion (2002)	JPY 1.5 trillion(2002)	JPY 72.6 billion(2002)	JPY 12.8 billion(2000)
	Main industry	Steel, Stainless, Petrochemical, cement, power plant, Electricity and R&D	Steel, Stainless, Petrochemical, Automobile	Chemical	Refining industry and fishery industry
	Features	To promote the creation of recycle-based society based on the industrial activities	To promote and develop a Sound Material-Cycle Society by inviting and accumulating environmental industries	To promote the involvement of the citizens and sound material-cycle society whose main players are the citizens	To work on the issues of treatment of industrial wastes in the areas around and to promote sound material-cycle society in small islands
Background	Socioeconomic Backgrounds	<ul style="list-style-type: none"> · Experience of air and water pollution · Rupture of bubble economy and decline and hollowing out of industries by globalization · To foster innovative industries 	<ul style="list-style-type: none"> · Experience of air and water pollution · Industrial decline and hollowing out by the decline steel industry · Utilization of the vast unused land 	<ul style="list-style-type: none"> · Split and sense of impotence among the citizens over Minamata disease · Decline of population · Decline and hollowing out of industries · Creation of industrial parks: to accumulate the enterprises 	<ul style="list-style-type: none"> · The treatment plants of illegally dumped industrial wastes in Teshima · Failure of the administrative measres against · Momentum of urban planning mainly by Benesse
	Local Technological Infrastructures	<ul style="list-style-type: none"> · Development of environmental technologies centered on heavy-chemical industries · Actual performance of material flow among entities since the creation of complexes, and improvement of pipelines and transport infrastructures · Trasnport function by land, port function and closeness to airports 	<ul style="list-style-type: none"> · Accumulation of existing industries · Distribution networks at home and abroad · The largest controlled landfill type landfill site in Japan 	<ul style="list-style-type: none"> · Trash separation by the citizens(1993 ~): To raise awareness of the citizens and quality of by-products · Technological capitals mainly of Chisso Co. Ltd., · Trasnportation infrastructures by land and sea 	<ul style="list-style-type: none"> · Longstanding refinery technologies and production infrastruacures of Mitsubishi Materials Corporation
	Local Initiatives	<ul style="list-style-type: none"> · The big heavy-chemical companies 	<ul style="list-style-type: none"> · Leaders' Initiatives: "Kitakyushu Initiatives" · "International Environmental Cooperation" · Large corporations' R&D 	<ul style="list-style-type: none"> · Initiative by the former mayor: the declaration for "Environmental Model City (1992)", Moyai-naoshi movement 	<ul style="list-style-type: none"> · Teshima wastes treatment project
Minucipal Support	<ul style="list-style-type: none"> · The feasible study of Eco-Town · To provide subsidiary : Kawasaki City provides the Eco-Town subsidiary(1% of the total amount of subsidiary given by the government) · Provision of treatment water from the sewage center in Kawasaki 	<ol style="list-style-type: none"> 1.To develop the hard infrastructures including sewage and road construction and securing the 2.To support the software side of the projects such as subsidies and PR activities, 3.Coordination and support including appealing waste segregation to other cities and towns, holding meetings, providing wastes as materials for research activities, briefings for the citizens, 4. "One-Stop Service" to achieve speedier procedures. 	<ul style="list-style-type: none"> · The feasible study of Eco-Town · To ease the regulations in "Minamata Environment Recycling Business Special District" to enable to lease public lands · Provision of subsidiaries : Minamata City provides Eco-Town hardware subsidy (Maximum is 10 million yen) for the businesses approved by the government, and other type of subsidy for the businesses not approved (Maximum is 10 million yen) 	<ul style="list-style-type: none"> · Waste management of Teshima illegal dumping · Measurement against harmful rumor · Easing of the regulations to carry industrial wastes beyond prefectural boundaries 	
Features of Business Activities	<ul style="list-style-type: none"> · To utilize by-products generated in the existing manufacturing processes (steel, stainless, cement, paper, chemical etc.) · Byproduct exchnages among business entities 	<ul style="list-style-type: none"> · Accumulation of various recycling industries · Information disclosure 	<ul style="list-style-type: none"> · Reuse and recycling based on trash separations by the citizens ex.) Bottle reuse and recycling projects ex.) Waste plastics compoud resin recycling project 	<ul style="list-style-type: none"> · To utilize the existing refinery technologies 	
Environmental activities	<ul style="list-style-type: none"> · Energy saving efforts by elementary and junior schools · NGOs 	<ul style="list-style-type: none"> · Kitakyushu Committee to Think about Wastes and Recycling · Environment Museum and Environment Volunteer 	<ul style="list-style-type: none"> · Establishment of "Environmental Mater Proram" · Expansion of involvement of the citizens such as office, home, school and hotel version of ISO. 	<ul style="list-style-type: none"> · Waste reduction and recycling · To hold warkshops for community-based town planning "WE LOVE NAOSHIMA" Reforestation activities, eco-tours, reused-bycicle rental 	
Partnerships among Stakeholders	<ul style="list-style-type: none"> · To establish "liaison center for creation of industry and environment " : waste heat and electricity recovery, industrial symbiosis and legal proections 	<ul style="list-style-type: none"> · Partnership within the Hibiki Recycling Complex · Partnership within the Integrated Environmental Complex · Eco-Town Center · Kitakyushu Eco Complex Concept 	<ul style="list-style-type: none"> · Minamata Eco-Town Comittee : Gatherings by 8 enterprises in Minamata Eco-Town to share the information on the environment,and ptomote the cooperation among the enterprises and PR activities. · Minamata Environmental Techno-Center : Research institute to promote the cooperation among the entities in the Eco-Town, local entities, colleges and universities, and Minamata City. 	<ul style="list-style-type: none"> · Eco-island Naoshima Promotion Committee : Members are a town-mayor, civil organizations, Kagawa prefecture, Mitshubishi Material,Benesse Corporation and other agencies, and its meetings are held for several times a year. 	

7. Lessons from Eco-Towns in Japan

7-2 Key Advantages and benefits for stakeholders

The benefits that Eco-Towns have brought to stakeholders are as follows.

(1) National Government

- ✓ Creation of a “Sound Material Recycling Society”

Eco-Town Projects has served the national government as a breakthrough in the deadlock of the waste management policy based on incineration and landfill. Eco-Town Projects have been effective in appealing a concrete picture of a Sound Material-Cycle Society to the citizens in late 1990s.

- ✓ Promotion of 3R industries

Eco-Town Projects have played an important role in the promotion of eco-business, particularly businesses related to 3R. Eco-businesses have also expanded their domestic and international markets. Eco-Town Projects have had significance success in promoting domestic industries and international competitiveness.

- ✓ Demonstration of the Initiative in the International Environmental Field

Japan is expected to contribute to the international environmental field, by demonstrating Eco-Towns as a model of sustainable consumption and production. One of the examples is that the Japanese government played a central role in organizing the 3R Ministerial Meeting in Tokyo in April 2005.

(2) Local government

- ✓ Revitalization of Local Economies

Eco-Town Projects have solved part of the problems in industrial fields such as enterprise revival, new business creation, effective use of unused land. As a result, tax revenues have increased, and new employment have been created. Kitakyushu local government has calculated the economic effects of the Kitakyushu Eco-Town Project and released them to the public.

- ✓ Environmental improvement

Eco-Town Projects have improved the local and global environmental issues, including final waste disposal problems, hazardous wastes and CO₂ emission.

7. Lessons from Eco-Towns in Japan

- ✓ Administrative capability enhancement

Local governments have established a more flexible network, since Eco-Town Projects are “multiple projects” to which various factors are related, and require interoffice cooperation within the administration. For example, they have enforced “One-Stop Service,” by which the necessity of the coordination among different local government divisions, a major burden on private companies, is substantially decreased.

- ✓ PR and City sales

Many cities in Japan have adopted “Environment-Harmonized City” and “Sustainable City” since 1990s. Eco-Town Project is one of many projects that such cities are engaged in, and the project makes it possible for cities with Eco-Towns to differentiate from those without. The differentiation that Eco-Towns bring about has led to PR and image improvement of the cities, such as the increase of visitors and promotion opportunities.

(3) Business

- ✓ Ensuring the Profitability of New Projects

3R businesses were an enormous business risk in 1997 due to its uncertainty. The risk concerning the procurement of waste materials, capital investment, and the market of recycling products, has been reduced by positioning Eco-Town Projects as a political measure.

- ✓ Accessibility to Information on Environmentally-Friendly Businesses

It is easy to access to information on environmentally-friendly businesses because most companies in Eco-Towns are aspiring to environmental management. Moreover, there is a high possibility for the companies located in the industrial community in Eco-Towns to find new business partners.

- ✓ Corporate Social Responsibility

It is possible for the companies engaging in 3R business to advertise their social contribution in the environmental field, and to interact with the local community.

(4) Citizens

- ✓ Promotion of Environmental Education

The citizens can experimentally learn the practical application of 3R, and how their firsthand efforts such as waste segregation contribute to the improvement of the global

7. Lessons from Eco-Towns in Japan

and local environment, by tours to Eco-Towns. In addition, Eco-Towns provide a place for local communities to practice their environmental activities.

- ✓ Increasing the transparency and openness of waste management

To open the facilities in Eco-Towns to the public will lead to the transparency of waste management. Eco-Towns contribute to development of a waste management system that is open to the public.

- ✓ Image Improvement of a city as an environmentally-friendly city

7. Lessons from Eco-Towns in Japan

7-3 Step-by-step flow chart

Figure 7-1 shows the key lessons learnt in the setting up of the Eco-Towns. These lessons will help in the development of step-by-step guidelines that will enable local/ national governments to set up Eco-Towns in their countries. It will also provide the necessary 'workable strategies' to develop demonstration projects and commitments, as well as resources to implement demonstration projects in cities in developing countries.

Figure 7-1 Step-by-Step Flow Chart

Roles Stakeholders	Governance			Education	Technology
	Laws & Legislations	Policy & Strategy	Finance	Awareness & Capacity Building	Technology Development & transfer
National Government	<ul style="list-style-type: none"> ✓ Clearing up Policy Guidance <ul style="list-style-type: none"> • Fundamental Law for Establishing a Sound Material-Cycle Society • Development of the laws related to 3R • Kyoto Protocol • law to promote global warming countermeasures 	<ul style="list-style-type: none"> ✓ Defining future scenarios <ul style="list-style-type: none"> • Sound Material-Cycle Society • Eco-Town Projects ✓ Designation of the important R&D and industrial promotion field (Environment / Nano-Technology / IT / Biotechnology) 	<ul style="list-style-type: none"> ✓ Setting out budgets <ul style="list-style-type: none"> • Eco-Town Hardware Subsidies • Eco-Town Software Subsidies • Subsidies for research projects related to the environment 	<ul style="list-style-type: none"> ✓ Rising awareness <ul style="list-style-type: none"> • Environmental Learning Programs • PR Activities (Internet, Brochures etc.) • Symposiums ✓ Building capacity <ul style="list-style-type: none"> • Secretariat Office of Committees ✓ PDCA cycle 	<ul style="list-style-type: none"> ✓ Holding International Conferences <ul style="list-style-type: none"> • 3R initiative (example) ✓ Establishing of demonstration projects ✓ Green Purchase
Local Government	<ul style="list-style-type: none"> ✓ Clearing up Policy Guidance <ul style="list-style-type: none"> • Ordinances related to the environment • Creation of the Plan to Achieve the laws related to 3R • Basic Plan to Combat Global Warming 	<ul style="list-style-type: none"> ✓ Urban planning to solve local issues <ul style="list-style-type: none"> • Designing Eco-Town plans ✓ Policy mix 	<ul style="list-style-type: none"> ✓ Setting out budgets <ul style="list-style-type: none"> • Eco-Town Hardware Subsidies • Eco-Town Software Subsidies • Industrial Waste Tax ✓ Developing premises for facilities <ul style="list-style-type: none"> • Infrastructure Development Costs 	<ul style="list-style-type: none"> ✓ Establishment of Eco-Town Centers ✓ Coordinating Eco-Tours ✓ Rising awareness <ul style="list-style-type: none"> • Environmental Learning Programs • PR Activities (Internet, Brochures etc.) • Symposiums ✓ Building capacity <ul style="list-style-type: none"> • Secretariat Office of Committees ✓ PDCA cycle 	<ul style="list-style-type: none"> ✓ Integrated Waste Management ✓ Establishing demonstration projects ✓ Green Purchase
Industries	<ul style="list-style-type: none"> ✓ Abiding the laws and legislations <ul style="list-style-type: none"> • Compliance ✓ Express one's opinions <ul style="list-style-type: none"> • Public Comments for the national/local environmental policy 	<ul style="list-style-type: none"> ✓ Strategy for survive <ul style="list-style-type: none"> • Plans to Commercialize 3R-Related Projects • Environmental Management • Plans to reduce GHGs and manage hazardous wastes 	<ul style="list-style-type: none"> ✓ lining up <ul style="list-style-type: none"> • Investment in Facilities • Financial Assistance ✓ Paying taxes 	<ul style="list-style-type: none"> ✓ Rising awareness <ul style="list-style-type: none"> • Opening Facilities for the Public • Sustainability Reporting ✓ Building capacity <ul style="list-style-type: none"> • Fostering of Experts • Participation in Study Groups • Establishing groups for Cooperation among communities 	<ul style="list-style-type: none"> ✓ R&D <ul style="list-style-type: none"> • 3R technologies and social systems • Waste exchanges • Distribution system ✓ Establishing demonstration projects ✓ Green Purchase
Banks	<ul style="list-style-type: none"> ✓ Abiding the laws and legislations <ul style="list-style-type: none"> • Compliance 		<ul style="list-style-type: none"> ✓ Investing in projects in Eco-Towns <ul style="list-style-type: none"> • Investment ✓ Paying taxes 	<ul style="list-style-type: none"> ✓ Setting out Socially Responsible Investments 	
Universities	<ul style="list-style-type: none"> ✓ Advising on policymaking of national/local government <ul style="list-style-type: none"> • Participation in Committees 	<ul style="list-style-type: none"> ✓ Strategy for survive <ul style="list-style-type: none"> • emphasis on practical R&D projects • business-academia collaboration 	<ul style="list-style-type: none"> ✓ Investing in R&D projects <ul style="list-style-type: none"> • R&D Project Costs ✓ Paying taxes 	<ul style="list-style-type: none"> ✓ Rising awareness <ul style="list-style-type: none"> • Reporting Research Results ✓ Building capacity <ul style="list-style-type: none"> • Fostering of Experts 	<ul style="list-style-type: none"> ✓ R&D <ul style="list-style-type: none"> • 3R technologies and social systems • Evaluation Methods • Assessment tools ✓ Coordinating among Stakeholders
Citizens/NGOs	<ul style="list-style-type: none"> ✓ Express opinions <ul style="list-style-type: none"> • Public Comments for national/local environmental policies 	<ul style="list-style-type: none"> ✓ Appealing to national/local government and industries as grass-roots opinions 	<ul style="list-style-type: none"> ✓ Paying taxes 	<ul style="list-style-type: none"> ✓ Participating programs <ul style="list-style-type: none"> • Environmental Learning Programs • Symposiums • Eco-Tours ✓ Building capacity <ul style="list-style-type: none"> • Establishing NGOs • Participation in Study Groups 	<ul style="list-style-type: none"> ✓ Separating trash properly according to types ✓ Green Consumers Activities

[Appendix: Further Information]

		URL	language
Laws and regulations (3R)	Ministry of Environment	http://www.env.go.jp/en/lar/index.html	English
		http://www.env.go.jp/recycle/circul/	Japanese
		http://www.env.go.jp/recycle/recycling/	
3R policies	Ministry of Economy, Trade and Industry	http://www.meti.go.jp/policy/recycle/main/english/3r_policy/index.html	English
		http://www.meti.go.jp/policy/recycle/index.html	Japanese
Eco-Town Program	Ministry of Economy, Trade and Industry	http://www.meti.go.jp/policy/recycle/main/english/3r_policy/ecotown.html	English
		http://www.meti.go.jp/policy/recycle/main/3r_policy/policy/ecotown.html	Japanese
	Ministry of	http://www.env.go.jp/recycle/ecotown/index.html	Japanese
Eco-industrial development in Japan	Morikawa, Mari. 2000. <i>Eco-Industrial Developments in Japan</i> . Indigo Development Working Paper # 11	http://icnet.ic.gc.ca/base/bioeconomy/eco/case/IndigoEco-Japan.doc	English
Kawasaki eco-town	Kawasaki city government	http://www.city.kawasaki.jp/28/28sangyo/home/ecotown/econ.html	English
		http://www.city.kawasaki.jp/28/28sangyo/home/ecotown/eco.html	Japanese
Urban and industrial symbiosis for	Kawasaki city government	http://www.city.kawasaki.jp/20/20rinkai/home/english/index.html	English
Broacher of Minamata Eco-	Minamata city government	http://www.minamatacity.jp/jp/eco-town/ecotown.htm	Japanese
Eco island Naoshima Plan	Kagawa prefecture	http://www.pref.kagawa.jp/haitai/ecoisland2/index.htm	Japanese
Teshima Waste Treatment Project	Kagawa prefecture	http://www.pref.kagawa.jp/haitai/teshima/project/epdf.htm	English
		http://www.pref.kagawa.jp/haitai/teshima/index.htm	Japanese
Kitakyushu Eco-Town	Kitakyushu Eco-Town homepage bureau	http://kitaq-ecotown.com/about/english/	English
		http://www.kitaq-ecotown.com/	Japanese
Kitakyushu Eco-Town	Kitakyushu city government	http://www.city.kitakyushu.jp/~k2602010/sesaku/ecotown.html	Japanese