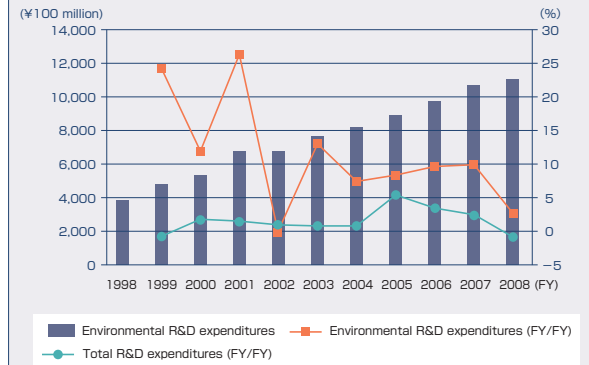


(3) Growth potential as a member of the Asian region

The Asian region, which has close geographical and economic ties to Japan, accounts for over half of the world's population and is seeing rapid economic growth, while it is confronted with serious environmental problems, including greenhouse gas emissions, air pollution, water contamination, inappropriate disposal of wastes and deforestation. If Asian countries under such conditions are to achieve sustainable development, Japan's experiences and wisdom to have overcome pollution problems while sustaining economic growth should be shared by Asian countries and it is also necessary for Japan to serve as a bridge for growth in Asia. It is deemed feasible to apply the strengths of Japan's environmental technologies in a proactive manner in this endeavor.

Figure5-1-5 Trends in Japan's Total Expenditure on R&D and Expenditure on R&D in the Environmental Field



Note: Of environmental R&D expenditures, those between 1998 and 2000 are figures under the category "environmental conservation" and those between 2001 and 2008 are figures under the category of "environment"
 Source: Prepared by Ministry of the Environment based on "Survey of Research and Development 2009" of Ministry of Internal Affairs and Communications

Section 2 Sound Material-Cycle Society Business for Sustainable Economic and Social Activities

1 Expanding Sound Material-Cycle Society Businesses

The Fundamental Plan for Establishing a Sound Material-Cycle Society, adopted in March 2008 by Cabinet decision, defines a sound material-cycle society as "a society in which the amount of new resource extraction is minimized at all stages of social and economic activities, from resource extraction through production, distribution, consumption and disposal, through a range of measures such as reduction of waste generation and use of circulative resources, thereby minimizing environmental loads." Businesses contributing to the building of the sound material-cycle society are called sound material-cycle society businesses. This section looks at the expansion of sound material-cycle society businesses.

The idea of "decoupling" is drawing attention in the environmental field as well. The term decoupling means "separation." When used in the environmental field, it indicates the desirable situation where the rate of increase

in environmental loads is lower than the rate of economic growth. We can say that the world in the past, particularly during the 20th century, has achieved economic growth by increased consumption of resources and intensification of environmental loads through mass production, mass consumption and mass disposal. If we turn our attention to the separation of vectors of economic growth and environmental loads that have grown almost in tandem, or to materials and resources, it becomes evident that the important thing is to have lower increase in the input of natural resources than the economic growth rate to create a decoupling situation.

Figure 5-2-1 shows trends of Japan's gross domestic product (GDP), the input of natural resources, etc. (quantity of domestically produced and imported natural resources and imported products), the cyclical use rate and final disposal amount indicator, the market size for sound

Figure5-2-1 Trends of Economic Indicators and 3R Indicators (1990=1.00)

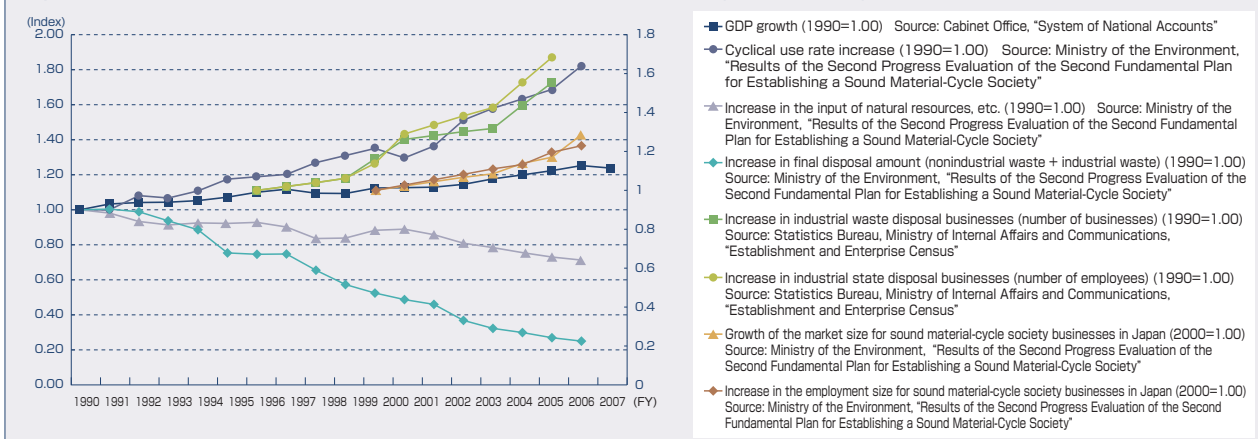
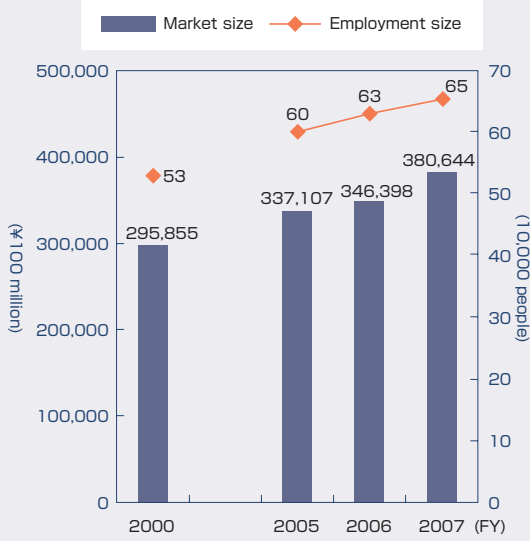


Figure5-2-2 Trends of the Market Size and Employment Size for Sound Material-Cycle Society Businesses

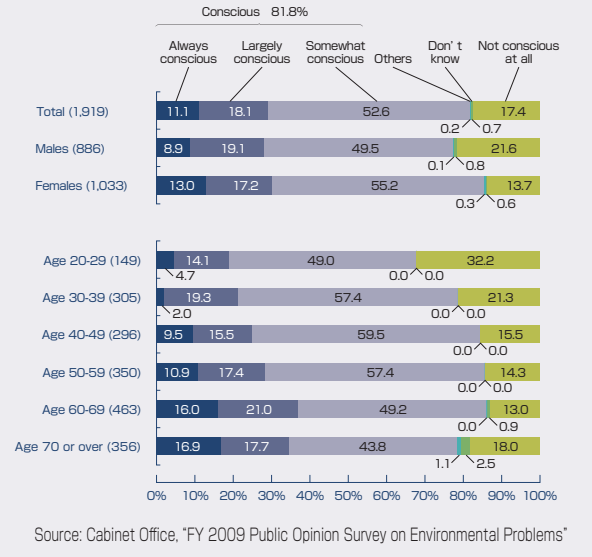


Source: Ministry of the Environment, "Concerning the Second Review of the Progress in the Second Fundamental Plan for Establishing a Sound Material-Cycle Society"

material-cycle society businesses and the size of employment. The figure indicates steady progress of the decoupling in Japan. It also shows that the new market and employment for sound material-cycle society businesses have been created and are expanding.

According to a survey by the Ministry of the Environment, the market for sound material-cycle society businesses, which stood at ¥29,585.5 billion in FY 2000 (about 5.9 % against GDP), the first year of a sound material-cycle society when the Basic Act for Establishing a Sound Material-Cycle Society (Act No.110 of 2000, hereinafter referred to as the "Sound Material-Cycle Society Basic Act") was enacted, is estimated to have grown 1.3 times to ¥38,064.4 billion in FY 2007 (about 6.8 % against GDP) (Figure 5-2-2). The size of

Figure5-2-3 Consciousness about Purchase of Environment-Friendly Products (Green Purchasing)



Source: Cabinet Office, "FY 2009 Public Opinion Survey on Environmental Problems"

employment in these businesses is also estimated to have increased some 1.2 times from about 530,000 in FY 2000 to about 650,000 in FY 2007.

The consciousness of each citizen, who is a consumer at the same time, has also been changing for certain. According to a public opinion survey conducted by the Cabinet Office in June 2009, asked how conscious they are about buying environment-friendly products in the purchase of products, etc., such as products using recycled materials and products that are easy to recycle when they become unnecessary, 81.8% of respondents said they are "conscious" (Figure 5-2-3). The ratio of "conscious" respondents was higher for females by sex and for people in their 50s and 60s by age. The survey results suggest that there is a fair chance of creating new demand by offering goods and services, etc. that correspond to this consumer consciousness.

2 Business Efforts toward a Sound Material-Cycle Society

A Sound Material-Cycle Society is developing with active use of various ideas. In this section, efforts toward a Sound Material-Cycle Society among Businesses which are exposed to consumers are introduced.

(1) Cultivation of new markets by leveraging efforts toward a sound material-cycle society

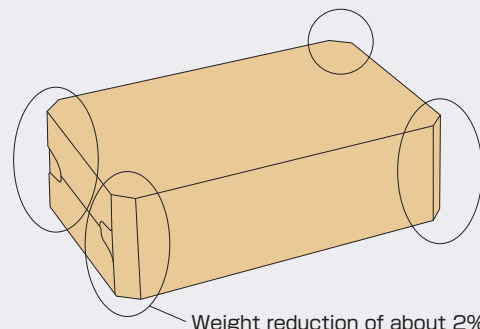
- Home builder S promotes renovated house "Ever Loop"
Company S offers the new "Ever Loop" system of renovating existing homes to sell as new houses, a concept that changes the conventional idea of the used house market. This is a sound material-cycle endeavor to promote the longer operating life of houses and effective use of resources by adding quakeproof and other up-to-date performances in such areas as exterior and equipment to existing homes for resale without tearing them down. This offers the "third option" for home buyers dither between "newly-built" and "existing" houses.

(2) Weight saving

- Weight saving in containers and packaging (Figure 5-2-4)

Beverage company N is selling bottled products in

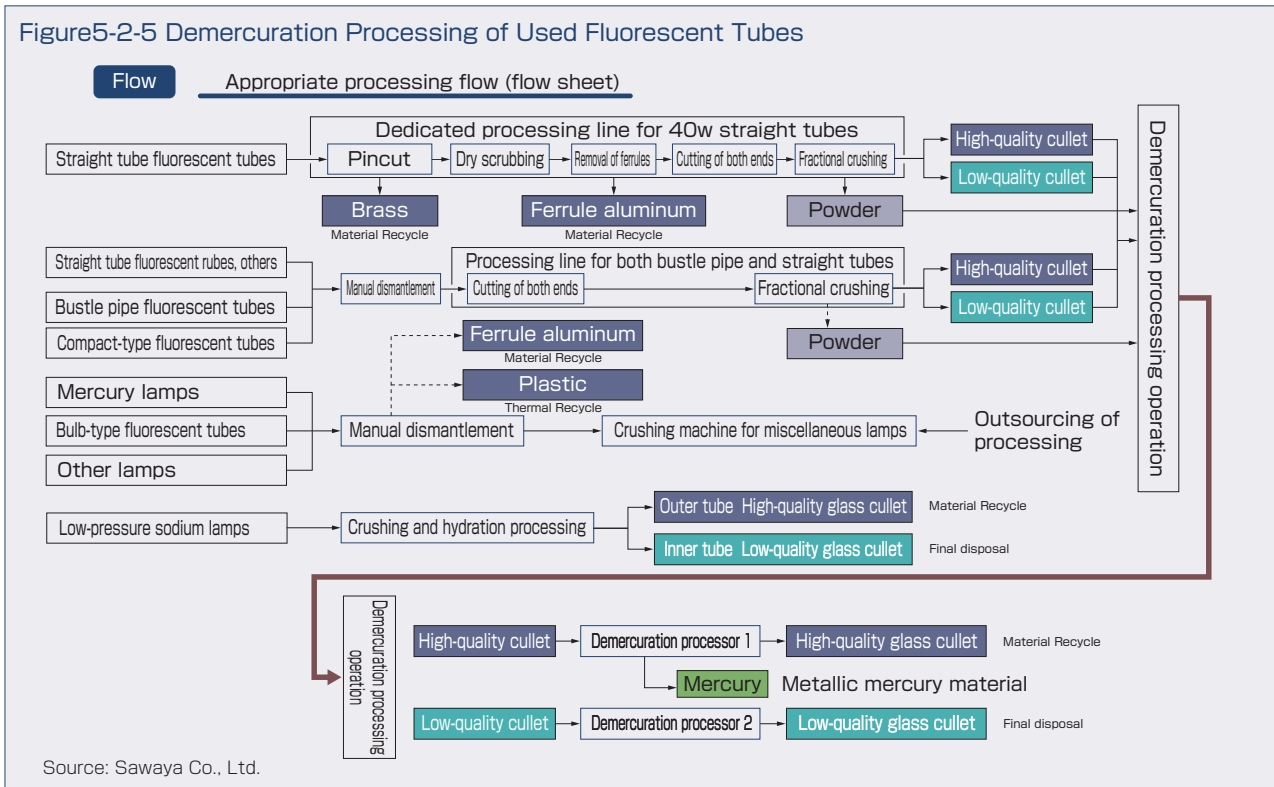
Figure5-2-4 Weight Saving of Containers and Packaging



Weight reduction of about 2%

Source: Prepared by Ministry of the Environment based on materials provided by Kirin Brewery Co., Ltd.





520-milliliter plastic bottles that adopt creative shapes to make them 40% lighter without damaging usability for consumers. Another beverage company K reduced cardboard consumption about 2% while realizing easy handling and enhancing cardboard box strength by adopting cartons with their exterior corners cut. Various other businesses are also making efforts to trim the weight of containers and packaging.

(3) Cooperation between venous and arterial industries

○ Making traditional craftwork from used fluorescent tubes (Figures 5-2-5, 5-2-6)
 Company S1 has developed the technology to recycle used fluorescent tubes (demercuration processing) and is making cullet, a material for glassware. Glass maker S2 is using this cullet to manufacture recycled glass at the

hands of craftsmen certified as Tokyo Metropolitan Government traditional artisans or Sumida Meisters. About one recycled glass is made from one used fluorescent tube and this glass has become the first EcoMark-certified glass in Japan. The cullet is used as material for making carafes adopted in a campaign of the Nagoya City Waterworks and Sewerage Bureau to convey the safety and palatability of tap water or efforts to reduce the use of plastic bottles.

(4) Integrated efforts for realization of a sound material-cycle society, low-carbon society and society in harmony with nature

○ Reuse of photovoltaic panels (Figures 5-2-7, 5-2-8)
 Company N in Nagano Prefecture is undertaking integrated efforts for a sound material-cycle society and low-carbon society through the reuse of used panels for photovoltaic power generation, a move in anticipation of

Figure5-2-8 Projections for Future Recycling · Reuse of Crystal Silicon Solar Cells and Modules

	2010	2015	2020	2025	2030
Projected annual amount of disposal* (Existing EVA-containing modules)	< 5MW (500 tons)	10MW (1,000 tons)	100MW (10,000 tons)	> 300MW (30,000 tons)	1,000MW (100,000 tons)
Reuse	For private residences	For disaster relief	For overseas	Accumulation center	New businesses?
Recycling by existing operators · Disposal · Collection of Al · Heating (burning of EVA) + · Nonferrous smelting technology · Collection of Al, glass and Ag	Less than 5MW	5-10MW			
Recycling at dedicated PV factories · Based on existing technologies · Collection of Al, glass, Si (Ag?) · Newly developed technologies · Collection of Al, glass, Si and Ag		Factories capable of handling 20MW panels		Factories capable of handling 100 MW panels (New method of low-cost processing)	

Note: The amount of disposal is projected on the basis of the actual introduction until 2004 and the projected introduction in 2005-2010 with the achievement of the 2010 introduction target of 4.82 million kW assuming disposal 20 years after purchase (See Figure 1-5-1). We assume that existing EVA-laminated modules are sold until 2010 and subject to disposal is this type of modules.
Source: New Energy and Industrial Technology Development Organization (NEDO)

Figure5-2-9 Forestry Dairy

- Effective utilization of abandoned satoyama, forested sites that need maintenance work, abandoned farmland, disused pastures, disused ski sites and golf courses, etc. → Value creation
- Grazing of 0.5-2 cattle per hectare → Natural circulation of excrements is possible.
- Feed cattle with undergrowth in forests without depending on imported feedstuff
- 365-day, day-and-night yearlong grazing → No need for large cattle sheds
- Natural mating, natural births, breast-feeding and long-term milking are the basis.



Source: Amita Holdings Co., Ltd.

the problem of disposal of photovoltaic panels that is expected to come to the fore in the future in tandem with the penetration of photovoltaic power generation.

○ Forestry dairy (Figure 5-2-9)

Company A is using unattended “satoyama” (community-based forest areas) to undertake natural grazing for “forest dairy” operations. The company is producing milk from dairy cattle that are pasturing and eating undergrowth in forests. Dairy cattle level the ground in forests and their excrements resolve into soil in forests, this cycle represents an integrated effort toward a sound material-cycle society and society in harmony with nature.

(5) Community business

○ Blending of bicycle rental business and measures to

cope with abandoned bicycles (Figure 5-2-10)

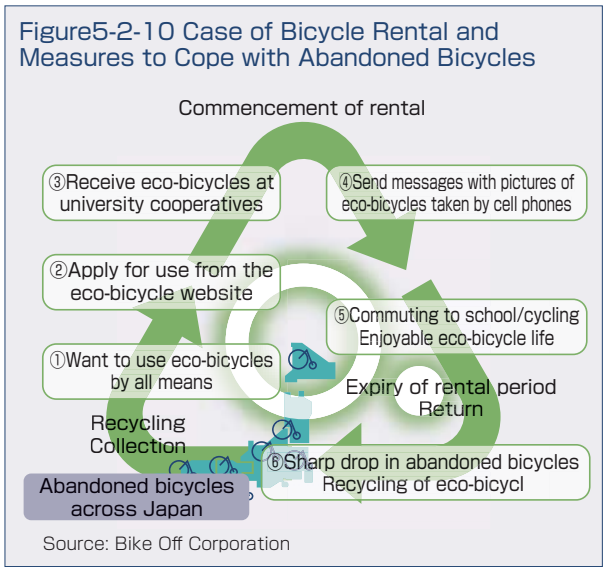
Company B is renting bicycles for students at about 120 universities across Japan by repairing bicycles abandoned at universities and commercial facilities to make them reusable. This can be described as an endeavor to blend efforts toward building a sound material-cycle society with measures to deal with abandoned bicycles.

(6) Regional revitalization by leveraging sound material-cycle society businesses

○ Shinshu-type wooden guardrails (Figure 5-2-11)

The Nagano prefectural government certifies as Shinshu-type wooden guardrails those wooden guardrails that have such characteristics as (1) contributing to measures to prevent global warming; (2) using thinned





wood produced in the prefecture; (3) contributing to building a sound material-cycle society, like post-disposal recycling; (4) contributing to preserving the environment and improving the landscape; (5) contributing to creating employment by nurturing a new industry in the prefecture. Wooden guardrails, already in use at tourist sites, etc., are also helping reduce steel consumption and promote the use of thinned wood.

- Effective utilization of circulative resources from local special products (Figure 5-2-12)
- Kojima in Kurashiki City, Okayama Prefecture, has flourished as the “town of textiles” since the Edo period and is also known as the “birthplace of Japanese Jeans.” About 50% of all jeans sold in Japan come from Kojima. Jeans makers in Kojima are manufacturing and selling eco-bags using leftover denims, thus contributing to

reducing waste generation and revitalizing the local economy.

As seen in various examples described above, sound material-cycle society businesses are starting up in various forms and scale across Japan. Investment in sound material-cycle society businesses can help reduce the use of resources and waste discharges as well as costs, and also create new demand. Making this first step could lead to the acquisition of the world’s top-level technology and the building of the world’s first business model. It is important to create a virtuous cycle and build a sound material-cycle and sustainable society.

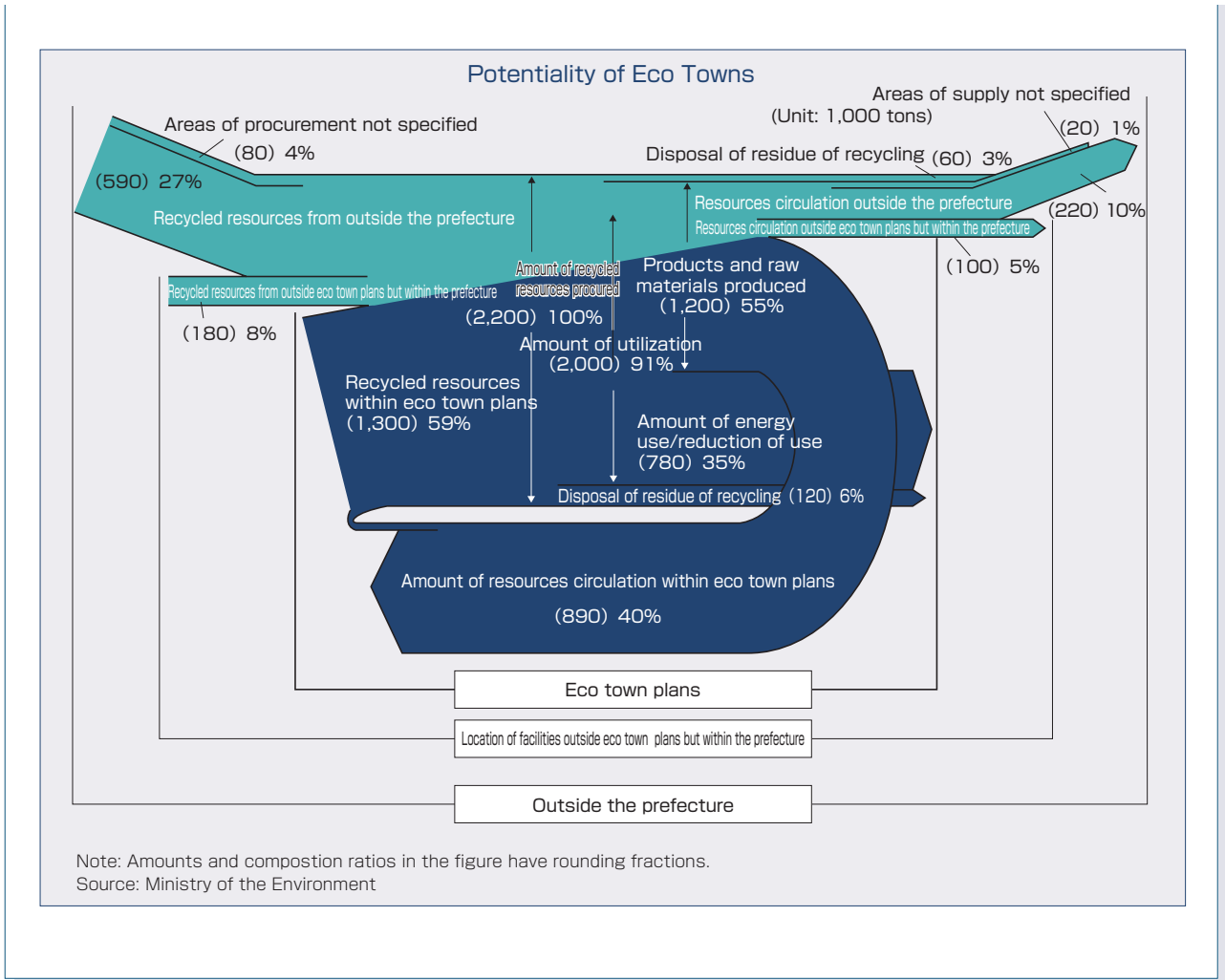
Column The Role of Eco Towns in the Resources-Recycling Process

The Eco Town Program is designed to promote the building of advanced environment-friendly communities by positioning the “zero emission plan” as the basic plan for an environment-friendly regional economic society and promoting it as the core of regional development. So far, a total of 26 regional eco town plans have been approved.

A survey on the resources-recycling process in eco towns by the Ministry of the Environment found that some 2.20 million tons of circulative resources have been put into the eco towns across Japan, and about 91% of them were utilized as products, raw materials or energy (including reductions in volume), confirming the highly efficient utilization. By region, about 59%

of circulative resources procured by eco town facilities were procured from within the same eco town plans and some 40% of products and energy supplied by eco town facilities were supplied within the same eco town plans, making it clear that eco towns can assume the function of the core of regional resources-recycling.

An estimation of the effect of reducing environmental loads at eco towns across Japan as a whole shows the reduction of about one million tons in the amount of final disposal and about 420,000 tons in carbon dioxide emissions, confirming the reducing effects to a certain extent.



Section 3 Environmental Technologies and Environmental Industries That Change the Socioeconomic System

As seen in the previous section, the environmental industry and circulation industry can be expected to make contributions from both aspects of environmental conservation and economic growth, and over the long term, they are believed to be capable of changing the socioeconomic system. As discussed in Chapter 2, for example, if the smart grid is realized, the use of renewable energy is expected to increase, electricity is likely to be charged into large stationary storage batteries for adjusting the power supply and demand

balance, and new services may be offered by adding security systems and the function of operating home electric appliances to the smart grid.

In this section, we introduce environmental technologies and services with the potential to alter the socioeconomic society like the smart grid, and give a broad overview of the current situation and future prospects of efforts to financially support the environmental industry and greening of economic activities.

1 Japan's Excellent Environmental Technologies

Raw materials and manufactured products produced with Japan's excellent technologies are bringing forward energy-saving effects through weight saving, and are greatly contributing to the mitigation of environmental loads. One of such technologies is carbon fiber. Japan commands an overwhelming share of around 80% in the world's market for high-performance carbon fiber (Figure 5-3-1). After Japanese companies continued research and development investment over long periods

of time and also received support from the national government for their research and development projects, they maintain a technological edge over Western companies.

Carbon fibers are fit for use as structural materials for airplanes and automobiles due to their characteristics of being light, strong and rustproof, and also help enhance the energy-saving performance. For a new medium-size aircraft now in production, for example,

