



Chapter 3 Building Healthy and Satisfied Local Communities

Section 1 Reconstruction from the Disaster

The Seven Principles for the Reconstruction Framework emphasize the importance of strengths of the local communities in the disaster-affected areas to bring about rehabilitation and reconstruction accompanied by technological innovation. The aim of these efforts is not just to create a leading, economic society in the affected areas,

but also to revitalize the Japanese economy. In order to achieve this, Japan will need to provide support in terms of overall policy and institutional design. Also, to revitalize the livelihood of local communities, it is important to maintain the social cohesion that exists within these communities.

1 Introducing Renewable Energy to the Tohoku Region

(1) Potential for Introducing Renewable Energy to the Tohoku Region

Promoting the introduction of renewable energy not only helps in mitigating climate change but also creates communities that are highly resilient in the face of disasters and energy risks, thanks to the establishment of distributed, self-reliant energy supply systems.

The Ministry of the Environment has carried out a Survey on the Potential for Introducing Renewable Energy. The results of this survey are being used as basic data in studies on future policies aimed at promoting widespread adoption of renewable energy. In this study, “available resources” are defined as being energy stocks that are theoretically estimable from such factors as available installation area, average wind speed, and river flow rate, and without consideration of various constraining factors (land slope, laws and regulations, land use, distance from residential areas, and so on). Energy stocks for which various constraining factors relating to the extraction and use of energy are taken into account in determining whether or not installation is feasible are defined and estimated as “introduction potential.” Energy stocks that are expected to be realized given certain business income and expenditure-

related scenarios (assumptions) are defined and estimated as the “scenario-specific introducible volume.”

Estimated results for renewable energy introduction potential were: 150 million kW for non-residential photovoltaic power generation; 280 million kW for land-based wind power generation; 1.6 billion kW for ocean-based wind power generation; 14 million kW for micro- and mid-scale hydroelectric power generation (less than 30,000 kW for rivers and agricultural water channels); and 14 million kW for geothermal power generation. It is essential to keep in mind that these estimates include values from existing development areas.

Detailed estimates of the renewable energy introduction potential in the Tohoku region are also being carried out. Great introduction potential exists for wind power generation, with up to 83 billion kWh per year being possible (this would be equal to the 82.7 billion kWh per year sold by the Tohoku Electric Power Company). In terms of geothermal power generation, Tohoku is on a par with Kyushu in terms of suitable locations. In summary, the Tohoku region has great potential for the introduction of renewable energy, and renewable energy use is seen as being an important point of consideration in the reconstruction of the Tohoku region.



Column

Local Economic Effects of Introducing Solar Power Generation and Wind Power Generation in the Tohoku Region

Renewable energy is being incorporated into the reconstruction of the Tohoku region in the aftermath of the Great East Japan Earthquake, but what sort of impact will this have on the region's economy?

This question has been addressed in a 2011 environmental economics policy research paper entitled *Balancing Environmental and Local Economic Concerns in the Correction of Endogenous Regional Disparities, the Creation of Local Jobs, and the Implementation of Relevant Policy* (Okayama University Graduate School Professor Ryohei Nakamura, et al.). This paper looked at three prefectures in the Tohoku region (Iwate, Miyagi, and Fukushima prefectures) and analyzed the potential local economic effects of introducing solar power generation and wind power generation.

This analysis utilized the prefecture-specific Survey on the Potential for Introducing Renewable Energy discussed above, and also took into consideration the existing renewable energy policies of each prefecture. Local inter-industry tables for each prefecture were used to create a new inter-industry table that incorporates the economic ripple effects of the environmental sector, in the form of solar power and wind power generation. On this basis, Professor Nakamura and his colleagues carried out an analysis of the economic ripple effects on the local economy.

These results show that if renewable energy were

introduced according to the potential of each of these three Tohoku prefectures, it would be difficult to produce an economic effect greater than existing power sources. However, because the need to buy power from existing power sources outside the region could be eliminated, the region would be able to retain more of its money, which could be used in local revitalization efforts, such as efforts to correct regional disparities. For example, in the case of Iwate Prefecture, the connection between existing power sources and local industry is comparatively weak and a high level of power is purchased from other prefectures. In this case, the production ripple effect resulting from the introduction of renewable energy would surpass that of existing power, and communities would be able to retain a comparatively larger portion of their money. In contrast, in Miyagi Prefecture, the connection between existing power sources and local industry is comparatively strong, and a comparatively low level of power is purchased from other prefectures. In this case, the production ripple effect resulting from the introduction of renewable energy would be less than that of existing power, and the amount of money retained by communities would be comparatively small. Also, in the medium to long term, generating renewable energy locally is likely to have the following effects: lowering the costs associated with the evolution of

renewable energy technologies; developing investment in infrastructure improvements connected with power storage facilities for electrical load leveling; hedging risks stemming from a future increase in prices due to the depletion of fossil fuels; improving local energy security; and further raising the level of local autonomy.

In order to realize these benefits quickly, it is important for renewable energy to be introduced

in a short period of time. Policies that can be used to facilitate rapidly adopting solar and wind power generation include creating an investment income stabilizing feed-in tariff system, and also promptly developing regulations that would create significant ripple effects in the local economy. The introduction of renewable energy could thus be speeded up on a large scale.

(2) Introduction of Renewable Energy in the Affected Areas

Because of the great length of time required to recover lifelines in the areas affected by the Great East Japan Earthquake, the majority of disaster survivors must suffer an inconvenient evacuation that exacerbates their refugee-like living conditions. In this situation, the effectiveness of pellet stoves, solar panels, and other distributed, autonomous heating appliances and power sources has fostered widespread recognition of the importance of renewable energy for such devices when the regular lifelines have been cut off. Renewable energy sources for evacuation shelters and other public facilities are also gaining attention from the standpoint of making communities resilient in the face of disasters.

This section looks at the examples of Aomori Prefecture and Oshu City in Iwate Prefecture, which were part of the Green New Deal funding program provided from 2008 to 2010, to consider the nature of local renewable energy usage initiatives in the Tohoku region.

In Oshu City, logging offcuts from mountain forests and used food oils from homes are collected and used as fuel to power and heat the hot spring facilities in the city. Specifically, the logging offcuts are chipped and wood

gas is extracted, and the used food oils are converted into biodiesel fuel. Electricity and heat are produced using these energy sources in a co-combustion system. The electricity is used in the hot springs facilities, and the heat is used to heat the bath water, thereby reducing CO₂ (Figure 3-1-1).

The cases of Oshu City in Iwate Prefecture and other initiatives in Aomori Prefecture show that the skillful utilization of local natural resources serves to promote the community and at the same time makes community development more distributed and autonomous. Thus the community is able to flexibly adapt in the face of disasters. In the wake of the Great East Japan Earthquake, a great many local governments are starting to take notice of these benefits.

According to basic principles for reconstruction from the Great East Japan Earthquake, the implementation of autonomous and self-reliant energy systems by leveraging unutilized resources in affected areas will be subsidized. Aid for reconstruction in affected areas is ongoing using the Regional Green New Deal Fund financed by the third supplementary budget for fiscal 2011. For example, leading-edge systems focusing on generating and storing energy in the evacuation area using renewable energy are being actively promoted.

Local Economic Effect of Introducing the Solar and Wind Power Generation in Tohoku Area

Table. Local Input-Output Table Incorporating the Solar and Wind Power Generation Sectors

		Primary Industry			Secondary Industry			Tertiary Industry (excluding existing power sector)			Existing Power Sector		Solar and Wind Power Generation		Final Demand	Outflow	Inflow	Production Value						
		1	2	3	A	B	F ₁	E ₁	M ₁	X ₁	F ₂	E ₂	M ₂	X ₂					F ₃	E ₃	M ₃	X ₃	F _A	E _A
Primary Industry	1	X ₁₁	X ₁₂	X ₁₃	X _{1A}	X _{1B}	F ₁	E ₁	M ₁	X ₁														
Secondary Industry	2	X ₂₁	X ₂₂	X ₂₃	X _{2A}	X _{2B}	F ₂	E ₂	M ₂	X ₂														
Tertiary Industry (excluding existing power sector)	3	X ₃₁	X ₃₂	X ₃₃	X _{3A}	X _{3B}	F ₃	E ₃	M ₃	X ₃														
Existing Power Sector ¹	A	X _{A1}	X _{A2}	X _{A3}	X _{AA}	X _{AB}	F _A	E _A	M _A	X _A														
Solar and Wind Power Generation ²	B	X _{B1}	X _{B2}	X _{B3}	0	0	F _B	0	0	X _B														
Gross Value Added		V ₁	V ₂	V ₃	V _A	V _B																		
Production Value		X ₁	X ₂	X ₃	X _A	X _B																		

1 Sector responsible for supplying grid power via existing power sources. Production value will decrease as the sector is replaced by solar and wind power generation.
 2 Sector responsible for solar and wind power generation. As production increases in this sector, production in the power sector will decrease and other economic ripple effects will be felt in other sectors.

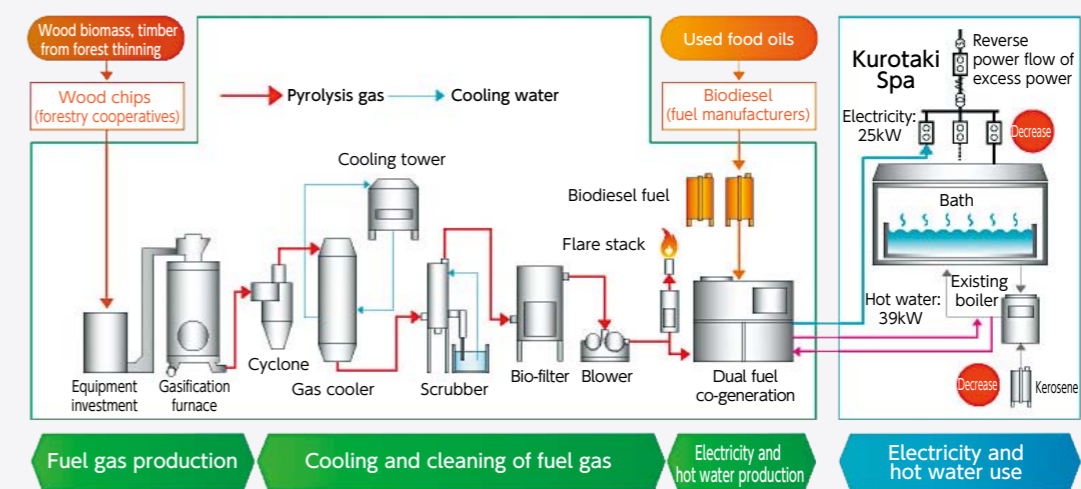
Source: the Ministry of the Environment Policy Research on the Environmental Economy 2011, *Balancing Environmental and Local Economic Concerns in the Correction of Endogenous Regional Disparities, the Creation of Local Jobs and the Implementation of Relevant Policy* Okayama University Ryohei Nakamura, and others.

Table. Local Economic Effects in Three Tohoku Prefectures as a Result of Introducing Solar and Wind Power Generation (units: million yen)

	Iwate Prefecture	Miyagi Prefecture	Fukushima Prefecture
Power Supplied By Solar and Wind Power Generation ¹	+9,357	+2,066	+5,390
Power Supplied By Existing Power Sources	-6,705	-1,340	-3,600
Production Ripple Effect on Industry in the Region ²	+182	-564	-977
Amount of Money Retained in the Region (amount of improvement in inter-regional balance of payments) ²	+2,608	+395	+1,541
Effect on the Local Economy ³	+5,442	+556	+2,354

1 Anticipated to be equivalent to 1% of introduction potential for each prefecture.
 2 Estimate based on the intra-regional inter-industry structure, and so on.
 3 Total economic effect produced locally if solar and wind power generation is introduced into each prefecture.

Figure 3-1-1 Woody Biomass Gas Co-Generation System Introduced in Oshu City



Source: Yanmar Co., Ltd.

2 Utilization of Local Forest Resources toward Reconstruction

A large number of disaster survivors have been forced to seek refuge in temporary housing in the aftermath of the Great East Japan Earthquake. At present, 110,000 people are enduring the inconveniences of refugee-like living conditions in temporary housing. Many of these temporary homes are prefabricated from inorganic materials, such as zinc, iron, and other metals. Living in these homes for long periods of time is unpleasant in terms of livability and comfort. Thus, increasing attention is being paid to the creation of temporary housing made of wood from local lumber.

In Sumita Town, Iwate Prefecture, wood homes made from local lumber have been common since before the earthquake disaster. Approximately 90% of the town's area is forest, which is known for its quality Kesen cedars, and the town itself is known for its long history of Kesen carpentry. Sumita utilizes its wealth of quality forest resources and advanced woodworking technology as a foundation for the development of an integrated supply chain in the town that extends from afforestation to home production. Furthermore, Sumita Town has invested in practices that seek to ensure forest resources are used sustainably. These include utilizing woody biomass resources as wood pellets and boiler fuel, and acquiring certification by the Forest Stewardship Council: Forest Management (FM) Certification, which certifies that appropriate forest management is taking place; and Chain of Custody (CoC) Certification, which certifies that the wood in wood products has come from approved forests.

In order to further expand these practices, Sumita Town has promoted the development of temporary housing that utilizes local lumber. This practice was originally intended as a means of communicating the excellence of Japanese lumber overseas, primarily through its use in international assistance efforts such as Official Development Assistance (ODA).

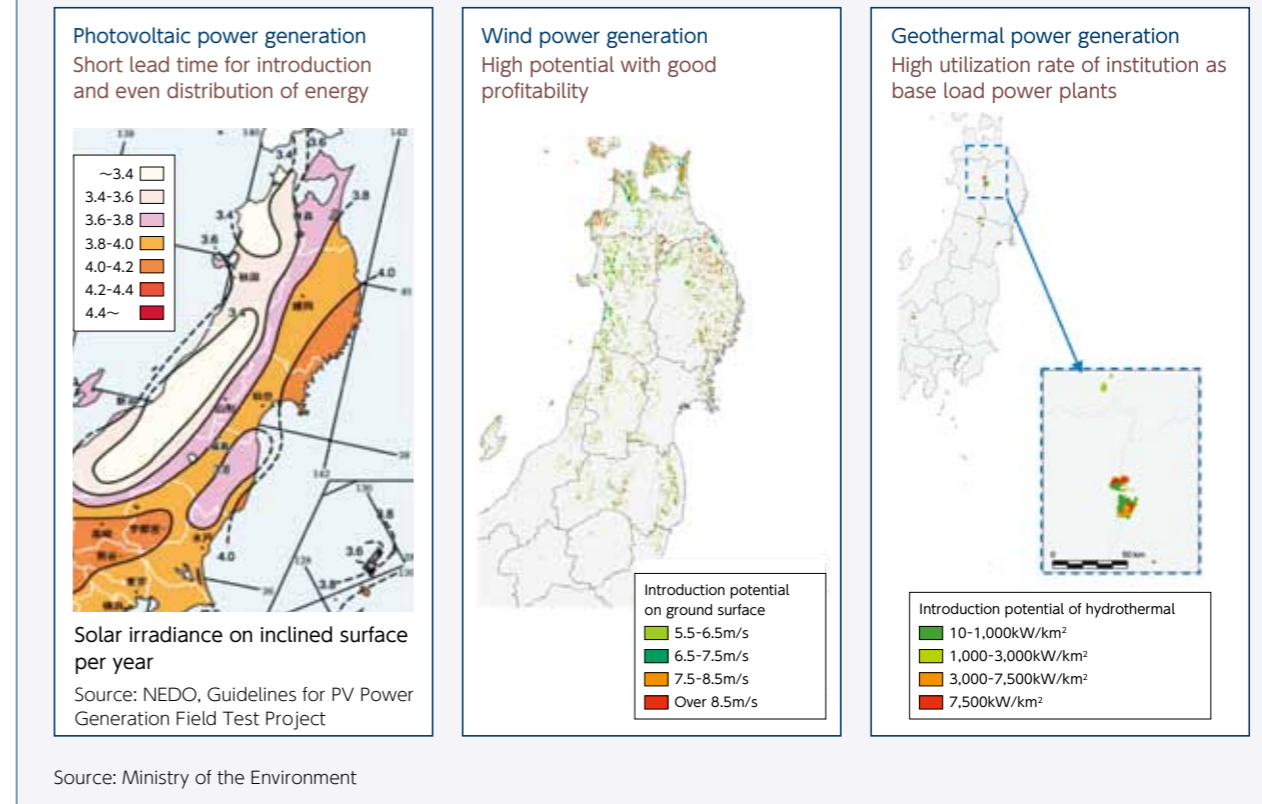
In the wake of the Great East Japan Earthquake, Sumita Town put this know-how to use. Within only two-and-a-half months after the disaster, they had constructed 93 temporary homes in three complexes within the town using locally sourced lumber. This housing has been used to accommodate disaster survivors from the adjacent cities of Rikuzentakata and Ofunato, among other locations (Photo3-1-1). This proactive effort on the part of a local government impressed many people, prompting them to volunteer to help Sumita Town in its efforts.

Furthermore, Sumita Town's wooden temporary housing is inexpensive thanks to the fact that it is made by local builders using locally sourced lumber. The cost per home, when ancillary work such as septic tanks is included, is around 3.5 million yen; in comparison, the average cost per home for prefabricated housing set up in Iwate Prefecture is 5 million yen. The wood-based construction also has a feel and smell that imparts a sense of warmth and comfort to residents. These selling points—cost, livability, and comfort—have benefited the local community and have also attracted the attention of a great many stakeholders, including local governments.

The people of the local community have come to realize the value of the forest resources where they live. Many people, including volunteers and other local governments, have been impressed by this demonstration of how the town has fully applied its successes, achieved from persistent efforts to rebuild local industries, to the support and care of disaster survivors. This leads to the creation of new interpersonal bonds that make a significant contribution to local revitalization.

This utilization of local natural resources is a good example of how forest resources can be used in working towards the realization of a future sustainable society. It is a model not only for earthquake-affected areas, but also for a great many communities throughout Japan.

Figure 3-1-1 The Potential Renewable Energy in the Tohoku Region



3 Damage and Reconstruction in Natural Parks

(1) Damage in Natural Parks

During the Great East Japan Earthquake, there was severe damage to public facilities that had been meant to enable visitors to utilize natural parks along the coast, and to organizations operating nature experience programs, such as ecotourism.

The result of an on-site survey of usage facilities associated with park-work facilities connected to Rikuchu Kaigan National Park found that 56% had sustained some form of damage (Ministry of the Environment survey, of a total of 121 park-work facilities, as of September 2, 2011). In particular, the survey found that the tsunami had destroyed many of the facilities along the coastline, including camp site, hotels, parking lots, and trails. The sandy shores of bathing beaches had disappeared in some cases, and fissure damage was evident on the Oshika Peninsula (Minami Sanriku Kinkasan Quasi-National Park), which had been close to the earthquake's epicenter.

The Pacific coastline of the Tohoku region provides various nature programs, such as sightseeing boats and small fishing vessel excursions, sea kayaking, fishing, and history and culture experiences. Of the 213 nature experience programs that were in operation along the coast between Hachinohe City in Aomori Prefecture and Soma City in Fukushima Prefecture, the survey found that, as of August 2011, a total of 100 programs (47%) had been affected

Photo 3-1-2 Devastated Camp Site at Rikuchu Kaigan National Park (Naka-no-Hama (Miyako City, Iwate Prefecture))



(Photograph taken April 7, 2011 by the Ministry of the Environment)

by the earthquake disaster, with 91 programs (43%) listed as "partially or not rehabilitated" (Report on the Current Operational Status of Major Nature Experience Programs on the Sanriku Coast, Ministry of the Environment, 2011).

On the other hand, with the exception of pine forests and some beaches, a great many of the scenic coastal areas that were the reason why the coastal natural parks earned their designations, such as sea cliffs, ria coasts, and unique rock formations, are just as awe-inspiring now as they were prior to the earthquake and tsunami.

Photo 3-1-1 Wooden Temporary Housing in Sumita Town



Temporary Housing Complex (bird's-eye view)
Photos: Sumita Town

Wooden temporary housing provided to disaster survivors (exterior and interior)

Photo 3-1-3 Scenic Landscape at the Rikuchu Kaigan National Park Unchanged after the Earthquake Disaster



Left: Anadoriiso (Ofunato City, Iwate Prefecture. Photograph taken April 15, 2011, by the Ministry of the Environment)
 Right: Kita-Yamazaki (Tanohata Village, Iwate Prefecture. Photograph taken September 8, 2011, by the Ministry of the Environment)

(2) Basic Policy of the Reconstruction about Natural Environments

Backed by the present conditions of such a stricken area, Sanriku Fukko (reconstruction) National Park and the matters in conjunction with natural environments are placed in “Basic guidelines for reconstruction in response to the Great East Japan Earthquake” that Reconstruction Headquarters in response to the Great East Japan Earthquake devised on July 29, 2011.

Basic guidelines for reconstruction in response to the Great East Japan Earthquake (extracts)

- Establish new styles of tourism that are only possible in Tohoku bringing out rich local tourism resources including natural landscapes, rich local culture, foods, national parks and World Heritage sites, through human resource development and formation of local platforms that include a wide range of related people.
- Consider the reorganization of existing national parks such as Rikuchu Kaigan National Park and establishment of Sanriku Reconstruction National Park (tentative name), including redevelopment of disaster-affected park facilities and new construction of long-distance coastal trail, with due consideration to disaster prevention. Implement various projects including promotion of ecotourism in collaboration with agriculture, forestry, and fisheries industries.
- Society in harmony with nature will be realized through nature restoration for recovering the linkages between the ecosystems of forests, Sato (countryside) and sea.
- Conduct studies on the current situations of natural environments affected by the tsunami as well as monitoring of the following changes over the years.

(3) Action to the Reconstruction Utilizing the Natural Resource of the Tohoku District

Various efforts aimed at protecting and utilizing the natural environment have been in practice on the Pacific coast of the Tohoku region since before the earthquake disaster. Some representative examples of these efforts will be discussed below.

Tanohata Taiken-Mura Village, run by the Tanohata Network NPO’ has actively promoted eco-tours. A large number of appealing nature programs are offered which employ fishermen as guides in small fishing boats, known as “Sappa boats.” Fishermen demonstrate skilled boating techniques, point out coastal flora and fauna, talk about fisheries, and allow visitors to enjoy tremendous coastal scenery that can only be reached by boat. Roughly 8,000 people per year took advantage of these programs (as of 2009).

These Sappa boat eco-tours were restarted on July 29, 2011. Every effort is being made to get these and other eco-tours back up and running. In Tanohata Village and elsewhere, efforts are being made to organize guides and others who can lead eco-tours and talk about the earthquake

Photo 3-1-4 Eco-Tour from Tanohata Village Using Japanese “Sappa Boats” (pre-earthquake disaster)



Photo: Provided by Tanohata Village

disaster.

Iwate Prefecture is the site of the Kitakami Mountains, which date back 500 million years and are Japan’s oldest geological formation. Numerous fossils are found in Iwate’s coastal areas. Beautiful underground caverns, which provided the minerals and ore that supported Japan’s modernization, are found throughout the prefecture. Efforts are underway to gain recognition for this area as a Global Geopark, while making the best use of its resources and conveying the history of Iwate’s battle with tsunami damage as it maintains an ocean-centered way of life.

(3) Policy for Sanriku Area Natural Parks in the Reconstruction Project

The Nature Conservation Committee of the Central Environment Council was consulted about incorporating Sanriku area natural parks in the reconstruction effort. After taking into consideration the results of opinion exchange meetings held by the Ministry of the Environment in various regions, the committee submitted a report on March 9, 2012, entitled Green Reconstruction at the Heart of National Park Creation – Harmonizing Reconstruction Efforts with the Nature of Forests, Satoyama, Rivers, and Sea. The basic principle for future reconstruction put forward by the report was to use the creation of a Sanriku Fukko (reconstruction) National Park and other diverse initiatives to convey to future generations how the forests, satoyama, rivers, and sea are interconnected as well as intertwined with the local way of life, and to use these in the context of reconstruction to teach people about the blessing and threats of nature. Specifically, the seven specific Green Reconstruction Projects outlined below will be implemented with the help and cooperation of various stakeholders, including international promotion.

- (1) Creation of the Sanriku Fukko (reconstruction) National Park (natural parks restructuring). A single national park will be created, which will contribute to local area promotion and reconstruction through appropriate utilization as a nature park; it will be centered on the Rikuchu Kaigan National Park, and will include the area from Kabu Island off the coast of Hachinohe City, Aomori Prefecture to the Oshika Peninsula of Onagawa Town, Ishinomaki City, Miyagi Prefecture, and including the surrounding natural parks.
- (2) Satoyama and Satoumi Field Museum and Facilities Improvement: Damaged facilities in the reorganized national park will be restored and redeveloped, and facilities will be developed for teaching about the blessing of nature and the local community’s distinctive way of life, as well as venues for learning about the

threats of nature. Also, a defined local area, centered on the national park and including surrounding *satoyama*, *satoumi*, and settlement areas, shall be established as a field museum where various resources are utilized and the local community is revitalized.

- (3) Fun Nature Tours Incorporating Local Treasures (Fukko (reconstruction) eco-tourism): In collaboration with the agriculture, forestry, and fisheries industries, in order to encourage tourists to stay for extended periods in the region, eco-tourism combined with guided tours of areas affected by the disaster, geo-tours, and so on, will be promoted.
- (4) A Trail to Deepen Exchange Between North and South (Tohoku Coastal Trail): A long-distance nature trail will be established, connecting various elements, such as the local natural environment and the local way of life, the traces of the earthquake disaster, the trail walkers and the local residents, and so on; depending upon the pace of visitors’ walk along the trail, a profound nature experience and new discoveries will be available. The trail is intended to encourage tourists to stay for extended periods in the region.
- (5) Restoration between Forest, Satoyama, River, and Sea Connections. This initiative will seek to conserve rich ecosystems by recognizing them as protected areas, and will seek to impart a well understanding about the importance of forest, satoyama, river, and sea connections to a great many people via direct experience. Also, by recognizing where the local environment has turned into tidal flats as a result of the earthquake and tsunami, and by understanding the impact of the earthquake and tsunami on tidal flat and eelgrass bed ecosystems, this initiative will help facilitate the natural restoration of the region.
- (6) Promotion of Education for Sustainable Development (ESD): ESD will be promoted, focusing on: the history and mechanisms of the natural environment; forest, satoyama, river, and sea connections; the local way of life; the threats of nature; and disaster prevention and reduction.
- (7) Monitoring the Effects of the Earthquake and Tsunami on the Natural Environment: This initiative will focus on those areas that are important from the standpoint of preserving biodiversity: surveys will be conducted on the impact of the earthquake and tsunami on the natural environment; ongoing changes in the natural environment will be monitored; data will be collected, including data gathered by researchers; the data will be consolidated and announced; and an overall assessment of the impact of the earthquake and tsunami on the natural environment will be provided.

Section 2 Towards Achieving Sustainable Local Communities

The experience gained from the process of reconstruction in the wake of the Great East Japan Earthquake, reviewed

in the previous section, can provide valuable knowledge applicable to realizing a sustainable society. This section

examines the thinking that underlies the creation of communities, from various standpoints: in terms of risk dispersion, creating autonomous and self-reliant communities; in terms of natural resource self-sufficiency,

creating communities that utilize natural resources; and in terms of rebuilding social cohesion, creating communities that value interaction between people. All of these contribute to the realization of a sustainable society.

1 Sustainable Use of Natural Resources as the “Commons”

Elinor Ostrom, who was awarded the Nobel Prize in Economic Sciences in 2009, has proposed a management approach to the commons that is centered on the communities closest to the scene of events, and which is based on observations made with regard to the view that “the tragedy of the commons,” a concept first published in 1968 by Garrett Hardin, does not necessarily occur.

In Hardin’s article, the following explanation was given regarding the process of overgrazing that occurs in shared pastures (commons) where there is no clear ownership: “Each herdsman, when rationally pursuing the maximization of his direct benefit, will try to increase the number of sheep in his herd. However, as more and more herdsmen do this, the shared pasture becomes devastated as a result of overgrazing, and the herdsmen suffer collectively.”

In other words, the tragedy of the commons in everyday life results when people, in accordance with their own values and standards of behavior, seek to maximize benefit for themselves. This is not limited to shared land such as pastures: the tragedy of the commons can be seen as a mechanism that operates in the general environment that no one owns, such as the air and water. Companies and individuals release environmental load substances during the course of their socio-economic activities, and the result is environmental pollution.

On the other hand, there are pasturelands, forests, fisheries, and other areas that offer shared natural resources all over the world; in many of these areas, not only is the tragedy of the commons not in evidence, but these natural resources are often considered to be collective property, which is managed in traditional, sustainable ways.

2 Self-Reliant Communities to Avoid Risk of Disasters

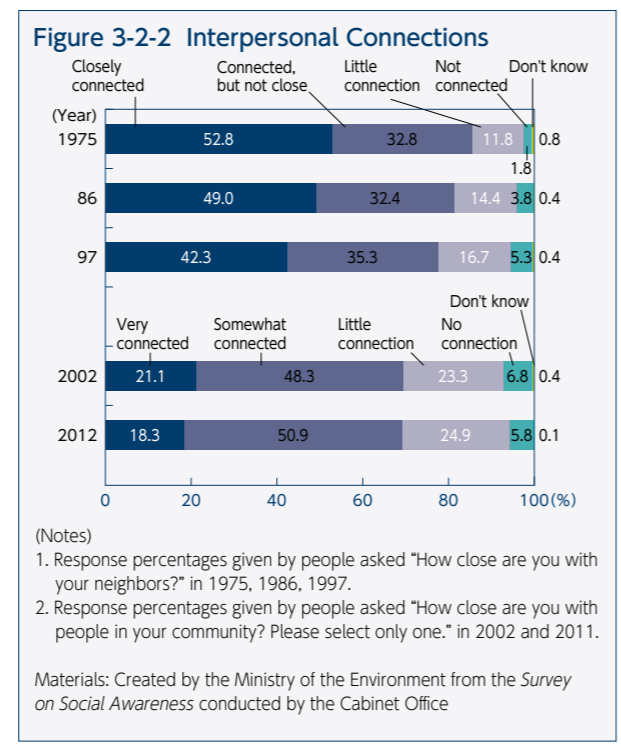
The Great East Japan Earthquake revealed the vulnerability of a socio-economic system where the production and distribution of energy and goods are over-centralized. Before the disaster, economic growth had focused on efficiency of scale, promoting over-concentrated mass production that emphasized divisions of labor and market expansion to drive the globalization of the global economy. At the same time, however, more weight is being given to people’s values as a component of “face-to-face” socio-economic activities, which foster greater local independence and make the relationship between people and goods more tangible.

This kind of thinking contributes to the realization of sustainable local communities as well as efforts that help diversification of risk. For example, the introduction of

Professor Ostrom analyzed a wealth of cases where the local residents were utilizing shared land and where the tragedy of the commons was not occurring. From this, she identified the following eight conditions for the successful autonomous management of shared land.

- (1) Clearly defined boundaries of the commons;
- (2) Rules regarding usage and management of the commons that are adapted to local conditions;
- (3) The ability of users to participate in group decisions;
- (4) Monitoring of adherence to rules;
- (5) Graded levels of penalties for rule violators;
- (6) Mechanisms for conflict resolution;
- (7) Recognition by higher-level authorities that authority over the commons lies with the parties primarily connected with the commons; and
- (8) A nested structure within the commons group.

These conditions do not mean that management of the commons will naturally work out so long as an autonomous organization exists. Management of local natural resources requires the following factors: recognition of the value of the resources unique to the community; overcoming internal and external conflicts over the resources; and a strong determination on the part of local residents to enjoy the bounty of nature over the long term. The sustainable use of local natural resources is impossible without a firm commitment by local residents to work towards the realization of a sustainable society.



distributed, self-reliant energy supply systems that utilize renewable energy will help to create local communities capable of coping in times of emergency.

The development of diversification and self-reliant infrastructure is inefficient from the standpoint of efficiency of scale and the direction of the global market, and it is expensive. However, such infrastructure offers flexibility in the face of unanticipated disasters by reducing risk. Furthermore, the inefficiencies and high costs of this sort of infrastructure can be improved to some degree through the application of Information Communication Technology (ICT) and advanced transportation systems.

Various regions are using these kinds of cutting-edge technologies and systems to construct diversification and self-reliant local communities.

3 Building Sustainable Local Communities Centered on Interpersonal Connections

(1) The Dilution of Interpersonal Connections

Sustainable management of natural resources can be described as people working directly with nature in a way that enables them to partake of its bounty in an ongoing fashion. In order for this to happen, it is important for the people in a community to understand the local environment and work together within it. People’s connections with one another and with nature are also important elements contributing to the vitality of a community.

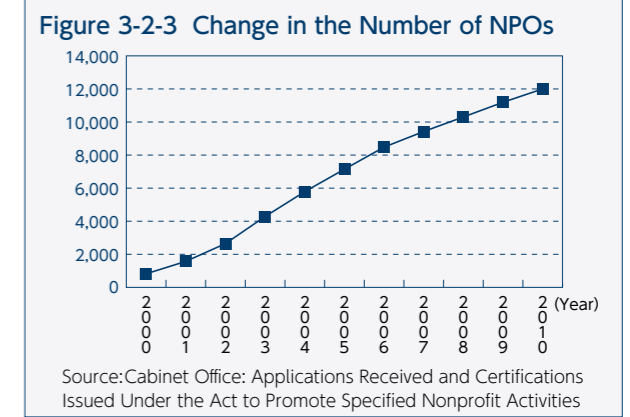
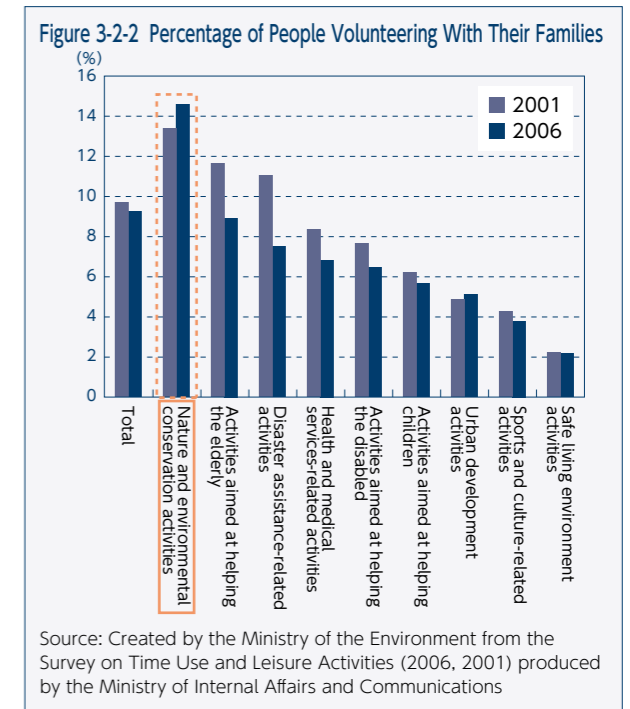
In modern local communities, however, interpersonal connections are becoming more and more diluted. The results of a survey on interpersonal connections within local communities conducted by the Cabinet Office shows that 60% of Japanese find it difficult to form relationships with others. The dilution of interpersonal connections within communities was the reason given for this difficulty by 54% of respondents, while more than 30% said the increasingly nuclear family and diluted relationships between parents and children were responsible.

This decrease in the cohesiveness and vitality of local communities will likely prove to be a major problem in the future management of local natural resources. Strengthening these interpersonal connections is essential to the sustainable utilization of natural resources.

(2) Volunteer Activities Related to Environmental Conservation and Environmental Education

Rehabilitating interpersonal connections to the point where they are a central aspect of local communities is an extremely difficult challenge. Two ideas for how this might be accomplished are volunteer activities related to environmental conservation and environmental education.

People tend to become more connected when they work together on environmental conservation efforts. People who volunteer to help protect nature and the environment frequently do so within a social or family group context. In



particular, nature and environmental protection volunteer activities attract more family volunteers than any other volunteer activity; thus, environmental conservation activities provide a venue for families to forge stronger bonds. In addition, the number of NPOs that focus on environmental conservation is on the rise (Figure 3-2-3). Through their shared concern for the environment and its deep connection to their lives, people are able to affirm the connections that exist within society.

Also, in order to advance these activities, it is important that those involved understand the value of the local natural resources, and hold them in common. In addition, children, who represent the next generation to inherit these natural resources, need to be educated about them. From this standpoint, it is important to implement environmental education (Education for Sustainable Development, ESD), which cultivates people who will build up sustainable societies.

ESD was first proposed by an NPO in Japan, and Japan then incorporated it into a proposal to the UN for the United Nations Decade of Education for Sustainable Development that was intended to start in 2005. This

proposal was subsequently adopted by the UN. Starting in 2006, Japan undertook initiatives based on an action plan for the United Nations Decade of Education for Sustainable Development (the ESD Action Plan). Thus far, the Ministry of the Environment has advanced ESD initiatives in fourteen model areas, as well as undertaken other initiatives, such as incorporating a focus on creating a sustainable society into the National Curriculum Standards. The ESD Action Plan was revised in June 2011 to extend it to 2014. When the affected areas are stabilized, discussions will be restarted on how to incorporate the lessons of the disaster and the thinking behind the post-disaster reconstruction into ESD promotion, in light of the experience of the Great East Japan Earthquake, and from a recognition of the need to be thoroughly prepared for natural disasters, to reassess energy distribution and usage, and to build new communities in the affected areas.

In addition to local residents, it is important to incorporate volunteers, families, and educational settings into community-wide initiatives aimed at promoting the sustainable use of local natural resources.

(3) Renewing Communities through Strengthening Interpersonal Connections (*Moyai-naoshi* in Minamata City)

Japan's amazing post-war economic growth came at a cost of great suffering for many people throughout the country due to tragic incidents of environmental pollution. One of the most infamous of these was the outbreak of Minamata disease, which occurred in Minamata City, Kumamoto Prefecture. This example of environmental pollution is known throughout the world. The company responsible, Chisso Corporation, had a plant in Minamata. It was on the leading edge of Japan's tremendous growth and was the leading driver of the local economy. At the same time, however, it caused tremendous damage to the local community in the form of Minamata disease. Following the official recognition of Minamata disease in 1956, Minamata City faced a variety of problems and challenges, such as how to help sufferers, how to address the stereotypes and discrimination they faced, and how to deal with the friction and strife that arose among residents. As a result,

the entire community suffered. Furthermore, the company responsible for the disease, Chisso, was one of the drivers of the local economy, meaning that the victimizer and the victim were both in the same community. It was hard for the community at large to confront the reality of Minamata disease head on; the government, patients, and residents were of different minds on the issue.

In this context, Kumamoto Prefecture and Minamata City jointly undertook the Minamata Environmental Advancement Initiative between 1990 and 1998 with the aim of renewing interpersonal connections in the community. At the start of this initiative there was a strong reluctance to address the issue of Minamata disease; however, as the years went by, the residents became increasingly focused on revitalizing the Minamata community, and the initiative became more and more resident-led. Various *moyai-naoshi* efforts aimed at restoring bonds within the community have been held to directly confront the issue of Minamata disease and foster true and mutual understanding, jointly involving patients, citizens, members of the government, and the Chisso Corporation. *Moyai-naoshi* is a Japanese word that literally means to re-secure a mooring line holding two ships together. In this case it represents the mutual efforts to restore the connections that once existed in the Minamata community by directly confronting the issue of Minamata disease through dialog and cooperation.

This effort is symbolized in the city's Fire Festival, which began in 1994. In this festival, participants light votive candles that represent prayers for those who fell victim to Minamata disease as well as prayers for the renewal of the community. The festival originated with the citizens of the community who wanted to do something for Minamata disease sufferers, and it is held each year through the cooperation of the government and residents. This festival also encourages everyone to think about the environment. The votive candles are made from used vegetable oil and are held in containers made from recycled glass bottles. Moreover, homes and offices turn off their lights during the festival to reduce CO₂ emissions (Photo 3-2-1).

In addition to this gradual reconnection of community bonds fostered by *moyai-naoshi*, the experiences and lessons of the unprecedented pollution that occurred in Minamata are incorporated into community-building efforts. In 1992,

Minamata City pledged itself to become an environmental model city, the first in the nation to do so, and since that time the whole community has come together for a variety of initiatives, such as thorough trash separation and recycling efforts. In 2001, Minamata City was recognized as an Eco Town for its efforts to attract recycling facilities as well as to promote resource recycling both within its own area and in other cities. In 2008, the city was recognized as a Model Environmental city by the Cabinet Secretariat, and currently it is actively working to become a low-carbon community. Minamata is also proactively involved in international environmental efforts. Under the auspices of JICA, the city has welcomed research students from Asian

countries every year since 2000; these students engage in research initiatives that utilize the experiences and lessons of Minamata disease to promote environmental renewal and conservation.

The efforts of the residents of Minamata City, such as the community-wide thorough trash separation and recycling drives and ISO campaigns, are carried out in concert with *moyai-naoshi* activities aimed at strengthening bonds in the community. These efforts have earned the city high praise both within Japan and overseas; they are seen throughout the world as a model, and as leading examples worthy of emulation.

Column Wisdom from NPOs toward Reconstruction

The Great East Japan Earthquake caused people to think about the fury of nature and at the same time how the Earth lets us live on it. Also, the shortage of electricity and the collapse of transportation systems in the immediate aftermath of the disaster reinforced people's sense of the scarcity and importance of energy and resources. This is a valuable opportunity to change the thinking of the Japanese people, sharing the experience of the recovery process implemented by the people living in affected areas, whose livelihood has been based on nature.

"The sea is alright," says Shigeatsu Hatakeyama, the director of NPO "Mori wa Umi no Koibito" (Forests are Lovers of the Sea) NPO and fisherman in Kesenuma, Miyagi Prefecture. He says that, for a month following the tsunami, all signs of life were missing from the ocean. Gradually, though, these signs have been returning. Schools of young Japanese anchovies have appeared offshore from Kesenuma; the oyster farms that had been destroyed are being rehabilitated.

He says that the mountain forests are important for the ocean's recovery from the damage it sustained in the earthquake disaster. Oyster cultivation depends on iron and nutrient salts from the land, and abundant cedar forests play an extremely important role in replacing the rafts that were lost, and which make oyster farming possible. These sorts of realizations appear to have struck home with a great many people, including students who have traveled from other regions and who are taking part in volunteer efforts. Hatakeyama's assurance that "The sea is alright," surely comes from insight that is the product of daily direct interaction with nature.

Next, there is the example of the Kiri-kiri region of Otsuchi Town, Iwate Prefecture, which suffered tremendous devastation as a result of the earthquake

and tsunami. The Kiri-kiri Koku (mini-independent country) NPO and other like-minded people in the Kiri-kiri district started the Rejuvenation Firewood Project in order to honor the memory of the dead by restoring a sense of energy and vitality to residents. This project collected wood rubble, such as the wooden timbers from destroyed homes, worked them into usable firewood and then sold them. Orders for firewood came in not only from surrounding prefectures, but also from prefectures throughout Japan and even from overseas. The firewood went on sale in May, and by September no wood rubble remained that could be sold as firewood.

The participants in the Rejuvenation Firewood Project live in the Kiri-kiri district, which is surrounded on three sides by mountains, and the sea, like an open window, serves as the fourth side. As a result of the disaster, the people of the region have a renewed sense of fear and awe in the face of nature as well as wisdom for living harmoniously with nature. Thus, the Rejuvenation Firewood Project was initiated out of a desire to make effective use of the forest resources that nurture the local environment and are ultimately connected to the ocean's recovery, and to ensure that these resources are maintained for future generations. This community-based initiative, which is geared towards creating jobs and facilitating economic recovery, has the goal of restoring the ocean to a state of abundance even greater than it had been before the tsunami. It goes into sections of forest that have hitherto gone untended, thins them in order to improve their health, and then makes use of the timber taken through forest thinning. The project is receiving widespread attention, as it demonstrates how efforts to promote independent communities can also be connected with promoting sustainable usage of local natural resources.

Local initiatives do not have to be contained

Photo 3-2-1 *Moyai-naoshi* Initiatives in Minamata City



Fire festival

Thorough trash separation

Acceptance of research students through JICA

Photos: Minamata City

solely to the local community: there are examples of initiatives that foster information sharing among communities. “Local Summit” centered on NPOs and local companies, which has been held four times in Nanto City, Toyama Prefecture, was convened in the aftermath of the earthquake disaster. At this summit, the migration measures implemented for the Kaga and Soma regions during the Great Tenmei Famine of the Edo Period were a topic of discussion, and community-focused proposals were put forward for addressing a wide range of challenges, such as the revitalization of community-centered agriculture and forestry and the independence of resources within communities. In the course of discussion, participants touch on the

importance of local cooperation, viewing families and traditional ways of life as knowledge resources, and using festivals and ceremonies as means of fostering interpersonal connections.

We need to cast off the unsustainable modern materialistic civilization that we had enjoyed before the earthquake disaster, and instead discover a more grounded and sustainable way of life. In seeking ways of utilizing natural resources that reflect the nature that varies region to region, respect for life, and a connection with the local culture, we are essentially seeking a way of life that is sustainable. In this search, NPOs have an extremely important role to play by undertaking community-focused initiatives.

NPO’s Role to Bring Together the Wisdom for Reconstruction



Oyster farming raft replacement using locally-sourced materials Chopping Rejuvenation Firewood View of the “Local Summit”
 Photos: Kyoto University (oyster farming raft), MOSEIBUN NPO (local summit)

Since 2008, the museum has been run by the Japan Good Toy Committee, a non-profit organization that was invited in by local residents. In its exhibition rooms, the Tokyo Toy Museum exhibits a number of toys built with plenty of natural materials, including cypress from the Kyushu mountains, white cedar from the Tsugaru region, umbrella pine from the Satsuma region, and bamboo from the Kuma region. The museum not only exhibit toys, but also allows visitors to touch and play with them, so that children can directly play with wood products at many locations in the facility (Photo 3-3-1).

Lacquer ware from Sabae City, Fukui Prefecture is known as Echizen lacquer. It is made with a technique that has been passed down for 1,500 years. Recently, handmade lacquer building blocks made using this traditional technique were designated as a traditional craft as defined by the Act on

the Promotion of Traditional Craft Industries. They were described as a “hundred-year toy” to be passed down through the generations. Sabae City attempts to build its community using lacquer, which is a natural resource with superior durability and safety features, in addition to other efforts.

Advancing the concept of “the beauty of practical usage” can be interpreted as a sign that folk arts (used and made by processing natural resources that are easily obtained) were at risk of gradually disappearing, even during the prewar period. On the other hand, efforts by local communities to support wooden toys can be understood as a sign of a movement whereby local residents voluntarily get back to the basics of the sustainable use of natural resources, while directly handling the gifts of nature in their daily lives.

Photo 3-3-1 Tokyo Toy Museum, Hundred-Year Toys “Lacquer-Coated Building Blocks”



Photos: Japan Good Toy Committee./Sanbongawa Inc.

Section 3 Sustainable Use of Natural Resources as “Commons” Community Property

Our lives are based on natural resources; so it is fundamental to consider sustainable use of natural resources. The section below describes how we manage

the natural resources and activities that are indispensable to human life (such as water, fishing, hunting, and forestry).

1 Forest Resources and Toys

In the early Showa period (the 1940s), the scholar Muneyoshi Yanagi, founder of the Folk Craft Movement, wrote *Teshigoto no Nippon* (literally, *Handiwork of Japan*). In this book he posed the question, “Does beauty ever deepen if it is separated from people’s lives?” Daily life, he said, is the center of everything we do, holding the roots of culture. The real worth of human beings should be demonstrated most clearly in their daily lives.

This idea, known as “the beauty of practical usage,” contrasts with art objects designed only for appreciation, and explains the idyllic and simple beauty of common tools routinely used in daily life. Today, the concept of “the beauty of practical usage” has a slightly different meaning than it did in Yanagi’s time, which reflects our modern socioeconomic conditions of mass production and mass consumption. In other words, asking whether there is “beauty of practical usage” in a lifestyle that readily disposes of things and

wastes resources is another way of asking about the ideal method of creating a sustainable society.

In Japan, forestry resources have been used for a variety of applications that extend from everyday items to traditional crafts, cultural assets, and buildings.

Wooden toys also include a variety of types, including building blocks and dolls (Photo 3-3-1). Toys may be something that achieves “the beauty of practical usage,” since they are directly handled by children, loved over many years, and even carefully stored once children no longer play with them.

There are a number of examples of community building using wooden toys that provide opportunities to learn about the end products of natural resources and to feel the texture of the materials.

The Tokyo Toy Museum, located in Shinjuku Ward, Tokyo, uses buildings that were once an elementary school.

2 Water Resources as a Common Property of Local Communities (Kabata in the Harie area of Takashima City, Shiga Prefecture)

Water is one of the resources indispensable to human socioeconomic activities. In our daily lives and business activities, the sustainable use of water is the most fundamental issue in natural resource management. This section provides some hints for ideal, sustainable use of local natural resources from the perspective of groundwater use in daily life.

A village in the Harie area of Takashima City, Shiga Prefecture, has been using groundwater for domestic applications since ancient times. Families using groundwater build a water intake opening to pool water for drinking. Through this opening, water discharged from the water source is taken into their houses for washing dishes, and the used water is drained into channels. This means that families living downstream use water that has already been used by those upstream. Therefore, close communication is needed between families living at both ends of the stream.

To secure communication, the village employs a device for using groundwater called a “kabata” (aquatic plant). Even now, the device is installed in the houses of about thirty families. The “kabata” basically consists of three elements: (1) the “motoike” (original pond) to store water to be used for drinking; (2) the “tsuboike” (vase pond) to store water to be used for washing vegetables or used

dishes; and (3) the “hataike” (end pond) to house fish such as carp that eat leftover food and the like. Water discharged from underground sequentially flows to the “motoike,” “tsuboike,” and “hataike” before being drained into a channel that leads outside the system.

Using groundwater like this allows the area to successfully establish unspoken rules for using groundwater without contaminating drainage, based on mutual confidence. The quality of the water drained from “kabata” remains stable, such that water crowfoot plants can grow in the village channels. The water crowfoot is classified as a vulnerable rare species in the Shiga Prefecture Red Data Book (Photo 3-3-2).

Thanks to this kind of traditional water resource management, the area maintains the cultural scenery of houses with old “kabata” devices standing side by side. Needless to say, these houses are owned by individual families and used for daily life. However, curious outsiders repeatedly visit them today. Sometimes, they trespass on private land without permission or peek at the “kabata” installed inside the houses. To cope with this, the area voluntarily established rules for visitors and provides a volunteer guide to take them to see the “kabata.”

As stated above, efforts to sustainably use natural

Photo 3-3-2 Photos from the Harie Area and Kabata



Channel flows through the Harie area In-house kabata and vegetables chilled in kabata Water crowfoot grows in pooled water
Photos: Taken by the MOE with permission of the owners. (Visitors to the area must contact the Harie Shozu no Sato Committee to see the structures.)

resources are indispensable to the lives of local people, and having people independently understand the value of natural resources and properly maintain them through

voluntary rules can be considered the most fundamental behavioral principle that enables sustainable use of local natural resources.

3 Fishery Resources in Traditional Lifestyles (“Hamauri” in Okinawa Prefecture)

Surrounded by water, the people of the Japanese archipelago have lived in coastal areas since ancient times. Since fishery resources particularly impact people’s livelihoods, exhaustion of these resources can give rise to local disputes. Unlike on land, fish and ships move around regardless of ocean boundaries. Decisions must therefore be made collectively by all stakeholders to sustainably use resources based on the concept of participation, whereby all stakeholders share the resources for controlling coastal areas such as fishing grounds.

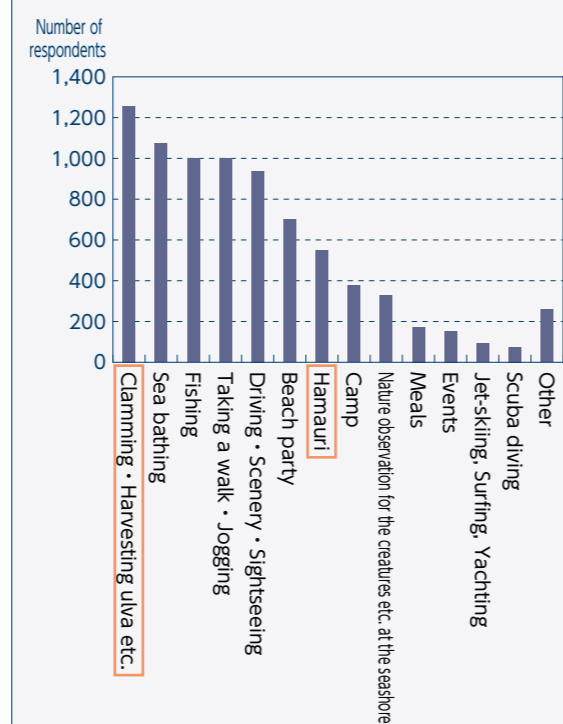
When the tide falls, they gather clams at the beach to enjoy the delicacies of the season. In accordance with Okinawan traditional customs, women purify themselves at the beach around March 3 (on the old lunar calendar) every year. They call this event “Hamauri” (literally, going down the beach). Around March 3, the gap between high tide and low tide is at its peak, so that many families gather at the beach to have a picnic or gather clams.

Coastal fishing grounds are home for the people who live beside them. Therefore, there is a close relationship between how local people make a living and how they control coastal areas. The section below gives examples from Okinawa of how people’s lifestyles are deeply rooted in the region and their ideal, sustainable use of coastal areas.

Okinawans have worshiped the seas and oceans as a fertility symbol that brings the harvest, while receiving

With oceans on all sides, Okinawa has developed various fishing methods from ancient times using the coral reefs along the seacoast. For example, many kinds of marine life, including those living in the coral reefs such as *gurukun* (a sea fish also known as *takasago*), filefish, grouper (sandfish), blue crabs, giant clam, cuttlefish, octopus, *Strombus luhuanus*, and seaweed are captured using drive-in nets, basket traps, gill nets, pound nets, and the like.

Figure 3-3-1 Purposes for Okinawans to Go to the Seashore



Source: Basic Plan for Maintaining Coast and Seashore in Ryukyu Islands, Created by the Ministry of the Environment from the results of the questionnaire (2003)

In Okinawan coastal areas, there are well-developed coral reefs. This creates calm water areas between the land and the deep sea called *inoh* (reef lagoons) (Figure 3-3-3). In the *inoh*, fish and shellfish use the gaps between sections of bedrock or sunken rocks for hunting food or laying eggs. The Okinawan people also use the *inoh* as a place to live and catch food. *Inoh* therefore loosely connect the land with the ocean, playing an extremely important role in both biodiversity and people’s lives.

The lifestyles described above are deeply rooted in people’s lives and are not limited to only fishermen (Figure 3-3-1). In early spring, Okinawans harvest edible seaweed such as sea lettuce (*Monostroma nitidum*) and *sunui* (*Cladosiphon okamuranus*), and *suku* (rabbitfish fry) in May.

the bounty of the oceans in their daily lives. As a result it is important for a sense of everyday life to be incorporated in ideal coastal area management in Okinawa, including controlling fishery resources and securing biodiversity.

For example, the “Hamauri” event is defined as “a rich cultural practice closely connected with nature” under the Overall Framework for Reviving Nature of the Sekisei Lagoon based on the Act on the Promotion of Nature Restoration. Furthermore, the Basic Plan for Maintaining

Coast and Seashore in the Ryukyu Islands based on the Coast Act mentions developing facilities for conserving the coast, taking religious events such as “Hamauri” into consideration.

From the perspective of managing local natural resources, creating reasonable linkages between a sense of community life and policy decisions is considered to be extremely important.

Photo 3-3-3 Coastal Areas and Marine Life in Okinawa



“Inoh” viewed from the air “Inoh” viewed from coast Outer edge of coral reef
Photos : Ministry of the Environment

Section 4 Achieving a Low-Carbon Society on the Characteristics of Local Communities

1 Low-Carbon Regional Development Initiatives Tailored to City Size

(1) Initiatives in Large Cities (Efficient Energy Usage Initiative in Kitakyushu City, Fukuoka Prefecture)

The lifestyles of people in large cities impose a significant burden on the environment through large-scale energy resource consumption. It is important that this energy usage be made more efficient across the board, so as to lower environmental load within cities. An important approach to achieving this is the formation of low-carbon city blocks. This in turn will require the development of efficient energy infrastructure.

aim is to achieve two-way communication of the energy supply and demand situation, thus enabling efficient energy usage for the entire region (Figure 3-4-2).

Because of the importance of developing a smart grid for the large-scale introduction of renewable energy across the board, the Kitakyushu City initiative for establishing such a system to supply renewable energy to the entire city is considered to be a model for intelligent area-specific energy utilization.

Kitakyushu City in Fukuoka Prefecture is known for how it obtains energy generated from the production activity of factories and applies this to the city’s power grid. First, hydrogen produced during the steel-making process at steel mills in the city is collected. Via a dedicated pipeline, a portion of this hydrogen is supplied to neighboring housing complexes, fuel cells for restaurants and public facilities, hydrogen filling stations for fuel cell cars, and so on. Furthermore, the roofs of factories, open public spaces, and other underutilized spaces are put to efficient use for large-scale solar power generation.

(2) Efforts in Mid-sized Cities (Toyota City of Aichi Prefecture)

Mid-sized cities often require costs for infrastructure and energy for transporting people and goods because of their low density population. This is different from large cities, so it is important for mid-sized cities to make an effort to design low carbon cities, which differs from the design of large cities looking above.

In order to ensure that these energy resources are being utilized efficiently, an advanced energy management system is being developed. A local energy-saving plant was put in place in 2011 to serve as an energy management system. Through the use of the local energy-saving plant, individual energy management systems, and smart meters incorporated into residential and commercial blocks, the

Toyota City of Aichi prefecture is known as the city of automotive industry. Toyota City has been making efforts to introduce an environmentally friendly transportation system with next generation vehicles such as EV (electric vehicle) and PHV (Plug-in Hybrid Vehicle).

EVs and PHVs utilize rechargeable batteries and they need enough chargers in entire area of the City for avoiding the uneasiness of a flat battery. In Toyota City, people can use EV and PHV with renewable energy under the successful plan for introducing charger stations with photovoltaic panels and storage batteries. The surplus

power which is generated in the stations is provided back into public facilities around them. This is a system which can use renewable energy efficiently.

Toyota City gives a high priority to the spread of PV and PHV. Subsidies for eco-friendly vehicles and free use of charger stations are examples of these efforts. Toyota City is going to launch a subsidy for introducing household chargers in 2012.

In addition, Toyota City is trying to introduce a smart grid: connection of electric systems between houses and PHVs, generating electricity by photovoltaic cells and charging a storage battery, and utilizing electricity in the storage battery as an emergency power source.

In a mid-sized city area, the charger facilities can be successful in a practice under a well-managed plan for introducing next generation vehicles and charger stations with renewable energy.

(3) Initiatives in Small Cities, Towns, and Villages (Shimokawa Town, Hokkaido)

In recent years, the depopulation of hilly and mountainous regions has led to depressed regional vitality. However, these regions are rich in natural resources, such as forest resources and water resources, which are hard to come by in urban areas. There are a number of examples of initiatives in small cities, towns, and villages seeking energy independence through actively and efficiently utilizing local renewable natural resources, such as biomass resources, small and medium-sized hydro power, and solar and wind power.

Shimokawa Town in Hokkaido is famous throughout Japan as a forestry area. The government, the forestry industry, its stakeholders, and the community residents are working

together to implement an action plan that seeks to promote sustainable forest management, zero carbon emissions timber processing, and effective utilization of the biomass resources obtained from this process (Figure 3-4-3).

Shimokawa is a cold, snowy region, which tends to rely on fossil fuels for heating. Given this fact, an active effort is being made to use biomass resources for heating, thereby reducing carbon dioxide emissions. For example, a system is being introduced which uses forest thinnings and leftover pieces of cut lumber as fuel for a wood furnace installed in the town office, and the heat produced by this furnace is then supplied to surrounding public facilities. In addition, the town is encouraging residents to install wood furnaces in their homes and is working on cultivating basket willows (which reach maturity in a short period of time) for use as an energy crop for these wood furnaces and the like. Also, logging offcuts from forest thinning and other forestry activities, as well as trees cleared from sites such as river

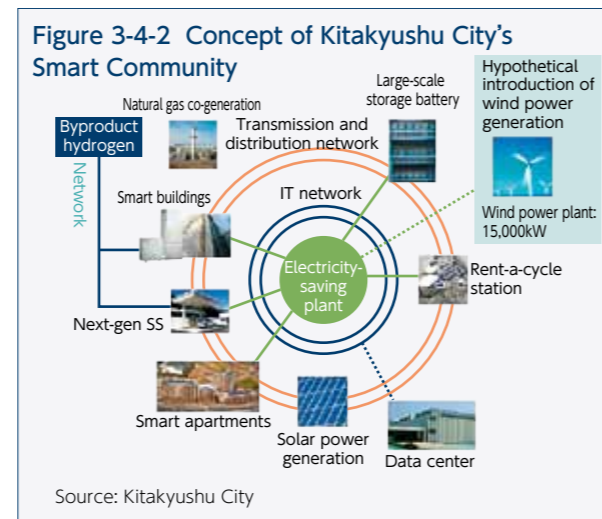


Figure 3-4-3 Biomass Utilization in Shimokawa Town

■Woody raw material production center



Source: Shimokawa Town

■Local heat supply center



and forest paths, are collected at a facility that uses them to manufacture and supply wood waste fuel for use in wood furnaces. Thus, this woody raw material production center makes effective use of underutilized woody biomass resources.

It is hoped that comprehensive utilization of biomass resources in areas that are rich in them, together with

the promotion of cooperation between residents, the government, and private business in forest development, will foster the creation of next-generation, low-carbon model societies that exist in harmony with the forests of northern Japan, contributing to local industry while reducing carbon dioxide emissions.

2 Establishing Self-Reliant Local Community

(1) Efficient Network System for Electricity Supply and Demand

Renewable energy such as photovoltaic and wind power depend on the natural conditions, so it is necessary to establish the integrated system on both the supply-side and demand-side including buck up generators and electricity storage systems in the case of mass introduction of renewable energy. The smart grid system is expected to overcome this issue since it can manage and control both sides, especially the demand-side which is difficult to manage, by utilizing Information Technology and electricity storage systems. Smart community expands the functions of the smart grid and it includes not only electricity systems but also heat and transportation systems. Such integrated systems are drawing attention recently to realize the security of energy supply and efficient use of electricity.

(2) Establishing Self-Reliant Local Community with Gas Co-generation

During the redevelopment of Roppongi Hills in Tokyo's Minato Ward, a co-generation system was installed that utilizes city gas (medium pressure). This system provides Roppongi Hills with tremendous energy efficiency and energy independence. As part of a concept to develop "a city to run to in times of disaster," seven state-of-the-art gas turbine-type co-generation systems have been installed. Electrical generating capacity is 38,660 kW; cold energy output is approximately 240 GJ per hour; and hot energy

output is approximately 180 GJ per hour. The combined energy efficiency for the electrical and heat supply is 75%, which is better than even a large thermal power plant, and this electricity and heat is supplied continually throughout Roppongi Hills' facilities.

During the Great East Japan Earthquake, when the Tokyo metropolitan area faced a severe power shortage due to damaged nuclear reactors, this system was completely unaffected thanks to the fact that it uses gas for fuel. Not only was the system able to support the energy needs of Roppongi Hills, but also, during the power crunches Tokyo experienced from March to April and July to September

Figure 3-4-1 Efforts for Introduction of EV and PHV in Toyota City

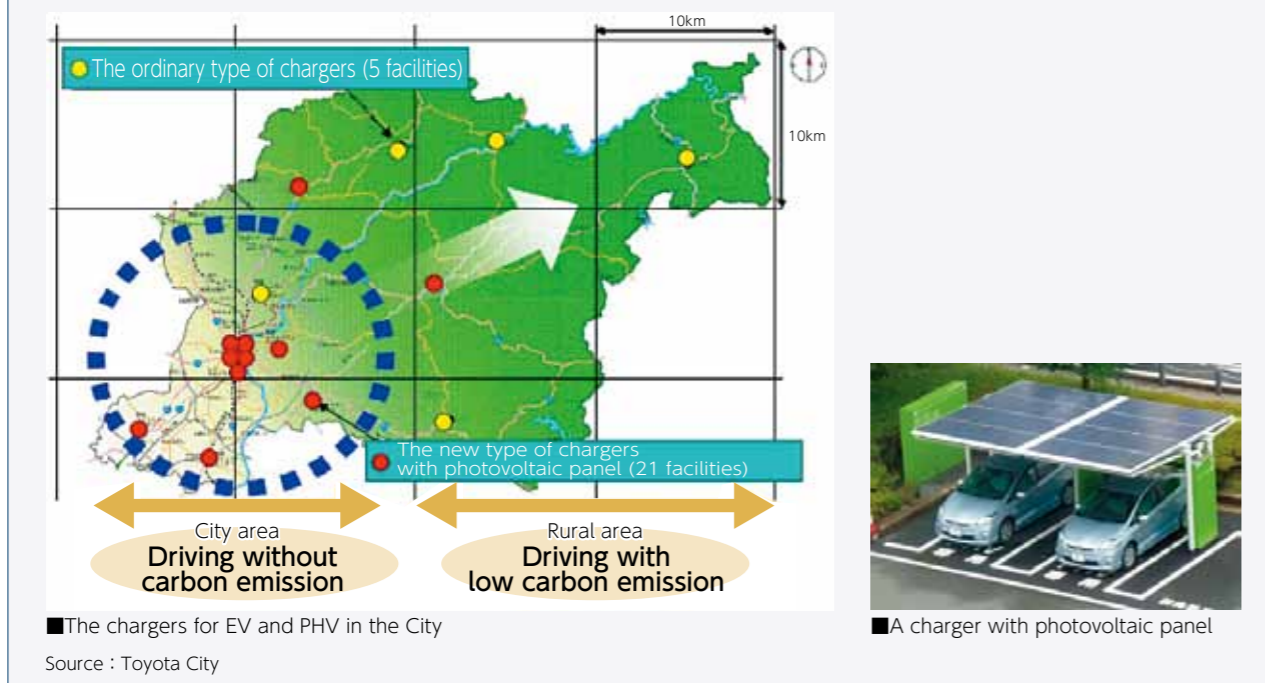
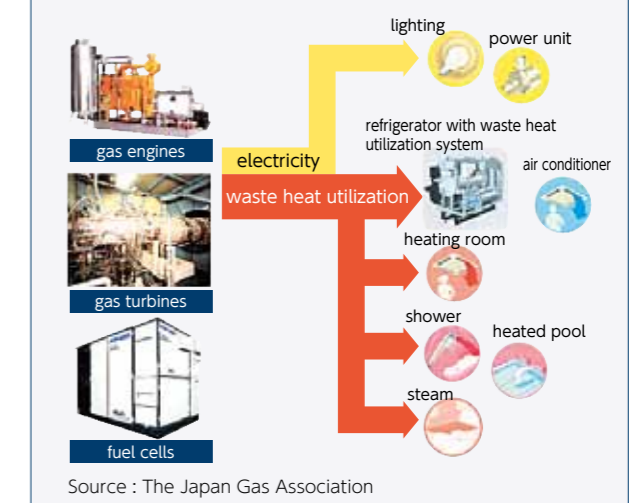
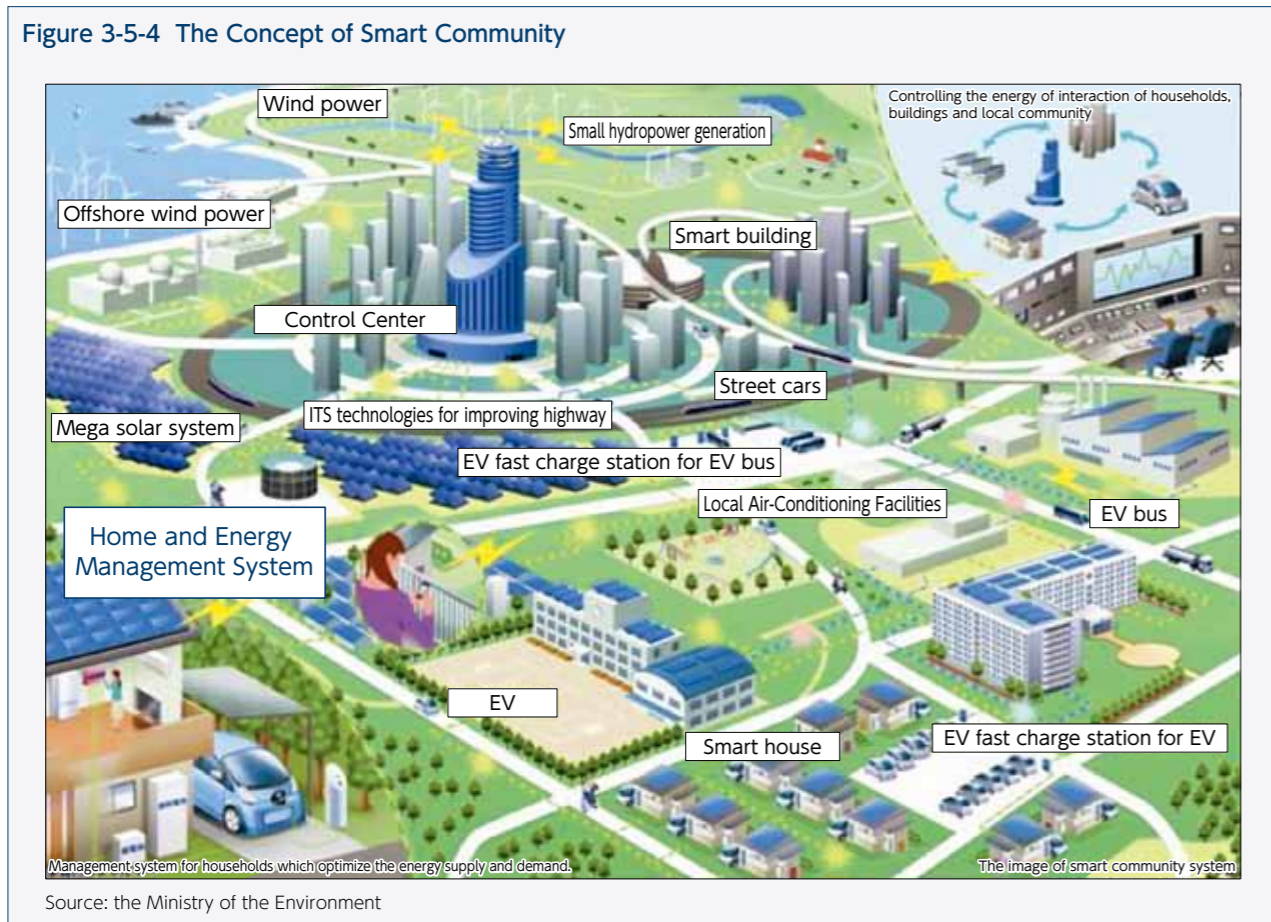


Figure 3-4-4 Gas Cogeneration Systems





2011, the excess electricity created as a result of proactive power saving measures combined with the system's normal excess electricity was supplied to the Tokyo Electric Power Company. This system clearly fulfilled its role as an autonomous, distributed urban power plant capable of standing up to disasters.

This effort to achieve energy self-sufficiency for Roppongi Hills by utilizing a co-generation system is attracting a great deal of attention, in terms of interest in initiatives aimed at developing low-carbon communities via autonomous, distributed energy for the purpose of utilizing local resources and developing disaster-prevention facilities.

3 Efforts for Low-Carbon Public Transportation (Fujisawa City, Kanagawa Prefecture)

Here is a challenge with public buses as an example of a progressive initiative being undertaken in communities throughout Japan as a means of reducing greenhouse gas emissions in the transportation sector.

In Fujisawa City, Kanagawa Prefecture, in recent years there has been an increase in commuters at Shonandai Station, which has resulted in more traffic congestion in the surrounding area. In order to alleviate this, the Ministry of Land, Infrastructure, Transport and Tourism, Kanagawa Prefecture, the Kanagawa Prefectural Police, Keio University, Fujisawa City, Kanachu (Kanagawa Chuo Transportation Co., Ltd.), and other groups got together in May 2003 to launch a committee to study the introduction of a new public transportation system. This committee explored a variety of systems and approaches geared towards resolving the congestion problem. The new public transportation system decided upon by the committee facilitates smoother traffic flow by adding articulated buses, which offer roughly twice the transport capacity of a normal bus, to the existing stock of feeder buses, as

well as by incorporating an Intelligent Transport System (ITS). Bus transportation has been made smoother thanks to the establishment of a Public Transportation Priority System (PTPS) by the police; transportation operators have introduced articulated buses; a bus locator system has been established, which lets users find out where buses are in real time through their mobile phones; and various other initiatives have been implemented to augment the public transportation system and make it more convenient. All of



this has resulted in less traffic congestion, which has meant fewer carbon dioxide emissions.

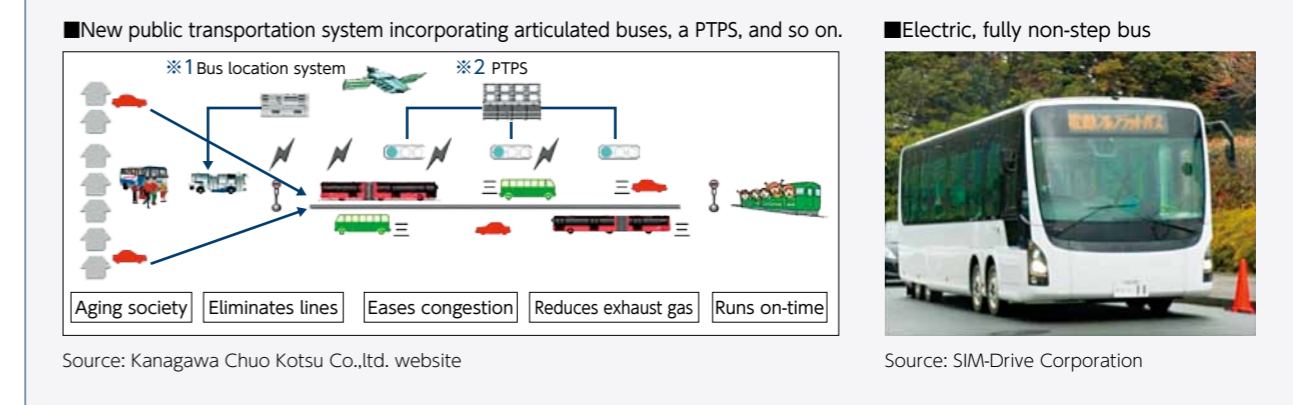
These initiatives represent seeds that came to fruition in the form of a demonstration project carried out in 2011 by the Ministry of the Environment as part of the Challenge 25 Regional Development Project. During this demonstration project, a low-noise, emission-free large-scale electric bus underwent demonstration testing. Development of this electric bus (an electric, fully non-step bus) began in July 2009 as a collaboration between Kanagawa Prefecture, Kanagawa Bus Association, Keio University, and others, and the first model intended for service was completed in March 2011. This 100% electric bus provides excellent environmental performance combined with a universally accessible design.

Because it is electric, there is no need to change gears, which means that it is easy to operate and offers smooth

acceleration. It also means that the bus is quiet with minimal vibrations, making the ride more pleasant. In addition, the bus consumes one-fourth as much energy as an equivalently sized diesel bus. Moreover, the adoption of wheel hub motors, in which the propulsive motors are located in the wheel hubs, does away with the need for an engine compartment; this allows the bus to be completely non-step from front to back (with only a slight difference in floor level), giving it superior accessibility (Figure 3-4-6).

As the above-mentioned initiatives show, it is extremely important for local governments, private business, and universities to work together, in order to introduce advanced transportation systems and vehicles equipped with state-of-the-art technology that will contribute to alleviating traffic congestion and also to building environmentally friendly communities.

Figure 3-4-6 New Public Transportation System and an Electric, Fully Non-Step Bus in Fujisawa City, Kanagawa Prefecture



Section 5 Towards Establishing Local Recycling Zones

It is important to look at regional challenges from the perspective of establishing a sound material-cycle society. This section will look at the thinking on local recycling

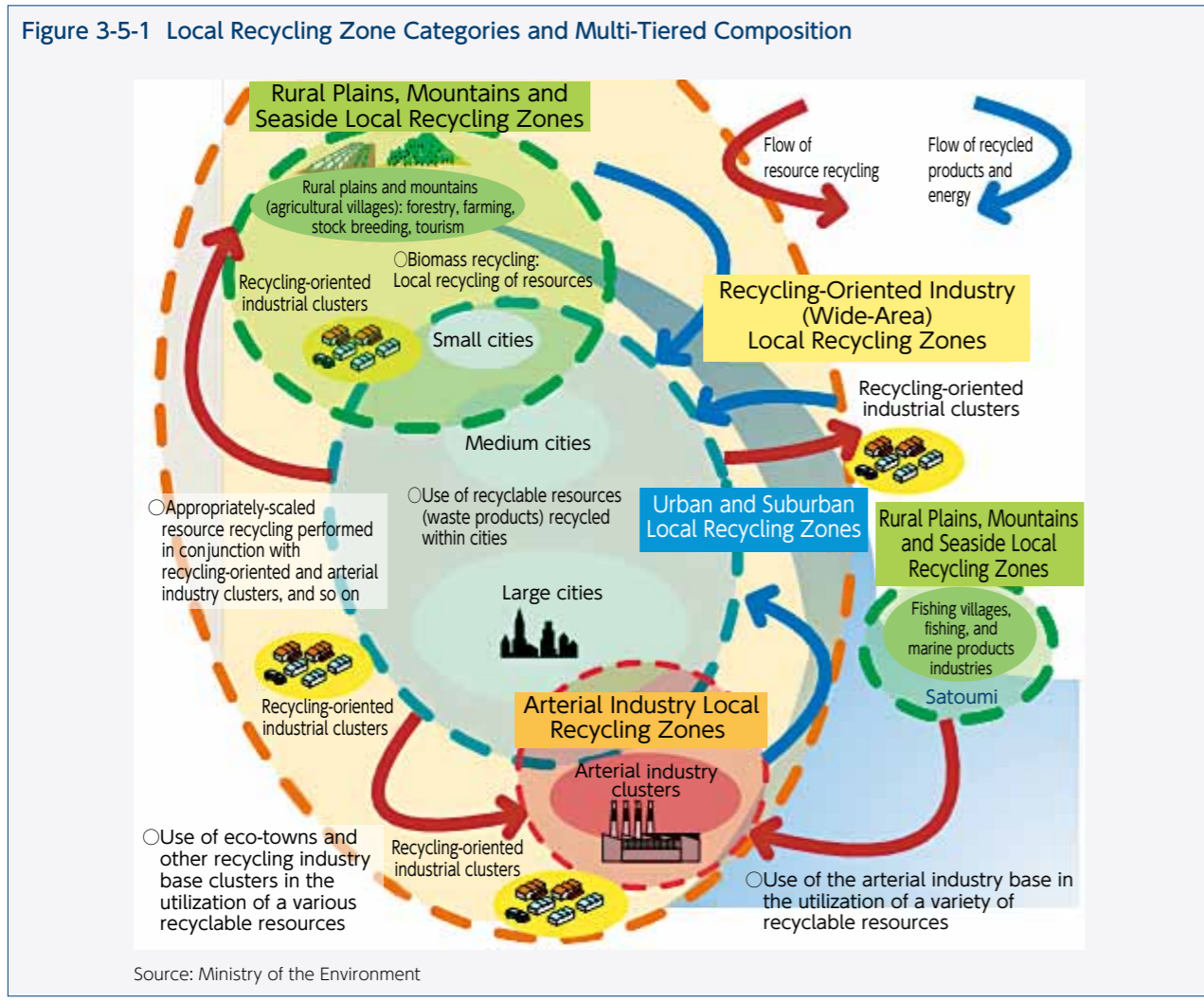
zones, which are part of the Fundamental Plan for Establishing a Sound Material-Cycle Society.

1 What are Local Recycling Zones?

Resource constraints are becoming more pronounced throughout the world, and the value of recyclable resources is increasing. Therefore, in addition to utilizing recyclable resources, it is becoming increasingly important to make efforts to reduce the amount of waste being generated at all stages of socio-economic activity: resource extraction, production, distribution, consumption, disposal, and so on. This will minimize the quantity of new resources being extracted and the burden being placed on the environment, thereby facilitating the creation of a sound material-cycle society. The key to realizing such a society on a large scale is to first create local recycling zones that take advantage of characteristics and vitality of a given community to foster the creation of a sound material-cycle society on a local scale. From this perspective, the Fundamental Plan

for Establishing a Sound Material-Cycle Society advances the concept of local recycling zones, based on the idea that locally recyclable resources should be recycled locally, while the material cycle should be extended over a larger area for those resources that cannot be recycled locally. Put another way, the plan aims to create local recycling zones, which are premised on the proper disposal of waste materials, and which promote recycling on an optical scale for the local characteristics of each type of recyclable resources, from the perspectives of scarcity, utility, fighting global warming, and protecting biodiversity.

Actually creating local recycling zones requires more than just the development of resource recycling systems. It requires a focus on creating a low-carbon society to combat global warming, as well as a focus on creating a society



that exists in harmony with nature so that the bounty of nature can be enjoyed by future generations. With these areas of focus in mind, it requires organic cooperation and collaboration among various stakeholders to produce

2 Categories of Local Recycling Zones

When creating local recycling zones, it is useful to think of them within conceptual categories. The optimal material-cycle range will differ according to the characteristics of the recyclable resource. For example: (1) a biomass-type recyclable resource that is produced only in a given area and which is prone to decomposition would be recycled appropriately within the area of its production; while (2) for a resource requiring the application of advanced treatment technology, recycling encompassing a wider region would be appropriate. Also, the category and range will differ depending upon the local characteristics of the target area as well as the location of existing recycling-related facilities, and so on.

(1) Rural Plains, Mountains, and Seaside Local Recycling Zones

In recycling zones centered on rural towns and villages,

a multi-tiered interweaving of new sound material-cycle businesses and environmental initiatives, combined with the development of recycling systems that revitalize communities from the standpoint of regional development.

biomass resources derived from rural agricultural, forest, and marine products industries would be locally produced and locally consumed. For example, in rural plains and mountain areas, low-carbon recycling systems would be constructed so as to incorporate composting and feed production using kitchen waste, and other such approaches. Energy systems such as micro-hydroelectric power generation or utilization of the energy derived from the agricultural or livestock industry would be put in place as a source of renewable energy.

In seaside areas, initiatives would be advanced such as the utilization of marine-derived waste products (fish ileum, shells, and so on), a network to reuse fishing vessels, and the utilization of biodiesel fuel (BDF) in fishing vessels. Furthermore, environmental education, eco-tourism, and other tourism industry-related initiatives could be put in place to utilize the abundance of the natural environment in these rural areas, thereby revitalizing them.

(2) Urban and Suburban Local Recycling Zones

Urban areas with significant population density produce a diverse range of recyclable resources. These resources can be efficiently recycled by collaborating with venous industry clusters (eco-towns, and so on) and arterial industry clusters (coastal industrial zones, industrial parks, and so on), and by including suburban agricultural areas.

A specific example of how such urban-rural collaboration could work would be the creation of a symbiotic relationship between an urban area and a rural suburban area, where the urban area provides its food waste to be utilized as feed and fertilizer by the rural suburban area, and the rural suburban area, in turn, provides the urban area with the agricultural products that are produced as a result.

(3) Arterial Industry Local Recycling Zones

The bases and infrastructure of core arterial industries (cement, steel, non-ferrous smelting, paper-making, and

3 Promoting Local Recyclable Resource Utilization Towards Tohoku Regional Reconstruction

A great deal of waste was left in the wake of the earthquake disaster, and it is essential for this material to be reused, to the greatest extent possible, as building materials and the like in recovery and reconstruction efforts. Also, it is important for the Tohoku region's status as a base for companies possessing superior detoxification and recycling technologies to be utilized to turn the region into a leading

so on) would be utilized to a greater degree than they have been previously; at the same time, through collaboration with urban areas that produce a large volume of recyclable resources, recycling system creation and energy utilization systems would become more sophisticated.

(4) Recycling-Oriented Industry (Wide-Area) Local Recycling Zones

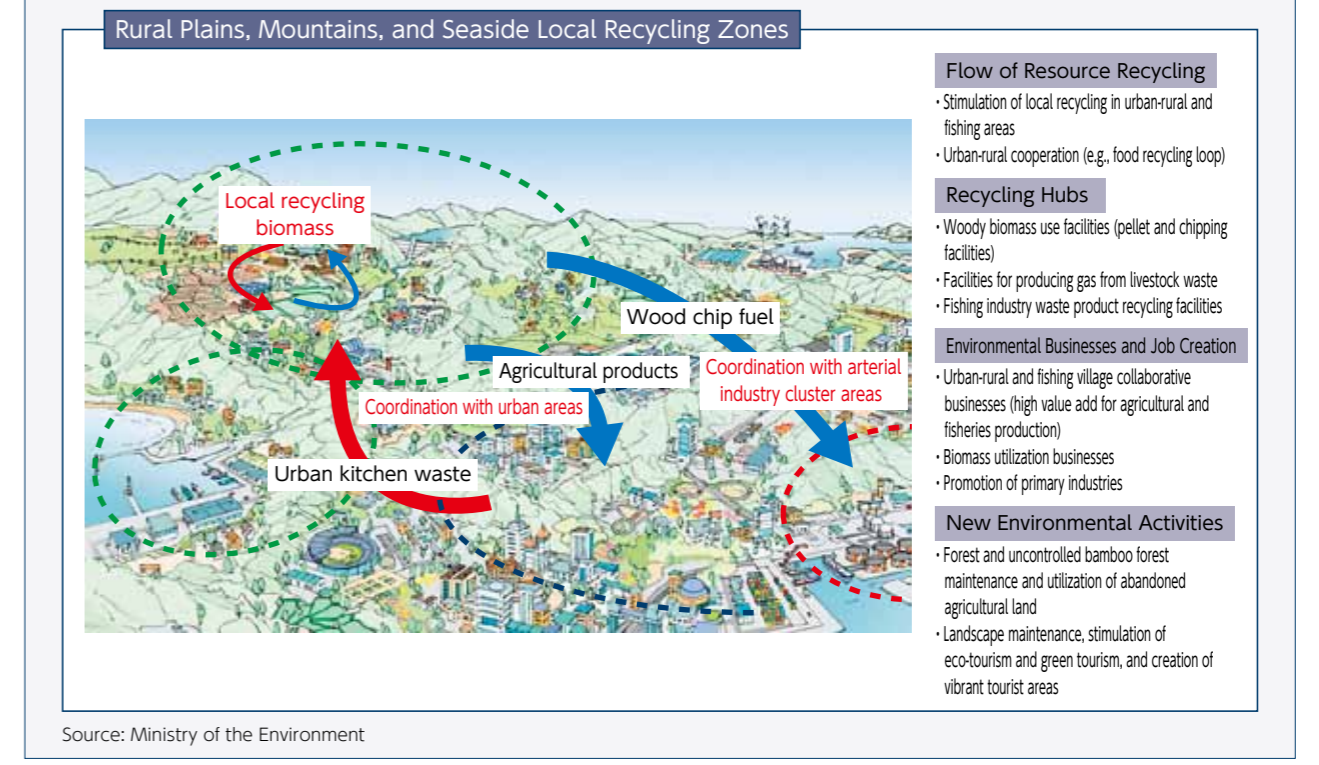
The conversion technologies, wide-area reverse physical distribution systems, and so on, possessed by eco-towns, which have a concentration of recycling-oriented industries, are made even more sophisticated. In addition, through collaboration with arterial industry local recycling zones, superior systems would be created for the recycling of recyclable resources for which highly efficient conversion treatment systems have not existed so far.

Recycling industry functions, such as sorting centers, would be utilized, and economic activity would be stimulated through the creation of local recycling zones.

hub for recycling businesses, thereby stimulating the economy, creating jobs, and contributing to the creation of a leading-edge sound material-cycle society.

Towards this end, in FY 2012 the Ministry of the Environment is: (1) providing support for the creation of resource recycling plans by local councils, including local governments; (2) undertaking demonstration projects

Figure 3-5-2 Conceptualization of Rural Plains, Mountains, and Seaside Local Recycling Zones



relating to the recycling of plastic products not covered by the Containers and Packaging Recycling Act and the recycling of food waste; and (3) undertaking demonstration

projects relating to the collection, cleaning, and local reuse of used bottles.

Figure 3-5-2 Concept of Urban and Suburban Local Recycling Zones

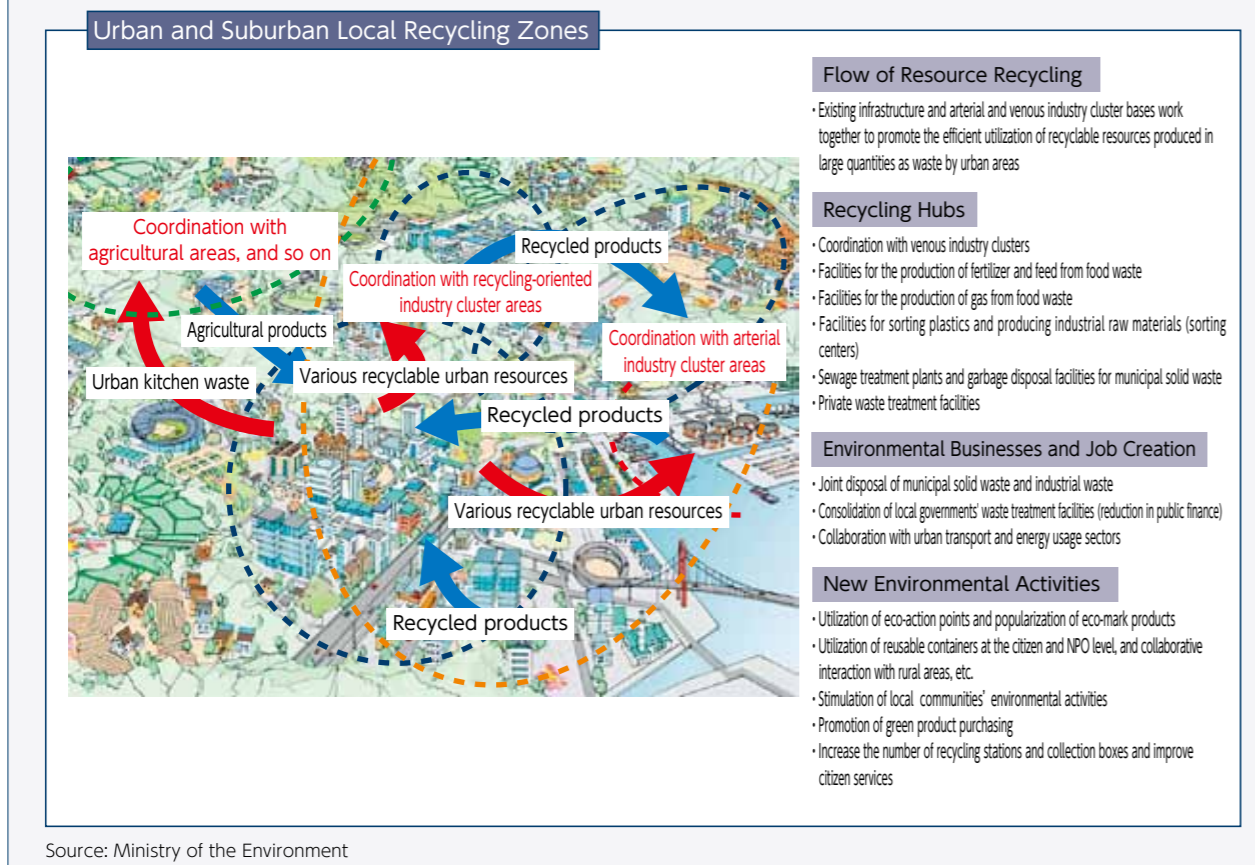


Figure 3-5-3 Concept of Arterial Industry Local Recycling Zones

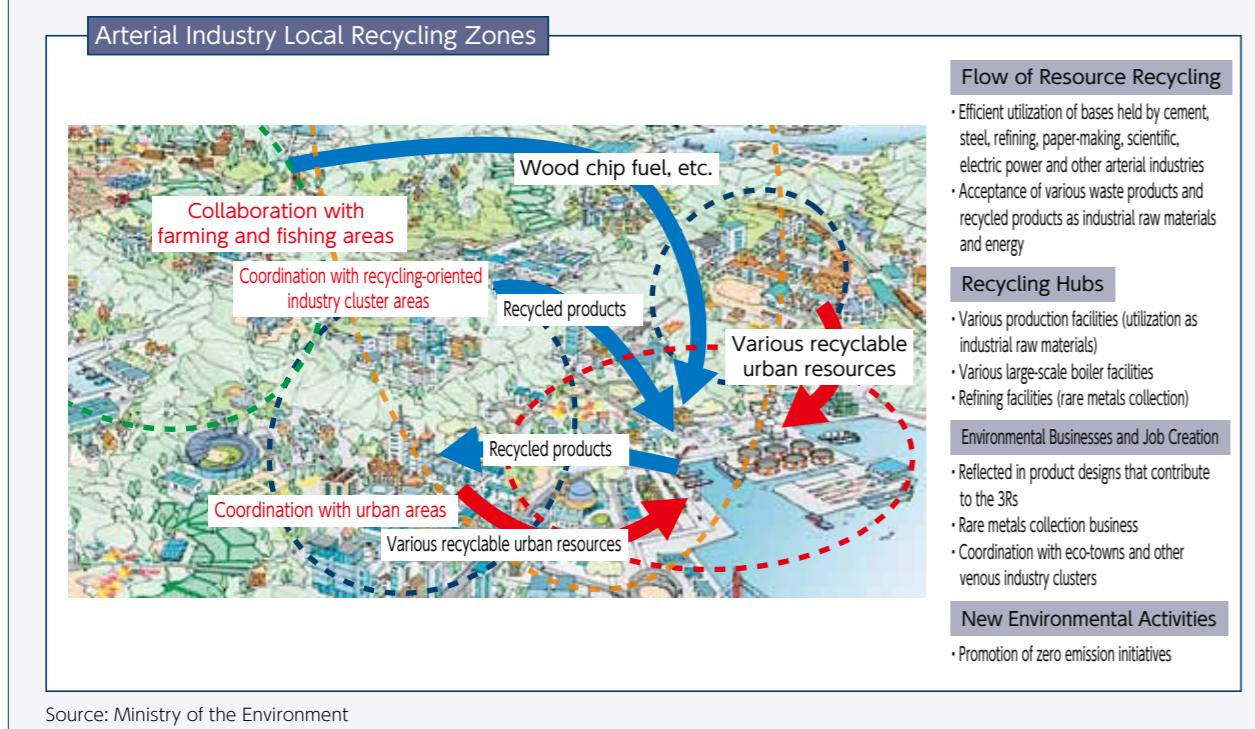
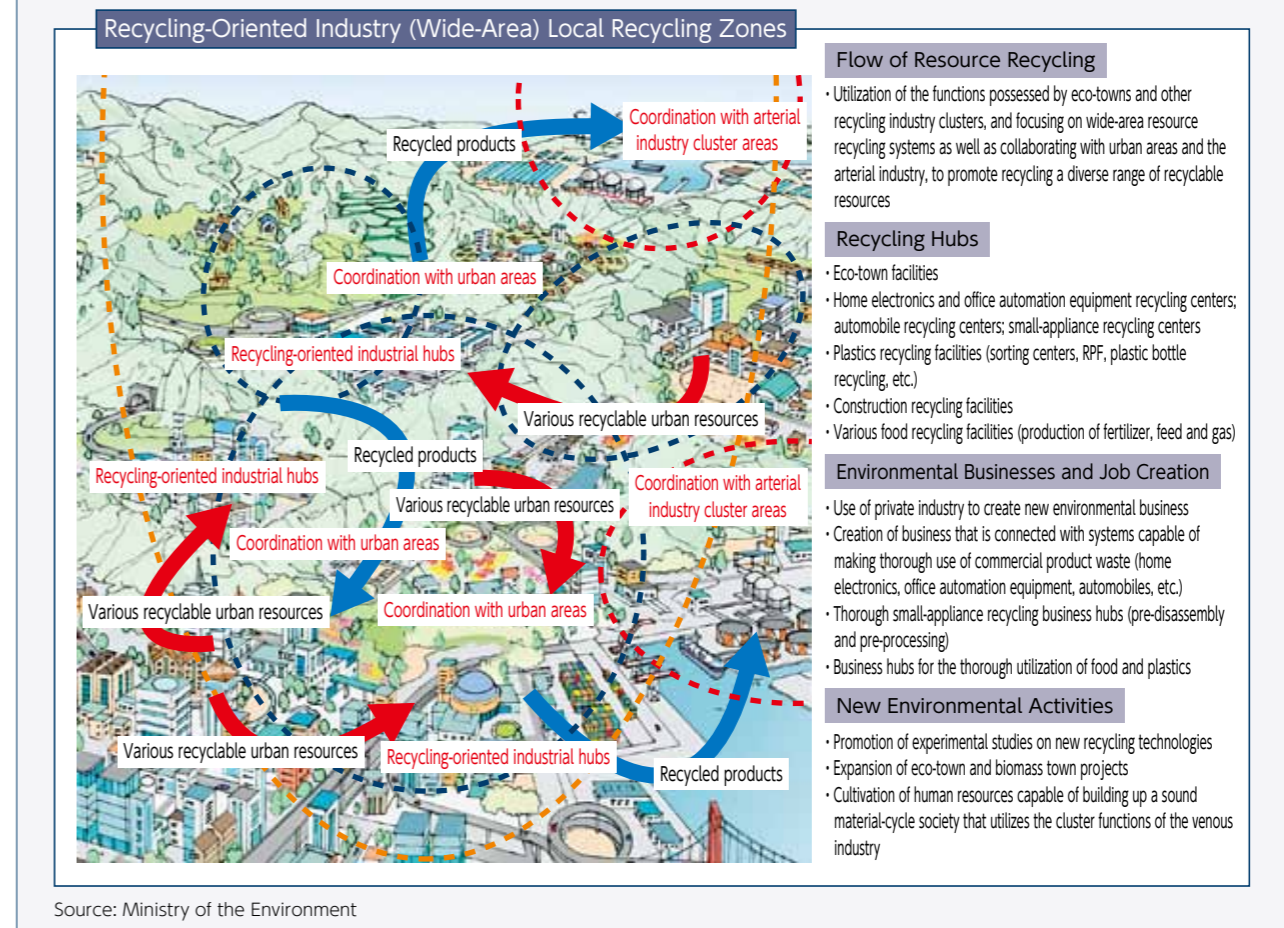


Figure 3-5-4 Concept of Recycling-Oriented Industry (Wide-Area) Local Recycling Zones



4 Guidelines for Promoting Local Recycling Zone

Local recycling zone creation promotes the cyclical use of local resources, cultivates human resources capable of carrying out the task of building a sound material-cycle society, and revitalizes local communities. For these reasons, it is hoped that local recycling zone creation initiatives will catch on nationwide. The Ministry of the Environment is developing guidelines for promoting the creation of local recycling zones. The aim of these guidelines is to promote

local recycling by providing specific project models and laying out the flow for creating the concept and vision.

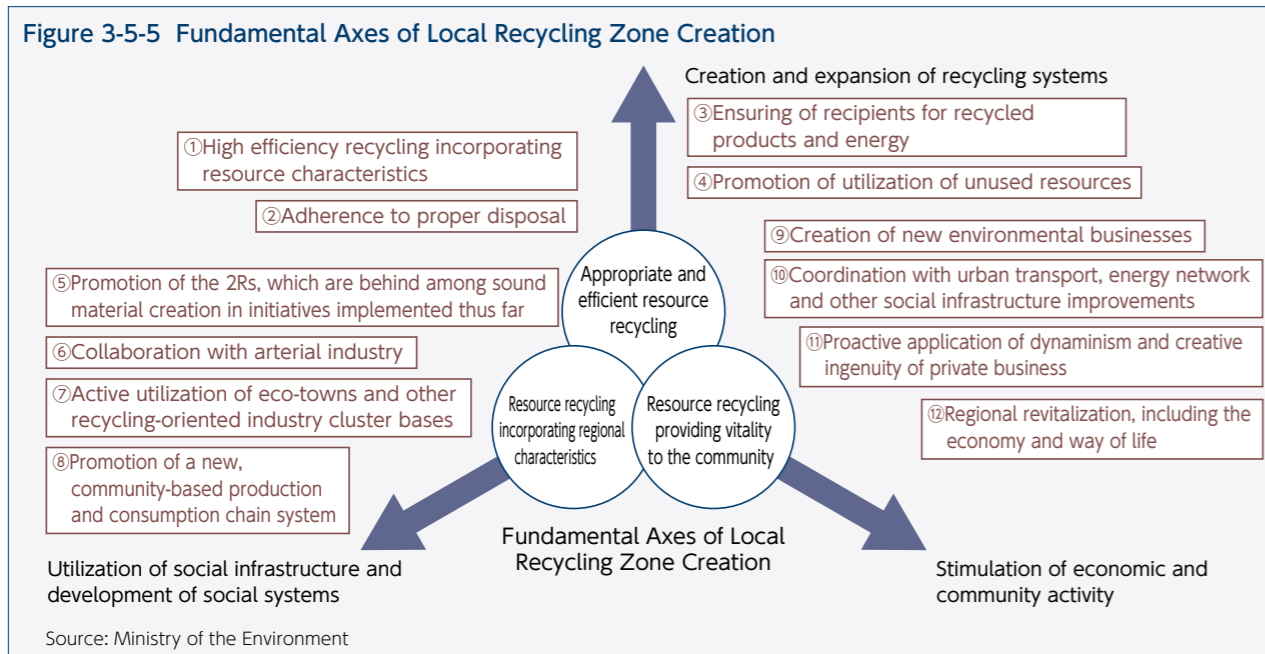
These guidelines establish three central axes for local recycling zone creation: (1) appropriate and efficient resource recycling; (2) resource recycling incorporating regional characteristics; and (3) resource recycling providing vitality to the community. From these, twelve key concepts are developed (see Figure 3-5-5).

Section 6 Community Cohesion That Protects Biodiversity

The Great East Japan Earthquake, which struck last year, has caused people to reconsider the importance of interpersonal cohesion. Because of this change in awareness, people are realizing once more that interpersonal cohesion and connections within communities are also important to the conservation of biodiversity and the sustainable use of nature. This way of thinking is not a wild idea: it is surely the natural conclusion reached when thinking about what biodiversity actually is.

Biodiversity represents the diverse, interrelated existence of different ecosystems, species, and individual creatures. We humans also represent part of this biodiversity; we

are a part of the ecosystem, and cannot exist without its bounty. The people with the greatest power to protect local biodiversity are the people who live in the local areas where it is found. It is the people who live and work in a given region who reap most of the natural bounty of that region (and also its disasters), making it extremely important that initiatives be carried out locally. This section examines initiatives in the Ogasawara Islands and a variety of other regions, in order to explore the role of the local community and the wisdom that has been passed down within these communities.



1 Registration of the Ogasawara Islands as a World Natural Heritage Site

These days, people’s image of the Ogasawara Islands is one of a subtropical wildlife paradise that tourists from around the world clamor to visit (Photo 3-6-1). The islands dot the ocean roughly 1,000 kilometers south of the main islands of Japan, and have only limited means of accessibility. Nevertheless, the annual number of visitors who take the once-a-week, 25-hour liner trip from Honshu to Haha-jima grew to 20,000 in 2011.

The Ogasawara Islands were once referred to as “uninhabited.” These islands were truly uninhabited until people began to move there after the Edo Period, and they were only discovered roughly 400 to 500 years ago.

In the mere 200 years since the islands were permanently settled, agriculture tailored to the subtropical climate and a fishing industry centered on bonito, tuna, coral reef fish, and so on, have flourished.

Following the Pacific War, the Ogasawara Islands were returned to Japan, and Ogasawara Village was established. The rehabilitation efforts begun at this time were centered

on agriculture, fishing, and tourism. In 1972, Ogasawara National Park was established over an area that includes an archipelago of volcanic islands, scenic weathered sea cliffs, and subtropical islands. In 2007, almost the whole area of the nationally owned forest that covers the majority of the islands was designated as a forest ecosystem protection area. These measures were undertaken as part of an initiative to promote industry at the same time as preserving the natural environment. In 2006, the Ogasawara Islands World Natural Heritage Site Liaison Committee was established, composed of related organizations in the region and a management organization, and it has been conducting its work with the advice of science committees consisting of members with academic backgrounds.

This initiative, which brings local residents and other stakeholders together for the cause of environmental conservation, has been lauded worldwide, and culminated in the islands’ registration in June 2011 as a World Natural Heritage Site: a distinction bestowed upon the world’s

Photo 3-6-1 The Ogasawara Islands, Registered as a World Natural Heritage Site.



Photos: Ministry of the Environment

uniquely valuable natural areas.

A ceremony to celebrate this registration was held in Ogasawara Village in October 2011, with the children of the village gathering to sing “Ao-umigame no Tabi” (Journey of the Green Sea Turtle). This song originates in Ogasawara Village and tells the tale of a young turtle who swims out to sea, and repeatedly beckons him to come back once he has grown large. This song is sung at various functions held in the village. The voices of the children symbolize the deep connection between nature and the islands’ residents, their appreciation of nature, and the pride they feel in their home, which is surrounded by the abundance of nature. It reminds residents that the islands’ registration as a World Natural Heritage Site is a starting point, and that they must ensure that the abundance of nature is passed down to these children.

From their formation until the present day, the Ogasawara Islands have never been connected with another body of land. Uniquely evolved land snails and vascular plants are found in abundance here, making these islands globally valuable microcosms of biological evolution. The Ogasawara Islands are also globally important habitats for various endangered species, such as the Bonin Fruit Bat and the Black-Footed Albatross; thus they are essential to the conservation of biodiversity in the Northwestern Pacific region (Photo 3-6-2).

Environmental protection and conservation must be practiced at a given site for it to be recommended for inclusion as a World Natural Heritage Site. In the case of

the Ogasawara Islands, various collaborative initiatives between the local community, government organizations, and researchers are in place.

The islanders’ way of life and industrial practices must harmonize with the conservation and management of the heritage site, and this would not be possible without their understanding and cooperation. An Ogasawara Islands World Natural Heritage Site Liaison Committee has been established, and its members examine how to share information and work with stakeholders to conserve and manage the natural environment.

One project carried out in the islands that involves the cooperation of a great many stakeholders is the feral cat policy.

Minamizaki is a site on the southern tip of Haha-jima. It is the only seabird breeding ground on any of the inhabited Ogasawara Islands, and it is greatly loved by the residents of Haha-jima. At one time there were ten to twenty Brown Booby nests and around ten Wedge-Tailed Shearwater nests seen every year at the breeding ground; however, these numbers began to decline and large numbers of seabird carcasses began to be found. The local NPOs that study bird species in the Ogasawara Islands discovered that feral cats were hunting and eating the seabirds. Realizing the seriousness of this situation, the national and local government began working together with local NPOs and the residents of Haha-jima to capture these feral cats. The captured feral cats are shipped off the island and examined by the Tokyo Veterinary Association. Those that are sick

Photo 3-6-2 Diversity of Mandarinia Species



Photos: Satoshi Chiba

1. *Mandarina mandarina* (Chichijima Is.)
2. *M. chichijimana Chiba* (Chichijima Is.)
3. *M. anijimana Chiba* (Anijima Is.)
4. *M. sp. A* (Ototojima Is.)
5. *M. tomiyamai Chiba & Davison* (Chichijima Is.)
6. *M. hirasei Pilsbry* (Chichijima Is.)
7. *Mandarina .SP* (Anijima Is.)
8. *M. sp. D* (Anijima Is.)
9. *M. suenoae Minato* (Chichijima Is. & Hatsunejima Is.)
10. *M. polita Chiba* (Hahajima Is.)
11. *M. polita Chiba* (Okimura in Hahajima Is.)
12. *M. polita Chiba* (Higashiyama in Hahajima Is.)
13. *M. polita Chiba* (Kita minato in Hahajima Is.)
14. *M. sp. C* (Hahajima Is.)
15. *M. aureola Chiba* (Nakanohira in Hahajima Is.)
16. *M. aureola Chiba* (Minamizaki in Hahajima Is.)
17. *M. aureola Chiba* (Sekimon in Hahajima Is.)
18. *M. aureola Chiba* (Sekimon in Hahajima Is.)
19. *M. aureola Chiba* (Sekimon in Hahajima Is.)
20. *Mandarina .SP* (Kita misaki in Hahajima Is.)
21. *M. ponderosa Pilsbry* (Sekimon in Hahajima Is.)
22. *M. ponderosa Pilsbry* (Mt. Sakaigatake in Hahajima Is.)
23. *M. ponderosa Pilsbry* (Hyogidaira in Hahajima Is.)
24. *M. ponderosa Pilsbry* (Mukojima Is.)
25. *M. sp. B* (Minamizaki in Hahajima Is.)
26. *M. conus Pilsbry* (Imotojima Is.)
27. *M. conus Pilsbry* (Imotojima Is.)
28. *M. hirasei Pilsbry* (Nishidai in Hahajima Is.)
29. *M. kaguya Chiba & Davison* (Minamizaki in Hahajima Is.)
30. *M. kaguya Chiba & Davison* (Mt. Chibusayama in Hahajima Is.)
31. *M. kaguya Chiba & Davison* (Mt. Chibusayama Hahajima Is.)
32. *M. kaguya Chiba & Davison* (Higashizaki in Hahajima Is.)
33. *M. hayatoi Chiba & Davison* (Mukojima Is.)
34. *M. hayatoi Chiba & Davison* (Imotojima Is.)
35. *Mandarina hahajimana* (Sekimon in Hahajima Is.)
36. *Mandarina hahajimana* (Mt. Sakaigatake in Hahajima Is.)
37. *Mandarina hahajimana* (Sekimon in Hahajima Is.)
38. *M. exoptata Pilsbry* (Mt. Sakaigatake in Hahajima Is.)
39. *M. exoptata Pilsbry?* (Nagahama in Hahajima Is.)
40. *M. trifasciata Pilsbry* (B type) (Nakodjima Is.)
41. *M. trifasciata Pilsbry* (D type) (Nakodjima Is.)
42. *M. luhuana* (Minamizaki in Chichijima Is.)
43. *M. carinata Chiba* (Chichijima Is. Fossil)
44. *M. carinata Chiba?* (Chichijima Is. Fossil)
45. *M. pallasiana Pfeiffer* (Chichijima Is. Fossil)
46. *M. hayamii Chiba* (Chichijima Is. Fossil)
47. *M. hayamii Chiba* (Chichijima Is. Fossil)
48. *M. hayamii Chiba* (Chichijima Is. Fossil)
49. *M. io Chiba* (Chichijima Is. Fossil)
50. *M. chichijimana Chiba* (Chichijima Is. Fossil)
51. *M. titan Chiba* (Minamijima Is. Fossil)
52. *M. sp. H* (Chichijima Is. Fossil)
53. *M. polita Chiba* (Hahajima Is. Fossil)
54. *M. sp. I* (Hahajima Is.)

Photo 3-6-3 Rare Endemic Species in the Ogasawara Islands



Boninosuccinea Ogasawarae

Photos : Ministry of the Environment



Pteropus Pselaphon

are treated, and the cats are taught to live with humans, eventually being placed with new owners.

Various stakeholders assisted in the development and introduction of this project to capture feral cats. On Haha-jima, a fence was constructed to keep feral cats out, and any feral cats found within the area enclosed by this fence were captured. As a result, in 2007 the Wedge-Tailed Shearwater population was confirmed to be growing again at Minamizaki.

In addition to Minamizaki, the Tohei area on Chichi-jima is a habitat for the Ogasawara Wood Pigeon, which is a species unique to the Ogasawara Islands and which has a population of less than forty. A protective fence was built in order to protect these birds from feral cats, and government representatives and local volunteers went about capturing any feral cats found within the fenced area.

These initiatives started with the discovery by local NPOs of feral cats preying on seabirds; from there, they shared this information with local residents and other stakeholders who then banded together to take action. The result has been the continued protection of the Ogasawara Islands' wild birds and a better life for the feral cats.

Another example of an initiative that incorporates the local community is the green anole initiative.

The green anole is not native to the Ogasawara Islands: it is a foreign species, which is now found throughout Haha-jima and Chichi-jima (Figure 3-4-7). The green anole eats insects, including the *Celastrina ogasawaraensis* species of butterfly and other rare species unique to the Ogasawara Islands, and this has had a significant impact on the ecosystem. *Celastrina ogasawaraensis* butterflies were once common across Chichi-jima and Haha-jima, but because of the green anole's predation, they are now only found in one part of Haha-jima. The seriousness of this situation motivated residents of Haha-jima concerned about the *Celastrina ogasawaraensis* butterfly to form a non-governmental group in 2005, which began working to protect this butterfly species from the effects of the green anole.

Photo 3-6-4 A Green Anole Captured by Anole Trap



Photo : Ministry of the Environment

In 2006, the national government put in place a protective fence to keep the green anole out of the Shin-yuhigaoka area of Haha-jima, where various rare insect species are found. Within the fenced-off area, local volunteers set about exterminating the green anoles as well as helping to cultivate vegetation that the *Celastrina ogasawaraensis* butterfly eats. The result has been a confirmed increase in this species' population.

In addition, since March 2010, under an agreement concluded with the specified non-profit corporation the Ogasawara Islands Forest Ecosystem Protection Project, activities to conserve indigenous plants and animals such as the Japanese wood pigeon and restore the native forest ecosystem have been ongoing. These activities include exterminating non-native plants and planting native plants, and examining native plants and animals.

Furthermore, to protect the precious forest ecosystem of the Ogasawara Islands, the extermination of non-native plants has been carried out targeting the invasive evergreen tree species *Bischofia javanica* and *Casuarina*.

Environmental protection and conservation in the Ogasawara Islands is thus a collaborative effort between the local community, the government, and researchers. This cooperative framework, which incorporates a diverse range of stakeholders, is the noteworthy product of many hours of dialog and effort. This, too, is a valuable asset, which is

on a par with the Ogasawara Islands' natural diversity as something that can be a source of pride for the people of the Ogasawara Islands.

During the review to determine if the Ogasawara Islands should be registered as a World Natural Heritage Site, the high level of participation by local residents in conservation and management, the multi-organizational collaborative nature of conservation and management, and the expansion of sea sections under recommendation review all earned praise from the global community.

At the same time, the registration came with the request

2 Ancestral Wisdom on life in harmony With Nature

Various factors have given Japan a tremendously rich biodiversity, such as its great length from north to south, its steep climb in elevation from the coast to the mountains, and its four distinct seasons. Moreover, in each region of Japan, our ancestors have handed down techniques and knowledge that show us how to sustainably use and benefit from this biodiversity. In addition, our ancestors show us how to live in harmony with nature and parry the awesome power of nature such as earthquakes, tsunamis, typhoons, and other natural disasters in Japan. By receiving this wisdom and knowledge, a connection with the ancestors is maintained, and profound hints are gleaned for how to realize a society in harmony with nature.

(1) The Wisdom of Traditional Swidden Agriculture

Japan has a moderate climate with a large amount of precipitation, which makes it extremely well suited to growing vegetation. By suppressing the over-proliferation of this vegetation and controlling natural transitions, benefits from nature can be enjoyed in a sustainable fashion. For example, in the central mountainous region of Kyushu and the western mountainous region of Shikoku, controlled burning is performed to maintain the fields. This farming technique has been used since the Jomon period (about 14,000 to 300 BC), and it represents wisdom about how to live in harmony with nature. According to a farming census conducted around 1950, controlled burning was performed for roughly 10,000 hectares of fields throughout Japan; however, in the post-war era, increased timber production rapidly transformed many of these fields to forests.

Swidden agriculture is an agricultural technique that entails clearing forest, burning the cleared land, and then cultivating crops on top of it (Photo 3-6-5). In the local dialect of Shiiba Village in Miyazaki Prefecture, a field that has undergone controlled burning is known as a "yabo," the clearing of forest in order to perform burning is known as "yabokiri," and the burning of the cleared area is known as "yaboyaki." "Yaboyaki" requires a large number of people: each household provides one or more experienced people, with at least ten people being needed to perform this task as a group. The most experienced member of the group directs the others, paying close attention to the day's wind

that current efforts to deal with the foreign species that threaten the native species be continued, and that tourism be carried out in a way which is not harmful to the environment.

For the future, greater cooperation among stakeholders is needed to: (1) address these issues; (2) deepen people's understanding of the islands' natural richness and beauty so that they will endeavor to pass it on to the next generation in even better condition than they found it; and (3) feel pride in the beautiful bounty of nature surrounding them and ensure that they live in harmony with it.

and weather. Afterwards, seed is scattered over the untilled field, and various grains, such as buckwheat and millet, are grown in rotation for three to four years. The field is then left fallow for around a decade, during which time it returns to a forested state.

Swidden agriculture has an immediate fertilizing effect on the soil, and because the sprouts and seeds of weeds on the soil's surface are burned up, weed growth is suppressed. Also, letting the field return to a young forested state encourages the growth of a bright forest of deciduous broad-leaved trees, where mountain vegetables, mushrooms, and other bountiful products of the mountainside can grow. At first glance, controlled burning of fields can appear to be environmentally destructive; however, it is a sustainable, cyclical agricultural technique that revitalizes the forest when used in a decades-long cycle. People who practice traditional field burning see how nature is repeatedly renewed each decade, and this connection with nature surely gives them an intuitive understanding of how it underpins their daily way of life.

In the same way, each region has developed its own unique knowledge and culture over time, grounded in their local environments and handed down through the generations. Rather than mass production and consumption, in order to achieve a sustainable way of life that fosters biodiversity and cultural diversity, we need to receive as well as pass on this unique knowledge and culture, which includes so much that we can learn. An example of this in action is the program Foxfire in Japan, sponsored by the Foxfire in Japan Executive Committee (which comprises representatives from the Ministry of Agriculture, Forestry and Fisheries, the Ministry of Education, Culture, Sports, Science and Technology, the National Land Afforestation Promotion Organization, the National Association of Fisheries Infrastructure, the National Federation of Inland Water Fisheries Cooperatives, and the Network for Coexistence with Nature). High school students visit with afforestation experts, charcoal makers, wood artisans, fishermen, female divers, and other experts whose trade is intimately tied to nature, in order to talk with them one-on-one, record what they are told, and then compile this as a written record. The reason for having these high school students—who represent the next generation—listen to and write down



what they are told is to provide them with an insight into the knowledge, techniques, and way of life and thinking which these experts possess, and from this to learn about the importance of maintaining a connection with nature and other people. It is important for all of us in the modern world to learn from those who carry on traditions that teach us about how to live in harmony with nature and with others.

(2) The Lessons of Past Natural Disasters

In addition to showing us how to sustainably enjoy the bounty of nature, the ancestral knowledge passed down in each region can also show us how to protect ourselves against its dangers. When we look at the positioning of shrines and temples bordering those areas that were flooded as a result of the tsunami created by the Great East Japan Earthquake, we see that a great many of them are positioned slightly higher than the boundary. The Sanriku region was one of the regions affected by this most recent disaster, but it has also been the victim of major tsunamis

several times in the past, such as the Jogan Sanriku Tsunami of 869 and the Keicho Sanriku Tsunami of 1611. It is believed that the reason why many of the shrines and temples escaped flooding during the most recent tsunami is that the ancestors who built them had learned from past experience which areas were most susceptible to flooding and chose sites outside of these areas.

In his work *Tensai to Kokubo* (Natural Disasters and National Defense), geophysicist Torahiko Terada (1878-1935) stated that old villages are located where they are as a result of natural selection, and with the explosion of urban development taking place in the modern era, we should take heed of this fact. He also pointed out that the damage sustained from natural disasters increases in intensity as civilization advances due to the fact that we overestimate civilization's might while underestimating nature's power. This is an observation that those of us in contemporary society should take to heart.

The Yoshino River has a watershed that spreads across all four prefectures in Shikoku, and it is known for its violent seasonal fluctuations in water level. Annual precipitation for the upstream reservoir reaches 3,000 millimeters, and when it rains, the plains of Shikoku can become flooded in an instant; in times of drought, however, the water can utterly disappear, to the point where the riverbed is visible. The plains of Tokushima are not suitable for rice cultivation, as they are prone to frequent flooding. However, they are suited to growing indigo plants, which thrive in the moist, fertile soil that flooding brings. This fact was not lost on the lords of the old Tokushima domain, and they encouraged indigo production as the signature agricultural product of the region. By 1790, in the middle of the Edo period, indigo cultivation spanned roughly 6,450 hectares. Not only was this the largest area of indigo production in Japan, it was

also the highest quality. During this period, the various regions of Japan were proactive about building levees as a means of flood control; however, in the Tokushima domain, the people were anything but proactive about building levees, as they valued the rich soil that flooding deposited, which was indispensable to the production of the indigo that underpinned the domain's finances.

As this example shows, there are cases in which communities do not want to avoid some of the dangers of nature, and want to utilize these dangers as a benefit of nature. It is important to remember that advances in science and technology are not just for repressing the power of nature: with the knowledge passed down from our ancestors, we can even learn to exist in harmony with the dangers of nature.

(3) Population Decline and Land Use

The above examples detailed how we can learn from our ancestors about how to sustainably use the benefits of nature and confront its dangers; however, the people who could become the future generations to receive this knowledge are disappearing from local communities. It is estimated that by 2050, twenty percent of the regions currently inhabited in Japan will become totally depopulated (Figure 3-6-2). Estimates of population decline are particularly high for hilly and mountainous areas. When the people who manage the natural environment of these regions are gone, it will become even harder to maintain the secondary nature of rural plains and mountains. This could actually mean

that passing down knowledge like controlled field burning, which is tailored to a specific region and which shows how to sustainably utilize it, will come to an end.

Furthermore, land usage in Japan today has seen residential areas extend out further and further into regions which are vulnerable to natural disasters, and ensuring the safety of these areas through the construction of levees, landslide barriers, and other kinds of social infrastructure requires a significant cost to be paid. The future population estimates released in January 2012 predicted that Japan's population would decrease significantly nationwide, declining to 86,740,000 by 2060. In light of this, it is important to keep in mind that one option is to ensure that there is no increase in the population size of communities that incur a significant cost to secure the safety of their residents, such as communities prone to frequent natural disasters. Another point is to ensure that Japan's environment is utilized in an efficient way that does not greatly increase the per-capita cost of maintaining the country. In 2007, a report entitled *Policies for the Creation of a Safe and Secure Society in Light of the Global Increase in Natural Disasters* was compiled and released by the Science Council of Japan. It made the point that, "It will not be easy to avoid a significant population decrease over the next hundred years, and it is therefore essential that regional disaster prevention take depopulation scenarios into account." Also, long-term scenarios incorporating comprehensive decisions, such as how to promote natural succession and actively promote reclamation by natural forests, are needed for areas that will no longer be maintained and managed due to depopulation.

