Chapter 1

Environment in the Declining Population Era

<Summary of Chapter 1>

A new declining population era has begun in Japan. This decline will speed up societal changes. These societal changes include changes in demographic structure such as decreasing birthrates and an aging population, as well as uneven regional population distribution resulting from rapid depopulation in rural areas and diffusion of urban areas.

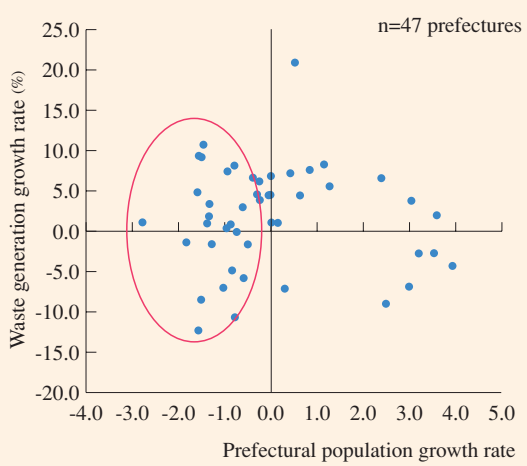
Chapter 1 examines what kind of impacts these factors will have on the environment.

Section 1. Demographic Trends and the Environment

1. Environmental Changes Resulting from Population Decline

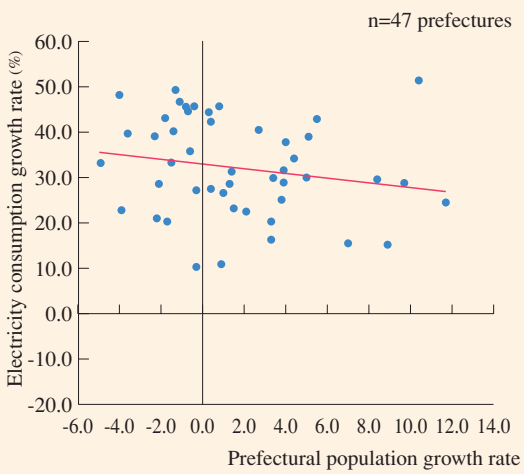
Since population decline will decrease the consumption of resources and energy, environmental burdens should be reduced to some extent in the long run. However, comparisons between population growth rate and total waste generation or electricity consumption in 47 prefectures in Japan have revealed that population decline bears no relationship to changes in waste generation or electricity consumption. This is probably because changes in social structures, values, lifestyles, or increased economic activities offset the smaller environmental burdens resulting from population decrease.

Comparison between Prefectural Population Growth Rate and Waste Generation Growth Rate (FY1998→FY2003)



Source: Data from the Ministry of the Environment, *Survey on the state of discharge and treatment of municipal solid waste*.

Comparison between Prefectural Population Growth Rate and Electricity Consumption Growth Rate (FY1990→FY2003)



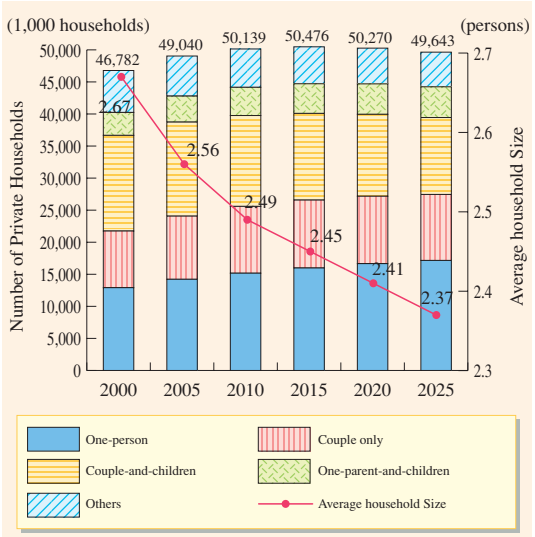
Sources: Compiled by the Ministry of the Environment based on the Statistics Bureau, the Ministry of Internal Affairs and Communications, *Population Census*, and *Population Estimates* as well as the Federation of Electric Power Companies of Japan.

In this way, demographic structural changes or rapid socioeconomic changes due to population decline would have impacts on the environment. The belief that "A population decline would decrease the environmental burden and have positive impacts on the environment" is not necessarily correct.

2. Household Changes and the Environment

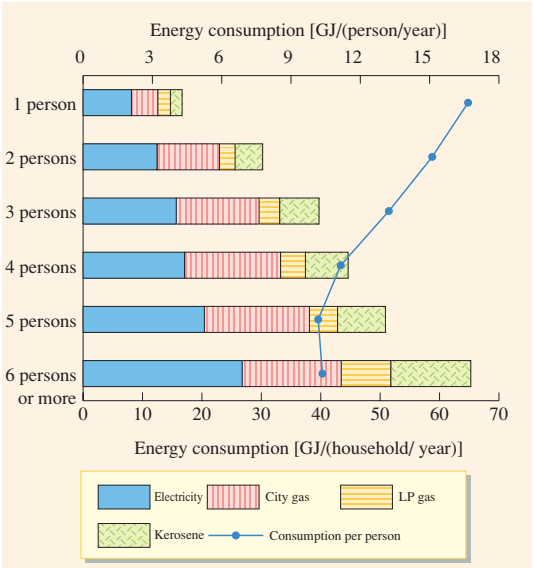
While Japan will experience a further decline in the birthrate and an increasingly aging population, single-person households will increase. Fewer family members in each household will push up the total number of households for a while even after Japan's total population starts decreasing. Because in many cases family members share hot water heating and electric appliances, energy consumption per person is likely to increase as the number of family members in each household decreases.

Number of Private Households by Family Type, and Average Household Size



Source: Compiled by the Ministry of the Environment based on the National Institute of Population and Social Security Research, *Household Projections for Japan*.

Energy Consumption per Household Member

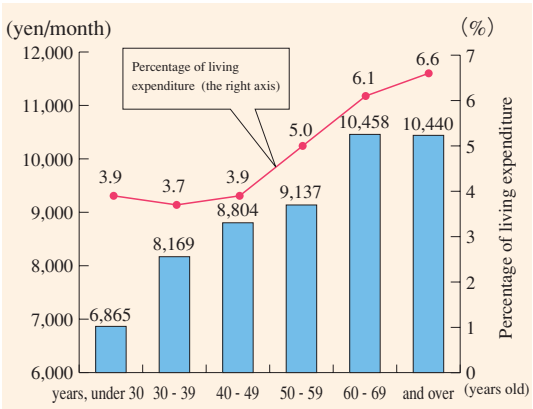


Source: Compiled by the Ministry of the Environment based on the Architectural Institute of Japan.

If other conditions remain unchanged, household energy consumption in Japan is projected to keep increasing until 2010, up 4.0% from the 2000 level, because the decrease in family members in each household will have a greater impact than the population decrease.

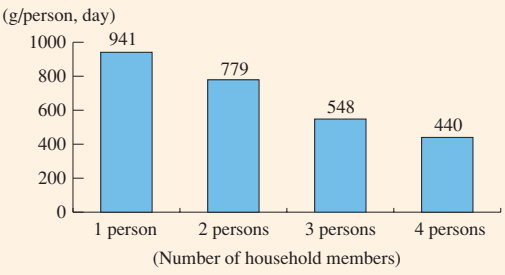
In single-person households that provide comparable data, water, lighting, and heating expenses increase as the head of the household gets older. In this context, an aging population will result in an increase in household energy consumption.

Household Fuel, Light and Water Charges, and the Percentage of Living Expenditure (One-person Households on a Monthly Basis)



Source: Compiled by the Ministry of the Environment based on the Ministry of Internal Affairs and Communications, *Family Income and Expenditure Survey, 2004*.

Amount of Household waste per Person Generated per Day by Household Size (2003, Kawasaki City)



Note: Household waste means ordinary trash, recyclable waste (sorted waste), or waste collected by citizens' groups.
Source: The Ministry of the Environment prepared this chart, drawing upon data from the Kawasaki City

With regard to household waste, the amount generated per person tend to increase as the number of family members decreases. This is because each household produces a sizable amount of garbage regardless of the number of family members. As the number of family members in each household will decrease further in the future, the amount of household waste per person will probably increase.

Column: The Amount of Food Waste Depends on the Cook's Environmental Awareness

There is a relationship between the age of the family member who buys/cooks food and takes care of meals at home, and food loss (leftover or dumped portions of edible food) per person per day in household food consumption (except for delicatessens and food cooked outside the household, such as lunch boxes). Food loss increases with the age of the family member responsible for family meals.

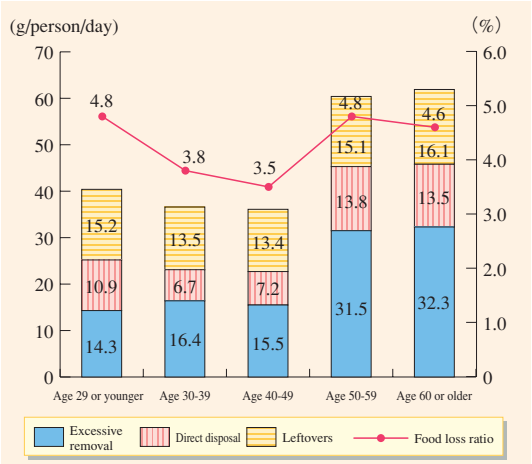
More specifically, leftovers (leftover or dumped portions of cooked meals) show no significant difference for all age groups, regardless of ages of family member responsible for food services, or the amount of food consumed.

Direct disposal (foods uncooked and discarded because the expiry date has passed or for other reason) increases for the age groups 29 or younger, and 50 or older. This is because people in the former group are unaccustomed to well-planned food purchase/consumption, while those in the latter group tend to buy unnecessary foods even after their family size decreases when their children leave home.

For excessive removal (edible portions that are removed and dumped with bones, peels or other inedible portions in the cooking process including excessive radish peels but excluding inedible portions such as vegetables/fruit peels or fish bones normally discarded), the figure for age 50 or older is twice that for age 49 or younger. This results from two factors: People aged 50 or older consume 20-30% more food because they have more opportunities to have their meals at home; and they consume larger amount of food where edible portions are likely to be peeled off with inedible portions (e.g., vegetables, fruits, and seafood).

Elderly people are generally believed to have a greater consciousness to carefully use things and avoid wasting food. However, such a belief is not necessarily correct because elderly people actually buy a large amount of food and dump a lot.

Food Loss and Food Loss Ratio by Age Group of Each Family Member Responsible for Family Meals (per Person per Day)



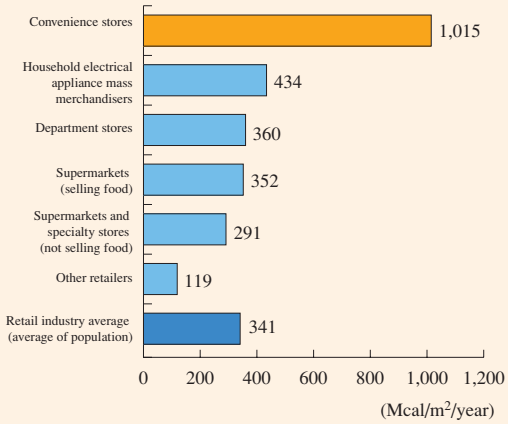
Note: Food loss percentage (%) = (Food loss/food consumption)×100
Source: Compiled by the Ministry of the Environment based on the Ministry of Agriculture, Forestry and Fisheries, *Statistical Survey on Food Waste, 2004 (The General Household Survey).*

Analysts point out that we now have an "open 24 hours" lifestyle in which a segment of the population is active every hour of the day.

Recently, convenience store (CVS) chains, which are synonymous with "open 24 hours," have significantly expanded their sales networks and floor space. As a result, carbon dioxide emission from CVS chains has increased 310% from 823,000 tonnes in 1990. It has been rising at a much faster pace than that of the corporate and public sectors (up 7.0% from the 1990 level). As this "open 24 hours" lifestyle permeates society, there might be a further increase in these overnight shops.

Although Japan's population will decrease in the future, changes in household structure or lifestyles will probably push up environmental burdens. Efforts will have to be made to reduce the environmental burdens generated by the activities of our daily lives. For example, "Team Minus 6%," a nation-wide project calling for reduced greenhouse gases, encourages the following actions: More household-level efforts such as "increasing efforts to save energy by spending more time with family members"; reducing containers and packages by employing "*Mottainai Furoshiki*" intended to encourage the 3R approach. It is important to pay a little more attention to making

Retail Industry's Carbon Dioxide Emissions per Selling Floor Space



Source: Compiled by the Ministry of the Environment based on the Institute of Energy Economics, Japan.

these efforts in our daily lives. Well-designed policy initiatives are necessary so that these behaviors will take root in our daily life.

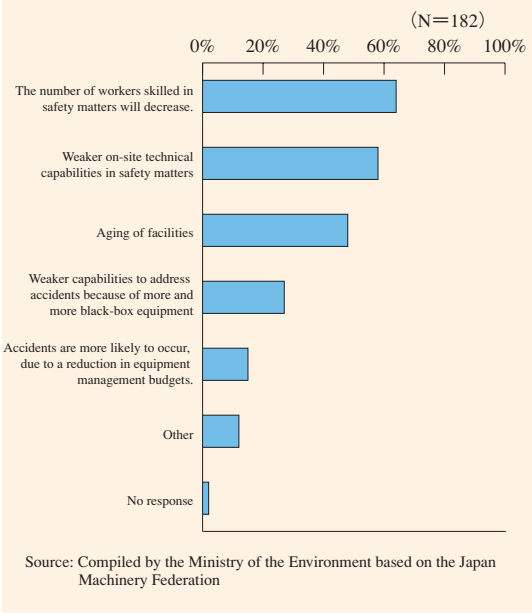
3. Decrease in the Size of the Labor Force

Baby boomers who have seen serious pollution and oil shocks from the late 1960s to the early 1970s will start leaving their jobs in large number in 2007 on reaching their retirement age. As a significantly large number of baby boomers will retire at around the same time, corporations and the government sector need to transfer baby boomers' techniques, skills, and experience to younger generations.

According to a survey, the largest percentage (63%) of respondents is concerned about more frequent accidents because "The number of workers skilled in safety issues will decrease." In environmental matters closely connected with safety issues, Japan might also suffer a shortage of technical staff after baby boomers retire from their jobs.

At the local government level, a lot of prefectures and ordinance-designated cities hired staff to be responsible for environmental issues in order to address serious pollution problems from the late 1960s to the early 1970s. This means that highly skilled staff with valuable experience in addressing and analyzing pollution problems will be leaving their jobs. In this situation, it is needed to transfer these valuable skills to the next generations.

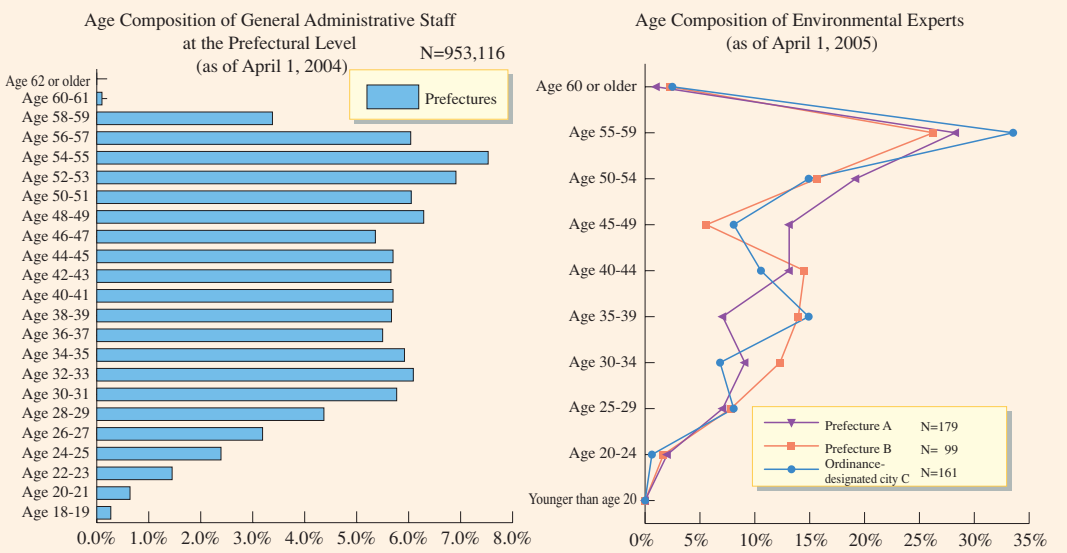
Factors that Could Lead to Accidents



Source: Compiled by the Ministry of the Environment based on the Japan Machinery Federation

In large-scale prefecture A, medium-scale prefecture B and ordinance-designated city C that have had serious pollution problems, environmental experts (usually, technical staff working for an environmental conservation section) in their late 50s make up a quarter of all the environmental experts, while civil servants in their late 50s account for less than 10% of the overall staff as a national average at the prefectural level. In these local governments, staffs in their 50s register almost 50% of all the environmental experts. From 2007 on, the problem of the loss of environmental experts might have a much more significant impact than the loss of general administrative staff.

Age Composition of General Administrative Staff at the Prefectural Level



Sources: Data from the Ministry of Internal Affairs and Communications, *Fact-finding Survey on Compensation of Local Government Employees* and documents from the Ministry of the Environment.

Source: Ministry of the Environment

Manufacturing and some other sectors have already started to address the 2007 problem by transferring techniques, skills and experience to younger generations. They are aiming to use OJT (on-the-job training) programs to transfer the know-how of skilled engineers and to create a database of examples and actual experiences of crises engineers have encountered.

As it is almost impossible to explain experiences or techniques for addressing serious pollution problems by reducing them to numerical or statistical data, transferring these experiences or techniques to the next generation as a manual will require significant difficulties. For this reason, it is important to provide a societal framework in which trained, knowledgeable, and skilled elderly people will be able to draw upon their wide work experience in environmental matters to lead on-site or grass-root environmental efforts at home and abroad.

Section 2. Uneven Regional Population Distribution and the Environment

1 *Satochi-satoyama* Areas (Community-based Forest Areas and the Surrounding Countryside)

Satochi-satoyama (community-based forest areas and the surrounding countryside), which have been created through interactions between humans and nature, now occupy approximately 40% of Japan. This moderate level of human intervention has yielded and maintained unique environments in these areas, providing habitats for various plants and animals, including endangered species. In addition to providing "desirable spaces for primary industry," these areas are becoming more important in providing city residents with easily accessible natural environments near urban areas.

Rural *satochi-satoyama* areas are now suffering rapid depopulation. Analysts point out that some depopulating local communities might disappear in these rural areas. According to the "Actual Conditions of Anti-Depopulation Policy Actions" released from Ministry of Internal Affairs and Communication in July 2005, approximately 10% of some 49,000 depopulating communities are facing difficulties in maintaining a viable community.

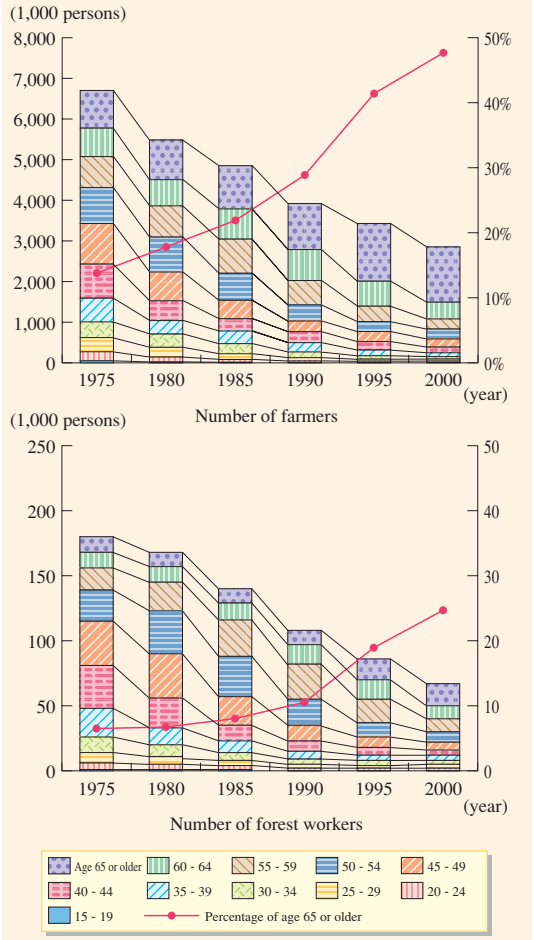
Satochi-satoyama

Through agriculture and forestry, *Satochi-satoyama* have provided suitable habitats for a diverse range of plants and animals and has led to harmonious coexistence between human beings and nature. However, Japan has recently seen a decrease in the number of farmers at the national level, while highly trained, knowledgeable and skilled farmers are getting increasingly older. These factors have resulted in stagnating/reducing agricultural production, weakening of local communities, and the expansion of abandoned agricultural land.

In addition, forestry activities are also stagnating, affected by deteriorating forestry productivity due to lower prices for Japanese lumber, as well as weaker demand for fuel wood because of the post-war energy revolution. As a result, workers in the forestry sector are getting older and decreasing in numbers. In addition, since some forests are suffering from inadequate replacement, care, tree thinning or other maintenance work, they might not be able to fully benefit the public.

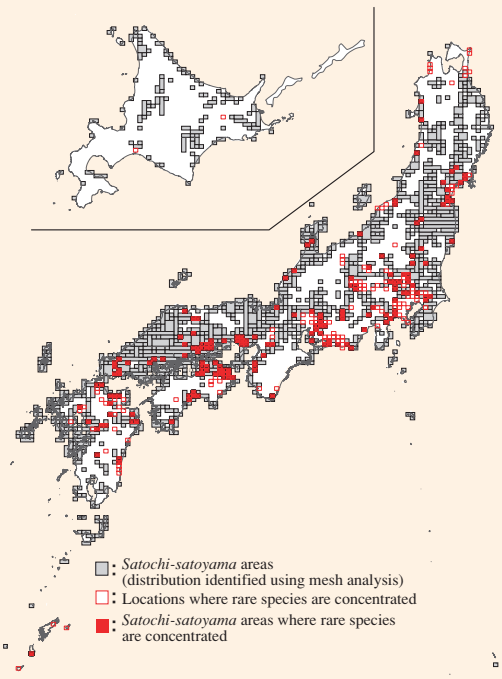
A progress in depopulation as well as further decrease in profit margins and stagnating activities in the agricultural and forestry sectors has deteriorated the quality of secondary natural environments that have been created and maintained due to a moderate level of human intervention, leading to the disappearance of wide range of wildlife characteristic of such environments. In this context, natural environments including *satochi-satoyama* areas are facing a crisis of a reduction in their biodiversity.

Number of Farmers and Forestry Workers by Age Bracket



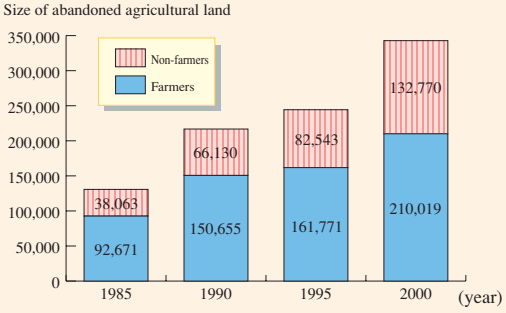
Source: Compiled by the Ministry of the Environment based on the Statistics Bureau, the Ministry of Internal Affairs and Communications, *Population Census*.

Overlapping Relationship between Satochi-satoyama and Rare Species Habitats



Source: Ministry of the Environment

Trend of Abandoned Agricultural Land



Source: Compiled by the Ministry of the Environment based on the Ministry of Agriculture, Forestry and Fisheries, *Census of Agriculture and Forestry*.

a. Rice Paddy Fields

Rice paddy field farming creates and maintains shallow marshes which provide habitats for cyprinodonts and other wildlife. However, if farmers abandon paddy field farming, rice paddy fields will dry out and thick weed growth will prevent riparian creatures from living there. If pampas grass or other perennial plants grow thickly on abandoned agricultural land in rural areas, such condition will provide suitable hideaways for wild boars or other animals and might lead to bird and animal damage.

Abandoned agricultural land

Diving beetle

b. Secondary Forests

Quercus serrata, sawtooth oak, and Japanese red pine forests have been used as ideal material for firewood, while their fallen leaves have been utilized for fertilizers. However, much weaker demand for firewood and fertilizer made from fallen leaves as well as depopulation of rural areas has pushed up the number of abandoned secondary forests. These abandoned secondary forests have larger trees, and turn into evergreen broad-leaved forests such as phaius flavus with bamboo grass, preventing sunlight from reaching the forest floor. Dog's tooth violets find it difficult to survive on these shady forest floors, as does *Luehdorfia japonica*, which sucks nectar from dog's tooth violets.

Forest devastation

Luehdorfia japonica

c. Artificial Forests

Through post-planting weeding/bush clearing, improvement cutting and tree thinning, cedar and other artificial forests benefit the public by preventing mountain disasters or global warming.

Stagnation of forestry services in recent years has resulted in some poorly managed artificial forests, which prevent adequate growth of grasses or shrubs in the forests due to insufficient sunlight. This might have negative impacts on animals or plants living in and around these forests.

d. Increased Conflict between People and Wildlife

The loss of moderate human intervention in nature obviously resulted in negative impacts on wild birds and mammals, such as wild boars. Medium and large mammals used to live in natural areas in the mountains or on the borders with *satochi-satoyama* areas, but they are expanding their habitats. For example, the 1978 and 2003 surveys have revealed that wild boars have expanded their habitats to farmland, secondary forests, and plantation forests. This resulted from the following factors: Expansion of abandoned agricultural land where thick growth of grasses and bushes has provided safe shelter for wild boars; and less active human intervention in *satoyama* areas has made it easier for wild boars to move from forests into abondoned agricultural lands.

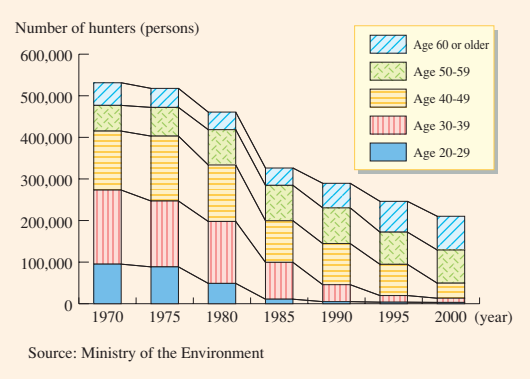
In addition to expanding habitats for wild boars, the lack of moderate human intervention has also brought about adverse impacts on the agriculture and forestry sectors by wild birds and mammals. According to a "Survey of the Government Sector and Agricultural Groups on Measures against Damage by Wildlife (Preliminary Data)" (Ministry of Agriculture, Forestry and Fisheries, 2005), about a half of agricultural groups said that they suffered increased damage from wild boars.

To mitigate these conflicts between people and wild life, it is important to properly protect and manage wild life as well as to comprehensively prevent such harm, by measures such as adequate fencing.

Hunters (hunting license holders) have played important roles in protecting or managing wildlife. However, since 1970, hunter numbers have decreased and they have become older, which suggests that it is necessary to ensure that there are a certain number of hunters and to transfer their expertise to the next generation.

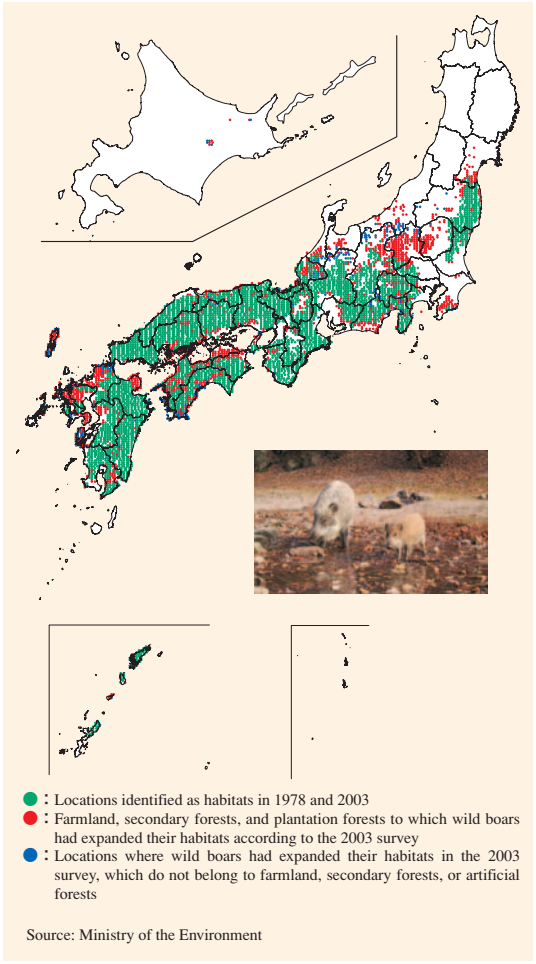
In *satochi-satoyama* areas, further depopulation and weaker agricultural and forestry activities in the era of declining population might upset the proper balance between nature and human activity, which results in a negative impact on conservation of biodiversity.

Trend of Hunters by Age Bracket



Source: Ministry of the Environment

Farmland, Secondary Forests, and Plantation Forests Where Wild Boars Have Expanded Their Habitats



● : Locations identified as habitats in 1978 and 2003
● : Farmland, secondary forests, and plantation forests to which wild boars had expanded their habitats according to the 2003 survey
● : Locations where wild boars had expanded their habitats in the 2003 survey, which do not belong to farmland, secondary forests, or artificial forests

Source: Ministry of the Environment

If we really want to continue sustainable use of such abundant secondary natural environments in *satochi-satoyama* areas while ensuring that these environments are passed on to the next generation, it is important to realize such areas have been maintained by positive use rather than restrictive measures. In such areas, human life and productive activity are closely connected with regional biodiversity. Each local community should secure activities necessary to conserve *satochi-satoyama* and develop systems to promote such activities.

2. Cities and the Environment

With consistently significant population growth and high economic growth rates in the post-war era, Japan has seen rapid population inflow to urban areas. Densely inhabited district (DIDs) populations have been increasing as a percentage of Japan's total population, while the size of DIDs has been expanding at a faster rate than the rate of population inflow to urban areas. Consequently the population density for DIDs has decreased.

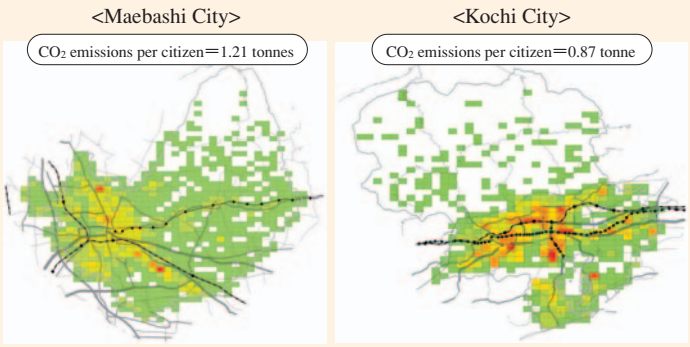
As above, Japanese cities are surrounded by low-density urban areas, which are constituted mainly from residential sectors. Such expansions of urban areas have brought significant impacts on the environment.

According to analysis on DID population density and automobile dependency rate or the transport sector's CO_2 emissions, urban areas with lower DID population densities (i.e., more expansive urban areas) tend to show a higher automobile dependency

rate and a larger CO_2 emission per resident. These data obviously suggest that expansion of urban areas is a main reason why Japan's transport sector has increased its CO_2 emissions.

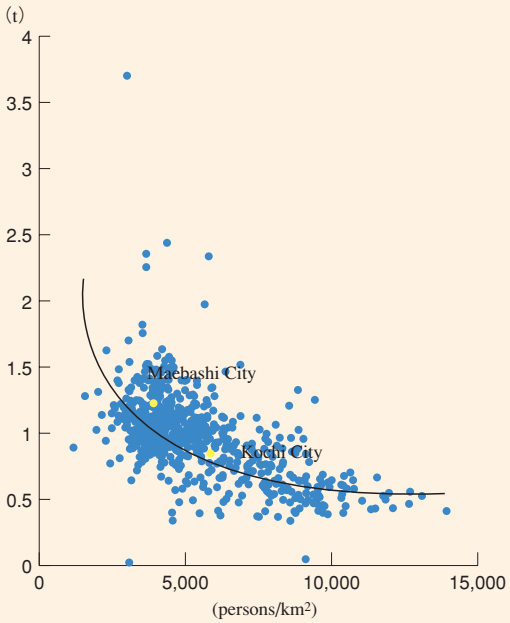
Higher automobile dependency rates have recently pushed down the number of people using public transportation. If the declining population causes problems in maintaining the current public transportation network, the automobile dependency rate will increase further, resulting in a vicious cycle which will push up CO_2 emissions.

Population Density and Urban Traffic in Maebashi and Kochi Cities



Note: The data on per-citizen CO_2 emissions only cover the transport sector.
Source: Compiled by the Ministry of the Environment based on the Ministry of Internal Affairs and Communications.

Transport Sector's CO_2 Emissions per Citizen (on Annual Basis) and DID Population Density



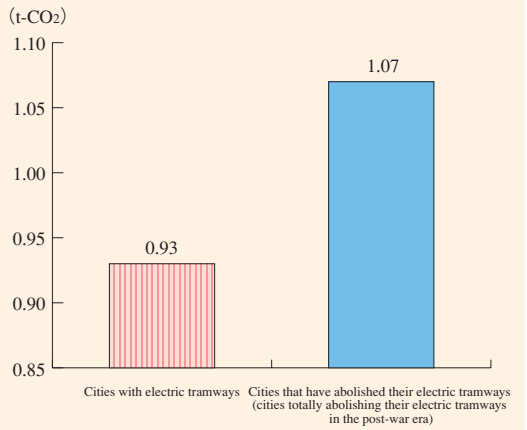
Notes:
1. The chart covers cities and Tokyo's 23 wards that have their DID population density data in the "2000 Population Census."
2. CO_2 emissions represent the data as of 1999.

Source: Compiled by the Ministry of the Environment based on the Ministry of Internal Affairs and Communications, *Population Census* and the National Institute for Environmental Studies.

The design of urban areas also impacts on administrative costs. Analysis of population density and administrative costs has revealed that urban areas with a lower population density have higher administrative costs.

In particular, in public services relevant to the environment such as sewage or garbage collection, local governments with a higher population density enjoy the economy of scale because they tend to see lower administrative costs per citizen.

Transport Sector's CO_2 Emissions for Prefectural Capitals (annual data/person)

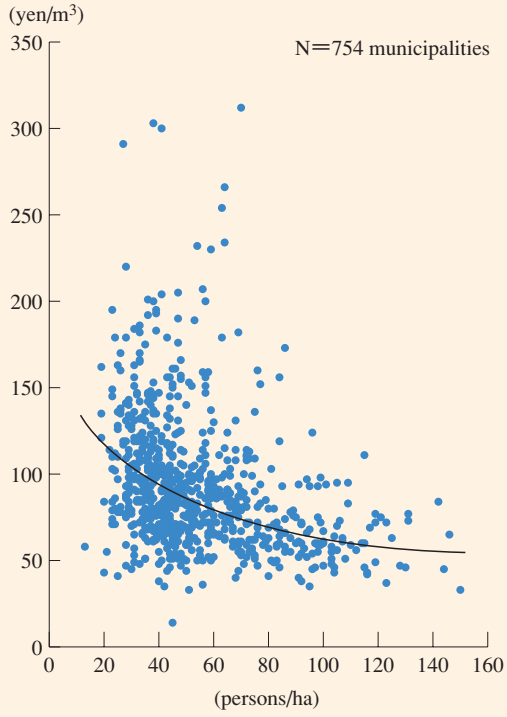


Notes:
1. In the context of this chart, prefectural capitals do not include Tokyo's 23 wards, Osaka and some other cities that replaced their electric tramways with subway systems.
2. The CO_2 emissions represent the data as of 1999.

Source: Compiled by the Ministry of the Environment based on the National Institute for Environmental Studies.

As population decline will further accelerate diffusion of urban areas, it is necessary to change the design of urban areas to suit their population size. To this end, there is a real need for efforts to prevent urban areas from haphazard expansion and try to create smaller local communities by restraining exurban development plans, concentrating urban functions in downtown areas, and paying attention to local needs. When reorganizing urban areas, it is necessary to pay due attention to global warming countermeasures and waste-related policy initiatives as well as the environmental perspectives stated below.

Decontamination Capital Costs (Maintenance Costs) and Population Density in Areas with Sewage Treatment



Source: Compiled by the Ministry of the Environment based on the Ministry of Internal Affairs and Communications.

a. Natural Environment Restoration

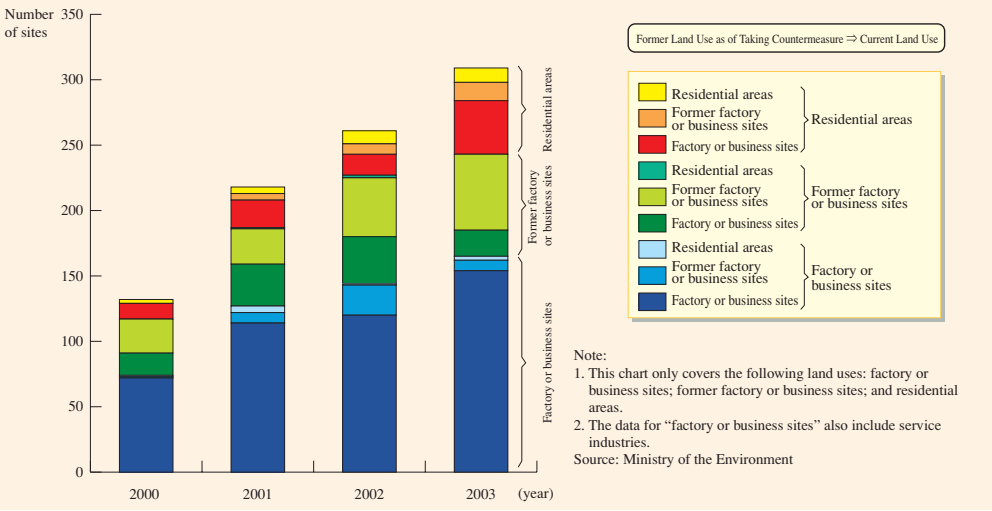
As urban areas have expanded through the conversion of land from agricultural, forestry, or mixed agricultural/forestry use to urban use (such as factories, or residential areas), many natural environments have disappeared. In this context, it is necessary to attempt to restore natural environments when creating more compact local communities.

b. Soil Contamination Countermeasures

In recent years, urban redevelopment projects or other projects that convert former factory sites into residential areas provide opportunities to identify soil contamination. The number of cases that conversion of former factory/business sites into residential areas provide opportunities to identify soil contamination is increasing.

More cases of soil contamination would be identified as more former factory sites are turned into residential areas. Because of this, it is necessary to proceed with more economic and rational surveys and soil contamination countermeasures.

Land Use for Major Contaminated/Surveyed Sites



Note:
1. This chart only covers the following land uses: factory or business sites; former factory or business sites; and residential areas.
2. The data for "factory or business sites" also include service industries.

Source: Ministry of the Environment

c. Traffic Pollution Control Measures

It is necessary to shift to active utilization of public transportation to avoid heavy inbound traffic in a location with serious air pollution, improve traffic flows, and create open spaces near intersections. Recognition of the fact that the shape of urban areas or buildings impacts on the quality of the local atmospheric environment and the urban environment measures in the medium and long term are required.

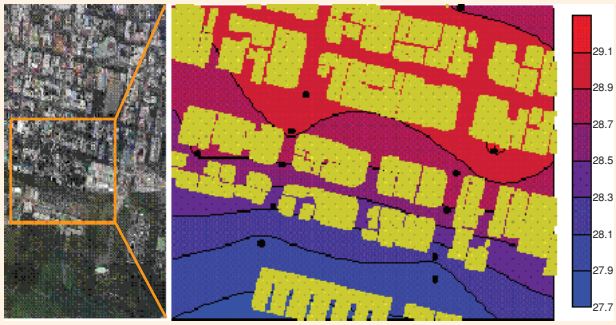
d. Urban Heat Island Countermeasures

It is necessary to create water and green networks. According to our survey in last summer on the cooling effect of the Shinjuku Gyoen National Garden, urban green area, the average temperature was more than 1℃ lower than urban areas, and the gardens cooled the temperature in the surrounding 100 meters. We also outlined possible urban designs that would maximize such cool island phenomena. It is necessary to proceed with implementation of policy to build compact urban areas with minimal environmental burdens.

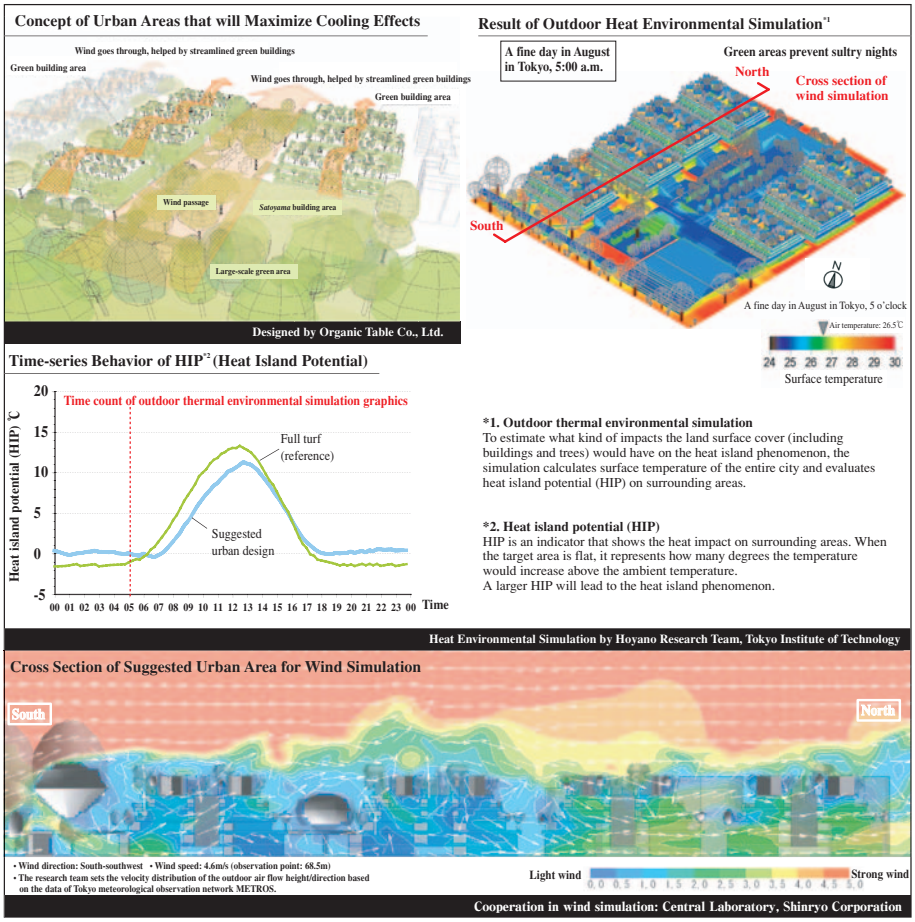
The mechanism of the heat island phenomenon is complex because it results from the interaction of various factors such as anthropogenic exhaust heat, land surface cover, urban design, topography and climate conditions. We should conduct surveys, carry out research and work on mitigating the heat island phenomenon, drawing upon survey results, state-of-the art technologies and up-to-date scientific knowledge.

Because the urban environment is created by a complex interaction of various factors, it is necessary to design urban areas so that the environmental burdens of entire cities will not increase.

Average Temperature on the North Side of the Shinjuku Gyoen National Garden (July 27 to August 29, 2005)



Source: Ministry of the Environment, *Review Meeting on Improving Regional Heat Environment through Urban Green Areas*; and Research Group of Professor Mikami, Tokyo Metropolitan University



Source: Ministry of the Environment, *Review Meeting on Improving Regional Heat Environment through Urban Green Areas*