

## **REGIONAL SUSTAINABLE DEVELOPMENT REVIEW: JAPAN**

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### **Summary**

The twentieth century was a century during which materialistic values – characterized by mass production, mass consumption, and massive waste – prevailed throughout the world. Japan during this century saw remarkable success in economic and industrial development, as well as in the modernization – or westernization – of its society and lifestyle. Such a hasty stride had adverse consequences, however, including the rise and collapse of militarism, environmental destruction, and the rise of materialism, which may threaten humans and all other creatures on earth. The 1960s saw a number of serious pollution problems caused by reckless industrial activities, and these led to powerful citizens' protests. A wide range of people and groups including labor unions, academics, students and women, as well as NGOs and NPOs, played important roles in addressing these problems, supporting the victims of pollution, and convincing government and society of the necessity of creating the Environment Agency in order to solve these problems. They also played key roles in the 1980s and 1990s in nature conservation movements working against reckless and destructive development projects, and acted as forerunners for sustainable development. The relationship between these groups and central and local governments was often difficult, especially during the 1960s and 1970s, but it improved greatly during the following two decades as government bodies became increasingly active in environmental conservation. The attitude of the business community, which was once severely criticized for its negative attitudes toward environmental conservation, also changed dramatically, and it now plays a leading role in pollution abatement and recycling.

The 1992 United Nations Conference on Environment and Development (UNCED) had far-reaching worldwide influence, and convinced all parties of the importance of tackling global environmental problems with international sharing of views and co-operation. A juridical structure for implementing sustainable development is being established in Japan: a key to its success is consolidation and further development of the

existing co-operation between the central and local governments, the business community, the scientific community, NGOs/NPOs, and citizens. With such a framework of mutual understanding and respect between different parties, together with its advanced technological and scientific skills, economic power, and peace-loving constitution, Japan is expected to play a major role in the international effort for achieving global sustainable development.

## 1. Introduction

Japan is an island country located along the east coast of Eurasia. It occupies 378,000 square kilometers of land, or about 0.3 percent of the world's land area. The global community is concerned with its past and present situations, and its future prospects in regard to sustainable development, for the following reasons:

- Despite its limited land area, Japan is not a small country in terms of economic capacity and population. Its GDP was \$4,506 trillion (2005) –the second largest in the world; its population of 127,768,000 (2005) is the second largest among the developed countries after the USA. Japan was recognized as a world economic power in the 1980s, after recovering from the devastation caused by the Second World War and overcoming the oil crises of 1973 and 1979. As an economic giant it is expected to make a substantial contribution to tackling global problems, especially environmental ones.
- Japan is closely linked with other countries by trade. The value of its annual trade amounts to \$855,084 million (2003), in third place after the USA and Germany. With very limited cultivable land to support its large population, Japan is the largest food importer in the world: for example, 95 percent of soybean and 87 percent of wheat consumed in Japan in 2006 were imported. If there is food shortage in the international market because of climatic or other environmental disorder, Japan is likely to be the country to suffer most. The country also lacks most vital natural resources, such as oil, iron, and other metals: for example, it imports 94 percent of its energy resources (2002) from overseas. Thus it affects, and is affected by, other countries' economic activities, which in turn are closely related with their own environments. It is also notable that Japan has great influence on the development of less developed countries through its ODA (Official Development Aid).
- Because of the extreme speed of modernization since the late nineteenth century Japan suffered from many serious environmental problems, including the world-famous Minamata disease. It overcame such serious pollution problems, however, and its achievement was praised in the world as an “anti-pollution miracle” in environmental management. The experiences of Japan, both good and bad, are considered to be instructive for other countries, especially developing countries, in helping them to avoid or overcome similar problems.
- By comparison with its effort in solving domestic environmental problems, Japan's commitment to global environmental issues was relatively limited until the 1980s. It was the United Nations Conference on Environment and Development (UNCED) in 1992 that brought about a major shift in peoples' attitude toward global sustainable development. Since then the central government, the scientific community, and the business community in Japan

have not only hosted or initiated a number of important international environmental conferences and projects but have also supported the activities of other countries, particularly those in Asia and Africa, as well as the environmental programs of the UN. Japan now assumes great responsibility for the betterment of the world's environment and the various conditions influencing its health through economic, political, academic, and cultural endeavors.

This chapter outlines the history of environmental changes in Japan; examines important aspects of these changes, their backgrounds, consequences, and problems and counter-measures; and discusses future prospects of the country from an environmental viewpoint.

## **2. Land, People, and Environment**

Environmentally sound management and use of the land are essential for food production, for improving living conditions and people's welfare, and ultimately for sustainable development, especially in a country where flat land is so scarce and population density is so high. In order to achieve these aims in Japan it is necessary to understand the country's geography, and its history of population and land-use/-cover change.

### **2.1. Geography**

Japan is a mountainous island country. About 70 percent of its land is on the highlands covered with forest, while its narrow lowlands are used intensively for urban and agricultural uses. The coastline has been modified considerably by reclamation and by the construction of concrete structures to protect the land from waves. Thanks to its oceanic setting and the productive sea nearby, Japan is one of the major fishing countries in the world. There are oceanic trenches along the archipelago, and this tectonic setting brings about volcanic eruptions and earthquakes from time to time. In 1995 a strong earthquake hit Kobe City and its vicinity, killing some 6,300 people. In 2000 the eruptions of Mt Usu in Hokkaido, and of Miyake Island south of Tokyo in the Pacific Ocean, caused serious damage to local communities. Earthquakes sometimes cause tsunamis, which can devastate coastal areas. However, volcanism is also an essential element of tourism in Japan, as it contributes to numerous hot springs and to the beauty of the landscape.

The Japanese archipelago, which covers a wide range of latitude, is fragmented by seas and mountains, and there are major regional variations in geology, landform, climate, vegetation, and fauna. The climate varies from sub-arctic in Hokkaido to sub-tropical in Okinawa, and it also displays a distinct seasonality. In summer, moist oceanic air masses prevail; in winter it comes under the influence of the cold Siberian air mass, which brings heavy snow to areas facing the Sea of Japan. The rainy season lasts from mid-June to late July, supplying plentiful water for rice cultivation as well as for urban and industrial uses. However, heavy rainfall, which often hits western and central Japan toward the end of the rainy season, frequently leads to serious floods and landslides. In summer and early fall typhoons bring much-needed water, as well as disasters, to the

southern and western part of the country. In northern Japan, low temperatures sometimes cause damage to rice crops.

Thus, the natural environment of Japan offers its dense population a wealth of water, heat energy, oceanic and volcanic resources, and biological diversity. However, the very conditions that support the people sometimes cause serious damages to the quality of their lives. Japanese people must take this into account in order to proceed towards sustainable development. Over-concentration of population and social, economic, cultural, and governmental functions in Tokyo might result in a serious loss of national resources as well as human lives in the event of a strong earthquake: such an event actually hit the city in 1923, hindering modernization and development of the country.

## **2.2. Population Trends**

Japan's dense population is supported not only by its rich natural environment, which guarantees highly productive agriculture, but also by high-level industrialization that supports a high economic standard. The population density in Japan was 91 people per square kilometer in the early 1870s, but it had increased to 340 people per square kilometer by 2000. During the Edo period, when the Shogun maintained a policy of national seclusion, the population remained fairly stable at around 30 million. The Meiji restoration, however, which started in 1887 changed the whole structure of the country, and the population started to grow rapidly. It maintained a high level of growth before the Second World War, although mortality and birth rates remained high. Both of these rates fell drastically after the war, and the recent rate of natural increase is drawing closer to zero. The present population of Japan is four times that during the Edo period, which is considered to represent the carrying capacity of the country on the basis of renewable resources and pre-industrial technology alone.

Japan has been enjoying high average life expectancy for decades: this now stands at 78.6 years for men and 85.5 years for women, both figures the highest in the world. The high life expectancy means that the country is "aging" fast, and that Japan's population structure is becoming one of the oldest in the world.

## **2.3. Urbanization**

Urbanization has represented the most conspicuous change of land use in Japan during the twentieth century, and includes land-use changes inside cities as well as those associated with urban expansion. Changing urban land uses reflect interactions between various urban functions, population, culture, affluence, technological and scientific advancement, and other factors, and they in turn have various effects on other types of land use and the environment. The expansion of major urban centers such as the Tokyo metropolitan area, the Osaka–Kobe metropolitan area, and the Nagoya metropolitan area, has been tremendous. After the late 1960s many people moved to suburbs, where land prices and rent were lower and environmental conditions were better. This out-migration process extended urban areas enormously over a short time.

Japan's population began to concentrate in large urban centers in the latter half of the 1950s, when high rates of economic growth set in; the rapid urbanization that followed

has changed the shape of the country. New residential areas, with single-family houses and apartments, developed along suburban railway lines in order to accommodate those commuting to urban centers. Because of urban expansion the area of farmland on urban fringes decreased. The population of Japan is now concentrated in three major metropolitan areas: Tokyo, Keihanshin (Kyoto–Osaka–Kobe), and Nagoya. Approximately 44 percent of the country's population lives in these metropolitan areas, which occupy only 6 percent of Japan's total land area.

Living conditions in larger cities are usually relatively unfavorable. Houses tend to be small and expensive, and open space is scarce. There are problems with noise, air pollution, and traffic congestion. Commuting to the central business district is quite time-consuming. The Tokyo metropolitan area displays all of these urban problems. The cost of living in Tokyo is one of the highest in the world. Despite long and heated discussions, however, relocation of Tokyo's capital function out of the city is unlikely to materialize in the near future.

Motorization since the late 1960s has been the major direct driving force of suburbanization. Commercial activities that were traditionally concentrated in city centers are shifting to the suburbs, where automobile access is easier. Accelerated urbanization has resulted in increased regional disparities in affluence, population distribution, and age structure. Marginal areas have been depopulated and their average ages have been increasing because of emigration of the young to large cities. In depopulated rural areas regional communities, economies, and traditional culture are struggling for survival (See: *Integrated Approach to The Planning and Management of Land Resources*" and "*Climate Change Convention*, EOLSS on-line).

#### **2.4. Changes in agricultural land use**

Although the total area of agricultural land in Japan has been fairly stable during the twentieth century, its distribution and composition have changed greatly. The percentage of agricultural land increased from 14.4 percent in 1850 to 16.7 percent in 1900, but has been stable since then at about 17 percent. The increase in agricultural land before 1900 was mainly attributable to increases in the area of dry arable land in Hokkaido. This development of new agricultural land in Hokkaido continued well into the 1980s, supported by strong government incentives, but it has been offset by decreases elsewhere. The Kanto Plain – the largest plain in Japan, occupied by Tokyo and many other cities – lost a large area of agricultural land as a result of urban expansion, but the development of new agricultural land in other parts of the plain more or less compensated the loss.

The area of paddy field has been stable since the middle of the twentieth century, mainly as a result of governments' policies, especially after the Second World War. Rice has long been the staple food in Japan and the country has been self-sufficient up to the present except in some extreme years. The total population has more than tripled over the last 150 years but, because of the increase in yield and a decrease in per capita consumption, rice self-sufficiency has been maintained without expansion of the area of paddy field. The "green revolution" of the 1960s had a great effect in increasing the yield of rice. The high productivity has, however, been maintained only with the heavy

input of energy, which originates from imported oil (See: *Sustainable agriculture and rural development*, EOLSS on-line).

## 2.5. Changes to Forest and Wetland

Before the Second World War, the use of forests generally remained constant. Traditional shifting cultivation and gathering of grass and fuel wood were commonly practiced in broad-leaved forests. Common or private forests were part of the self-support system for farmers in mountain villages. In the forest areas throughout the country except Hokkaido there were many slash-and-burn fields, land for grass or fuel wood, pine forests resulting from the over-use of forest, deforested land, and other types of rough land. Among these, slash-and-burn fields were important to farmers in mountain areas, particularly those in semi-deep mountains. Grass was used mainly as fertilizer in paddy fields. In many mountain areas, especially those in western Japan, a large part of common land became wasteland because of over-use by farmers who cut too much grass. The exploitation and poor management of mountain slopes often resulted in land degradation, flooding, and other disasters before the war.

Forest also suffered from urbanization, agricultural development, and wars. However, the decrease in its area was reversed by the post-war afforestation boom and by reforestation of abandoned farmland. Consequently, the areas of forest at the beginning and the end of the twentieth century were about the same. Utilization of forest resources has been declining because of changes in the nation's economic and industrial structure since the Second World War. In the agricultural sector the use of chemical fertilizers and machines proceeded apace. Farm animals – and the village commons providing them with food – decreased almost to nil. Firewood and coal were also replaced by oil.

The government and landowners in mountainous areas took action on forest rehabilitation after the Second World War. Many landowners planted coniferous trees – Japanese cedar and Japanese cypress – in response to sharp increases in timber prices during the post-war period, as well as to governmental subsidies. The afforestation boom continued well into the period of high economic growth during the 1960s, since economic development pushed up the demand for timber. The increase in the area of conifer plantations, however, caused reductions in the populations of many wild animals, as their habitats were either completely destroyed or seriously altered.

Depopulation of mountain villages started in the early period of high economic growth in the 1960s, and some cultivated land was turned back to forest. Since the maintenance and preservation of forest was considered to be of national importance, much of the area deforested shortly before and during the Second World War had been returned to forest by the late 1960s. Furthermore, a large area of broad-leaved forest had been cut and replaced by conifers in the 1970s and 1980s. Plantations now occupy about 40 percent of the area of forest, and most of them occupy land that used to be economically marginal. The government thought that the high timber price was the main obstacle to economic development, however, and decided in 1963 to start importing cheap timber from overseas. This lowered the price of domestic timber in the 1970s and 1980s, and many forest owners in mountain villages abandoned the management of their forests. Moreover, the era of high economic growth resulted in the exodus of many people from

mountain villages, and led to a shortage of forest workers. The management of the newly planted forests is an important issue, not only for the maintenance of forest resources but also for the protection of the mountain environment.

Most of the wetland in Japan, except in Hokkaido, was reclaimed mainly for agricultural uses before the Meiji restoration in 1868, and only about 1,520 km<sup>2</sup> remained at the beginning of the twentieth century. This area is now 730 km<sup>2</sup>, over 90 percent of it in Hokkaido. The Kushiro Mire, the largest wetland in the country, was registered with the Ramsar convention in 1980 and became the first wetland national park in Japan in 1987. There are many wild Japanese cranes and other birds there. The most serious threat to the wetlands and their wildlife in Hokkaido is agricultural development (See: *Sustainable mountain development, Conservation of biological diversity*, EOLSS on-line).

## 2.6. Changes of Coast and Sea

Only 55 percent of Japan's long coastline of 33,000 km remains in its natural state. Alteration to the coastline, especially reclamation of shallow coastal seas, has had profound effects on the marine environment. In the case of Tokyo Bay, as much as 20 percent of the bay area has been reclaimed since the Meiji Restoration of 1868, mainly for industrial and urban uses. Tokyo Bay, as well as other major bays such as Osaka Bay or Ise Bay, and Seto Inland Sea, once suffered from serious pollution problems, both pollution by toxic substances or eutrophication, particularly in the 1960s. The environmental situation of these bays and inland seas has been improving since then, but the problems are still far from being overcome. The disappearance of estuaries is particularly damaging to marine ecosystems. Reclaimed lands in coastal areas, on the other hand, suffer from time to time from land subsidence, high tides, and earthquakes, although they have important roles in a mountainous country with only limited flat land.

## 2.7. Kogai: Public Nuisance

The high growth of the Japanese economy during 1955–74 had a serious negative aspect. During this period, industrial pollution became a serious problem. Industrial emissions and wastewater polluted the environment and harmed people's health. In the 1960s Minamata disease attracted public attention. It was caused by mercury discharged into Minamata Bay from a chemical plant: its victims were estimated at several thousand. Other serious pollution problems during this period include Niigata Minamata disease along the Agano River, Itai-Itai Disease in Toyama Prefecture, and arsenic-poisoned milk that killed and harmed thousands of babies in and around Osaka City. Many citizens' organizations were established to help the victims and resist the polluting industries. The public gradually realized that no one was free from the dangers of environmental pollution.

Other kinds of problem also harmed basic human rights and welfare: the noise of airplanes, road vehicles, or trains; and land subsidence caused by over-abstraction of groundwater by some companies. The word *kogai*, or public nuisance, was widely used with regard to problems of this kind, which often reflected distortions caused by rapid economic growth.

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### Biographical Sketch

**Dr. Yukio Himiyama** is professor of geography at Hokkaido University of Education, Asahikawa Campus, in Japan. He received his master's degrees in physics at University of California at Los Angeles, USA, and at Tohoku University, Japan, and his Ph.D. in geography at King's College London, UK. He joined Hokkaido University of Education in 1980 as a lecturer in geography, becoming an associate professor in 1983, and then professor of geography in 1989. Professor Himiyama initiated International Geographical Union Study Group/Commission on Land Use/Cover Change (IGU-LUCC) and chaired it during 1996-2004. He has conducted a number of projects on land use/ cover change including the CJLUC (China-Japan comparative study of Land Use/Cover Changes) project sponsored by the Japanese Government. He is also active in environmental education, geography education, map education, and lifelong learning. The annual Children's Environmental Map Contest which he initiated already counted eighteen times, and is spreading not only inside Japan, but also in many other countries.