

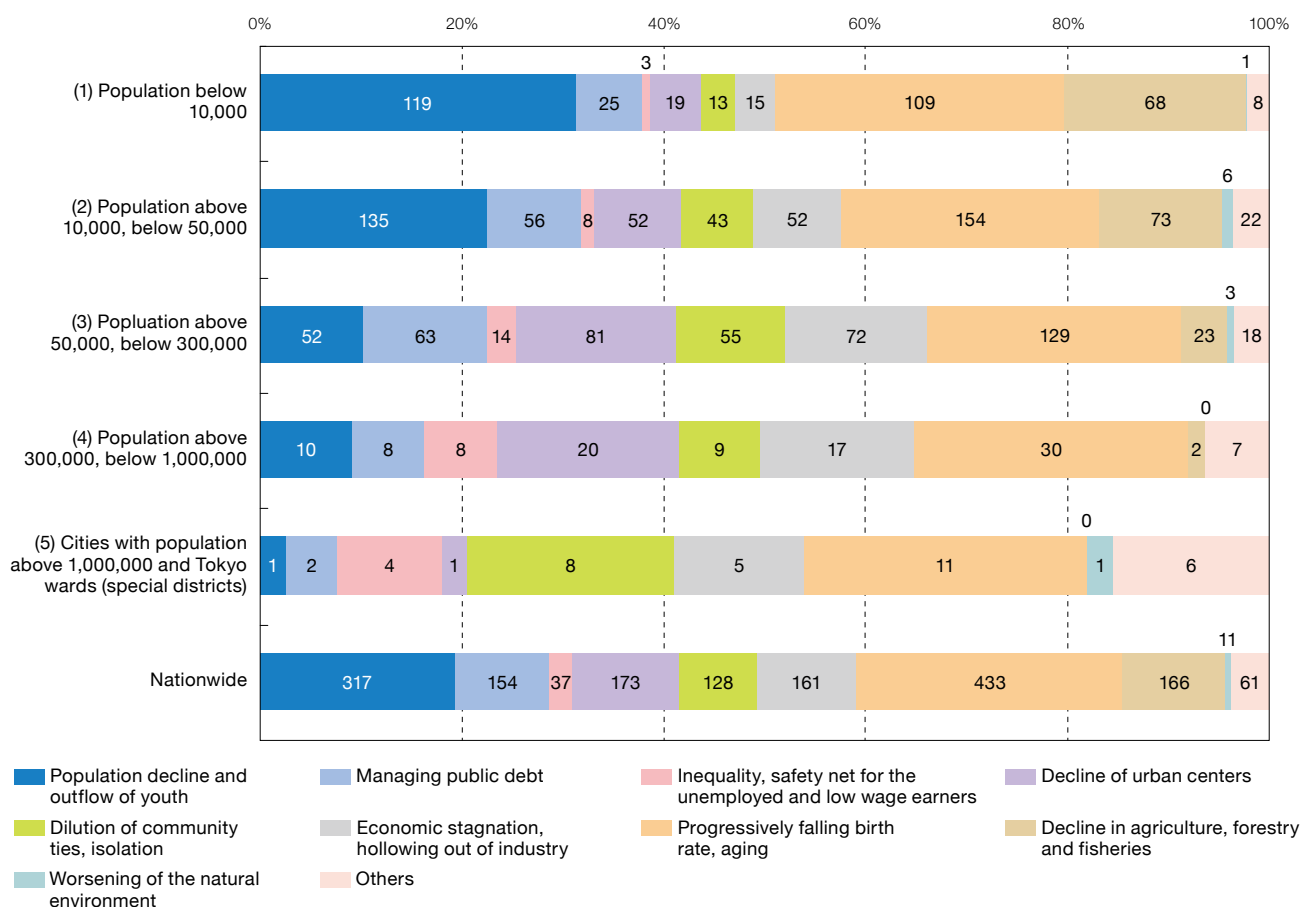
Environment, economy, and society today —building sustainability

Socioeconomic state and environmental issues in Japan

Introduction

Preserving the environment is an urgent concern for human society and prosperity. In Japan, the shrinking population, aging, and globalization have given steep rise to a number of economic and social difficulties, including ballooning social welfare costs, sharp expansion of public debt, and fierce competition on a global scale. As environmental, economic, and social issues grow in severity, systematic approaches are needed to address them in order to build sustainable communities. Integrated operations are crucial particularly in rural regions where these issues are closely interrelated. The following section presents three issues that illustrate the relationship between socioeconomic changes and the environment.

High-priority policy issues faced by regions (multiple answer allowed, by population size)



Notes: 1. Sent to a total of 986 entities, including half of municipalities nationwide (selected at random), ordinance-designated municipalities, core cities and special districts, with a 60.5% return rate (597 entities).
2. Figures shown on graph are the number of entities responding.

Source: "Nationwide Survey of Municipalities Regarding Regional Rebirth and Revitalization," Professor Yoshinori Hiroi, Chiba University, July 2010

Deterioration of *Satochi-Satoyama* and increase in damage from wildlife

The word *satochi-satoyama* refers to tracts of land located midway between cities and wilderness, comprising villages, secondary and planted forests that surround villages, farmland, ponds, and similar geographical areas. In Japan, these tracts represent about 40% of land nationwide and about 60% of all land where endangered species are mostly concentrated. Traditionally, local residents maintain *satochi-satoyama*, however, population decline and aging are leading to deterioration of these areas and thus triggering a related increase in damage from wildlife.

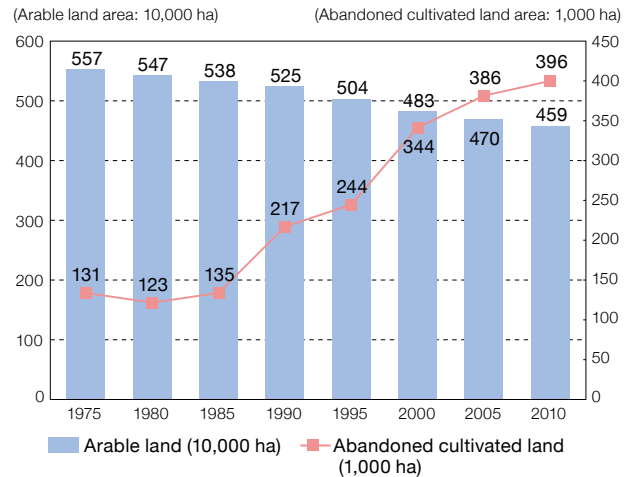
Japan's population has fallen from its peak in 2008, and population aging has also advanced. According to statistics, the country's total population will fall to 86,740,000 by 2060, when the percentage of the population 65 years of age and older is expected to reach 39.9%.

In rural areas, population decline and aging is proceeding more rapidly than in the country as a whole. Yet a natural decline in birthrates and population aging are not the only problems for people in rural areas. There is also a social decline caused by the migration of young people out of these areas, resulting in a higher average age of the population that has been left behind. Looking at the demographic shift in the Tokyo metropolitan area and rural areas outside the three major metropolitan areas (Tokyo, Osaka, Nagoya), significant net excess migration from rural areas to the Tokyo metropolitan area—primarily of people between 15–24 years of age—has continued.

A consequence of this depopulation in rural areas is cultivated lands being abandoned at a higher rate. *Satochi-satoyama* tracts of land are not being maintained as in the past, due in part to the increase in abandoned cultivated lands that serve as shelter and feeding grounds for wildlife, a decline in human activity in *satochi-satoyama* and similar areas, and a decline in the number of hunters. These factors have led to an increase in both the population and habitat range of certain wildlife, including sika deer (*Cervus nippon*) and wild boar (*Sus scrofa*). In addition, there is concern that the falling number of people with hunting licenses as well as the aging of the hunting population will grow more acute. This is creating a vicious cycle in which damage from wildlife increases, leading to reduced motivation to engage in agriculture, which in turn results in more cultivated lands being abandoned and more damage from wildlife.

As the animals feed on and damage plants, negative impacts on the natural environment include deterioration of forests, which results in lowered capacity to purify water and air as well as alleviate flooding. As forest capacity declines, even metropolitan regions may begin to experience a variety of negative effects as the impacts ripple through the ecosystem connecting forests to the countryside, rivers, and seas as well as through the entire agricultural, forestry, and fishery fields.

Transition of arable and abandoned cultivated land area



Note: Abandoned cultivated land refers to once-arable land on which crops have not been grown for more than the past year, and for which no clear intent to resume farming in the next several years has been indicated.

Source: "Census of Agriculture and Forestry" and "Statistics on Arable Land and Crop Acreage," Ministry of Agriculture, Forestry and Fisheries

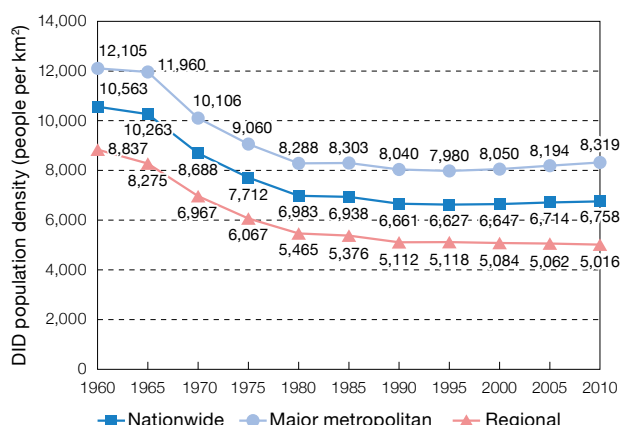
Urban structure and an increase in CO₂ emission

In the past, Japan experienced rapid urbanization in the context of a growing population. The growth of cities was characterized by urban sprawl and thinning urban density in the suburbs. Today, however, the population of so-called densely inhabited districts (DID)—regions within municipal boundaries with high population densities—continues to fall. This trend is notable in cities outside the three major metropolitan areas and is a cause of social problems as well as higher CO₂ emissions.

Cities with greater urban diffusion have more roads, and there is greater reliance on automobiles for transportation. As a result, stores located along roadways and other suburban businesses enjoy higher sales, while central business districts suffer from lower sales and a gradually declining economy. A characteristic of regional cities in particular is transportation lines halting their operations as local railways and private-sector bus operators face financial difficulties, which then further restricts options for the elderly to go outside the home. Nowadays, these depressed regions have the social problem of an enormous number of people with limited access to shopping facilities. Compared with more densely concentrated areas, cities with this kind of urban diffusion also need to focus more on rebuilding, maintaining, and upgrading railways, water and sewage lines, and other social infrastructure as well as on collecting and transporting waste to waste disposal facilities, which may put more burden on them.

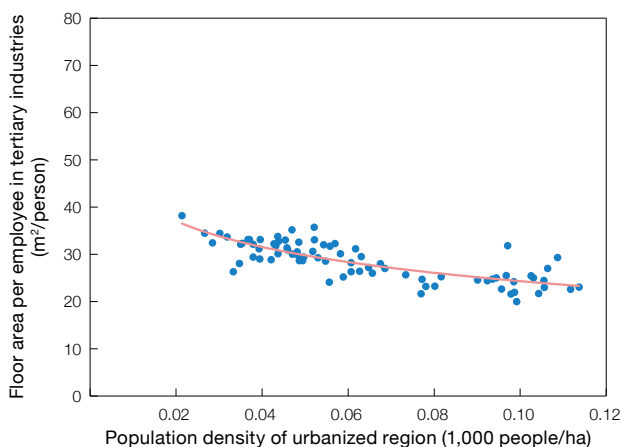
The problems of urban diffusion go beyond those noted above to include exacerbated CO₂ emissions. Cities with diffuse urban areas tend to have a higher volume of CO₂ emissions because of higher per-resident automobile use compared with more densely concentrated cities. This stems in part from the location of suburban stores and reduced access to public transportation. As a result of the greater reliance on automobiles, the distance traveled by car per resident increases. Development on relatively inexpensive land is also possible in cities with diffuse urban areas. Those activities could make it easier to secure a larger footprint for buildings, and commercial floor space tends to become larger as a result. Since such growth correlates with greater energy consumption for lighting, air conditioning, and others, it may also have an impact on increased CO₂ emissions in the commercial sector.

Transition of DID population density



Source: "2010 National Census," Ministry of Internal Affairs and Communications

Population density in urbanized regions and floor area per employee in tertiary industries (cities with population above 200,000)



Source: "2010 National Census," "2009 Economic Census" and "2012 Survey of Fixed Assets," Ministry of Internal Affairs and Communications; "2011 Annual Report on Urban Planning," Ministry of Land, Infrastructure, Transport and Tourism

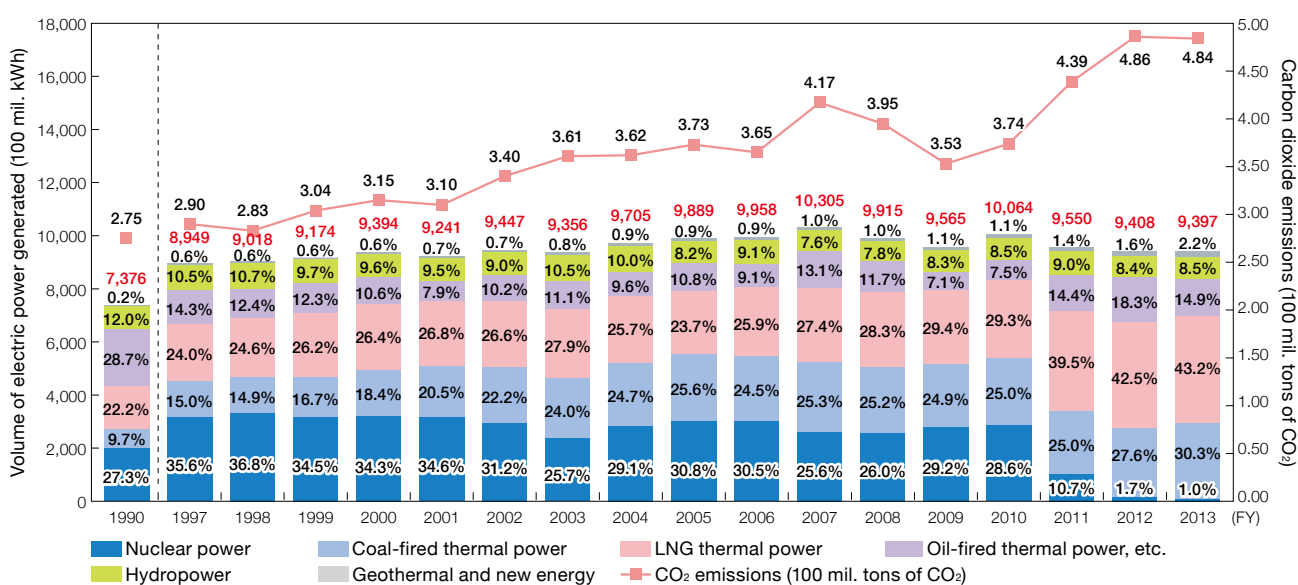
Power supply constituents and increased CO₂ emission

CO₂ emissions in Japan

Although final energy consumption in Japan has been falling since its peak in fiscal 2004, CO₂ emissions are trending upward. The primary causes are increased coal- and natural-gas-powered thermal power production as a percentage of electricity utilities' power generation mix. In particular, the increase in thermal power generation following the Great East Japan Earthquake and accident at the Fukushima Daiichi Nuclear Power Plant has resulted in a rapid increase in CO₂ emissions from energy sources.

Major countries have reduced their CO₂ emission factor (CO₂ emissions per 1 kWh of electricity generated) since 1990 (base year under the first commitment period of the Kyoto Protocol), while Japan's emission factor remained flat between 1990 and 2010. Looking at CO₂ emissions from power generation since 1990 by specific fuel type, it is evident that Japan's percentage of coal- and natural-gas-powered thermal power generation has increased as a proportion of the power generation mix. Therefore, the fact that Japan's CO₂ emission factor has not been reduced between 1990 and 2010 can be partly attributed to its higher proportion of coal-fired thermal power generation, which has higher CO₂ emissions.

Changes in volume of electric power generated by type of power source and carbon dioxide emissions

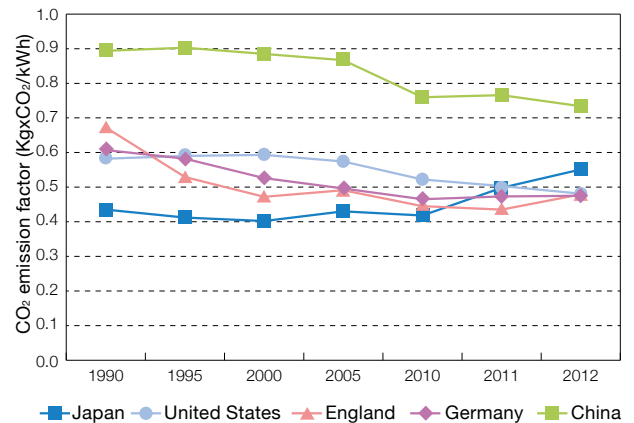


Note: Total for 10 general electricity utilities

Source: (Electric power generated by type of power) "Overview of Energy Development," Agency for Natural Resources and Energy; "Fiscal 2013 Comparison of Electric Power Generation Mix by Type of Power Source" and "Environmental Action Plan by the Electric Power Industry," the Federation of Electric Power Companies of Japan (Carbon Dioxide Emissions) "Global Warming Countermeasures by the Electric Power Industry" and "Environmental Action Plan for the Electric Power Industry," the Federation of Electric Power Companies of Japan

Furthermore, Japan's emission factor worsened dramatically after 2011, when thermal power generation began serving as an alternative for supply shortages caused by the suspension of nuclear power plant operations nationwide following the post-earthquake accident at the Fukushima Daiichi Nuclear Power Plant.

Changes in CO₂ emission factor from electric power sector in major countries



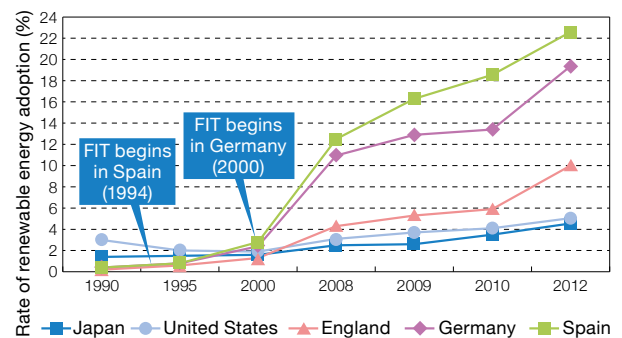
Source: "CO₂ Emissions from Fuel Combustion 2014," IEA

Renewable and coal-fired thermal power generation

According to the International Energy Agency's "Energy Balances of OECD Countries" (2014 edition), the percentage of renewable energy as a proportion of Japan's power generation mix is low relative to other major countries. While the use of renewable energy has grown with the introduction of feed-in-tariffs (FITs) in July 2012, as of fiscal 2013, renewable energy, excluding hydropower, represented just 2.2% of electric power production.

In addition, while Japan has made advances in developing world-leading coal-fired thermal power generation technologies, including advanced ultra-supercritical (A-USC) and integrated coal gasification combined cycle (IGCC) power generation, at the level of technology in use today, even the latest coal-fired thermal power plant emits about twice the amount of CO₂ emission as the latest LNG thermal power plant. Compared to other fossil fuels, coal presents relatively low geopolitical risk and is superior in terms of the stability of supply and economic efficiency. In the event that more coal-fired thermal power plants are built and started operations, however, the CO₂ emission factor in the electric power segment will undeniably worsen. As a result, it may undermine the effects of corporate and household efforts to conserve energy by reducing power consumption.

Changes in rate of renewable energy adoption in major countries



Note: Renewable energy includes geothermal, solar heat, sunlight, tidal power, wind power and biomass.

Source: "Energy Balances of OECD Countries 2014 Edition," IEA

Enhancing the environment, economy, and society

Introduction

Given the interrelated nature of environmental, economic, and social issues today, achieving a sustainable society and passing on a healthy and bountiful environment to future generations requires incorporating environmental considerations in the socioeconomic system. Environmental sustainability must be achieved at the same time as achieving robust and lasting economic and social stability. Here we discuss an approach to creating sustainable communities that pursues harmonized enhancement of the environment, economy, and society.

Promotion with local resources

As economic and social issues become severe, Japan will need to design environmental measures in terms that go beyond the traditional concept of environmental preservation to include their capacity to contribute to resolving economic and social issues. For this reason, Japan is directing its environmental policy toward an emphasis on concurrent enhancement of the environment, economy, and society, as described in the Basic Environment Plan.

Regional socioeconomic activity is built on local resources, which have a significant impact on regional characteristics. These local resources are in turn a source of local diversity. Local resources include not only local energy, natural resources, and urban infrastructure, but also a variety of other components such as community, organizations, culture, and climate. Given these factors, local resources must not be compromised by socioeconomic activity if local communities are to be sustainable. On the contrary, enhancing the quality of local resources has the potential to bring about improvements in socioeconomic activity.

Using local resources in local environmental initiatives may also help resolve economic and social issues faced by local communities. Environmental preservation efforts, including significantly reducing greenhouse gases in the medium-to-long term, ensuring proper recycling of materials and substances, and preserving biodiversity, are approaches that can achieve integrated enhancement of a region's environment, economy, and society. These environmental initiatives should contribute to resolving economic and social issues through local economic revitalization and community development. For example, introduction of independent, distributed energy systems that utilize renewable energy sources can provide an emergency power source as well as reduce the cost of that energy. In addition, selling surplus energy generated by these energy systems to other regions can be a way to obtain funds from outside sources. Another example is thermal recycling to supply electricity and heat through the waste disposal process, which can revitalize regional economies and communities through the introduction of independent, distributed energy not reliant on fossil fuels.

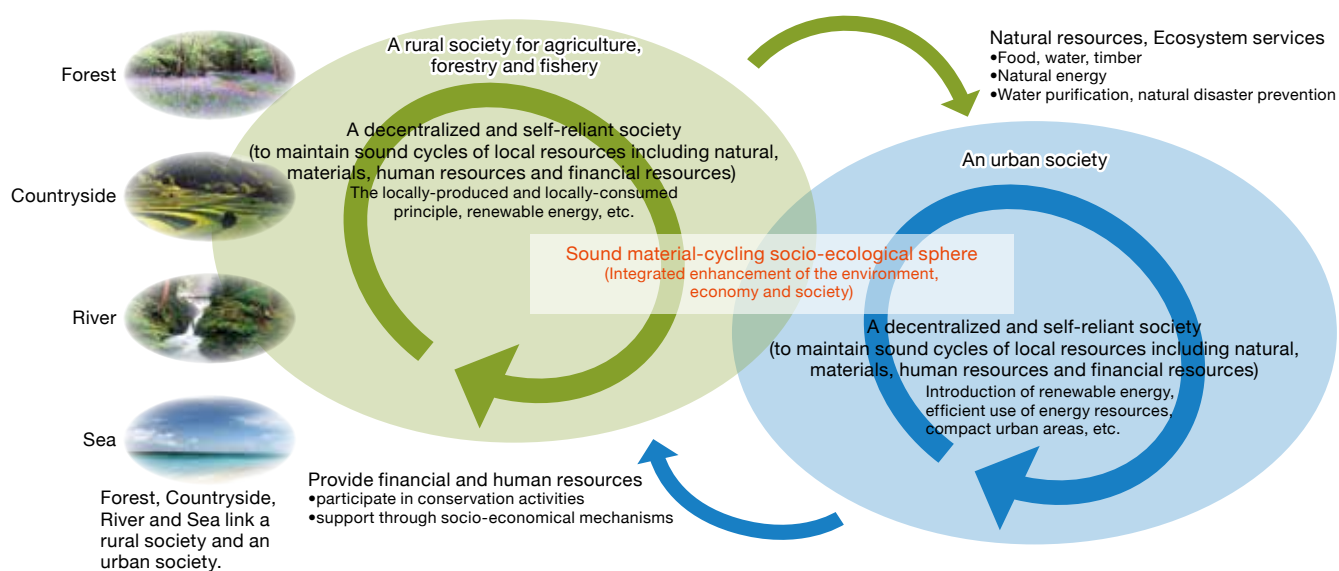
Sound material-cycling socio-ecological sphere

Creating sound material-cycling socio-ecological sphere is an approach in which different resources circulate in regions to form independent, distributed societies that are complementary and mutually supportive. Circulation and symbiosis represent Japan's long-term goals for building a sustainable society, and are incorporated in the current Fourth Basic Environment Plan. Circulation refers to achieving an economic and social system that places a smaller burden on the environment through the recycling and streamlining of resources and energy as well as efforts to curb waste at every level of socioeconomic activity. Symbiosis refers to the maintenance of a healthy ecosystem through appropriate efforts to preserve the environment in accordance with its characteristics while working to use resources wisely and engage in richer interactions.

Cities and agricultural, fishing, and mountain villages are notable for their complementary relationships. For example, since cities have limited amounts of renewable energy that can be supplied to meet local energy demand, the shortfall may be covered by supply from villages. In the same way, villages supply ecosystem services, including water and food generated from their natural abundance. And while the agricultural, fishing, and mountain villages are able to supply clean air and other ecosystem services, they lack the funds to pay for the cost of managing those resources, and thus receive the needed human and financial resources from the cities.

The complementary relationship mutually generates synergies. Creation of sound material-cycling socio-ecological sphere, in which each region conducts socioeconomic activities, is an important part of achieving sustainable communities built on the simultaneous enhancement of the environment, economy, and society.

Illustration of Sound material-cycling socio-ecological sphere



Source: An offer opinion of the Central Environment Council, "Building Society with an Integrated Approach to Low-carbon, Sound Material-cycle in Harmony with Nature"

The project on connecting and supporting Forests, Countryside, Rivers, and Sea

As we alter the forests, countryside, rivers, and sea, their responsible use gives us access to ecosystem services. The bounty generated by these forests, countryside, rivers, and sea is our shared natural capital.

Through development and overuse, however, the links between these resources have been severed and their quality has deteriorated. As climate change advances and the risk of natural disasters rises, lack of proper resource management due to population decline and aging may invite even greater deterioration.

Involving every citizen in effective management of our forests, countryside, rivers, and sea, as well as helping these areas to recover, can contribute to a more secure and abundant society sustained by the blessings of nature. This requires both repairing environmental links and support. Repairing environmental links refers to rebuilding the ties between our forests, countryside, rivers, and sea as well as managing our natural environment so that it recovers its original abundance. Support refers to having every citizen share in the cost of repairing these links. Repairing links and support of our forests, countryside, rivers, and sea are major keys to successfully building sustainable communities.