



Chapter 1 Sustainability and Quality of Life

Section 1 Trends in Sustainability and Quality of Life

1. The Origins of the Earth's Resources

It is believed that the early solar system was born from cosmic dust and gas. This dust and gas, which was collected in one place, caused nuclear fusion that converted hydrogen into helium, and the sun began to shine in the center of the solar system. Meanwhile, some of the dust encircling the sun gathered and became

planetesimals, then came together and evolved into planets, including the early Earth. (Figure 1-1-1).

Various atomic elements were included in the huge number of asteroids and meteors that impacted the Earth in the process of the birth of the early Earth. The mineral resources that originate from astronomical objects support our current social and economic activities.

It is thought that the surface of the early Earth melted due to the impacts of the asteroids and meteors, and was in an intense-heat condition as a magma ocean. The melted magma cooled and hardened, and the early continental shelf and ocean were formed. In these processes, metals such as heavy iron that were originally contained in the planetesimals moved into the inner core of the Earth. Subsequently, the current earth deposits were formed by activity of volcanoes and water (Figure 1-1-2). As for rare metals such as platinum, because much of them moved to the Earth's core 4.5 billion years ago, the rate of content in the crust is now low.

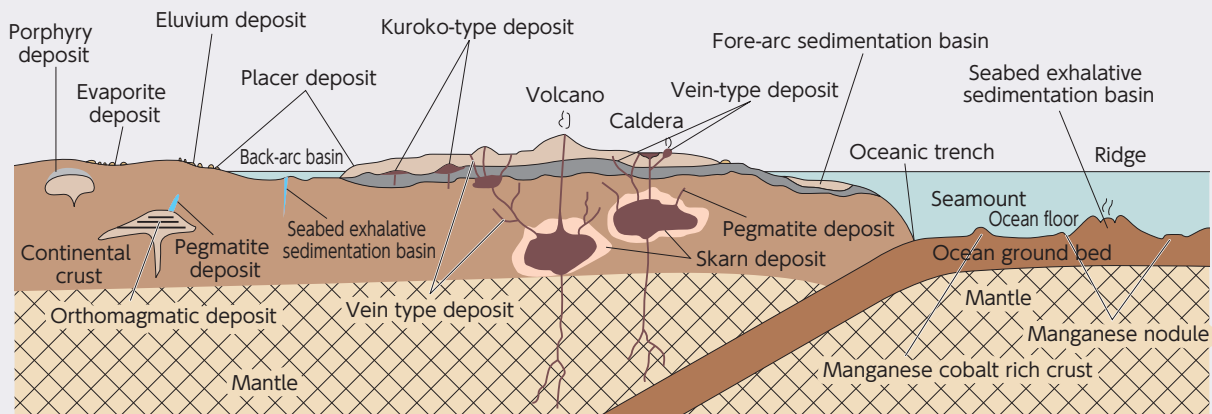
Rare earth deposits, whose value has been recognized in recent years because of their increasing demand, were either accumulated in magma reservoirs by volcanic activity, or accumulated by absorption on clay particles.

Figure 1-1-1 Early Solar Disk



Source: NASA/JPL-Caltech

Figure 1-1-2 Various Places where Ore Deposits are Formed



Source: "Introduction to the Earth and Planetary Science," edited by Kazunori Arita, Toru Takeshita, Shoshiro Minobe, and Shigeto Watanabe



In the former case, rare earth elements are sometimes mixed with radioactive elements such as uranium and thus are difficult to handle. In the latter case, they are comparatively easy to handle, but are very scarce because they only exist in extremely limited regions such as China.

It is thought that the first life forms arose from organic compounds in the early oceans approximately 4 billion years ago. Photosynthetic organisms such as blue-green algae appeared 3.9 billion years ago, and the oxygen level in the atmosphere of the early Earth started to increase. The oxygen then formed the ozone layer encircling the Earth, and protected the Earth from the sun's ultraviolet radiation. Because the atmospheric composition became similar to the current one and the climate became stable, the foundation of terrestrial ecosystem had been constricted. Subsequently, plants

moved onto land and ancient forests grew, and animals moved into the terrestrial ecosystems. These dynamics caused terrestrial ecosystems to be complex.

Fertile soil was created from the organic matter produced by those plants and animals. The organic matter mainly in the ocean got buried deep underground by movements of the plates, and strong pressure and enormous amounts of heat caused the organic matter to turn into the fossil fuels such as oil and coal that support our human activities today.

The various resources that we today obtain from the Earth were created over a long time since the Earth was born, and therefore they are limited. Mineral resources and fossil fuels are non-renewable on the human time scale, and they are biological resources that will be lost forever unless they are used in a sustainable way.

Column

The Asteroid Itokawa and the Earth

Our solar system consists of the Sun, eight planets and their satellites, and many small celestial bodies such as asteroids and comets. Counting only the asteroids and other small celestial bodies whose orbits are calculated, there are as many as 100,000, mostly existing between the orbits of Mars and Jupiter.

Except for the moon, humans have never landed directly on celestial bodies and obtained rocks and fine particles from them. Because large celestial bodies such as the Earth and the Moon have changed in composition significantly since their birth until today, it is not possible to know the composition of substances in the early stage of the solar system. If technology were available to bring back samples from asteroids (so-called "sample return") which have a comparatively fixed record of the composition of substances when the planets were born, it would be possible to obtain clues about the materials that created planets and asteroids.

The Japan Aerospace Exploration Agency (JAXA) probed the asteroid "Itokawa" in a mission of the

asteroid explorer "Hayabusa (MUSES-C)" launched in May 2003.

Detailed observation by Hayabusa found that Itokawa is a small celestial body of 540m in longest diameter and an average diameter of 320m, shaped like a sea otter floating on the ocean, with a surface comprising areas where rocks are exposed and areas where sand and gravel are accumulated.

This "Hayabusa" mission achieved a variety of results, such as the operation of an ion engine, a rendezvous with Itokawa using autonomous optical navigation for landing on asteroids, and various scientific observations of Itokawa. One of the greatest results was that it successfully brought particles from Itokawa's surface back to the Earth.

The fine particles were collected from the capsule that returned to the Earth in June 2010.

Some of the particles were identified as rocky particles by observation using an electron microscope. They have been under a series of physical and chemical analysis of things such as particle surface and inside composition, elemental composition, existence of macromolecular organic complexes and the types and content of mineral substances. It is expected that from the results of such analysis we will be able to obtain extremely valuable scientific knowledge related to the birth of the Earth.

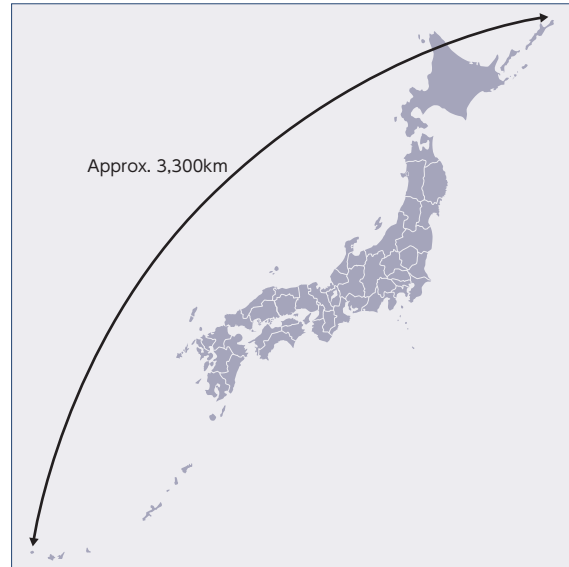
When Hayabusa landed on Itokawa in September 2005, Itokawa was in a position approximately 320 million kilometers away from the Earth. To make an analogy of the space traveling of Hayabusa (1m x 1.6m x 2.0m), it was precision work as if an approximately 0.02mm grain of sand ("Hayabusa") launched from the northernmost point of Etorofu Island in Hokkaido directly hit a grain of rice approximately 5mm long ("Itokawa") situated at the westernmost point of



Source: The Japan Aerospace Exploration Agency (JAXA)

Yonaguni Island in Okinawa Prefecture, and then again returned to Japan’s northernmost point.

Japan has thus contributed substantially to the world with the highest level of science and technology in order to study the history of the Earth and learn the paramount importance of the planet we live on.



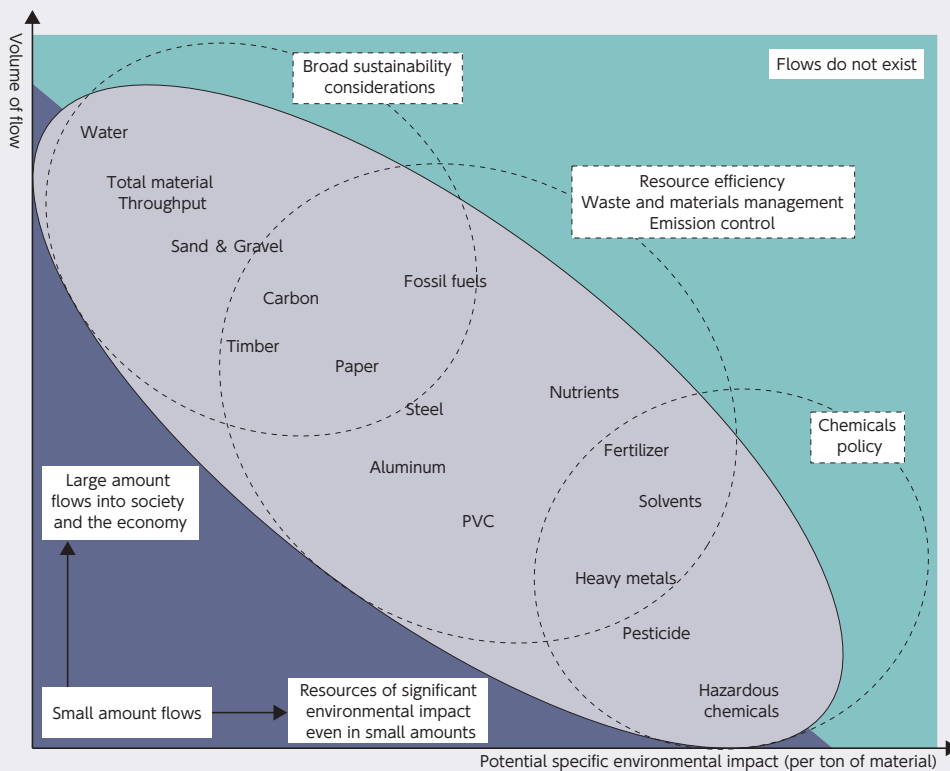
2. Sustainability and Quality of Life in Our Daily Lives

The Earth has limited resources such as fossil fuels, minerals and land, and renewable resources such as water, air, and biomass produced by living organisms. It also has energy resources absorbed from outside the Earth, such as sunlight, and those that the Earth has inside itself, such as geothermal energy. Our better lives and life satisfaction are based on these natural resources

of the Earth. In our social and economic activities, we are repeating the process of taking materials, using them, and then discharging the wastes and greenhouse gases into the Earth.

Some activities cause almost no impact on the environment and some cause significant impacts on the environment, such as emission of pollutants. However,

Figure 1-1-3 Amount of Materials and Potential Environmental Impact



Source: Created by the Ministry of Environment, based on *Measuring Material Flows And Resources Productivity* Volume 1. The OECD Guide



in the process of our daily activities today, there is an increasing trend that we use a lot of resources for mass production, consume a large amount of products, and then dispose a large amount of waste, with significant impacts on the environment (Figure 1-1-3). We must consider that these impacts have negative affects on not only our daily lives but also on biodiversity.

For our better lives, there are two important viewpoints for considering the sustainability of the Earth: the limitation of non-renewable resources, and the value of

biodiversity that can never be brought back once they are lost.

In the following subsection, we will give an overview of the progress in international awareness about sustainability and quality of life, and the world's efforts aimed at evaluating such awareness, and we will also discuss the status of sustainability and quality of life around the world and in Japan, focusing on environmental aspects.

3. Progress in International Awareness about Sustainability and Quality of Life

(1) The World History of Moving toward a Sustainable Society

In the 1960s to the 1970s, while environmental pollution became a large social problem in developed countries, the urgent task in developing countries was to break free from poverty. Amid such circumstances, in 1972 the United Nations Conference on the Human Environment was held in Stockholm. Based on the Stockholm Declaration, a framework for agreement and actions in order to promote environmental conservation were formed. However, there were conflicts between developed countries and developing countries over the awareness about environmental problems. The developed countries continued their lifestyle of mass production, mass consumption, and mass disposal and further expanded economic activities, while developing countries prioritized development in order to break free from poverty. This was development that could not be called sustainable.

Around this time, however, predictions about the future of humankind, such as the "Limits to Growth" (a report of Club of Rome) and the "Global 2000 Report to the President" (a report of the United States), were published, clarifying the limits of the resources on the Earth and environmental constraints, and greatly shocking the people of the world.

What triggered the establishment of the term "sustainable development" was the report "Our Common Future" by United Nations World Commission on Environment and Development, which had been established by the United Nations based on a proposal by Japan.

The "United Nations Conference on Environment and Development (the Earth Summit)" was held in Brazil's Rio de Janeiro in June, 1992, and an action program for sustainable development was adopted. At this Earth Summit, countries adopted the "Rio Declaration on Environment and Development," which is a principal of action toward sustainable development, and "Agenda 21," which is an action plan for the declaration. The United Nations Framework Convention on Climate Change, which was a decision for each country to cooperate with efforts to prevent global warming, and the Convention on Biological Diversity, which was a decision in order to conserve biodiversity and use it sustainably, were adopted by consensus. With such movements in the background, the concept of "sustainable development" became widespread throughout the world.

After that, international discussions about global

warming proceeded, and in 1997 the Kyoto Protocol was adopted at the 3rd Conference of the Parties to the United Nations Framework Convention on Climate Change that was held in Kyoto. In 2008, at the G8 Hokkaido Toyako Summit, the leaders of developed countries made declarations about global warming, including the goal of achieving at least a 50% reduction of global emissions by 2050.

Meanwhile, international movements concerning preservation of biodiversity and sustainable use also became active, and in 2002 the Johannesburg Declaration on Sustainable Development was politically declared at the Johannesburg Summit held in Johannesburg, South Africa. The 6th Conference of the Parties to the Convention on Biological Diversity (COP6) was held at The Hague in the Netherlands, and the 2010 Biodiversity Target of reducing the rate of loss of biodiversity by the year 2010 was decided upon. In October 2010, which was the year for achieving that target, the 10th Conference of the Parties to the Convention on Biological Diversity (COP10) was held in the City of Nagoya, Aichi Prefecture, and the "Aichi Targets," which would become new worldwide targets for preserving biodiversity, and the "Nagoya Protocol," which concerns access to genetic resources and benefit sharing (ABS), were adopted.

(2) Worldwide Efforts for Monitoring & Evaluation of Quality of Life and Sustainability

As concerns about sustainability increase, it becomes important to consider what true quality of life and sustainable development are. Although there are many different points of view concerning sustainable development, one of the widely accepted definitions is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs," which was indicated in the previously mentioned report "Our Common Future." Under this perspective, the world has made efforts for reconsideration of methods for measuring conventional development by scale of economic activity. That served as a trigger for spreading awareness of the necessity of measuring not only the scale of economic activity but also true quality of life, and the necessity of evaluating quality of life not only for the current generation but also that for the next generation.

Thus, in addition to the efforts for achieving sustainability, international organizations such as

Table 1-1-1 Major International Actions toward a Sustainable Society

Year	Name of the Treaty, Conference, or Documents and Publication	Notes (location, etc.)
1972	United Nations Conference on the Human Environment, Stockholm Declaration	Location: Stockholm, Sweden
	<i>The Limits to Growth</i>	By: The Club of Rome
1980	<i>The Global 2000 Report to the President</i>	By: The government of the United States
1987	<i>Our Common Future</i>	By: The United Nations World Commission on Environment and Development
1992	The United Nations Conference on Environment and Development (Earth Summit)	Location: Rio de Janeiro, Brazil
	The Rio Declaration on Environment and Development, "Agenda 21"	
	The Convention on Biological Diversity	
	The United Nations Framework Convention on Climate Change	
1997	The 3 rd Conference of the Parties to the United Nations Framework Convention on Climate Change "Kyoto Protocol"	Location: Kyoto City, Kyoto
2000	The United Nations Millennium Summit Millennium Development Goals (MDGs)	Location: New York, USA
2002	World Summit on Sustainable Development (Johannesburg Summit)	Location: Johannesburg, South Africa
	The 6 th Conference of the Parties to the Convention on Biological Diversity	Location: The Hague, Netherlands
2008	G8 Hokkaido Toyako Summit	Location: Toyako-cho, Hokkaido
2010	10 th Conference of the Parties to the Convention on Biological Diversity	Location: Nagoya City, Aichi

Source: Ministry of the Environment

the Organisation for Economic Co-operation and Development (OECD) and the United Nations have discussed development of indicators for measuring sustainability and quality of life, which has become an international trend (Table 1-1-2).

Under the United Nations Development Programme (UNDP), since 1990 the degree of human development has been measured by using the Human Development Index (HDI), which is a composite indicator that gives weight to and calculates individual values for income, life expectancy, literacy rate and schooling and education standards.

The "Genuine Savings" indicator developed by the World Bank in 1998 is a sustainability indicator that builds on the concepts of green national accounts, which take into account investments in human capital, depletion of natural resources and damage caused by pollution and carbon dioxide emissions. If genuine savings are negative, it means that there is a reduction of overall wealth, and that the current level of consumption is not sustainable.

The OECD has been publishing "Society at a Glance - OECD Social Indicators," "OECD Key Environmental Indicators," "Economic Policy Reforms: Going for Growth," and other various indicators related to the environment, the economy, and society to evaluate the status of progress of international society. These indicator sets have become widespread around the world as the basic indicators for measuring development.

In addition, at World Forums hosted by the OECD with the cooperation of the World Bank, the EU, the United Nations, and other organizations, efforts have been taken to measure society's progress and human development. In Istanbul, Turkey, the second forum

was held, and the "Istanbul Declaration (2007)" was signed. This declaration proposed recommendations for developing indicators in order to measure society's progress.

There are movements to reconsider GDP, which has been used to measure the scale of economic activities. Even if GDP indicates a country's income, it sometimes presents movement that differs from the degree of life satisfaction that people actually feel, due to factors such as that the status of household income is not sufficiently linked to GDP, that elements such as the quality of services and goods considered necessary for measuring human well-being are not included, that it is difficult to grasp housework and leisure that have not been commercialized, and that GDP focuses on short-term economic activity and does not emphasize long-term accumulation of capital such as natural resources and human capital.

The "Beyond GDP Conference," which comprises the European Commission, European Parliament, the Club of Rome, the OECD, and the World Wildlife Fund (WWF), is trying to define indicators that are optimal for measuring society's progress. This conference has discussed in order to have such indicators utilized in the public's decision-making and in policy-making. In 2009 the conference's results were published and five key actions for improving indicators to measure society's progress were announced as below:

1. Complementing GDP with environmental and social indicators
2. Near real-time information for decision-making
3. More accurate reporting on distribution and inequalities
4. Developing a European Sustainable Development Score-



Table 1-1-2 Indicators Set by International Organizations in Order to Measure the Status of the Environment, the Economy, and Society

Year	Party that Announced the Indicator, Etc.	Product	Objectives, Content
1990-	The United Nations Development Programme	Human Development Index (HDI)	An integrated indicator that targets 175 countries of the world for global assessment of countries' achievements in different areas of human development
1996		Sustainable Development Indicators (CSD indicator)	A set of 14 indicators that target 53 states and focus on sustainable development and assist decision-makers at all levels to adopt sound national sustainable development policies
1998	The World Bank	Where is the Wealth of Nations? Measuring Capital for the 21 st Century	An evaluation of sustainability by using indicators such as genuine savings to measure the savings in an economy after taking into account investments in human capital, depletion of natural resources and damage caused by pollution
2000-	OECD	Society at a Glance - OECD Social Indicators	A set of indicators for providing quantitative data on social equality, health, and social cohesion in OECD countries, in the general context of society, self-sufficiency, equality of income distribution, social welfare, and social cohesion (e.g. crime rate, suicide rate, life satisfaction)
2001-	OECD	OECD Key Environmental Indicators	A set of indicators for supporting evaluation of the status of OECD countries' environmental policy progress and political measures, and providing information to the public sectors (climate change, ozone layer, air quality, waste generation, freshwater quality, freshwater resources, forest resources, fish resources, energy resources, biodiversity)
2004-	OECD, the World Bank, EU, the United Nations, etc.	World Forum	A world-wide forum for encouraging awareness of what constitutes society's progress and assessment of progress of well-being. The first meeting was held in Palermo, Italy (2004). At the second meeting the Istanbul Declaration (2007), which proposed recommending development of indicators to work for social progress, was published. The third meeting (2009) was held in South Korea
2005-	OECD	OECD Factbook	A set of indicators providing a global overview of trends in the economy, society, and the environment, based on OECD statistics (population, GDP, consumer price indices, primary energies, gender ratios in employment, expenditures for research and development, international student assessments, public finance, life expectancy, emigration, etc.)
	OECD	Economic Policy Reforms: Going for Growth	A set of indicators for indicating a country's performance in relation to improvement of labor productivity and employment (product market regulation indicators, human capital, labor market, labor tax, labor market policies, etc.)
2007-	The European Commission, the European Parliament, the Club of Rome, OECD, WWF	Beyond GDP Conference	A conference for defining indicators that are appropriate for measuring society's progress, and how those indicators can be integrated in public decision-making
2009	OECD	Government at a Glance 2009	A set of statistics for evaluating government activities and performance and assessing fundamental issues of good governance (e.g. data related to government income, expenditures, and hiring)
	Commission on the Measurement of Economic Performance and Social Progress (CMEPSP)	CMEPSP Reports	Proposal of a system of indicators, requested by French President Sarkozy, for identifying the limit of GDP and measuring economic, environmental, governmental, and social quality of life and sustainability, focusing on the future and the current generation

Source: Created by the Ministry of the Environment, using the CMEPSP report "Survey of existing approach to measuring socio-economic progress," materials from the Cabinet's first Study Group for the level of happiness (December, 2010), etc.

board

5. Extending National Accounts to environmental and social issues

As requested by France's President Sarkozy, based on awareness of the limits of GDP and the need for measuring sustainability and quality of life, the Commission on the Measurement of Economic Performance and Social Progress (CMEPSP) has been established. A report by the Commission proposed indicator systems in order to measure quality of life and sustainability in environmental, economic, and social aspects. It also pointed out that there are various difficulties and that indicators are imperfect, because using a composite indicator is not enough for measuring quality of life and sustainability, since the way in which various items are weighted is arbitrary and the messages of results are ambiguous.

The report presents an approach that incorporates the idea that sustainability is securing quality of life for future generations.

The following examples of methods were given as ways

of measuring sustainability:

- 1) Development of composite indicators,
- 2) Dashboards or sets of indicators that gather and put in order series of indicators,
- 3) The System of Environmental Economic Accounting (SEEA), that account for the impact of the economy on the environment,
- 4) Adjusted net savings (ANS), also known as genuine savings, to measure the savings in an economy after taking into account investments in human capital, depletion of natural resources and damage caused by pollution, and
- 5) Environmental footprints, which measure the regenerative capacity of the biosphere.

The report proposes that it is important to use indicator dashboards that gather and put in order series of indicators, and proceed with measurement of stocks.

The report also suggests three ways of evaluating quality of life (QoL). The first is a subjective approach that evaluates people's satisfaction with their daily lives as a whole and then analyzes the results. The second is a

Table 1-1-3 France's 2010 -2013 Nine Strategies and New Indexes for Sustainable Development

	Highlight Index (Level 1)	Supplementary Index (Level 2)
Socio-Economic Background	0.1 Domestic gross income per person and GDP / citizen (EU) 0.2 Unemployment rate and underemployment 0.3 Income distribution 0.4 Birthrate	
Strategy 1 - Sustainable Consumption and Production	1.1.1: Productivity of raw materials	1.2.1: Change in waste generation; Biannual measurement at source, by type of waste 1.2.2: Percentage of waste recycling 1.2.3: Ratio of SAU in organic agriculture (goal: 20% in the year 2020) 1.2.4: Employment rate in eco-activities
Strategy 2 - Knowledge Society	2.1.1: 18 to 24 year olds who leave school before obtaining a graduation diploma 2.1.2: Percentage of research and development in GDP	2.2.1: Ratio of young people who have difficulties in reading 2.2.2: Comparison of the number of people who have obtained high school diplomas in the age groups 25 to 34 and 25 to 64 2.2.3: Ratio of people who pursue continuing education, by age group and social position 2.2.4: Barometer of knowledge in each household about the concept of sustainable development
Strategy 3 - Governance	3.1.1: Rate of participation by women in the upper levels of governance : Ratio of members of the Upper House	3.2.1: Rate of participation in the previous election of the same type 3.2.2: Participation in group activities (every two years since 2006) 3.2.3: Number of measures against climate change in local areas and the local version of Agenda 21
Strategy 4 - Climate Change and Clean Energy	4.1.1: Amount of greenhouse gas emissions (EU) 4.1.2: Carbon debt : In final domestic demand	4.2.1: Ratio of energy consumption per resident to GDP for energy consumption 4.2.2: GES emissions by sector
Strategy 5 - Sustainable Transport and Mobility	5.1.1: Energy consumption for transportation per resident	5.2.1: Distribution of transportation by type (car, bus, railroad, airplane) 5.2.2: Ratio of use of public transportation : Ratio against the total number of ground travelers 5.2.3: Distribution of transportation by type for commercial use 5.2.4: Amount of emissions of exhaust pollutant materials from transportation (NOX and aerosol)
Strategy 6 - Sustainable Conservation and Management of Biodiversity and Natural Resources	6.1.1: Number of wild birds (EU) 6.1.2: Change in ratio of land made artificial	6.2.1: Ratio of fishing resources for fish catches (EU) 6.2.2: Water quality analysis index for surface water 6.2.3: Consumption of phytosanitary products
Strategy 7 - Public Health, Risk Prevention and Management	7.1.1: Average life expectancy by occupation and average life expectancy of those who were born healthy (EU)	7.2.1: Accidents in the workplace 7.2.2: Work-related illnesses 7.2.3: Ratio of people unable to receive desired medical care (due to economic circumstances) 7.2.4: Suicide rate 7.2.5: Waste from nuclear power (every 3 years)
Strategy 8 - Demographics, Immigration and Social Inclusion	8.1.1: Rate of economic poverty after social movement (EU) 8.1.2: Comparison of employment rates among older people for the age groups 55-64 and 55-59 8.1.3: Young people's assimilation into society: Ratio of people aged 16 - 25 who are not in education, employment, or training	8.2.1: Number of households with excessive debt 8.2.2: Unprivileged living environment (payment arrears, difficulty obtaining housing, restrictions on consumption, etc.) 8.2.3: Overpopulation in housing environment 8.2.4: Salary disparities between men and women 8.2.5: Ratio of long-term unemployed people 8.2.6: National debt (against GDP), and corporate and household debt 8.2.7: Population composition by age
Strategy 9 - International challenges of sustainable development and the fight against world poverty	Development assistance by public organizations	Ratio of imported goods in domestic resource consumption

Note: "EU" within the table denotes indicators that use indicators common throughout the European Union

Sources: "Les indicateurs de la stratégie nationale de développement durable 2010-2013 from France's Ministry of Sustainable Development

"FY 2010 Policy Research on the Environment and the Economy" (Professor Masaharu Yagishita, Yuki Nishiguchi, et al. Sophia University) from the Ministry of the Environment

capability approach that conceives an individual's life as a combination of the various "doings and beings" (functioning) and his or her freedom to choose among that functioning (capability). The third approach is a welfare economics approach, based on theories of welfare economics, of weighting non-monetary dimensions of QoL in respect to people's preferences, such as fairness of income distribution.

Although these approaches are different, they also have similarities with each other. When measuring QoL it is important to focus on measurement of subjective elements (the individual situation and the person's actual feelings) and measurement of objective elements (health, education, individual activities such as leisure, status of governance, social connections, status of the environment, personal safety and peace of mind).

Further, based on these results, the Ministry of Sustainable Development of France adopted a National Sustainable Development Strategy for the period from 2010 -2013, including nine key challenges and indicators (Table 1-1-3).

As seen above, all these discussions about GDP's usefulness and its limitations, measurement of QoL, and measurement of sustainable development aim to establish an important evaluation method in order to achieve sustainability and life satisfaction so that future and current generations can both enjoy their lives. We expect that international discussions that include Japan will continue in the future.

In the next section, we will provide an overview of the sustainability and QoL of the Earth and Japan, mainly in terms of the environment.

Man is small and, therefore, small is beautiful.
 “Small is Beautiful” by Ernst F. Schumacher

Schumacher published “Small is Beautiful” in 1973, based on awareness of the problem of how to secure and expand humanity in modern society. This book coincided with the environmental pollution that became a social problem mainly in developed countries. At the same time, the United Nations Conference on Human Environment was held in Stockholm and the Stockholm Declaration was adopted (1972), and the world was trying to move forward toward building a framework for a sustainable society on a global scale. However, there still were continuous mass production, mass consumption, and mass disposal, in a way that could not be called sustainable. The book says that these human activities and technologies cause a crisis of eating up limited natural resources.

The book says that people find little satisfaction and lose their humanity because such modern style of production splits the work that used to achieve humanity and life satisfaction into pieces of work. This is the first crisis that the world faces. The second crisis is the ones of the environment that

supports human life but now is showing signs of collapse. The third crisis is the depletion of natural resources.

Schumacher writes that we should create “intermediate technology” that is appropriate for humans. This way of thinking is summarized by the words “Man is small and, therefore, small is beautiful,” which became the title of the book.

In this book, Schumacher also makes some epigrams. Schumacher says that it is too optimistic to expect that we can deal with the destructive forces by solving environmental destruction, conserving wildlife, discovering new energy and achieving agreements on peaceful coexistence.

The moral choices, he says, are necessary and it is possible to obtain justice (*justitia*), courage (*fortitudo*), and temperance (*temperantia*) with knowledge (*prudential*).

These are virtues that are absolutely essential for the continued existence of civilization.

Section 2 Evaluation of Sustainability and Consideration of Quality of Life

1. The Current Status of the World’s Sustainability

“As seen in the previous section, the life satisfaction is based on stability of the following three viewpoints: sustainable environment, economy and society.” In order to evaluate whether human life is sustainable or not, it is necessary to consider whether each of the following systems have been established and maintained: an environmental conservation system that allows the consumption of natural resources at an acceptable level of the Earth’s environment (environmental sustainability), an economic system that enables fair and appropriate economic activities (economic sustainability), and a social system that will ensure fundamental human rights and cultural and social diversity (social sustainability) (Figure 1-2-1).

In this sense, it is possible to think that the environment is the foundation of our society and the economy, because if environmental sustainability is lost, it will lead to degradation of our life and depletion of natural resources, which would affect social and economic

sustainability.

Dynamics in society and the economy affects the environment. For example, demographic dynamics is one example of important worldwide social changes in recent years. The world’s population, which was 3.7 billion in 1970, sharply rose to 6.8 billion in 2009. According to estimation by the United Nations Population Division, the increase of the world’s population has continued driven thus far by population increases in China and other East Asian countries, and India and the other Central and South Asian countries. From today until 2050, the population increase in East Asia will slow down, but the population in Central and South Asia will continue its remarkable increase, and the population increase in Africa will accelerate (Figure 1-2-2).

As for economic trends from 1970 to 2009, China had particularly remarkable growth in GDP, and Asia’s economy is growing, mainly in East Asia (Figure 1-2-3). Meanwhile, in Africa, GDP is not growing in comparison

