

The Japan Perspective

The role of scientific information in society

The Science Council of Japan

The Japan Perspective

Hiroyuki Yoshikawa
President of the Science Council of Japan

The Science Council of Japan represents the scientific community in Japan. It monitors the general status of scientific activities and their development, and provides scientific advice to society for making social decisions.

Scientific knowledge is essential to the decision-making process in all areas of society. Scientific advice can take many forms, but in principle, there are two basic types. The first type comes from research scientists, who suggest the kinds of research to be done, as well as the scales and methods of execution. This type of advice is based on intellectual curiosity or a desire to contribute to society.

The second type of advice is based on a scientist's unique experience within a specific scientific field. Using the scientific method, the scientist systematically pursues knowledge unhampered by contradictions, at least within a specific field. The scientist is thus able to offer advice that is neutral, effective, and does not contradict the advice from other sources. In this way, the scientist earns the trust of society.

Because it represents a wide range of scientific fields, the Science Council of Japan can make observations across a broad range of scientific fields and offer advice that goes beyond the scopes of these fields. Moreover, by establishing a harmony of purpose, the Council can expand the scope of its advisory role to all areas of academia.

Today, Japan must determine both its future direction and the contributions it can make to the resolution of global problems. The Science Council of Japan can offer advice that will help ensure that the best possible decisions are made. Presented herein is our interim report.

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Introduction

*by Kiyoshi Kurokawa
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Chairman of the Japan Perspective Committee*

Standing at the beginning of the 21st century, humanity wonders what kind of world lies ahead in the next one hundred years and what path should be taken. One thing is quite clear. To move forward, we must first look back. Specifically, we must look at the three events that defined the 20th century: two world wars, the explosive growth of science, and technology, and the rapid increase in the world population.

What prompted the explosive growth of science and technology in the 20th century?" Curiosity, a desire to better our lives, and a yearning for greater power. From these basic human needs arose new discoveries and inventions. Science and technology, however, did not develop simply because of the actions or desires of individuals. It developed because the Western powers, which had explored the world over a span of several centuries, finally conquered the last frontiers in the 19th century. Put another way, the land and resources that could be captured through territorial expansion had been fully exploited by the end of the 19th century. To overcome the finite limits to the Earth's bounty, we turned to science and technology.

Entering the 20th century, nations invested vast sums in the development of new weapons to use in wars over territory and resources. This strongly motivated scientific research and technological development, the results of which were eventually absorbed by the private sector and ultimately led to rapid and dramatic changes in the lifestyles of average citizens. While the speed of change at the dawn of the 20th century was clearly much slower than it is today, developments in the fields of transportation and communications were already laying the foundations of a global society through which goods, people and information could be exchanged on a worldwide scale.

We are now in the 21st century, and our relationship with science and technology has changed dramatically. Modern society cannot exist without science and technology, nor science and technology without social interaction. Academic research can no longer take place in a closed and narrowly delineated environment, now that science, technology, and society are so deeply intertwined. We scientists are being asked how we shall conduct ourselves and how science itself shall be conducted in the 21st century. Yet, the scientific community has become more

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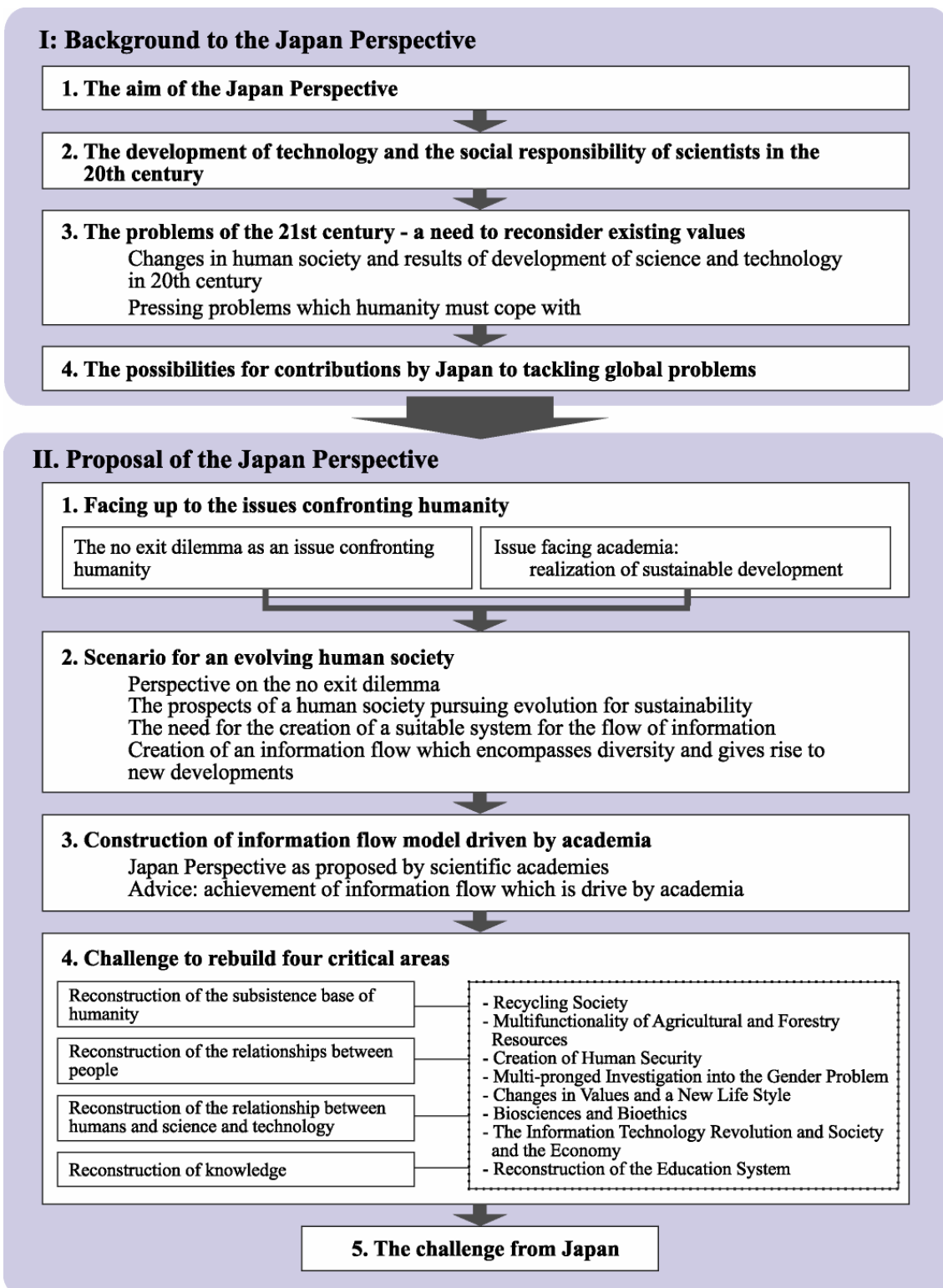
insular and the gap between the scientific community and the outside world has actually widened. If science and technology is confronting a crisis, it is rooted in this insularity.

The 19th-century crisis of limitations was overcome in the 20th century by developments in science and technology. Society enjoyed the fruits of those developments for many decades. By the end of the 20th century, however, humanity was once again confronted with a crisis of limitations brought about by the excessive consumption of energy and resources and the rapid population growth. This crisis was much more complex, larger in scale, and more all-encompassing and fundamental than the crisis experienced at the end of the 19th century. Today, we face myriad problems, including global warming, the destruction of the ozone layer, desertification, the shrinking of the rain forest, and the reduction of biodiversity, as well as high population growth in the developing countries, the North-South problem, and the spread and intensification of ethnic and religious conflicts.

The community of scientists will also experience changes in the 21st century. It must confront the global problems that emerged in the 20th century and shoulder the responsibility to resolve those problems, the origins of which can be traced back to science and the scientists themselves. In the 21st century, we scientists must look deep into ourselves and determine how, as both members of the scientific community and members of society, we can contribute to resolving these problems.

The community of scientists will also experience changes in the 21st century.

The Japan Perspective is the culmination of discussions held over the course of a year and a half by the Japan Perspective Committee, which was established by the Science Council of Japan. The fruits of these discussions are embodied in the form of this report. Our target audience is society at large. While many important issues have yet to be addressed, we have decided to directly face the demands of our times. We hope that you will read this report and give us your opinions and criticisms so that we may develop better prescriptions for change. We further hope that the Japan Perspective is merely the first step on our journey to fulfill our role and responsibilities as a scientific body and contribute to the betterment of humanity.



Composition of The Japan Perspective

The Japan Perspective

Executive Summary

Background

The aims of the Japan Perspective

The Japan Perspective provides a road map of the path that humanity should take in the 21st century. It offers a broad-based look at the various problems that confront our species, clarifies the fundamental nature and structure of such problems, and proposes a direction for humankind to take over the next 30 to 50 years.

The development of science and technology and the social responsibility of scientists in the 20th century

Today, our lives are highly dependent upon science and technology. In light of the turbulent history of the 20th century, we scientists must carefully consider the effects of our research on society.

The problems of the 21st century—a need to reconsider existing values

Changes in society and 20th-century developments in science and technology—particularly in telecommunications and the life sciences—have made it necessary to review our values. Moreover, many critical issues have arisen since the end of the Cold War, including security and sustainable development.

We must face these problems in the 21st century. The objective of the Japan Perspective is to confront the fundamental problem of how we can live within the finite resources of our planet while our economic activities expand and become globalized, the pace of life quickens, and new regional and ethnic values and world views emerge.

Japanese contributions to the solutions for global problems

As the first East Asian culture to incorporate Western science and technology, Japan is uniquely qualified to offer solutions to global problems. However, while Japan made rapid economic gains and has become the second largest economy in the world, the country has remained mired in an economic recession and rising social instability since the 1990s.

Japan's current struggles are due in part to a social framework that discourages individuals from achieving their full potential. Japanese society as a whole has lost confidence in its ability to move forward. As a result, it is unable to fully take advantage of its true strength and vitality. The Japan Perspective describes ways in which Japan can break free of its current malaise, as well as proposes a path that the country should take in the 21st century.

Proposal

Facing up to the issues confronting humanity

The no-exit dilemma

The Japan Perspective was proposed as a means of resolving the ‘no-exit dilemma’ that arose at the beginning of the 21st century. The term ‘no-exit dilemma’ refers to the problem of how humanity can continue to develop when the Earth is a closed system with finite resources.

Seeking sustainable development through technology

Sustainable development is becoming a goal around the world, but it will never be achieved if the no-exit dilemma is not resolved. National academies and international organizations of scientists are cooperating to support sustainable development. Japan’s national academy, the Science Council of Japan, is actively contributing to these efforts.

Scenario for an evolving society

Perspective on the no-exit dilemma

We can solve the no-exit dilemma in one of two ways. We can change the environment surrounding the dilemma, or we can change our values. Our society developed in the 20th century because we used science and technology to change the environment surrounding the dilemma. In the 21st century, however, sustainable development will be possible only if we are prepared to change individual and group values.

The prospects of society pursuing ‘evolution for sustainability’

We can achieve sustainable development within the finite resources of Earth by eliminating acquisitiveness, which, in turn, can be achieved by removing disparities and inequities while respecting cultural diversity and ensuring universal equality. This process is called ‘evolution for sustainability.’

Creating a system to promote information flow

Society can be sustained only by synchronizing and harmonizing the circulation of goods and information. ‘Evolution for sustainability’ requires the harmonious flow of goods through science and technology as well as a ‘flow of information.’ While the creation and transmission of information have yet to be scientifically systematized, the no-exit dilemma cannot be resolved within a fixed framework. Only by manipulating the framework or by coming up with new ideas (new information) and sharing these ideas with

others can the no-exit dilemma be resolved and ‘evolution for sustainability’ achieved.

In other words, the no-exit dilemma can be resolved by either changing the environment that surrounds the problem or by changing the awareness and values (probably via information flow) of those confronting the problem. However, history shows that the greatest impact on the resolution of no-exit dilemmas has come from the creation, application, and spread of new technology. This is achieved initially by means of information flow. Only when goods and information flow simultaneously can the no-exit dilemma be resolved.

Creating an information flow that encompasses diversity and encourages new developments

The Japan Perspective outlines a basic approach to solving the no-exit dilemma. It describes a system of information flow that encompasses diversity, new developments, and ‘evolution for sustainability.’ The creation of information differs from its transmission, but both require institutions that are independent and imaginative. In a world of uniform thought, new ideas emerge with difficulty, even with information flow, so diversity must be respected. The Japan Perspective’s fundamental paradigm applies to all of the world’s societies, including Japan’s.

Constructing an information flow model driven by academia

The Japan Perspective: advice from scientific academies

The Japan Perspective is a message from the Science Council of Japan. The message and points the way toward sustainable evolution and is aimed at both Japan and the world.

Constructing an information flow model driven by science

The no-exit dilemma can be resolved by organizing the flow of information from scientists and by creating a model for the free flow of information driven by science. Once the information flow is organized and functioning smoothly, the community of scientists can respond to the requests of society. Society can then take appropriate action. This flow of information can overcome the no-exit dilemma.

The challenge of rebuilding the four critical areas

The Science Council of Japan has identified four major problem areas related to the relationships between the flow of goods and society and the flow of information within society. The Council has established special committees

that are now examining ways to organize the flow of information from scientists.

1. Rebuilding the subsistence base of humanity

To achieve a recycling society, we must rebuild our subsistence base. We must also develop a value system that appreciates agricultural land and the forests not only as bases for production, but also as natural environments. Finally, safety and security must be sustainable and based on freedom from want and fear.

2. Rebuilding relationships between people

In order to build a new social system based on relationships between people, we must replace our male-centric social structure with one in which men and women have equal roles. We must also replace our materialistic values with ones that are more humanistic and embrace diversity.

3. Rebuilding our relationship with science and technology

Science and technology have both greatly strengthened and adversely affected our subsistence base. The relationship between humanity and science and technology must be rebuilt.

4. Rebuilding our knowledge of how information flows through society

We must reconstruct our knowledge base through new broad-based research and a new system of education. We must also use this new educational system to train and equip individuals to resolve the problems facing humanity in the 21st century. To achieve these goals, we must coordinate the actions of the concerned parties.

The Japan Perspective

Background to the Japan Perspective

Aims of the Japan Perspective

The Japan Perspective is produced by the Science Council of Japan, a community of Japanese scientists. The aims of the Japan Perspective are to establish a path for humanity to take in the 21st century and to actively contribute to the resolution of global problems. The Japan Perspective takes a broad view of the myriad problems that confront the world. It clarifies the structure of the fundamental problems and proposes ways to approach and resolve them over the next 30 to 50 years.

Mired in economic stagnation for more than 10 years, present-day Japanese society suffers from a deep and general malaise. Yet the country's level of scholarship remains high and capable of significant contributions to global affairs. By looking into the reasons for the economic stagnation and the social malaise, Japan's scholars can develop responses that will greatly benefit both Japanese society and the international community in the 21st century.

To this end, the Science Council of Japan has proposed an Action Plan for creating a path for humanity to take in the future. The first step of the plan calls for Japan to extricate itself from its current stagnation. Once this is accomplished, the country can assume a larger role in the international community, work with other countries to resolve global problems, and propose directions to take in the future.

The Science Council of Japan promotes the exchange of ideas among researchers in the fields of the humanities, social sciences, and natural sciences. The Japan Perspective distills and summarizes their ideas. These ideas, however, are based on information specific to a field of study. To ensure that they are properly discussed in the broad context of society, they must be widely circulated. Moreover, predictions of the future that have not been validated but are based on verified scientific information should be accepted. To this end, we provide advice that can be used to help achieve society's goals.

The Japan Perspective divides the many problems that plague the world into several historical categories. It then analyzes the problems and offers solutions. It also promotes direct dialog

The Science Council of Japan's Action Plan creates a path for humanity to take in the future.

among all generations—grandparents, parents and children—with an eye to setting directions for society over the next 30 to 50 years.

This report should be considered version 1.0 of the Japan Perspective. It does not cover all of the world’s problems, but rather serves as a summary of advice to Japan.

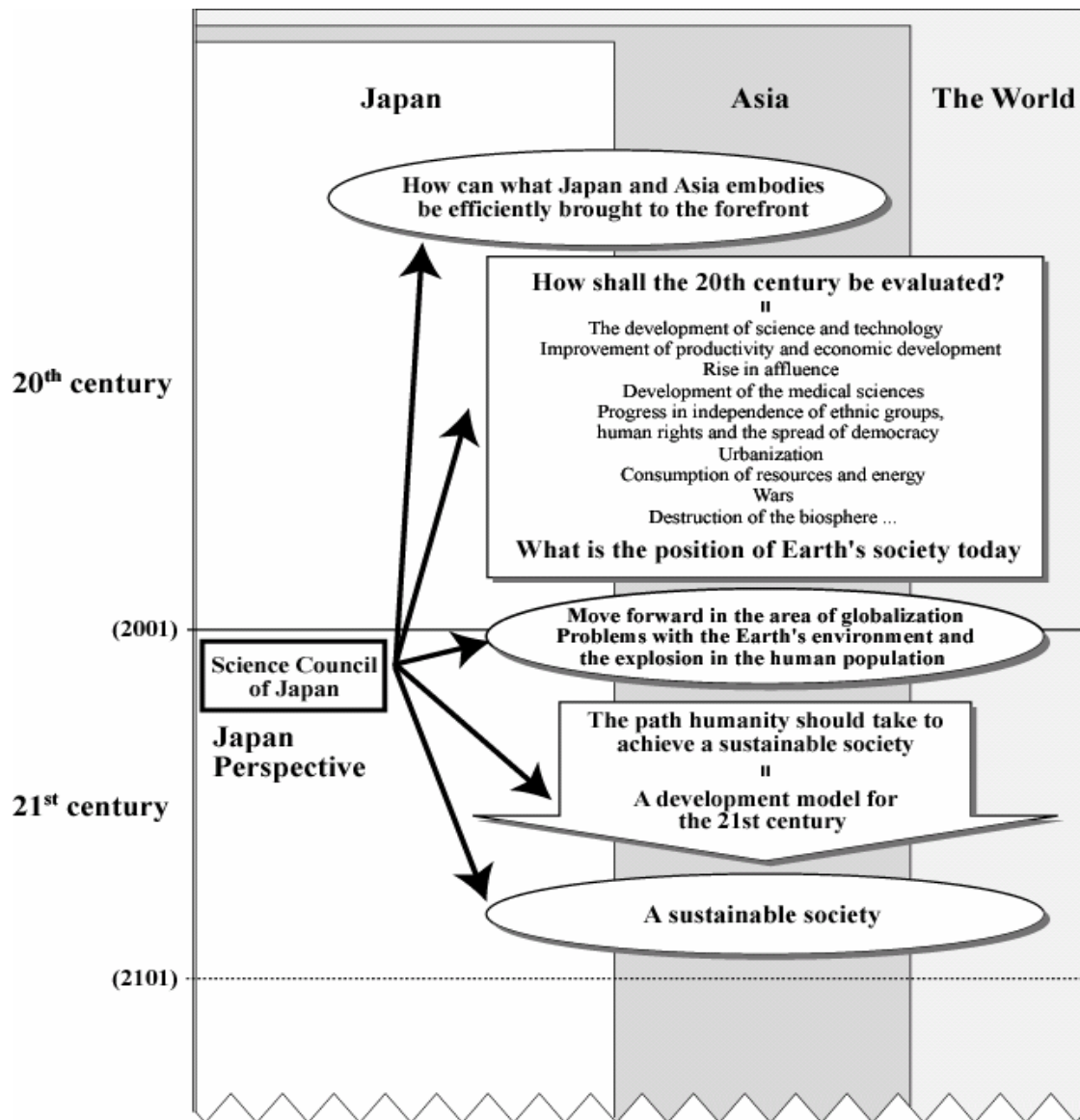


Figure 1. Investigative Scope of the Japan Perspective

The Japan Perspective examines the true nature of the problems which face us today on a worldwide scale based on a confirmation of the role which science and technology played primarily in the 20th century.

It also proposes the path which humanity should take in the 21st century to achieve a sustainable society.

The development of science and technology in the 20th century, and the social responsibility of scientists

The 20th century saw explosive progress in science and technology. While this progress led to greater social affluence and significant changes in life styles and values, it also resulted in major advances in military technology and extensive destruction of the environment. Our appetites for material goods and energy grew enormously, population growth rocketed, and the world suffered two major 'hot' wars and one 'cold' war. Now more than ever, scientists must consider the effects that their research may have on society.

The 20th century was indelibly marked by the development of science and technology. In terms of population growth and material and energy consumption, this 100-year period was the most prosperous in the long history of humankind. But the bright light of science and technology has cast deep shadows.

In just 100 years, the human population has nearly quadrupled in size.

In just 100 years, the human population has nearly quadrupled in size, growing from 1.6 billion at the beginning of the 20th century to over 6 billion at the end. This rapid growth in population is due to improvements in agricultural production capacity, the development of commerce, a drop in the mortality rate, and advancements in medical and health care that have increased the human life span.

War and conflict have been constant parts of human history, but the scale and barbarity that characterized the two world wars of the 20th century were unprecedented. The Cold War that dominated the latter half of the 20th century until around 1990 spurred enormous investments in the development of new weapons. Many scientific and technological developments in transportation, communications, nuclear energy, and chemistry had military objectives. In fact, the enormous advances in science and technology during the 20th century owed much to the huge investments made by nation states in their militaries.

For example, the Wright brothers' first flight in 1903 propelled humankind into a new sphere of activity in the sky. Lindberg made the first solo trans-Atlantic flight in 1927, and the first non-stop flight around the world was made in 1949. Our species then moved into space in 1961 with Vostok 1. We landed on the moon in 1969, and 12 years later, in 1981, the United States launched a reusable space shuttle.

In the shadows of these peaceful endeavors, however, less benign events were taking place. In World War I, the airplane became a weapon. By World War II, it could sink battleships and destroy cities. In 1905, Albert Einstein presented his theory of relativity. Forty years later, that theory, along with quantum theory, produced the atomic bomb. These events underscore the deepening connections between human conflict and science and technology.

In the latter half of the 20th century, military technologies evolved into civilian technologies that spread quickly and widely and opened the door to new possibilities and levels of affluence. Science and technology influenced all aspects of human life and economic activities. Products such as the television, telephone, automobile, computer and then the Internet have revolutionized and become deeply rooted in our way of life. New transportation and telecommunication technologies have dramatically expanded international trade and globalized our economic activities. But while the economies of each country have become more interdependent, regional differences have actually widened.

Medical research has provided tremendous benefits. Many diseases have been conquered by the discovery of bacteria and pathogens, the subsequent development of antibiotics, the discovery of the structure of DNA, advances in medical care equipment, the elucidation of the etiology of diseases, improvements in disease countermeasures, and the development of new drugs. As a result, life spans have been dramatically lengthened and the human population has grown. The world is becoming more urbanized, and international transportation and distribution are spreading. Living habits are changing, resulting in rapid rises in the incidence of diabetes and the emergence of new diseases such as AIDS.

Today the fruits of science and technology are becoming linked to each and every aspect of our lives. Consequently, scientists must consider very carefully the effects that their research activities will have on society and assume responsibility for these effects.

...scientists must carefully consider the effects that their research will have on society...

The problems of the 21st century—a need to reconsider existing values

The collapse of the Cold War framework revealed many social issues that need to be addressed in the 21st century. Among them is the fundamental problem of how we are to live within the limitations of the Earth's resources while expanding our global economic activities. This problem is complicated by divergent regional and ethnic values, making international cooperation essential. Many regions must now alter their values as a result of social changes and the development of science and technology.

The Berlin Wall was a powerful paradigm that molded much of the latter half of the 20th century. Its fall in 1989 brought an end to the East-West Cold War framework, but also exposed a variety of social problems, such as the destruction of the global environment, which had been hiding in the shadows of the Cold War's political and military confrontations.

The concept of sustainable development,¹ was set forth in the Brundtland Report, *Our Common Future*, which was issued by the World Commission on Environment and Development in 1987. Five years later, the United Nations Conference on Environment and Development (UNCED), popularly known as the Earth Summit, was held in Rio de Janeiro. At this 1992 conference, participating nations signed both the Convention on Biodiversity and the Framework Convention on Climate Change, which called on every nation to fight global warming.

The end of the Cold War structure also removed the lid from many conflicts and disputes that had been simmering beneath the surface of world events. These include long-standing regional conflicts, the endless cycle of revenge through terrorism and military action, the clash of values in the areas of government, economics, society, and religion, the growing gaps in the incomes of various regions (such as the North-South problem) caused by the globalization and liberalization of their economies. The events of September 11th in New York and Washington D.C., which ushered in the 21st century, symbolize the global problems we face.

¹ The report *Our Common Future* by the World Commission on Environment and Development defines sustainable development as: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Advances in science and technology are pressuring regions to change existing values. This, too, has led to new problems.

The spread of the computer and the Internet is changing politics, business, economy, daily life, and education. The nation-state and corporation can no longer effectively control access to information. We are now moving into a new and dramatically different world in which we are able to measure our lives and societies against those of other countries and regions. While this new world has the potential to promote the sharing of values, it can also facilitate conflict.

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Gender is one modern issue for which the flow of information has engendered both a sharing and a clashing of values. Women have made rapid and substantial inroads into societies around the world, particularly in Western countries, spurring a general reexamination of lifestyles and how society functions. Moreover, debate has arisen over the existence of universal gender values and, if so, whether they apply to the entire world. Issues such as this are increasing dramatically in number. All require careful consideration.

Advances in science and technology are also upsetting existing values in the field of bioethics. We are being asked to reconsider the most basic and fundamental elements of human society such as marriage, family, and the relationship between parent and child, in the light of rapid advances in genetic engineering, reproductive medicine, gene therapy, and cloning. Moreover, our attitudes regarding the definition of death and the line between "self and other" are being challenged by organ transplants, regenerative medical care, and the concept of brain death.

How Japan can help solve global problems

Japan was the first Asian country to introduce Western science and technology. It also has the second largest GDP in the world. But the Japanese social system is burdened by myriad problems, including a social structure that is designed to discourage talented individuals from achieving their potential. Japan has much to offer the international community. But first, it must open itself to the world.

Japan's history and position in international society have given it three perspectives: Japan, Asia, and the world. As a country that has embraced aspects of both Eastern and Western societies, Japan provides unique perspectives on the problems faced by the world community today.

Japan has a distinctive geography and history. An island nation off the eastern coast of the Eurasian continent, Japan is physically relatively isolated, yet it has creatively imported aspects from outside civilizations and systems. For example, its government, culture, and economy have all been influenced by China and Korea.

Japanese culture developed its unique aspects by integrating its core values with those of many other cultures. Japan dedicated itself to modernization in the latter half of the 19th century after the Meiji Restoration, becoming the first Asian country to incorporate Western science and technology. The aim of Japan's industrialization and economic growth was to catch up with the countries of the West, and many Western scholars and entrepreneurs were brought to Japan to help achieve this goal.

The modernization of Japan, however, was based on education. Beginning in the Meiji era and extended after World War II, a compulsory school system educated the entire population. This system of higher education and the country's economic growth ultimately resulted in higher intellectual levels among the general populace. Even today in modern, westernized Japan, the Confucian precepts that arose in East Asia and the Buddhist precepts that arose in South Asia deeply influence Japanese culture, and the value of harmony and the unique aesthetics of "*wabi/sabi*" still remain.

The modernization of Japan was based on education.

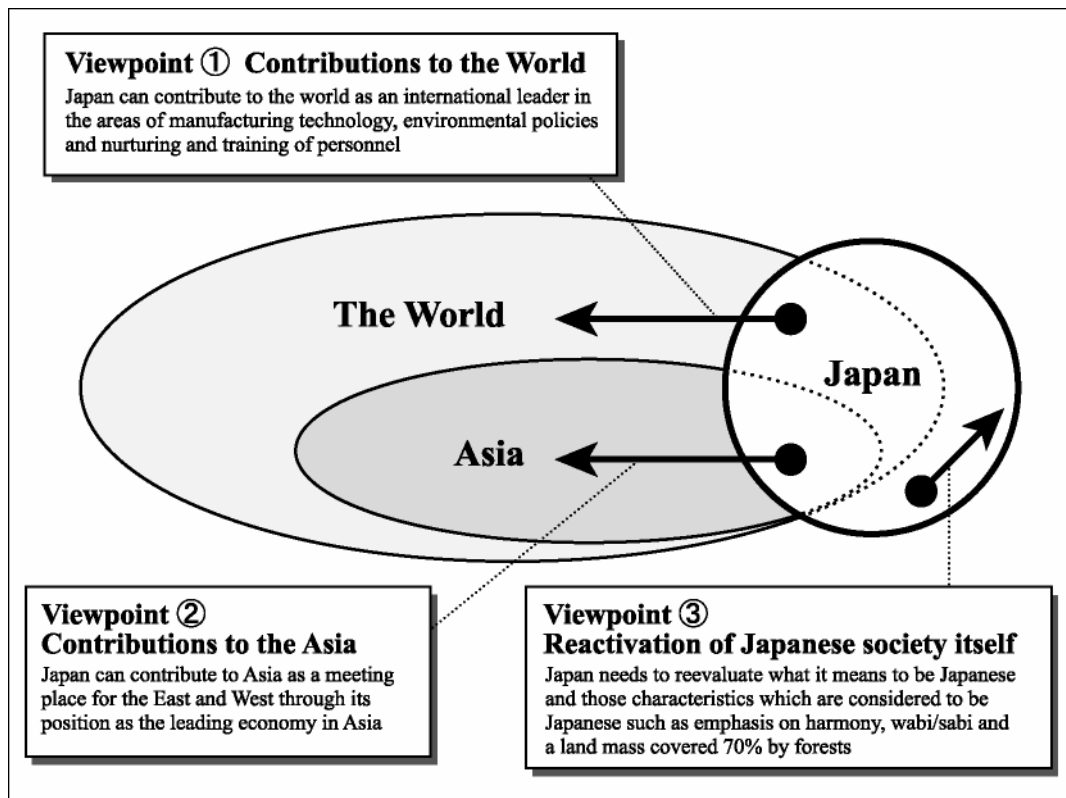


Figure 2. Three viewpoints from Japan

Viewpoint ③ is designed to reactivate Japanese society itself through a reevaluation of what it means to be Japanese and those characteristics which are considered to be Japanese, while viewpoints ① and ② are aimed at promoting contributions by Asia to the world.

As the world tackles the issues of the 21st century, Japan can offer valuable experience with both the positive and negative aspects of economic development. In the latter half of the 20th century, Japan became the most economically developed country in Asia, but this growth created many intractable social problems. For example, while urbanization and industrialization have substantially altered the landscape of this geographically limited country, 70% of the land remains covered in forest. Managing this land has proven to be extremely difficult. Questions have arisen about how to coexist with Nature while industrialization continues unabated. Japan has also experienced serious levels of pollution, some of it life-threatening. While the country has achieved a certain degree of success in reducing such pollution through scientific investigation into their causes, other environmental problems can be solved only by developing eco-friendly replacements for our internal combustion engine-powered transportation systems. Every citizen in Japan must pause and consider the nature of human values. What are the purpose and value of life? While modern Japan is richer than at

any time in its history, many social problems have arisen during the long economic downturn of the 1990's. Over the past three years, the suicide rate in Japan has increased by close to 30%. The rate has been particularly high for Japanese in their 40s and 50s, the peak years of productivity. In addition, the phenomenon of "*karoshi*," or death from job-related exhaustion and stress, emerged in the 1980's and became a major social issue with no counterpart in other countries.

The keys to Japan's revitalization lie in freeing the individual from the group and breaking down the group mentality that exists in the government, corporations, and universities. In the Japanese way of thinking, the organization is valued above all else and individual achievement is frowned upon. This has made it extremely difficult for individuals to apply their talents and abilities outside the framework of an existing organization.

Japan can make significant contributions to the world social order by creating an open, internationally minded society. The world expects the second largest economic superpower to have a major impact on international events. But the international community also views Japan with certain amounts of both worry and expectations regarding the responsibilities that Japan must shoulder, the role that Japan plays in international cooperation, and the philosophical doctrines that the country promotes.

Throughout the country's history, academics and scientists have made tremendous contributions to the development of Japanese society through their work in education, science, and technology. The Japanese scientists are extremely aware of the need for the scientific community to make a positive contribution to the healthy development of Japanese society and international cooperation.

The key to Japan's revitalization lies in freeing the individual from the group.

A Proposal

Confronting Historical Issues

The No-Exit Dilemma as a Historical Issue

Humanity faces a fundamental question at the beginning of the 21st century: How can the Earth's limited resources support unlimited development? The answer? They can't. Progress in the 21st Century will require a new idea: sustainable development.

Looking back at the 20th century, it is clear that we have reached the limits of our activities in this finite space called Earth.

In the several centuries prior to the 20th, Europe used its competitive advantages in seafaring, military technology, and economics to expand into the Americas, Africa, Oceania, and Asia. The United States of America pushed westward across North America, then moved into the Pacific and East Asia. Inevitably, these territorial ambitions met and clashed in two world wars and the Cold War. These conflicts were the result of reaching the limits of the Earth's land and resources.

In the latter half of the 20th century, the colonies in Asia and Africa declared their independence and territorial expansion came to an end. At the same time, industrial technology developed rapidly, replacing land and minerals as the source of prosperity. The advanced industrialized countries expended increasing quantities of energy and resources to create consumer lifestyles that were the envy of the rest of the world.

Even while these changes were happening, our perception of the Earth was shifting. Since the 1970's, we no longer view the world as a finite physical space, but as a system with limited resources and a delicate environment. In the 20th century, we exploited huge volumes of natural resources in the name of growth and development, but in the process, we pushed many species into extinction, destroyed our forests, and caused global warming and acid rain. If the 20th century was the century of global conflict, then the 21st century is likely to become known as the century of environmental destruction.

What happens when the Earth's population reaches 9 billion, as it is expected to do in 2050? Can we continue to develop at the same pace? In the 20th century, our response to the no-exit

dilemma was to look beyond the Earth for answers. No answers appeared. Clearly, the closed system that we call Earth has no external escape route.

At the beginning of the 20th century, the Western powers reached the limits of territorial expansion and began to grasp the implications of the no-exit dilemma. In order to achieve sustainable development, ways must be found to collect and fully exploit the wisdom of the human race. Scientists are now being asked by society how science and technology can be applied to solving the problems we all face in the 21st century.

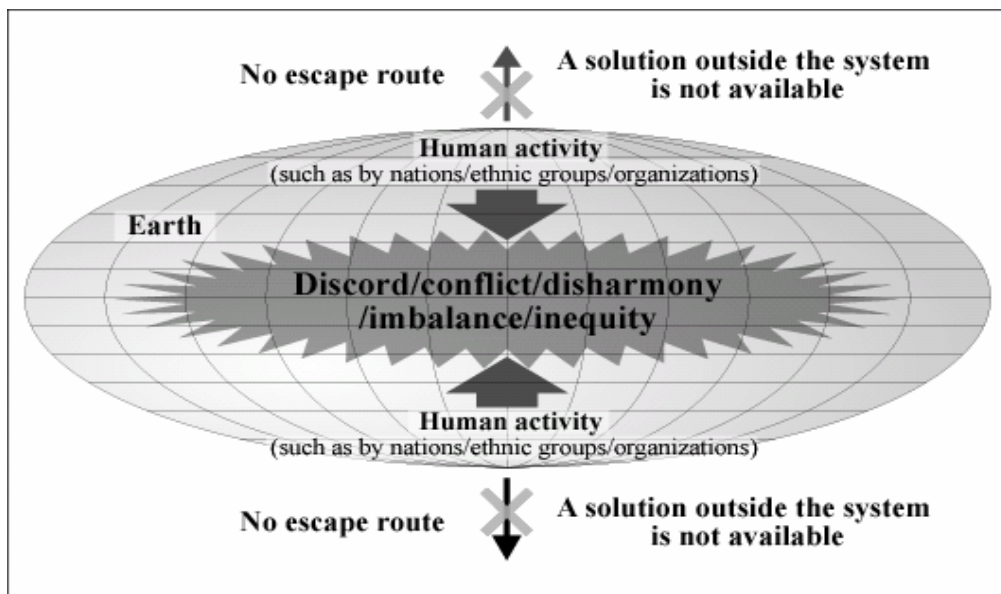


Figure 3. An outline of the no-exit dilemma

The problem of expansion of human activity on Earth must be resolved within the confines of the finite space of Earth. Thus the problem should now be based on the premise of a no exit dilemma which cannot be resolved by looking to the outside for a way out as humanity has been wont to do up until now. At the beginning of the 20th century, the Western powers ran up against the limits of geographical expansion, i.e., the no exit dilemma, which constitutes a serious threat to human society overall.

Contribution to society in the 21st century: achieving sustainable development

Sustainable development should be the goal of all societies. While this concept is gaining wide acceptance around the world, it is currently no more than an abstract thesis lacking concrete policies. Exactly how sustainable development can be achieved is still unknown, but the roles of science and technology and human wisdom (rational decision-making processes) in achieving this goal will be substantial.

Technology contributed to economic development and population growth during the 20th century, and will surely contribute to the attainment of sustainable development in the 21st century. But it is impossible for all the countries of the world to achieve economic growth via the path taken in the 20th century. The finite nature of the Earth is clear, as is the need for new policies that can lead to sustainable development.

A variety of International exchanges have addressed the issue of preserving the Earth's environment. The United Nations Framework Convention on Climate Change was signed at the Earth Summit held in Rio de Janeiro in 1992. The Kyoto Protocol Pact, signed at the Earth Summit in 1997, established specific targets for reducing carbon dioxide. And the World Summit on Sustainable Development (WSSD), held in Johannesburg in 2002, looked at ways to implement sustainable development.

Looking at all this activity, one could reasonably assume that the objectives of sustainable development have already been widely accepted. This is an important issue for humanity, so it cannot remain an abstract concept. We must confront the issue and develop a common knowledge base and plan of action.²

How can science respond to such a request? One way would be to present a quantitative simulation model covering the world's environment and resources. For example, by looking at the current figures for production and consumption of foodstuffs, it would be possible to determine the amount of foodstuffs needed in the future. Production could be expanded based on the

If the 20th century was the century of global conflict, then the 21st century is likely to be known as the century of environmental destruction.

² The action plan Agenda 21 was adopted at the 1992 Earth Summit (United Nations Conference on Environment and Development). In Chapter 35 of this document, entitled *Science for Sustainable Development*, four program areas were set down for the field of science: a. strengthening the scientific basis for sustainable management; b. enhancing scientific understanding; c. improving long-term scientific assessment; and d. building up scientific capacity and capability.

development of future production technologies, population growth, and changes in standards of living and life styles. It would then be possible to quantify the conditions necessary to supply the required level of foodstuffs. In this way, the total amount of air, water, plant and animal life, mineral resources and land that will be required by society can be estimated in light of the future growth of the population. By comparing these figures with current figures, we can also determine the level of sustainable development that can be achieved.

Science can also provide choices for human activities that promote sustainable development. In particular, the economically advanced countries must exercise self-restraint and aggressive leadership. For example, what social systems or new technologies can maintain the current level of affluence despite cuts in per capita energy consumption, and what types of mechanisms are necessary for sustainable development? It is hard to envision any field other than science being capable of proposing concrete and insightful responses to these difficult questions.

The International Council of Scientific Unions (ICSU), the InterAcademy Panel on International Issues (IAP), the InterAcademy Council (IAC), the Science Council of Asia (SCA), and other scientific bodies that represent the international scientific community have banded together and begun to take action. Movement is beginning to appear at the international level, such as at the United Nations World Summit on Sustainable Development (WSSD), held in Johannesburg in August of 2002. These activities demonstrate that sustainable development has become a critically important issue. The Science Council of Japan is taking a leading role in these endeavors.

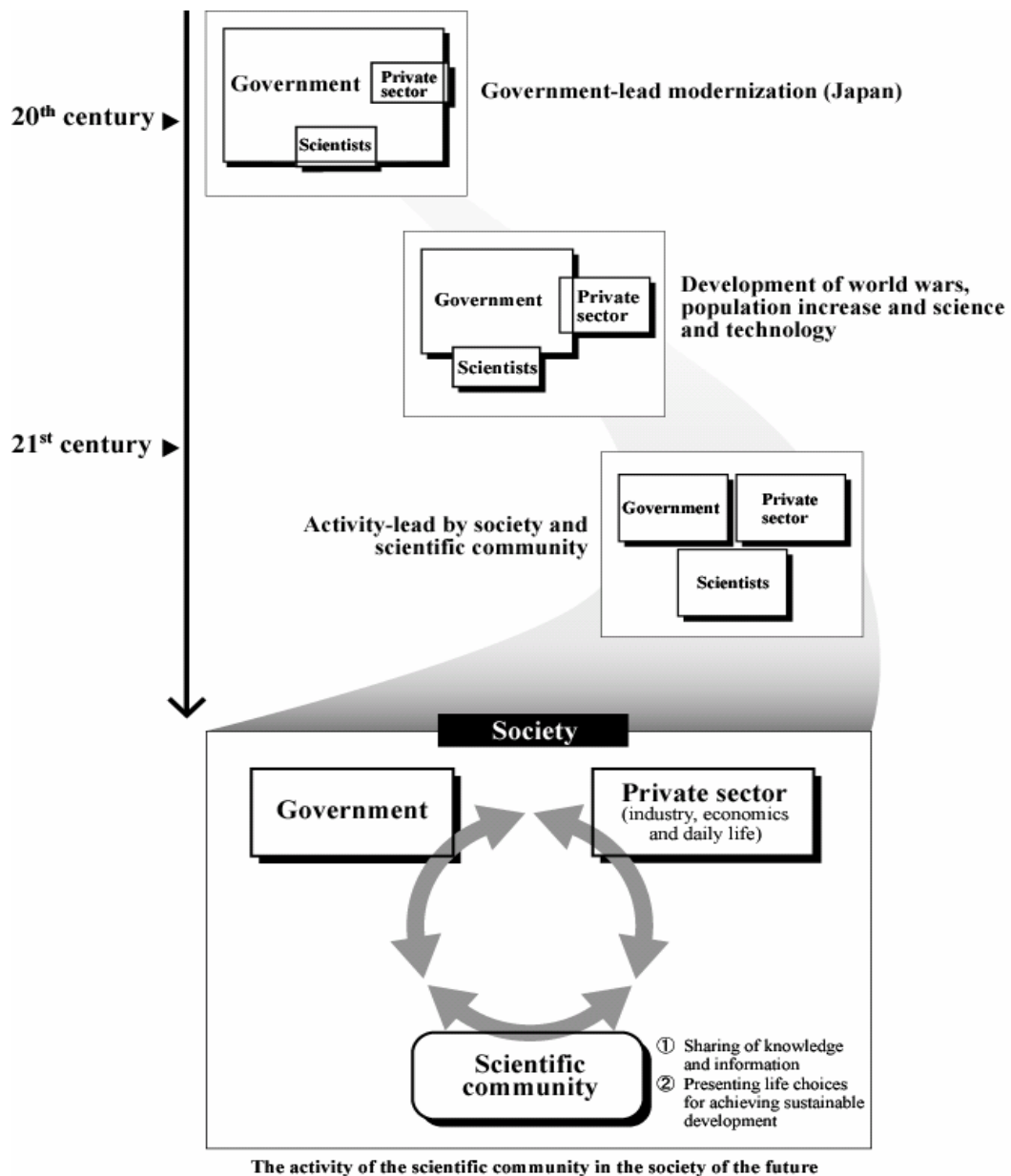


Figure 4. Development of the idea of the scientific community contributing to society

Japan in the 19th century achieved government-led modernization through the Meiji Restoration. Industry and technology were also broadly stimulated in the beginning by government contributions to state-run factors and national universities. As Japan entered the 20th century, the development of technology contributed to population increase and economic development, while the country also became embroiled in international conflicts. In the latter half of the 20th century, industrial development was striking in the private sector and economic activity expanded with Japan occupying a significant place in the global economy. The main activities of the Japanese scientific community were also conducted in the international arena. The scientific community in the 21st century is also being pressed to contribute to human society in the two areas of sharing of knowledge and information and presenting choices for achieving sustainable development.

Scenario for the evolution of society

Viewpoints on the no-exit dilemma

The no-exit dilemma has two solutions. The first changes the environment surrounding the dilemma. The second changes the prevailing awareness and values by which we confront the dilemma. Sustainable development is possible only by embracing the second approach and will depend on the evolution of a decision-making system covering both individuals and groups.

The no-exit dilemma defies solution under current conditions. Even if proposals are presented, contradictions and complications will make them extraordinarily difficult to implement. The no-exit dilemma can be solved only by changing both the conditions surrounding the dilemma and the values and standards of the people facing the dilemma.

At the end of the 19th century, humanity lived under the constant threat of epidemics. By the first half of the 20th century, however, diseases such as smallpox, cholera and the plague had been tamed by rapid progress in health care technology. Thus, a no-exit dilemma was resolved through developments in science and technology. We can expect more changes such as this to emerge in the future, including 1) changes in the creation and development of technical programs based on the natural sciences, such as energy-saving and recycling technologies, 2) changes in social programs, such as policies, systems, organizational structures, ethics, and customs, and 3) changes in individual programs, such as the manner of personal behavior.

One additional change concerns the values and level of wants and desires among individuals. Social leaders in particular must radically alter their awareness and values. We must scale down our materialistic expectations and learn to be happy with fewer goods and using less energy. By restraining our desires and revising our values, we will give ourselves more options for resolving our problems.

The rapid developments of the 20th century were based on a problem-solving approach in which the environment that surrounded the problem was changed. Technology-based programs were rapidly implemented, producing great changes from which great rewards were reaped.

In the 21st century, however, society faces issues that cannot be resolved using 20th-century problem-solving approaches. A new problem solving approach is required, one that is premised on

changing the awareness and values of those who are confronting the problems.

The adoption of sustainable development will facilitate the emergence of this type of society. In biology, the term evolution refers to genetic changes that arise over generations. The concept has been verified through detailed research, but when used to refer to society, the term means different things to different people. In our proposal, ‘evolution³’ refers to the qualitative changes that a stable social system adopts in order to create a new and equally stable social system in response to new conditions, such as climate changes or increases in population.

Prospects for a society governed by sustainable development

In pursuing sustainable development, it is important to consider the modern world’s inequalities, differences, and cultural diversity. Disparities and inequalities can be eliminated and sustainable development obtained only by suppressing and redirecting our desires and wants and recognizing the universality of society and respecting cultural diversity.

Achieving sustainable development will be enormously difficult. It will require eliminating the disparities and inequalities between the nations and regions of the world and even within nations. We have frequently seen the developed and developing countries clash over this point and noted the difficulties involved in achieving international agreement. As the North-South problem worsens, scientists are advocating world peace and universal equality. Their leadership will be extremely important to society in the 21st century. It would indeed be significant if the academies of Japan were to move in this direction, obtain the agreement of societies around the world, and achieve sustainable development. For this to happen, however, policies must be implemented on a global scale (for example, setting global limits on carbon dioxide), leaving little room for growth. A country that

³ In the term evolution is used in many fields other than biology, sometimes with negative connotations. For example, its use in the field of eugenics has many unfavorable associations. It also has less than stellar associations in Japan, where some have pointed out that the Japanese word for evolution has nuances that differ significantly from its English counterpart. Evolution as a biological term is a strictly defined term based on scientific fact, but when used in general society, it may conjure up undesirable associations from the past. In the Japan Perspective, however, the word is used only to broadly describe the path that culture should take to facilitate social progress in the 21st century.

fails to follow these global policies cannot expect the cooperation of other countries in its pursuit of benefits for its citizens.

Let's consider the following three paths. The first path sees the developed countries protecting their own interests and seeking their own high standard of living while pressuring developing countries to hold down their standards. Colonialism exemplifies this type of approach, which is clearly and totally contrary to the concept of human equality. Following such a direction could intensify regional conflicts.

The second path sees the developed countries suppressing the desires of their own populace. An example of this is the European concept of sustainable consumption. However, even if the developed countries were able to cap the standard of living and restrain production activities, it would simply freeze the present situation and perpetuate the current imbalances in wealth and other social disparities. Poverty and inequality would breed discontent in the population and incite conflicts and unrest both domestically and internationally.

The third path eliminates extreme disparities in wealth and rectifies inequalities and disparities. It has emerged as the best way to achieve sustainable development. Sustainable development is achieved by respecting the diversity of the world's cultures, ensuring universal equality, and changing values and restraining the desire for material goods. The World Summit on Sustainable Development in Johannesburg followed this third approach. This approach, however, may lead to uniform social systems in every country and region. Globalization breaks down the diversity of regional cultures and lifestyles by widening the flow of information and goods. When emphasis is placed upon the elimination of disparities, however, diversity breaks down and a uniform sameness emerges. The end result is that the world takes on the culture and lifestyles of a select group of developed countries.

Obviously, it is not desirable for society to lose its rich cultural heritage. Stability and peace are possible, however, so long as the world's countries and regions avoid reckless behavior and adopt new directions founded on an awareness of the Earth's finiteness. Independence can be protected and preserved by respecting cultural diversity, building relationships of mutual equality, and deepening mutual understanding.

The need for an appropriate system of information flow

Two basic characteristics of active societies are the flow of goods and the flow of information. Sustainable development can be realized only by achieving synchronicity and harmony in the circulation of goods and information.

Premised on the assumption of humanity's innate goodness, the sustainable development approach may seem naïve, but the approach is the outcome of deep and wide-ranging debate and is based on the relationship between people, goods, and information. In one view, societies form on the two axes of the flow of goods and the flow of information. Living organisms maintain their existence by adapting to their environment, specifically the flow of goods via processes such as the mutation, selection and replication of genetic information. These actions are all directed toward survival. Since society is a part of the living world, its only option for survival is to achieve sustainable development by establishing norms for the interaction between living organisms and the environment and by living in harmony with that environment.

The flow of information can be looked at conceptually from three standpoints. The first is the temporal flow of information that is stored and transmitted through the three stages of recording, retention and generation. Concrete examples of this process are the storytelling tradition, education, and libraries.

The second standpoint is the spatial flow of information that is transmitted through the three stages of generation, transmission and reception. Concrete examples of this process are the telephone, TV broadcasting, and the Internet.

The third standpoint is the format of the information flow. This is the conversion of the content and format of the information that is stored and transmitted and covers the conversion of media that contain information (paper into radio waves), the conversion of symbols (Japanese into English), and the conversion of meaning (the color white into innocence).

The creation of new information and its transmission are essential to the resolution of this type of no-exit dilemma, which can't be solved despite numerous attempts within a fixed framework. Achieving a flow of information, characterized as manipulating the framework, developing ideas for solutions (new

information) and sharing these ideas with concerned parties, will determine whether or not sustainable development is achieved.

It is reasonable to believe that a healthy flow of information by itself will enhance the possibility of resolving the no-exit dilemma. We must recognize that our societies were created by the flow of goods and information.

Two different approaches to solving the no exit dilemma were outlined above. The first changes the environment surrounding the dilemma, while the second changes the awareness and values by which this dilemma is confronted.

Awareness and values probably can be changed only via information flow. If we look back at the history of humanity, however, the greatest impact on the resolution of no-exit dilemmas has come from the creation, application, and spread of new technology. It has also impacted the flow of goods in the natural world and living beings other than humans. Specific examples include applications in farming, the rearing of livestock, the exploration and extraction of petroleum and mineral resources, the chemical industry, construction, the selective breeding of plants and animals, and biotechnology.

New technology is initially created, applied, and spread through information flow. The no-exit dilemma can be resolved only when goods and information flow simultaneously to produce social evolution.

Creating an information flow that encompasses diversity and gives rise to new developments

The Japan Perspective outlines a scenario for constructing a system of information flow that encompasses diversity, gives rise to new developments, and facilitates sustainable development as a basic approach to solving humanity's no-exit dilemma. The fundamental paradigm described by the Japan Perspective applies to all of the world's societies, including Japan's.

It is wholly inappropriate to look at the relationship between the no-exit dilemma and diversity and conclude that diversity is one of the causes of the dilemma. (“We can’t reach an agreement because there are too many different opinions.”) Moreover, the main thrust of the argument embodied in the Japan Perspective is that the key to resolving the no-exit dilemma lies in creating information. For that purpose, diversity is the only option.

The creation of information differs from the application and transmission of information, but both require primary institutions that are independent and imaginative. In a world of uniform thought, new ideas emerge only with difficulty, even with information flow. This is why diversity must be respected.

When diversity is embraced, the flow of information generally has the following format: mutual understanding, mutual recognition, mutual coordination, a fixed scope of agreement, and the formation of a new information space based on unity. When diversity is deemed desirable, mutual understanding and mutual recognition should not suffer. Moreover, agreements should be formed in mutual coordination and within a fixed scope of agreement, making necessary the formation of a new information space based on unity.

A desirable flow of information requires the selection of values based on the two foundations of scientific knowledge and rationality. Thus, the first task should be to create and expand databases in various fields that are firmly grounded in science. Simply accumulating scientific data isn't effective, however, because scientific knowledge undergoes a continual process of evolution. Moreover, binding agreements must be reached regarding the decision-making process for those problems with a high level of uncertainty.

Finally, values should be selected based on general agreement. The scientific community must aggressively promote descriptive and normative research into the science of value selection, specifically the rational selection of values that support democratically and socially based decision-making.

A desirable flow of information can be achieved in the following two ways. The first is to create public arenas for information flow (interface space). Examples of public arenas are consensus conferences and town meetings. Although small, public arenas traditionally have been an essential part of the policy formulation process.

The second way is to exchange personnel. Together, these two structures promote diversity and new developments, which, in turn, produce a desirable flow of information. Academia can make a huge contribution to the creation of the information that supports public arenas. Academia can also nurture individuals who have the ability to create information.

The message of the Japan Perspective is this: to resolve the no-exit dilemma faced by all of the world's societies, including Japan's, we must embrace the diversity that gives rise to new developments. As a basic paradigm for resolving the no-exit dilemma and achieving sustainable development, the Japan Perspective proposes a model for the free flow of information driven by academia.

Constructing an information-flow model driven by academia

The Japan Perspective: advice offered to scientific academies

Science and technology have now extended their reaches into every corner of society. The scientific community plays a vital role in the effort to achieve sustainable development, and its responsibilities are heavy. The scientific academies of each country and the scientists in various international organizations are working together to attain the common goals of humanity.

Issued by the Science Council of Japan, The Japan Perspective is a message aimed at both Japan and the world. Its objective is to point the way toward sustainable development.

Sustainable development is a topic of intense interest in countries and regions around the world. In 1987, the United Nations World Commission on Environment and Development (known as the "Brundtland Commission") issued a report, *Our Common Future*, stating that present-day society must use resources and the environment responsibly so that future generations will be able to enjoy them. The report also stated that this could be achieved through environmentally sustainable development.

Sustainable development covers the two common goals of all regions and nations: the elimination of poverty and the protection of the Earth's environment. Although everyone agrees with these two objectives, achieving both simultaneously will be difficult. Years of scientific study have shown that our activities are directly related to the deterioration of the environment; more activity leads to greater damage to the environment.

While we don't know precisely how to achieve sustainable development, science and technology are surely only part of the solution. In May of 2000, the Tokyo conference of the Academies of Science issued a declaration in support of sustainable development. The Science Council of Japan signed this declaration and has participated in activities aimed at resolving the sustainable development problem. Unlike the other academies, the Science Council of Japan includes in its activities the humanities and social sciences as well as the natural sciences. The Japan Perspective Committee also participates in these activities.

Today's information flow systems are self-contained and self-fulfilling. But the borders surrounding these systems are crumbling and a new borderless structure is emerging. While this new structure acknowledges the different qualities of the self-contained systems, problems are emerging associated with their diversity. What has become known as the "clash of civilizations" is actually a large-scale example of diversity. We are now in a transition period between the old structures of many self-contained information-flow systems, and a new and broader global system of information flow.

This new flow of information between the scientific community and society requires scientists to provide information to the public, industry and government. It also requires a three-pronged system of information flow linking industry, science and government. The ultimate goal is for one broad, all encompassing system to cover the entire flow of information in all of the areas that used to be handled separately or on a regional basis, such as communications, personnel, education, and databases.

Advice: create a model of information flow driven by science

By establishing order in the flow of information by scientists and achieving a model of information flow driven by science, we can overcome the no-exit dilemma and attain sustainable development.

The Science Council of Japan has identified four major problem areas concerning the flow of goods and information through society. Even now, special committees are working to establish order in the flow of information from scientists.

We can expect to encounter many difficulties in the 21st century, including the problem of how to achieve sustainable development. The problems related to the circulation of goods are already being investigated by such organizations as the Scientific Committee on the Problems of the Environment (SCOPE), which is part of the International Council of Scientific Unions (ICSU), as well as the International Geosphere Biosphere Programme (IGBP) and the World Meteorological Organization (WMO). Because the relationship between goods and society is complex, the Science Council of Japan has established the Special Committee on Achieving a Recycling Society.

Information flow is a relatively new concept. Currently, scientific research consists of observational research and planning research. Planning research provides advice to society

based on information gleaned from observational research. It formulates hypotheses for actions using knowledge from multiple, related fields to systematically predict the results of these actions and propose improvements. Observational research analyzes the properties of the subject of research in a particular field and then predicts changes in the subject of research.

There is an increasing need for broad-based research as part of the information flow among the scientific community. In society, groups known as ‘actors’ and ‘decision-makers’ can be found in politics, law, administration, education, industry, farming, commerce, medical care, welfare, the media, culture, and the arts. Information flows within and among these fields. Actors create change through their actions within society, but some of the effects may be unforeseen and not in line with their objectives. Actors typically monitor the situation through a weak loop of information. Putting scientists into the loop will enhance the flow of information in society, since they organize and link information from every field.

Information flow will grow in importance in the 21st century. The declarations and research activities of international scientific organizations such as the ICSU are excellent examples of modern information flow.

Two groups will drive the information cycle: the scientific community in response to the demands of society, and society in response to the proposals of the scientific community. At the heart of this cycle is the scientific community. Recognizing this, the Science Council of Japan has set up eight special committees that are working in different areas to create a model of freely flowing information driven by science. The eight areas targeted for study are, quite naturally, viewed from the perspectives of the flow of goods and information, and cover the following four critical areas.

1. Rebuilding the subsistence base of humanity: the relationship between the flow of goods and human activities.
2. Rebuilding relationships between people
3. Rebuilding our relationship with science and technology.
4. Rebuilding our knowledge of how information flows through society.

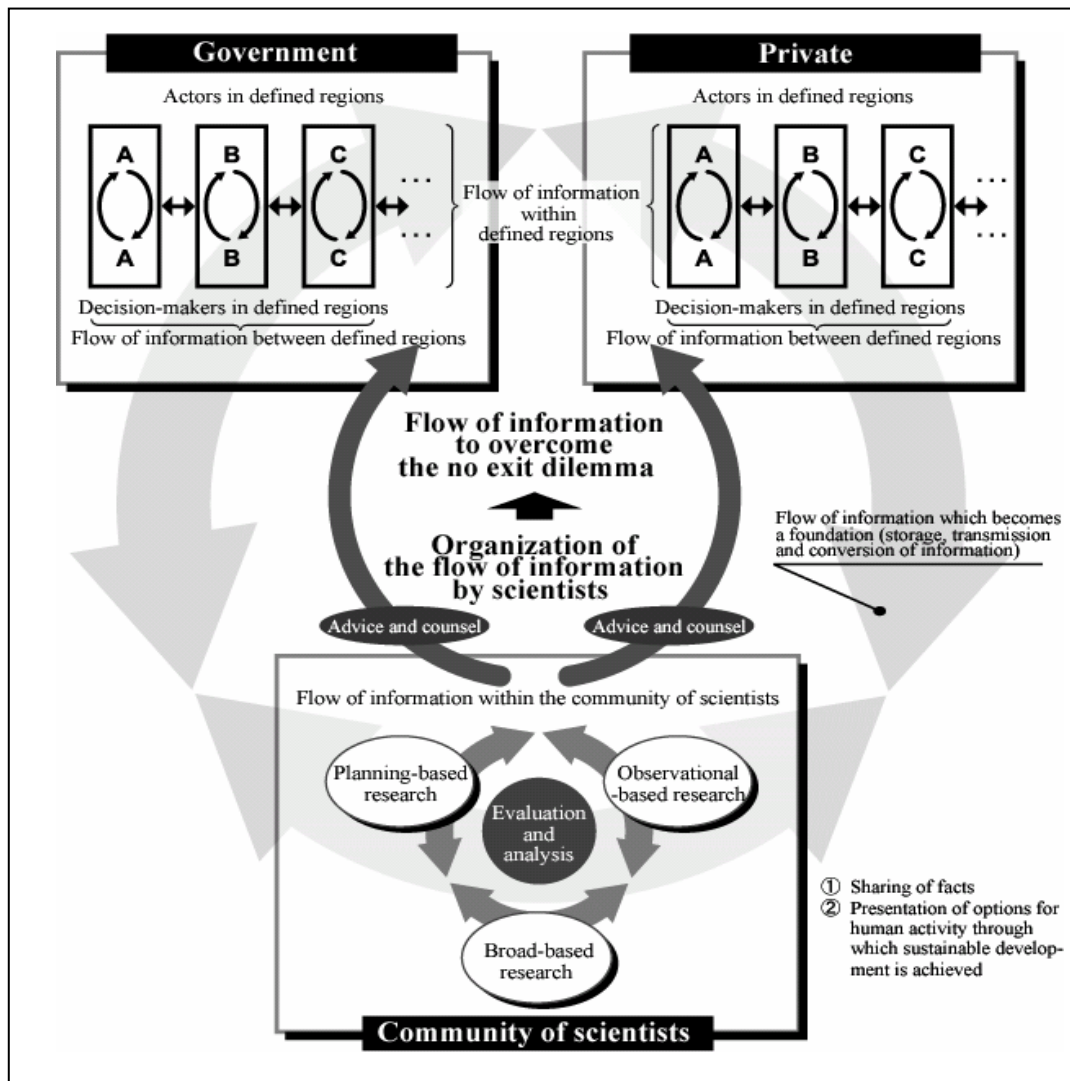


Figure 5. Model of information flow driven by science

The establishment of organization in the flow of information by scientists and the achievement of a free flow of information model driven by science which can overcome the no exit dilemma as a driving force is required in order to achieve evolution for sustainability. Scientists within the community of scientists engage observational research and broad-based research which encompass research across separate fields. An information flow has formed in planning research through which scientists offer advice to society based on the information which is embodied in the observation research and broad-based research. In addition, actors and decision-makers exist in their own defined unique areas of government and the private sector within society and information flows within and between these fields. It is anticipated that once the information flow is organized in this way by scientists and functioning smoothly, the community of scientists can respond to the demands of society and conversely, society can respond to the advice offered by the scientific community, then an information flow will emerge that will overcome the no exit dilemma.

The challenge of rebuilding the four critical areas

Rebuilding our subsistence base

To achieve a recycling society, we must rebuild our subsistence base. We must also develop a value system that appreciates agricultural land and the forests not only as bases for production, but also as natural environments. Finally, safety and security must be sustainable and based on freedom from want and fear.

In the 20th century, the development of science and technology led to an expansion of human activity that ultimately destroyed the very foundation of humanity. This foundation must be rebuilt if we are to survive in the 21st century.

The Special Committee on the Recycling Society has studied the problem and determined that society must evolve toward sustainable development based on the coexistence of humanity and nature.

Building a recycling society will require adjusting the human ecosphere to the workings of the natural ecosphere. Initially, laws should be enacted that promote the creation of a recycling-based society. This will eventually lead to fundamental changes in energy policies, industry (which will learn to recycle resources), and lifestyles.

Technical developments, economic and legal measures, and the establishment of the ethics of recycling will form the basis for social consensus. Intergenerational ethics, societal ethics and ethics of daily life should be shared, and research should be performed based on the established ethical climate.

The Special Committee on the Multi-functionality of Agricultural and Forestry Resources has pointed out the downside of material prosperity: environmental problems. These are created when economic development is guided by market principles that focus on economic efficiency. In the future, agricultural and forestry resources must be developed under the principle of multi-functionality, which holds that agricultural land and forests are both bases for production and natural environments. Developing such resources requires balancing economic, environmental, and quality of life values. Disagreements concerning agricultural trade and the multi-function role of agricultural and forestry resources reflect

regional differences in environmental conditions and cultural/political perspectives.

Japan's approach to agriculture and forestry could have a major impact on the fate of many countries engaged in small scale farming, such as the developing countries. While the scale of agriculture in Japan is restricted and agricultural villages in the mountains are disappearing, their management still requires an evaluation of their agricultural and forestry resources under the principle of multi-functionality. The world's agriculture and forestry resources should be similarly allocated and managed.

The globalization brought about by science and technology and economic expansion in the 20th century has had a huge impact on the nation state, particularly in terms of safety and security. While these issues have been concerns of society throughout the ages, the development of nation states, national economies, and science and technology have created new worries, according to the Special Committee on Human Security.

Fear and want are part of the backdrop to international terrorism, regional conflicts, and wars. Further development of science and technology will give rise to new types of fear and want. To structurally eliminate fear and want from the nation-state system, broad-based disciplines covering the separate issues of safety and security must be developed to monitor developments in science and technology.

Rebuilding relationships between people

In order to build a new social system based on relationships between people, we must replace our male-centric social structure with one in which men and women have equal roles. We must also replace our materialistic values with ones that are more humanistic and embrace diversity.

The expansion of human activity has led to disharmony between society and the relationships among people. To move human society towards sustainable development in the future, we must replace the current social system with one that fosters relationships between people.

The 20th century was marked by social progress for women and a move away from male dominated societies. This movement was due in large measure to the inroads made by democracy and technological innovations. The Special Committee on Gender Issues is looking into how to achieve male and female equality on

an international basis and address systemic disparities that are based on differences in culture and customs. All individuals, regardless of gender, must be guaranteed the opportunity to use their talents, and society must respect diversity in personality, characteristics and qualities.

The values of materialism have produced economic prosperity, but they have also brought about environmental problems and economic disparities (the North-South problem). To resolve these problems, the Special Committee on Changing of Values and New Life Styles proposes new values and life styles that emphasize long-term considerations regardless of the short-term drawbacks.

As an island nation, Japan has always been relatively isolated. During the Meiji Restoration of the mid-19th century, however, the country developed a near-fanatical respect for Western science and technology. This has produced the world's second-largest economy, but in the process, Japan has lost its way spiritually. To rediscover its true spirit and soul, Japan must somehow develop new ways of thinking that embrace change and diversity.

Rebuilding our relationship with science and technology

Science and technology have both greatly strengthened and weakened our subsistence base. The relationship between humanity and science and technology must be rebuilt.

Science and technology underwent remarkable development in the 20th century greatly improving productivity and reducing mortality, But science and technology also brought humanity closer to the limits of the Earth, and their unforeseen adverse effects are now casting a long shadow across society. Our relationship with science and technology must be rebuilt.

The life sciences have undergone considerable development in recent years, reaching a stage where we can now manipulate life itself. According to the Special Committee on the Overall Image of the Life Sciences and Bioethics, we must review the effects on society and bioethics of new developments in reproductive medicine, cloning technology, and genetic analysis and diagnosis. While humanity has reaped significant benefits from the progress in the life sciences, many questions have been raised about its ethical, social, and legal implications. This has produced much uncertainty over the use of these developments.

To achieve social consensus on their use, we must rid ourselves of this uncertainty.

Extraordinary advances have also been made in information technology. Technological innovations, the computer, and the Internet are the foundation for globalization, which has had a huge impact on industrial and social activities. Incorporating this technology in a full-scale structural reform of the Japanese economy will allow Japan to make full use of its power and capabilities. According to the Special Committee on the Revolution in Information Technology and the Economy and Society, the most effective long-term strategy for reforming the Japanese economy is information technology. Science and technology will improve productivity in the private sector over the short- and mid-terms, but qualitative changes must also be implemented in society's 'software' infrastructure: the legal system, government bureaucracy, and education and research institutions. As science and technology continue to advance, the social system itself must be adjusted and 'upgraded' to ensure that society as a whole receives the benefits of these advances.

Rebuilding our knowledge of how information flows through society

We must reconstruct our knowledge base through new broad-based research and a new system of education. We must also use this new educational system to train and equip individuals to resolve the problems facing humanity in the 21st century. To achieve these goals, we must coordinate the actions of the concerned parties.

The expanding roles of science and technology have led to numerous problems in our academic and education systems. The Special Committee on the Rebuilding of the Education System proposes rebuilding our knowledge base by constructing an interdisciplinary, integrated and broad-based learning system without the conventional vertically divided fields of specialization. This will require careful consideration of globalization and the use of technical information, so the Committee also proposes reorganizing the educational curriculum and education method in order to train personnel to handle the issues facing society in the 21st century. This will require expanded educational support systems. The traditional school-based education system will remain, but new social education and lifelong learning systems will become important. Cooperation must be encouraged, as must competition unfettered by

regulations. Scientific journalism must also be enhanced to ensure that the results of academic research reach the public.

Broad-based research into various issues must continue, particularly into the issues of safety and security. Gender bias, which has dominated academic research up to now, must be corrected by encouraging a new gender-free view of society.

Rebuilding our knowledge base is at the heart of the model of information flow that is driven by academia. Any actions to this effect should be undertaken in harmony with other actions to ensure maximum efficiency. Among the individuals who form society, there should be no contradictions in their awareness and recognition of societal problems. The aim of these efforts is to ensure that every individual has an equal opportunity to achieve their potential. This is the objective of the Japan Perspective.

The challenge from Japan

The no-exit dilemma is at the heart of the issues that confront humanity at the beginning of the 21st century. The solution—and ultimate goal shared by all humanity—is sustainable development.

The Japan Perspective proposes a two-pronged approach to achieving sustainable development: create a model of information flow driven by academia that encompasses diversity and gives rise to new developments, and rebuild the four critical areas. By setting up a formal flow of information within society, actions taken in the past can be corrected by the actors, who see the outcomes of their actions through their interactions with other actors, resulting in a cycle of constant improvement. For this to work, each actor must accept the existence of other actors (members of the same diversified society) and understand his or her relationships to the other actors. In this way, the flow of information actually forms a foundation for embracing diversity.

The prospects for this happening, however, are not good at the present time. Nor is it certain that an actual organized flow of information can be established soon. For these reasons, the current Japan Perspective should be considered ‘Version 1.0.’ In the future, the Japan Perspective will direct its efforts toward establishing dialogue with other academies in the world while calling for scholars in Japan to join the community of scientists. Their goals will be to create a new system of science, promote research activities oriented towards rebuilding the four critical areas of social interaction, and formally organize the flow of information.

Taking a neutral and broad-based viewpoint...selecting and nurturing scientists who are interested in the actions of actors in society and the decisions made by decision-makers...contributing to the organization of the flow of information and ultimately acknowledging the position of these scholars. Through these activities, the community of scientists in Japan will be able to provide Japanese society with effective advice for overcoming the no-exit dilemma and achieving the goal of sustainable development.

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