

Special Presidential Committee Report

-- The Future of Civil Engineering and the Role of Civil Engineers --

March, 2007

FY2006 Japan Society of Civil Engineers Special Presidential Committee

Introduction

The civil engineering and civil engineers in Japan are continuing to face difficult circumstances and various issues due to loss of reliance of the public. The public has criticized improper investments for construction of unnecessary infrastructures and illegal conducts in the bidding of public projects, while the investment for the construction of infrastructures is reducing because of the financial deficit of the central and local governments. Furthermore, there are claims in the public that the social infrastructures are developed in Japan more than necessary and no further money should be spent. On the other hand, excessive price competition in the construction industry has increased fears for the quality decline of the public works and has worsened the working conditions as compared with the other industries. Civil engineering is considered to be an unattractive occupation these days, and the number of young people choosing it as a career has shrunk conspicuously.

Many experienced civil engineers belonging to the baby boom generation of Japan have begun to retire in recent years, and the transfer of experiences and knowledge to young generations is becoming more difficult. That is also resulting in the quality decline of the construction works. The civil engineering community is overwhelmed by pessimism about the future and is struggling in the darkness without finding ways to overcome these problems.

The Japan Society of Civil Engineers (JSCE) initiated an action plan in 1999 to resolve these urgent issues in civil engineering. Firstly, in order to regain public's reliance in civil engineers and in public works, it amended the ethics code, which had been initially enacted in 1938. The JSCE research committees and the special presidential committees formed by successive presidents have studied various issues in civil engineering such as population reduction and aging in Japan, transferring technology and knowledge to next generations, and prevention of improper conduct in bidding of public construction projects. JSCE has further sought to deepen its cooperation and collaboration with public by establishing social support and communication divisions to improve society's understanding on public works. The results, however, have not yet become fully apparent. Furthermore, we have been continually emphasizing that construction and improvement of infrastructures of Japan are inadequate as compared with the other developed countries. Consequently this will, in turn, result in reduction of Japan's international competitiveness and its power as a nation, and seriously jeopardize the country's safety and security against natural disasters. However, these messages from civil engineers have not been fully understood by public, yet.

Meanwhile, the explosive growth of populations, and the shortages of water, food, and energy have been becoming serious problems in the developing countries. The threat of natural disasters increases while the natural environment deteriorates. In these regions, the development and the improvement of social infrastructures becomes an issue of even greater urgency. The advanced civil engineering technology of Japan can be deployed to solve these issues in those countries.

The American Society of Civil Engineers (ASCE) held the Summit on the Future of Civil Engineering in Washington, DC in June 2006. Some 60 engineers and researchers holding leadership positions in the United States and other countries participated in the summit. They discussed the social conditions that the civil engineering community will face in the next two decades, the leadership of civil engineers to provide solutions to the problems they envisioned, the technological development that those solutions will require and other related issues.

The JSCE was represented by the president and one of members in the summit. At the summit, JSCE's policies for the construction of safe and secure society, the roles of civil engineer and the necessary abilities of civil engineers to fulfill their roles were presented. Through the summit, it was strongly recognized that the civil engineers in the world have many common issues to be resolved and international cooperation and collaboration are essential for the resolution of these issues. Therefore, JSCE organized a special presidential committee to deepen the understanding of these common issues in civil engineering and to find the solutions by inviting past ASCE presidents Dr. Patricia D. Galloway and Dr. Kris R. Nielsen, both of who played leading roles at the ASCE Summit, this committee as guest members.

This report presents the various civil engineering issues that have been studied inside and outside JSCE, and reviews the analyses of the circumstances of civil engineering in Japan and other countries. The report discusses the roles that civil engineers and the civil engineering community should play, and describes the required capacity and qualities of the civil engineers. It also emphasizes that what role of the JSCE should be to enable civil engineers to fulfill those roles and to acquire the necessary qualifications.

In compiling this report, the opinions of more than 600 JSCE members regarding what roles that civil engineers and the JSCE should play in the future were consulted through the JSCE's website. I would like to express my respect and my heartfelt thanks for their sincere commitment and concern for the future of civil engineering field and the JSCE.

The members of the special committee, who are listed below named, compiled this

report. I take this opportunity to express my profound gratitude for their great service they have rendered.

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94th President of Japan Society of Civil Engineers

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1. Current Social Circumstances and Prospects

1.1 Japan's Current State and the Status of Civil Engineering

In Japan, through the period of so-called “high-economic growth” that began in the 1960s, rapid progress was made on the construction of social infrastructures, including highways, bullet trains, harbors and ports, water, sewage and electrical power facilities, but public infrastructure investments have decreased precipitously since the 1990s, as a result of the worsening of fiscal condition at both national and local levels following the collapse of the so-called “bubble economy” of the early-1990s.

Furthermore, the social environment surrounding civil engineering has become increasingly harsh, as a result of criticism of industry for fraud and unethical conducts such as the current problem of dangō (bid rigging), and the inability of the industry to find the way forward, as typified in dumping or low-ball bidding.

On the other hand, concerns are now being directed toward the aging of the social infrastructure, most of which was constructed in the earlier period of rapid economic growth. In addition to fiscal problems, the declining birthrate and aging society, and the decline in the labor population, it is becoming a critical issue that industry, academia, and government should cooperate toward solving the issues of the maintenance, management, repair and renewal of the social infrastructure with the aim of assuring of a safe and secure society.

Japan is one of the world's few highly seismic countries and some twenty percent of the world's annual earthquakes of magnitude M6 and greater occur in or offshore Japan. A major earthquake is anticipated in Tōkai or nearby regions in conjunction with the seismic activity of the Nankai trough, as well as an intra plate type earthquake in the Tokyo area. Particularly, the cost of the resulting damage in the case of a major Tokyo earthquake is expected to exceed 1.5 times the annual national budget, and such an event could lead to long-term damage to Japan's national influence and competitiveness, potentially resulting in a decline of the country's international status. Under such threats, it is crucial to make preparations to minimize the resulting damage, and prevent economic stagnation of Japan and international society. Concerns have also been raised to increasing levels of storm and flood disasters due to global climate change, which is believed to be one of the causes of torrential rains that lead to overflowing rivers, flooding of urbanized areas, and high tides. Unfortunately, we currently have insufficient social infrastructure to deal with such natural disasters.

The formations of a rapidly industrializing society and excessive population concentration in urban centers have caused severe environmental problems in cities and their suburbs. Similarly, the modern mass-production and mass-consumption lifestyle is

leading to the critical problem of waste treatment. On the other hand, the declining of population in rural areas and “hollowing” of communities have led to the economic prostration of regional cities, attrition of agricultural lands and forests, and the worsening urban environment, and land decay. In turn, such problems in rural agricultural towns and villages have led to a continuing drop in Japan’s self-sufficiency in food production. And policies on the problems of environment and waste treatment to achieve a full national consensus are yet to be implemented.

Japan imports 96% of its energy, including petroleum, coal, natural gas and uranium. Beginning with the petroleum shock of 1973, Japan has undertaken policies such as increasing its petroleum reserves, but it lacks a national policy to produce a sufficient level of energy for national security. A stable supply of energy is the most critical issue in determining the survival of the nation. Other important issues are the development of highly reliable nuclear energy, the safe disposal of radioactive wastes, the introduction of hydrogen and other new energy technologies, such as wind power, solar energy and other renewable energy resources.

Japan’s civil engineers have contributed to the development of the national land through public works projects, although the current social attitude for public works is harsh. Nevertheless, when one considers recent changes to the social situation and natural environment, the fields, in which the contributions of civil engineers are required, are, on the contrary, both expanding and multiplying. From the proper maintenance, management, repair and renewal of the social infrastructure to the harmonization of cities and the natural environment, providing for infrastructures resistant to natural disasters, providing stable supplies of energy, safe water and foodstuffs—much will be expected from civil engineers as their roles expand beyond traditional definitions.

1.2 Global Conditions and Prospects

Exploding populations and particularly the concentration of population in cities of the developing nations of Asia has led to many serious problems, including environmental destruction and natural disasters, together with issues regarding the sources of water, food and energy. It is further believed that these issues will become even more pronounced in coming years.

The number of fatal casualties from earthquakes around the world has greatly increased over the past twenty years, and some ninety percent of those casualties have been concentrated in Asia. The rising level of casualties in these regions is not due to the increase of the number of earthquakes, but it is rather due to the vulnerabilities of the social infrastructure. Typhoons and hurricanes, floods and other wind and

water-related damages have also increased rapidly over the last two decades. Ninety-five percent of the deaths caused by torrential rains and other wind and water-related damage has also been concentrated in Asia. Some of the blame for these natural disasters can be laid on the aberrant meteorological phenomena of global warming, rising sea levels and other aspects of global climate change. Nevertheless, it is also true that a substantial factor in the outbreak of so many disasters is the excessive concentration of population in cities and insufficiency of their infrastructure, together with deforestation and devastation of agricultural lands in upstream areas of rivers. Most of the victims of natural disasters are those of low-income people, and the increased impoverishment resulting from a natural disaster creates a vicious cycle whereby the society is made even more vulnerable to the next disaster.

The population increase in the world's developing nations has a worsening influence on the sufficiency of sources of foods, water and energy. They are important factors in current international disputes, civil revolts, and wars, and it is linked to the destruction of people's habitat, precious ecological and natural environment, and their cultural legacy. The population explosion and its urban-concentration have the effect of increasing air, land and water pollution due to the improper handling of wastes, and the excessive release of CO₂ from a precipitous rate of industrialization is said to be accelerating global warming.

Civil engineers of Japan have participated in development projects of social infrastructure and energy in Asia and the Middle East, and in that way have greatly contributed to the development of each nation. However, the projects in some cases, have not received the positive evaluation from the public and peoples of the respective countries, or they have left issues regarding the corporate profitability of the projects. And one factor possibly lying behind these issues is the insufficient appreciation of the other nation's culture and history.

The future expansion of Japanese civil engineering overseas has become inevitable due to the shrinking of the domestic market. However, within the context of expanding globalization, helping other countries to attain sustainable development by building their social infrastructure will contribute to world development and peace, and by extension, to the safety and security of Japan. In that sense, increased international exchange and cooperation in the field of civil engineering will be indispensable. For this purpose, it is necessary to provide and internationalize the various institutions associated with civil engineering, and success at that endeavor will likely be tied to the improvement of public's attitudes toward civil engineering.

2. The Role of Civil Engineering and Civil Engineers

2.1 Creation of a Safe, Secure and Sustainable Japanese Society

(1) Creating a Sustainable Society

- i. Creation of a sustainable society strong against natural disaster while respecting the natural environment and landscape, and benevolent to human life
- ii. Maintenance and management of social infrastructure utilizing advanced technology to enhance the sustainability of the society
- iii. Provision of social infrastructure to maintain and enhance national strength and international competitiveness

Japan has been blessed with a beautiful natural environment. However, it is also a region subjected to frequent natural disasters such as earthquakes and damages from wind and water. It cannot be denied, however, that occasionally an overemphasis on building social infrastructure to overcome natural disasters and allow economic development has resulted in environmental destruction and ugly landscapes, and forced harsh living conditions on those who are most vulnerable. In order to reclaim the beautiful, wonderfully attractive Japan, it will be necessary to build a human-friendly social infrastructure with splendid landscapes in harmony with nature.

On the other hand, infrastructure is still insufficient in the case of earthquakes, wind and water-related damage, and other natural disasters. In particular, recent years have witnessed repeated earthquakes and rainfalls with magnitudes or levels exceeding design values, and this fact is becoming one factor in the occurrence of unprecedented disaster damage. From the perspective of how to minimize damage to life and property in the case of unprecedented natural phenomena, we must take actions to inspect existing facilities and reinforce them as necessary, while simultaneously constructing new infrastructural facilities.

Furthermore, most of Japan's current infrastructure was constructed during the postwar period of rapid economic growth, and concerns are being expressed regarding its aging and degradation. Given current conditions of stressed state finances and insufficient numbers of technicians, there is a need to utilize computer IT and other advanced technologies for maintenance and management, in order to extend the service life of Japan's aging infrastructure.

In recent years, the economic growth of the so-called BRICs (Brazil, Russia, India, China) has been remarkable, and in the near future the international competitiveness of India and China is expected to put the world in a spin. In response, Japan is

experiencing industrial hollowing as industries move overseas, and together with the insufficiencies of shipping and transportation infrastructure, concerns are being expressed that Japan's international competitiveness will decline. Therefore, there is an urgent need to promote airport and port construction and the improvement of Japan's domestic transportation systems in order to enhance Japan's national strength and competitiveness.

These kinds of social infrastructure projects cannot wait the result of strategic debates on what kind of nation, Japan should be. The Japan Society of Civil Engineers must make more aggressive proposals regarding fundamental strategies for the national infrastructure, and the kind of social foundations, Japan should have.

[Concrete Roles and Issues]

- i. Creation of a sustainable society strong against natural disasters and respectful to the natural environment and landscape.
 - Development and dissemination of construction technology for nature restoration and universal design
 - Proposals for laws and institutions to promote the construction of a beautiful, safe and secure society
 - Development of civil engineering technology oriented toward recycling
- ii. Maintenance and management of social infrastructure utilizing advanced technology to enhance the sustainability of the society
 - Development of computerization and robot technology in response to decrease of civil engineers and laborers
 - Development and implementation of asset management for social infrastructure
- iii. Provision of social infrastructure to maintain and enhance national strength and international competitiveness
 - Drafting and implementation of strategic social infrastructure plans through cooperation of government, citizens, and business
 - Technical development toward the creation of a lifeline system resistant to natural disasters
 - Maintenance and evolution of civil engineering technology for creating human resources through the education of civil engineers, and transmission of technology to the next generations.

- (2) Environmental Preservation, Restoration and Renewal, and the Formation of a Recycling conscious Society
 - i. Environmental Preservation and Renewal
 - ii. Formation of a Recycling conscious Society
 - iii. Promotion of Measures against Global Warming

Domestically, there have been recently some improvements on urban and rural environments relative to trends in the rapid-economic-growth period, numerous problems remain still unsolved, including waste management, issues relating to the water and soil environment, and deforestation. Outside Japan, innumerable problems also remain to be solved, including shortages of natural resources and energy, measures against global warming and desertification due to drying up of water sources, danger of famine, and so on. Multifarious mutually interrelated factors lie behind these issues and they make difficult to overcome them through individual responses to any single issue.

Civil engineers are now being required to possess attitudes respecting nature, minds that are considerate of harmonious coexistence, and in cooperation with a wide range of academic and technical fields, contributing to the formation of a recycling- conscious society and the solution of both local and global environmental problems. One of the newly important roles of the civil engineer is to propose new ideas for structuring the national land that take into full account the natural environment and ecology, and for designing a recycling conscious society that conserves resources and energy, and produces less waste.

Solving environmental problems and creating a recycling conscious society will require broad-based cooperation between governmental agencies, academics, citizens, and environmental protection groups and other NPOs; the Japan Society of Civil Engineers as an academic and technical organization, has to play a central role in these activities.

[Concrete Roles and Issues]

- i. Environmental Preservation and Renewal
 - Proposals for preserving and renewing a healthy natural environment (basin zones, coastal zones) and urban environments, and for the development and dissemination of the elemental technologies necessary for that purpose.
 - Proposing wide-range and local plans for national land use and preservation, watersheds, and urban areas
 - Understanding current state of water recycling and material recycling systems, and the development and implementation of systems for evaluating their

status.

- Development and implementation of technology for restoring the quality of water and soil, and for eliminating toxic substances.
- Development and implementation of technology for reducing the environmental burden caused by the construction and maintenance of social infrastructure.
- Development and implementation of measures against heat island effects and technologies to improve the urban environment.

ii. Creation of a Recycling-conscious Society

- Proposals toward the realization of healthy and sustainable recycling of water and solids
- Creation and development of a regional management system including the preservation of environment and resources
- Creation and development of a physical recycling system, together with the promotion and implementation of the “3R”s (Reduce, Reuse, Recycle)
- Development and promotion of safe, secure, and economical recycling materials

iii. Promotion of Measures against Global Warming

- Reducing and stabilizing the generation of greenhouse gases, together with the development and dissemination of technology to sequester those gases
- Creation and promotion of an efficient logistics system with low environmental impact
- Development and expansion of traffic systems to reduce congestion

(3) Contributing to the Mitigation of Natural Disasters

- i. Proposing policies regarding social infrastructure for improving disaster resistance
- ii. Development and implementation of technology to mitigate the effects of natural disasters
- iii. Aggressive participation in citizen movements for self-help, mutual aid, and public assistance in times of disaster

Global warming, the shrinkage of forests, and desertification are increasing the potential for changing patterns and new kinds of natural disasters, such as torrential rains and other abnormal precipitation, and giant typhoons and hurricanes. Also, increasing population concentration in cities, hollowing of rural communities, low birth rates and aging populations are weakening society's ability to respond to disasters.

In future natural disasters, the basic responsibility placed on civil engineers will be to protect human life and property and build a safe and secure society. The Japan Society of Civil Engineers and its members must not only actively participate in citizens' movements, from the level of self-help to mutual-aid and government-sponsored disaster relief, but also to provide disaster-prevention and disaster-mitigation technologies to protect all those important infrastructural facilities that support the people's lives, economy, and industrial activity from natural disasters. By protecting roads, railways, airports, harbors and other transport networks, lifelines and communication infrastructure, civil engineers can contribute to the creation of a highly disaster-resistant society.

In addition to providing rapid response in times of disasters and devoting their energies to restoration and recovery activities, civil engineers are further being called upon to contribute to the "software" side of disaster-prevention by developing and disseminating hazard-mapping and risk-assessment technology for natural disasters, contributing to disaster-awareness programs through education and training of public, and by helping in the creation of a society with networks that provides quick and accurate information in times of disaster.

[Concrete Roles and Issues]

- i. Proposing policies regarding social infrastructure for improving disaster resistance
 - Proposals for creating a national territory strong against natural disasters
 - Proposals for disaster prevention matching the unique regional characteristics of cities, mountain areas, and coastal zones
 - Drafting and implementing plans for social infrastructure with high disaster

resistance

ii. Development and implementation of technology to mitigate the effects of natural disasters

- Development and implementation of technologies to prevent and to mitigate the effects of disasters on rivers, roads, railways, airports, harbors and social lifelines.
- Development and implementation of technology to monitor and predict areas prone to flooding, mudslides and landslides
- Development and implementation of technology for prediction and response in coastal areas subject to beach erosion, flooding, and high-tide damage
- Introduction of disaster prevention monitoring and warning systems utilizing satellite imagery, IT and other advanced technologies
- Development of prediction/response technology to deal with coastal erosion, flooding, and high tides accompanying rising sea levels

iii. Aggressive participation in citizen movements for self-help, mutual aid, and public assistance in times of disaster

- Disaster education of public
- Assistance with drafting regional disaster preparedness plans
- Assistance with drafting corporate Business Continuity Plans (BCP)
- Participation in emergency rescue and first-aid activities during disasters

(4) Contributing to the Solution of Energy Problems

- i. Development of construction technology for providing safe and stable energy supplies
- ii. Technological development for the safe use of nuclear energy, including the disposal of radioactive wastes
- iii. Development of new energy sources including solar, wind, geothermal, exhaust-heat recovery, etc.
- iv. Development of technology for building low-energy consuming cities

Civil engineering facilities supporting the stable supply of electricity, gas and other types of energy range from hydroelectric, conventional thermal, and nuclear power generation plants and their transmission equipment to LNG and petroleum storage facilities, pipelines and so on. Civil engineers have contributed to the maintenance and improvement of human life, economy and industrial activity by using their broad engineering expertise to construct and operate these facilities, thereby helping to provide stable supplies of energy.

Reliance on fossil-fuel resources, however, has led to environmental problems including the production of acid rain and the global warming due to greenhouse gas generation. On the one hand, the global expenditure of fossil-fuel resources has increased year by year, leading to apprehensions that the world will run out of such resources, while worries have also increased regarding the safety of nuclear power, including the earthquake resistance of nuclear facilities and the handling of nuclear wastes. Further, concerns have grown regarding the “heat island” effect in Tokyo and other large metropolitan areas resulted from the high-energy consumption taken place in those areas.

Civil engineers must contribute to this issue by building supply systems and facilities for the efficient and safe use of fossil fuels and nuclear energy, while also helping solve the problem of future energy needs through the development of natural and new energy sources. At the same time, they are also being called upon to construct low-energy consuming cities and aggressively advance with social programs and technological developments toward reducing energy use and enhancing the efficiency of energy usage.

[Concrete Roles and Issues]

- i. Development of construction technology for providing safe and stable energy supplies
 - Enhancing efficiency of energy supply facilities management, and increasing

- their service life
- Assuring reliability of energy supply facilities by disaster prevention and mitigation
- ii. Technological development for the safe use of nuclear energy, including the safe disposal of radioactive wastes
- Development of technology for final disposal of radioactive wastes and decommissioned reactors
- iii. Development of new energy sources including solar, wind, geothermal, exhaust-heat recovery, etc.
- Development of recycling technology for wastes and energy generated as a byproduct of urban activities
 - Development of biogas generation and other new energy resources
 - Application of civil engineering technology to energy resource exploration and fossil-fuel mining
- iv. Development of technology for building low-energy consuming cities
- Proposals toward the construction of low-energy consuming cities and societies
 - Development of technology to enhance efficient use of energy and heat, and to lower costs

(5) Working Jointly with Citizens to Establish Social Infrastructure

- i. Restoration of public trust in civil engineering and civil engineers
- ii. Planning, design, implementation, management, and rebuilding a citizen-participant-type social infrastructure
- iii. Response to social and public demands for environmental protection and disaster mitigation

Cases of bid rigging, fraud and lingering doubts regarding the necessity of public works projects have become factors in exposing civil engineering and civil engineers to public criticism. As a result, it is first of all indispensable to regain and increase social and public trust in civil engineering and civil engineers. To achieve that, civil engineers must possess a high standard of ethics and pride as technicians, devoting their efforts to producing an infrastructure that truly addresses public needs. The most important role of civil engineering is to discover and analyze society's problems, and to mobilize a broad range of technology and expertise for solving those problems. And in conjunction with that, the civil engineering world must make greater efforts to increase the transparency of the process of planning and executing civil engineering projects.

In order to proceed with civil engineering infrastructure projects that are accepted by the public, we must provide objective and easily understood explanations not only to the government, but to the people, on the various effects and impacts of such projects on the people's lives, the economies of the nation and local municipalities, and on the natural environment. In conjunction with that, we must work toward building a social system oriented toward a citizen-participation type social infrastructure capable of adequately reflecting the opinions of the public and society. Finally, it will be necessary to suggest proposals regarding the optimum shape of social overhead capital in response to the various issues currently faced by society, including the environment and disaster prevention, declining birthrate and the aging society.

Civil engineers must remind themselves of the significance of the word "civil" in their chosen occupation, aiming to realize a social infrastructure for the people and measured from the people's perspective, while as experts in the field providing appropriate suggestions based on a long-term viewpoint.

[Concrete Roles and Issues]

- i. Restoration of public trust in civil engineering and civil engineers
 - With a firm sense of ethics as civil engineers, to maintain an active voice and aggressive active public role
 - As civil engineers, to work for a greater transparency in the process of planning and execution of social infrastructure projects

- Promotion of social and public understanding of the activities and role of civil engineers
- ii. Planning, design, implementation, management, and renewal of a citizen-participant-type social infrastructure
 - Creation of a social system oriented toward a citizen-participation type of social infrastructure projects
 - Analysis and explanation of the effects and impacts of social capital projects on people's lives, economic activity, and natural environment
- iii. Response to social and public demands for environmental preservation and disaster mitigation
 - Proposals regarding the optimum state of social capital in response to environmental and disaster-prevention issues

2.2 Contributions to the Construction of a Peaceful, Safe, and Secure Global Social Infrastructure

- i. Contributions to the construction of social infrastructure oriented toward sustainable development
- ii. Contributions to mitigate the effects of natural disasters
- iii. Contributions to the environmental restoration, including air, water, and soil
- iv. Contributions to issues of energy and resources

The repeated outbreaks of natural disasters in Asia and other developing regions have been observed in recent years. The deaths caused by earthquakes and tsunami in Asia account for 90 percent of the global total, and the number rises to 95 percent when deaths resulting from floods, high tides and other storm damage are only considered. Furthermore, the rapid rate of deforestation, desertification, and riverbank erosion is destroying the natural environment, they act as factors in the occurrence of natural disasters. In addition, global climatic change is increasing the occurrence of torrential rains and droughts, causing floods and landslides and depletion of water resources. Also long-term civil wars and terrorism have resulted in the destruction of historical cultural resources, many of which have no potential for restoration.

In Japan, economic expansion since the late 1970s was accompanied by an increase—in both quality and quantity--of ODA and other overseas economic aid. However, the aid has not always been sufficient for the needs of the recipient countries. Japan must make more efforts toward using its high level of civil engineering technology to promote sustainable development by contributing to the solution of problems of social infrastructure, natural disaster mitigation, the environment and energy resources, while respecting and taking into consideration the recipient country's lifestyles, cultures, histories, thoughts, and religions. Japan's civil engineers must demonstrate leadership in these infrastructural projects, promoting a shift of emphasis from mere efficiency and function to a more balanced development that takes into consideration local and global environments and the protection of the weak. Such considerate support for the economic development of developing nations will contribute to international peace, as well as to Japan's stable development. In order to produce this kind of international contribution and activity, however, it will be necessary to reform the way in which civil engineering is done domestically as well.

Japan has world-leading expertise in the “hardware” technology, including disaster prevention, long-span bridge construction, and tunneling, as well as the “software” technology for construction management and preventative maintenance; together, these

represent technologies that have been perfected by Japan's civil engineers as they overcame numerous obstacles. The aggressive application of these technologies to overseas public works projects can be considered linked to the transmission of Japan's civil engineering technologies developed at home.

Finally, while hopes are being placed on the contribution of Japanese civil engineers to social infrastructure projects throughout the greater Asian region, it must also be recognized that there is insufficient training to produce civil engineers capable of contributing to such overseas projects. In that sense, there is a need to make more concrete proposals regarding the state of higher education and post-graduation training.

[Concrete roles and issues]

- i. Contributions to the construction of social infrastructure oriented toward sustainable development
 - Proposals for urban and development planning harmonized with nature
 - Support for social infrastructure to supply stable food production harmonized with nature and ecology
 - Construction and technological development of water works, energy, communication and other lifelines
 - Planning and development of construction technology for roads, railroads, airports, harbors and other public transportation systems
- ii. Contributions to mitigate the effects of natural disasters
 - Implementation of disaster-prevention education in response to natural disasters and regional characteristics, and support of measures to prevent and to mitigate disasters
 - Rapid support in response to earthquakes, tsunami, and storm disasters
 - Education and deployment of instructors for natural disaster mitigation
- iii. Contributions to environmental restoration, including air, water and soil
 - Analysis and education regarding the physiological and ecological effects of warming and other global climatic change, and the degradation of water, soil and other local environmental elements
 - Promotion of the construction of facilities for cleaning waste gases and acid-water discharge from mining and heavy chemical industries
 - Proposals for reforestation by greening and tree-planting, and for support and restoration of water recycling functions
 - Construction of water intake, purification and distribution systems for provision of safe water supplies

- Construction of sewage facilities contributing to a hygienic lifestyle by eliminating and preventing the spread of wastes
 - Development and implementation of technology for water and soil purification, and for the insolubilization of toxic substances
- iv. Contributions to issues of energy and resources
- Construction of facilities for the stable production and distribution of energy, and development and implementation of the related technology
 - Promotion of the development and implementation of technology for, solar, wind, geothermal and other natural forms of energy

3. Abilities and Qualities Required of Civil Engineers

3.1 Self-Confidence and Pride in Civil Engineering

There is a feeling that many civil engineers have experienced an excessive loss of self-confidence due to the long-term downturn in public works investments and the severe criticisms of public works arising from the practice of dangō (bid rigging).

In order to restore the public's trust and positive evaluation of civil engineers and public works projects, it is of great importance that civil engineers must themselves regain their own sense of self-confidence and pride in their profession, while aggressively speaking out regarding the state of civil engineering and suggesting various systems appropriate for a new generation. Renewed recognition by public should be achieved that neither Japan's development following the Meiji Restoration, nor reconstruction after World War II would have been possible without the contribution of civil engineers, and that Japan's civil engineers have played an important role in the economic growth of developing nations. Furthermore, it should be remembered with self-confidence and pride that civil engineering technology is crucial for realizing a "beautiful, safe, and secure Japan," and a "peaceful, safe, and secure world." While regulating their behavior with a high sense of ethics, civil engineers must inform public of the role that they have played until now, as well as their future mission, through which they will receive the public's understanding and trust. Engineers must convey that their mission is to protect the public's health safety and welfare while at the same time balancing harmony between the quality of life as the public now knows it to the protection of the earth for future generations. Finally, it is also important to transmit to the new generation of civil engineers and young people the expanding roles of civil engineers in environmental preservation and restoration, and the mitigation of natural disasters.

3.2 Broad Knowledge, Awareness and Leadership

There is an easily understood consensus that public works projects from the Meiji period to the postwar era of rapid economic growth were driven by the national desire to catch up with the West. As a result of that, the institutions and skills required were designed to promote the realization of an affluent society. Civil engineering greatly contributed to this need by promoting a vertically integrated technology focusing on hardware, and the development of on-site management technology.

On the other hand, as the social infrastructure has been completed to a certain extent and now entered a mature stage, the needs of national development have greatly changed. In order to respond to society's multifarious needs, including the demand for

consensus formation, the solution of environmental problems, the advance of information technology, preservation and transmission of culture and so on, civil engineers are being required to possess knowledge and understanding extending over a wide range of fields. In other words, in contrast to earlier eras, a horizontal-development model of technology together with an overarching system of integrated management is now demanded. Civil engineering must exhibit leadership in constructing the country, and thus must reflect on the fact that it has not responded to these kinds of demands.

Furuichi Kimitake, the first president of the Japan Society of Civil Engineers stated in his inauguration speech that “The civil engineers are required to take the leadership among all fields of engineering and technology.” This fact is equally applicable to the current situation today. Civil engineering is an academic and technological organization that originally lies at the border region between nature and human relations, and its first and foremost goal is to contribute to people’s happiness and peaceful existence in harmony with nature. Therefore, it is necessary to integrate and implement not only construction technology, but the technology and knowledge of a wide range of disciplines of the science, engineering and humanities, and in that context what is demanded from civil engineers is leadership backed by discernment, decisiveness and management skills based on knowledge in these broad fields.

As it was pointed out in Section 1, humanity is beginning to face natural disasters, energy and food shortages and other unprecedented crises arising from global environmental destruction. We must be more cognizant of the fact that it is civil engineers who can most directly contribute to overcoming these issues and leading the way for a brighter future for humanity.

As a result, it is necessary that civil engineers make use of both school education and social experience to acquire knowledge in the specialist fields listed below and wisdom.

i. Horizontally integrated technology acquisition

- Sociological, political, economic and cultural knowledge regarding social infrastructure
- Multi-disciplinary technology in environmental preservation, restoration and natural disaster mitigation
- Information and automation technology relevant to the maintenance management, renewal and safe construction of social infrastructure
- Knowledge of advanced technology in fields of bio- and nano-technology, and aerospace engineering

ii. Integrated management technology

- Management technologies, including project management, risk management, quality control, quality assurance and labor management
- Fiscal expertise, including project financing, cost accounting, project cost control, variance analysis, operation management and project audit evaluation.
- Planning and presentation abilities for promoting projects
- Written and oral communication skills and knowledge critical for consensus formation with interested parties
- Technology regarding risk management and asset management
- Legal knowledge regarding relevant laws, ordinances and contracts
- Communication and culture skills applicable to international society
- Recognition of the need for diversity in project teams, including gender
- Understanding and sophistication capable of promoting interdisciplinary cooperation and demonstrating leadership

3.3 Abilities and Qualities Necessary for Internationalization

As Japan deepens its relations with Asian and other nations, it is believed that Japan's civil engineers will have increasing opportunities to participate actively in overseas construction projects. Japan's advanced civil engineering technology--from tunneling to long-span bridge construction, land improvement and earthquake-resistant design--possesses great potential to contribute to the social infrastructure of developing countries. In addition, Japanese technology for environmental preservation and restoration and the mitigation of natural disasters has the potential to contribute to the realization of safe and secure societies throughout Asia and the rest of the world.

Much of Japan's current social infrastructure was built at a rapid pace during the postwar period of rapid economic growth, leading to tremendous advances in convenience for the people's lives. On the other hand, that rapid construction has resulted in numerous problems of environmental destruction and loss of culture and human habitat. It is thus necessary to offer our experiences and technological contributions to other countries while taking full recognition of their respective conditions and cultures.

It is said that, compared to civil engineers around the world, those in Japan tend to have less skill at project management tied to cost competition, and local cultural understanding and communication. In response, civil engineers must be equipped not only with the fundamental technologies of each specialist field, but also a wide range of management proficiencies, including the ability to understand differences in culture, diversity, social institutions, and religions, as well as skills in both written and oral

communication, international contracting, negotiation and dispute resolution.

These abilities cannot be acquired overnight; the development of a civil engineer's skills is dependent on increasing the opportunities for international activity, including participation in international conferences, joint research and education.

Support for greater international activity by Japan's civil engineers should also be considered from Japan's domestic civil engineering curriculum, by approaching education from the perspective of Japan as part of international society, and encouraging not only foreign language study, but also the aggressive acceptance of foreign exchange students.

3.4 The Education of the Civil Engineer

At present, the educational curricula of civil engineers in Japan present the following problems at each level:

- i. Industrial high schools, vocational schools, specialized vocational high schools
 - Due to a declining image of civil engineering and diminishing numbers of employment offers from the industry, many schools are not meeting their entrance quotas, so that some schools are being pressed to combine their civil engineering specialties with other programs, while others are expressing concerns regarding the viability of entire faculties or departments.
- ii. University and graduate school
 - A gap exists between the graduates from schools and the new employees desired by industry, specifically in the area of business skills and problem-solving abilities.
- iii. Professional education/training
 - Industry currently lacks programs to send employees for post-graduate degrees and to engage in personnel exchange, and educational institutions lack programs of support for such purposes.
 - Insufficient educational systems exist to make full use of retiree personnel.
- iv. Public education
 - Despite the high interest among citizens in environment, disaster prevention and other civil-engineering-related issues, virtually no system exists to provide such education

In order to reconstruct an educational system that responds to these kinds of issues, the following three conditions must be fulfilled:

- i. Securing personnel with high level of motivation

- It is first necessary that we secure sufficient numbers of people with high motivation, both at the entrance and completion of civil engineering training, so as to maintain both the quality and quantity of human resources required to fulfill demanded roles. This will require an educational system for the society at large that portrays public works in a more attractive way.
- ii. Education of well-qualified human resources
- There is a need to redefine the roles and the kind of people required at each educational stage, industrial high schools, vocational schools, junior college, college and post-graduate (doctoral) levels, all the way to continuing public and retiree education.
- iii. System to allow the demonstration of motivation
- Aim for the creation of a social system that allows motivated personnel to feel a sense of fulfillment, and a system that repays personal excellence.
 - Create a system that assures fair assessment of personal abilities, thus maintaining high quality

4. The Role and Concrete Policies of the Japan Society of Civil Engineers

4.1 Activities of the Japan Society of Civil Engineers

In May, 1999, the Japan Society of Civil Engineers revised its “Beliefs and Principles of Practice for Civil Engineers” first implemented in 1938, instituting a “Code of Ethics for the Civil Engineer” as a policy of self-discipline for carrying out professional duties. In that Code, it states with pride that the civil engineer shall “perform civil engineering work from a broad perspective based on his/her specialized expertise and experience regardless of his/her organizational affiliation,” and declares that he or she shall “actively explain the significance and role of his/her own work and respond sincerely to any criticism of such explanation.”

Subsequently, the “Sendai Declaration on Infrastructure Development and Civil Engineering Technology” was adopted in 2000. Based on the recognition of increasing demands to challenge the way in which social infrastructure has been carried out, it presents a concrete embodiment of the aforementioned Code of Ethics, laying out to the public our perspective as civil engineers of the significance and ideals of social infrastructure, and our perception of the policies for the realization of those ideals. Furthermore, these principles are to be implemented while respecting a wide variety of historical traditions and value systems, which the civil engineers may encounter.

Namely, the significance of constructing social infrastructure is the building, maintaining and utilizing of infrastructures to create “a beautiful national land,” “a safe and comfortable life,” and “a prosperous society,” and the civil engineer’s foremost mission lies precisely there. In addition, as ideals of social infrastructure, the Declaration points out the three principles of “Harmonization with Nature and Sustainable Development,” “Respect for Regionality,” and “Respect for Historical Heritage and Tradition,” while suggesting such concrete implementation strategies as “Communication and Accountability to the Public,” “Clarification of Visions and Plans,” “Fair Evaluation and Competition,” and “Technological Development for Building Social Infrastructure.”

On the other hand, a fundamental re-evaluation of activities of JSCE is being undertaken. In 1998 the JSCE issued the activity policy JSCE2000, expressing its fundamental direction as being founded on (1) contribution to academic and technological advance; (2) direct contribution to society, and (3) mutual exchange and interchange between members of the Society.

This was followed in 2003 with a publication of the document JSCE2005, which aimed to strengthen the Society’s management by emphasizing the importance of communication between public, the JSCE, and individual members in achieving the

goals outlined in the previous document.

Finally, previous JSCE presidents have established special presidential committees in order to study themes such as “The Role of Civil Engineers in the Era of Declining Birthrate and Aging Society,” “Communication with Citizens,” and “the Spirit of the Civil Engineer,” and the results of those studies have been issued as proposals to the members of the Japan Society of Civil Engineers as well as to the public. Unfortunately, a few of these proposals have moved to the stage of implementation, while many issues remain virtually untouched.

The Japan Society of Civil Engineers has issued numerous proposals and reforms both to its own members and to the nation regarding the role it should play in building a rich, safe, secure, and beautiful land, but only a limited number of those have actually been realized, and many of those proposals have yet to move to the stage of implementation. What is most needed at present in the Japan Society of Civil Engineers is that the conclusions of this Special Committee and the proposals of past presidents should be realized. In other words, the officers, members, and staff of the JSCE must begin to take concrete steps toward that purpose.

4.2 Roles of the JSCE in Surveys and Research

The most important duty of the Japan Society of Civil Engineers is “to contribute to society through scientific and academic progress.” In addition to committees within the research and studies division, special committees and many other teams are producing studies through their work. However, the results of those surveys and studies have not been sufficiently publicized or feedback those results to the JSCE members. There have been also very few opportunities for the JSCE to be directly involved in setting the basic policy orientation for research and studies on issues confronting the nation including topics of social infrastructure, disaster prevention, and the environment. Under these circumstances, we propose the following concrete actions regarding the surveys and research undertaken by the Society.

(1) Approach to current crucial issues, including social infrastructure, disaster prevention and the environment

The Japan Society of Civil Engineers shall establish survey and research topics and research methodologies relevant to social infrastructure, disaster prevention and the environment necessary for realizing the “creation of a safe and secure society, and shall present these to the Science Council of Japan and the Council for Science and Technology Policy. Appropriate approaches shall also be made to relevant government ministries and agencies, and members of the Diet. These proposals shall also be made

known to the general public through the media.

In addition, the Japan Society of Civil Engineers shall set crucial research topics regarding issues deeply related to the civil engineering industry and the people's lives, and establish research groups composed of members from multiple survey and research committees to promote that research.

(2) Promotion of multi-disciplinary, interdisciplinary research

The research and studies division of the Japan Society of Civil Engineers has established twenty-nine research committees, but it must be admitted that there has been insufficient communication and linkage among those committees. There is a need to establish horizontally linked, inter-disciplinary connections with regard to topics such as the mitigation of damage from natural disasters, environmental preservation and restoration, and extending the life of aging infrastructural facilities. To pursue researches on these topics, the research and studies division should establish interdisciplinary committees composed of members drawn from multiple research committees relevant to each topic; furthermore, each committee should be established for a specific duration and provided with priority research funding. It will also be necessary to set the topics not only through the acceptance of open nominations, but also through top-down decision-making.

(3) Promotion of joint research and projects with other academic societies

The research project "Response to Severe Earthquake Disasters" undertaken jointly since FY2003 with the Architectural Institute of Japan (AIJ) is producing steady results, as a result of the cooperation of these two construction-related academic associations, and the research has become noted by the public; the Central Disaster Prevention Council is taking steps to concretely reflect the results of this research within the government's disaster response policies. In addition to earthquake disaster prevention, many other research topics exist that require a joint approach in cooperation with the academic associations of a wide range of social, economic, information, chemical and food-related disciplines, including issues relating to the environment, energy, resources, and urban problems. Together with the rapid establishment of a common ground where organizations related to these research disciplines can meet together, the Japan Society of Civil Engineers should play a leading role in the joint research undertaken between industry, academia and the government.

Furthermore, conferences and seminars should be organized jointly with other academic associations to allow research results to be disseminated more effectively both within and outside the JSCE.

(4) Publicizing the results of surveys and research

The Japan Society of Civil Engineers is an organization of engineers and researchers, and the studies and research undertaken by them to enhance the knowledge and understanding of specialists in the field as their primary goal. At the same time, however, it is also important to explain from an impartial perspective how those research results are utilized by the society and contribute to the happiness of the people of Japan. Each research and studies committee must always consider what part of their research results should be generally publicized to the society, and establish websites allowing mutual information exchange, together with opportunities for meeting with the media, thus disseminating those results to public.

(5) Promotion of joint research between industry, academia and government, and introduction of external research funding

Together with acquiring public research funding from such as Science and Technology Promotion Funds, inter-organizational joint research should be promoted among industry, academia, and government, as a part of which the Japan Society of Civil Engineers should act as a leading research body. To achieve that goal, first of all, the activity of the Technology Development Promotion Committee currently located within the Organization for Promotion of Civil Engineering Technology must be stimulated, and communication between itself and the research and studies division must be enhanced. As an organization of technocrats and researchers in industry, academia, and the government, the Japan Society of Civil Engineers should be strongly promoted as an organization capable of undertaking inter-organizational and problem-solving types of research. Furthermore, it should be pointed out that the JSCE has the capacity of being able to integrate multiple kinds of surveys and studies similar to those undertaken individually by private construction-related companies. For that purpose, the JSCE should provide opportunities for roundtable discussions with technical representatives of the private construction industry, together with implementing a top-down decision-making method to clearly define strategic issues, while placing the strongest emphasis on increasing research funding and support (research funding for prioritized issues) toward those goals.

4.3 Support of Restoration and Re-construction after Natural Disasters; and Disaster Prevention Education.

The Japan Society of Civil Engineers should aggressively participate in national movements for disaster prevention led by the Cabinet Office. Joining the circle of

self-help, mutual aid, and public assistance in times of disaster, the JSCE should contribute in a wide-ranging ways to mitigate disasters, from the level of governmental to citizens.

Particularly with respect to activities at the citizens' level, the Society should forge strong ties with the NPO "Engineers without Borders, JAPAN" as it expands its work in the following ways:

(1) Promotion of disaster-prevention education and training in disaster-mitigation techniques

To mitigate the effects of natural disasters; it is important to educate the younger generation (especially elementary and middle-school students), and train them for methods of mitigating disaster effects. The Japan Society of Civil Engineers has traditionally engaged in disaster education and issued publications both in Japan and abroad centering on its student members, but these activities should be increasingly strengthened in future.

The inter-organization of "disaster prevention education associations" formed by student members at each university should be integrated within the Japan Society of Civil Engineers, thus supporting the activities of student members. Also, disaster mitigation experiences and techniques should be concretely transmitted by aggressively publicizing the records of disaster surveys undertaken by the Society.

(2) Technological support for restoring and rehabilitating regions subjected to natural disasters

One of the central pillars of the Japan Society of Civil Engineers' activity policy is "direct contribution to society." As an academic and engineering organization, the Society promotes research and development of technology for mitigating the effects of natural disasters, while also providing technological assistance both in Japan and abroad to aid the restoration and rehabilitation of regions struck by such natural disasters. For that purpose, cooperation should be further promoted with the NPO Engineers without Borders to raise funding for activities, while also registering and organizing senior engineers.

4.4 Restoring Trust in Civil Engineering and Civil Engineers

As an association composed of civil engineers drawn widely from industry, academia, and government, the Japan Society of Civil Engineers has an important role in the regaining trust in public works and civil engineers. It can be considered that the two wheels supporting the axle of restoration of social trust include grass-roots activity in strengthening communication with public as mentioned below, and aggressive

publication of information to public, such as by offering proposals regarding government policies and implementation regarding social infrastructure, disaster-prevention and environmental problems.

(1) Dissemination of the importance and critical nature of social infrastructure to public

As an academic organization, the Japan Society of Civil Engineers should aggressively explain to citizens the importance and critical nature of social infrastructure. Specifically, materials and pamphlets explaining, in easy-to-understand language, how important social infrastructure is for the creation and sustaining of a safe and secure society, and enhancing Japan's international competitiveness should be published. It is also important to explain how past public works projects have contributed to Japan's development, and how historical public works structures contributed to the formation of Japan's culture. Communication is necessary to convey the message that civil engineering is all around us and that no one can live without civil engineering. The air we breath, the water we drink, the transportation that we use and the facilities for sanitation-all evolve around civil engineering. By attaching the vitality of the importance of civil engineering to what the public experiences in their everyday lives will assist in forming a bond between what is taken for granted by the public and what civil engineers provide. Finally, society should be informed of the role played by civil engineers in restoration and rehabilitation following national disasters.

The materials and pamphlets used to explain these points should be created by JSCE head offices and utilized at branch offices in training sessions and by lecturers sent from the head offices.

(2) Commenting aggressively on social problems confronting public works

An editorial committee should be established to aggressively disseminate the views of the JSCE and its members regarding the system of bidding for public works, and other widespread issues confronting the profession. Furthermore, opportunities should be taken to conduct roundtable discussions with members of the media, together with organization of symposiums and conferences to disseminate such views both within and outside the JSCE.

The FY2005 Special Presidential Committee issued an interim report with regard to the bidding system used for public works and the maintenance of quality in public works projects. Based on previous studies of these issues undertaken by the construction management committee, consultant committee, and other related study teams, the Japan Society of Civil Engineers should mold a consensus on the issues and disseminate it both within and outside the JSCE.

In 1999, the society issued a “Code of Ethics for Civil Engineers,” and establishment of a Committee for Ethics and Social Norms was determined by the board of directors in January 2007 to support the implementation of ethics by civil engineers.

(3) Proposals for the reform of policies and institutions

A mid- and long-term policy vision should be composed regarding the national land and social infrastructure. Proposals should be drafted regarding policies and institutions for the achievement of that vision, and the cooperation of the media enlisted to disseminate those suggestions widely to the larger society. The proposals should also be disseminated to Diet members, local government leaders, and bureaucrats, with the aim of having the policy vision reflected in government practice.

(4) Social recognition of the engineers professional qualification system

Five years have passed since the Japan Society of Civil Engineers implemented its civil engineer professional qualification system, but the role and responsibility of these qualification-holders in public works projects remains unclear. The current situation is critical, since some of those, who have successfully obtained the qualification, have themselves pointed out that the qualification system is unprofitable. In addition it cannot be overlooked that the JSCE experiences an annual accounting loss of some 20 million yen due to the expenses of supporting the qualification system. Toward reforming the professional qualification system, the fourth directors meeting of FY 2006 reaffirmed the following basic policies, and a new task force was assembled directly under the aegis of the president and assigned to compile concrete suggestions by the end of FY2006.

- i. The Japan Society of Civil Engineers’ licensed engineer qualification system should be opened to all those working in civil engineering field and, making it possible for non-members of the Society to achieve the qualification, (excluding special upper-level engineers).
- ii. To produce a qualification system that provides practical benefit within work in the construction industry, expand the range of existing qualifications, or add new qualifications to increase the depth of the system.
- iii. Efforts to increase and promote the achievement of qualifications by younger engineers.

The “engineers registration system” of the Organization for Promotion of Civil Engineering Technology has remained virtually unused since its inception, but given

the current age in which the evaluation of engineering abilities is shifting from the organization to the individual, an emphatic policy should be implemented to make use of the system as a database of engineers.

(5) Solution of structural problems of in the JSCE

The Japan Society of Civil Engineers is confronting numerous problems, including decreasing membership numbers and financial deficits. Mid- and long-term structural reforms are required that take into account predictions for future reductions in the number of civil engineers. Concrete topics of pressing importance include the methods used for choosing the president, vice-president, executive director, and directors, together with their terms of service, the optimum assignment of staff and their numbers. In consideration of the reform of public interest corporations scheduled for 2010, a task force has started to deal with these issues.

4.5 Communication with Public

(1) Feedback of citizens' opinions through citizen-participation JSCE projects and NPO activities

For some time, the Japan Society of Civil Engineers has, held citizen-participation forums primarily through its branch offices, and dispatched lecturers on topics regarding public works and civil engineering, and engaged in disaster-prevention education and on-site observation sessions. The head offices should support these branch activities by producing advertisements and pamphlet materials.

With respect to disaster prevention, environment, and urban revitalization issues, cooperative ties should be forged with existing NPOs and citizen groups, using citizen forums and roundtable discussions between citizens and civil engineers to reflect citizens' opinions back into the Society's activities.

Volunteer members of the Japan Society of Civil Engineers and Architectural Institute of Japan have cooperated to establish the Japanese NPO "Engineers without Borders, JAPAN" as a means to mitigate the effects of natural disasters. Plans for the group call for the participation of many ordinary citizens as well as volunteer members of the two founding associations. It is hoped that the activities of this NPO will allow the formation of a common base of activity for disaster-prevention issues between Society members and ordinary citizens.

(2) Creation of cooperation and relationship of trust with media

A cooperative relationship already exists between the Japan Society of Civil Engineers and Japan Broadcasting Corporation (NHK) and other mass media in regard

with coverage of natural disasters, and JSCE surveys of earthquake damage are regularly reported and thus made cognizant to public.

In order to obtain public's understanding of the civil engineering community and the activities of the Japan Society of Civil Engineers, regular discussions should be sponsored with representatives of television, radio, and traditional paper based media to disseminate news about the JSCE activities (citizen-participation events, results of surveys and research projects, etc.), accomplished civil engineers, both male and female to serve as "role models", major civil engineering projects constructed both domestically and those constructed by Japanese companies outside Japan, and to respond to requests and questions from the media. International civil engineering guests visiting Japan should be newsworthy to demonstrate the importance of the profession world-wide. Such activities should help to build a smooth and continuing relationship of trust with the media. Already, four such meetings have been held with the media during FY2006.

4.6 Establishing International Cooperation and International Leadership

(1) Expansion of joint activities with overseas academic associations

The Japan Society of Civil Engineers have already established agreements with partner societies from twenty four nations in Asia and around the world. In recent years, international seminars and other joint projects have been hosted in Asia, and annual conventions of associations in England and the United States have likewise been used as opportunities for information exchange. Exchange activities have also rapidly taken on substance, centering on regional meetings held in locations such as Korea, Taiwan, and Mongolia, and the Japan Society of Civil Engineers is playing a central role in the Asian Civil Engineering Coordinating Council (ACECC). Given the fact that natural disasters are a frequent occurrence in Asia, and the environmental relationship between nature and urban areas is also worsening, more concrete joint activities should be undertaken with partner associations; under the leadership of the Japan Society of Civil Engineers, and international conferences should be sponsored and technological support given to various issues in the field of public works.

(2) Strengthening roundtable discussions at JSCE's annual meetings

The occasion of annual JSCE meetings has been used to host roundtable discussions with the participation of related overseas associations. However they have produced insufficient results. Reflecting on this fact, preparations for the FY2006 meeting were advanced centering on a common theme, and with the participation of six countries, a joint proposal was issued. The holding of roundtable discussions with the participation

of Asian and other nations should be taken as a perfect opportunity for the Japan Society of Civil Engineers to demonstrate its leadership. Therefore conference themes should be selected based on an analysis of the topics considered necessary for the Asian nations, and the Japan side should make presentations toward solving those issues, together with engaging in full follow-up activities through post-conference joint projects and so on. Potential themes for joint projects might include the transfer of civil engineering technology for disaster-prevention and the environment, engineering education, and various systems for implementing public works.

(3) Proposals regarding ODA and other governmental international cooperation

Intergovernmental aid from Japan to developing nations is undertaken primarily through the Foreign Affairs Ministry, Japan International Cooperation Agency (JICA), and the Japan Bank for International Cooperation (JBIC). In turn, the Japan Society of Civil Engineers sends survey and assistance teams overseas when natural disasters strike, to provide direct assistance in restoration and rehabilitation of the stricken areas. Similarly, overseas disaster-prevention educational activities led primarily by student members have received high praise from the respective countries. This might be called the expansion of support closely linked to the locality. Roundtable discussions also provide opportunities to elicit requests and desires from the counterpart nation. These kinds of concrete results produced by the Japan Society of Civil Engineers should be used as the basis for drafting themes for intergovernmental cooperation, presenting these to the relevant authorities as well as publicizing them through the media.

Furthermore, while there are many examples of Japanese civil engineering technology playing a role in international cooperation, those facts are frequently not transmitted to overseas policy experts and to local government officials. The Japan Society of Civil Engineers should play a more active role in disseminating information regarding the necessity of projects and their socio-economic effects, as well as data about Japan's high level of technological expertise.

(4) Linkage with NPO "Engineers without Borders, JAPAN"

Established by volunteer members of the Japan Society of Civil Engineers and Architectural Institute of Japan, the Japanese NPO "Engineers without Borders" has provided assistance in reconstruction and rehabilitation following natural disasters in countries such as Indonesia and Pakistan. These activities have received high praise from the overseas societies where they are undertaken, and it is believed that they will help nurture a sense of trust toward Japan's civil engineers. By expanding overseas aid activities centered on NPOs, it will become easier to obtain financial aid from the

nation, local governments, and industry; by the participation of ordinary citizens, the range of activities for civil engineers will expand, and by extension, it will help to regain public's trust in public works and civil engineers.

(5) Disseminating information overseas

While an overseas newsletter and English-language publications are being issued, they have not yet become widely available information sources. Financial problems have also slowed the progress of translating and issuing English-language versions of JSCE publications. To promote greater internationalization within the Japan Society of Civil Engineers and more international consciousness among civil engineers, it is crucial to stimulate the overseas dissemination of news from the JSCE. The JSCE should analyze the current issues, clarify the problem points involved, and hammer out a strategy for disseminating information to overseas, and then to implement those elements that are most practical.

4.7 Improving the Education of Civil Engineers

(1) Creating “problem-solving” human resources trusted by public

Producing human resources equipped with “problem-solving” capabilities is very important. The engineering educational curriculum should be redesigned so as to include courses in “engineering design”, “ethics education”, “public policy”, “leadership”, “communication”, “project management” and “globalization”. Education-related committees should take the lead in rethinking the standard curriculum for civil engineers at all levels, from high school to vocational schools, university and post-graduate education.

(2) Public education

To regain public trust in civil engineering and secure adequate human resources to support Japan in the future, a system of support should be created to provide information about civil engineering to schools at the elementary and middle-school levels. For this purpose, horizontal linkage between the activities of branch offices, and cooperation with other academic associations and NPOs should be promoted.

(3) Stimulation of the Society's activities regarding education

Individuals involved with school, adult, and continuing education should be invited to participate in various symposia and forums held to stimulate the JSCE activities regarding education.