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THE 19TH MEETING ON PUBLIC WORKS RESEARCH AND DEVELOPMENT IN ASIA

Proceedings

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Ministry of Land, Infrastructure, Transport and Tourism,
Japan

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No.625, February 2011

The 19th Meeting on Public Works Research and Development in Asia

Proceedings

February 2011

Synopsis:
This proceedings summarize the reports of the session on subject of common interest, lecture notes, etc. on the 19th Meeting on Public Works Research and Development in Asia held mainly at the National Institute for Land and Infrastructure Management (NILIM) in Tsukuba and Yokosuka from November 16, 2010 to November 19, 2010.

Keywords:
Infrastructure development considering global and local environment
(for sustainable development of society)
Meeting on Public Works Research and Development in Asia
National Institute for Land and Infrastructure Management

FOREWORD

The 19th meeting on Public Works Research and Development in Asia was held at the National Institute for Land and Infrastructure Management (NILIM), Ministry of Land, Infrastructure, Transport and Tourism(MLIT) in Tsukuba, Ibaraki Prefecture from Tuesday, November 16 to Friday, November 19, 2010.

The meeting has been held every year since 1993 aiming to encourage government officials responsible for research and development of civil engineering technology in Asian countries to meet together to exchange their views and to develop their research network.

Representatives of 4 countries : India, Indonesia, Myanmar and Japan attended the 19th meeting. In line with the subjects of "Infrastructure development considering global and local environment (for sustainable development of society)", they presented their papers and discussed the related problems.

This report summarized the participants' presentation papers, documents provided for discussion, records of lectures and related information. In conclusion, we would like to extend our deepest gratitude to people and organizations concerned, especially, the Japan International Cooperation Agency (JICA), the Public Works Research Institute (PWRI) and MLIT for the support of and cooperation with the conference.

Secretariat of the 19th Meeting on Public Works
Research and Development in Asia

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I　PROGRAM

November 14 (Sun.) **Arrival in Japan**

Accommodation: JICA Tsukuba International Center
3-6 Koyadai, Tsukuba, Ibaraki 305-0074, Japan
TEL. +81-29-838-1111, FAX +81-29-838-1119

November 15 (Mon.) **Venue: JICA Tsukuba**

Morning Orientation by JICA （at JICA Tsukuba International Center）

Accommodation: JICA Tsukuba International Center
3-6 Koyadai, Tsukuba, Ibaraki 305-0074, Japan
TEL. +81-29-838-1111, FAX +81-29-838-1119

November 16 (Tue.) **Venue: NILIM**

09:30-10:00 Opening Ceremony
（8th floor, International Conference Room）

10:00-10:10 Break

10:10-12:00 Keynote Lecture "Impacts and Responses of Climate Change
-New Challenge for Infrastructure Management-"

Dr. Nobuo MIMURA
Director, Professor, Institute for Water Environment Studies, IBARAKI University

12:00-13:00 Lunch

13:00-16:05 Session

13:00-13:15 Meeting Report
Mr. Masaaki NAKAYASU,
Director, Planning and Research Administration Department, NILIM

This is to show the outline and history of the Meeting of Public Works Research and Development in Asia.

13:15-16:05 Session on Subject of Common Interest
"Infrastructure development considering global and local environment (for sustainable development of society)"

	13:15-13:50	Japan Dr. Kazuhiro NISHIKAWA Director General, NILIM
	13:50-14:25	India Mr. Koneru Venkata Ramana Director of Port Government of Andhra Pradesh
	14:25-15:00	Indonesia Mr. Srie Handono Mashudi Head of QMS department Technical Implementation Unit Directorate General of Highways
15:00-15:30	Break	
	15:30-16:05	Myanmar Mr. Khin Mg Swe Deputy Chief Engineer Bridge Department, Public Works, Ministry of Construction

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18:00-19:30 Welcome Party

(Venue: Hokuto Room, ANNEX 2F, Okura Frontier Hotel Tsukuba)

Host Director General of NILIM

Guests Chief Executive of PWRI

Accommodation: JICA Tsukuba International Center
3-6 Koyadai, Tsukuba, Ibaraki 305-0074, Japan
TEL. +81-29-838-1111, FAX +81-29-838-1119

November 17 (Wed.) **Venue: 8thF International Conference Room, NILIM**

09:30-14:30 Session I (Global Climate Change) (∗)

09:30-10:15 Lecture "Introduction to ICHARM and its Regional Cooperation activities on water-related disaster management - in partnership with ADB"
Mr. Katsuhito MIYAKE
Team Leader, Disaster Prevention Research Team, ICHARM, PWRI

10:15-10:30 Break

10:30-11:15 Lecture "The affection of the climate change on the flood prevention and the adaptation measures"
Mr. Atsushi HATTORI
Head, River Division,
River Department, NILIM

11:15-12:00 Lecture "New Role of Sewerage System in the Low-carbon Society"
Mr. Masashi OGOSHI
Head, Waste Water and Sludge Management Division,
Water Quality Control Department, NILIM

12:00-13:00 Lunch

13:00-13:45 Lecture "Newly-Proposed Operation Rules against Floods Exceeding Design"
Mr. Shinya MITSUISHI
Head, Water Management and Dam Division,
River Department, NILIM

13:45-14:30 Lecture "Sediment Disaster Forecasting and Warning System"
Mr. Masaki MIZUNO
Senior Researcher, Erosion and Sediment Control Division,
Research Center for Disaster Risk Management, NILIM

14:30-14:45 Break

14:45-16:30 Observation Tour

14:45-15:15 River model experiment facility

15:15-15:45 Marine coastal experiment facility

15:45-16:30 ITS experiment facility

(∗) For port specialist ――――――

Special Program･･････Yokosuka Office
Lecture, Presentation and Observation Tour (Yokosuka facilities)

Accommodation: JICA Tsukuba International Center
3-6 Koyadai, Tsukuba, Ibaraki 305-0074, Japan
TEL. +81-29-838-1111, FAX +81-29-838-1119

November 18 (Thu.) Venue: 8th International Conference Room, NILIM

09:00-14:30 Session Ⅱ (Transport and Urban Environment)

09:00-09:45 Lecture "ITS Deployment in Japan"
Mr. Fumihiko KANAZAWA
Head, Intelligent Transport System Division,
Research Center for Advanced Information Technology, NILIM

09:45-10:30 Lecture "Actions of road traffic measure to contribute reduction Greenhouse Gas from transport section and improvement of air quality on roadside in Japan"
Mr. Manabu DOHI
Senior Researcher, Road environment Division,
Environment Department, NILIM

10:30-10:45 Break

10:45-11:30 Lecture "Promotion of roadside noise abatement based on Environmental Impact Assessment"
Mr. Hiroshi YOSHINAGA
Senior Researcher, Road environment Division,
Environment Department, NILIM

11:30-12:15 Lecture "Pavement Technologies in Japan"
Mr. Kazuyuki KUBO
Head, Pavement Research Team,
Road Technology Research Group, PWRI

12:15-13:00 Lunch

13:00-13:45 Lecture "The external force estimation for adaptation measures of storm surge protection in Japan"
Mr. Kenzi NOGUCHI
Senior Researcher, Coast Division,
River Department, NILIM

13:45-14:30 Lecture "Water Quality Improvement and Change of Environmental Concern for Rivers in Japan"
Mr. Kunihiko AMANO
Head, River Environment Division,
Environment Department, NILIM

14:30-14:45 Break

14:45-15:30 Session Ⅲ (Conclusion meeting etc.)

15:30-18:30 Move

Accommodation: JICA Tokyo International Center
10-5, Ichigaya Honmura-cho Shinzyuku-ku, Tokyo 162-8433, Japan
TEL. +81-3-3269-2911, FAX +81-3-33269-2054

November 19 (Fri.)	**Venue: MLIT and Tokyo Area observation sites**

09:00-09:45	Move (From JICA Tokyo to MLIT)
10:00-10:20	Courtesy Call to Ministry of Land, Infrastructure Transport and Tourism (at MLIT)
10:20-16:30	Site visit to Tokyo

10:20	Leave MLIT
10:20-11:00	Move
11:00-12:00	Tokyo bay Aqua Line highway
12:00-13:00	Lunch
13:00-13:30	Move
13:30-15:00	Bureau of Sewerage (Sewerage Exhibit Hall ”RAINBOW”)
15:00-15:45	Move
15:45-16:30	Arakawa-Karyu River Office
16:30-17:30	Move
17:30	Arrive at JICA Tokyo
18:00-19:15	Meeting with JICA

Accommodation: JICA Tokyo International Center
10-5, Ichigaya Honmura-cho Shinzyuku-ku, Tokyo 162-8433, Japan
TEL. +81-3-3269-2911, FAX +81-3-33269-2054

November 20 (Sat.)	**Return to Home Country**

Accommodation: JICA Tokyo International Center
10-5, Ichigaya Honmura-cho Shinzyuku-ku, Tokyo 162-8433, Japan
TEL. +81-3-3269-2911, FAX +81-3-33269-2054

Ⅱ　PARTICIPANTS

The 19 Meeting on Public Works Reserch and Development in Asia

No.	Country	Title	Name	Office/posion	Address
1	India	Mr.	Koneru Venkata Ramana	Director of Ports, Govement of Andhra Pradesh	Port Administration Building Beach Road Kakinada, East Gdavari District, AP, India, PIN.533007
2	Indonesia	Mr.	Srie Handono Mashudi	Head of Quality Management System Department, National Road Implementation Body V Surabaya, Directorate General of Highways, Ministry of Public Works	JL. Raya Waru No.20, Sidoarjo- Eastjava, Indonesia
3	Myanmar	Mr.	Khin Mg Swe	Deputy Chief Engineer, Bridge Department, Public Works, Ministry of Construction	Bridge Department, Public Works, Ministry of Construction, Naypyitaw, Myanmar
4	Japan	Mr.	Kazuhiro NISHIKAWA	Director-General National Institute for Land and Infrastructure Management, Ministry of Land, Infrastructure and Transport	Asahi 1, Tsukuba-Shi, Ibaraki-Ken 305-0804 JAPAN

Ⅲ MINUTES

Session on Subject of Common Interest
"Infrastructure development considering global and local environment (for sustainable development of society)"

Minutes

1. Date and venue: 13:00-16:05 Tuesday, 16th November 2010
   International Conference Room of NILIM

2. Participants

India	Mr. Koneru Venkata RAMANA
Indonesia	Mr. Srie Handono MASHUDI
Myanmar	Mr. Khin Mg SWE
Japan	Mr. Kazuhiro NISHIKAWA
	Mr. Akira TERAKAWA
	Mr. Masaaki NAKAYASU
	Mr. Hirouki KISHIDA
	Mr. Junich YOSHITANI
	Mr. Hiroaki TERAMOTO

3. 19th Meeting on Public Works Research and Development in Asia
Conference Report by Mr. Masaaki Nakayasu

Today's topic I will be talking about is, "The conference on Public Works Research and Development in Asia." This conference is an opportunity to share and discuss the issues and challenges faced by the Asian countries.

My introduction is divided into five parts; the background of the conference, the objectives, history, countries that have participated in the past, and the past achievements of the conference.

The former Public Works Research Institute had decided to bring together the top officials of public works institutes in Asia to a forum in order to establish a close relationship in the area of Public Works R&D. As a result of efforts to realize this, the first international conference was held in 1993 in cooperation with Japan International Cooperation Agency.

The three objectives of the conference are information exchange, discussion on common technological issues, and establishment of personnel network in R&D between participating countries.

Information exchange has been done on specific issues that Asian countries are facing today. Due to historical and geographical differences, Asian countries have big differences on development and infrastructure status. Therefore, it is useful to share the current state of infrastructure and development and management plans in each county before discussion. In order to understand these in each country, each participant is presenting a country report. Specific issues discussed in the past conferences include water pollution of the Mekong River in Thailand, Cambodia, Laos, other countries, flood disaster in Bangladesh, landslide in Nepal, urban traffic congestion in China, and volcanic disaster in the Philippines.

To establish a global sustainable society, we need collaboration in the whole Asia in common issues, considering regional and social differences. By bringing knowledge and experience together, we can discuss technically and politically the challenges and also shed light on these challenges faced by each country. Some common issues include climate change, natural disaster, water resources management, international freight transport system, and traffic and road. Issues of this conference will be global and regional environment.

The final objective of the conference, personnel network can be established through discussions. I expect this will expand to a larger scale network and a joint project between two countries.

The conference is an annual event. The themes of past conferences vary from disaster management, environment, to training of civil engineers. The conference this year is the 19th one with them of "Infrastructure Development Considering Global and Local Environments －for Sustainable Development of Society－."

From 19 countries, 151 government engineers participated in the past conferences.

Below are examples of NILIM's achievements of the conferences: research cooperation in Asia, technical cooperation and promotion through JICA projects, and inter-visitation. More details of research cooperation in Asia are: memorandums signed with counterpart organizations of India and Indonesia; joint workshops on disaster management in Indonesia and Vietnam; and technical promotion and cooperation in Indonesia for erosion control and capability building on road management. With respect to inter-visitation, 971 NILIM researchers visited institutes in Asia outside Japan and 1814 researchers came to NILIM. NILIM would like to increase this exchange activity further.

As a conclusion, this conference has contributed to research development in the area of public works in Asia. This conference is the most important international activity for NILIM. I am sincerely hoping that this conference will be fruitful and productive for all of you and that your stay in Japan will be an abiding memory of you. Thank you.

4. Country Reports

Presentation from Japan: Dr. Kazuhiro Nishikawa

Until quite recently, Japan had been witnessing a rapid increase in population. The population increased by a factor of 3.4 from 1875 to 1975, from about 34 million to 120 million, and with a few exceptions, the annual rate of increase was over 1% during this period. This made Japan much more populous than western countries. Now, the Japanese population is about 127 million, but it has started to decrease after peaking in 2007. It is estimated that it will be less than 100 million in 2050, because of the rapidly decreasing birthrate and life expectancy.

The Japanese economy achieved an annual growth rate of more than 10% between the 1960s and the early 1970s. During this period of high economic growth, the living standards of people in Japan were improved greatly, but this period also left negative legacies such as environmental destruction. Affected by the oil shock in 1973, the pace of economic growth slowed down. The oil shock damaged Japan severely because the country depended on oil for most of its energy. Japan promoted energy-saving measures as a national policy and made significant developments in energy-saving technologies. Today, Japan’s oil dependency is less than 50%.

Economic growth slowed down further at the beginning of 1990. Although the slowdown was largely attributed to the burst of the economic bubble, some analyses suggested that it was greatly affected by the decrease in the productive population (that is, people between the ages of 16 and 65 years), which started in 1995. At the same time, another important factor was that people began to pursue a sense of spiritual wellbeing instead of material wealth, as they diversified their beliefs about happiness. An opinion survey conducted by the Cabinet Office indicated an intensification of the trend to place as much importance on the natural environment as on disaster prevention and a stable supply of food and resources, and this was a subject that the nation would have to emphasize in its nation building for the next 20 years. The same change can be observed in the tasks assigned to the Ministry of Land, Infrastructure, Transport and Tourism (MLIT). In particular, in urban areas, citizen groups are involved in an increasing number of tasks related to environmental conservation.

Historically, environmental problems arose in three stages in Japan. In the first stage, which started around 1960, public hazards, including water pollution and atmospheric contamination, attracted public attention. Subsequently, awareness of conservation and restoration of the natural environment started to increase around 1970, and geoenvironmental issues began to come under the spotlight around the year 2000. To address these issues, the government enacted the Basic Act for Environmental Pollution Control in 1967, which was superseded by the Environmental Basic Act in 1993, the Nature Conservation Act in 1972, and the Law Concerning the Promotion of Measures to Cope with Global Warming in 1998.

Public hazard is one of the negative legacies of the period of high economic growth. It is defined as “pollution caused by business and human activities that spreads considerably widely and damages human health and the living environment.” It is easy to imagine that the rapid improvement of expressways and the sharp increase in the number of cars, beginning in the 1960s, were partly responsible for the atmospheric contamination. The environmental standards of emission control grew stricter because cars were regarded as one of the emission sources of nitrogen dioxide, which is harmful for human respiratory organs. These standards are helpful in decreasing the observed amounts of nitrogen dioxide, and the level of atmospheric contamination has been greatly improved.

Recently, strong measures for the reduction of gas emissions through mitigation of traffic jams have been introduced to help in the reduction of nitrogen dioxide. Smoothly running traffic, achieved through the introduction of state-of-the-art technologies such as vehicle information communications systems (VICSs) and electronic toll collection (ETC), contributes to environmental improvement. The VICS supplies the driver with traffic information in real time and helps him select roads to avoid traffic jams, which results in lower gas emissions and better energy saving. The ETC also contributes to the improvement of the surrounding environment and energy saving by reducing traffic jams considerably, which is achieved by eliminating the necessity for a driver to stop at a toll booth on a toll road. This is one of the systems for which the National Institute for Land and Infrastructure Management (NILIM) itself performed experiments and implemented the system through joint research with public companies.

As for water quality, environmental standards were established on the basis of the Basic Act for Environmental Pollution Control, and various measures were taken to achieve them. The major measures included regulations on effluent from plants, and improvement of the sewage system. At present, 90% of rivers have cleared these environmental standards. Because the sewage system across the country now covers 70% of the population, rivers in particular have recovered their water quality greatly, which has allowed animals and plants to return to these habitats. There have been some reports stating that rivers that once had detergent foam on and above the surface have become clean, and animals and plants that used to live there have reappeared.

Mitigation and adaptation should be considered simultaneously to address global warming. Various plants are being formulated with an emphasis on adaptation for rivers. NILIM has estimated the situation of heavy rain in 100 years’ time in collaboration with researchers in various meteorological fields; they found that heavy rain would be 20–25% stronger, especially in the northern part of Japan. At the same time, the research team also estimated that the volume of water flowing into dam lakes would decrease, because the increasing temperature would melt snow earlier in 100 years’ time than it does at present, and so the amount of water flowing into dam lakes would decrease. Therefore, it may be possible that more severe water shortages will occur in the irrigation period (needed for rice cultivation) than in other periods. The research results that NILIM have published are used in the reports for the committee of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) as their base data. On the basis of the policy reports, adaptation policies for each river will be formulated.

MLIT formulates successive environmental policies and action plans, which organize the knowledge gained from successful cases and from lessons learnt, in a bottom-up manner. In the latest environmental action plan, it voiced the following four viewpoints as the important approaches to achieve each target in terms of public hazards, conservation of natural environment, and geoenvironmental issues.

The most important task is to improve the environment and economic society in an integrated manner. A good environment can supposedly be constructed inexpensively in the long run if more consideration is given to the environment from the planning stage in the development of social capital. The second point is to acknowledge the importance of integration and collaboration. Various departments need to work together to address environmental issues. It is necessary to put technologies developed by universities and public companies into practical use, and to make decisions while maintaining communication with residents. The third is to motivate people and companies to take action. Collaboration with companies and residents is necessary, and it is sometimes necessary to entrust residents with management. The fourth is to place importance on the expansion of viewpoints in terms of both area and time. It is necessary to make evaluations by extending the time up to the life cycle of the facilities, to address problem-solving by thinking about the basin instead of focusing only on the river, and to take approaches that transcend the regulations imposed by existing laws and established practices.

In the period of high economic growth, Japan had to rush the construction of expressways in urban areas to be in time for the Tokyo Olympics in 1969, and many expressways were constructed on the rivers used as canals. The stone bridge called Nihonbashi at the center of Tokyo was no exception. Back then, the scene of cars traveling on the structures above was said to be a symbol of high economic growth. However, no one now says this is a beautiful sight. It is said that it would cost five billion dollars to dismantle these elevated bridges. I think Japan could have achieved better results if it had considered the four viewpoints I mentioned above for its development in that period of high economic growth. It gives me great pleasure that the specific issues and case examples observed in the on-site review will be analyzed from those four viewpoints hereafter for the building of a better nation.

Presentation from India: Mr. Koneru Venkata Ramana

Mr. Koneru Venkata Ramana presented the inception report on Directorate of Ports, Government of Andhra Pradesh (AP), India. The organization position in the government and also the organizational hierarchy of the port department was explained in brief.

Coastline of India including Andaman and Nicobar Islands and Lakshadweep Islands is 7517 kilometers and Indian mainland is 6100 kilometers. The coastline of India is surrounded by Arabian sea in the West, Bay of Bengal in the east, and Indian ocean in the South. To protect this coastline, Indian Coast Guard was constituted in February 1977. State wise, the coastline of Andhra Pradesh is 996 kilometers, only next to Gujarat with 1600 kilometers and then Tamil Nadu with 910 kilometers.

Along the coastline in India, there are 12 major and 139 non-major ports. Major ports are controlled directly by the Government of India. Non-major ports are controlled by state governments. Andhra Pradesh has one major port and 15 non-major ports with 5 non-major ports in operation, 6 under development, and 4 which will be developed in the future. The cargo handled by these five non-major ports in operation is 43.29 million tons earning 75.73 crores in revenue to the Government of AP.

The broad principle that is followed in the development of non-major ports is public-private partnership with state support. Private developers entered into long-term agreements of 30 years under BOOT basis. The state supported the project by providing long lease of lands, fiscal incentives, providing external infrastructure to the port, and bearing the cost of relief and rehabilitation (R&R) of the project.

In Kakinada Deep Water Port (KDWP), Government of AP constructed three berths at a total cost of 293 crores by 1996 with ADB loan. In 1999, the Government gave the project to a developer, M/s International Seaports Ltd (renamed as Kakinada Seaports Limited) for effective implementation of the project. The project was awarded on operate, maintain, share, and transport basis. The initial period was for 20 years, which was later extended to another 20 years. The developer invested 400 crores into the project and has proposed to expand the cargo handling capacity by constructing two more berths. The developer has to share 22% of gross income as revenue to the Government of AP. The cargo handled at KDWP is basically ammonia, bitumen, coal, POL products, etcetera.

The Gangavaram Port has three equity partners, M/s DVS Raju, Warberg Pincus, and Government of AP with 58.1% share owned by M/s DVS Raju. Around 178 crores of expenditure was incurred by Government of AP to develop the port infrastructure including land, road connectivity, water supply, R&R.

Next, the Krishnapatnam Port Concession Agreement was entered in 2004 for 30 years on build, operate, share, and transfer basis (BOST). Five multipurpose berths were built with three more berths under final construction. A special purpose vehicle was formed to provide rail connectivity to the port planned in two phase with Phase I of 19 kilometers completed and Phase II of 91 kilometers still in progress. The port also has road and airport connectivity which is proposed to be further upgraded in the near future; the four-lane road will be upgraded to six-lane road in the future. In Phase II, seven more berths are proposed to be constructed.

In India, there are number of issues and challenges faced by the Port department as well as by the developers at present. Firstly, the logistics of port development is governed by multiple ministries and one has to get clearance from all the ministries. There is no single ministry that coordinates the logistics. Secondly, legal procedures are disjointed and take long time to get government clearances. Thirdly, customs procedures are long and cumbersome resulting in delays in delivery of cargo. Fourthly, there are multiple check posts and documents requirements which further delay the cargo delivery. Lastly, if the countries are not interlinked with improved transportation network, regional integration process will not move ahead at a desired pace.

To overcome the challenges, there are number of efforts and innovation practices going on in India with regard to infrastructure development. Firstly, to increase public investment in infrastructure, government has launched many programs including National Highways Development Project, National Maritime Development Programme. Secondly, an inter-ministerial committee (IMC) was setup to facilitate the development and implementation of a multi-modal infrastructure with the Ministry of Commerce and Industry as the node. It is still not very effective resulting in co-ordination issues between the agencies. Thirdly, the Multimodal Transportation of Goods Act, 1993, was framed to regulate the movement of goods involving more than two modes of transport from India to abroad based on a single, multi-modal transport contract. Fourthly, the foreign direct investment regulations permit 100% FDI under the automatic route for all logistic services except courier and air transportation services. Lastly, development of cross-border infrastructure like energy pipelines with neighboring countries is underway which is expected to contribute to the regional integration by reducing transportation costs and facilitating intra-regional trade and services. Thank you.

Q (Kishida): My first question is, in the beginning of your presentation you talked about the coastline of India, coastline of AP, and the administration of the ports, so are these 12 major ports administered at the country level and 139 non-major ports administered at the state level?

A (Raman): All the major ports are administered by the Government of India through individual port trust. The chairman of the port trust is an IAS officer, who works directly under the Government of India. The State government has no control over them. The 12 major ports work under Ministry of Shipping, Government of India. For non-major ports, each state has its own system. For example, in Andhra Pradesh, there is director of ports. In other states like Gujarat and Tamil Nadu, there is State Maritime Boards. Now, Ministry of

Shipping is insisting on having State Maritime Boards in each of the non-major ports states. Then, a CEO will be heading the State Maritime Boards.

Q (Kishida): Second question is, in India, is coastline erosion happening?

A (Raman): Breakwater system is in existence in India. Coastline erosion is also happening. There are statistics, but due to time constraints, it could not be got. In major ports, there is effective planning due to long-term historical perspective and research. In non-major ports, the developers are getting data, but the maritime board needs the expertise to monitor and prevent the coastal erosion. Hence, the planning is not thorough and not based on research and a better planning is required.

Q (Nakayasu): Under global situation, when a country creates a major port, it acts as a hub for the country. In India, does all 12 major ports act as hubs or only some out of them act as hubs? Can you explain the situation?

A (Raman): All the major ports are functioning as hubs. Amongst the non-major ports, only few are functioning as hubs, for example, Krishnapatnam port in Andhra Pradesh.

Presentation from Indonesia: Mr. Srie Handono Mashudi

Mr. Srie Handono Mashudi presented his inception report titled “Trees for Life.” Mr. Mashudi heads the Quality Management System (QMS) Department of National Road Implementation Body V (NRIB V), Directorate General of Highways in Surabaya, East Java Province. The QMS Department is a unit of technical implementation of National Road under Directorate General of Highway. This department is responsible for controlling, supervising, monitoring, and improving the implementation of public works in three provinces of Indonesia, east Java, Central Java, and the special region of Jogjakarta Province.

Considering the global and local environmental issues, the Directorate General needs not only experts but also managers of infrastructure development. One of the programs of NRIB V is to improve highway environment by planting trees that reduce air pollution. NRIB V has also collaborated with PT Djarum Kudus for Corporate Social Responsibility program. As a result of these programs, mahogany has been planted in East Java while Albizia Saman (Trembebsi) has been planted in Central Java because of their economic value and superior quality.

Albizia Saman absorbs more CO2 compared to other trees, based on the data obtained from an institute in Bogor. The canopy of the tree is 15 meters wide. The tree can withstand heavy rainfall. It can grow in a wide range of altitude. With regard to Mahogany, it is easy to find and grows in dry area. Furthermore, the roots of both trees do not damage the pavement, the leaves and the seeds are not dangerous to the traffic, and they both grow very fast.

The total length of national roads in East and Central Java and Special Region of Jogjakarta is 3640 kilometers. The plan for this year is to plant Trembebsi in 193 kilometers in Central Java. The planting of the trees start from October 2010 with sapling height of 1.5 to 2 meters. The planting will be done in two stages; one, from Semarang to Pekalongan and second, from Pekalongan to Losari, the total length being 195 kilometers. The trees will be planted along the national road and will comply with national roads standard.

Mr. Mashudi also shared the execution photos and the progress of the tree plantation, from staking out by Directorate General of Highways team to planting the saplings to the various stages of growth of the trees. He explained that the canopy of the tree stops the light from reaching the pavement resulting in lower temperature of the pavement. This leads to longer life of the pavement and lower vehicle operating cost.

The communities living around the national road were also involved during the implementation of the program as well as the national universities. Thank you.

Q (Nishikawa): With the canopy, the life of the road can be extended. The tree shadow falls on the road extending the life of the asphalt. So, the tree protects the road. Was this one of the expectations in the past?

A (Mashudi): Because of the canopy, the people living around the national roads feel convenient. We can decrease the vehicle operating cost because of lower temperature of the pavement and the tires lasts longer. The pavement will also have a longer life.

Q (Nakayasu): Mahogany was mentioned as the most economical tree to plant. Is Mahogany cut after few years of planting on the roadside and sell them as lumber, for example?

A (Mashudi): It is hoped that mahogany is not cut for lumber. Mahogany is planted as a stimulant to the people around the national road as this is a good tree.

Q (Nakayasu): So, why do you think Mahogany is economical and desirable tree to be planted?

A (Mashudi): Mahogany has a good value and is planted with some purposes as has been mentioned in the presentation. The other purpose is to act as a stimulant for people living around the national highway. In Java Island, there is a variety in food crop and trees. Trees like Albizia and Tectona grandis has good value. So, Mahogany is also promoted as a tree to be planted along national road.

Q (Kishida): First question is related to the previous question. At NILIM, the absorption of CO_2 by trees is tested and measured locally and so there is a measurement result of this test. As was mentioned, the annual absorption rate was 28.5 tons per year, is this rate measured by an institute in Indonesia? Who is doing this measurement of CO_2 absorption rate?

A (Mashudi): The rate of measurement is from IPB Bogor. It was published in Trobos magazine #456, February 08.

Q (Kishida): Is the gentleman a university professor or from a national research institute?

A (Mashudi): He is from a national government institute in Bogor.

Q (Kishida): Second question, is there a database of the roadside trees, like the number of trees planted in the past and the kind of trees planted?

A (Mashudi): The data is in the flash disk and can be shown, if needed.

Break

Presentation from Myanmar: Mr. Khin Mg Swe

Mr. Khin Swe made a presentation on infrastructure development considering global and local environments for sustainable development of society from the slides. He pointed out that Myanmar has signed or acceded to or ratified a number of international environment conventions. Therefore, Myanmar is moving towards increased international engagement in environmental arena, and the government has also shown initiatives and some awareness in environmental issues.

In 1997, Myanmar became a member of Association of Southeast Asian Nations (ASEAN). ASEAN in recent times has been focusing on regional cooperation in dealing with environmental problems. To this purpose, ASEAN Regional Centre for Biodiversity Conservation was set up to empower communities in their ecoefficiency objectives. Mekong River Commission (MRC) is also another program in which Myanmar is involved. Such institutional mechanisms can be applied to engage the government at information-sharing and dissemination of current environmental affairs. This engagement can lead to training of officials for environmental assessment.

The Government of Myanmar adopted a policy of conservation and effective utilization of natural resources. Environmental protection and conservation occupy a special significance on national agenda of Myanmar.

Next, Mr. Swe presented organizational hierarchy of Public Works department which is under the Ministry of Construction. Public Works undertakes the construction and maintenance of major infrastructure of Myanmar. It has a multidisciplinary team of 12000 staffs including engineers and technicians.

The State Peace and Development Council is the highest authority of which Public Works is a part of. In the past, Public Works used labor-intensive method to implement a project. Now, although computers have been introduced, but due to absolute software and hardware, the highway management information system (HMIS) can only perform limited operation.

With the regard to budget allocation for new construction, it is allocated by the national budget directly to the Ministry of Construction. For maintenance purpose, maintenance budgets are provided which is of three types; routine, periodical, and special maintenance. Routine maintenance is done every year, while periodical maintenance is done every 4 years. Special maintenance is done only during special occasion. The allocated funds are not always adequate and have to be supplemented with supplementary budget.

Public Works is responsible for 34178 kilometers out of total 130050 kilometers of road network in Myanmar. From 1988 to present, Public Works has constructed 4263 bridges and 175 more bridges are under construction.

On private sector participation, Public Works introduced the build, operate, and transfer system (BOT) to encourage private sector participation. The government provided the land and infrastructure to the private entrepreneurs. They then built or improved the road and collected the toll for agreed time period. Foreign investors are also being encouraged to participate for upgrading infrastructure.

Today, due to underdevelopment and poverty, Myanmar faces a number of environmental challenges like deforestation, land degradation, etcetera, although air and water pollution is minimal due to low level of industrialization and low chemical use in agriculture. The challenges has three dimensions; institutional development, resource capacity, and environmental education.

In Myanmar, the environmental awareness is slowly gaining interest. Various development projects by departments and ministries integrate environment, but lack of proper institution still remains the main constraint. However, formation of NCEA and adoption of Myanmar Agenda 21 should help in solving the integration issue in the future. Thank you.

Q (Kishida): At present, as said in the presentation, Myanmar is implementing various environmental initiatives. When building long roads or bridges, there is considerable environmental impact. Do you do environmental assessment of such projects or has it been done in the past?

A (Swe): At present, Myanmar is trying to develop various infrastructures. The Public Works constructs roads and bridges all over the country. Myanmar being a developing country, there is less knowledge of environmental assessment, but it has been trying to develop it from other countries.

Q (Teramoto): First, Myanmar introduced private-public partnership in toll road construction and management. From the explanation, for 56 toll-road systems, 21 companies have studied this private-public partnership. Do you feel any disadvantages of this kind of system? Second, as you explained in the presentation, foreign companies are also invited for this partnership. Are there any Japanese companies participating or not?

A (Swe): The partnership is through build, operate, and transfer (BOT) system. Hence, all 21 companies are BOT companies. In constructing bridge, we have JFE from Japan in steel truss production.

Dr. Kishida thanked Dr. Swe for the presentation and also thanked other participants.

End of the Meeting

The 19th Meeting on Public Works Research and Development in Asia
Discussion on Specific Subject

(Subject: Introduction to ICHARM and its Regional Cooperation activities on water-related disaster management - in partnership with ADB

Summary of Minutes

1. Date and venue: 9:30–10:15 a.m.
   Wednesday, November 17, 2010
   International conference room

2. Participants

Indonesia	Mr. Srie Handono MASHUDI
Myanmar	Mr. Khin Mg SWE
Japan	Mr. Katsuhito MIYAKE

3. Summary of discussion

(1) Lectures

The following two lectures were delivered as contributions to today's theme "Accommodating Climate Change."

1) Information was presented on the representative activities of the International Centre for Water Hazard and Risk Management (ICHARM), engaged in activities contributing to the mitigation of water-related disasters in the world. The background to its foundation and its three mainstays of research, training, and information networking were discussed.
2) Information was presented on the current activities of each country in the regional technology cooperation ICHARM, started in alliance with the Asian Development Bank (ADB) in November 2009.

(2) Questions and answers

Q (Mr. MASHUDI): I am in charge of expressway construction in Indonesia. In my country, sudden rainfall often interrupts construction work because of the insufficient ability to predict rainfall precisely. I wonder if ICHARM can contribute to the improvement of the present situation.

A (Mr. MIYAKE): The current flood prediction system offered by ICHARM does not predict rainfall because it provides information on rainfall after it has received observation results from the satellite. (Information provided by the agencies involved in the satellite operation does not contain predictions on rainfall at present). I wish to leave the problem of rainfall prediction for future consideration. I know that Indonesia is operating several radar rain gauges. I suppose that you may be able to obtain information that is useful for construction work if you establish a system that coordinates these gauges for data processing, and combine the system with the movements of rain clouds. I would suggest that you ask the Meteorological Agency in your country about this suggestion.

Q (Mr. SWE): Myanmar has been suffering from water-related disasters lately because of floods upstream and cyclones, particularly cyclone Nargis. I would like ICHARM to extend its assistance to Myanmar.

A (Mr. MIYAKE): ICHARM acknowledges Myanmar as one of the important countries. It invited the ex-secretary of Myanmar's Meteorological Agency to deliver a lecture last year. Some of ICHARM's researchers are carrying out simulations of storm surge inundation. We would like to present the simulation results to Myanmar once reliable results are obtained. (In addition, ICHARM accepted a student from Myanmar onto its Masters course last year).

The 19th Meeting on Public Works Research and Development in Asia
Discussion on Specific Subject

(Subject: Impacts of the climate change on the flood prevention and the adaptation measures)

Summary of Minutes

1. Date and venue: 10:30–11:15 a.m.
Wednesday, November 17, 2010
International conference room

2. Participants

Indonesia	Mr. Srie Handono MASHUDI
Myanmar	Mr. Khin Mg SWE
Japan	Mr. Atsushi HATTORI

3. Summary of discussion

(1) Lecture

It was explained that Japanese utilization of flood-prone low-lying areas is highly sophisticated, but that the degree of safety from floods is relatively low in general and that there is concern about the growing risk of flood-related disasters due to the climate change predicted in the foreseeable future.

It was reported that the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) would implement multilayered flood-control measures, with a view to decreasing the number of victims to zero through adaptation measures.

It was explained that torrential monitoring technology using the X-Band Multiparameter Radar could be an example of the pioneering measures applicable to the increasingly visible changes in the climate.

The results of river discharge capacity assessment under the climate change were also presented in a preliminary study, to be considered when forming a long-term adaptation strategy. An explanation was given of the improvements necessary to secure the degree of safety stipulated in the water control policy when considering the increasing rainfall due to climate change.

(2) Questions and answers

Q: On the X-Band Multiparameter Radar

A: We exchanged opinions on the differences in specifications such as the resolution between the X-Band Multiparameter Radar and the conventional C-Band Radar, and also on the research into flood forecasting and warning in the future, which will use the X-Band Multiparameter Radar.

Q: On the increasing flood flow associated with the urbanization of the basin

A: We understand that in Indonesia, flow increases with the progress of urbanization, but this knowledge is not well incorporated into actual urbanization plans.
I think that the Japanese flood measures in the urbanized basin will be useful for the participating countries.

The 19th Meeting on Public Works Research and Development in Asia
Discussion on Specific Subject

(Subject: New Role of Sewerage System in the Low-carbon Society)

Summary of Minutes

1. Date and venue: 11:15 a.m. to 12:00 p.m.
   Wednesday, November 17, 2010
   International conference room

2. Participants

Indonesia:	Mr. Srie Handono MASHUDI
Myanmar:	Mr. Khin Mg SWE
Japan:	Dr. Masashi OGOSHI

3. Summary of discussion

(1) Lecture

A sewerage system is vital for a city to manage its waste. Besides collecting and screening out sewage and effluent, it channels these to the sewage plant, where pollutants are separated and eliminated to protect the water environment where the water will be discharged. Amid the recent moves to prevent global warming, and with the pursuit of sustainability in contemporary society, the role of the sewage plant is developing to involve the recycling of water and resources. In this lecture, Japanese approaches to the cyclic use of water and the cyclic use of resources in which the sewage plant plays the central role were introduced, and the problems arising from the cyclic use of resources were discussed.

(2) Questions and answers

Q (Mr. MASHUDI): Could you tell me how you distribute the treated water.

A: We distribute the treated water using double piping. That is, we build a pipe for sending treated water and another pipe for water services.

Q (Mr. SWE): Do hotels have such equipment?

A: Some hotels in Tokyo have such equipment.

Q: (Mr. MASHUDI) Do you have an established system for the use of treated water?

A: Though not mandatory, the Tokyo Metropolitan government asks for buildings with a large floor area to have a system for the use of treated water.

The 19th Meeting on Public Works Research and Development in Asia
Discussion on Specific Subject

(Subject: Newly-Proposed Operation Rules against Floods Exceeding Design)

Summary of Minutes

1. Date and venue: 13:00–13:45
   Wednesday, November 17, 2010
   International conference room

2. Participants:

Indonesia	Mr. Srie Handono MASHUDI
Myanmar	Mr. Khin Mg SWE
Japan	Dr. Shinya MITSUISHI

3. Summary of discussion

(1) Lecture

It was explained that recently, dramatic improvements had been made in the research into dam operation methods. Damage to the flooded area is minimized by setting the optimal amount of advance release and maximum release. This is achieved through the integrated operation of the dam's flood-control capacity and water utilization capacity, based on rainfall predictions that utilize the Water Research and Forecasting (WRF) Model.

The flood adjustment system widely adopted in Japan was introduced, and the problems associated with it were explained. At the same time, the rational flood adjustment method using rainfall prediction and management of its prediction error was discussed, the simulation results for dams across the country using the flood data were shown, and the effectiveness of this method was explained.

In addition, flood adjustment examples carried out in the field were presented. The management of prediction error to strengthen the function and measures to improve the facilities were explained.

(2) Questions and answers

Q (Mr. MASHUDI): It is an important point of view that the dam should be managed taking the risk into consideration. What flood adjustment method do you use if the actual rainfall exceeds the predicted rainfall?

A (Dr. MITSUISHI): We compare the available storage capacity of the dam with the volume of inflow, and discharge water in advance if the available storage capacity is insufficient. We increase the outflow rate by considering the available storage should further storage be needed.

Q (Mr. MASHUDI): The shortage of available storage due to the accretion of sand has become the biggest problem in dam management, and planting in the basin is underway in Indonesia. What measures are being taken in Japan?

A (Dr. MITSUISHI): Some dams are nearly 100 years old, and measures for the accretion of sand have also become a big problem in Japan. In addition to constructing bypasses for sand elimination and implementing dredging, some dams like the Unazuki Dam have had sand elimination gates installed.

Q (Mr. MASHUDI): Some dams, including the one on the Blantas River, have a gate, and the gate is opened for sand elimination in our country. However, it is impossible to construct a gate in some dams, including the dam on the Soro River, because they are vital for fishery or because they have big cities downstream. Planting is not problem-free because we cannot solve some mounting problems such as illegal harvesting, and our inability to solve these is a big problem. In fact, problematic planting is related to shore erosion.

A (Dr. MITSUISHI): Japan had many clear-cut areas in the Edo period and in 1945. Planting has brought Japan to its current situation. Dams in Japan are planned on the assumption that the forest in the basin is well managed. The accretion of sand in the dam has made river-bed degradation and environmental deterioration visible.

The 19th Meeting on Public Works Research and Development in Asia
Discussion on Specific Subject

(Subject: Sediment Disaster Forecasting and Warning System)

Summary of Minutes

1. Date and venue: 13:45–14:30
   Wednesday, November 17, 2010
   International conference room

2. Participants

Indonesia	Mr. Srie Handono MASHUDI
Myanmar	Mr. Khin Mg SWE
Japan	Mr. Masaki MIZUNO

3. Summary of discussion

(1) Lecture

The Japanese sediment disaster forecasting and warning system traditionally organized rainfall records obtained during disaster periods and normal times, and predicted the occurrence of a sediment disaster on the basis of whether or not the snake line was above the limit of the sediment disaster risk occurrence baseline (straight line).

However, because this method had several problems, Japan has adopted a method for determining the critical line (CL) using the Radial Basis Function Network (RBFN), which is a kind of neural network, and has set up standards for information on sediment disaster warnings.

The setup method, announcement procedure, and actual operation examples in disasters of the Japanese sediment disaster forecasting and warning system (sediment disaster warning information based on the RBFN) were introduced.

(2) Questions and answers

On the response of the sediment control facilities after the eruption of a volcano

Q (Mr. MASHUDI): Mt. Merapi is erupting, and the sediment control dam is buried because of ash-fall sediment in Indonesia. Do you have any suggestions as to what we should do?

A (Mr. MIZUNO): You need measures to decrease the damage due to the migration of sediment after ash fall. I will use the response to the eruption of Unzen and Fugendake in 1991 as a case example when Japan implemented hardware-based measures (except such software-based measures as raising the alarm and evacuation).

For the urgent protection of objects subject to conservation from the sediment disaster after ash fall, we repeatedly eliminated stones in the existing sediment control dams, built emergency sediment storage places, and installed tentative channelizing dams outside the off-limit area.

For fundamental mudflow measures, we constructed sediment control dams and channelizing dikes (in the downstream direction of the approaching mudflow) as shown in Figs. 1 and 2. In addition to these, we revamped the Mizunashi River (for example, by eliminating, burying, by blocking sediment, and by widening the buffer zone to reduce and eliminate flood energy).

Fig. 1: Image of the completed sediment control facilities on the Mizunashi River of Unzen and Fugendake

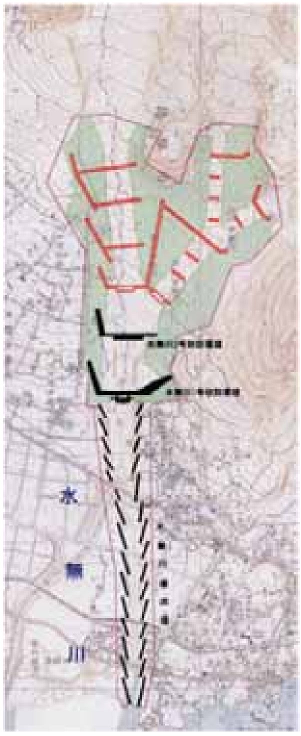


Fig. 2: Improvement plan of the sediment control facilities on the Mizunashi River of Unzen and Fugendake

The 19th Meeting on Public Works Research and Development in Asia
Discussion on Specific Subject

(Subject: ITS Deployment in Japan)

Summary of Minutes

1. Date and venue: 9:00 –9:45 a.m.
   Thursday, November 18, 2010
   International conference room

2. Participants

India	Mr. Koneru Venkata RAMANA
Indonesia	Mr. Srie Handono MASHUDI
Myanmar	Mr. Khin Mg SWE
Japan	Mr. Fumihiko KANAZAWA

3. Summary of discussion

(1) Lecture

The concept of “Smart Way” was explained, together with its realization through road-to-vehicle communication technology that uses Dedicated Short Range Communications (DSRC: spot communications) in the 5.8-GHz bandwidth, as employed by electronic toll collection (ETC) in Japan.

The history of research and development to date was presented. The outline of the intelligent transport system (ITS) spot service, scheduled for full-scale development beginning in 2010, was introduced, and available services like dynamic route guidance, safety driving support, IP connection, and services under development (utilization of probe information, settlement services, and logistics support) were discussed.

(2) Questions and answers

We exchanged opinions mainly on the following subjects.

○ On the safety driving support service

Q: Please tell us about the responsibility for an accident that occurs due to the service being down and failing to give the necessary safety information.

A: This service is to support the driver. The driver is responsible for the accident, and I think the system is not liable for it.

○ On the obligations of the private sector

Q: Does the private sector have obligations for the future development of the ITS spot service?

A: This service is offered through collaboration between the government and the private sector. The government improves the infrastructure, and the private sector is responsible for the manufacturing and sales of onboard units and roadside equipment, as well as follow-up services. The government does not give orders to the private sector, and the private sector has no obligations to the government.

It is similar to the case of the ETC, which is used by more than 90% of expressway users.

The 19th Meeting on Public Works Research and Development in Asia
Discussion on Specific Subject

(Subject: Actions of road traffic measure to contribute reduction Greenhouse Gas from transport section and improvement of air quality on roadside in Japan)

Summary of Minutes

1. Date and venue: 9:45 -10:35 a.m.
   Thursday, November 18, 2010
   International conference room

2. Participants

India	Mr. Koneru Venkata RAMANA
Indonesia	Mr. Srie Handono MASHUDI
Myanmar	Mr. Khin Mg SWE
Japan	Mr. Manabu DOHI

3. Summary of discussion

(1) Lecture

The emissions of “greenhouse” gases from the road traffic sector in Japan were explained, and the legal system and basic ideas for the reduction of emissions were introduced.

The history, present situation, legal system, and improvement measures for roadside air quality in Japan were also introduced.

Subsequently, specific explanations were given about the road traffic policy effective for both of the above two problems, that is, the policy for cars, and the policy for roads. The importance of an integrated approach for the reduction of emissions from various fields, such as car, road, and traffic, was discussed.

In this discussion, the participants agreed on the importance of having an integrated approach to solve the above problems.

The 19th Meeting on Public Works Research and Development in Asia
Discussion on Specific Subject

(Subject: Promotion of roadside noise abatement based on Environmental Impact Assessment)

Summary of Minutes

1. Date and venue: 10:45－11:30 a.m.
   Thursday, November 18, 2010
   International conference room

2. Participants

India	Mr. Koneru Venkata RAMANA
Indonesia	Mr. Srie Handono MASHUDI
Myanmar	Mr. Khin Mg SWE
Japan	Mr. Hiroshi YOSHINAGA

3. Summary of discussions

(1) Lecture

The present situation of roadside noise was explained, and a brief summary of measures for noise reduction and environmental impact assessment was given. In terms of the present situation, it was mentioned that environmental standards are set as administrative objectives on the basis of the Environment Basic Law. An example was given: despite the fact that noise exceeding the environmental standards is observed in about 10% of residences, in many of them noise does not pose a problem on the roadside even though it exceeds these environmental standards. In terms of noise-reduction measures, a brief summary of each of the measures for noise sources, noise propagation channels and noise receiving was explained. Subsequently, the sound insulation wall (as a noise propagation channel) and the drainage pavement (as a measure for the noise source) were discussed in a little more detail. Lastly, the necessity of working on possible noise-control measures in the planning stage was explained. It was also mentioned that the National Institute for Land and Infrastructure Management (NILIM) is conducting research on methods for noise estimation and assessment.

(2) Questions and answers

Q: Please elaborate on the Japanese environmental standards of 45 dB in the daytime and 40 dB in the nighttime stipulated for inside a building.

A. It is close to the conditions if no one were to speak in the conference room.

Q. I wonder if the sound from a car horn is noisy. Is it regulated?

A. Because Japanese drivers observe safety rules very closely, they rarely sound the horn. The sound of the horn is not regulated. The regulations for altered mufflers were intensified last year because these are the subject of many complaints.

Q. What material is used to strengthen the acrylic sound insulation wall? Is it a grid material?

A. It is made of nylon code, and it is in strips, not in a grid.

Q. When will the current “engineering method of environmental impact assessment” be revised?

A. It is scheduled to be revised in two years.

The 19th Meeting on Public Works Research and Development in Asia
Discussion on Specific Subject

(Subject: Pavement Technologies in Japan ~Measures against Environmental Issues~)

Summary of Minutes

1. Date and venue: 11:30 a.m. to 12:15 p.m.
   Thursday, November 18, 2010
   International conference room

2. Participants

India	Mr. Koneru Venkata RAMANA
Indonesia	Mr. Srie Handono MASHUDI
Myanmar	Mr. Khin Mg SWE
Japan	Mr. Iwao SASAKI

3. Summary of discussions

(1) Lecture

A brief summary was given of the surveys and research on pavement technologies that Japan is developing and implementing as a solution for environmental problems such as the global environment (carbon dioxide emissions), the urban environment (heat island), and the roadside environment (pedestrians' heat environment).

Recycling has been adopted as a pavement technology that is helpful for the reduction of carbon dioxide emissions. The process and the present situation in terms of the recycling of pavements in Japan were introduced, as well as the construction method for recycling pavement materials and the results of calculations of reduced carbon dioxide emissions. At the same time, the ideas of utilizing the recycling methods of other industries, water-retentive pavements helpful for the reduction of road surface temperature, and heat-shielding pavements were introduced, and case examples estimating the effects of these pavement technologies were explained.

(2) Questions and answers

○ On the aggregate size of recycled hot asphalt mixture

Q. Recycled asphalt concrete is supposed to have a smaller aggregate size if old crushed materials are reused in it.

A. A certain amount of new aggregate (and new asphalt) is added and mixed with the recycled asphalt concrete, and the production plant designs the mixture of recycled asphalt concrete by setting the size of the new aggregate as coarse, in order to achieve the optimal aggregate size in each production.

○ On the repeated usage of pavement as paving asphalt recycling

Q. How many times is asphalt concrete recycled?

A. The answer is different for urban and rural areas. According to material usage statistics compiled by the Public Works Research Institute and the estimates of pavement asset stock, more than 50% of pavements are recycled at least once. In combination with the increasing usage of modified asphalt, we observe signs of the decreasing penetration of asphalt (development of material oxidation) in the pavement materials used within Japan.

○ On the construction method of recycled asphalt pavements and the unit prices of the materials

Q Three kinds of recycling technologies are available for asphalt: hot-mix asphalt recycling, warm-mix recycling, and cold(ambient)-mix recycling. Please tell us the price of each recycling technology.

A The hot-mix asphalt recycling costs less than the production of new asphalt, because there are no expenses for disposing of asphalt concrete wastes, and because it can reduce the amount of new asphalt required for production. The warm-mix asphalt recycling costs more than the production of new asphalt at present, but there are ongoing efforts that ask the user(road authorities) to bear the increased cost incurred by using the system, such as the green procurement adopted last year.

○ On the cost to make an asphalt mixing plant suitable for recycling

Q Please tell us the cost for the modification of an existing mixing plant to make it suitable for recycling.

A. I do not have detailed information because I am not on the producers' side, but I am informed that it does not cost much in comparison with the cost of all the equipment. The indirect heating type only requires equipment to input recycled aggregates(used asphalt) into the mixer, and even the attached dryer heating type requires only the building of a dedicated dryer for recycling, and equipment for the storage and supply of recycled materials.

○ Other comments

- Mandatory policies like the green procurement are very effective for making recycling technology more widespread, but it is necessary to discuss their pros and cons carefully because we are observing signs of the decreasing penetration of the asphalt (development of material oxidation), that is, signs of rapid deterioration of asphalt stock as road pavement assets.
- The reasons for the in-place recycling method not being widespread in Japan are as follows: (1) there are too many fixed recycling plants already installed; (2) there is limited space available for constructing in-place recycling plants; and (3) porous asphalt pavements are already popular. However, technology transfer looks promising because cases suitable for the in-place recycling method are supposed to be abundant in foreign countries.

The 19th Meeting on Public Works Research and Development in Asia
Discussion on Specific Subject

(Subject: The external force estimation for adaptation measures of storm surge protection in Japan)

Summary of Minutes

1. Date and venue: 13:00–13:45
Thursday, November 18, 2010
International conference room

2. Participants

India	Mr. Koneru Venkata RAMANA
Indonesia	Mr. Srie Handono MASHUDI
Myanmar	Mr. Khin Mg SWE
Japan	Mr. Kenzi NOGUCHI
	Dr. Hirouki KISHIDA

3. Summary of discussion

(1) Lecture

The present situation of the Japanese coastline was introduced. The major problem for coastal protection in Japan is coastal erosion. On the assumption that climate change is related to coastal erosion, Japan’s policy on climate change and our present knowledge of the changes in ocean waves, typhoons, and tidal levels were introduced.

(2) Questions and answers

Q (Mr. MASHUDI) Cyclones gradually erode the coastline in Indonesia. Do you have any good suggestions for the prevention of coastal erosion, because people working in the fishing industry are worried that they will lose their livelihoods in the future?

A (Mr. NOGUCHI) You need to know whether the coastal erosion due to cyclones is temporary or advancing slowly, because the measures to be taken can vary depending on this. If it is temporary, you have to wait, without erecting any structural objects on the coastline, because the coastline will certainly recover.

A (Dr. KISHIDA) You have to take measures such as beach nourishment, sand bypassing, and sand recycling, either temporarily or permanently. Erecting structural objects is an easy and lasting method. However, it causes side effects. It may be feasible to prevent the structural objects from being washed out to sea by constructing many small jetties.

A (Mr. NOGUCHI) I would suggest that you consider creating a reef effect instead of destroying the fishery. Methods for protecting the beach scarp through sand packing using geotextiles and geotubes are available. I read an article on such measures taken on the coastline of your country (India).

The 19th Meeting on Public Works Research and Development in Asia
Discussion on Specific Subject

(Subject: Water Quality Improvement and Change of Environmental Concern for Rivers in Japan)

Summary of Minutes

1. Date and venue: 13:45–14:30
   Thursday, November 18, 2010
   International conference room

2. Participants

India	Mr. Koneru Venkata RAMANA
Indonesia	Mr. Srie Handono MASHUDI
Myanmar	Mr. Khin Mg SWE
Japan	Mr. Kunihiko AMANO
	Mr. Hiroaki TERAMOTO

3. Summary of discussion

(1) Lecture

The history of water quality in Japanese rivers was introduced, and it was shown that the water environment is affected by various kinds of human activity because the change of environmental factors other than that of water quality occur concurrently. The history of the environment in the basin of Ise Bay was used as a case study.

At the same time, brief explanations were given of the human influence on Japanese rivers, and of the resulting effects and measures for their mitigation.

(2) Questions and answers

(Mr. TERAMOTO) I wish to know the water quality of the Ganges River.

(Mr. RAMANA) The Ganges River is a holy river from a religious perspective, but in fact, water pollution there is worsening.

Ⅳ　SESSION REPORTS

1. Japan

Mr. Kazuhiro NISHIKAWA

Infrastructures for Global and Regional Environment
-Good Practices and Lessons-

Kazuhiro Nishikawa
Director-general
National Institute for Infrastructure and Land Management

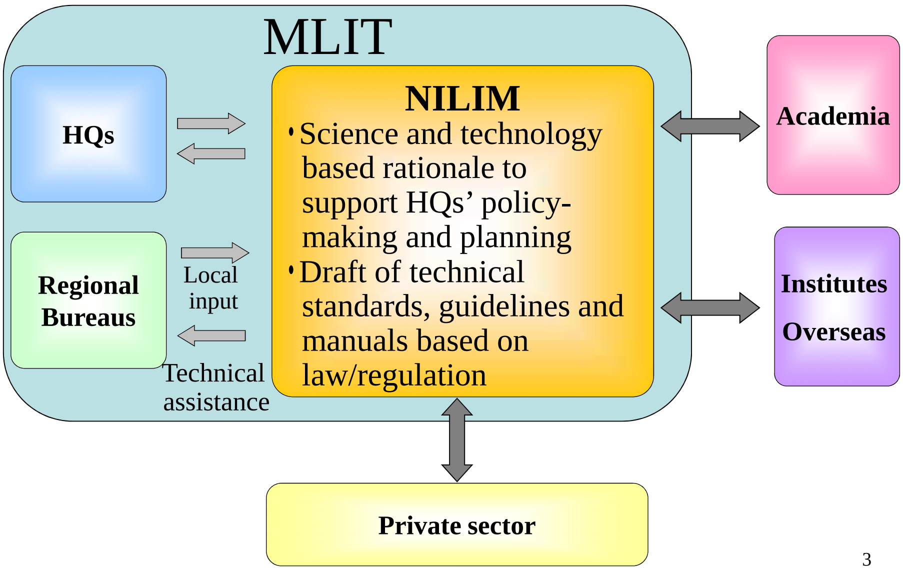
1

Outline

I. Introduction to NILIM
II. Natural and societal background of Japan
III. Actions and consequences
IV. Conclusion

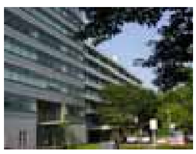
2

NILIN in civil engineering society



3

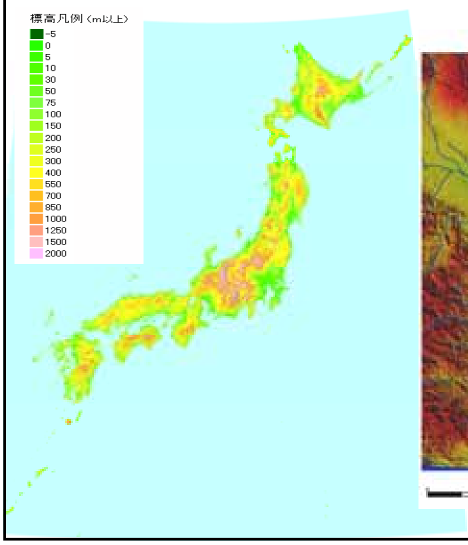
Research departments and centers at NILIN

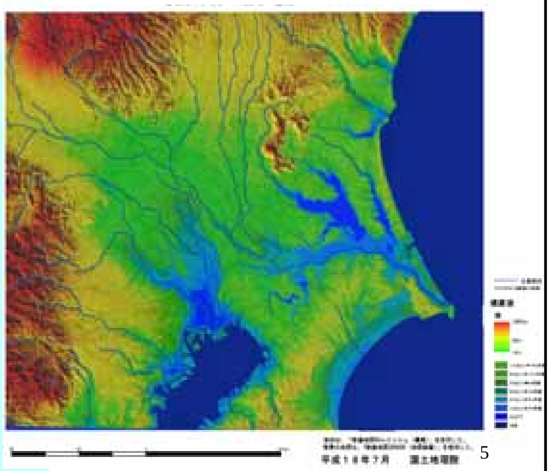

Environment Department
Water Quality Control Department
River Department
Road Department
Building Department
Housing Department
Urban Planning Department
Coastal and Marine Department
Port and Harbor Department
Airport Department
Research Center for Land and Construction Management
Research Center for Advanced Information Technology
Research Center for Disaster Risk Management

4

Landscape of Japan



Kanto (Tokyo and its vicinity)



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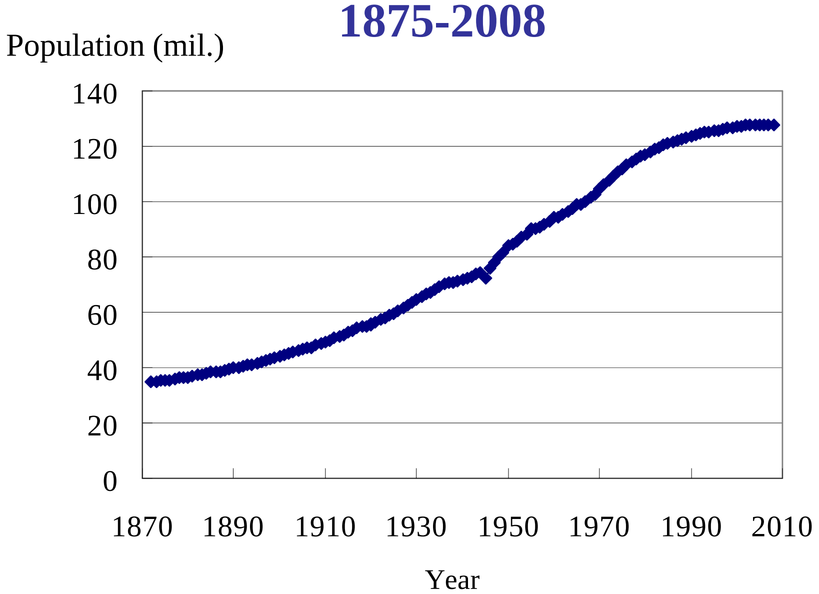
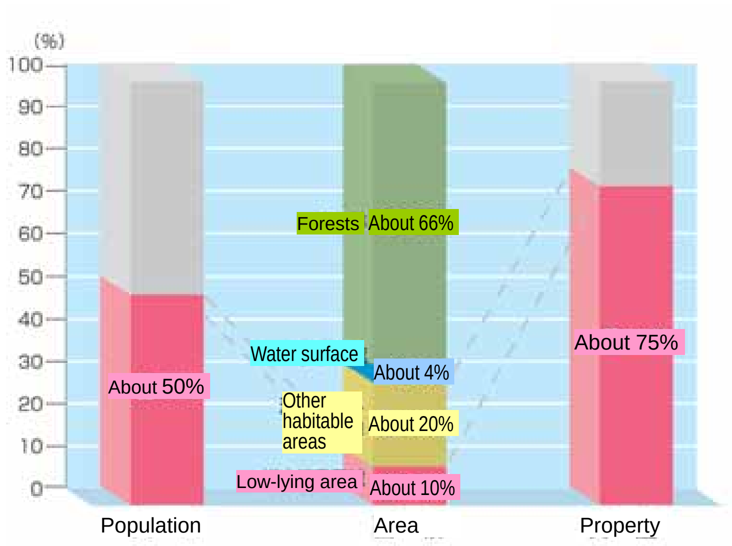
Demographic Change of Japan 1875-2008



6

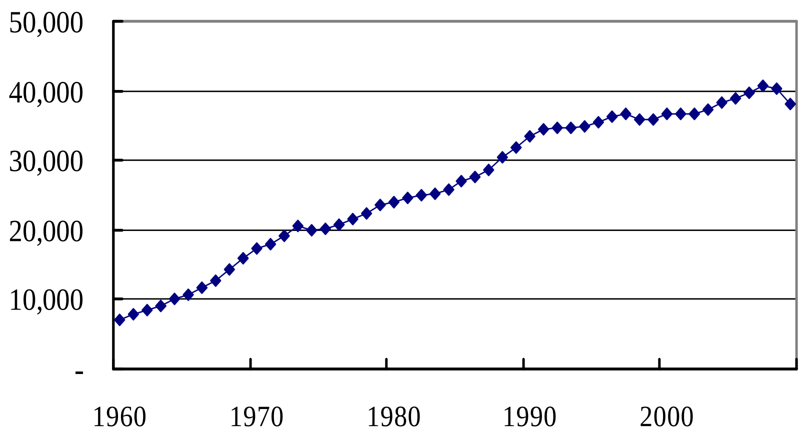
Landuse in Japan



Source: River Bureau, MLIT 7

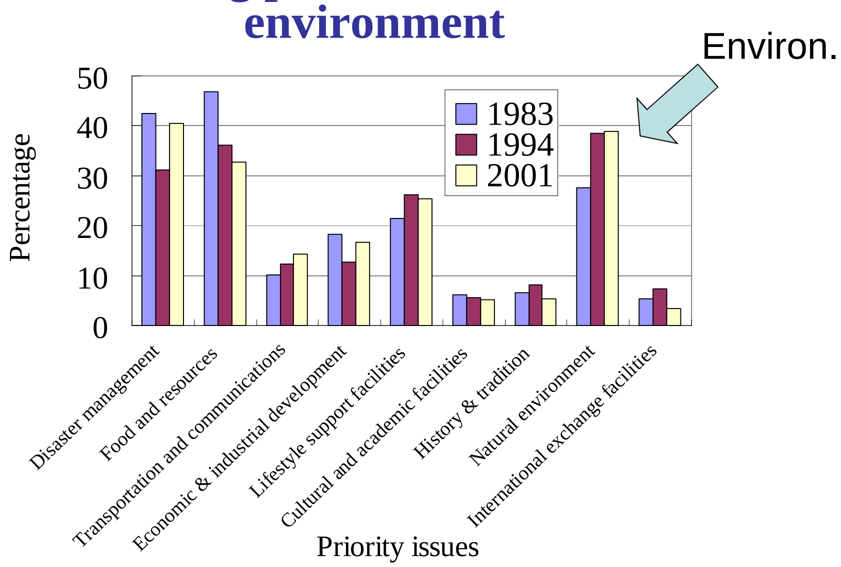
GDP

GDP per capita (constant 2000 USD)



Sources: World Databank 8

Growing public awareness on environment



Sources: Public opinion survey on Perspectives of Future Land, Cabinet Office

Evolution of environmental concerns

Pollution (public disruption)

Natural Environment

Global Environment

1972 Nature Conservation Law

1967 Basic Law for Environmental Pollution

1933 Basic Environment Law

1998 Law Concerning the Promotion of the Measures to Cope with Global Warming

Pollution (Public Disruption)

Public disruption: Wide-area pollution caused by business or others that harm health or living environment of the public

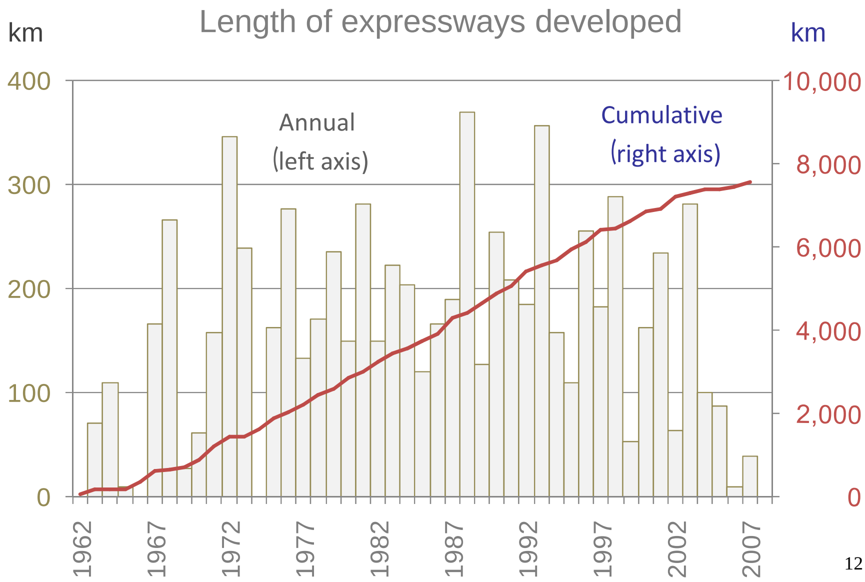
Air pollution from traffic

River surface covered with detergent foam from domestic effluent

11

III. Actions and consequences

Expansion of expressways



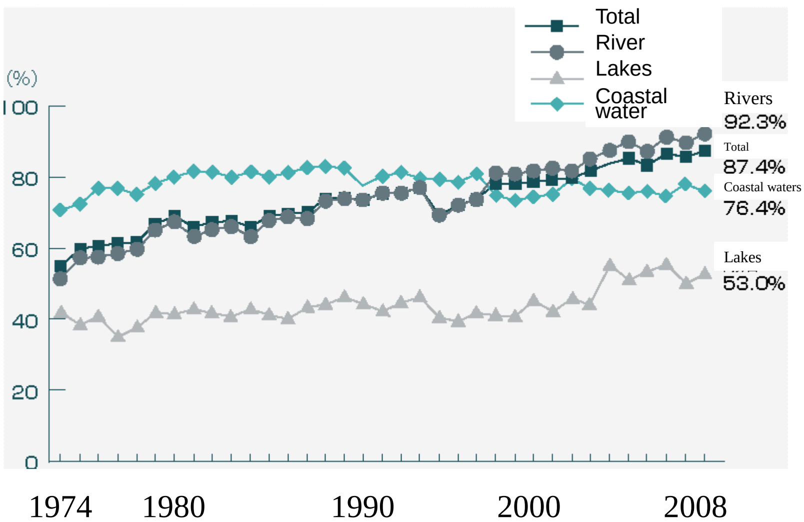
12

12

Expressway build on river in downtown Tokyo

13

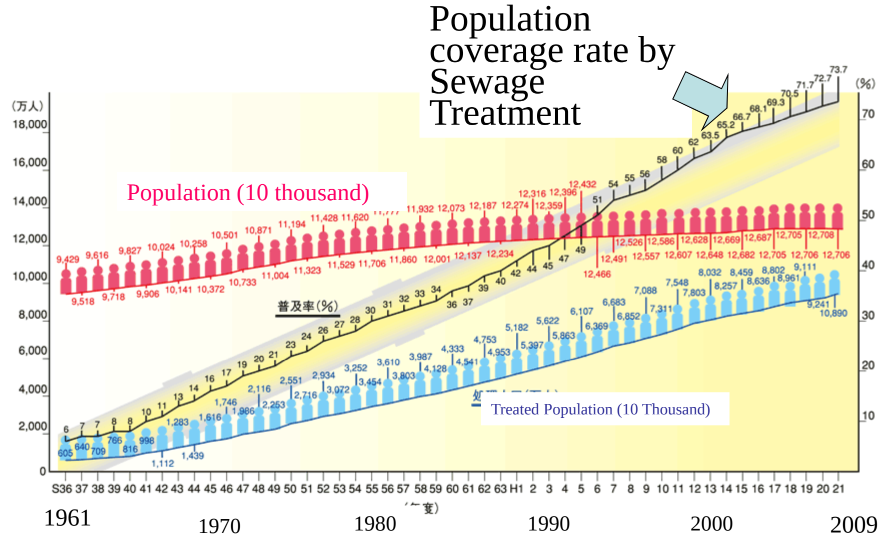
Achievement Rate of Environmental Standards (BOD/COD)



Source: 2010 White Paper on Environment, Environmental Agency, 2010

14

Progress of Sewage Treatment Works



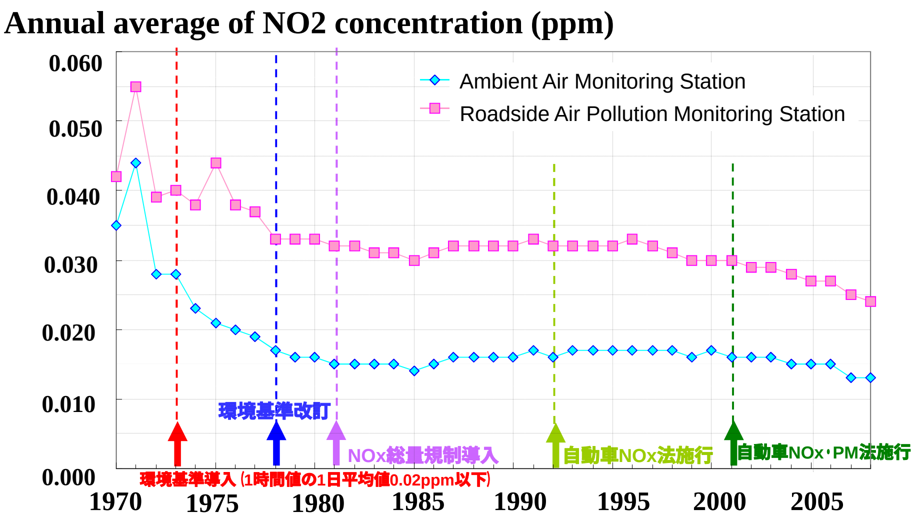
15

III. Actions and consequences

Restored water quality and plants and animals

16

NO_2 concentration in the atmosphere



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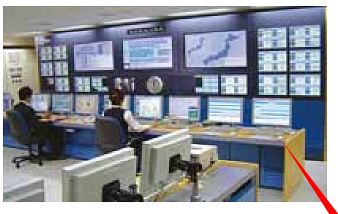
Intelligent Transport System



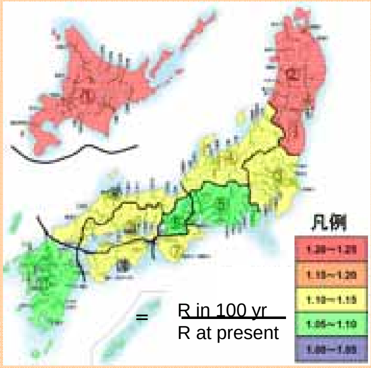
18

Intelligent Transport System

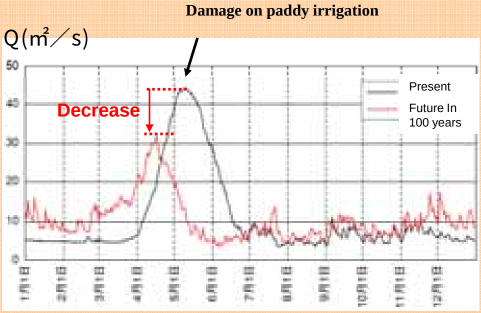
19

Climate Change Adaptation in Water Resources

Analysis of outputs of GCMs adapted in IPCC report



Annual maximum of daily precipitation



Annual hydrograph flow into a reservior

Base information for "Climate Change Adaptation Strategies to Cope with Water-related Disasters due to Global Warming (Policy Report)", June 2008, Panel on Infrastructure Development

http://www.mlit.go.jp/river/basic_info/jigyo_keikaku/gaiyou/kikouhendou/pdf/draftpolicyreport.pdf

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III. Actions and consequences

Climate Change Adaptation

Improving the reliability of an existing facility (a coastal facility)

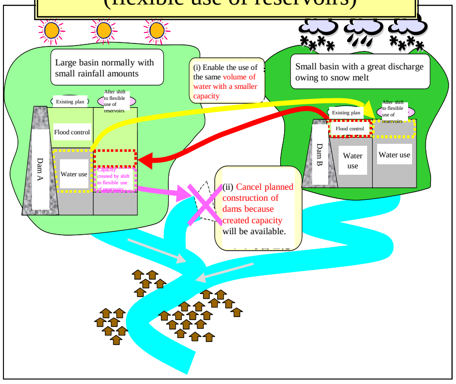
Before improvement

Revetment with deteriorated concrete

After improvement

Revetment with increased thickness

Effective use of existing facilities (flexible use of reservoirs)



Flexible use of reservoirs

- Use the capacity for water use of the existing reservoir for controlling floods
- Flexible use of combined capacity of existing and newly constructed reservoirs

Increase the effectiveness for flood control and safety against floods

21

IV. Conclusion

Environmental Principles of MLIT

Environmental Policy Outline January, 1994

- Environ. as base of human’s activities
- Environ.=Nature elements + Community facilities + Buildings
- Internalization of Environ in Public Works

Environmental Action Plan June, 2004
-Towards greener MLIT administration-

“4 perspectives”

- Reduction in environ. load at every level of administration
- Priority of broader/watershed perspective
- Comprehensive and prioritized actions
- Collaboration with private sectors and promotion of information sharing

Environmental Action Plan 2008 July, 2008
- Livelihood in global environ. era-

“4 perspectives”

- Integration of environ. and economy/society
- Priority of comprehensiveness and collaboration
- Encourage people and companies to act
- Priority of broader area and longer time consideration

Revised River Act of 1997

New mission of environ. added to flood control and water use missions

Strategy for an Environmental Nation in the 21st entury, Cabinet decision in July 2007

Three approaches towards sustainable society

- Low carbon society
- Environmentally-Sound Material Cycle
- Coexistence of People and Nature

22

Conclusion

Perspectives

- ✓ Integration of environ. and economy/society
- ✓ Priority of comprehensiveness and collaboration
- ✓ Encourage people and companies to act
- ✓ Priority of broader area and longer time consideration

from **Environmental Action Plan 2008** - Livelihood in global environ. era- , July, 2008

Conclusion

Five stage of environmental care

- ✓ Know the state (monitoring and evaluation)
- ✓ Introduction of alternatives for solution
- ✓ Understand impact and response (prediction/projection)
- ✓ Planning and public communications
- ✓ Action and review


Thank you!

2. India

Mr. Koneru Venkata RAMANA

Welcome to
JICA Group Training Course on
Infrastructure Development & Management

1

Inception Report on
Directorate of Ports,
Government of Andhra Pradesh, INDIA

By
K.V.Ramana IAS
Director of Ports

2

Coastline

- Coastline of India – 7517 Km.
  – 9 States, 2 UTs.

- Coastline of AP – 996 Km.
  – 8 Districts.

3

Ports in India

- There are 12 major and 139 non-major ports along the coastline.

- The twelve major Indian Ports are: Calcutta, Haldia, Chennai, JNPT, Kandla, Kochi, Goa, Mumbai, New Mangalore, Paradip, Tuticorin & Visakhapatnam.

4

Ports in AP

Major Port	:	1
Non-Major Ports in Operation	:	5
Non-Major Ports under Development	:	6
Non-Major Ports yet to be developed	:	4

5

Non-Major Ports in operation

Non-Major Ports in Operation	: 5
Cargo handled	: 43.29 MT
Revenue earned by GoAP	: Rs.75.73 Crores

6

Principles followed in Development of Non-Major Ports

- Development through Public Private Partnership by providing State Support.
- Entered into Long term Concession Agreements under BOOT basis for 30 years period (can be extended).

7

Principles followed in Development of Non-Major Ports (contd..)

The State Support includes:

(1) Long Lease of lands.

(2) Fiscal Incentives.

(3) Provision of external infrastructure like Road connectivity, Power and Water supply up to the boundary of the Port.

(4) Bearing the cost of R&R of the project by the Govt.

8

Kakinada Deep Water Port (KDWP)

- GoAP has constructed 3 berths by 1996 at a total cost of Rs.293 crores with ADB Loan of Rs.242 crores.
- KDWP was awarded to M/s International Seaports Ltd. (now renamed as Kakinada Seaports Ltd.) on OMST basis in the year 1999, initially for a period of 20 years.
- 22% of Gross Income as Revenue share to GoAP.

9

KDWP (contd..)

- 4 berths and 2 OSV Jetties completed.
- M/s KSPL has invested an amount of Rs.400 Crores.
- Cargo handled at KDWP – Ammonia, Bitumen, Coal, Cement Clinker, POL products etc.
- M/s KSPL is proposing for expansion of cargo handling capacity upto 17 MTs by constructing 5th and 6th berths with an investment of Rs.800 Crores.

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Gangavaram Port

Equity Partners :

M/S DVS Raju & Others	–	58.11 %
Warberg Pincus	–	31.50 %
Govt. of AP	–	10.39 %

11

Gangavaram Port (contd..)

Expenditure incurred by Govt :

	Rs. in Crores
• Lands (1800 Acres Towards Equity + 1052 Acres on Lease)	35.00
• Road Connectivity	15.00
• Water Supply	13.72
• Power Supply	30.74
• R&R Package	61.00
• Hill Top Road	12.75
• Fish Landing Centre	3.00
• Nallah Diversion	7.00
• Total Expenditure	Rs.178.21 Crs.

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Krishnapatnam Port

- Concession Agreement entered on 17-09-2004 for 30 years on BOST basis.
- 5 multipurpose berths each with a length of 300m were built.
- Current draft of 14.5 m to be increased to 20m.
- 3 more berths under final stages of construction.
- Export – Iron Ore, Granite Stone.
- Import - Steam Coal, Coking Coal, Pet Coke, Fertiliser, Raw Sugar.

13

Krishnapatnam Port (contd..)

Rail Connectivity :

- KRCL is a SPV comprising the GoAP, KPCL and Rail Vikas Nigam Ltd, formed to provide rail connectivity to the port.
- Phase-I: A dedicated 19-km railway line connecting the port to the Chennai-Kolkata main line.
- Phase-II: A 91-km new broad gauge line between the port and Obulavaripalle with an outlay of Rs.600 Crores. This rail line will reduce the distance between the port and the region in eastern Karnataka and Southern AP by 75 km, thereby saving substantial freight cost.
- Project cost:Rs.788 Crores. (Equity of GoAP - 13 %).

14

Krishnapatnam Port (contd..)

Road Connectivity :

- Dedicated 26-km four-lane road connecting the port to NH No.5 (Chennai-Kolkata Highway) will be upgraded to six-lane road in the future.

Air Connectivity :

- 180 km from the International Airport at Chennai.
- 120 km from domestic airport at Tirupati.
- Proposed air strip dedicated to the port.
- Six helipads inside the port area.

15

Krishnapatnam Port (contd..)

Phase II :

- 7 additional berts - 4 dedicated for coal, 2 for General Cargo & 1 for Containers.

Govt expenditure:

	Rs. In Crores
• Providing four lane road from Venkatachalam to Krishnapatnam Port (R&B Department) (20 Km)	149.00
• Power Supply (A.P.Transco)	10.93
• R&R	57.00
Total	Rs.216.93 Crores

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Issues and Challenges

1. Logistics is not governed by a single Ministry.

   - Ministry of Road Transport and Highways
   - Ministry of Shipping
   - Ministry of Civil Aviation
   - Ministry of Railways
   - Ministry of Finance
   - Ministry of Commerce and Industry

17

Issues and Challenges (contd..)

2. Legal procedures are often fragmented and Government clearances take a long time to be acquired.

18

Issues and Challenges (contd..)

3. Customs procedures for transporting goods are long and cumbersome, leading to delays in reaching the destination.

19

Issues and Challenges (contd..)

4. Multiple check posts and documentation requirements further delay the delivery of cargo.

20

Issues and Challenges (contd..)

5. If the countries are not interlinked each other through improved transportaion network, regional integration process will not move ahead at desired pace.

21

Efforts and Innovations in India

1. Stepping up public investment in infrastructure through various programmes.

   - National Highways Development Project
   - National Maritime Development Programme
   - Dedicated Freight Corridors
   - Mass Rapid Transit System

22

Efforts and Innovations in India (contd..)

2. An Inter-Ministerial Committee (IMC) was set up in 1992 to facilitate the development and implementation of a multimodal infrastructure.

The Ministry of Commerce and Industry, as the nodal agency, co-ordinates with the other Ministries.

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Efforts and Innovations in India (contd..)

3. The Multimodal Transportation of Goods Act, 1993

- to regulate the multimodal transportation of goods from a place in India to a place outside it involving two or more modes of transport based on a single multimodal transport contract.

24

Efforts and Innovations in India (contd..)

4. The Foreign Direct Investment (FDI) regulations permit 100 percent FDI under the automatic route for all logistics services except courier and air transportation services.

25

Efforts and Innovations in India (contd..)

5. Development of cross-border infrastructure, especially transportation linkages and energy pipelines with neighbouring countries is underway and expected to contribute to the regional integration in Asia by reducing transportation costs and facilitating intra-regional trade and services.

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Thank You

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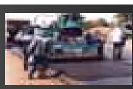
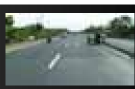
3. The Republic of Indonesia

Mr. Srie Handono MASHUDI

KEMENTERIAN PEKERJAAN UMUM
DIREKTORAT JENDERAL BINA MARGA





INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT

TREES FOR LIFE

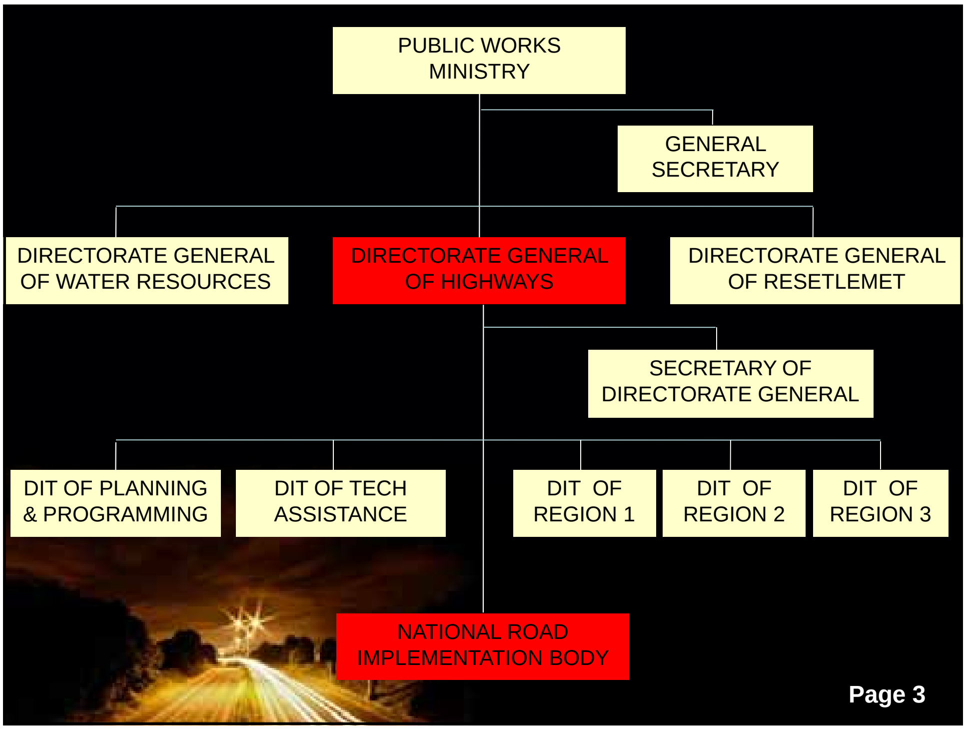
JICA GROUP TRAINING COURSE FY 2010

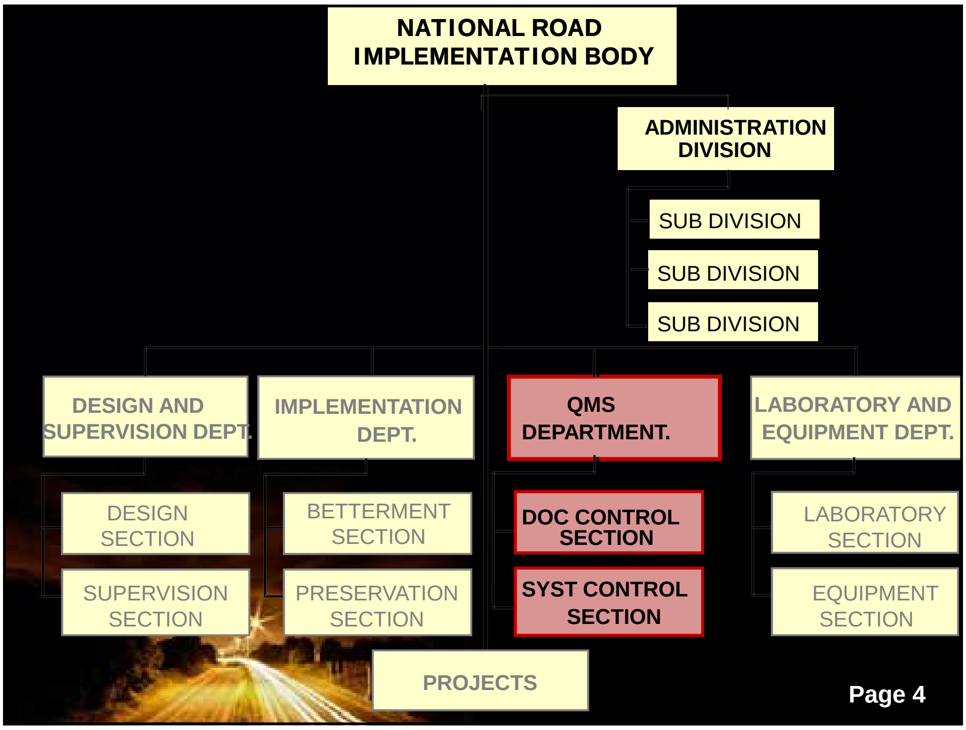
PRESENTED BY : SRIE HANDONO MASHUDI

NAT ROAD IMPLEMENTATION BODY
DIRECTORET GENERAL OF HIGHWAYS

1. MAIN TASK :

THE ROLE OF NATIONAL ROAD IMPLEMENTATION BODY IN ROAD DEVELOPMENT IS ENSURING THE IMPLEMENTATION OF ROAD CONSTRUCTION IN A PROPER MANNER INLINE WITH THE INDONESIAN GOV RULE AND PROVISIONS OF THE TECHNICAL SPECIFICATION OF THE DGH


PUBLIC WORKS MINISTRY
GENERAL SECRETARY
DIRECTORATE GENERAL OF WATER RESOURCES
DIRECTORATE GENERAL OF HIGHWAYS
DIRECTORATE GENERAL OF RESETLEMET
SECRETARY OF DIRECTORATE GENERAL
DIT OF PLANNING & PROGRAMMING
DIT OF TECH ASSISTANCE
DIT OF REGION 1
DIT OF REGION 2
DIT OF REGION 3
NATIONAL ROAD IMPLEMENTATION BODY
Page 3


NATIONAL ROAD IMPLEMENTATION BODY
ADMINISTRATION DIVISION
SUB DIVISION
SUB DIVISION
SUB DIVISION
DESIGN AND SUPERVISION DEPT.
IMPLEMENTATION DEPT.
QMS DEPARTMENT.
LABORATORY AND EQUIPMENT DEPT.
DESIGN SECTION
SUPERVISION SECTION
BETTERMENT SECTION
PRESERVATION SECTION
DOC CONTROL SECTION
SYST CONTROL SECTION
LABORATORY SECTION
EQUIPMENT SECTION
PROJECTS
Page 4

NAME OF ORGANIZATION

QUALITY MANAGEMENT SYSTEM DEPT
NATIONAL ROAD IMPLEMENTATION BODY V
DIRECTORATE GENERAL OF HIGHWAYS.

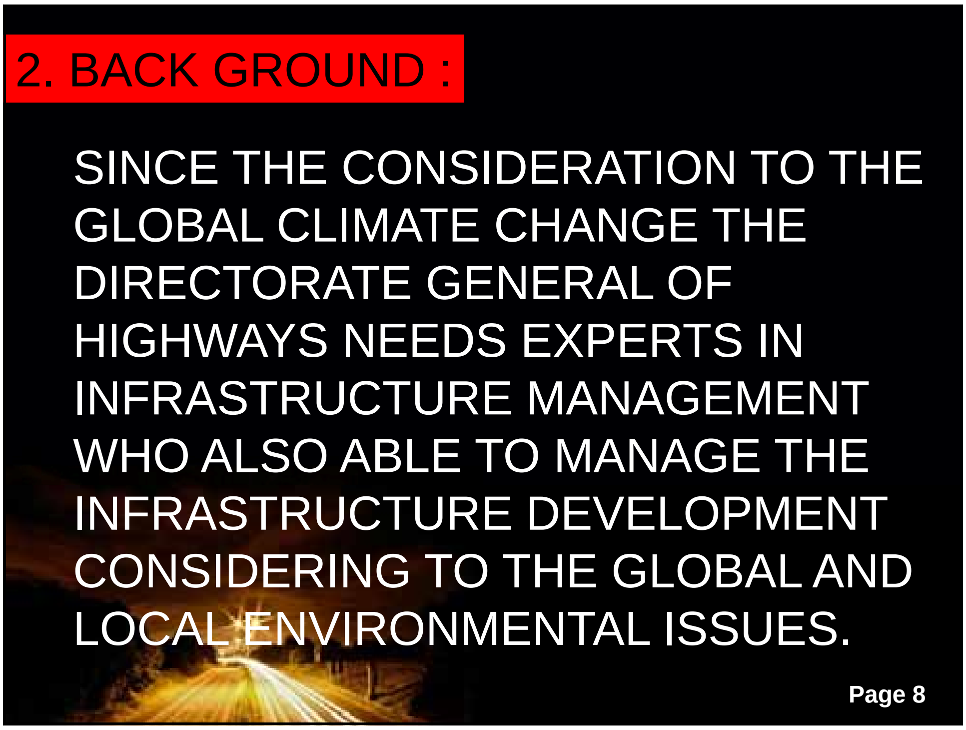
Page 5

QMS DEPT MAIN TASK

CONTROLLING, SUPERVISING, MONITORING AND IMPROVING THE IMPLEMENTATION MINISTRY OF PUBLIC WORKS QMS SINCE PLANNING, PROGRAMMING, DURING CONSTRUCTION AND AFTER CONSTRUCTION OF THE NATIONAL ROADS IN EAST JAVA , CENTRAL JAVA AND THE SPECIAL REGION OF JOGJAKARTA PROVINCE.

Page 6


SUMMARY OF ORGANIZATION:
QUALITY MANAGEMENT SYSTEM DEPARTMENT, NATIONAL ROAD IMPLEMENTATION BODY V IS A UNIT OF TECHNICAL IMPLEMENTATION OF NATIONAL ROAD UNDER DIRECTORATE GENERAL OF HIGHWAY.
Page 7


2. BACK GROUND :
SINCE THE CONSIDERATION TO THE GLOBAL CLIMATE CHANGE THE DIRECTORATE GENERAL OF HIGHWAYS NEEDS EXPERTS IN INFRASTRUCTURE MANAGEMENT WHO ALSO ABLE TO MANAGE THE INFRASTRUCTURE DEVELOPMENT CONSIDERING TO THE GLOBAL AND LOCAL ENVIRONMENTAL ISSUES.
Page 8

3. PROGRAMS:

1. ONE OF THE NATIONAL ROAD IMPLEMENTATION BODY (NRIB) V PROGRAM IS TO IMPROVE THE ROAD SIDE ENVIRONMENT BY PLANTING VARIOUS VARIETY OF TREES WHICH ABLE TO DECREASE THE LEVEL OF AIR POLLUTION..
2. THE NRIB V WORKING TOGETHER WITH PT. DJARUM KUDUS IN THE CORPORATE SOCIAL RESPONSIBILITY PROGRAM.

Page 9

4. IMPLEMENTATION :

MAHOGANY (BEST IN ECONOMICAL VALUE AND GOOD IN ABSORBING AIR POLLUTANT AGENTS) HAS BEEN CHOSEN IN EAST JAVA
WHERE AS :
ALBIZIA SAMAN /TREMBESI (BEST IN ABSORBING AIR POLLUTANT AGENTS AND GOOD IN ECONOMICAL VALUE) HAS BEEN CHOSEN IN CENTRAL JAVA.
BOTH OF THE TREES HAVE SUPERIORITY BETWEEN EACH OTHER

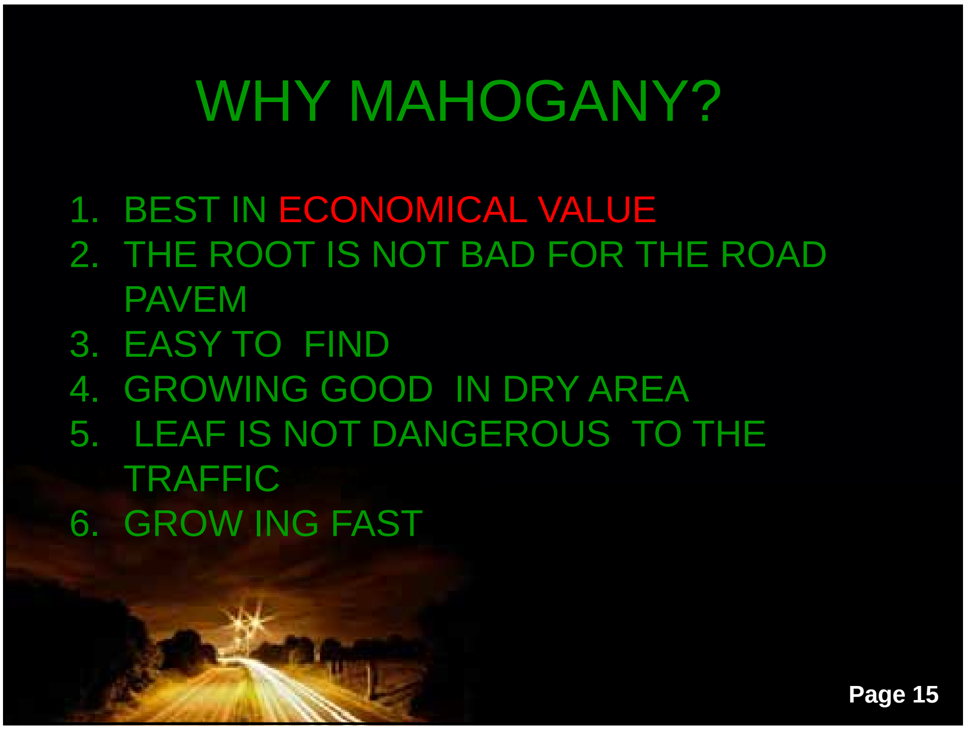
Page 10

WHY ALBIZIA SAMAN ?

1. BEST IN ABSORBING CO2 COMPARED WITH OTHE TREES (28,5 TON CO2/YEAR/TREE WITH15 METER IN DIAMETER CANOPY)
2. THE ROOT IS NOT BAD FOR THE ROAD PAVEMENTS
3. ‘DIE-HARD TREE’ (RAIN FALL INTENSITY 600 – 3.000 MM/YEAR, PH 4,6)
4. GOOD : 3 – 800 METERS ABOVE SEA LEVEL
5. LEAF AND SEED ARE NOT DANGEROUS TO THE TRAFFIC
6. GROW ING FAST

Page 11


CM 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
TENTH 1 2 3 4 5 6


WHY MAHOGANY?
1. BEST IN ECONOMICAL VALUE
2. THE ROOT IS NOT BAD FOR THE ROAD PAVEM
3. EASY TO FIND
4. GROWING GOOD IN DRY AREA
5. LEAF IS NOT DANGEROUS TO THE TRAFFIC
6. GROW ING FAST
Page 15

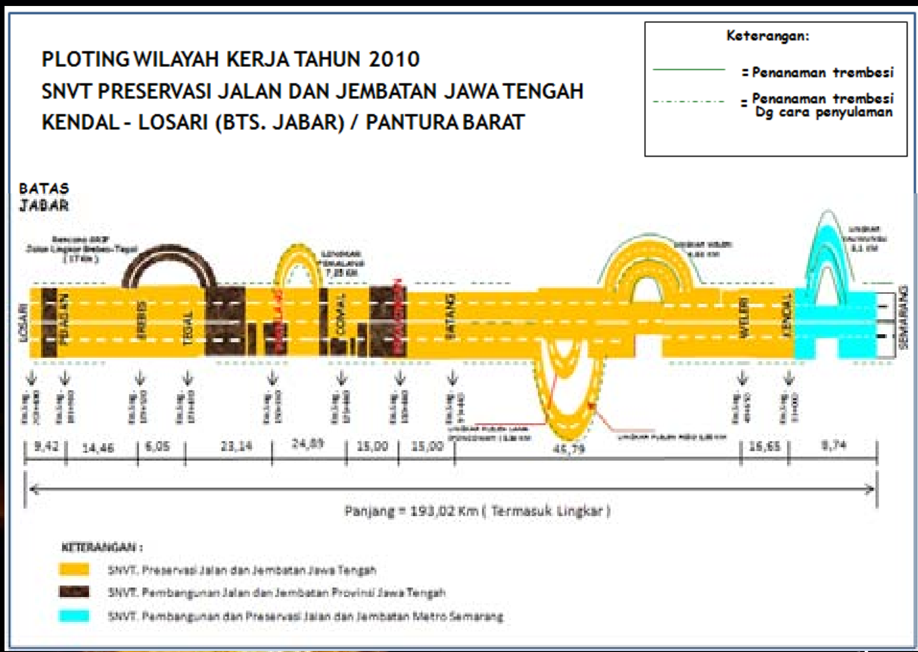
LENGTH OF NATIONAL ROADS

UNDER THE NATIONAL ROAD IMPLEMENTATION BODY V SURABAYA IS AS FOLLOWS:

East Java	: 2.027 km
Central Java	: 1.390 km
SR of Jogjakarta	: 223 km
Total length	**: 3.640 km**

Page 17

Page 18



EXECUTION PLAN

1. PLANTING : MONSOON SEASON / OKTOBER 2010
2. 1,5 – 2 meter HIGHT OF TREES
3. FIRST STAGE PLANTING : SEMARANG to PEKALONGAN
4. SECOND STAGE : PEKALONGAN to LOSARI
5. MAINTENANCE : 3 YEARS
6. PLANTING PRIORITY : ALONG NATIONAL ROAD COMPLY WITH NATIONAL ROAD STANDART

Page 20

DOCUMENTATION

EXECUTION PHOTOS
AND
THE PROGRESS

Page 23

STAKING OUT BY DBL TEAM

Page 24


BULAN MARET 2010


Page 40


LSM


DJARUM


DJARUM
SEKOLAH TINGGI
AGAMA ISLAM NEGERI KUDUS


TERIMA-KASIH

4. The Union of Myanmar

Mr. Khin Mg SWE

INCEPTION REPORT

ON

JICA GROUP TRAINING COURSE ON
INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT
J.F.Y.2010

SUMITTED

BY

KHIN MG SWE

DEPUTY CHIEF ENGINEER (BRIDGE)

BRIDGE DEPARTMENT

PUBLIC WORKS, MINISTRY OF CONSTRUCTION UNION OF MYANMAR

JICA Group Training Course on

Infrastructure development and management

Sir . No Contents

1. Organization Data
   - 1.1 Name of Organization
   - 1.2 Summary of Organization
   - 1.3 Organization Chart
   - 1.4 Organization's Position in Government

2. Personal Data
   - 2.1 Recent Work
   - 2.2 Contact Address

3. Infrastructure development considering global and local environments
(for sustainable development of society)...

JICA Group Training Course on

Infrastructure development and management

(J.F.Y.2010)

Inception Report

Name	MR. KHIN MG SWE
Country	MYANMAR
Organization	PUBLIC WORKS, MINISTRY OF CONSTRUCTION
Position	DEPUTY CHIEF ENGINEER (BRIDGE)

Infrastructure development considering global and local environments

(for sustainable development of society)

Myanmar has signed a number of the international environmental conventions: it has signed, and acceded to, or ratified Convention on Climate Change and the Convention on Biological Diversity at the 1992 United Nations Conference on Environment and Development (UNCED), the Convention on Biological Diversity (1994), the Convention on International Trade of Endangered species (1979), the International Tropical Timber Agreement (1996) and the Framework Convention on Climate Change (1994). It has also participated in the UN Conference on Environment and Development, and received funds through the Global Environment Facility. Myanmar's path is leading towards increased international engagement in environmental arenas.

This engagement can open up channels of communication to discuss environmental issues with the government. The government has shown, through its limited environmental initiatives, a 'greening' in some of its policies. Although it can be argued that, ultimately, the government's policies are merely lip service, the government has at least demonstrated some level of awareness of environmental issues in Myanmar. Moreover, in 1997, Myanmar became a member of the Association of Southeast Asian Nations (ASEAN), which is leaning increasingly towards regional cooperation in dealing with environmental problems. For example, in September 1997, ASEAN members signed the Jakarta Declaration on Environment and Development and pledged to use resources efficiently and sustainably. As a result, ASEAN set up the ASEAN Regional Centre for Biodiversity Conservation with the aim of supporting and empowering communities to achieve their ecoefficiency objectives. The Mekong River Commission (MRC), with its pre-eminent role in the Mekong region and expanding work program, is another transnational institutional mechanism that can work with Myanmar.

ASEAN, the MRC and the international environmental treaties that the government has signed are all potential institutional mechanisms that can be applied to engage with the government. Such engagement can at least be aimed at information sharing and dissemination about the current state of environmental affairs in Myanmar, perhaps leading to training relevant officials for environmental assessment.

To establish sound environment policies in the utilization of water, land, forests, mineral, marine resources and other natural resources in order to conserve the environment and prevent its degradation, the Government of the Union of Myanmar adopted the following policy on 5 December 1994.

" The wealth of a nation is its people, its cultural heritage, its environment and its natural resources. The objective of Myanmar's environment policy is aimed at achieving harmony and balance between these through the integration of environmental considerations into the development process to enhance the quality of life of all its citizens. Every nation has the sovereign right to utilize its natural resources in accordance with its environmental policies; but great care must be taken not to exceed its jurisdiction or infringe upon the interests of other nations. It is the responsibility of the state and every citizen to preserve its natural resources in the interest of present and future generations. Environmental protection should always be the primary objective in seeking development".

Environmental protection and conservation occupy a place of special significance on the national agenda of Myanmar, and Myanmar's National Commission for Environmental

Affairs will continue to strengthen its efforts for preserving and protecting the environment while participating and cooperating in the global effort.

1. Organization Data

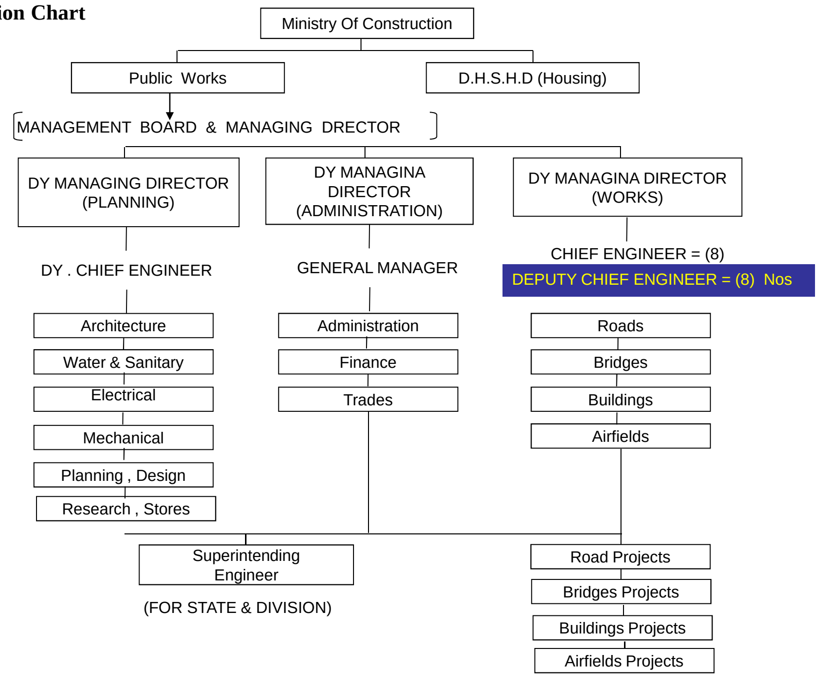
1.1 Name of Organization : Public Works ,Ministry of Construction

1.2 Summary of Organization

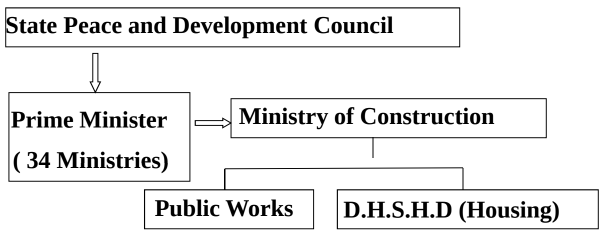
Public Works, under the Ministry of Construction has been undertaking the construction and maintenance of Roads, Bridges, Airfields and Buildings all over the country. According to the long term plan, Public Works will continue to participate in the development of the economic, education, social, health and administrative functions of our country. Public Works which is responsible for construction and maintenance of the budget works assigned by Ministry of Construction and other Ministries concerned. The organization structure is managed by management board which advised to managing director who have overall management responsibilities. Managing director reports directly to deputy minister and minister who are assigned by three deputy managing directors, such as administration,

planning and works. Deputy managing director (works) control and manage section concern with pre engineering works, design and is assigned by chief engineers , deputy chief engineers and superintending engineers. Public Works has a multidisciplinary team of professionals, who have many years of experience in Myanmar. It has over 12000 staffs and including about 9000 engineers and skill technicians. Public Works had been allotted 145 billion Kyat for new construction of bridges and roads, and 30 billion Kyat for maintenance works in the last financial year.

1.3. Organization Chart



1.4 Organization's Position in Government



Before the introduction of market economic system, construction and maintenance of roads and bridges are the sole responsibility of the Government. Public Works had used labor intensive method to implement the project. In 1987 UN funded Road Research and Development Project introduced computerized road network planning and management system in Public Works. But the highway management information system (HMIS)software can operate to a very limited degree because of obsolete computer and software.

Budgets for new construction of the Road and Bridge projects and maintenance are allocated by the National Budgets direct to the Ministry of Construction . Capital Budget is according to the priority of the national plan . Concerning with the Maintenance funds, there are three type of budgets allocated as follow ; (1) Routine maintenance (2) Periodical maintenance (3) Special maintenance .Routine maintenance
we defined as for pot hole patching, jungle clearing along the road way before and after rain in every year etc.. Periodical maintenance we defined as resealing of the surface in two years for single surfacing, three years for double surfacing or four years
and more for asphalt concrete pavement and finally, special maintenance means
damages due to the unforeseen natural disaster such as cyclone, storm, earthquake and land slide etc.. However, sufficient funds are not always available in the budget. It is commonly the case that an initial partial allocation at the beginning of the fiscal year is supplemented with supplementary budget allocation. The priorities for road and bridge projects are set primarily by the higher authority usually emphasizing regional development.

At present among the total road network in the whole country of (130050) km , Public Works ,Ministry of Construction is responsible to undertake the total length of (34178) km. From 1988 to at present, Bridges under responsible by Public Works, Ministry of Construction is as follows.

- Under 50 Ft - 2886 Nos.
- 50 Ft to 100 Ft - 777 Nos.
- 100 Ft to 180 Ft - 344 Nos.
- Over 180 Ft - 276 Nos.

- **Total - 4263 Nos.**

Regarding to the infrastructure development, Bridges which are constructed by Public Works (From 1988 to at Present)

No	State/ Division	Under 50ft	50ft -100ft	100ft-180ft	Above 180ft	Total
1	Kachin State	311	81	21	19	432
2	Kayar State	22	2	1	1	26
3	Kayin State	128	50	9	7	194
4	Chin State	13	3	1	3	20
5	Sagaing Division	241	126	41	17	425
6	Thanintharyi Division	80	24	12	7	123
7	Pegu Division	94	47	30	19	190
8	Mgway Division	116	34	14	20	184
9	Mandalay Division	150	38	24	12	224
10	Mon State	68	36	27	4	135
11	Rakhine State	144	76	39	36	295
12	Yangon Division	39	14	14	30	97
13	Shan State (East)	128	28	12	4	172
14	Shan State (South)	142	35	8	5	190
15	Shan State (North)	58	13	9	7	87
16	Ayeyarwaddy Division	181	83	48	50	362
17	Bridges on Road Network in Ayeyarwaddy Delta Region	361	54	26	12	453
18	Bridges on Yangon – Mandalay Express way	590	33	8	23	654
	Total	**2866**	**777**	**344**	**276**	**4263**

Thanlyin Bridge

oHvsifwHwm;

Aung Zay Ya Bridge

at rmfaZ, svlwHm;

Thanlwin Bridge (Mawlamying)

olvGifwwHm;(armfvjrdKif)

Ayeyarwaddy Bridge (Yatanarbon)

{&m0wDwHwm;(&wemyHk)

Regarding to the infrastructure development, Bridges which are under construction by Public Works

No	State/ Division	Under 50ft	50ft -100ft	100ft-180ft	Above 180ft	Total
1	Kachin State	-	1	-	5	6
2	Kayar State	3	-	-	1	4
3	Kayin State	2	1	-	3	6
4	Chin State	-	-	-	-	-
5	Sagaing Division	8	6	3	3	20
6	Thanintharyi Division	2	5	3	-	10
7	Pegu Division	5	3	1	3	12
8	Mgway Division	2	3	2	4	11
9	Mandalay Division	1	2	1	4	8
10	Mon State	3	-	2	-	5
11	Rakhine State	-	3	5	4	12
12	Yangon Division	7	-	-	-	7
13	Shan State (East)	1	1	-	-	2
14	Shan State (South)	-	-	-	1	1
15	Shan State (North)	2	2	2	-	6
16	Ayeyarwaddy Division	5	5	-	7	17
17	Bridges on Road Network in Ayeyarwaddy Delta Region	-	6	-	42	48
	Total	**41**	**38**	**19**	**77**	**175**

Ayeyarwaddy Bridge (SinKhan)

{ &n0wDrWn;(pi fcef)

Ayeyarwaddy Bridge (Pakokku)

Ayeyarwaddy Bridge (Malun)

Ayeyarwaddy Bridge (Nyaungdon)

Leinli Bridge

1.4.1 Private sector participation

Public Works introduce the B.O.T system in roads all over the country .The government supports for the toll road projects by providing the entrepreneur with land and existing road infrastructure. The entrepreneur will improve or construct the road and operate toll collection for agreed period and turnover the facilities to the government on the agreed date. Public Works have also just started introducing toll roads program in (56) roads with 21 companies about 2796 miles. For upgrading Infrastructures foreign investors are being invited to participate in joint-venture operation for production of construction materials such as steel beam, steel truss, cement products and bitumen base surfacing materials. On toll road project, foreign investor could join as partners with Myanmar entrepreneurs.

2. Personal Data

2.1 Recent Work

At present, I am responsible for directing and controlling for technical, financial, materials of Bridge Construction works and Maintenance all over the country.

In the Past three years, I was Executive Engineer of Special Bridge Construction Unit (2) of Public Works. I was responsible for management of Bridge Construction, at Shwe Laung Suspension Bridge, Pan Hlaing Bridge and Pegu Bridge.

Shwe Laung Bridge is 1900 Feet Long Bailey Suspension Bridge, and PanHlaing Bridge is 1940 Feet Long R.C and P.C Bridge. This Bridge was Constructed for smoothly transportation of Delta region and Yangon City.Our Organization has Survey team , Soil research section , Account Section , Bridge design Section , Procurement Section ,Quality Control team and Construction Group.

2.2 Contact Address

- Office Address	:	Building No (11) Public Works,
		Ministry of Construction.
		Nay Pyi Taw, Myanmar.
- Phone Number	:	95-67-407082
- Fax Number	:	95-67-407452
-Email Address	:	yinminpapa@gmail.com

3. Infrastructure development considering global and local environments (for sustainable development of society)

Myanmar like other developing countries faces environmental problems arising from underdevelopment and poverty. Myanmar has some problems of deforestation, loss of biological resources, land degradation due to wind and water erosion, urbanization and waste management. Natural hazards like cyclones and earthquakes are few and frequency of occurrence is not very high. The degree of air and water pollution caused by industry or agriculture has been minimal due to still low level of industrialization and relatively small amount of chemicals use in agriculture.

The initial challenges for environmental due to infrastructure in Myanmar are rooted in three dimensions: institutional development; budget or resource capacity; and knowledge or environmental education (capacity building). The first challenge for environmental governance in Myanmar is to understand the depth and breadth of the challenges that lie in these three dimensions.

In Myanmar, the environmental awareness is gradually rising. Presently, there is only a partial integration of environment into development, mainly in the form of natural resources conservation projects carried out by the sectoral ministries and departments. The main constraint with integration of environment into development at the moment is the institutional factor. However, with the institutional setting such as the formation of NCEA and adoption of Myanmar Agenda 21, full integration of environmental consideration into the national economic development will come into exist in the near future with realizing the general guiding principle of sustainable development adopted by the World Commission on Environment and Development that is, current generations should meet their needs with compromising the ability of future generation.

AT 2nd, May ,2008, Ayeyawaddy delta region had been destroyed by nargis Cyclone. Life and wealth of many people were lost.

Before Nargis cyclone, Relying only on water way in the past, Ayeyawaddy delta region with poor transport , motor roads, After nargis cyclone Government had been implemented Infrastructure development, road networks, Bridger, Building and cyclone shelters ect: So there will be smooth and better transport in the Ayeyawddy delta region. At transportation sector, There were constructed (11) Road networks and (458) Bridges on the roads.

All of bridge and R.C , Steel truss and Bailey bridge. There are constructed within two year.

The bridges on the road networks are follow

Item	Name of Road	Bridge Under(50')	Bridge (50')to(100')	Bridge (100')to(180')	Bridge Above(50')	Total
1	Maubin-Yelaglay Mawlamying gun road	-	-	-	2	2
2	Mawlamying gun Hlaing Bon-Pyinslu road	1	16	5	22	44
3	Labutta-thinGanGyi-Pyinslu Road	4	1	2	5	12
4	Labutta-ohthwin-Thatsom Road	2	5	1	6	14
5	Bogalay-Kwin-Chang-Kadonkani Road	5	16	8	8	37
6	Bogalay-Satsan-Ama Road	-	5	4	7	16
7	Pyapon-Kyoin-Ka-Don-Ama Road	-	-	-	-	-
8	Kyoin-Ka,don-Satsan Road	-	-	1	-	1
9	Pathain-Mawtim Son Road	348	14	5	2	369
10	Bogalay-Mawgyun-wakhema Road	-	2	-	6	8
11	Pathein-Nga Putaw Road	2	1	-	2	5
	Total	362	60	26	60	458

Photo Records of Bridges.

Road No (1)

Razudine (1) Bridge (1955 Feet)

Road No (2)

Hte Lay Thain Bridge (130 Feet)

Nyaung Pake Birdge (200 Feet)

Mezali Bridge (200 Feet)

Road No (1)

Razudine (2) Bridge (540 Feet)

Road No (2)

Pat Byew Bridge (280 Feet)

Thit ni zew Bridge (100 Feet)

Pyew Cha Tawk Bridge (100 Feet)

Road No (2)

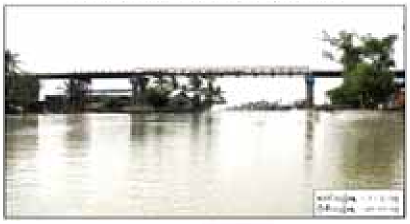
Ye Kyaw to Bridge (90 Feet)

Bingala Bridge (240 Feet)

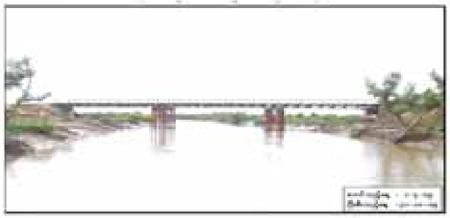
Danisake Bridge (180 Feet)

Road No (3)

Sakin Bridge (260 Feet)



Na linkyaw Bridge (150 Feet)

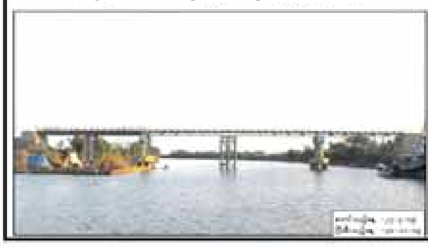


Pyinkanu yakyaw Bridge (150 Feet)

Road No (5)

Knout pyan toe Bridge (90 Feet)

Khaya chaung Bridge (260 Feet)



Lamu chaung Bridge (140 Feet)

Road No (6)

Htaw Paing Bridge (350 Feet)

Yway chaung Bridge (80 Feet)

V　LECTURE NOTES

1. Keynote Lecture

"Impacts and Responses of Climate Change"

-New Challenge for Infrastructure Management-

Dr. Nobuo MIMURA

Contents of Presentation

1. Trend of Natural Disasters in Asia
2. Future Prediction of Climate Change
3. Coastal Impacts in the Asia and Pacific Region
4. Response to Climate Change
5. Wise Adaptation and Relation with Sustainability

1. Trend of Natural Disasters in Asia

Occurring Impacts

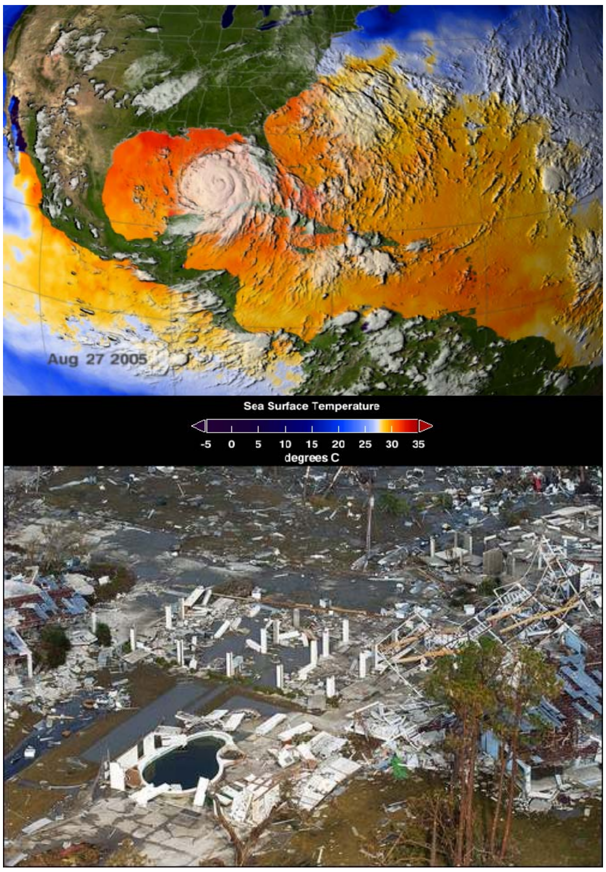
2003 European heat wave
Excess deaths in France (14,802), U.K.(2,045) etc.

2004 Typhoon damages in Japan

2005 Hurricane Katrina
Losses of US$96 billion.

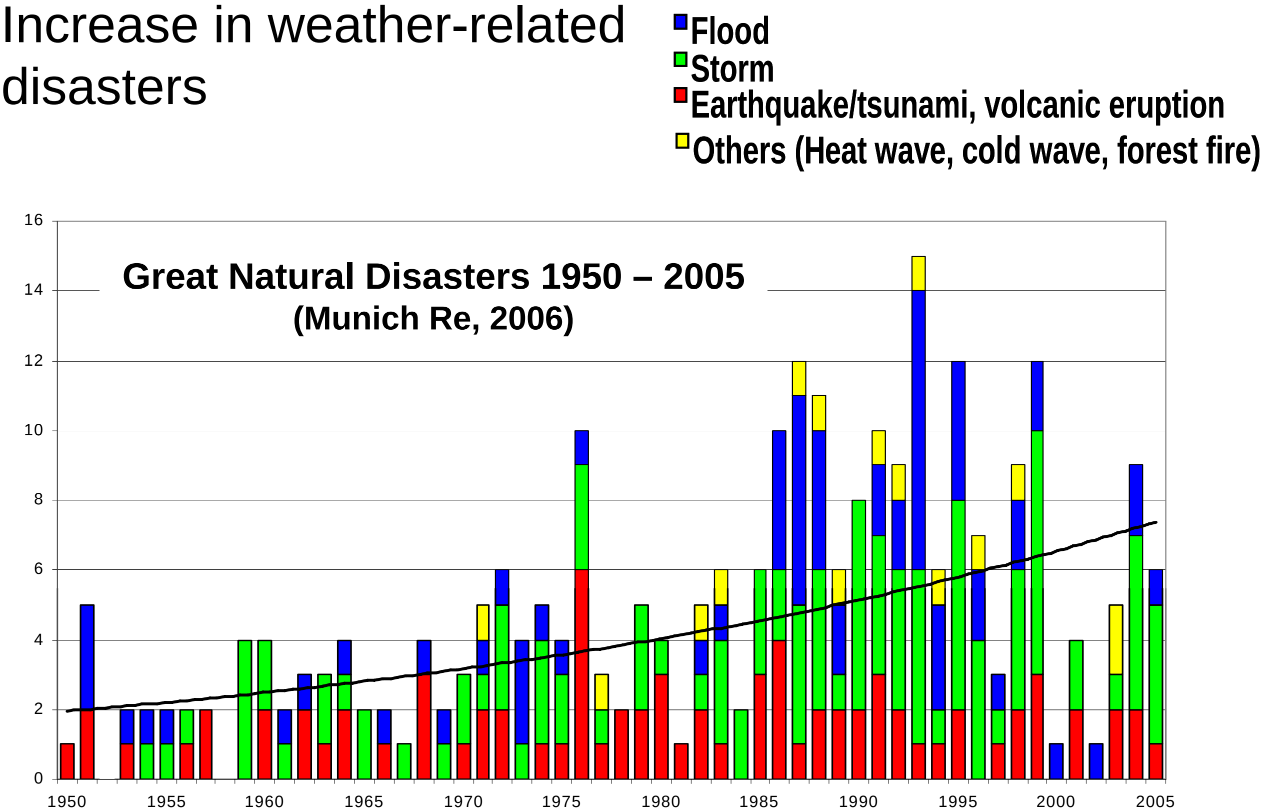
2007 Heat waves and bushfires in Greece

2010 Floods in Pakistan,
Japan's historical hot



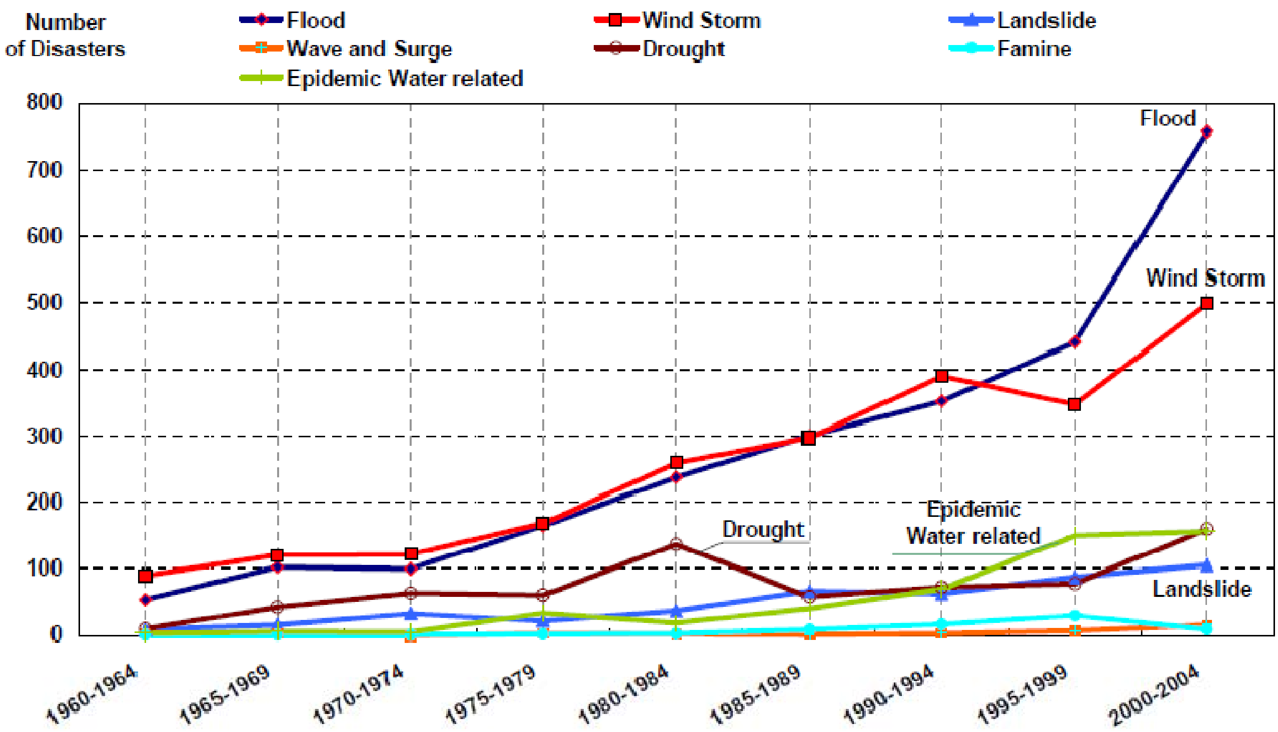
Present Impacts: Increasing Disasters

- Increase in weather-related disasters

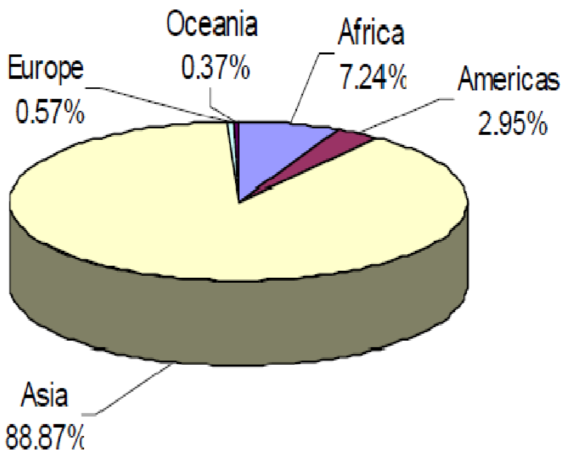


Global trend of natural disasters, 1960 to 2004

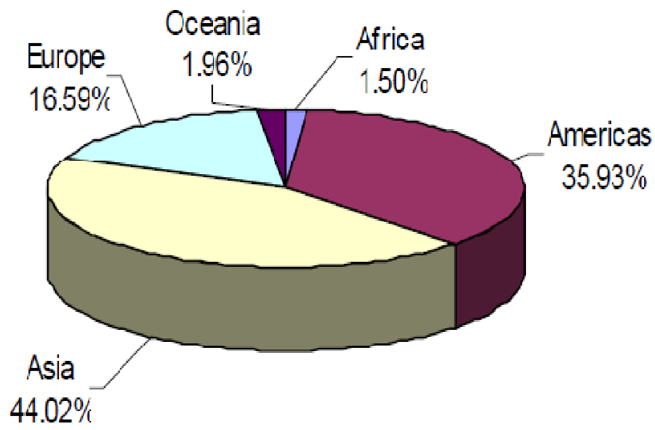
(PWRI, 2005)



Regional Distribution of Damages, 1975 to 2005

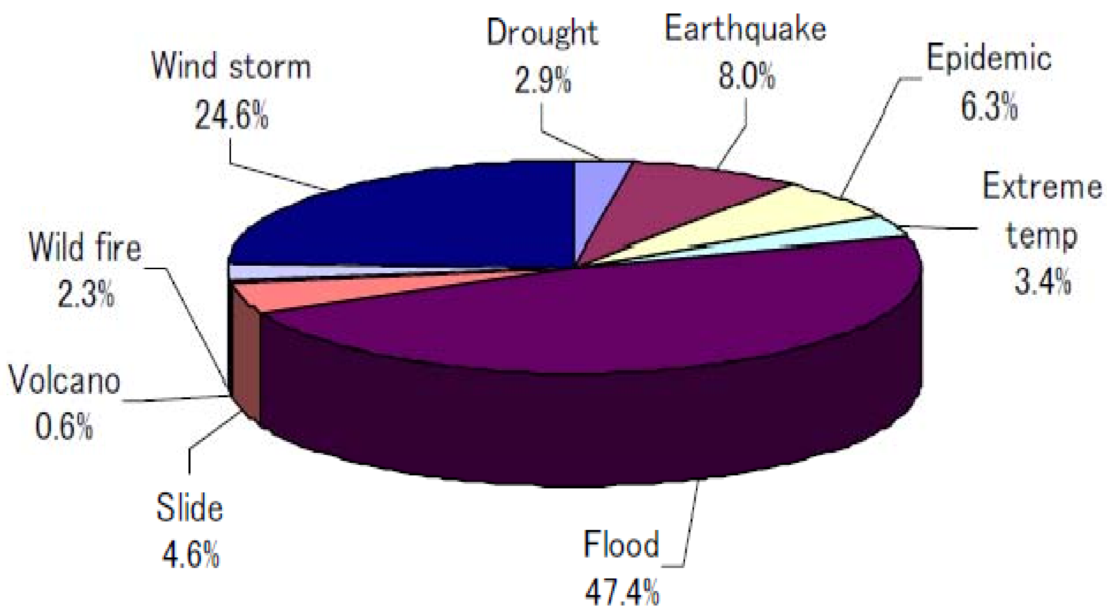


Affected people



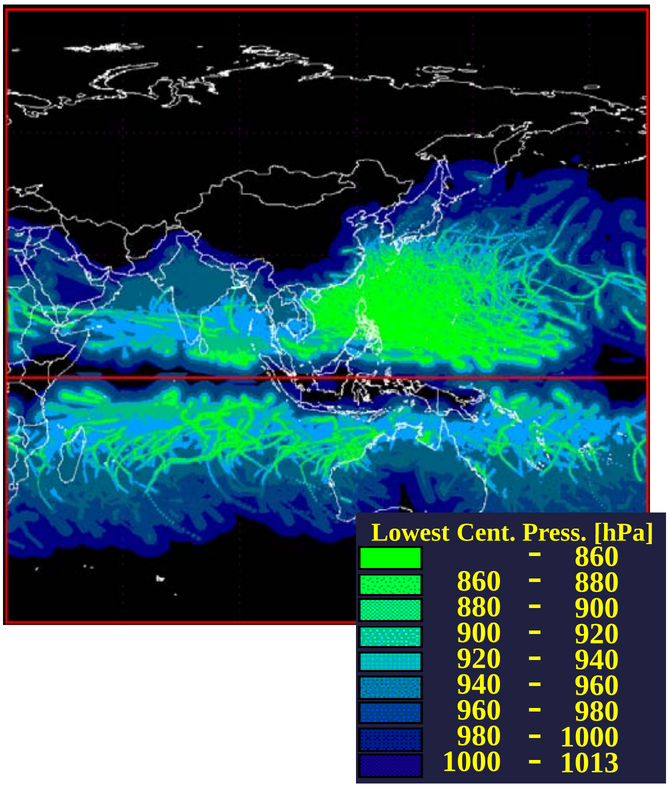
Economic damages

Types of natural disasters in Asia in 2005 (ADRC, 2006)

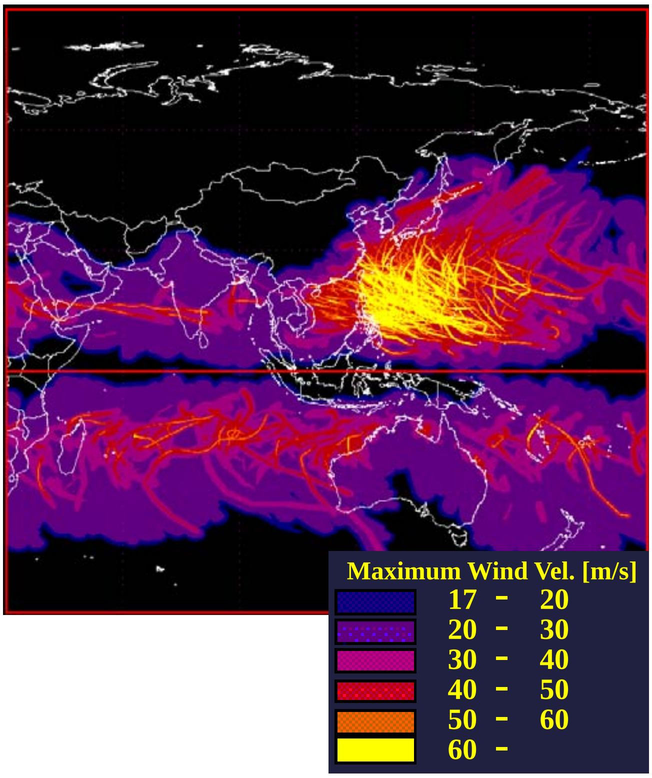


Estimated Typhoon Parameters

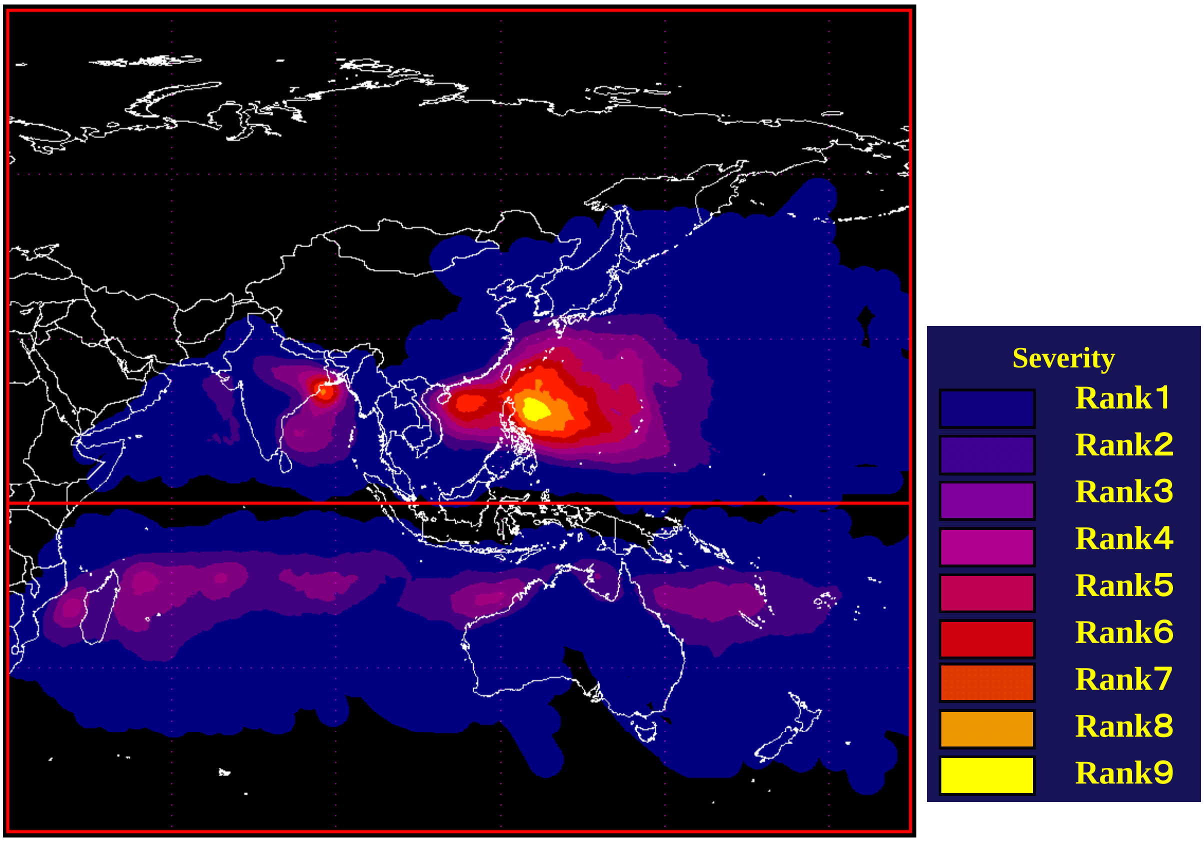
Lowest Center Pressure



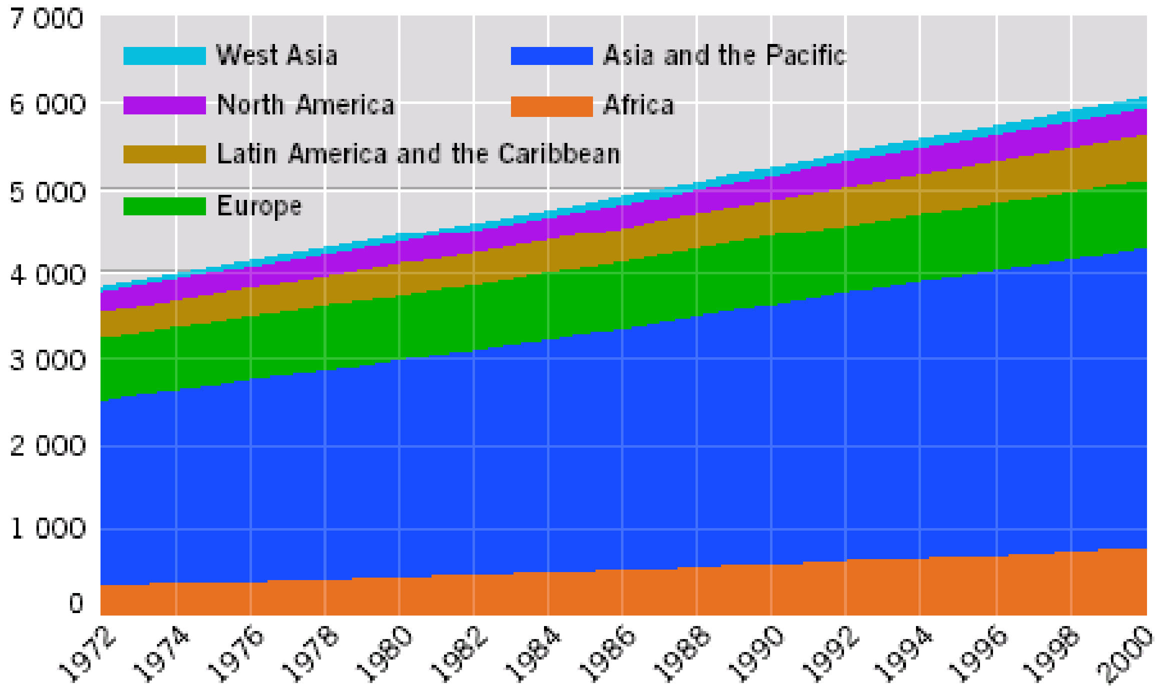
Maximum Wind Velocity



Hot Spots of Typhoon Impacts

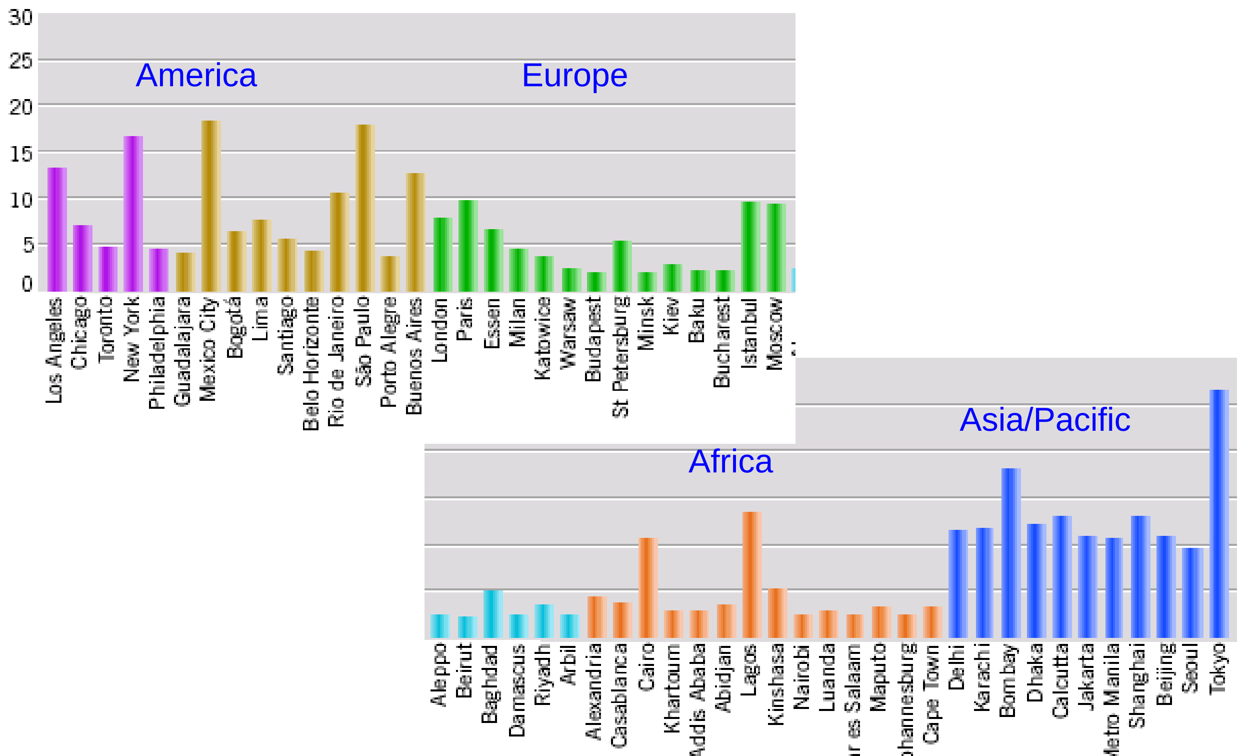


Population Growth in Asia



World population is currently growing at 77 million a year, with two-thirds of the growth in Asia and the Pacific

Mega-Cities in the World



Relative vulnerability of coastal deltas by sea-level trends to 2050 (extreme >1 million; high 1 million to 50,000; medium 50,000 to 5,000)

2. Future Prediction of Climate Change

2.1 Scientific Assessment of Global Warming IPCC's Role

- <u>Intergovernmental Panel on Climate Change (IPCC)</u>
  Jointly established by WMO and UNEP in 1988
  IPCC's role is assessment of the latest scientific understanding.

- <u>IPCC Assessment Reports</u>
  1990 First Report
  1995 Second Report
  2001 Third Report (TAR)
  2007 Fourth Report (AR4)
  2014 Fifth Report (AR5)

- <u>Working Groups(WG)</u>
  WG1 The Physical Science Basis
  WG2 Impacts, Adaptation and Vulnerability
  WG3 Mitigation of Climate Change
  Synthesis Report

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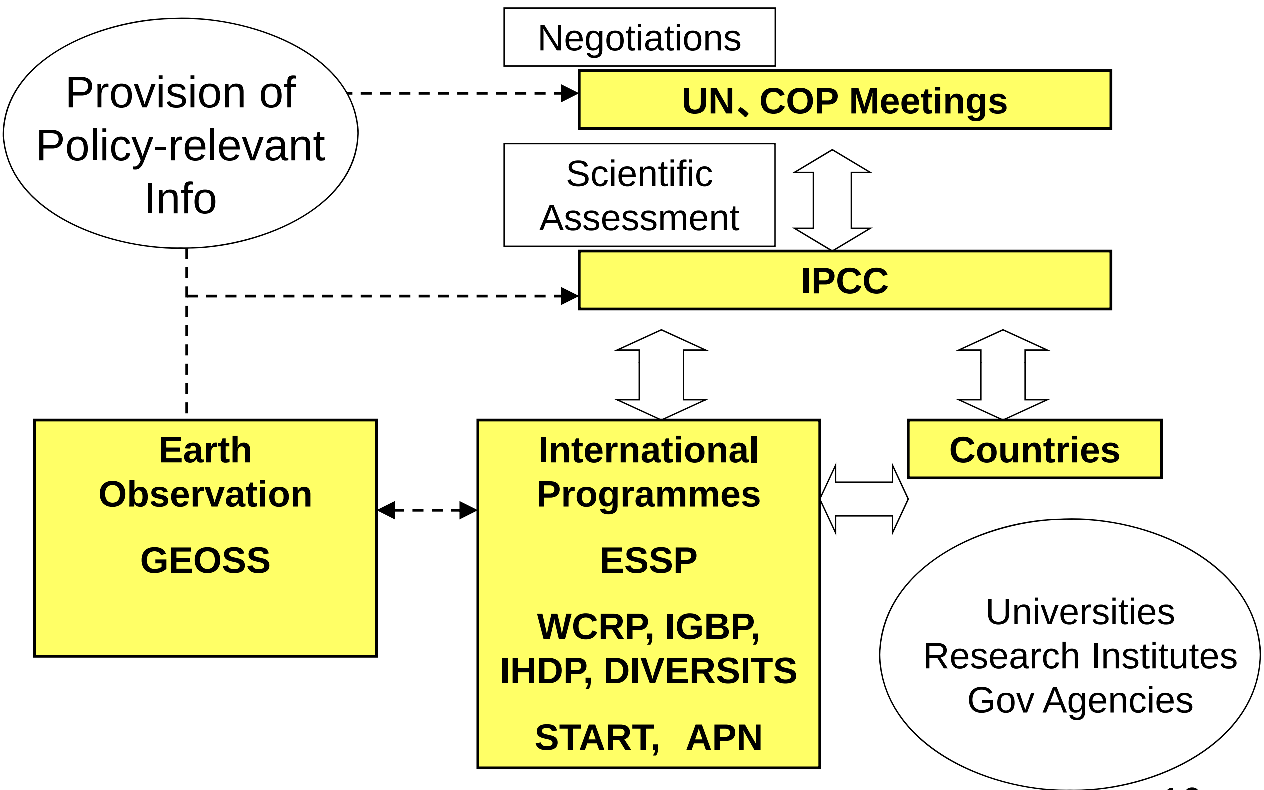
Flow of Scientific Knowledge



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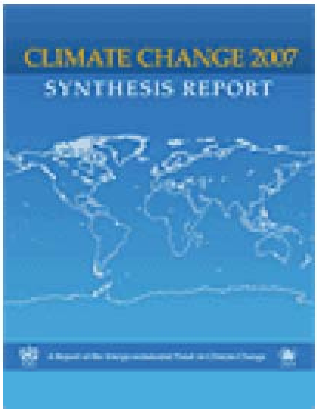
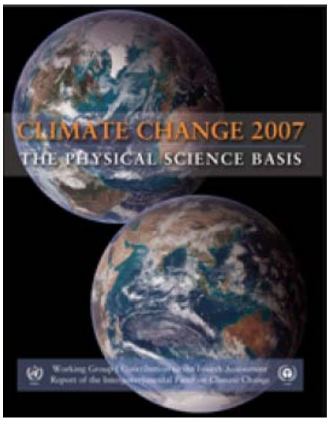
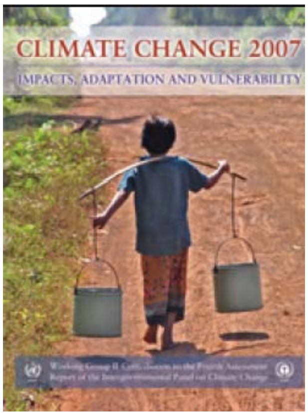


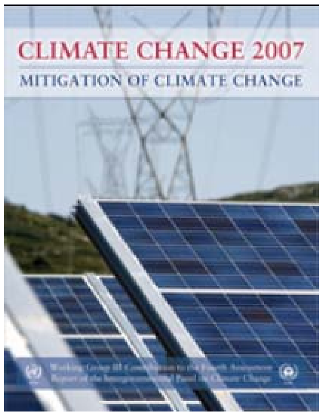
Synthesis Report



WG1



WG2



WG3

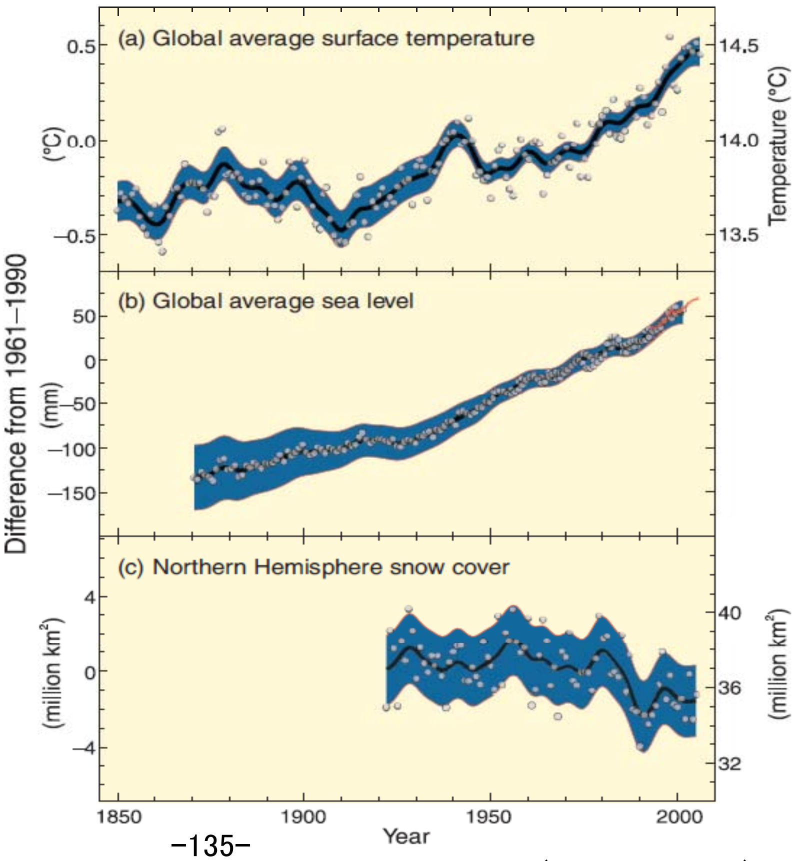
2.2 Observed Changes

Changes in

- Global average surface temperature

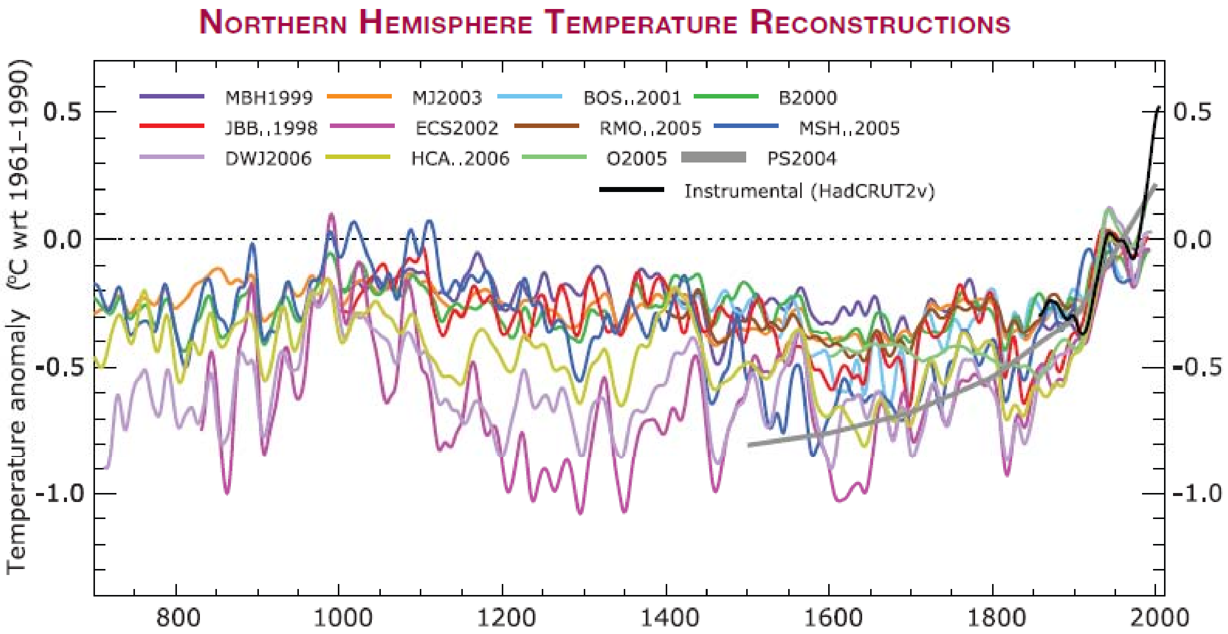
- Global average sea level

-Northern Hemisphere snow cover



(IPCC AR4, 2007)

Long-term Trend of Northern Hemisphere Temperature



0.74℃ increase for the past 100 yrs

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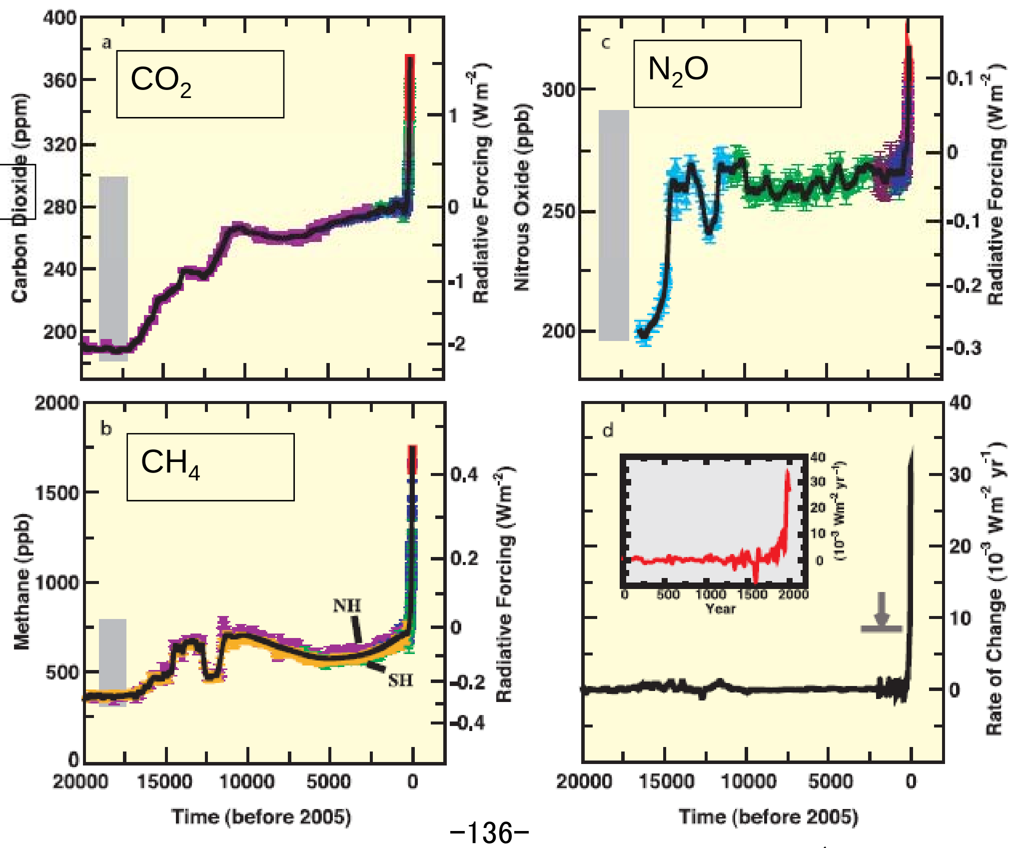
（IPCC AR4, 2007）

Changes of GHG Concentration -20,000yrs

280ppm



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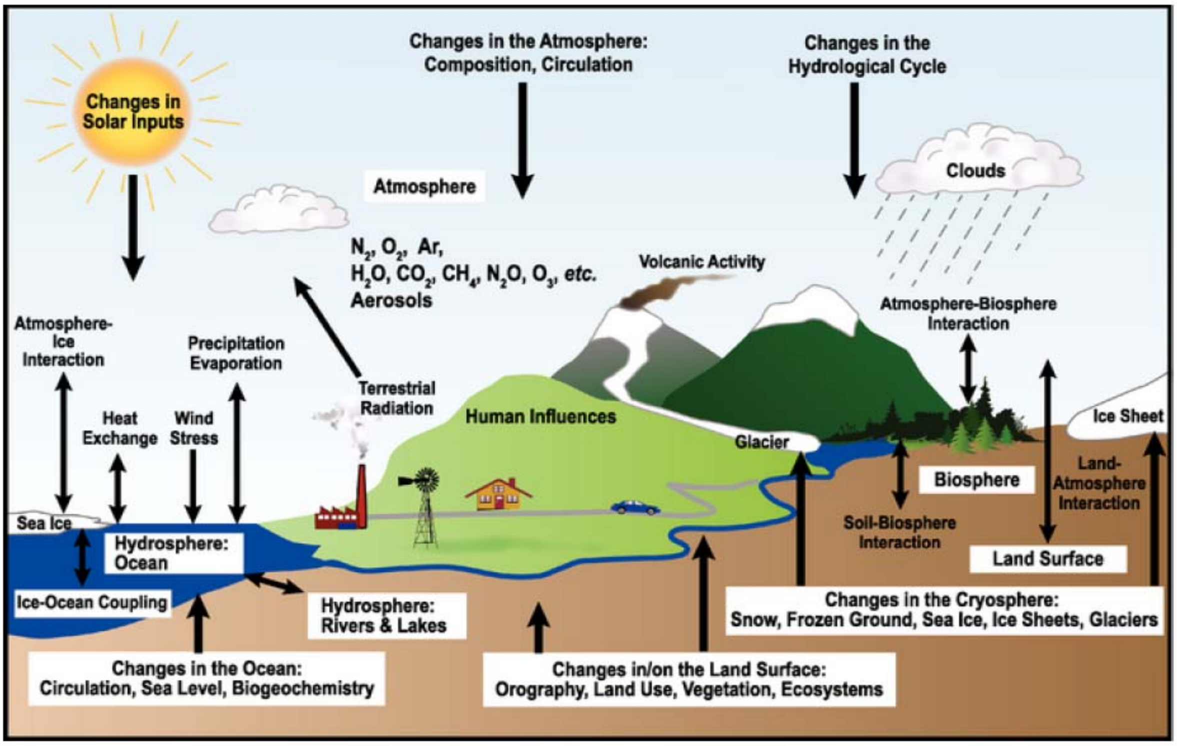
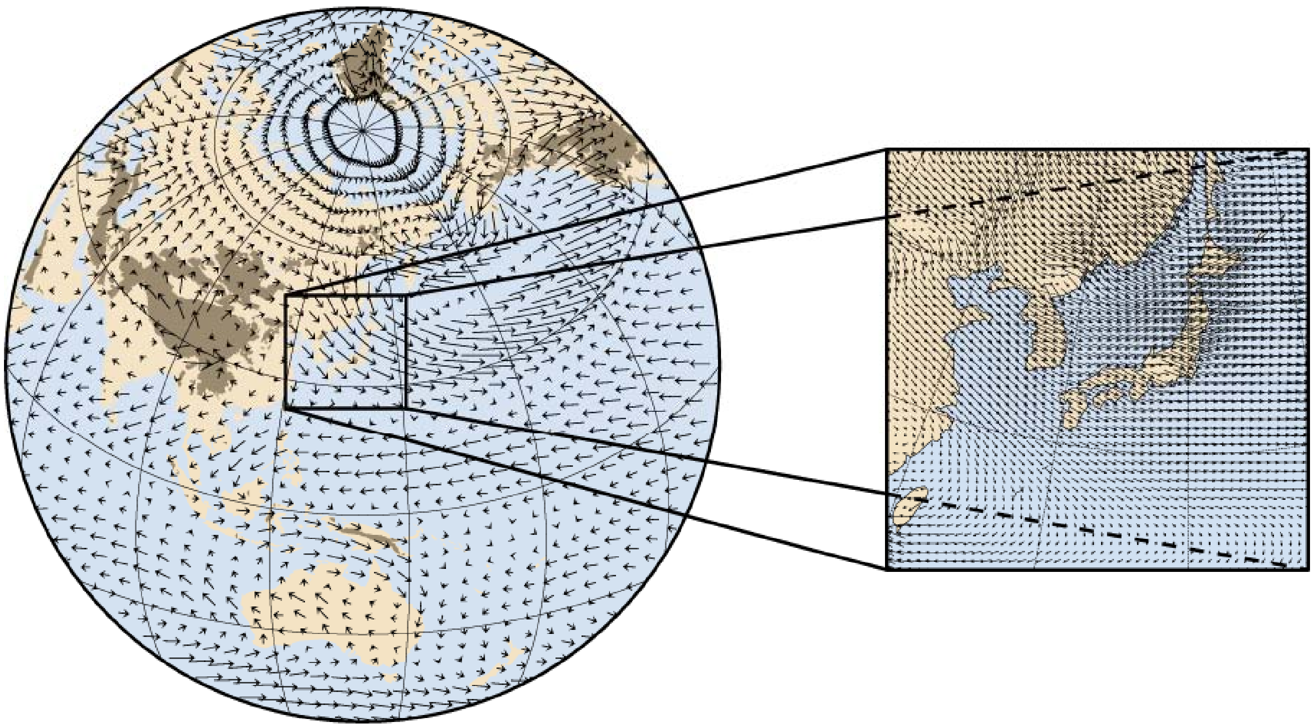
（IPCC AR4, 2007）

2.3 Prediction of Climate Change
Modeling Climate System

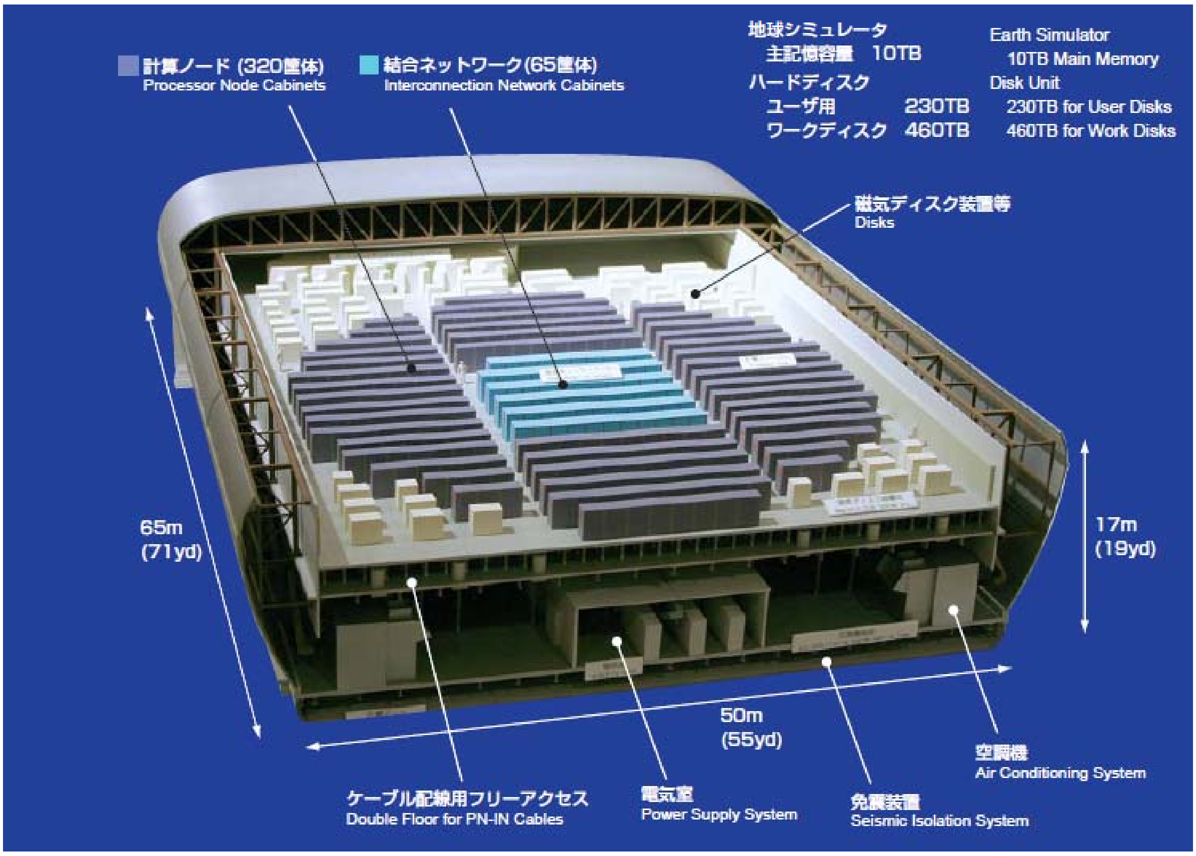


(IPCC WGI AR4, 2007)

GCM and Regional Model (Nesting)



Earth Simulator

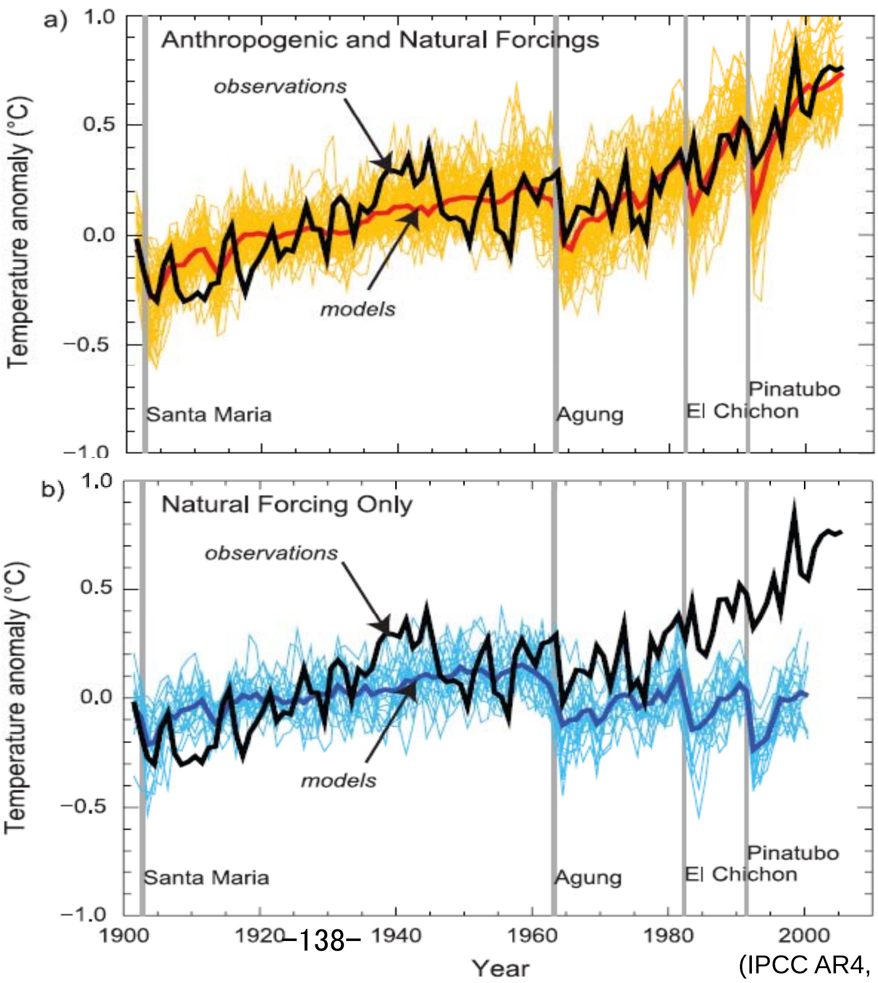


(JAMSTEC Pamphlet)

Comparison Observed and Modeled

a)Natural＋GHG

b)Only natural



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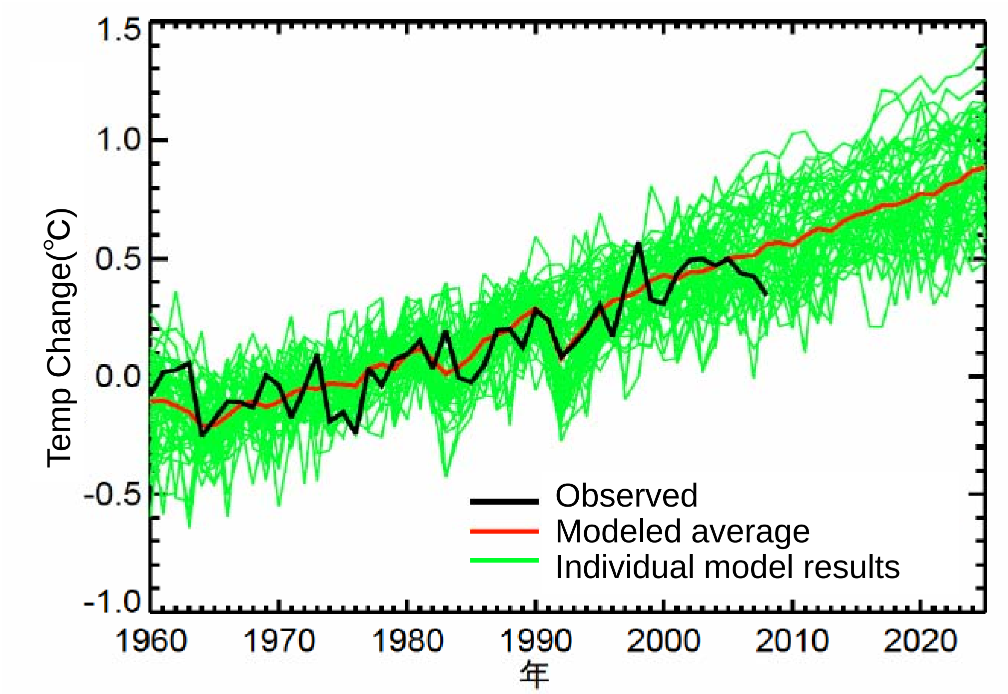
(IPCC AR4, 2007)

Overall Comparison of Observed and Modeled Temp



1960～2025 年の気温変化の観測結果と予測シミュレーション

英国気象局ハドレーセンター作成の世界平均気温観測値（HadCRUT3）及び IPCC AR4 で使われた複数の気候予測モデルのシミュレーション結果（世界気候計画の結合モデル比較プロジェクト（WCRP CMIP3）マルチモデルデータセット）をプロットしたもの。

作成：国立環境研究所

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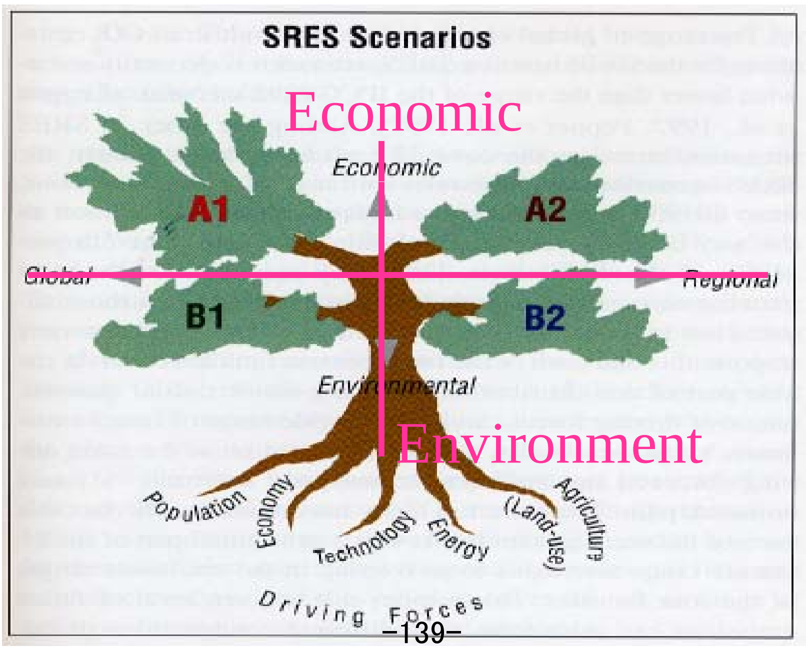
Scenario-based Approach for Climate Prediction

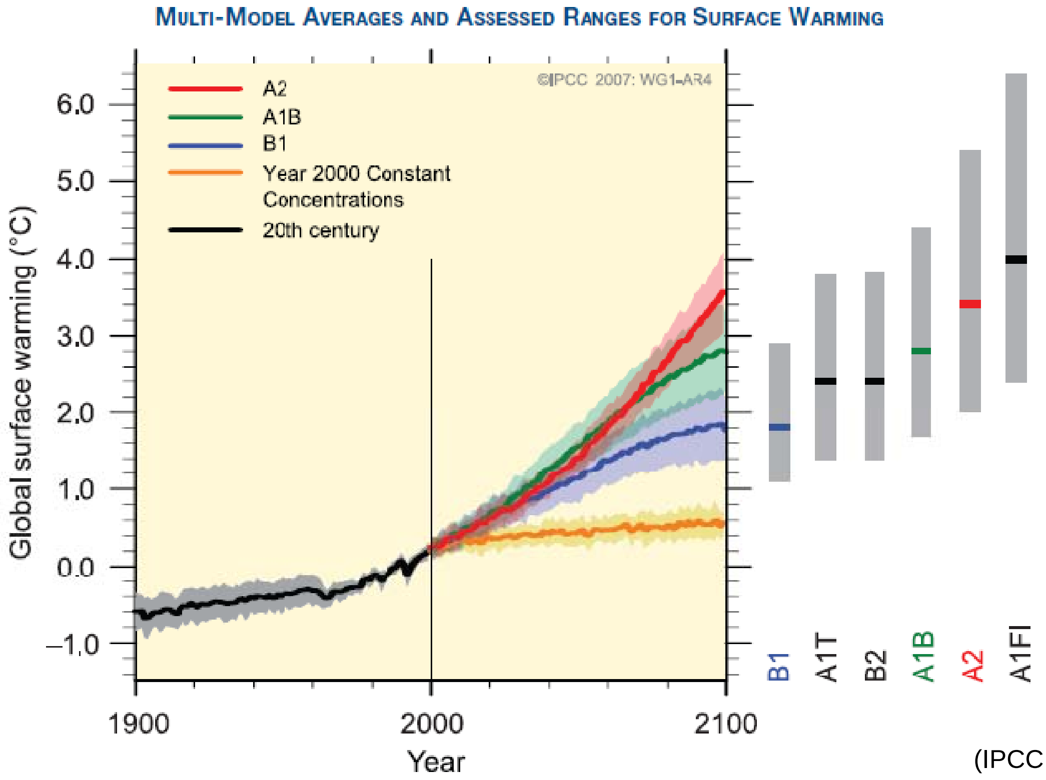
Future emissions of Green House Gases are estimated based on scenarios for future societies. Six scenarios (SRES scenarios) were used for climate prediction.

Global

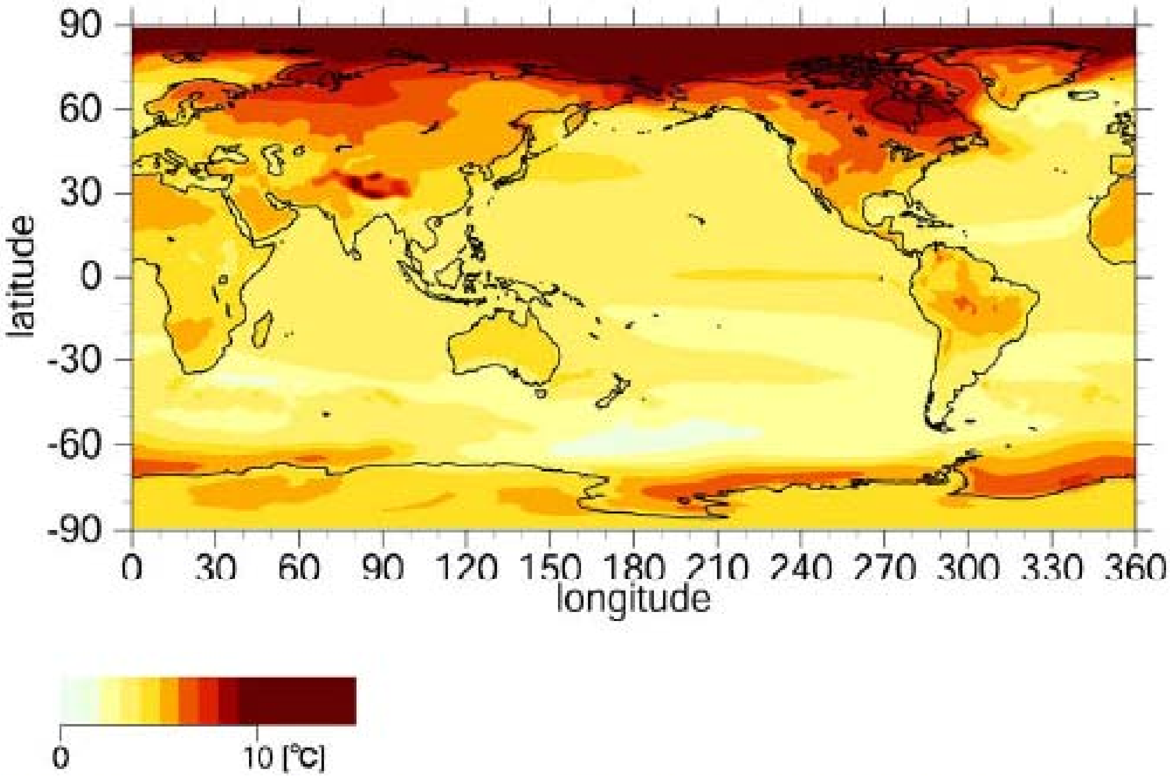


Regional

Climate change projection given by IPCC's Fourth Assessment Report (AR4)



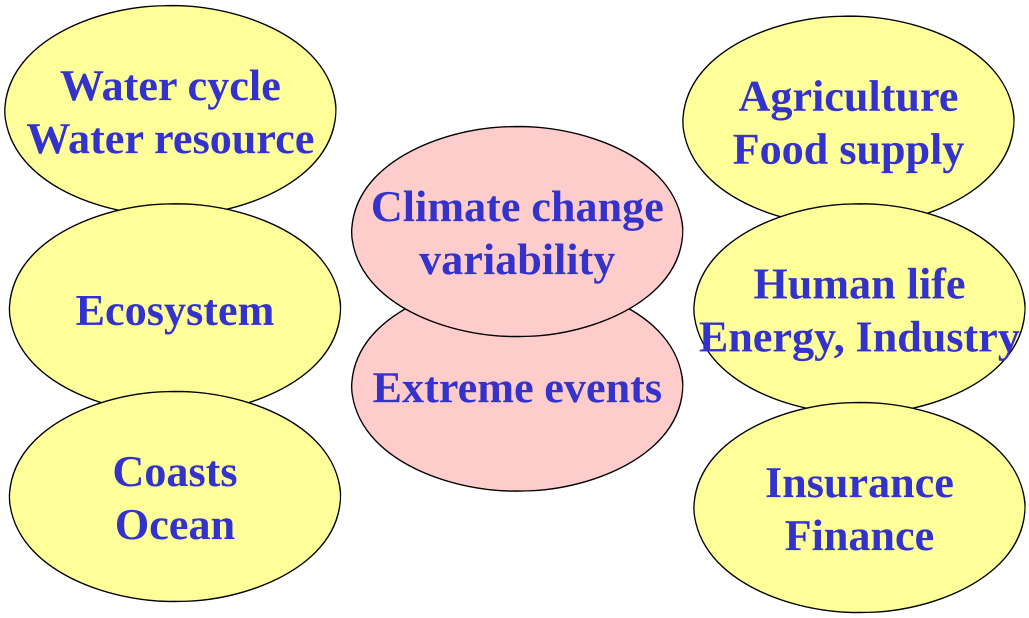
(IPCC AR4, 2007)



Regional Distribution 2071-2100

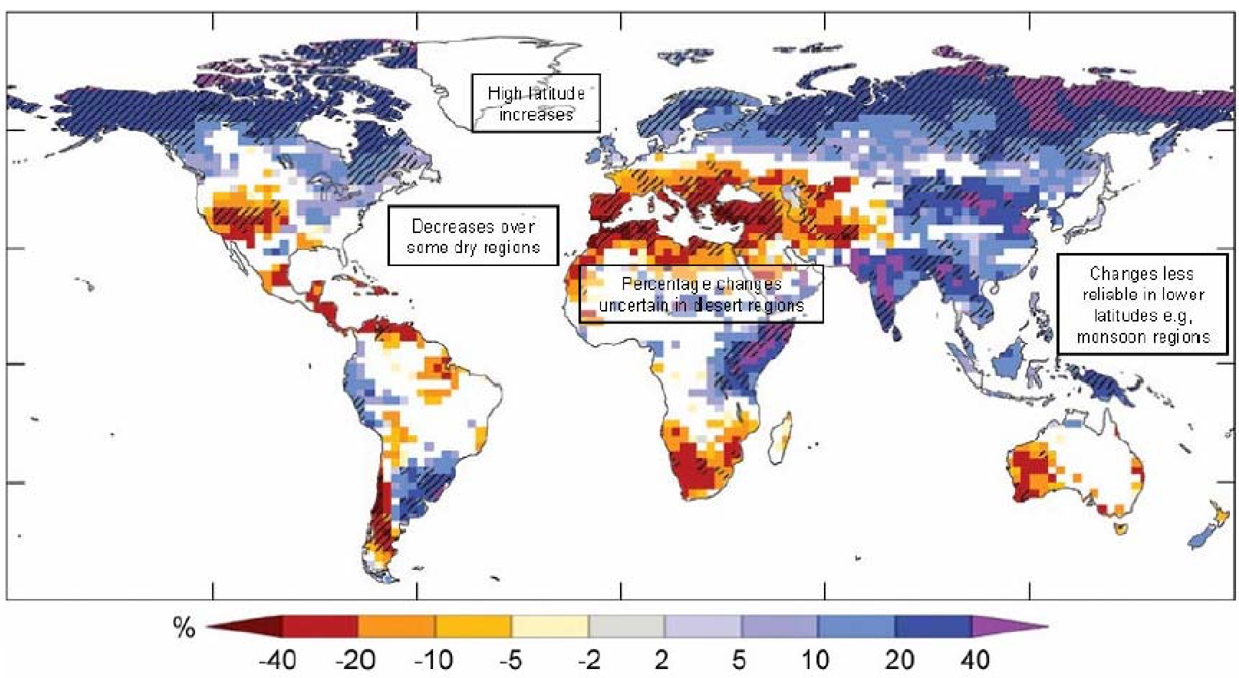
(Univ. Tokyo, NIES and JAMSTEC, 2007)

2.4 Overall Impacts of Climate Change



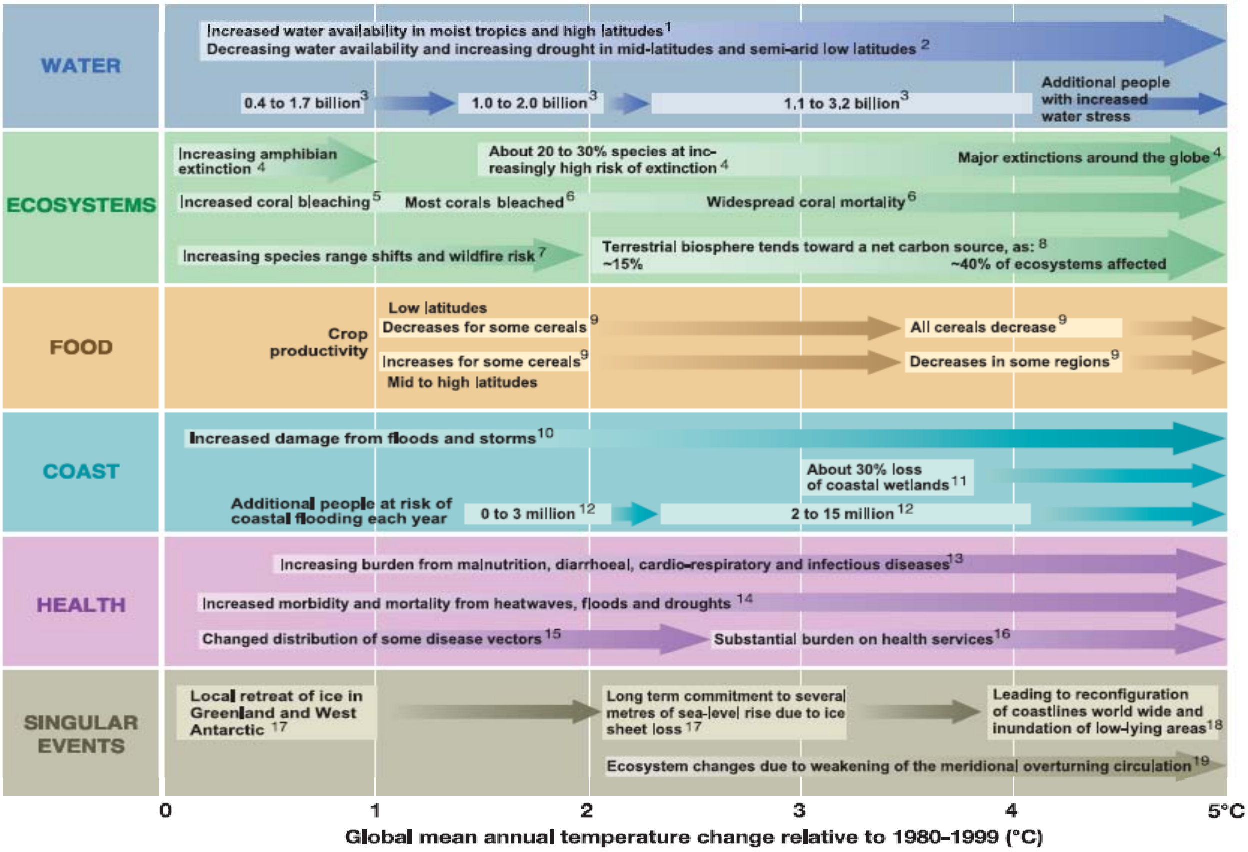
Changes in Run-off

Projections and model consistency of relative changes in runoff by the end of the 21st century



(IPCC AR4, 2007)

Overall Impacts Shown in AR4



（IPCC AR4，2007）

Major Findings of AR4

• Major impacts are likely to occur in water resources, ecosystem, food supply, coastal areas, human health and settlement. Impacts would vary with regions which have different changes and adaptive capacity.

• All regions may have negative economic consequences if global average temperature increase over 2 to 3 degree C.

• Climate change could impede nations' abilities to achieve sustainable development pathways.

• A portfolio of adaptation and mitigation measures can diminish the risks associated with climate change.
  - Mitigation to avoid "unmanageable"
  - Adaptation to prepare "unavoidable"

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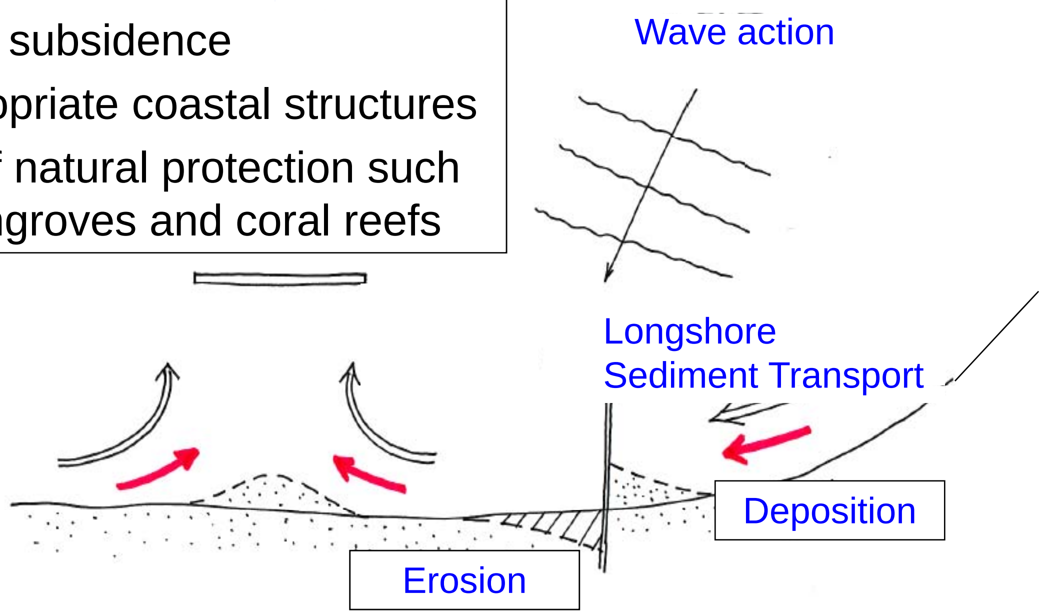
3. Coastal Impacts in the Asia and Pacific Region

Typical Coastal Impacts

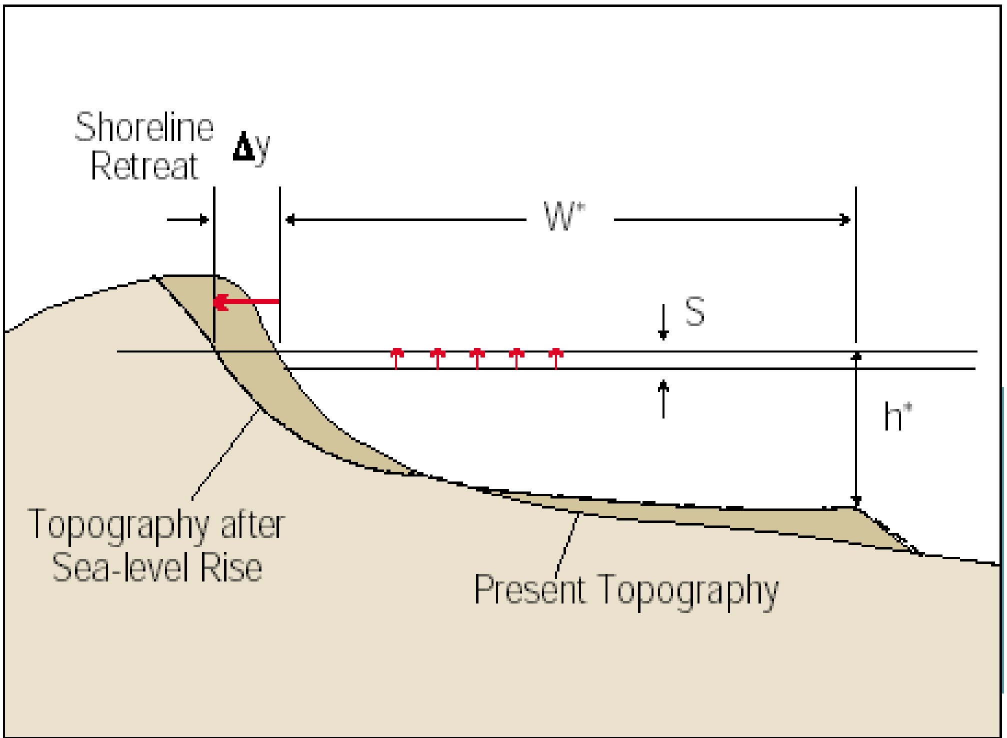
1. Coastal erosion
   - Sandy beaches
   - Mangrove coasts
2. Inundation and flooding
   - Flood due to storm surges
3. Salt water intrusion to aquifers and rivers

3.1 Coastal Erosion

1. Loss of Sediment supply from rivers
2. Changes in relative sea level
   - Sea-level rise
   - Land subsidence
3. Inappropriate coastal structures
4. Loss of natural protection such as mangroves and coral reefs

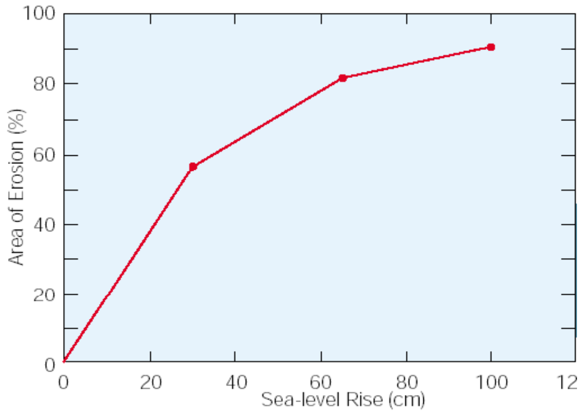


Erosion of sandy beaches due to SLR



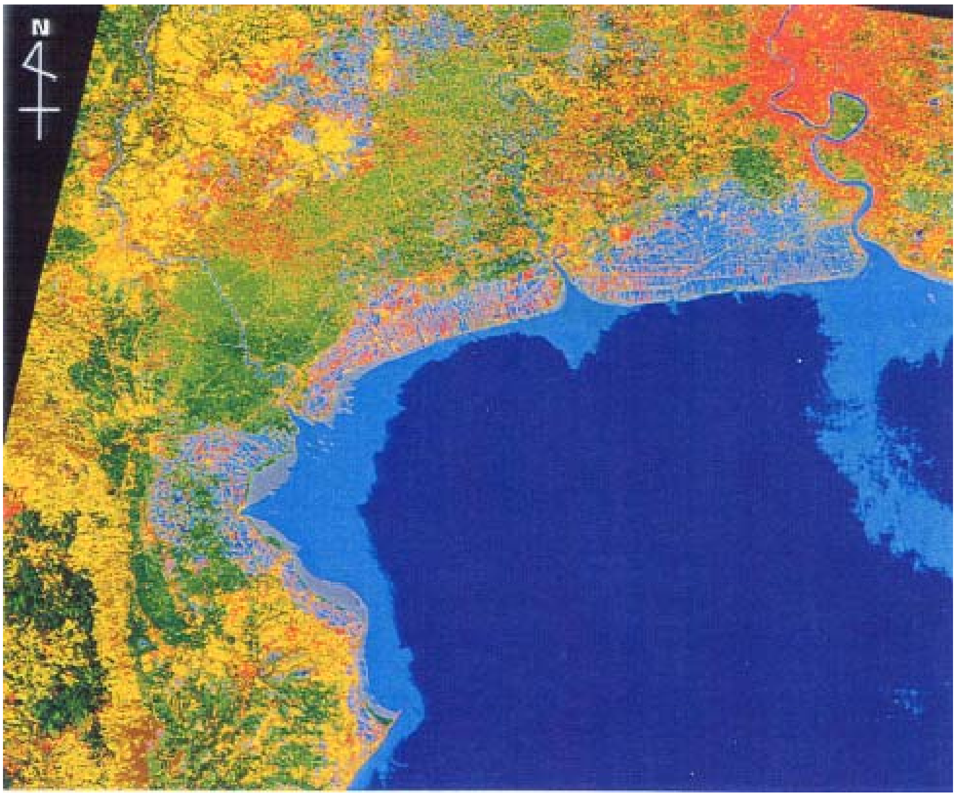
Erosion of Japanese coasts

- Japan lost about 100km^2 of sandy beaches for the past 100years.
- Heavy measures against erosion.
- Will the national land be covered by concrete walls?

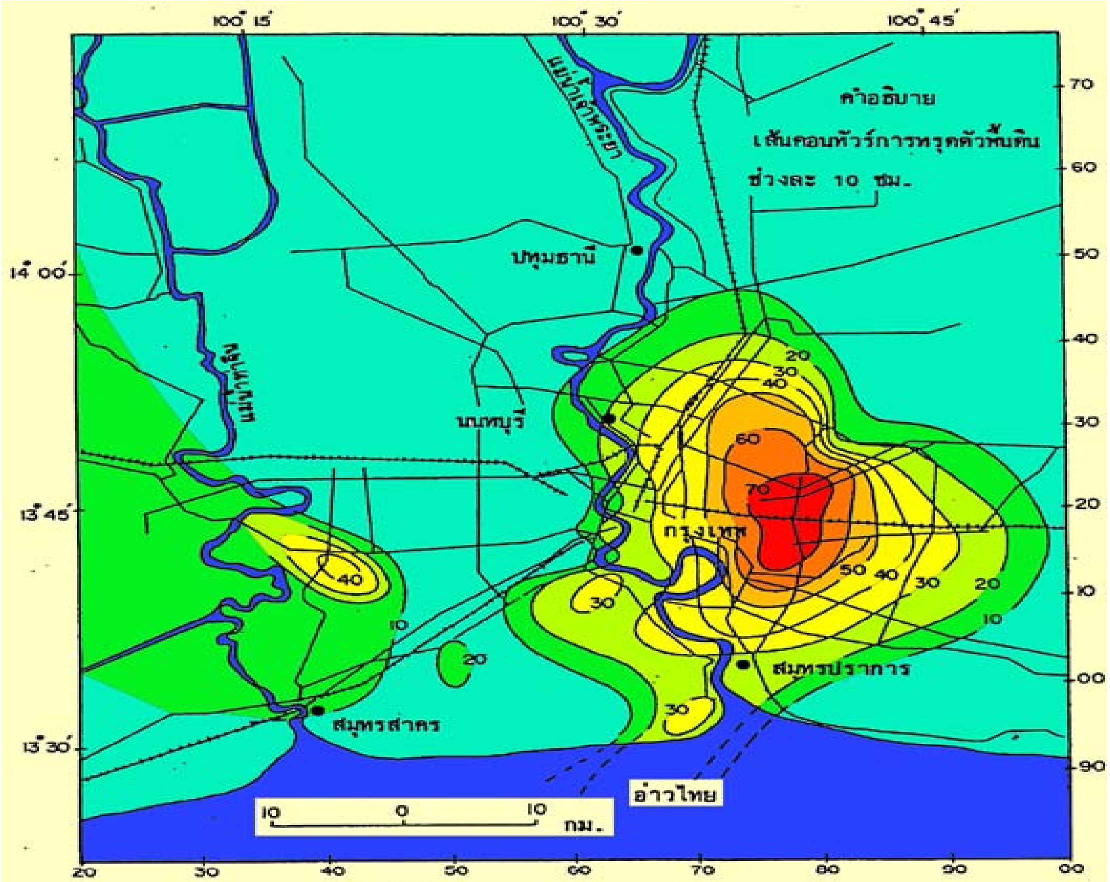


Erosion of Mangrove in Thailand

Satellite image around river mouth of Chaophraya

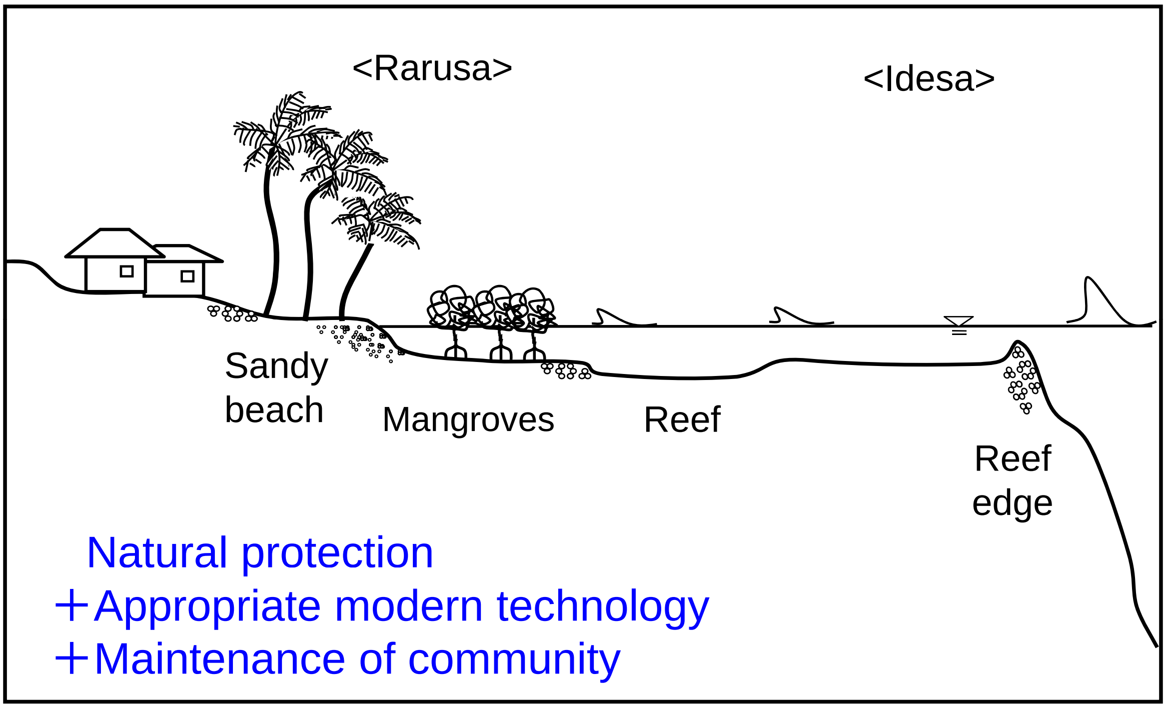


Erosion at the front



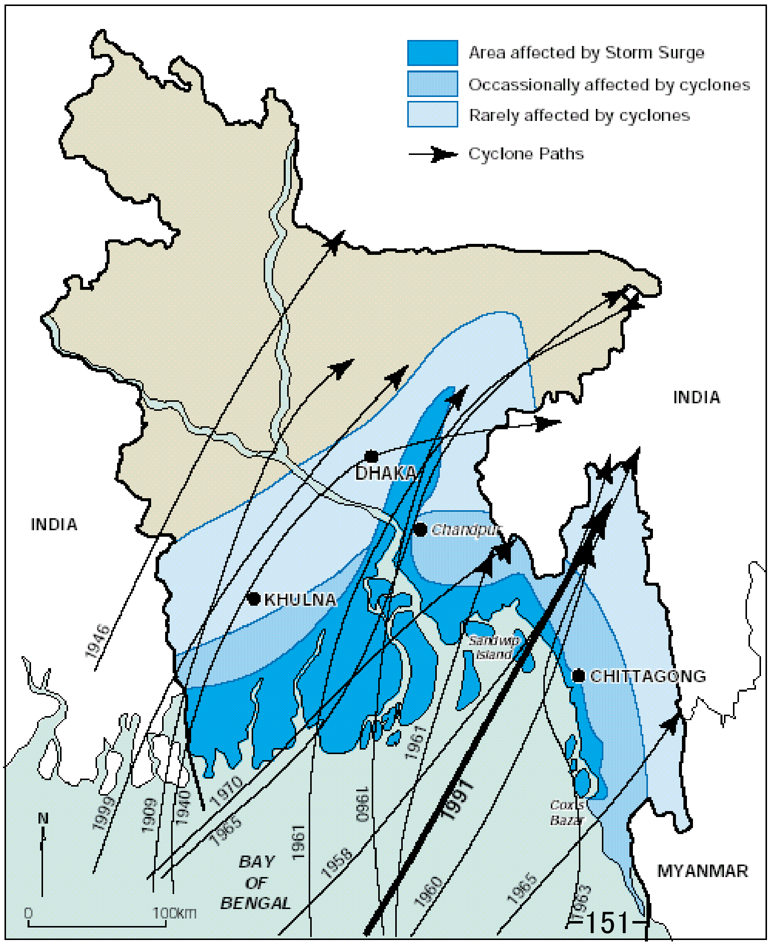
Ground Subsidence in Bangkok Source:Somkid(2002)

Combining Traditional Wisdom and Technology



What should we do against coastal erosion?

1. Maintain the <u>sediment flow from mountains</u> to the coasts.
2. Maintain the <u>sediment transport along the coast</u>. We need a careful planning and design for coastal structures so that they will not obstacle the flow of sediment.
3. Preserve <u>natural protection</u> as much as possible, such as sandy beaches, mangroves, wetlands, and coral reefs.
4. Apply <u>well-designed structures</u>.



3.2 Inundation and Flooding by Storm Surges

Tropical Cyclones in Bangladesh

History of Cyclone Damages

Date	Max Wind (m/s)	Max Wind Radius (km)	Storm surge (m)	Casualties（people）
30 Oct 1960	57.5	74	4.57-69.10	5,179
9 May 1961	40.8	64	2.44-3.05	11,468
28 May 1963	55.6	74	4.27-5.18	11,520
11 May 1965	58.1	74	3.66	19,279
31 May 1965	44.7	64	6.10-7.62	12,000
23 Oct 1966	40.3	64	6-6.67	850
12 Nov 1970	61.7	74	6.10-9.14	500,000
24 Nov 1974	44.7	64	2.8-5.2	200
9 Nov 1983	33.3	64	3.05-4.57	11,069?
25 May 1985	42.5	64	3.05-4.57	11,069?
29 Nov 1988	44.4	64	1.52-3.05	5708
29 Apr 1991	62.5	74	6.10-7.62	138,000
25 Nov 1995	58.3	74	-	650
19 May 1997	55.6	74	4.6	126
26 May 1997	41.7	74	3.0	70
16 May 1998	45.8	74	1.83-2.44	-

Countermeasures in Bangladesh

Combination of hard structures and soft measures

Hard Structure

・Cyclone shelters: High buildings
・Evacuation roads to shelters
・Coastal dykes
・Aforestation of coastal forests
・Raising ground（*Killa*）for livestock

Soft Measures

・Disaster prevention Plan
・Early warning for cyclones
(Radar system for cyclone observation)
・Peoples awareness raising and education
・Workshops in communities（*para*）
・Evacuation practices

Combining Early Warning and Hard Measures

Cyclone Shelter (Chittagong Port City)

Evacuation Road to a Cyclone Shelter
(South-west coastal region of Bangladesh)

Coastal Aforestation

(Cox's Bazar Beach in the south-east costal region)

Risk and Countermeasures in the A/P region

- Population of the region will nearly double at the end of the 21st century.
  - ✓ 3.7 billion in 2000 to 7.4 billion in 2100

- Increased population concentrate to the coastal areas. Poor migrants will live in unsafe, unsanitary low-lying areas.

- The problem is how to ensure the safety and security for the several thousands of millions people.
  - ✓ Regulation of unmanaged urban growth
  - ✓ Long-term urban planning and disaster prevention plans

- Sustainable economic growth is needed to achieve these policies.

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Japan's Comprehensive Policy against Natural Disasters

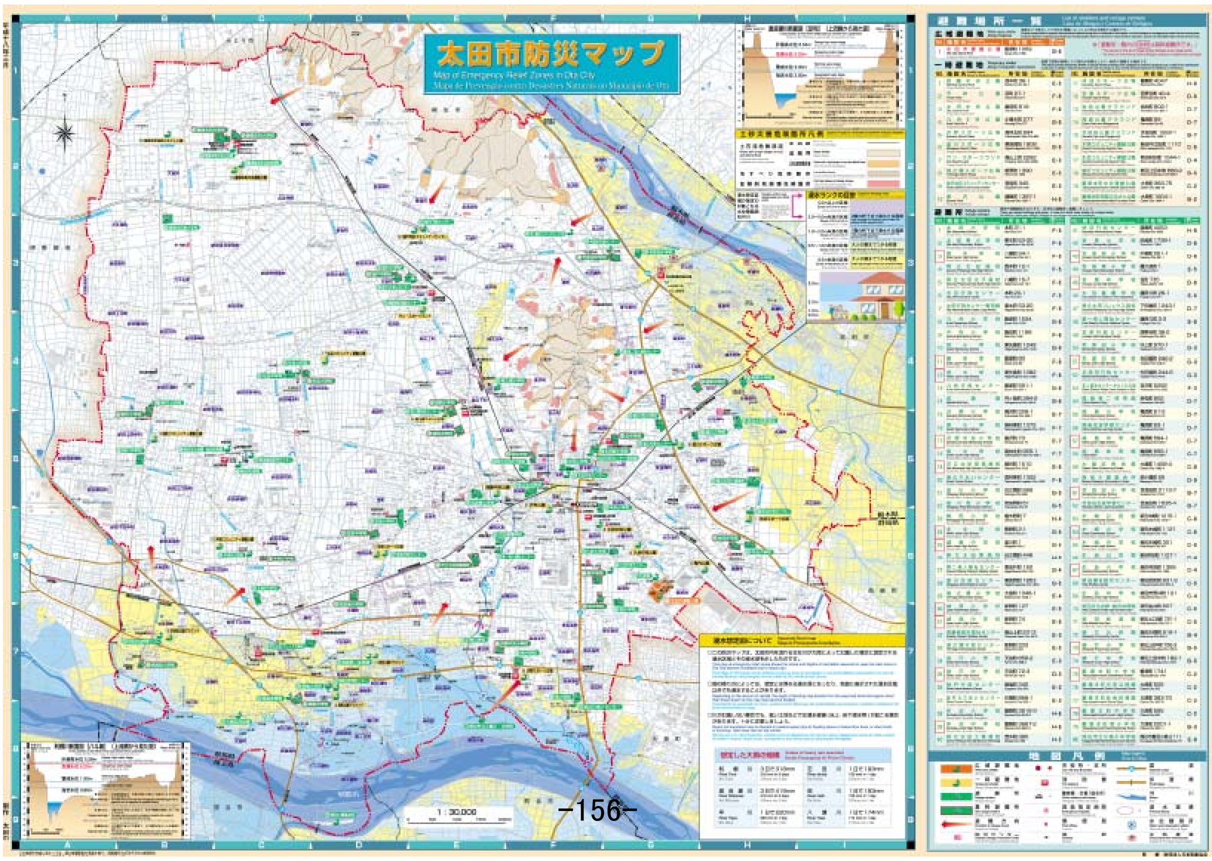
Basic Strategy

○ Combining soft and hard measures
○ Introduction of multiple measures to grade up the social preparedness as early as possible
○ Re-construction of communities' resilience and preparedness

Policy

① Introduction of flexible measures to respond to the recent trends of increasing natural disasters, including land use planning and facility operation.
② Strengthening the risk management function of local governments.
③ Provision of relevant information for evacuation.
④ Raising peoples awareness through dissimilation of the past experience and new knowledge on natural disasters.
⑤ Re-construction of communities' preparedness through education, practices, advertisement etc.
- combination of self-, mutual- and public supports

Information Infrastructure
-Hazard Map and Evacuation Practices



4. Response to Climate Change

Responses to Climate Change

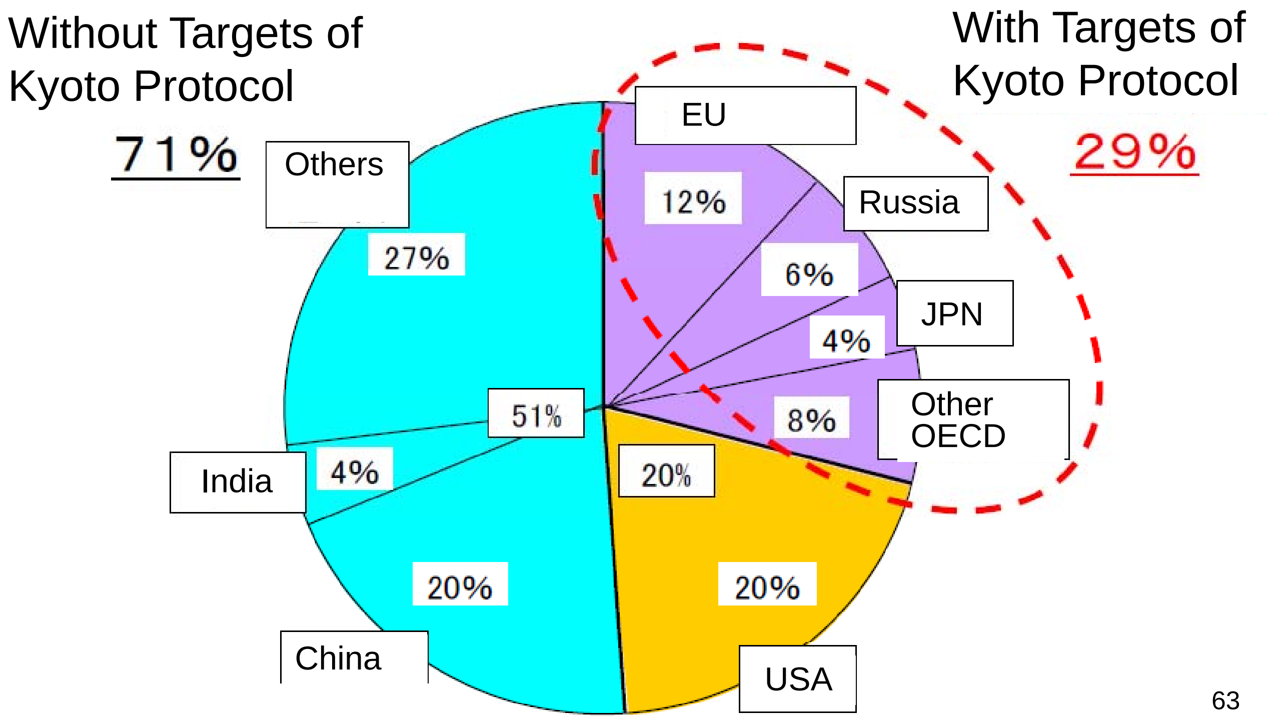
Mitigation : Reduce GHGs emission

Adaptation: Adjustment of natural and human systems to cope with warmer world

Role of adaptation

A portfolio of adaptation and mitigation is the only way to diminish the risks associated with climate change.

Global CO_2 Emission and Kyoto Protocol



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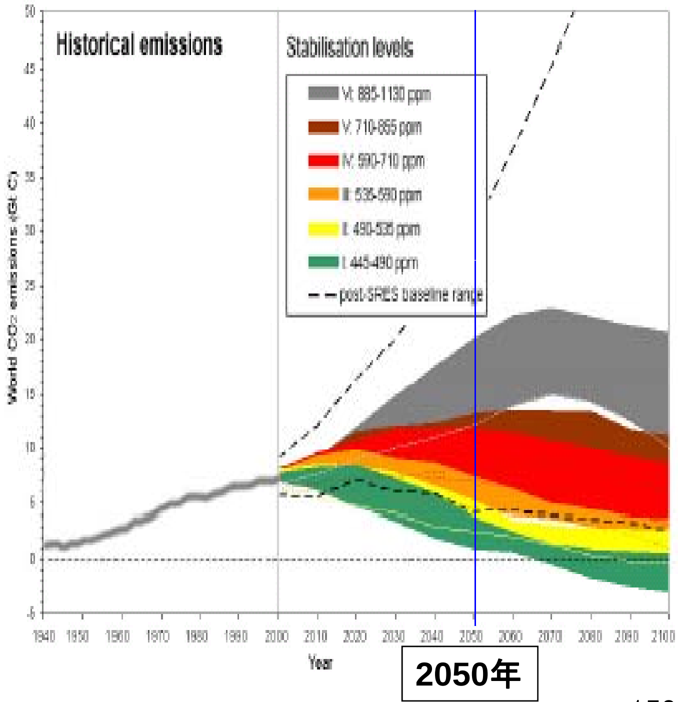
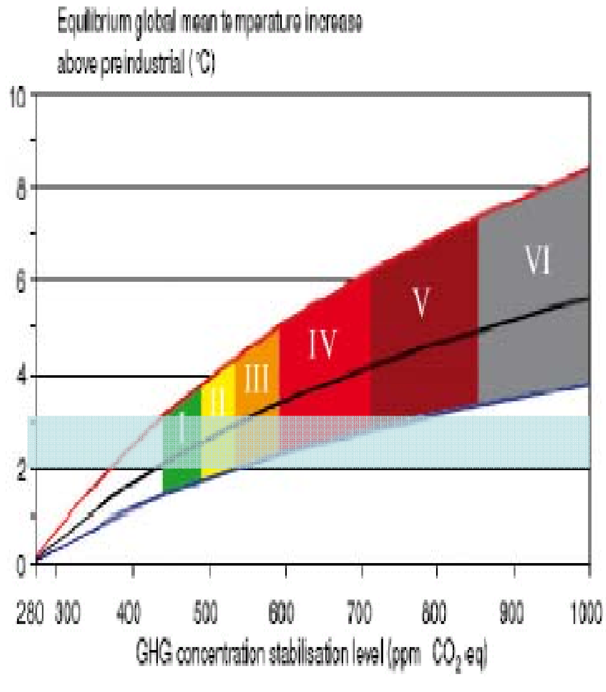
Stabilization Pathways

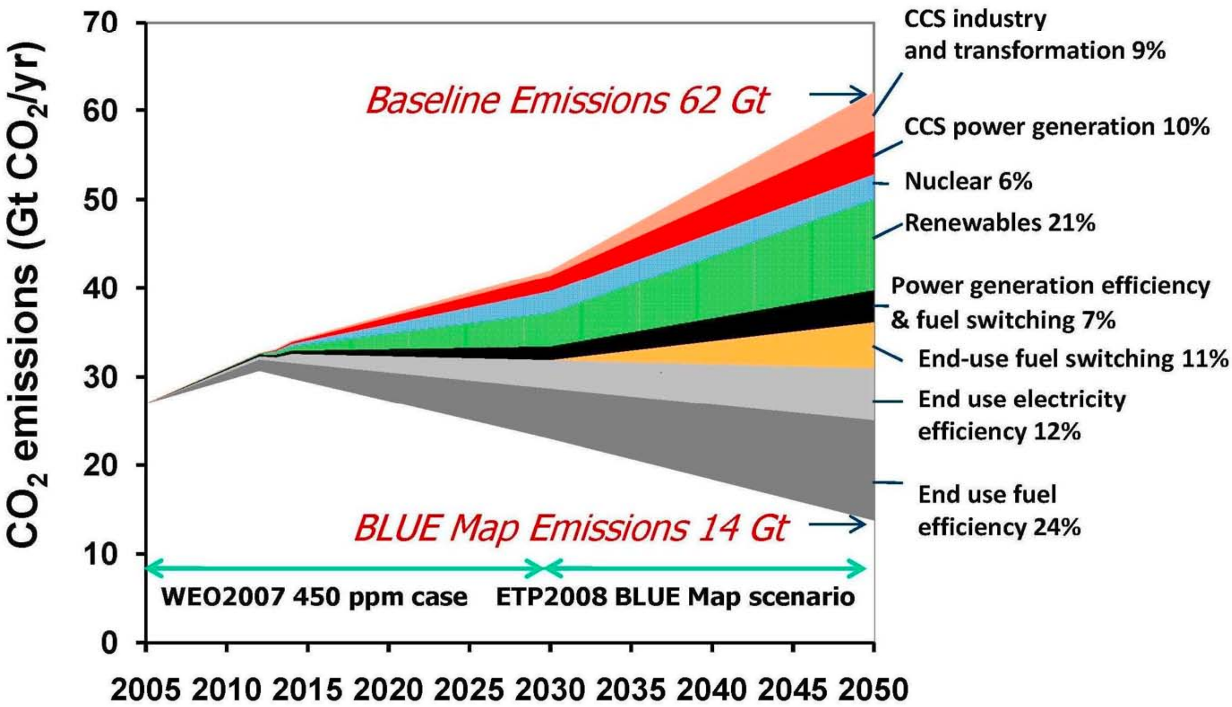




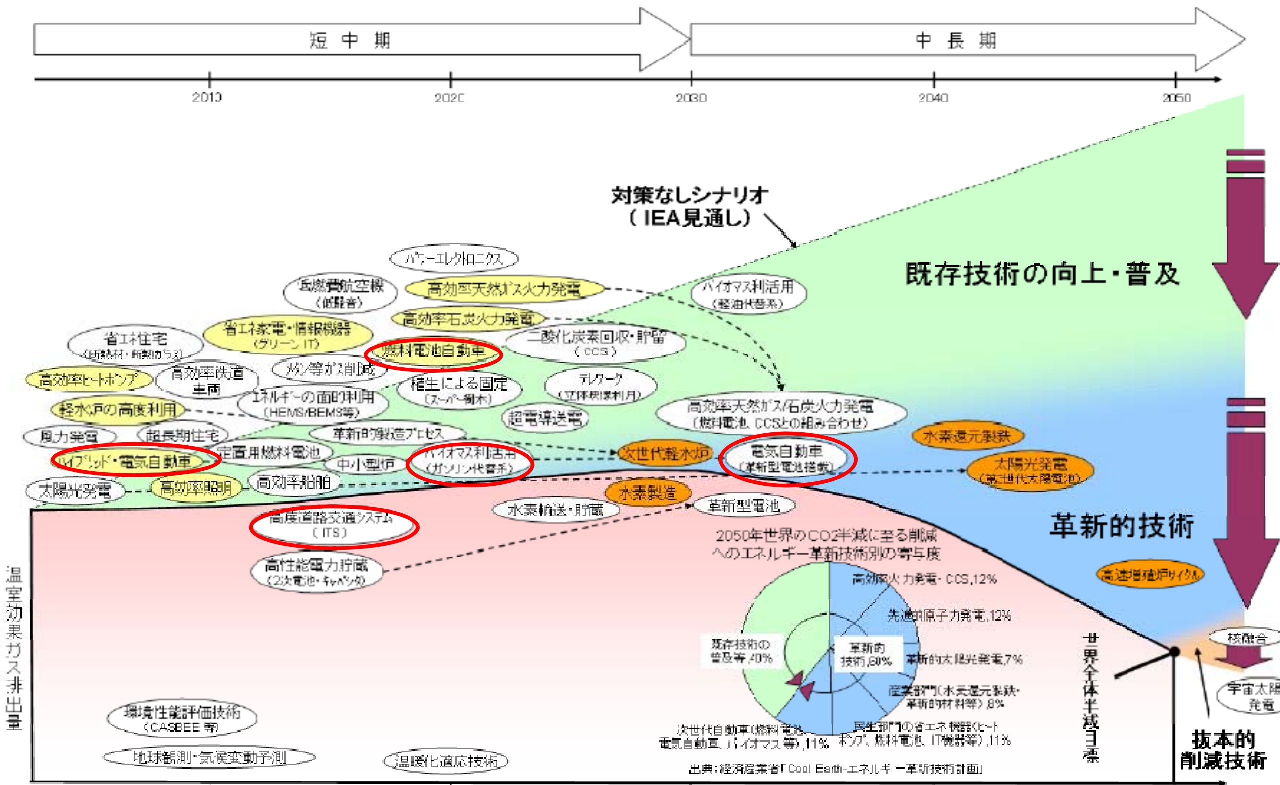
(IPCC WGIII AR4 SPM)

Estimate to Achieve the Goal of 50% Reduction in 2050

（IEA(2008）Energy Technology Perspectives 2008)



Trend of Technology Development

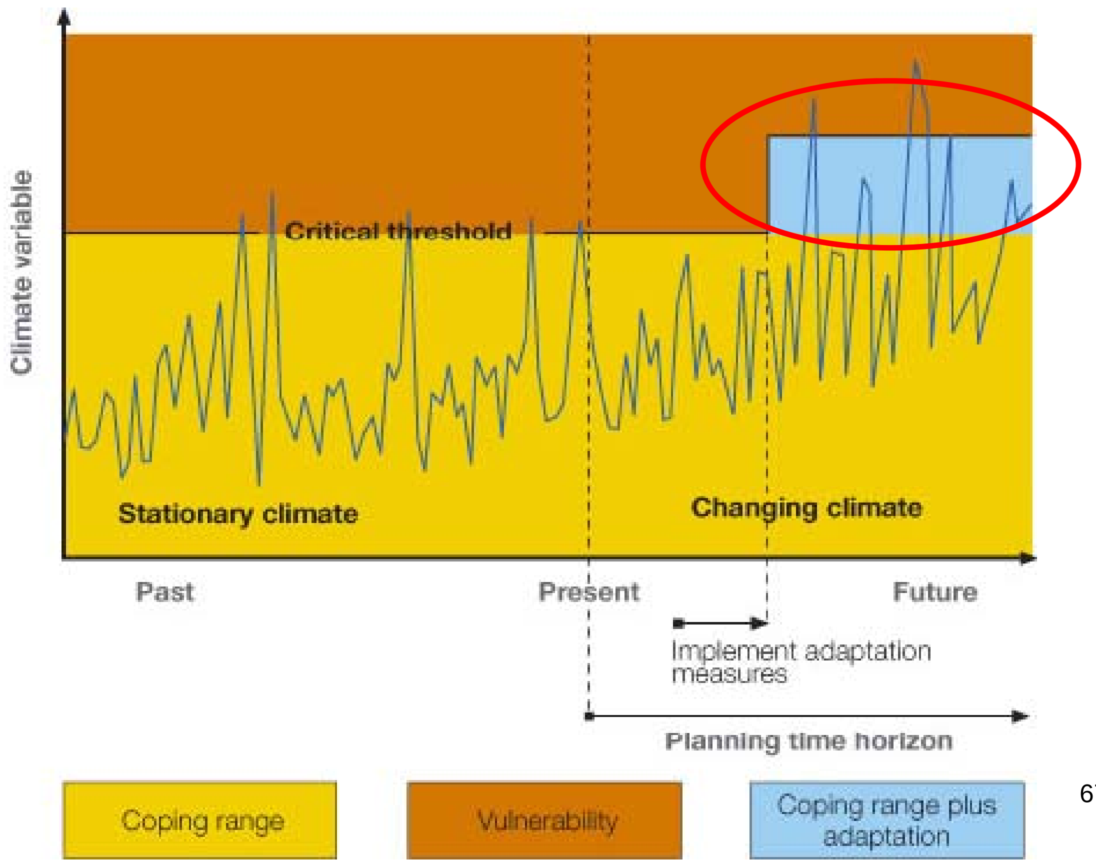


2010 2020 2030 2040 2050

短中期で削減効果が大きい主な技術　中長期で削減効果が大きい主な技術

（注）世界全体の温室効果ガス削減のイメージを示したものである

Climate Change Adaptation



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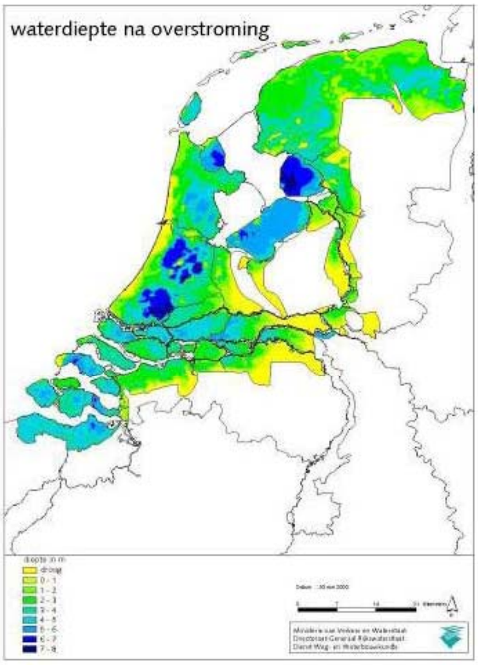
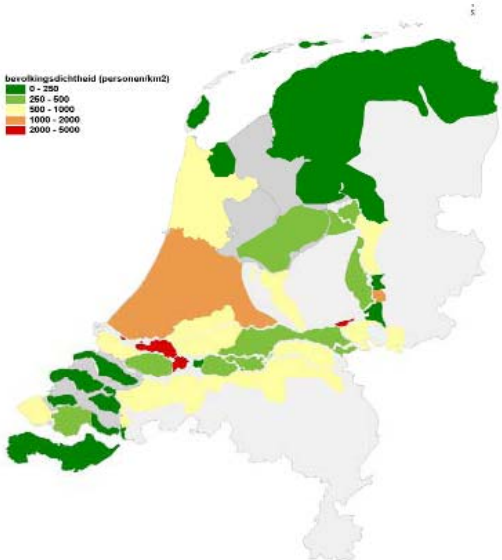
Concept of Coastal Adaptation

Retreat	**Move from dangerous areas** **Development regulation for disaster-prone coastal areas** **Land use planning** **Evacuation from highly vulnerable coastal areas** **Immigration**
Accommodation	**Change use and living patterns** **Changes of land use patterns** **Protection of mangroves** **Disaster insurance**
Protection	**Protect societies from risks** **Protection by hard structural measures** **- Dikes, seawalls, floodgates** **- Anti-erosion measures** **- Water resource management** **Protection by soft technologies** **- Anti-erosion measures** **- Conservation of coastal ecosystems** **- Early-warning systems** **- Evacuation practices** **- Awareness raising**

The Netherlands' Policy





1. Protection: Reduce Flooding

2. Urban Planning: Preparedness

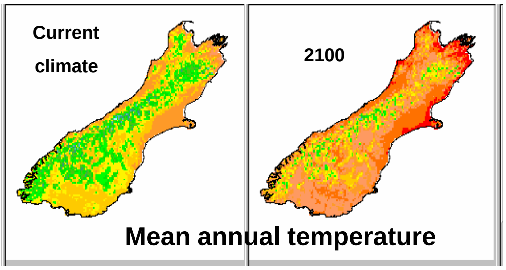
3. Risk Management: Reduce damages

Flood fighting

Evacuation

Utilize Favorable Conditions

Grape cultivation for wine in the South Island, NZ



Needed Adaptive Capacity (Resilience)

Resources	Financial and infrastructures
Human resources	Human power
Knowledge	Basic scientific knowledge, and people's understanding
Access to information	Personal and aggregate capacity to approach to the scientific information
Technology	Basic and applied technologies
Social institution	Variety of social organizations to support safety net
Community	Social group for mutual support
Ability of Risk management	Social ability to handle potential risks

5. Wise Adaptation and Relation with Sustainability

Wise Adaptation

- How to plan adaptation under uncertainties in climate projection, effects of mitigation, social changes etc?
- Introduce effective, efficient, flexible adaptation.

- Short-term and long-term planning

1) Short-term adaptation “real time adaptation”
   - respond to occurring climatic extremes
   - monitoring/early warning e.g. new radar system
   - evacuation

2) Long-term adaptation “adaptive adaptation”
   - flexible adjustment of adaptation planning

Elements of Wise Adaptation

1. Impact/vulnerability assessment at local level
2. Monitoring/early warning
3. Soft options first, then hard options
4. Incorporate CC adaptation to renewal cycle of infrastructure
5. Co-benefit approaches for mitigation and adaptation
6. Collaboration of ministries
7. Participation of stakeholders and capacity building

+ etc

Climate Change Adaptation in Green Innovation

- In 2090, the Japan's Prime Minister declared 25% reduction of GHG emission by 2020 in the UN General Assembly to call for collaborative efforts of many countries.

- In 2010, the Japanese Government set New Economic Growth Strategy to respond to the three major constraints.
  1) climate change
  2) aging society
  3) economic growth

- Major targets include;
  1) Green innovation towards a low carbon society
  2) Life innovation for active aging society
  and others

This means that green innovation becomes a major driver for the new economic growth.

Climate Change Adaptation in Green Innovation

- Green Innovation consists of mitigation and adaptation as two pillars.

- Changes in perception for climate change countermeasures
  - turning “passive” to “active”
    1) to avoid adverse impacts
    2) to promote new social values
       - opportunity to transform to a safer society with high QOL
       - opportunity to solve other problems
       - opportunity for new business for low-carbon and CC adaptive society

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<Large Cities>

Public Transport
Efficient Energy Use
Potential flood risk
Heat island
Aging society

Social Experiment for Low-Carbon/ CC Adaptation Cities
- A way of learning by doing

<Local Cities>

Compact city
Co-benefit of mitigation and Adaptation

<Rural Areas>

Local production/consumption of food and energy
Conservation of ecosystem

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Adaptation and Sustainability
Some Key Issues (1)

1. As developing countries are already vulnerable to the present climatic conditions, win-win approach is effective to developing countries.

- "Win-win" means to be effective both to the present vulnerability and future impacts.
  Increase of their responsive ability to the current disasters will also strengthen their preparedness and resilience to the impacts of future climate change.

Key Issues on Adaptation (2)

2. The success of adaptation depends on the adaptive capacity (i.e. resilience) of each country and local community.

- Enhancing adaptive capacity to the current climate variability and future climate change is one of the most important goals of an adaptation policy.

- From this viewpoint, it is also important to utilize and enhance the local and indigenous knowledge.
  It is a major challenge to incorporate the traditional knowledge and technologies in modern science and technology.

Key Issues on Adaptation (3)

3. Human security and sustainable development

- Adaptation to improve society's resilience to climate change and human security also constitutes an important policy towards achieving sustainable development.

- Adaptation is not a single policy, but a comprehensive approach to development policies, such as poverty reduction, agricultural development, water resources management and disaster prevention. (Mainstreaming adaptation)

Key Issues on Adaptation (4)

4. The real world is under multiple stresses.

- Global warming is not the only constraint to the society. Human society also faces other problems.
  e.g. environmental pollution, loss of biodiversity,
  changes in land use due to economic development,
  population growth and economic globalization.

- As adaptation to climate change has co-benefits to other stresses, it will be a measure to ensure the safer societies and healthy basis for future development. In this sense, adaptation is a major component of the policy toward sustainable development.

Summary

1. The Asia and Pacific region is already vulnerable to the present natural disasters and climatic conditions.
2. Climate change and sea-level rise will cause more threats on the growing population and economic development in the region.
3. Natural disasters, water resources, food security and human health will be a major threats to the region. Adaptation to these issues needs a long lead time.
4. Adaptation is a major response to climate change. Adaptation should be incorporated to the development policies. In this sense, adaptation is a component of sustainable development.

Thank you very much for your attention.

Appendix
New Japanese Initiative: Comprehensive Assessment and Adaptation S-4 and S-8

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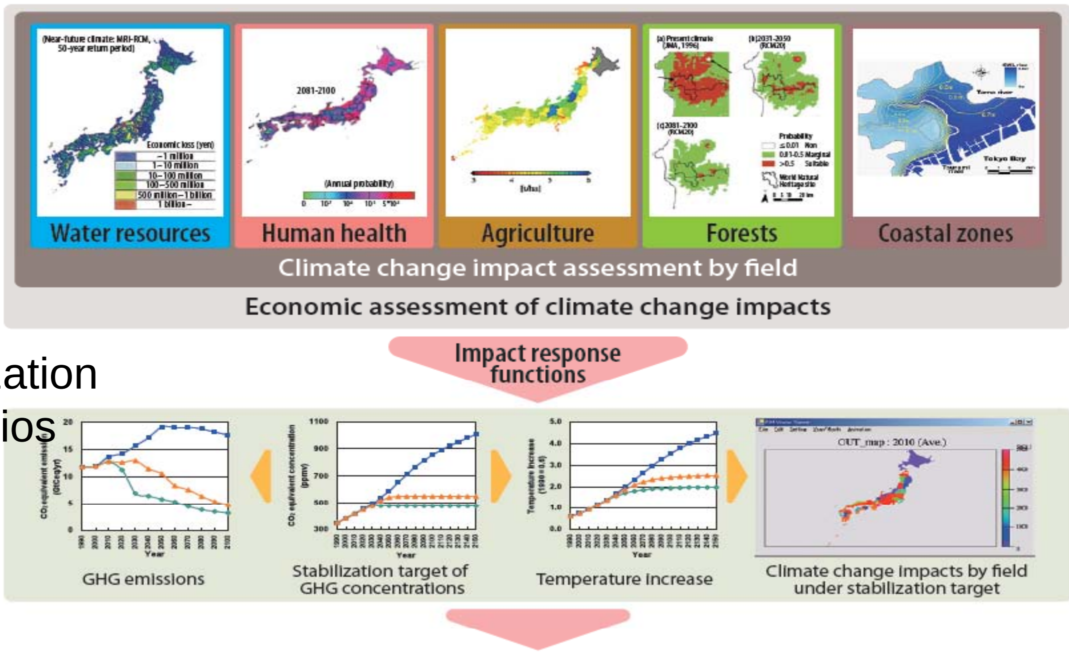
S-4: Purposes and Structure

Target Areas

Stabilization Scenarios



- Distribution of damages
- Damage costs for different emission pathways
- Foundation for national CC policy

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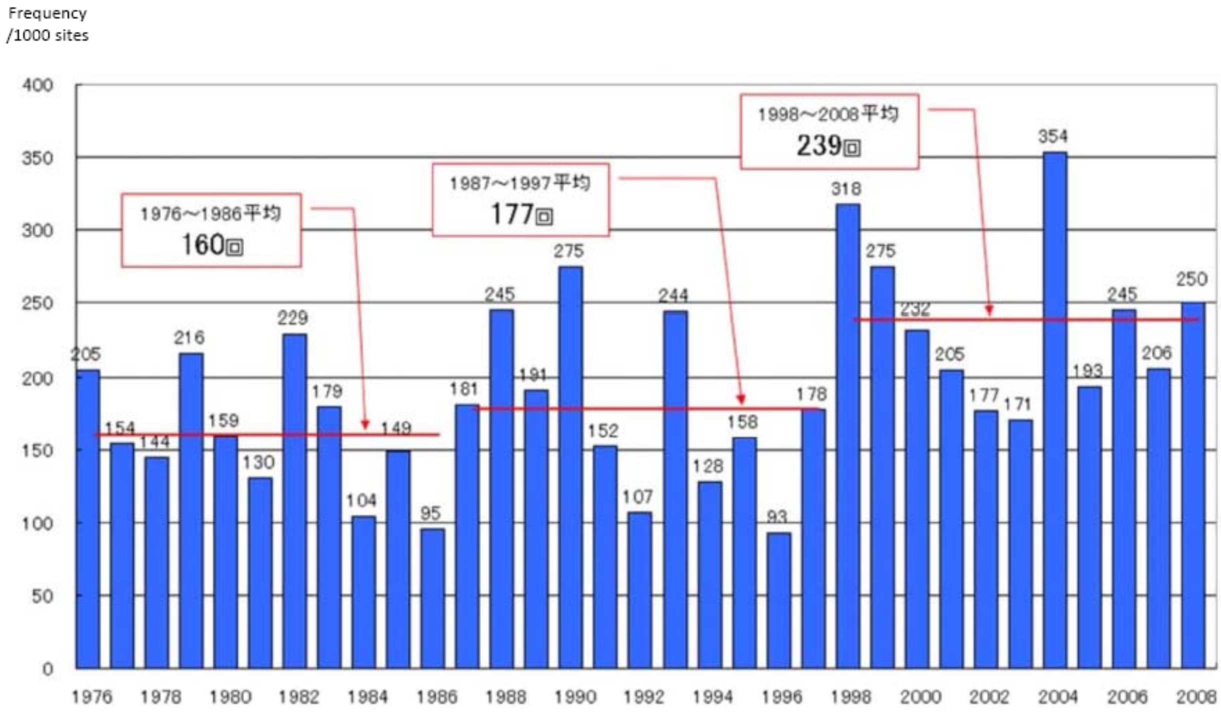
Comprehensive Assessment in Japan

Changes in Frequency of Heavy Rain Events (>50mm/hr)



(Source) Meteorological Agency (2009)

Land Slide due to Record Rainfall

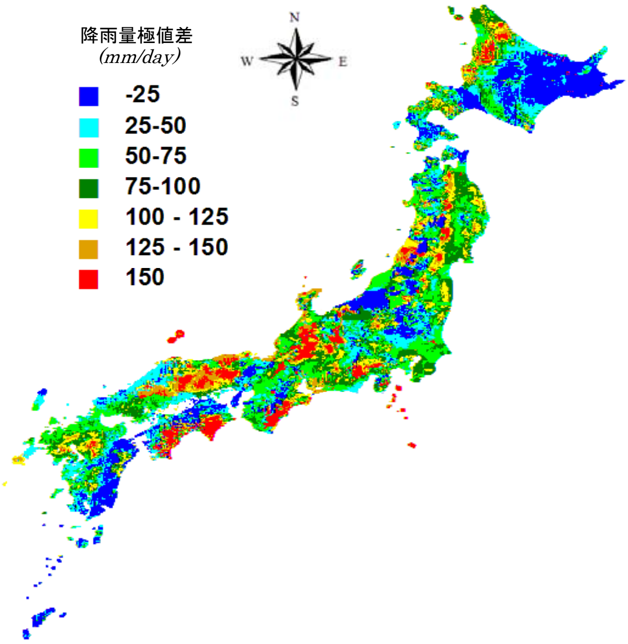
July 2009

(Source) Japan Society of Civil Engineers

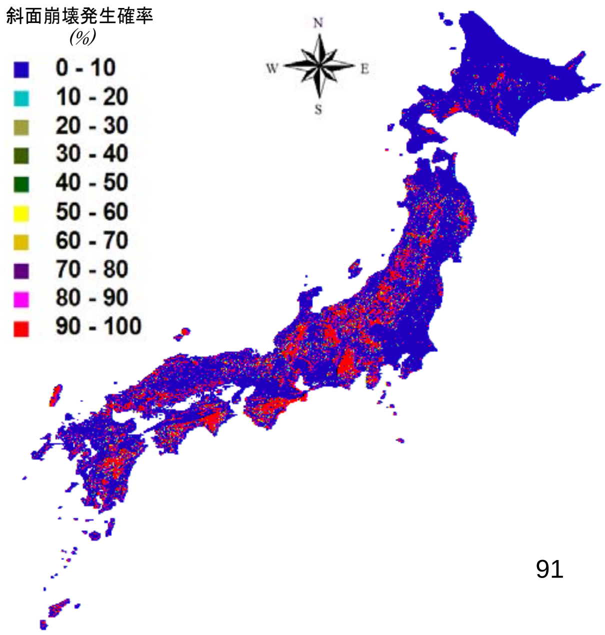
Distribution of Disaster Risks

Changes in Precipitation In 2030

- 1/50 present becomes 1/30



Increased land slide probability in 2050



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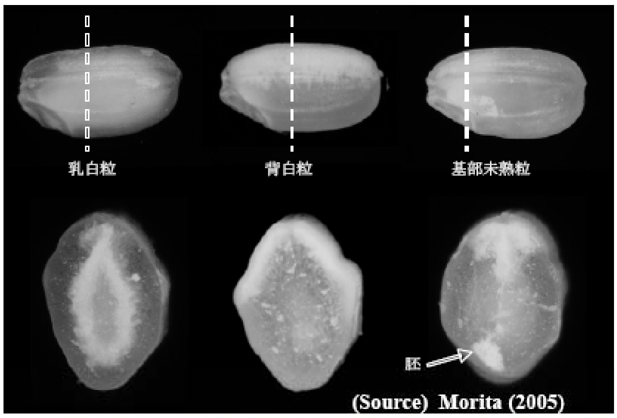
Agriculture – Quality Degradation

High Temperature Injury of Ripening in Rice



Mandarin orange could suffer from High Temperature and Water Shortage

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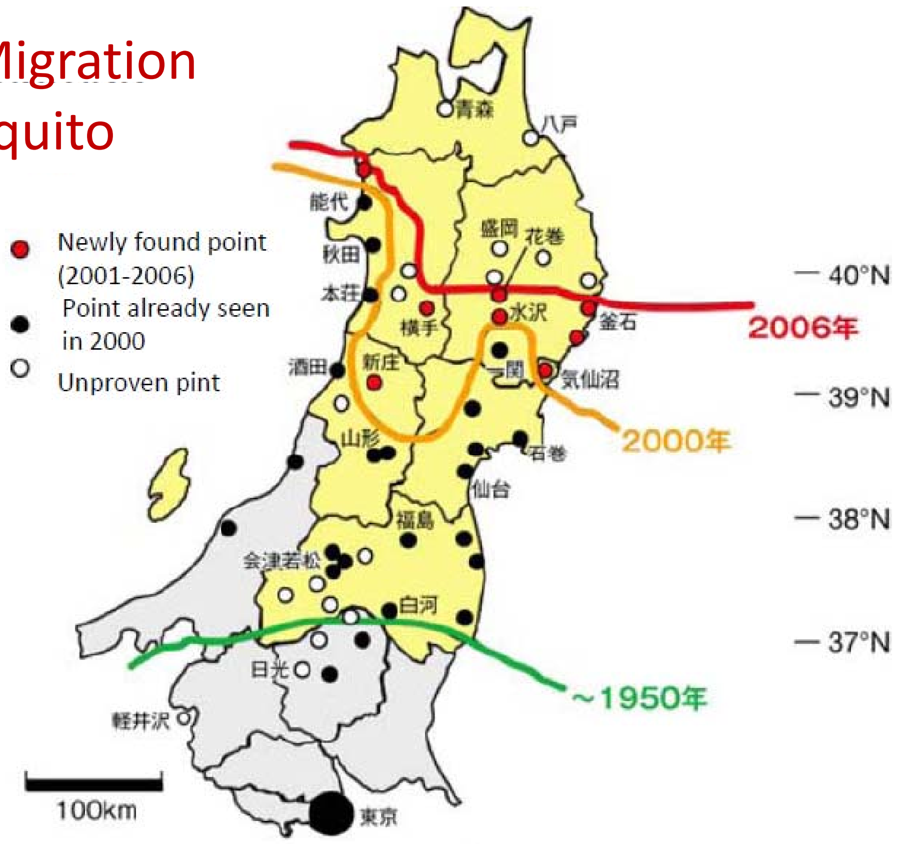
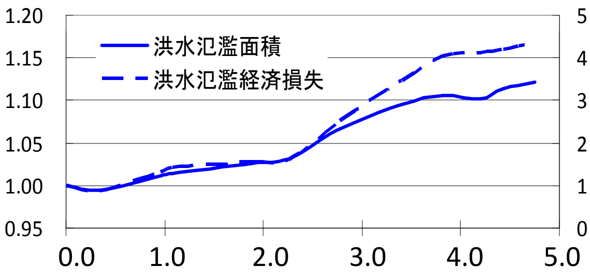
Northward Migration of Tiger Mosquito



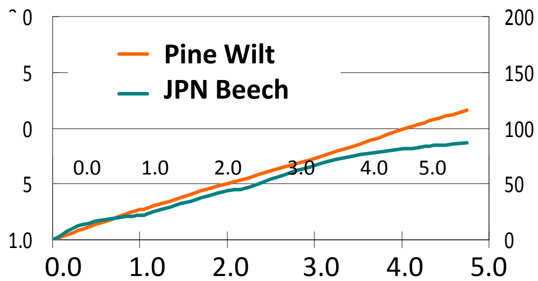
出典：Kobayashi, M. et al., 2008

Impacts Functions for Dangerous Level

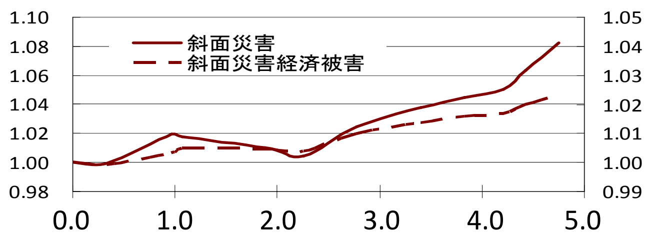
Flood Risk



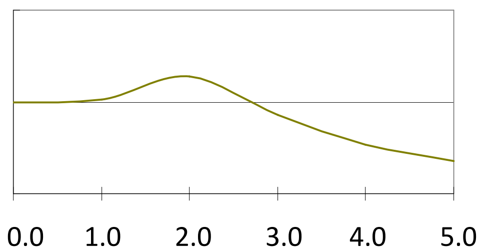
Forests



Land Slide

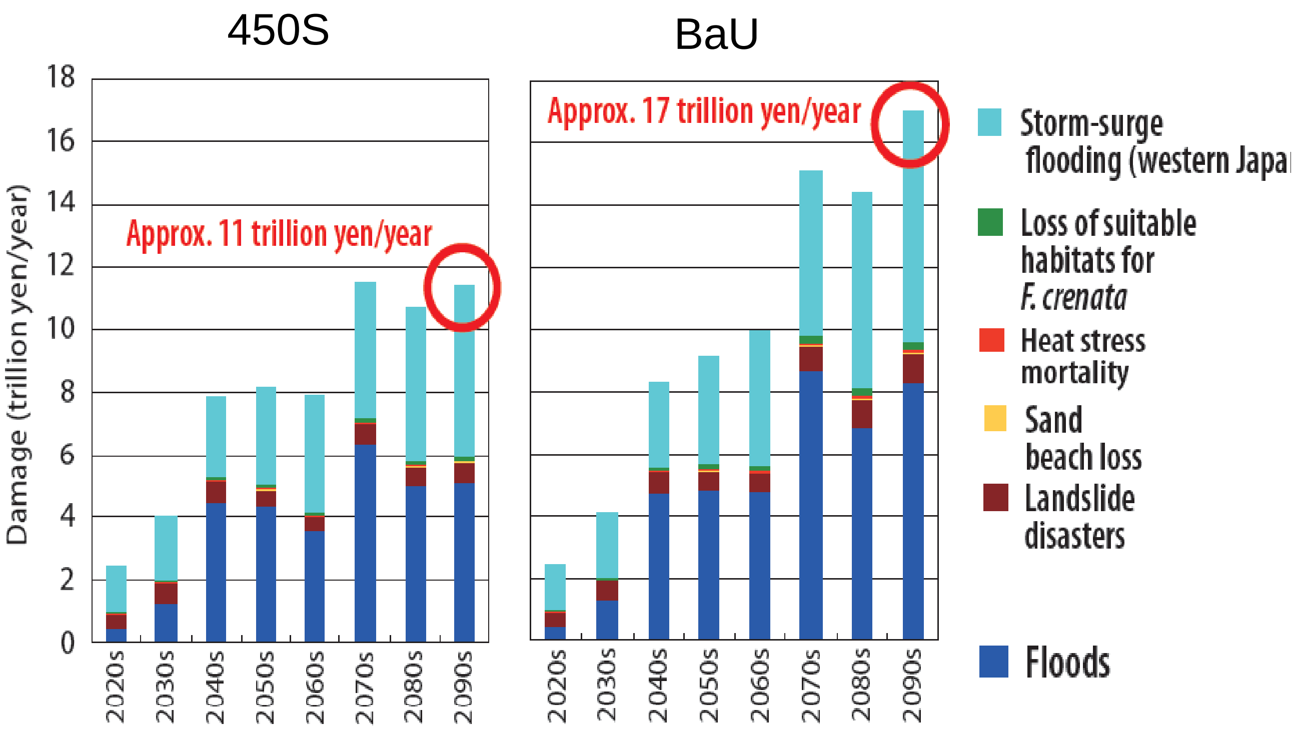


Rice Yield



Average Temperature Rise (1990=0℃)

Difference in Damage Costs in 21st C



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Ⅴ-2. Lecture

“Introduction to ICHARM and its Regional Cooperation activities on water-related disaster management
- in partnership with ADB”

Mr. Katsuhito MIYAKE

Introduction to ICHARM and its Regional Cooperation activities on water-related disaster management

- in partnership with ADB

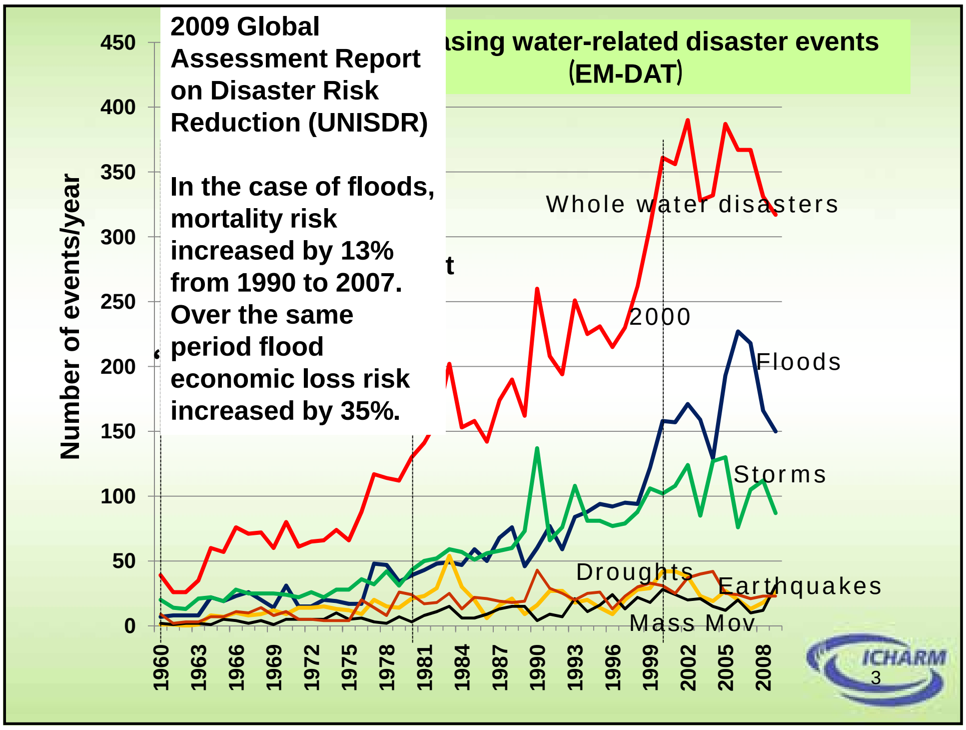
Katsuhito Miyake
Team Leader,
Disaster Prevention Research Team,
International Centre for Water Hazard and Risk Management under the auspices of UNESCO (ICHARM)

19th International Meeting on Public Works Research and Development
17 November 2010

1

Introduction to ICHARM and its typical activities

2



ICHARM

International Centre for Water Hazard and Risk Management

under the auspices of UNESCO

hosted by PWRI, Tsukuba

4

ICHARM is based on rich experience of Japan's WRDRR

ICHARM Objective

International Centre for Water Hazard and Risk Management
Since 6 March 2006

- **To be the global Center of Excellence to provide and assist implementation of the best practicable strategies to localities, nations, regions and the world to manage the risk of water related hazards including floods, droughts, land slides, debris flows and water contamination.**
  - **At the first stage the priority is on flood-related disasters**

ICHARM

5

Director of ICHARM
Dr. Kuniyoshi TAKEUCHI

Profile of Dr. Takeuchi

- 1968 MS in Civil Engineering from University of Tokyo, Japan
- 1972 Ph.D in Ciyt and Regional Planning from University of North Carolina at Chapel Hill,USA
- 1982 Dr. Eng. in Civil Engineering from University of Tokyo, Japan
- 1982 Professor in Faculty of Engineering, University of Yamanashi, Japan
- 2003 Professor in Interdisciplinary Graduate School of Medical and Engineering, University of Yamanashi, Japan
- 2006 Director, ICHARM

- 1998--2000 Chairman of the Inter-Governmental Council of UNESCO International Hydrological Programme (IHP)
- 1998--2000 Deputy President of International Water Resources Association (IWRA)
- 2005 President of International Association of Hydrological Sciences (IAHS)
- 2000-- Chairman of Japan National Committee for the UNESCO International Hydrological Programme (IHP)

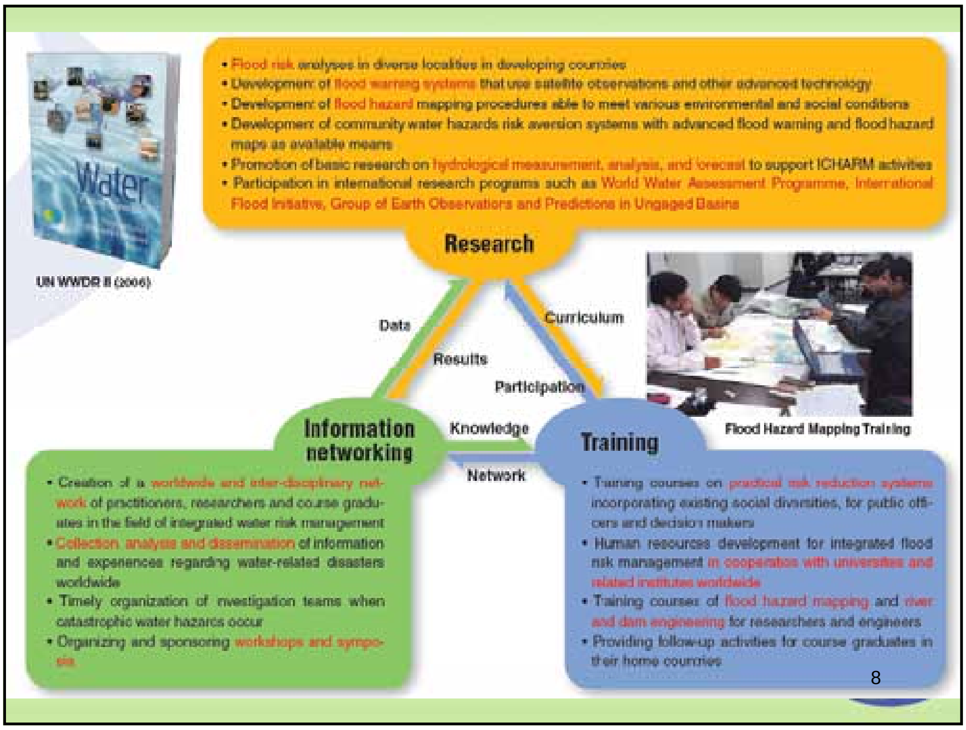
ICHARM

6

ICHARM members

(Oct. 2010)

7



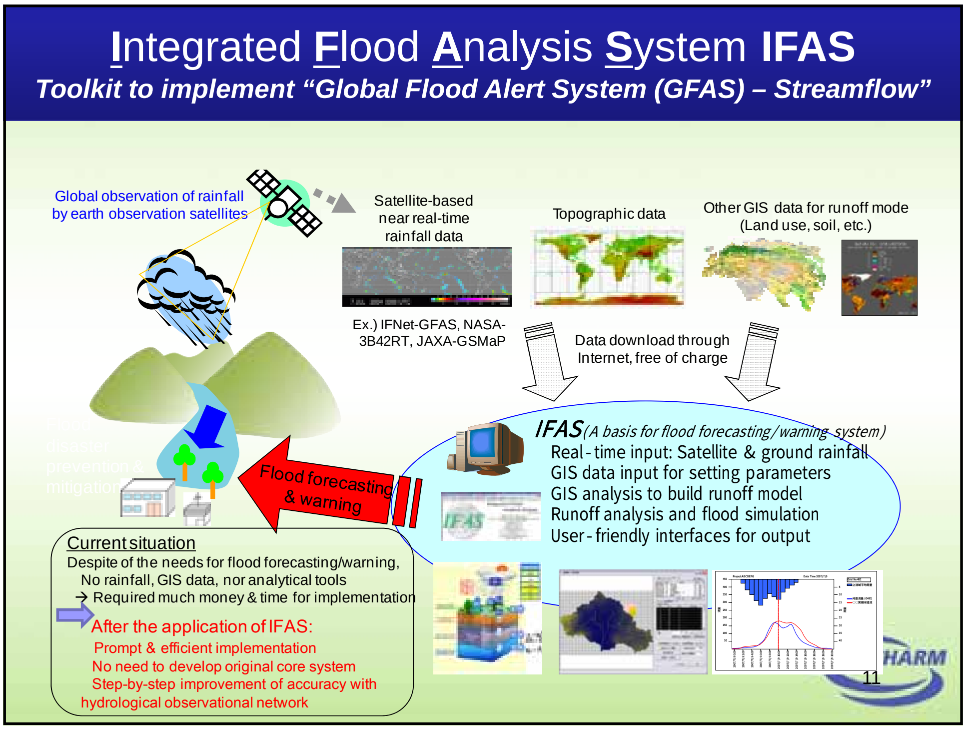
Research activities by ICHARM

9

Research activities by ICHARM

Satellite-based rainfall application
& IFAS (Integrated Flood Analysis System)

10



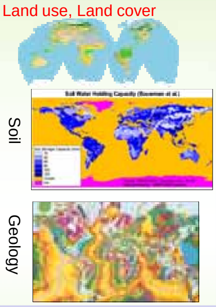
Parameter estimation using global GIS data

GIS data

Land use, Land cover

Soil

Geology



Parameter

Roughness
Surface permeability

Soil permeability
Soil thickness

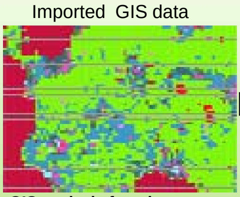
Rock permeability

Relation between land-use classification and parameters

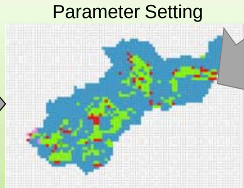
Land use classification	Parameter classification
Broadleaf Evergreen Forest	1
Broadleaf Deciduous Forest	1
Needleleaf Evergreen Forest	1
Needleleaf Deciduous Forest	1
Mixed Forest	1
Tree Open	1
Shrub	2
Herbaceous	2
Herbaceous with Sparse Tree/Shrub	2
Sparse vegetation	2
Cropland	3
Paddy field	3
Cropland / Other Vegetation Mosaic	3
Mangrove	3
Wetland	3
Bare area,consolidated(gravel,rock)	2
Bare area,unconsolidated (sand)	2
Urban	4
Snow / Ice	5

The parameter values of each classification are set up at basins which can obtain hydrological data beforehand

Imported GIS data

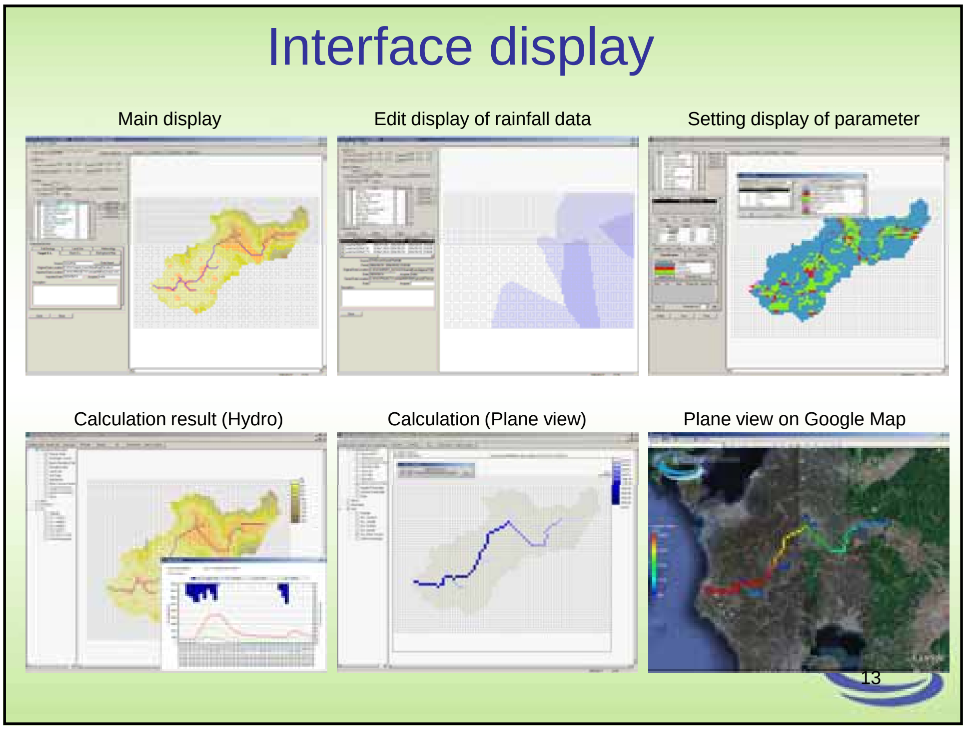


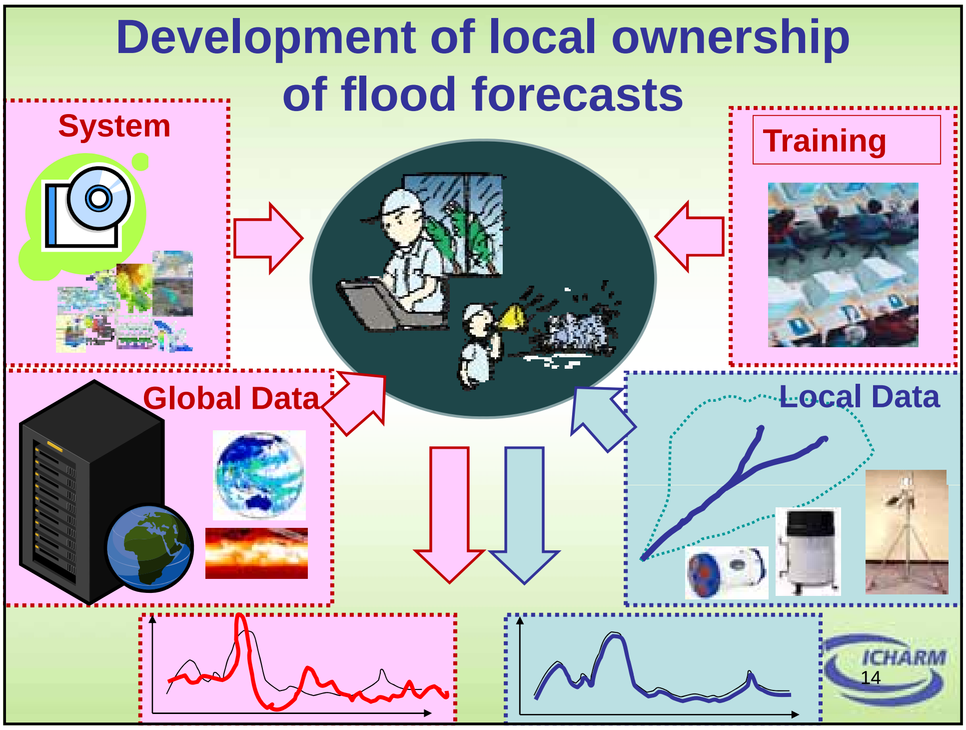
Parameter Setting

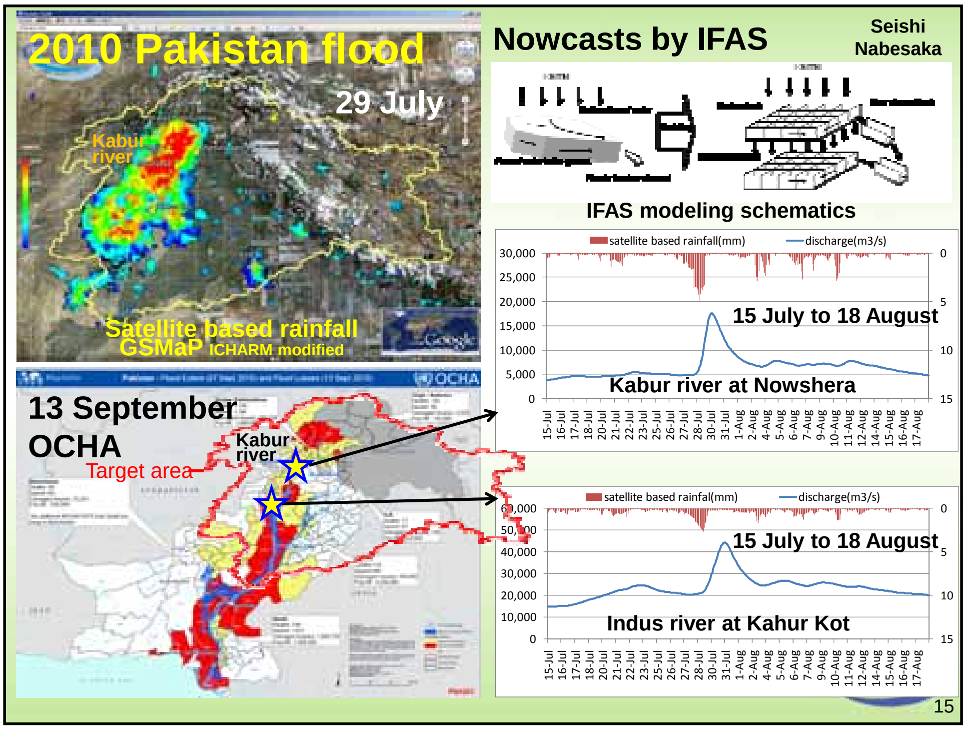


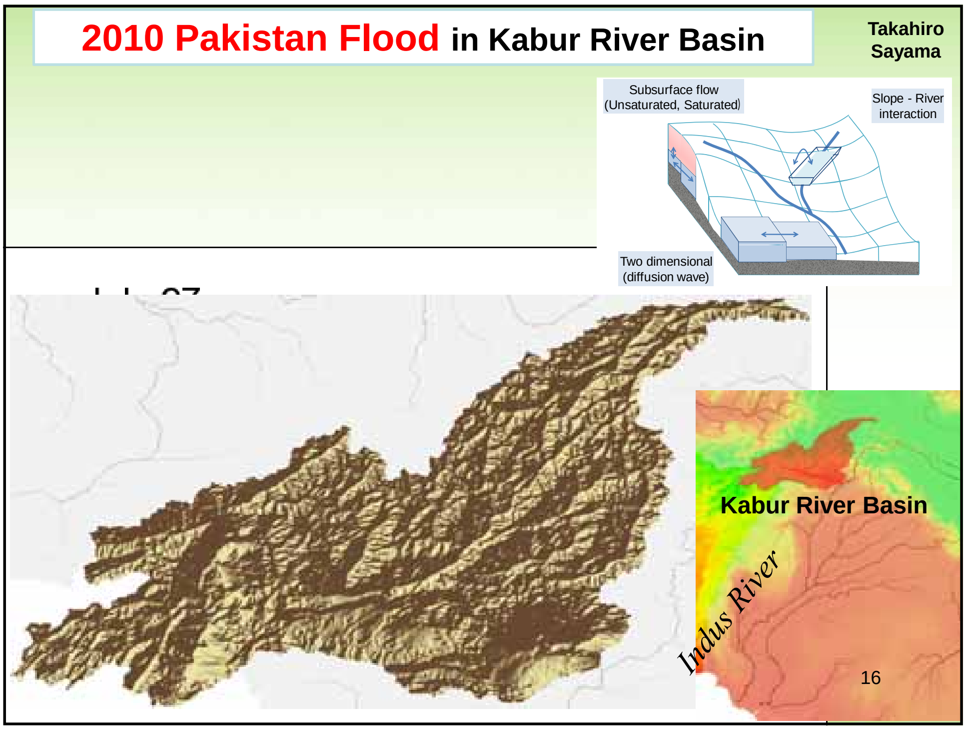
GIS analysis function

12

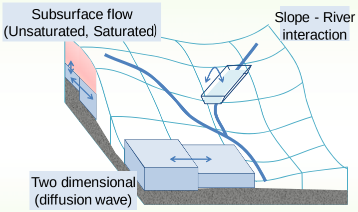

Interface display
Main display
Edit display of rainfall data
Setting display of parameter
Calculation result (Hydro)
Calculation (Plane view)
Plane view on Google Map
13

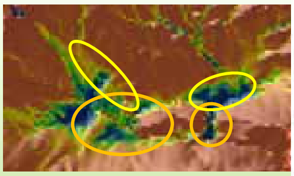

Development of local ownership of flood forecasts
System
Training
Global Data
Local Data
ICHARM
14


2010 Pakistan flood
29 July
Kabur river
Satellite based rainfall
GSMaP ICHARM modified
13 September
OCHA
Target area
Kabur river
Nowcasts by IFAS
Seishi Nabesaka
IFAS modeling schematics
satellite based rainfall(mm)
discharge(m3/s)
15 July to 18 August
Kabur river at Nowshera
15 July to 18 August
Indus river at Kahur Kot
15


2010 Pakistan Flood in Kabur River Basin
Takahiro Sayama
Subsurface flow
(Unsaturated, Saturated)
Slope - River interaction
Two dimensional
(diffusion wave)
Kabur River Basin
Indus River
16

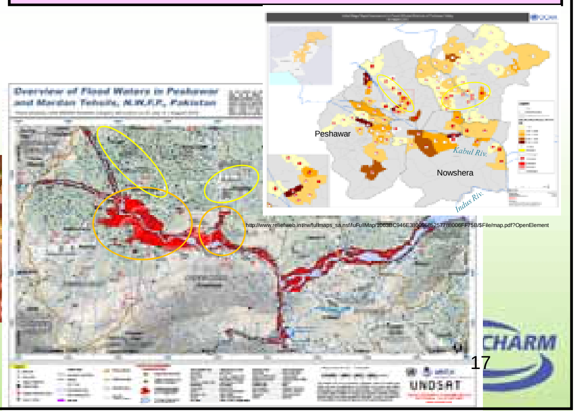
Comparison between satellite-based inundation extent and inundation simulations with a ICHARM's Rainfall-Runoff-Inundation (RRI) Model for Pakistan flood, August 2010





Sayama et al.(2010)

Runoff-inundation simulation can **interpolate <u>missing</u> satellite-based information** on flood inundation area caused by flash flood.



17

Research activities by ICHARM

Automatic river flow & sediment discharge observation using non-contact current meter and unmaned-boat-mounted ADCP

(In cooperation with MLIT & NILIM)

18

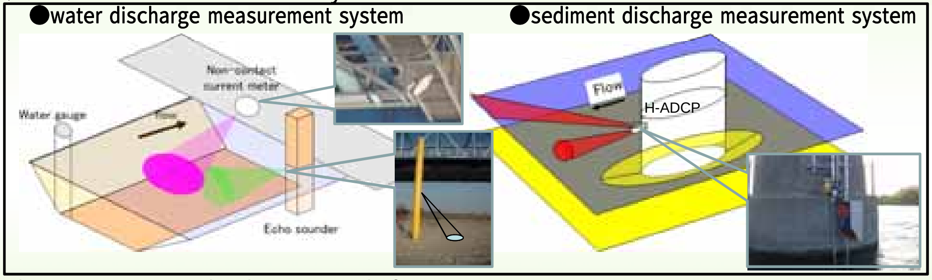
Development of automatic flood/sediment discharge observation system (2009-2011)

◆Purpose

ICAHRM and NILIM have jointly started a research project since May 2008 for the enhancement of water/sediment discharge observation technology. The final target of the project is to provide **a practical technique for automatic flood flow/sediment-discharge observation system**.

◆Automatic observation system

●water discharge measurement system ●sediment discharge measurement system



The system is planned to be composed of
1) flood flow observation with non-contact current meter
2) river-bed observation with echo sounder installed in river flow with oblique angle
3) water surface slope measurement with water-level gauge
4) river-bed and bed load discharge observation with a H-ADCP

For verification purposes, cross sectional measurement with an Acoustic Doppler Current Profiler (ADCP) is conducted during flooding

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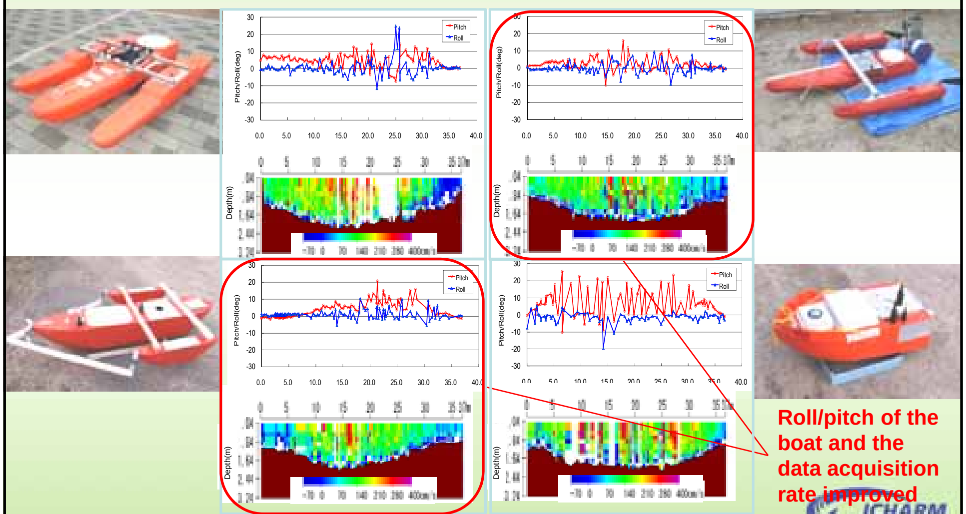
◆Development of tethered ADCP platform ～Field observation for boat test～

For verification of the automatic observation system, we have to establish a measuring method for flood flow using a tethered ADCP.

We carried out field observations and proposed a structure of the tethered ADCP platform for high-speed-flow measurements from a viewpoint of safety and measurement accuracy improvement.



The tethered ADCP platform is expected to expand possibility of ADCP measurements in wide variety of flooding condition with high flow and suspended objects/sediments of steep rivers.

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Research Activities
Risk Factor Analysis Series

<u>Reports published</u>
- Bangladesh
- Sri Lanka
- The Philippines
- Hatiya Island, Bangladesh

<u>Reports to be published</u>
- Honduras
- Infanta, the Philippines

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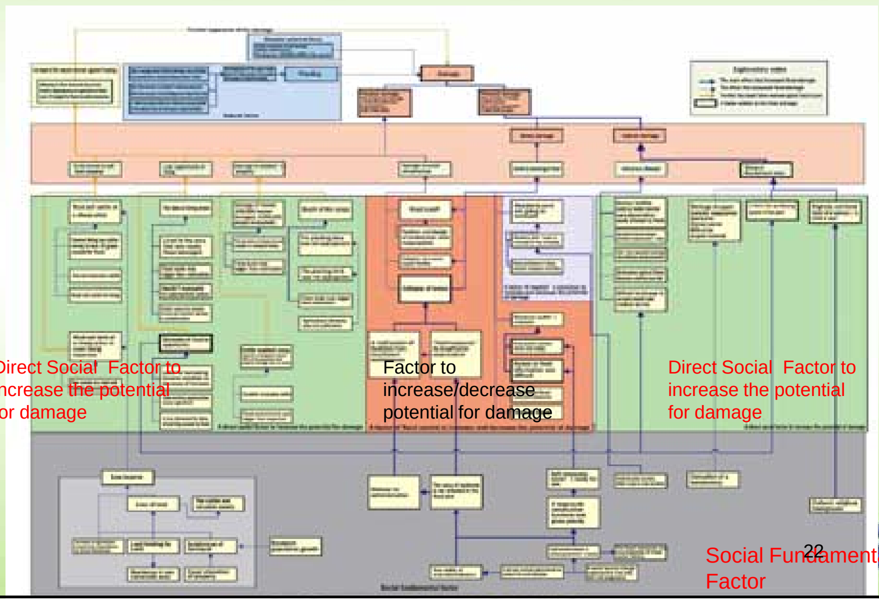
ICHARM's Factor Analysis of disasters
Bangladesh Flood case in 1998



22

Research on sustainable measures for tsunami damage mitigation

[Activities]

(1) investigation on the possible measures of comprehensive tsunami disaster prevention based on the potential tsunami hazard and the existing land use in the target area;

(2) assessment and development of education materials on comprehensive tsunami disaster prevention

(3) study on the potential implementation of coastal vegetation as a tsunami barrier; and

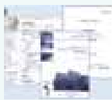
(4) development of guideline for planning and design of tsunami mitigative coastal vegetation belt.

[Output]

23

Research on practical application of local experience on disaster management

[FY2010]	[FY2011]	[FY2012]
Collection of local traditions, legends, techniques in Japan and other countries	Study on rationality of collected knowledge, compilation of knowledge • Similarities (time, climate, topography, materials, social conditions, ideas, etc.) • Validation from scientific viewpoint	Preparation of draft GL, peer review by selected country experts → GL/handbook compilation on local DM experience Sharing knowledge through PWRI publication, wikipedia, etc.

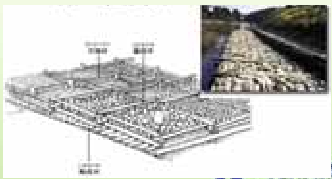



Our Mission
The mission of ICHARM is to serve as the Centre of Excellence to provide and assist implementation of best practicable strategies to localities, nations, regions, and the globe to manage the risk of water related disasters.

[provide best practices and assist implementation]

Debris flow breaker

Stone Monuments, local history book, local legends, etc.



Mattress made of trees and stone

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Capacity building at ICHARM

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Ongoing Training/academic Courses at ICHARM

Under JICA's Technical Cooperation Project

Short-term	Local Emergency Operation Plan with Flood Hazard Maps (2009, 2010 and 2010)
Short-term	Capacity Development for Adaptation to Climate Change in Asia- Climate Change Analysis: 5 weeks (in 2011)
Long-term	Water-related Risk Management Course (Disaster Management Policy Program with GRIPS) One-year Master's degree course launched in 2008
Short-term	Follow-up seminars on Flood Hazard Mapping
Long-term	Ph. D degree Course Three-year course launched in 2010

Ad-hoc Trainings

Short-term training courses on IFAS

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Flood Hazard Mapping exercises

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Master's degree course

- Partners
  - ICHARM - Teaching, supervision and assessment
  - GRIPS - Degree awarding institution
  - JICA – Provides financial sponsorship
- Duration – One year (October –September)
- Modes of teaching
  - Lectures
  - Assignments (Tutorials)
  - Field visits
  - Individual studies leading to a thesis
- Successful candidates are awarded the degree of Master of Disaster Management by the National Graduate Institute for Policy Studies (GRIPS)

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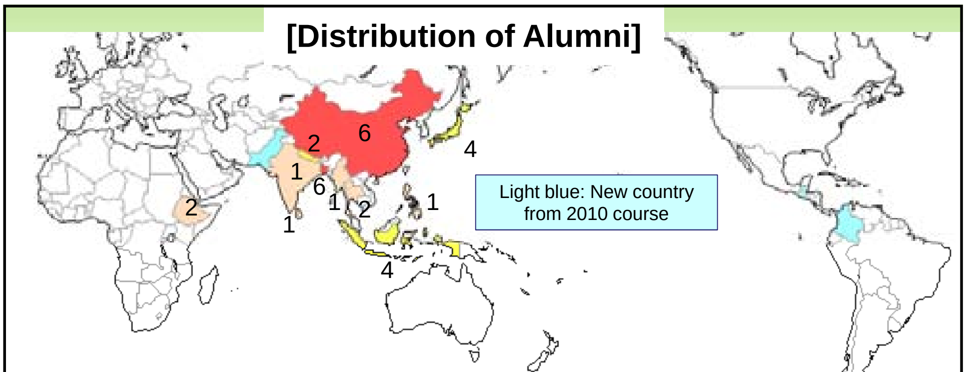
[Distribution of Alumni]



Country	Total	Organization
Bangladesh	6	Bangladesh Water Development Board
China	6	Bureau of Hydrology, Ministry of Water Resources, etc.
Ethiopia	2	Ministry of Water Resourse, Dire Dawa University
India	1	Water Resource Dept., Govt. of Assam
Indonesia	4	Ministry of Public Works
Nepal	2	Department of Water Induced Disaster Prevention
Myanmar	1	Ministry of Agriculture and Irrigation
Philippines	1	Department of Public Works and Highways
Sri Lanka	1	Department of Irrigation
Thailand	2	Royal Irrigation Department, Ministry of Agriculture and Cooperatives
Japan	4	Consulting companies, Japan Water Agency

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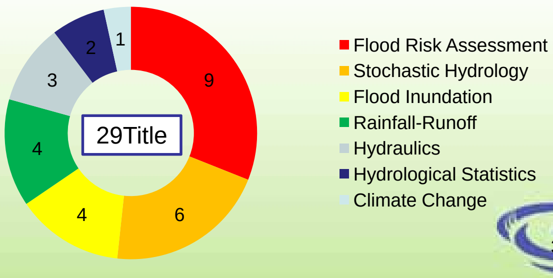
[Course]

Category		Course
Basic Study	Management Basis	Disaster Mitigation Policy
		Disaster Risk Management
		Integrated Flood Risk Management
	Engineering Basis	Computer Programming
		Hydrology (Basic, Advanced)
		Hydraulics (Lecture & Practice)
Application	Management Application	Local Disaster Management and Hazard Mapping
		Practice on Local Disaster Management Plan
	Engineering Application	Urban Flood Management
		Flood Hydraulics and Sediment Transport
		Mechanics of Sediment Transportation and Channel Changes
		Dam Development & Management
		Sabo Development & Management
		Practice on Flood Hazard Modeling & Flood Forecasting

[Master's Thesis]



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Ph. D. degree course

- Started in October 2010
- Entry requirement – Masters degree or equivalent in a relevant field
- Duration – 3 years
- Mode of training
  - Lectures on advanced topics in Hydrology, Flood Hydraulics and Sediment Transport, Integrated Flood Management, Hydraulics, River Morphology, etc.
  - Individual research leading to a high quality thesis
  - Certain graduate courses in Tokyo University will also be open to the students
- Criteria for award of Ph. D. degree
  - Research performance to be judged by a committee of examiners
  - Publication of 2 peer reviewed journal papers
- Financial support – By way of part time employment at PWRI.
- Ph.D. students will also be encouraged to help Masters students

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<List of Training Program in the last 5 years>

ICHARM Short Training Course

	Training Program	Year	Number of Total Participant
①	Flood Hazard Mapping Training Course	FY2004-FY2008	76
②	UN/ISDR Comprehensive Tsunami Disaster Prevention Training Course	FY2008	11
③	Local Emergency Operation Plan with Flood Hazard Map	FY2009-	10
④	Capacity development for Adaptation to Climate Change in Asia	FY2010	5 (Tentative)

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Information Networking activities by ICHARM

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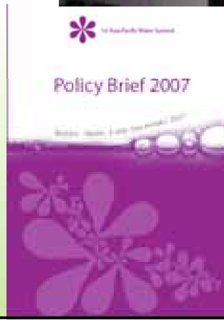
Asia-Pacific Water Summit(APWS) and regional knowledge hubs

- On 3-4 Dec. 2007, the 1st Asia-Pacific Water Summit was organized, inviting app. 300 high-level guests from the region.
- ICHARM acted as Lead Organization for priority theme “Water-related Disaster Management”.
- During APWS, it was agreed that Regional Knowledge Hubs would be established to serve for reducing water problems in the region.



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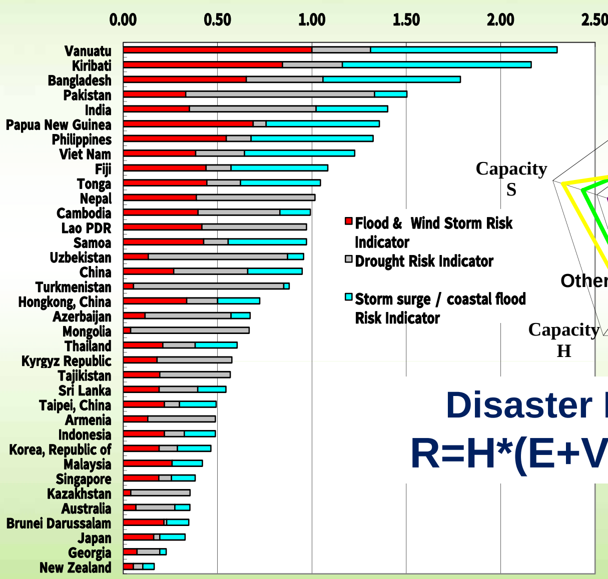
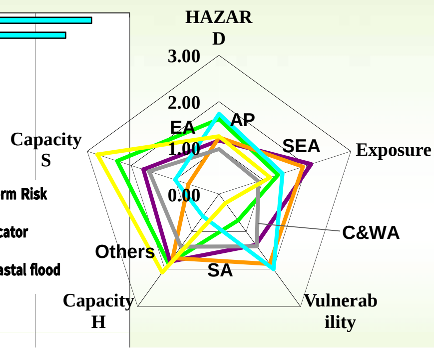
Contribution to Asian Water Development Outlook

Ranking of Water Related Disaster Risk





Disaster Risk Indicator

$$R = H*(E+V_B)*(1-C/Cmax)$$

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[ICHARM Publications]

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[ICHARM Newsletter & Leaflet]

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5th International Conference on Flood Management (ICFM5)

- Only Intern Conf solely focused on floods
- Organized by field level practitioners of nations
- Plenary sessions discuss implementation of UNSGAB/HLEP actions

27-29 September 2011
Tsukuba, Japan

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Regional Technical Assistance in collaboration with ADB

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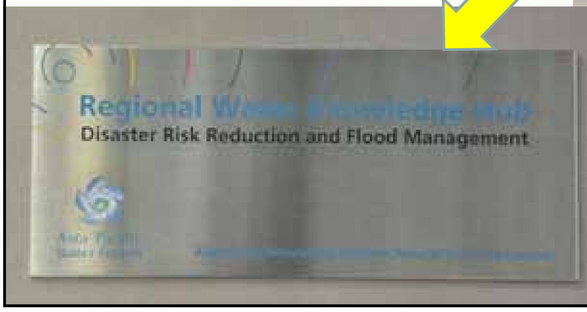
ICHARM was designated as Regional Water Knowledge Hub for Disaster Risk Reduction and Flood Management under the APWF

ICHARM Entrance

Knowledge Hub Plate



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Our Challenge: *Localism*

Localism is a principle that takes into account local diversity of natural, social and cultural conditions, being sensitive to local needs, priorities, development stage, etc., within the context of global and regional experiences and trends, to be needs driven rather than supply driven, responsive to respective local realities.

⇩

Research programs should be coupled with capacity building, by closely working with local institutions, knowledge partners, engineers/scientists

Inauguration of Regional Technical Assistance with ADB

Director-General Yao (left), Chief Executive Sakamoto (center) and Director Takeuchi (right) shake hands at the signing ceremony.

- On 13 November 2009, Partnership Agreement was signed between PWRI/ICHARM and ADB
- ADB provides funds for operational cost and consulting service procurement, ICHARM provides Expert services, etc.

United Nations Educational, Scientific and Cultural Organization

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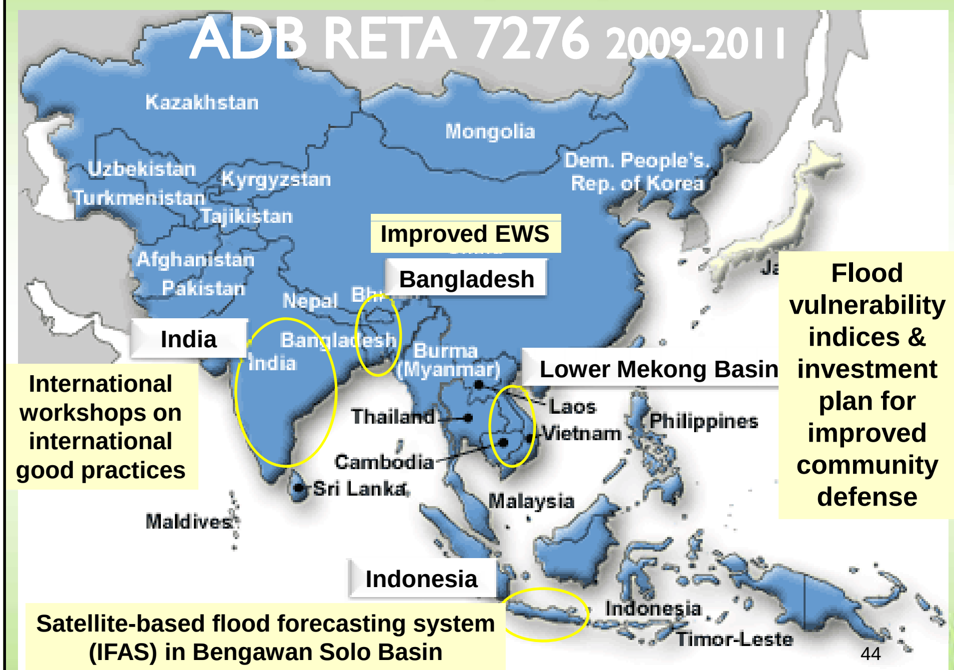

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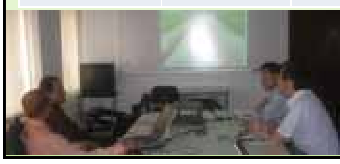
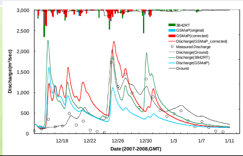
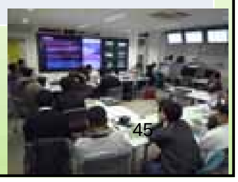
Project Support

Country	Area	Project support content
Indonesia	Bengawan Solo river	✓ Satellite-supported flood alert system ✓ Capacity building on local disaster management
Bangladesh	Country	✓ Technical support of current EWS for improvement ✓ Capacity building of engineers and managers
India	TBD	✓ Capacity development through exchange visits and meetings.
Lower Mekong basin	Cambodia Laos Vietnam	✓ Support MRC in developing flood vulnerability indices







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Regional Technical Assistance in collaboration with ADB

- Local application of IFAS to Bengawan Solo river basin in Indonesia

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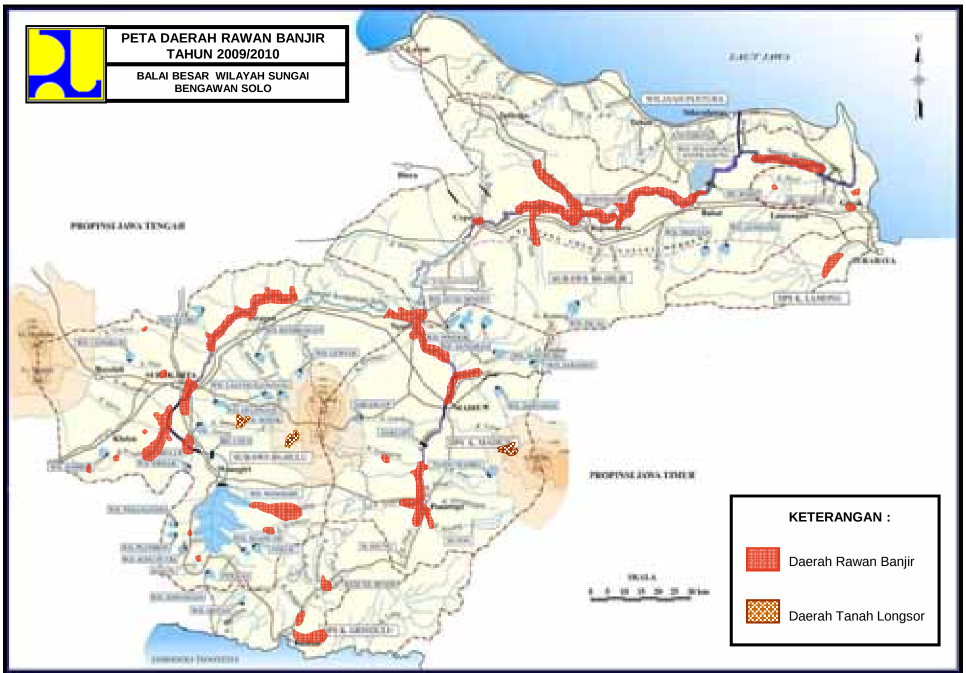
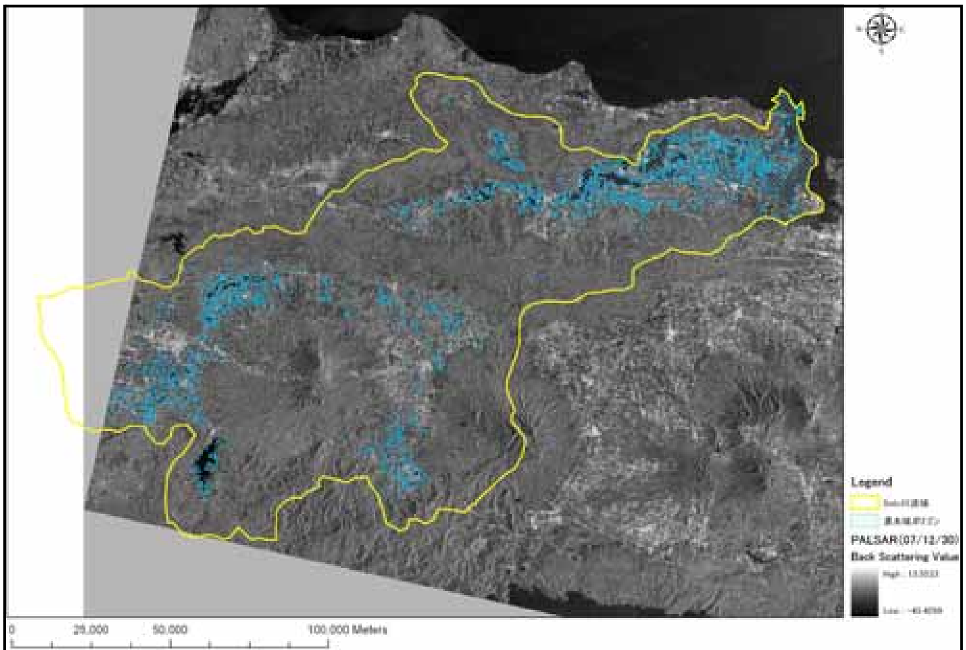


Flood plain area in Bengawan Solo river basin in 2009



Flood plain area in Bengawan Solo river basin in 2007

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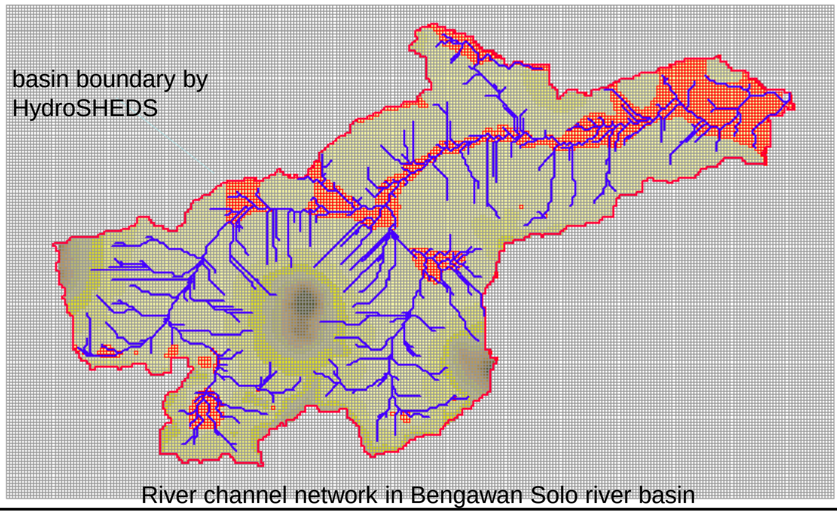
Current situation of IFAS modeling

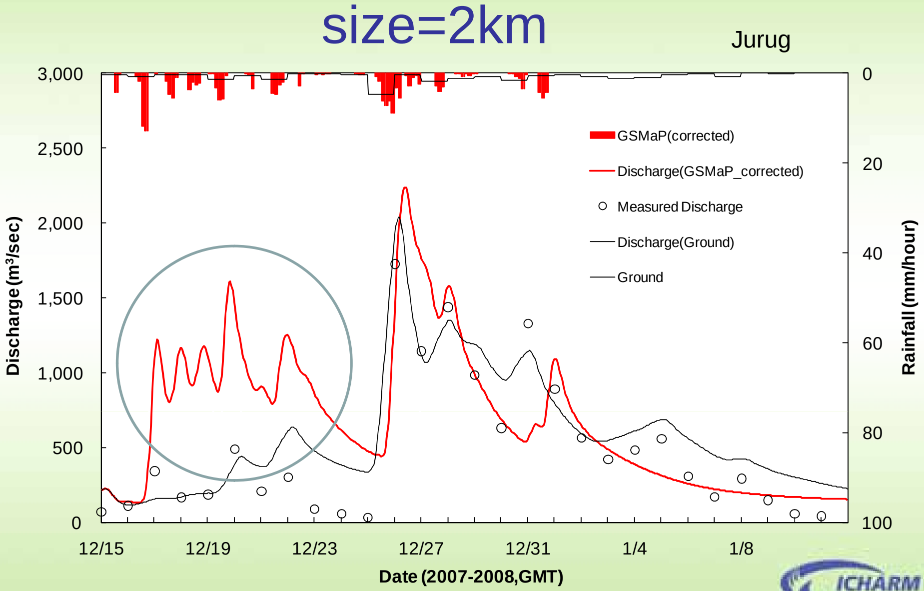
Topography : Global map
Basin boundary : HydroSHEDS
Cell size : 1km
Time interval : 1h
Land cover : Global map

Model check time : 30min
Calculate time : 45min
It is necessary too much time to calculate discharge.



River channel network in Bengawan Solo river basin

Experimental Calculation cell size=2km



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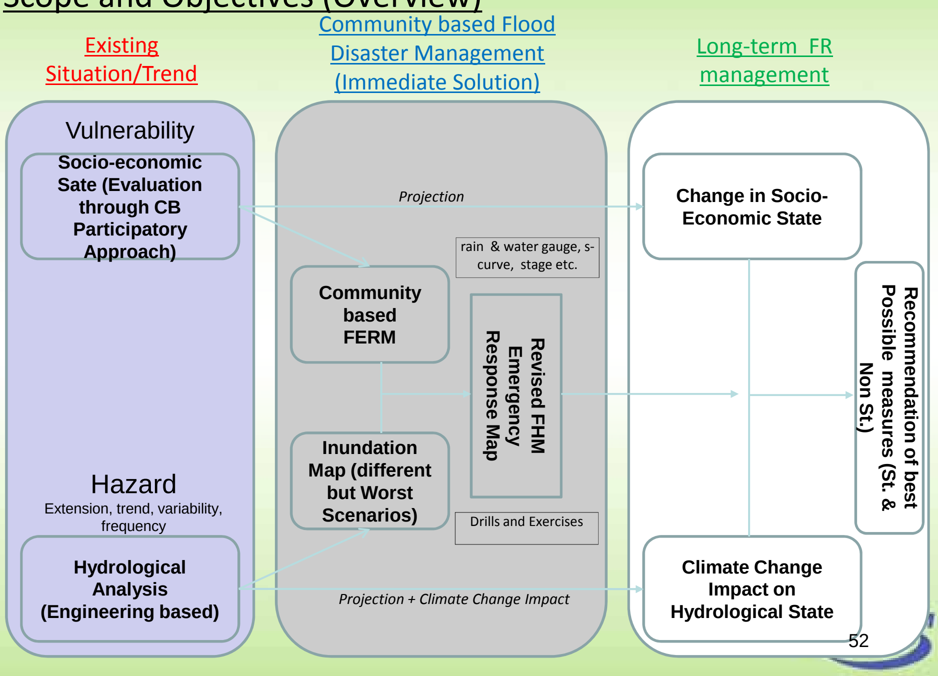
Regional Technical Assistance in collaboration with ADB

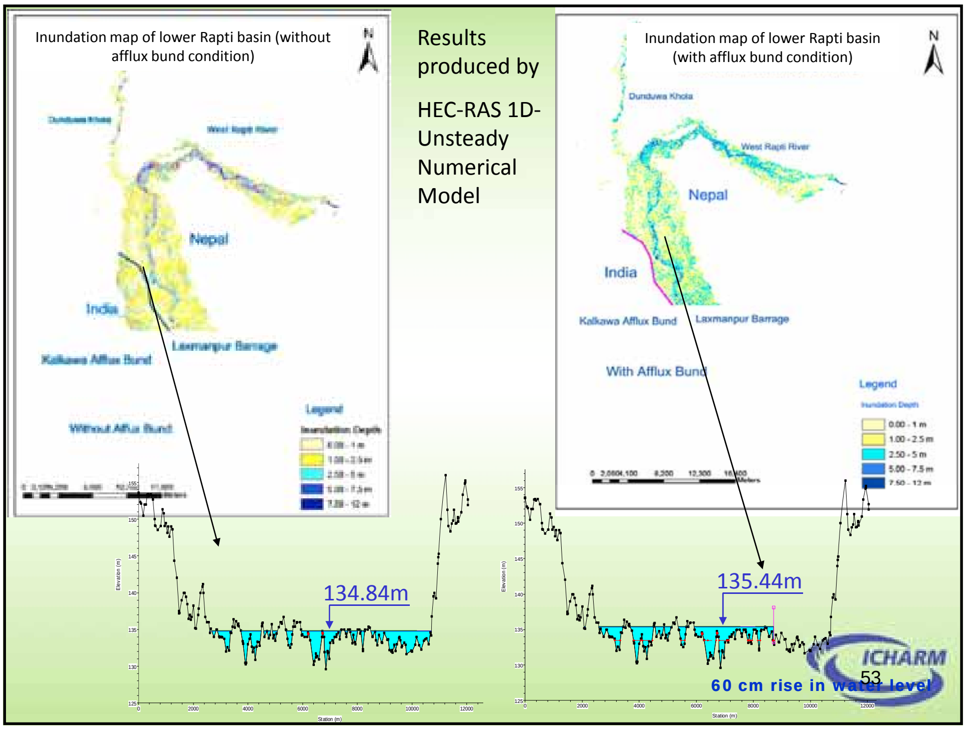
Community Based Flood Disaster Risk Management

in Solo River Basin, Indonesia

ICHARM

Scope and Objectives (Overview)




Inundation map of lower Rapti basin (without afflux bund condition)
Results produced by
HEC-RAS 1D-Unsteady Numerical Model
Inundation map of lower Rapti basin (with afflux bund condition)
Nepal
India
Dunduwa Khola
West Rapti River
Kalkawa Afflux Bund
Laxmanpur Barrage
Without Afflux Bund
With Afflux Bund
Legend
134.84m
135.44m
60 cm rise in water level
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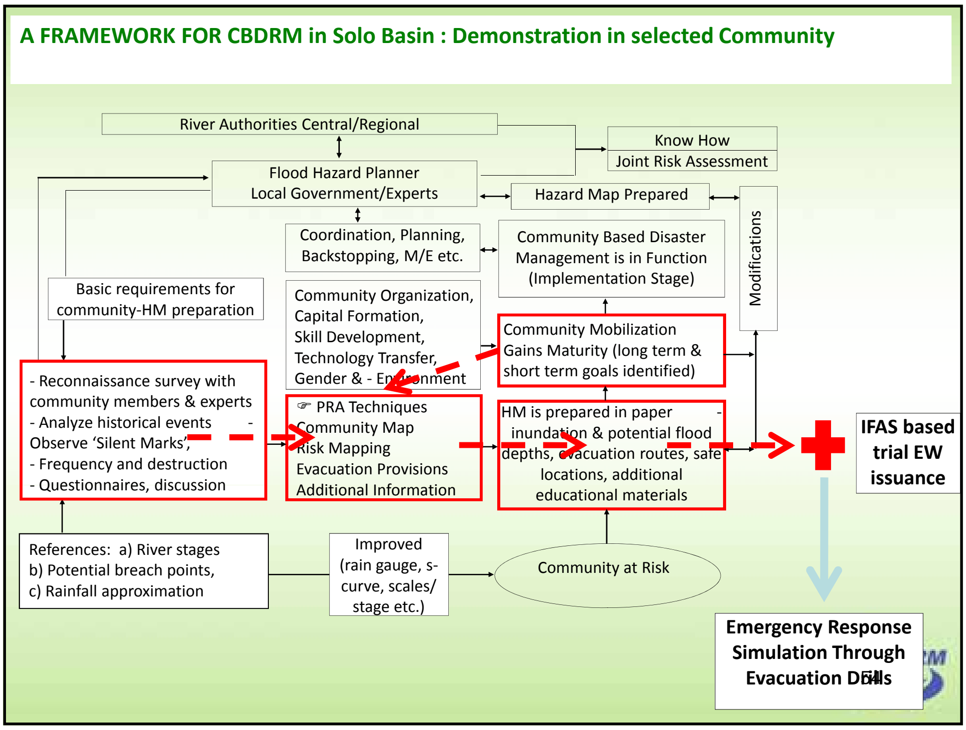
A FRAMEWORK FOR CBDRM in Solo Basin : Demonstration in selected Community
River Authorities Central/Regional
Know How
Joint Risk Assessment
Flood Hazard Planner
Local Government/Experts
Hazard Map Prepared
Coordination, Planning, Backstopping, M/E etc.
Community Based Disaster Management is in Function (Implementation Stage)
Modifications
Basic requirements for community-HM preparation
Community Organization, Capital Formation, Skill Development, Technology Transfer, Gender & - Environment
Community Mobilization Gains Maturity (long term & short term goals identified)
- Reconnaissance survey with community members & experts
- Analyze historical events
Observe 'Silent Marks',
- Frequency and destruction
- Questionnaires, discussion
PRA Techniques
Community Map
Risk Mapping
Evacuation Provisions
Additional Information
HM is prepared in paper inundation & potential flood depths, evacuation routes, safe locations, additional educational materials
IFAS based trial EW issuance
References: a) River stages
b) Potential breach points,
c) Rainfall approximation
Improved (rain gauge, s-curve, scales/ stage etc.)
Community at Risk
Emergency Response Simulation Through Evacuation Drills
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Regional Technical Assistance in collaboration with ADB

- Review of Flood Early Warning Systems in Bangladesh

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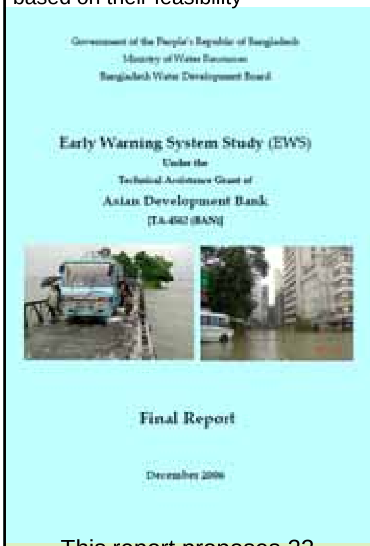
Bangladesh: Under the supervision of ICHARM, Consulting team members will carry out technical review of EW systems and rank the proposed interventions including those proposed by TA-4562 based on their feasibility



This report proposes 22 interventions for the improvement of EW system in Bangladesh

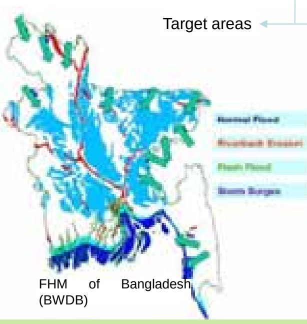
1. Review documentation on EW
2. Identify, visit and review relevant institutes activities on EW
3. Assess existing systems and performance
4. System evaluation based on SWOT＋AHP & MCR analysis
5. Priority ranking of proposed interventions
6. Ranking based on the feasibility a-h
7. Stakeholders meeting for information dissemination
8. Recommend measures and drafting the reports

Study will give feed back to PPTA

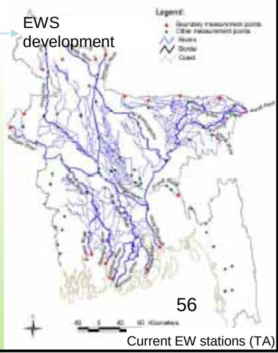
Project Preparatory Technical Assistance (PPTA)

Target areas

EWS development



FHM of Bangladesh (BWDB)



Current EW stations (TA)

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Activity	Intervention	Tentative Cost (US$ million)	Duration	Type of intervention
B. Improve flood forecasts to meet demands of end-users	B1. Expanding the flood forecasting system to cover all flood prone areas	2.00	3 years	Consultancy, field operations
	B.2 Preparing detailed flood forecasts at regional and local levels	3.50	3 years	Consultancy, field operations
	B.3: Extending lead times by preparing medium term and long term forecasts	6.80	5 years	Consultancy, field operations
	B.4: Preparing detailed forecasts to assess performance of key infrastructure and agricultural land during floods	2.00	3 years	Consultancy, field operations
	B.5: Preparing flood forecasts for metropolitan cities (Dhaka) and urban areas	1.00	2 years	Consultancy, field operations
	B.6: Implementing forecasting tools for storm surge areas	5.00	5 years	Consultancy, field operations
	B.7 Developing and implementing forecasting tools for flash floo1s	1.00	2 years	Consultancy, field operations
C. Improve the extent of coverage and the penetration of the early warning system	C.1 Establishing network of key stakeholders to develop system for disseminating flood warnings	5.91	5 years	Consultancy, training, equipment
	C.2 Developing packages of flood forecasting information in response to needs of different end users	3.00	1 year	Consultancy, training, equipment
	C.3 Extending existing systems for disseminating flood warnings from national to local levels	1.50	5 years	Consultancy, training, equipment
	C.4 Developing people-centered flood warning and dissemination	2.00	5 years	Equipment, consultancy
D. Expand coordination between key institutions in early warning system	D.1: Institutional study for the BWDB hydrological services	0.70	1 years	Consultancy
	D.2: Strengthening of BWDB in forecast Dissemination	0.50	2 years	Consultancy, training, equipment
	D.3: Strengthening the key institutions involved in the early warning system	3.02	3 years	Consultancy, field activities, training
	D.4: Enhancing national, regional and international awareness of flood forecasting	0.25	5 years	Workshops Training

Activity	Intervention	Tentative Cost (US$ million)	Duration	Type of intervention
A. Increase accuracy and timeliness of input data for forecasting	A.1 Upgrading collection and transmission systems for rainfall and water level data	11.50	2 years	Equipment, construction
	A.2 Enhancing the existing manual data collection system of BWDB	1.30	3 years	Equipment Training
	A.3 Updating DEM to increase spatial extent of forecasting in flood prone area of Bangladesh*	6.00	2 years	Consultancy Investment, Equipment
	A.4 Improvement of data exchange mechanism with riparian countries	0.30	3 years	Workshops, visits
	A.5 Installing additional Doppler Radar at Moulvi Bazar **	Not applicable	2 years	Equipment, construction

Activity	Intervention	Tentative Cost (US$ million)	Duration	Type of intervention
	D.5: Develop process to make flood forecasts and warnings useful to infrastructure managers	0.73	3 years	Training, investment (equipment)
	D.6: Establishing mechanism for monitoring, evaluation and feedback of early warning system	1.15	3 years	Consultancy, training, equipment
	Total Cost (excluding A2 and A3 see Notes)	33.18	-	-

Notes: * JICA has committed funds for this project with survey of Bangladesh cliefs. BWDB/FFWC should request that to prioritize preparation of DEM for flood-prone areas

**JICA has committed funds for this project but implementation has not yet started

Pre-Feasibility Package			
A1 Upgrading collection and transmission of rainfall and water level data	B1 Expanding flood forecasting to cover all flood prone areas	C1 Establishing network of key stakeholders for disseminating flood forecasts	D1 Institutional study for the BWDB's Hydrologic Services
A2 Enhancing BWDB's manual data collection system	B3 Extending lead times of forecasts		D3 Strengthening key EWS institutions
	B7 Developing and implementing forecasting tools for flash floods		D6 Establishing monitoring, evaluation and feedback

Check Lists for Review*

Risk Knowledge (Hazard Map, Education, Risk Perception)

Checklist

1. Organizational Arrangements Established
- ☐ Key national government agencies involved in hazard and vulnerability assessments identified and roles clarified (e.g. agencies responsible for economic data, demographic data, land use planning, social data etc).
- ☐ Responsibility for coordinating hazard identification, vulnerability and risk assessment assigned to one national organization.
- ☐ Legislation or government policy mandating the preparation of hazard and vulnerability maps for all communities in place.
- ☐ National standards for the systematic collection, sharing and assessment of hazard and vulnerability data developed, and standardized with neighbouring or regional countries, where appropriate.
- ☐ Process for scientific and technical experts to assess and review the accuracy of risk data and information developed.
- ☐ Strategy to actively engage communities in local hazard and vulnerability analyses developed.
- ☐ Process to review and update risk data each year, and include information on any new or emerging vulnerabilities and hazards established.

2. Natural Hazards Identified
- ☐ Characteristics of key natural hazards (e.g. intensity, frequency and probability) analysed and historical data evaluated.
- ☐ Hazard maps developed to identify the geographical areas and communities that could be affected by natural hazards.
- ☐ An integrated hazard map developed (where possible) to assess the interaction of multiple natural hazards.

3. Community Vulnerability Analysed
- ☐ Community vulnerability assessments conducted for all relevant natural hazards.
- ☐ Historical data sources and potential future hazard events considered in vulnerability assessments.
- ☐ Factors such as gender, disability, access to infrastructure, economic diversity and environmental sensitivities considered.
- ☐ Vulnerabilities documented and mapped (e.g. people or communities along coastlines identified and mapped).

4. Risks Assessed
- ☐ Interaction of hazards and vulnerabilities assessed to determine the risks faced by each region or community.
- ☐ Community and industry consultation conducted to ensure risk information is comprehensive and includes historical and indigenous knowledge, and local information and national level data.
- ☐ Activities that increase risks identified and evaluated.
- ☐ Results of risks assessment integrated into local risk management plans and warning messages.

5. Information Stored and Accessible
- ☐ Central 'library' or GIS database established to store all disaster and natural hazard risk information.
- ☐ Hazard and vulnerability data available to government, the public and the international community (where appropriate).
- ☐ Maintenance plan developed to keep data current and updated.

Monitoring and Early Warning (Data, Interpretation/Analysis, Quality

Checklist

1. Institutional Mechanisms Established
- ☐ Standardized process, and roles and responsibilities of all organizations generating and issuing warnings established and mandated by law.
- ☐ Agreements and interagency protocols established to ensure consistency of warning language and communication channels where different hazards are handled by different agencies.
- ☐ An all-hazard plan to obtain mutual efficiencies and effectiveness among different warning systems established.
- ☐ Warning system partners, including local authorities, aware of which organizations are responsible for warnings.
- ☐ Protocols in place to define communication responsibilities and channels for technical warning services.
- ☐ Communication arrangements with international and regional organizations agreed and operational.
- ☐ Regional agreements, coordination mechanisms and specialized centres in place for regional concerns such as tropical cyclones, floods in shared basins, data exchange, and technical capacity building.
- ☐ Warning system subjected to system-wide tests and exercises at least once each year.
- ☐ A national all-hazards committee on technical warning systems in place and linked to national disaster management and reduction authorities, including the national platform for disaster risk reduction.
- ☐ System established to verify that warnings have reached the intended recipients.
- ☐ Warning centres staffed at all times (24 hours per day, seven days per week).

2. Monitoring Systems Developed
- ☐ Measurement parameters and specifications documented for each relevant hazard.
- ☐ Plans and documents for monitoring networks available and agreed with experts and relevant authorities.
- ☐ Technical equipment, suited to local conditions and circumstances, in place and personnel trained in its use and maintenance.
- ☐ Applicable data and analysis from regional networks, adjacent territories and international sources accessible.
- ☐ Data received, processed and available in meaningful formats in real time, or near-real time.
- ☐ Strategy in place for obtaining, reviewing and disseminating data on vulnerabilities associated with relevant hazards.
- ☐ Data routinely archived and accessible for verification and research purposes.

3. Forecasting and Warning Systems Established
- ☐ Data analysis, prediction and warning generation based on accepted scientific and technical methodologies.
- ☐ Data and warning products issued within international standards and protocols.
- ☐ Warning analysts trained to appropriate international standards.
- ☐ Warning centres equipped with appropriate equipment needed to handle data and run prediction models.
- ☐ Fail-safe systems in place, such as power back-up, equipment redundancy and on-call personnel systems.
- ☐ Warnings generated and disseminated in an efficient and timely manner and in a format suited to user needs.
- ☐ Plan implemented to routinely monitor and evaluate operational processes, including data quality and warning performance.

*Based on UNISDR Recommendation

Check Lists for Review Continue

Dissemination and Communication (Networking, Reliability on Forecasting, Forms of Warning)

Checklist

1. Organizational and Decision-making Processes Institutionalized

- ☐ Warning dissemination chain enforced through government policy or legislation (e.g. message passed from government to emergency managers and communities etc).
- ☐ Recognized authorities empowered to disseminate warning messages (e.g. meteorological authorities to provide weather messages, health authorities to provide health warnings).
- ☐ Functions, roles and responsibilities of each actor in the warning dissemination process specified in legislation or government policy (e.g. national meteorological and hydrological services, media, NGOs).
- ☐ Roles and responsibilities of regional or cross border early warning centres defined, including the dissemination of warnings to neighbouring countries.
- ☐ Volunteer network trained and empowered to receive and widely disseminate hazard warnings to remote households and communities.

2. Effective Communication Systems and Equipment Installed

- ☐ Communication and dissemination systems tailored to the needs of individual communities (e.g. radio or television for those with access; and sirens, warning flags or messenger runners for remote communities).
- ☐ Warning communication technology reaches the entire population, including seasonal populations and remote locations.
- ☐ International organizations or experts consulted to assist with identification and procurement of appropriate equipment.
- ☐ Multiple communication mediums used for warning dissemination (e.g. mass media and informal communication).
- ☐ Agreements developed to utilise private sector resources where appropriate (e.g. amateur radios, safety shelters).
- ☐ Consistent warning dissemination and communication systems used for all hazards.
- ☐ Communication system is two-way and interactive to allow for verification that warnings have been received.
- ☐ Equipment maintenance and upgrade programme implemented and redundancies enforced so back-up systems are in place in the event of a failure.

3. Warning Messages Recognised and Understood

- ☐ Warning alerts and messages tailored to the specific needs of those at risk (e.g. for diverse cultural, social, gender, linguistic and educational backgrounds).
- ☐ Warning alerts and messages are geographically-specific to ensure warnings are targeted to those at risk only.
- ☐ Messages incorporate the understanding of the values, concerns and interests of those who will need to take action (e.g. instructions for safeguarding livestock and pets).
- ☐ Warning alerts clearly recognizable and consistent over time and include follow-up actions when required.
- ☐ Warnings specific about the nature of the threat and its impacts.
- ☐ Mechanisms in place to inform the community when the threat has ended.
- ☐ Study into how people access and interpret early warning messages undertaken and lessons learnt incorporated into message formats and dissemination processes.

Response Capacity at User Level (Warning Quality, Emergency Preparedness, Response)

Checklist

1. Warnings Respected

- ☐ Warnings generated and distributed to those at risk by credible sources (e.g. government, spiritual leaders, respected community organizations).
- ☐ Public perception of natural hazard risks and the warning service analysed to predict community responses.
- ☐ Strategies to build credibility and trust in warnings developed (e.g. understanding difference between forecasts and warnings).
- ☐ False alarms minimised and improvements communicated to maintain trust in the warning system.

2. Disaster Preparedness and Response Plans Established

- ☐ Disaster preparedness and response plans empowered by law.
- ☐ Disaster preparedness and response plans targeted to the individual needs of vulnerable communities.
- ☐ Hazard and vulnerability maps utilized to develop emergency preparedness and response plans.
- ☐ Up-to-date emergency preparedness and response plans developed, disseminated to the community, and practiced.
- ☐ Previous disaster events and responses analysed, and lessons learnt incorporated into disaster management plans.
- ☐ Strategies implemented to maintain preparedness for recurrent hazard events.
- ☐ Regular tests and drills undertaken to test the effectiveness of the early warning dissemination processes and responses.

3. Community Response Capacity Assessed and Strengthened

- ☐ Community ability to respond effectively to early warnings assessed.
- ☐ Response to previous disasters analysed and lessons learnt incorporated into future capacity building strategies.
- ☐ Community-focused organizations engaged to assist with capacity building.
- ☐ Community and volunteer education and training programmes developed and implemented.

4. Public Awareness and Education Enhanced

- ☐ Simple information on hazards, vulnerabilities, risks, and how to reduce disaster impacts disseminated to vulnerable communities and decision-makers.
- ☐ Community educated on how warnings will be disseminated and which sources are reliable and how to respond to different types of hazards after an early warning message is received.
- ☐ Community trained to recognise simple hydro-meteorological and geophysical hazard signals to allow immediate response.
- ☐ On-going public awareness and education built in to school curricula from primary schools to university.
- ☐ Mass media and folk or alternative media utilized to improve public awareness.
- ☐ Public awareness and education campaigns tailored to the specific need of each audience (e.g. children, emergency managers, media).
- ☐ Public awareness strategies and programmes evaluated at least once per year and updated where required.

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Check Lists for Review Continue (Cross-cutting Issues)

Governance and Institutional Arra. (SOD, Communication Among, Collaboration)

Checklist

1. Early Warning Secured as a Long Term National and Local Priority

- ☐ Economic benefits of early warning highlighted to senior government and political leaders using practical methods such as a cost-benefit analysis of previous disasters.
- ☐ Examples and case studies of successful early warning systems disseminated to senior government and political leaders.
- ☐ Early warning role models or "champions" engaged to advocate early warning and promote its benefits.
- ☐ The priority natural hazard risk requiring an early warning system identified, and operational arrangements within a multi-hazard framework established.
- ☐ Early warning integrated into national economic planning.

2. Legal and Policy Frameworks to Support Early Warning Established

- ☐ National legislation or policies developed to provide an institutional and legal basis for implementing early warning systems.
- ☐ Clear roles and responsibilities defined for all organizations (government and non-government) involved in early warning.
- ☐ Overall responsibility and authority for coordination of early warning assigned to one national agency.
- ☐ One political leader or senior government official empowered by law as the national decision maker.
- ☐ Policies developed to decentralise disaster management and encourage community participation.
- ☐ Local decision making and implementation of early warning systems placed within broader administrative and resource capabilities at the national or regional level.
- ☐ Regional and cross-border agreements established to ensure early warning systems are integrated where possible.
- ☐ Relationships and partnerships between all organizations involved in early warning institutionalised and coordination mechanisms mandated.
- ☐ Early warning integrated into disaster reduction and development policies.
- ☐ Monitoring and enforcement regime in place to support policies and legislation.

3. Institutional Capacities Assessed and Enhanced

- ☐ Capacities of all organizations and institutions involved assessed and capacity building plans and training programmes developed and resourced.
- ☐ Non-governmental sector engaged and encouraged to contribute to capacity building.

4. Financial Resources Secured

- ☐ Government funding mechanism for early warning and disaster preparedness developed and institutionalised.
- ☐ Access to funding at the international or regional level explored.
- ☐ Public/private partnerships utilised to assist with early warning system development.

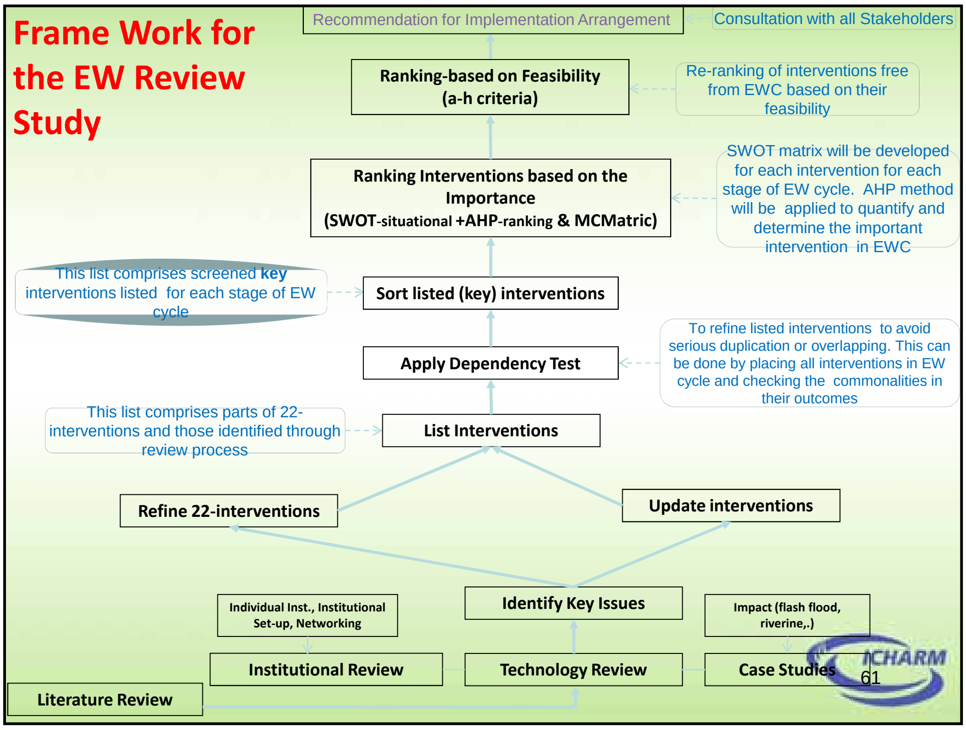
Socio-cultural Aspect , Participation (TBD)

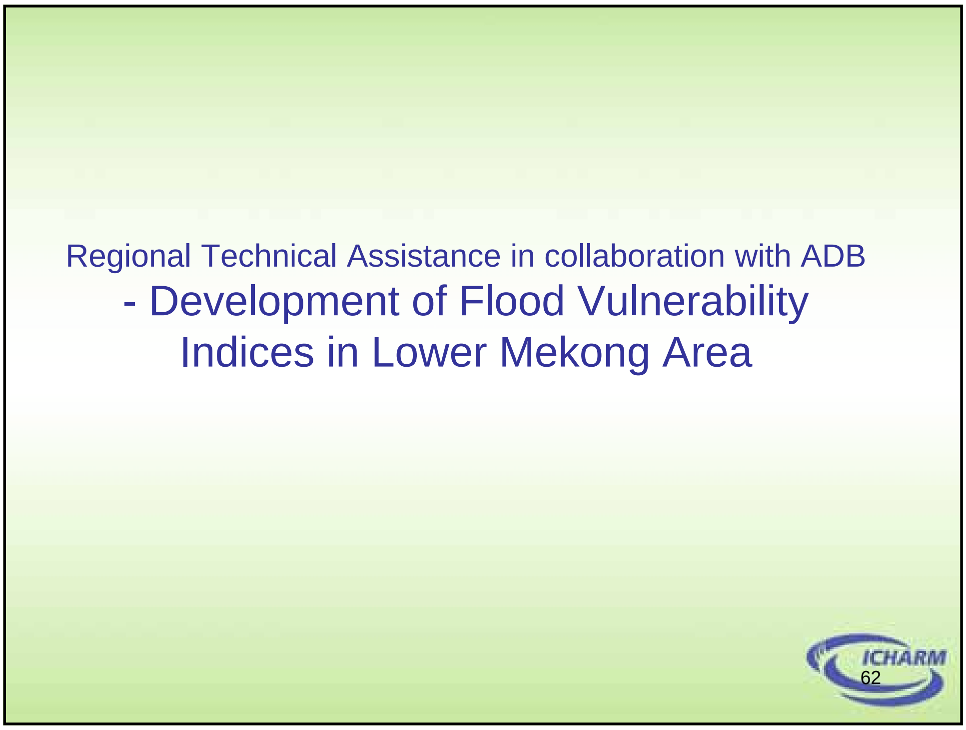
Checklist

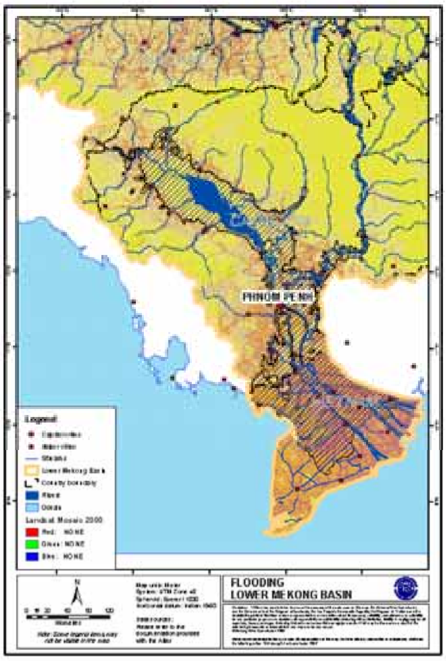
To Be Determined

60

*Based on UNISDR Recommendation


Frame Work for the EW Review Study
Recommendation for Implementation Arrangement
Consultation with all Stakeholders
Ranking-based on Feasibility (a-h criteria)
Re-ranking of interventions free from EWC based on their feasibility
Ranking Interventions based on the Importance (SWOT-situational +AHP-ranking & MCMatric)
SWOT matrix will be developed for each intervention for each stage of EW cycle. AHP method will be applied to quantify and determine the important intervention in EWC
This list comprises screened key interventions listed for each stage of EW cycle
Sort listed (key) interventions
Apply Dependency Test
To refine listed interventions to avoid serious duplication or overlapping. This can be done by placing all interventions in EW cycle and checking the commonalities in their outcomes
This list comprises parts of 22-interventions and those identified through review process
List Interventions
Refine 22-interventions
Update interventions
Individual Inst., Institutional Set-up, Networking
Identify Key Issues
Impact (flash flood, riverine,.)
Institutional Review
Technology Review
Case Studies
Literature Review
ICHARM
61


Regional Technical Assistance in collaboration with ADB
- Development of Flood Vulnerability Indices in Lower Mekong Area
ICHARM
62



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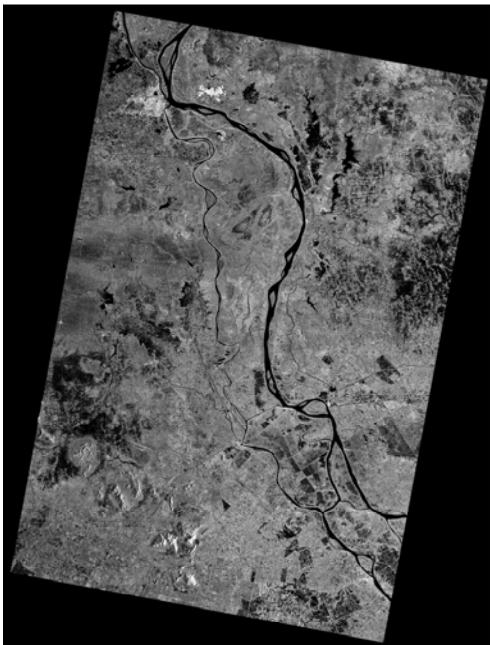
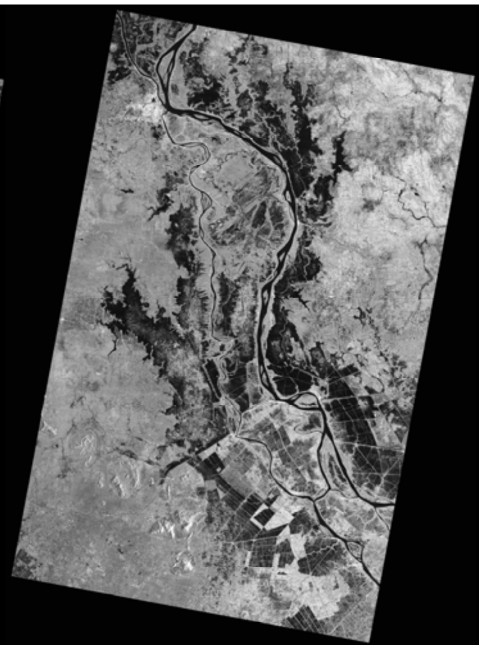


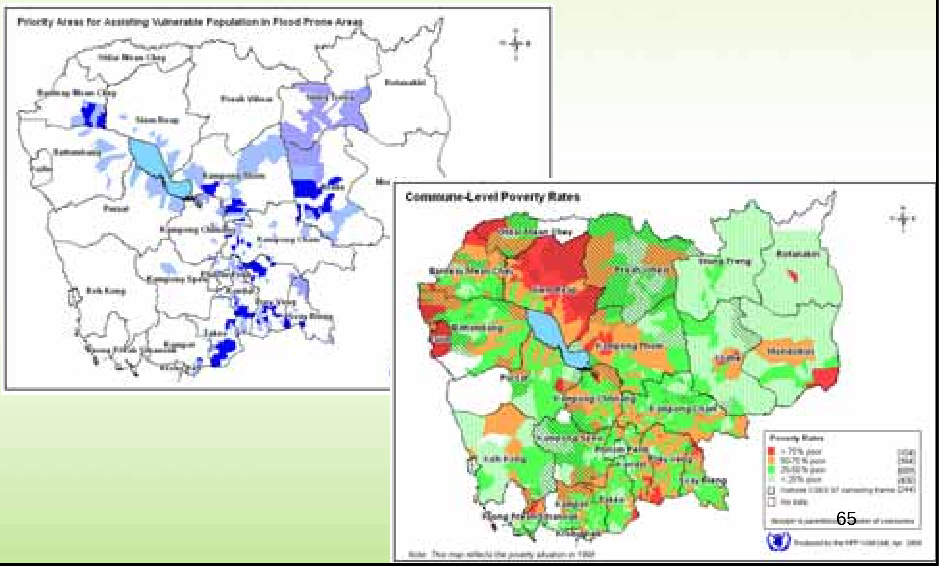
TerraSAR 2010 Aug.10



TerraSAR 2010 Sep.10

64

Based on past achievement, FVI will be proposed



65

Proposed Activities for LMB
5 phased activities

Phase 1 (Fact finding and concept development) and 2 (Pre-consolidation of data and info.) are completed.

Phase 3; Consolidation of data, concept and proposed methodology;

proposed activities are mostly logistic, organizational issues and, data compilation for indices development are included in this phase.

Phase 4; Survey design and execution, analysis and verification of FVIs.:

mostly field survey in six Cambodian villages

Phase 5: Projection of local vulnerability indices to regional scale

ICHARM

66

ICHARM is trying hard to disseminate and extend knowledge that contribute to water-related disaster risk reduction

Please visit ICHARM website at

http://www.icharm.pwri.go.jp/

Thank you very much for your attention.

67

Ⅴ-3. Lecture

"The affection of the climate change on the flood prevention and the adaptation measures"

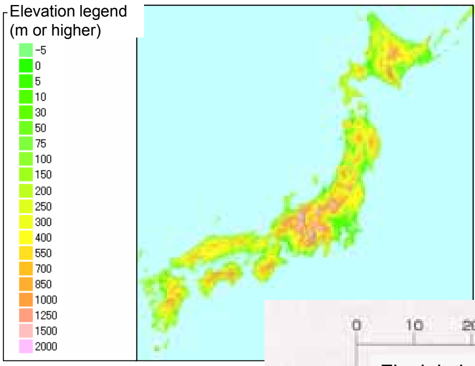
Mr. Atsushi HATTORI

The affection of the climate change on the flood prevention and the adaptation measures

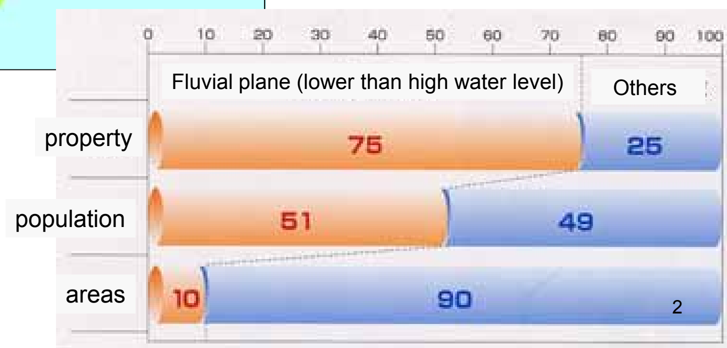
Atsushi HATTORI
Head of River Division
River Department, NILIM

1

Natural and Social condition of Japan



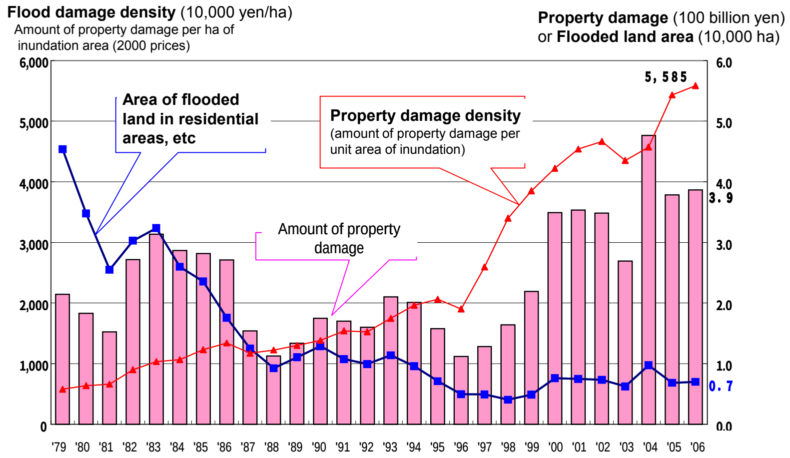
About half of all national population and three quarters of assets concentrate in the alluvial plains, which is about 10% of all nation's land.
→Devastating damage is anticipated when flood occurs.



2

The amount of flood damage is on the increase

→Although the area of inundation had been on the decrease because of flood control measures, it has been showing a slightly increasing trend in recent years. Mainly because of the urbanization of flood-prone areas and the increase in flood-vulnerable property, the amount of damage has been showing a tendency to increase.



Notes: 1. Averages in the last five years
2. The amount of property damage and flood damage density include business interruption loss.
3. Source: 2006 Flood Statistics combined by River Bureau, Ministry of Land, Infrastructure, Transport and Tourism
4. 2000 prices

3

The resultant urbanization has caused the water retention and detention functions of the watersheds to decline.

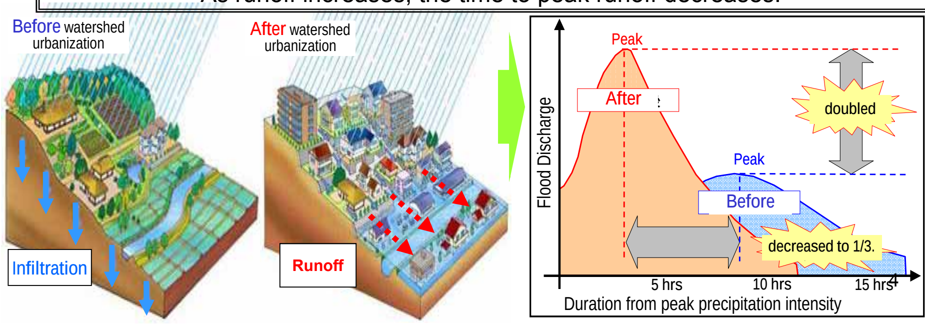
1958
Percentage of urbanized area: about 10%

2004
Percentage of urbanized area: about 85%

Example:
Tsurumi River basin

Transportation network developed in each period

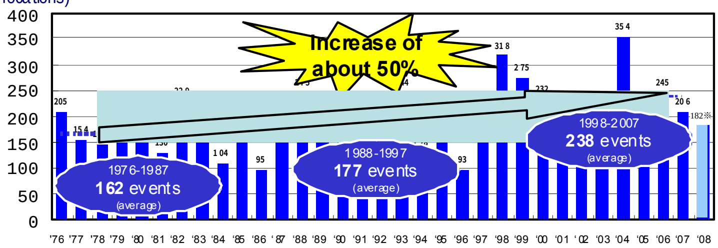
As runoff increases, the time to peak runoff decreases.



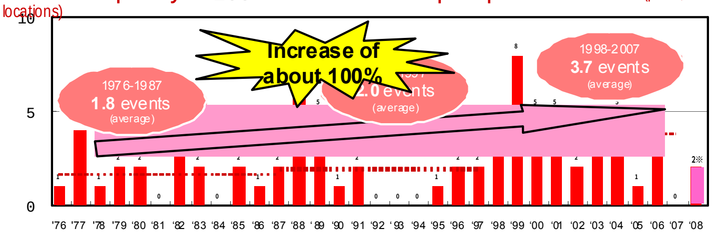
4

Both hourly rainfall and daily rainfall tends to increase.

Annual frequency of 50 mm/hour or more precipitation events (per 1,000 locations)



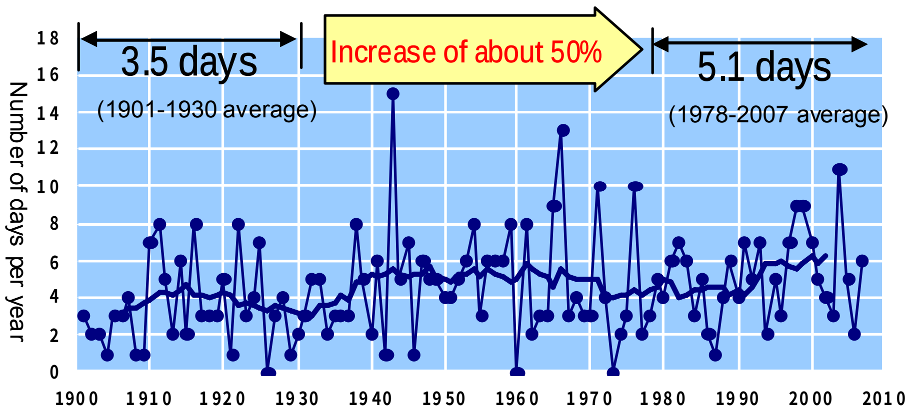
Annual frequency of 100 mm/hour or more precipitation events (per 1,000 locations)



・The annual frequency of precipitation events with different hourly precipitations was calculated from AMeDAS data obtained from about 1,300 locations in Japan.
・The 2008 data are data obtained on or before September 2, 2008.

5

Annual frequency of days with a daily precipitation of 200 mm or more



The annual frequency of days with a daily precipitation of 200 mm or more calculated from measurements obtained at 51 locations in Japan. Both values in each year (thin line) and 11-year moving averages (thick line) are shown. (JMA data)

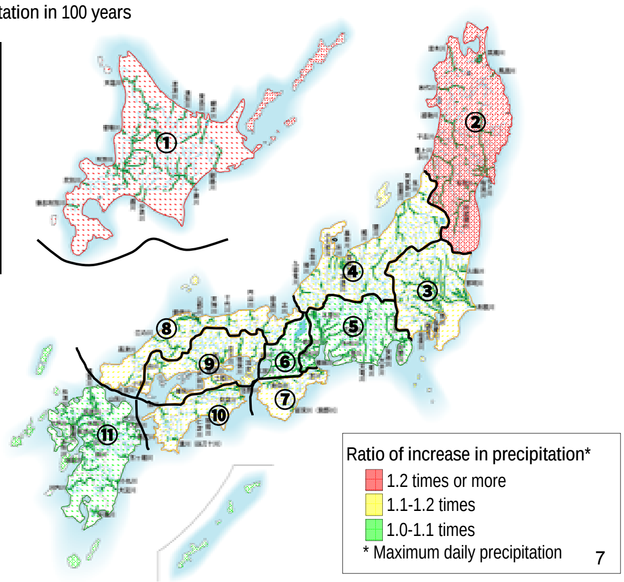
Increasing frequency of heavy rains: The trend is expected to continue.

6

In future, <u>precipitation is likely to increase throughout the country.</u>

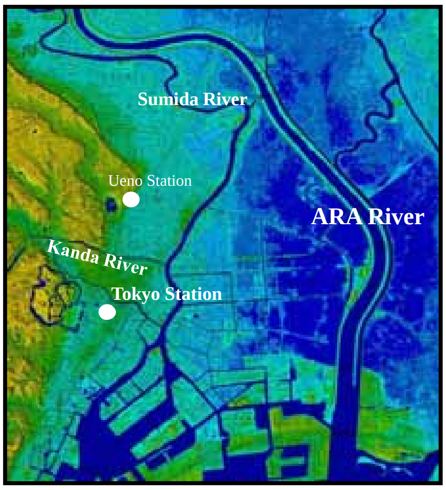
Projections of increase in daily precipitation in 100 years

①	Hokkaido	1.24
②	Tohoku	1.22
③	Kanto	1.11
④	Hokuriku	1.14
⑤	Chubu	1.06
⑥	Kinki	1.07
⑦	Southern Kii	1.13
⑧	Sanin	1.11
⑨	Setouchi	1.10
⑩	Southern Shikoku	1.11
⑪	Kyushu	1.07



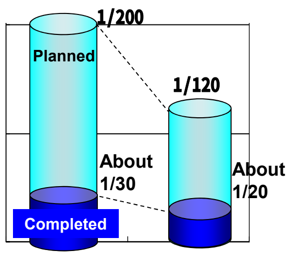
7

Relatively Low Level of Flood Protection Safety Compared with the High-Degree Land Use



Prepared by Geospatial Information Authority of Japan

Influence of increased precipitation 100 years from now on the flood safety level of Ara River



Flood safety (return period) will decrease <u>to about 1/2 of the target level</u> in 100 years because of 10 to 20% increase of Rainfall.

8

Climate Change : Adverse Affects of Concern

Doubled Hardship for Flood safety Administrators

Relatively Low Level of Flood Protection safety Compared with the high-degree land use

Increasing Flood-Disaster Risk under the ongoing Climate Change

9

Direction of future MLIT efforts

The goal: Working toward "zero victims"

Complete protection from increasingly severe floods is difficult to achieve.

①Studies are conducted on ways to achieve **"zero victims."**

②In the areas where key state functions are concentrated, priority measures such as **measures to prevent serious damage on key state functions are to be taken.**

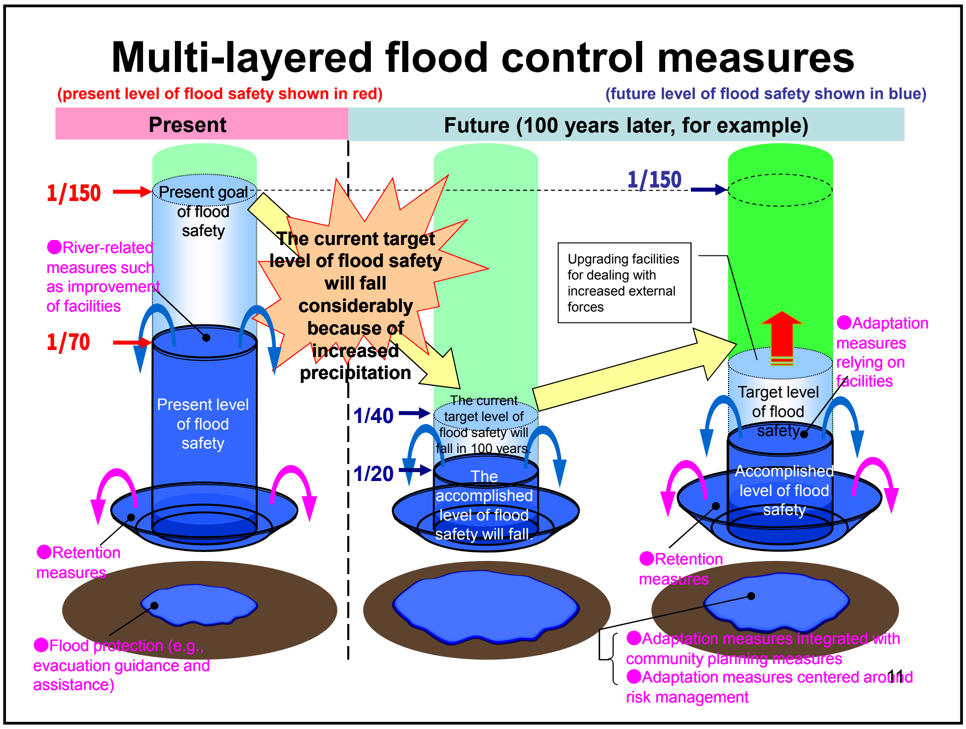
⇨ Minimization of damage

Measures to cope with growing external forces

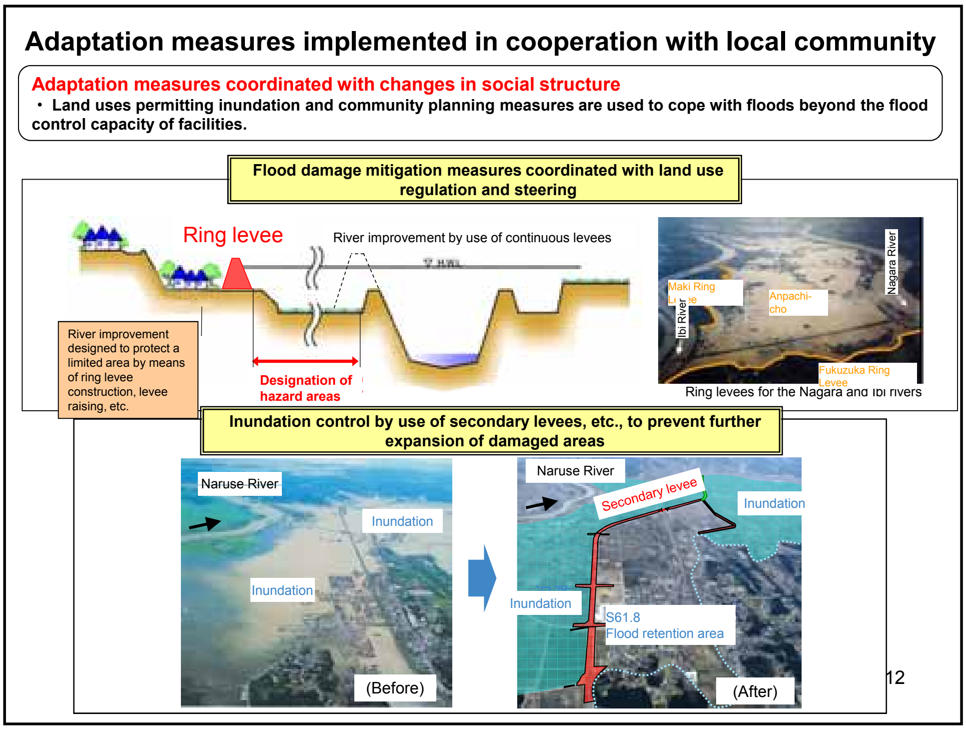
◆Multi-layered flood control measures

・In addition to the flood control measures designed to ensure safety from the design-basis discharge, watershed-based measures are also taken to ensure safety from growing external forces.

10



Multi-layered flood control measures
(present level of flood safety shown in red)
(future level of flood safety shown in blue)
Present
Future (100 years later, for example)
1/150
Present goal of flood safety
River-related measures such as improvement of facilities
1/70
Present level of flood safety
Retention measures
Flood protection (e.g., evacuation guidance and assistance)
The current target level of flood safety will fall considerably because of increased precipitation
1/40
The current target level of flood safety will fall in 100 years
1/20
The accomplished level of flood safety will fall
Upgrading facilities for dealing with increased external forces
1/150
Adaptation measures relying on facilities
Target level of flood safety
Accomplished level of flood safety
Retention measures
Adaptation measures integrated with community planning measures
Adaptation measures centered around risk management
11



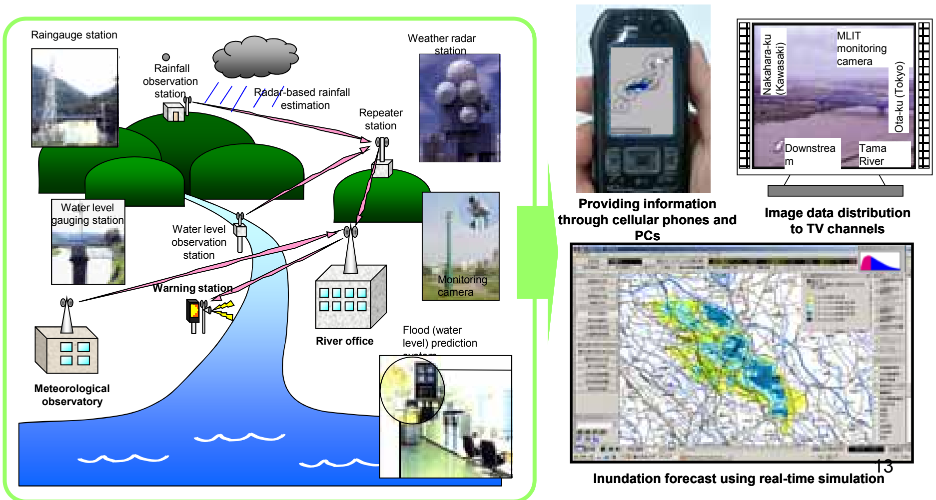
Adaptation measures implemented in cooperation with local community
Adaptation measures coordinated with changes in social structure
・ Land uses permitting inundation and community planning measures are used to cope with floods beyond the flood control capacity of facilities.
Flood damage mitigation measures coordinated with land use regulation and steering
Ring levee
River improvement by use of continuous levees
River improvement designed to protect a limited area by means of ring levee construction, levee raising, etc.
Designation of hazard areas
Nagara River
Ibi River
Anpachi-cho
Ring levees for the Nagara and Ibi rivers
Inundation control by use of secondary levees, etc., to prevent further expansion of damaged areas
Naruse River
Inundation
Inundation
(Before)
Naruse River
Secondary levee
Inundation
Inundation
S61.8
Flood retention area
(After)
12

Adaptation measures centering on risk management

Integrated damage mitigation and restoration/recovery measures from the viewpoint of risk management

- **Improving forecasting/warning technology and systems by strengthening observation systems and improving rainfall/runoff prediction technology**

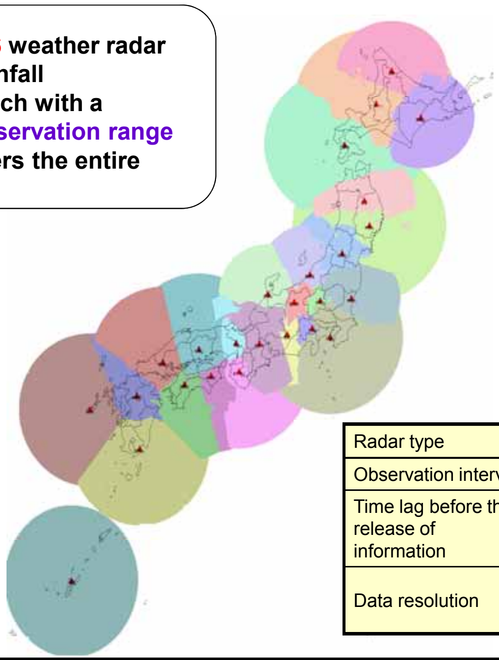
Improvement of real-time information sharing and flood forecasting by providing rainfall and water level information through cellular phones, Internet, public safety radio communications systems, etc.



13

Weather Radar Observation Network

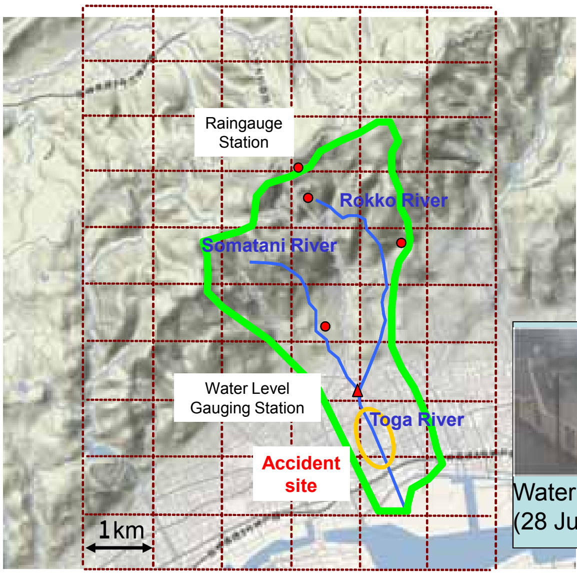
A network of 26 weather radar systems for rainfall observation, each with a quantitative observation range of 120 km, covers the entire country.



Radar type	C band radar
Observation interval	5 min.
Time lag before the release of information	5 to 10 min.
Data resolution	1km

14

An emerging type of disaster caused by localized heavy rain



= C Band Radars' Resolution

- On July 28, 2008, the Toga River (Class B river) swelled rapidly because of localized heavy rainfalls.
- At Kabutobashi, a water level rise of 1.3 m in 10 minutes was observed.
- Five people including school children were drowned.

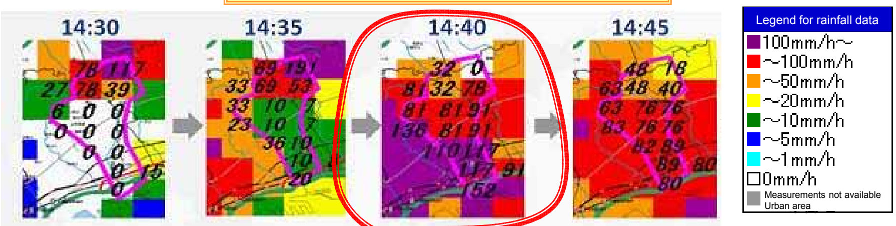
Water level rose 1m34cm in 10 minutes. (28 July 2008 14:40～14:50)

Prepared by FRICS Information Development Division

15

Necessity of radar rainfall observation systems capable of detecting localized heavy rainfalls in urban areas

Time lag between observation and information delivery

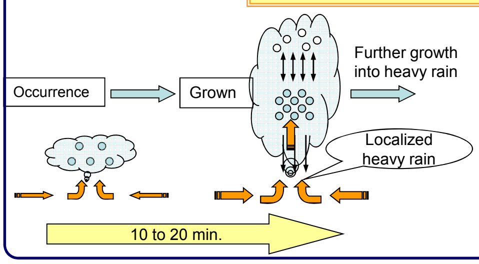


Observation data for 14:30～14.35 were delivered after 14:40.

Water level rose by 1.3 m in 10 minutes from 14:40.

Prepared by FRICS Information Development Division

Radar rainfall observation system capable of detecting localized heavy rains



Monitoring by use of X band radar

(1) Monitoring of "guerilla type" heavy rain that occurs suddenly and grows heavier rapidly

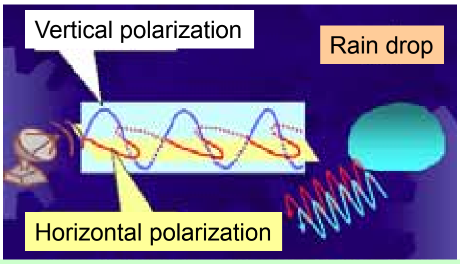
- Spatial resolution of the order of 100 m

(3) Providing information in real time

- Updating information at 1 minute intervals

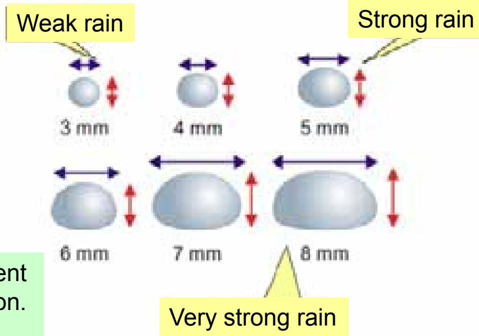
16

How to monitor the precipitation by X-band MP radar



Since the rain drop is flat, we receive different signals for vertical and horizontal polarization.

→Phase difference is to be generated.



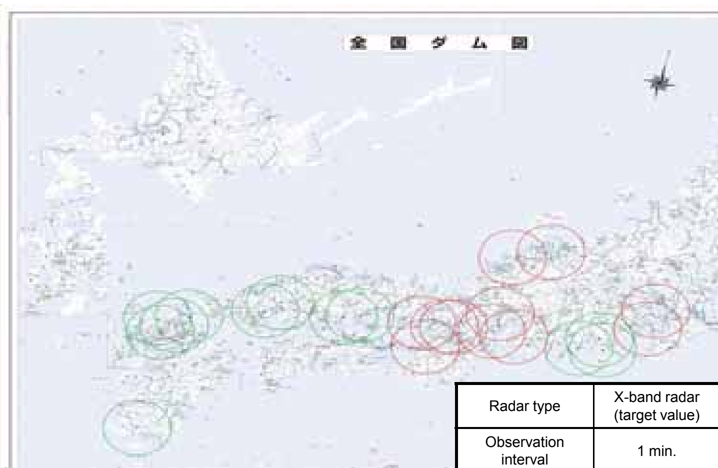
The stronger the rainfall,
The flatter the rain drop.

We estimate the precipitation from the phase difference between vertical and horizontal polarization.
(The bigger the phase difference, the stronger the rainfall)

17

Development of X-band MP radar network

26 radar systems will be installed in urban areas in Japan.



Already set in fiscal year 2009 (radius : 60 km)

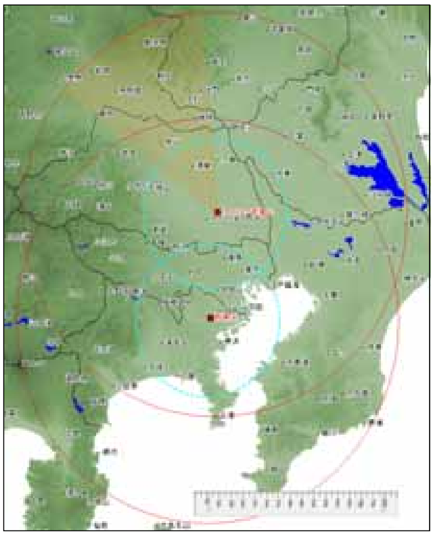
To be set in fiscal year 2010 (same)

Radar type	X-band radar (target value)
Observation interval	1 min.
Time lag before the release of information	1 min.
Resolution of provided data	250m

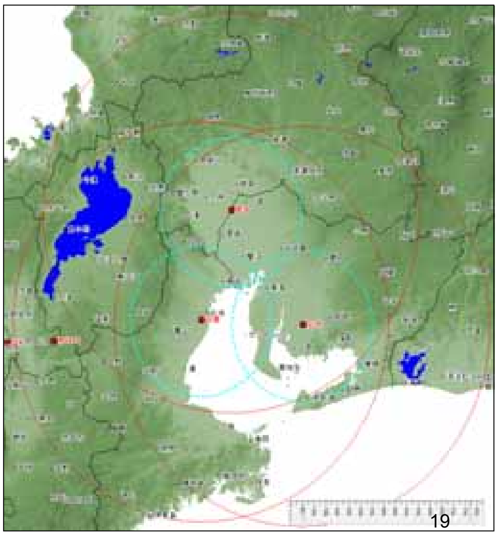
18

Monitoring range of X-band MP radar

Near Tokyo



Near Nagoya



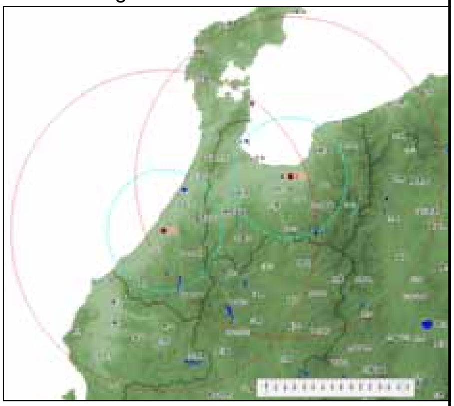
19

Red circle：80km radius Blue circle：30km radius

Monitoring range of X-band MP radar

Near Osaka

Hokuriku region

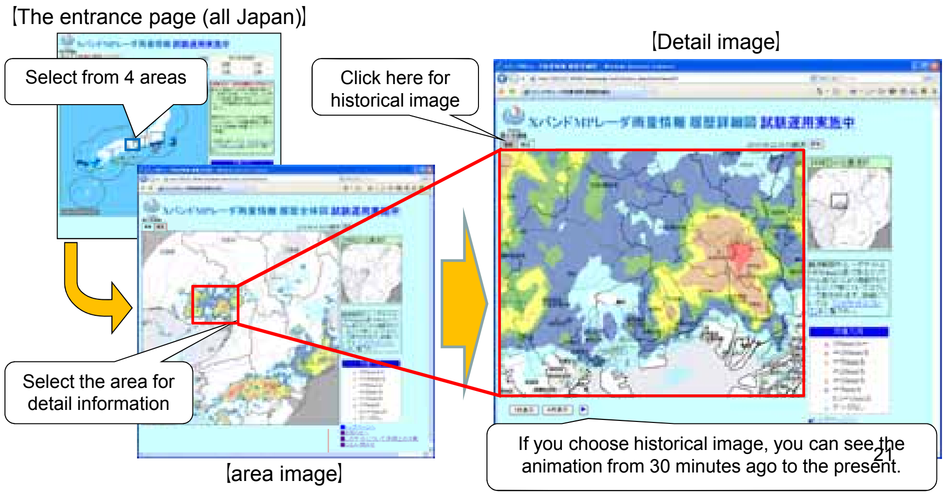


20

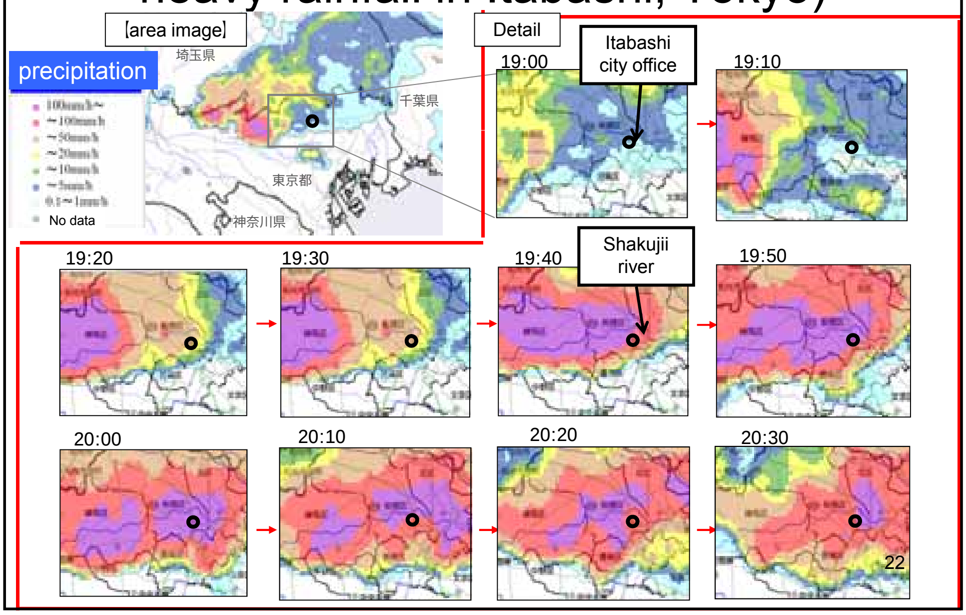
Red circle：80km radius Blue circle：30km radius

Provision of X-band MP radar precipitation information on the Web

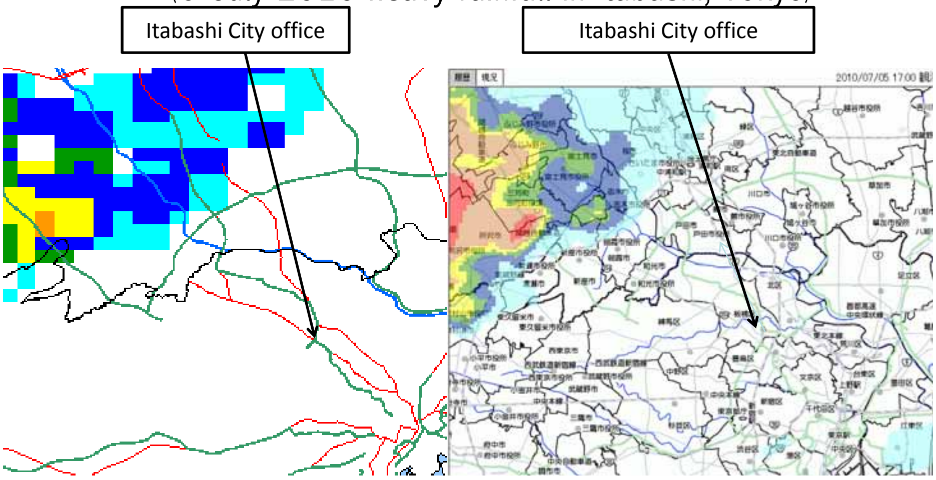
〇In 4 areas, we are providing the precipitation information by X-band MP radars on the Web.
〇Real time precipitation distribution (every minute) and historical image (from 30 minutes ago to the present).
〇http://www.river.go.jp/xbandradar/



Example (5 July 2010, heavy rainfall in Itabashi, Tokyo)



Comparison between C-band and X-band MP radar
(5 July 2010 heavy rainfall in Itabashi, Tokyo)



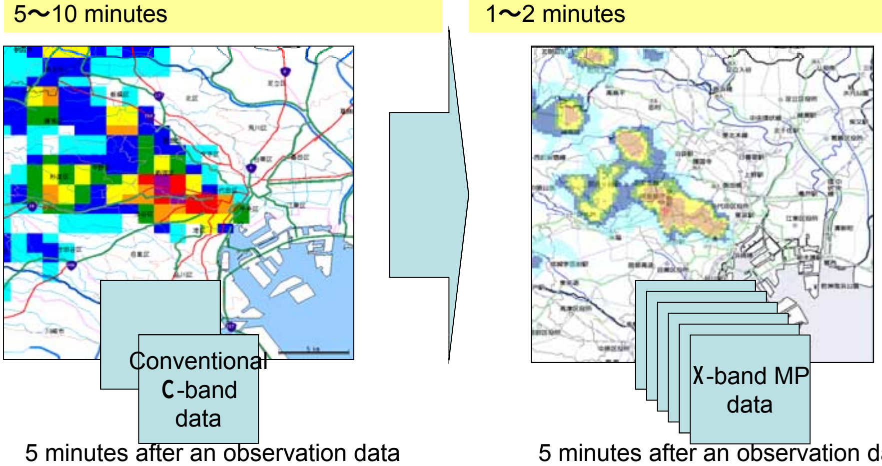
C-band radar

X-band MP radar

23

Comparison between conventional C-band and X-band MP

Conventional C-band radar observation	X-band MP radar observation
Minimum unit: 1km mesh	Minimum unit: 250m mesh
Interval: 5 minutes	Interval: 1 minute
Required time for data distribution: 5〜10 minutes	Required time for data distribution: 1〜2 minutes



5 minutes after an observation data
→2 observation data are available

5 minutes after an observation data
→6 observation data are available

24

* Observation radius for C-band radar is 120km, for X-band MP 60km.

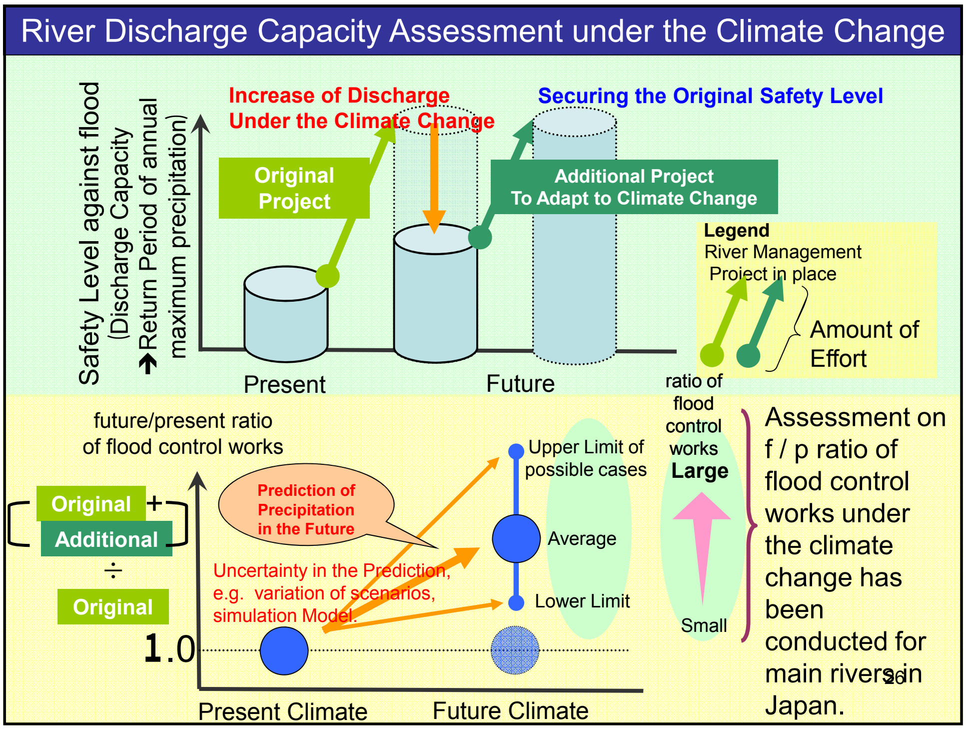
Prediction on the annual maximum precipitation under the climate change

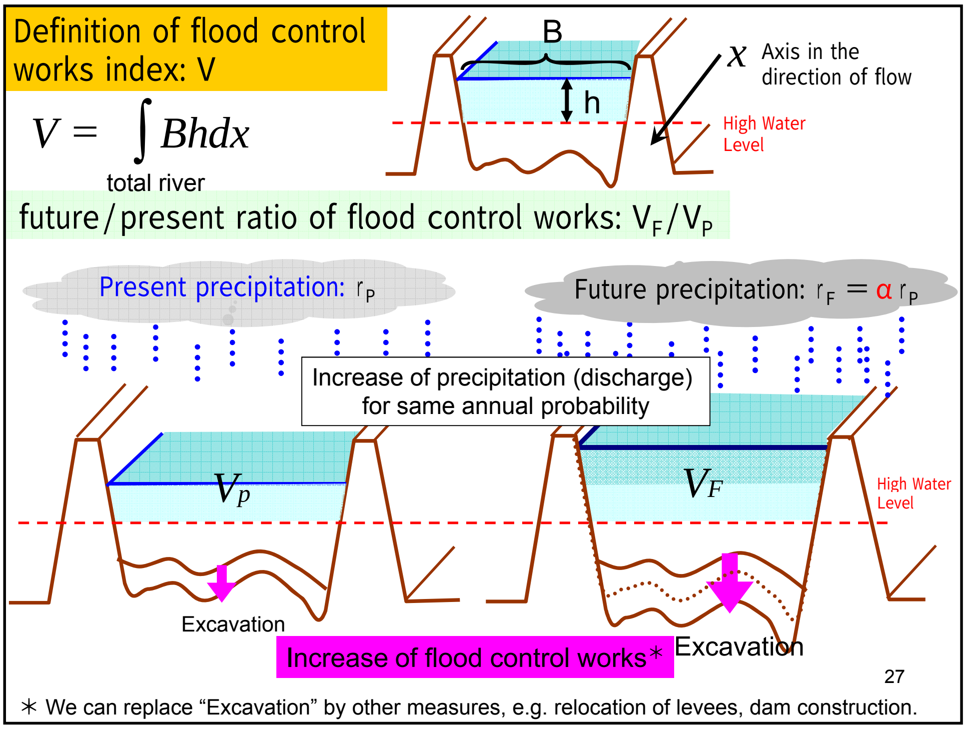
Influence on the flood control works

Grasp the relation between them, and facilitate the debate on the adaptation measures depending on the prediction data under the climate change.

- Introduction of the nationwide, common, and simple measures. →Flood control works index V
- Enable the effective debate depending on the differences among the rivers.
- Apply the measures all over Japan.
- Connect the results to the debate in the field.

25

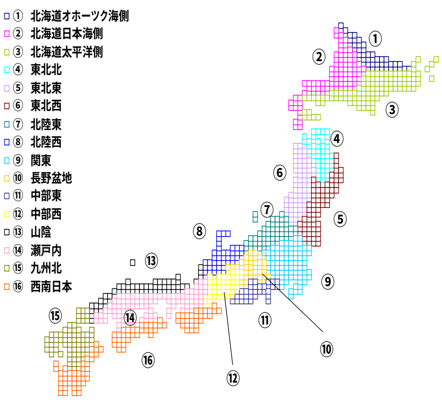


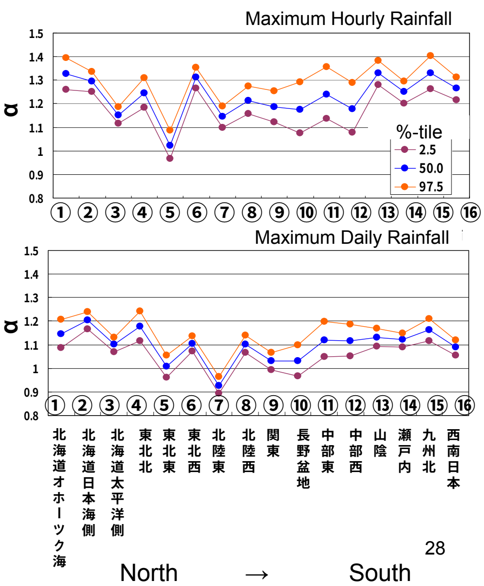


Increases in maximum hourly and daily precipitation

* Prediction data was provided by Japan Meteorological Research Institute

・Comparison of the maximum daily precipitations 100 years from now in 16areas in Japan.
・Although the ratios of increase vary among the areas, almost all areas show a value greater than one.





Future precipitation (the median of the values calculated as shown below) was estimated from

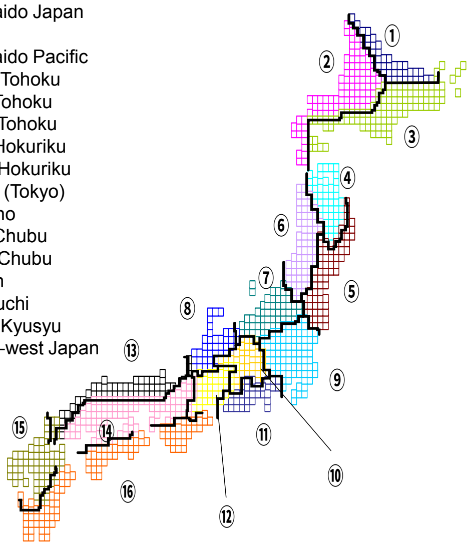
$$\alpha = \frac{2080-2099 \text{ average}}{1979-1998 \text{ average}}$$

which was calculated from the maximum hourly and daily precipitations at different survey points obtained from RCM5km (A1B scenario).

28

Future / present ration α on the maximum daily precipitation in a year for each region

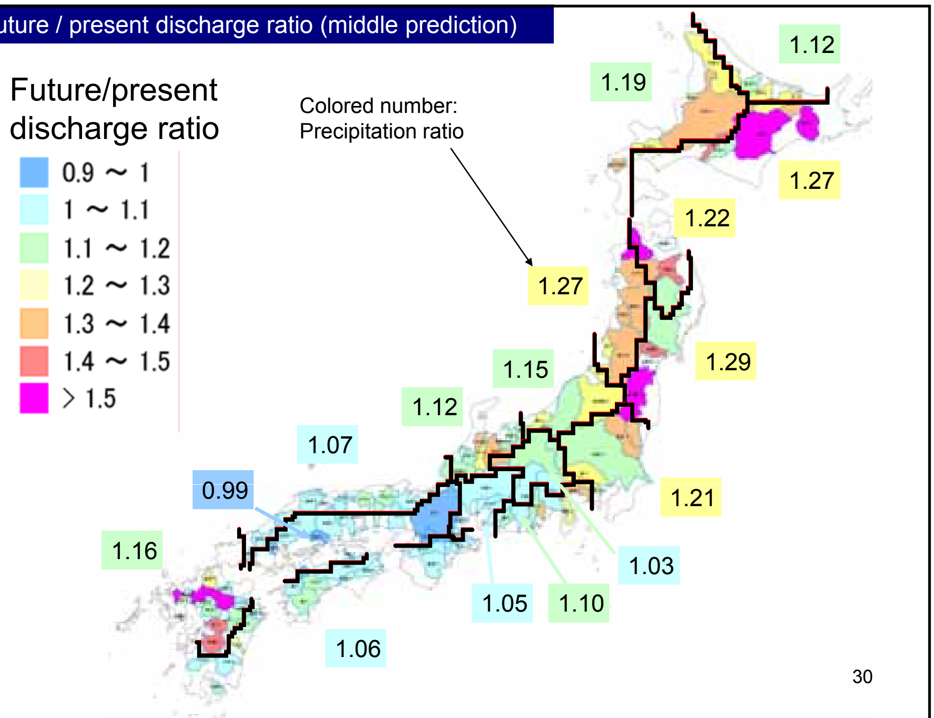
①Hokkaido Okhotsk
②Hokkaido Japan sea
③Hokkaido Pacific
④North Tohoku
⑤East Tohoku
⑥West Tohoku
⑦East Hokuriku
⑧West Hokuriku
⑨Kanto (Tokyo)
⑩Nagano
⑪East Chubu
⑫West Chubu
⑬San-in
⑭Seto-uchi
⑮North Kyusyu
⑯South-west Japan



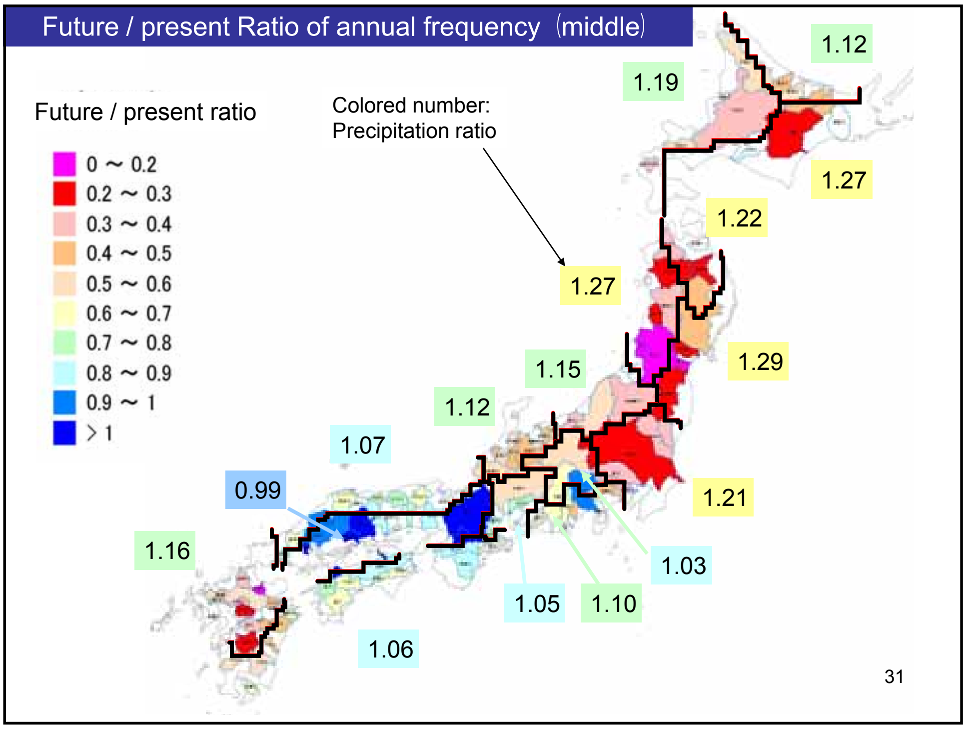
Region	lower	middle	upper
①	1.10	1.12	1.15
②	1.18	1.19	1.21
③	1.25	1.27	1.28
④	1.20	1.22	1.25
⑤	1.27	1.29	1.32
⑥	1.26	1.27	1.29
⑦	1.13	1.15	1.17
⑧	1.10	1.12	1.14
⑨	1.19	1.21	1.23
⑩	1.01	1.03	1.05
⑪	1.08	1.10	1.13
⑫	1.03	1.05	1.08
⑬	1.05	1.07	1.08
⑭	0.98	0.99	1.01
⑮	1.14	1.16	1.17
⑯	1.05	1.06	1.07

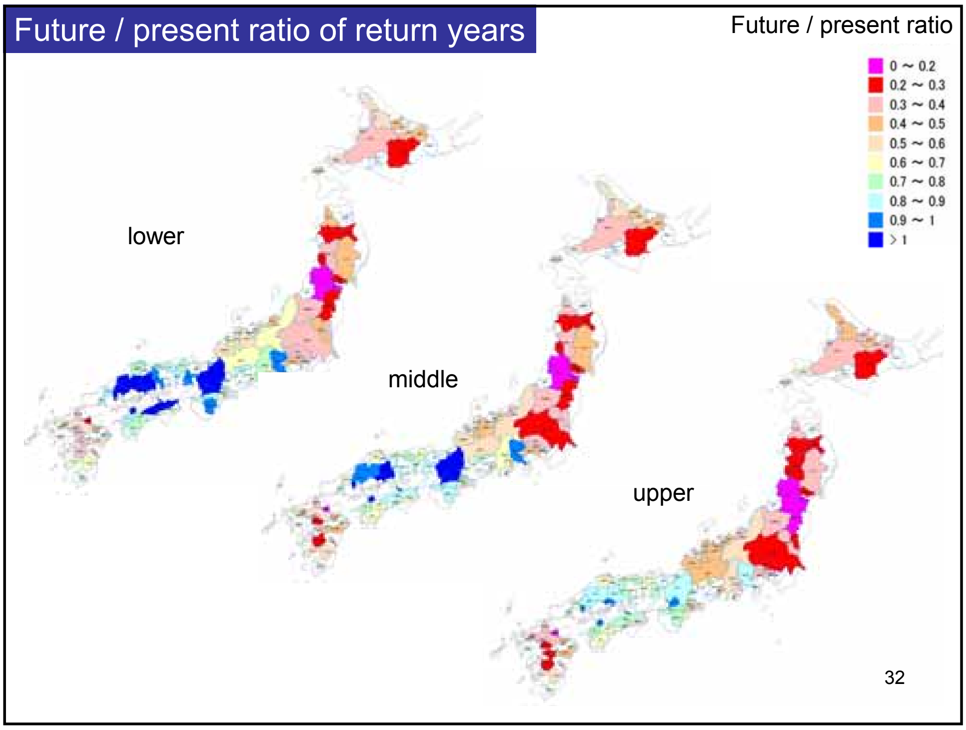
29

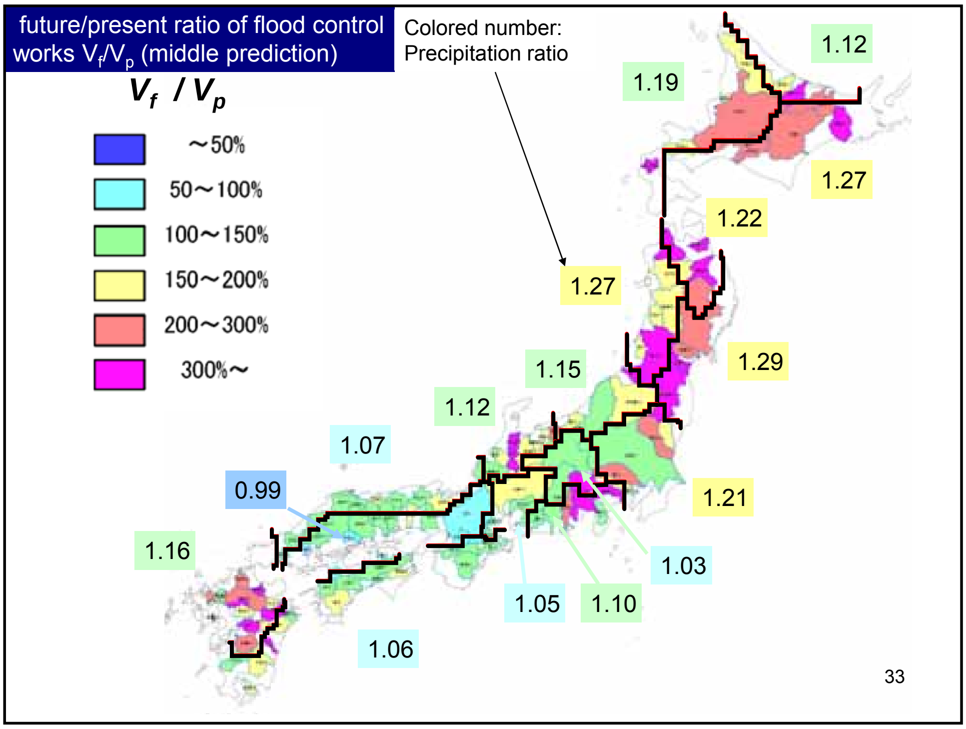
Future / present discharge ratio (middle prediction)

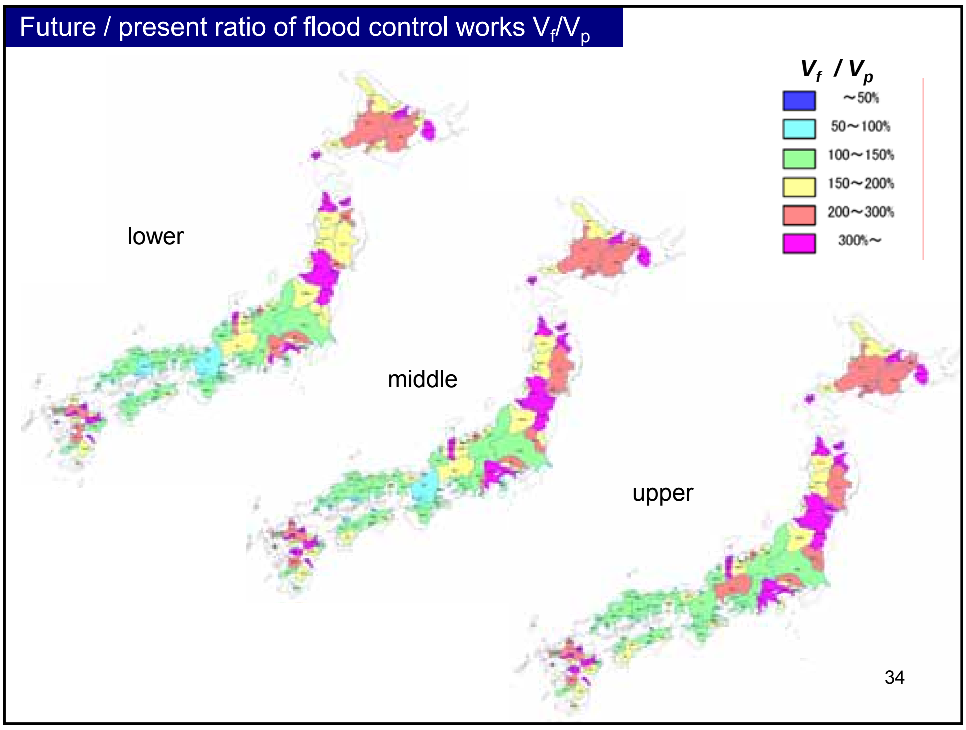


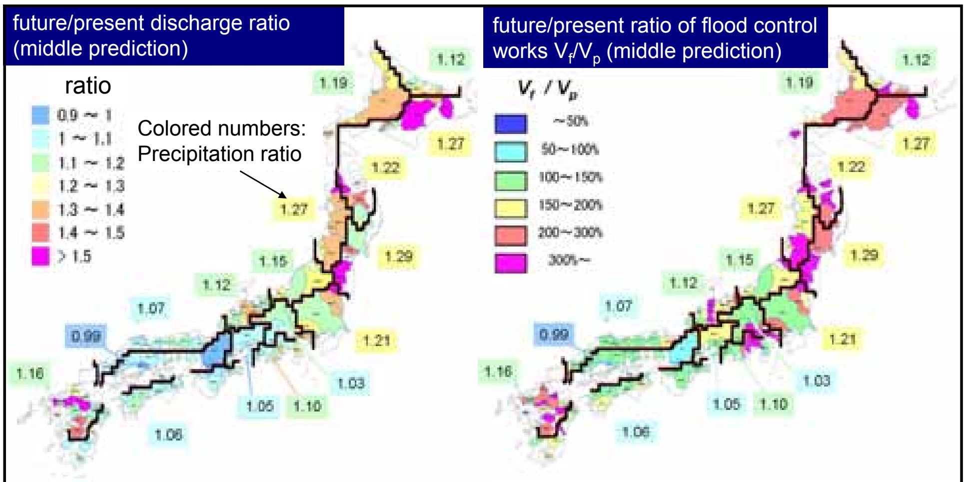
30


Future / present Ratio of annual frequency（middle）
Future / present ratio
0 ～ 0.2
0.2 ～ 0.3
0.3 ～ 0.4
0.4 ～ 0.5
0.5 ～ 0.6
0.6 ～ 0.7
0.7 ～ 0.8
0.8 ～ 0.9
0.9 ～ 1
＞1
Colored number:
Precipitation ratio
1.12
1.19
1.27
1.22
1.27
1.29
1.15
1.12
1.07
0.99
1.21
1.16
1.03
1.05
1.10
1.06
31


Future / present ratio of return years
Future / present ratio
0 ～ 0.2
0.2 ～ 0.3
0.3 ～ 0.4
0.4 ～ 0.5
0.5 ～ 0.6
0.6 ～ 0.7
0.7 ～ 0.8
0.8 ～ 0.9
0.9 ～ 1
＞1
lower
middle
upper
32


future/present ratio of flood control works V_f/V_p (middle prediction)
Colored number: Precipitation ratio
V_f / V_p
～50%
50～100%
100～150%
150～200%
200～300%
300%～
1.12
1.19
1.27
1.22
1.27
1.29
1.15
1.12
1.07
0.99
1.16
1.21
1.03
1.05
1.10
1.06
33


Future / present ratio of flood control works V_f/V_p
V_f / V_p
～50%
50～100%
100～150%
150～200%
200～300%
300%～
lower
middle
upper
34



		Precipitation ratio **α** (result of A1B scenario, GCM20)	Discharge ratio	Future/present ratio of flood control works V_f/V_p
Average of all basins (from 2080 to 2099)	Lower prediction	1. 07	1. 10	1. 50
	Middle prediction	1. 12	1. 20	1. 75
	Upper prediction	1. 18	1. 30	2. 05

35

Ⅴ-4. Lecture

"New Role of Sewerage System in the Low-carbon Society"

Mr. Masashi OGOSHI

New Roles of Sewerage System for the Low-Carbon Society

National Institute for Land and Infrastructure Management

NILIM

Outline

- Progress and Current status / future trend of wastewater treatment and reuse
- New roles of sewerage system for the low-carbon society
  - Reduce GHG emission by N2O control
  - Reduce GHG emission utilizing bio-mass energy
  - Waste heat recovery from sewage

2

WATER RESOURCES

Limited affordable water resources

- 97.47 % - Sea Water
- 1.76 % - Glacier
- 0.76 % - Ground Water
- 0.01% - Surface Water
- = 0.1 million km^3

(2003)

3

ARTIFICIAL WATER SYSTEM

Water Works

&

Sewer Works

Water treatment

&

Wastewater treatment

4

PROGRESS OF WASTEWATER TREATMENT

19C SS removal

↓

20C BOD removal by CAS

↓

Nitrogen and Phosphorus removal by Modified AS

5

CONTROL OF INFECTIOUS MICROORGANISMS

Disinfection by Chlorination

Indicator Organism

Total Coliforms ~ bacteria ~ fecal pollution

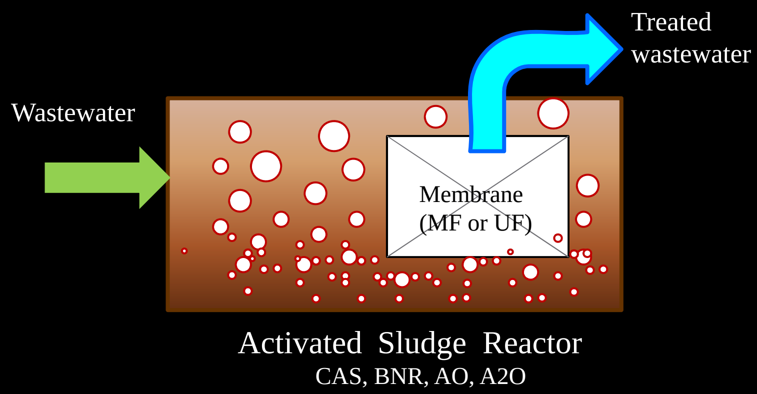
Diarrhea / Protozoan or Viral

appropriate indicator unknown

High removal rate by MBR

6

MBR



7

WATER REUSE /RECYCLE

Cascade type

Tap → Miscellaneous use → reclamation → toilet flushing → Sewer
→ MWTP
→ irrigation → natural waters

Recycle type

Sewer → Satellite purification → Miscellaneous uses → Sewer
→ MWTP → miscellaneous water pipe → toilet flushing → Sewer

8

PROGRESS OF WASTEWATER TREATMENT

SS removal

↓

BOD removal by CAS

↓

Nitrogen and Phosphorus removal by Modified AS

↓

Microorganisms, Virus, and
DOM (Pesticide, PCB, Dioxin, EDs., etc.) removal
by Membrane

MF NF RO

Smaller < energy < Larger

9

ENERGY SAVING WATER REUSE /RECYCLE

River/Lake – Aqueduct – Purification Center – Water pipe – Distribution Pond – Service pipe – Tap - - - - - Drain – Sewer – MWTP – Public water

Reuse treated wastewater

&

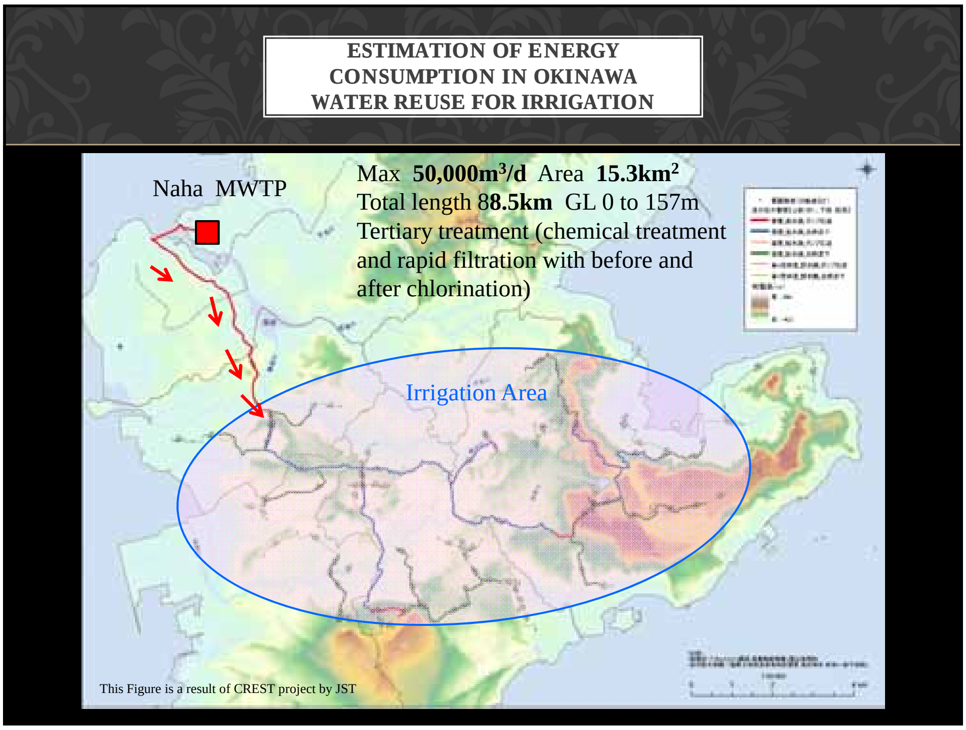
Save fresh water

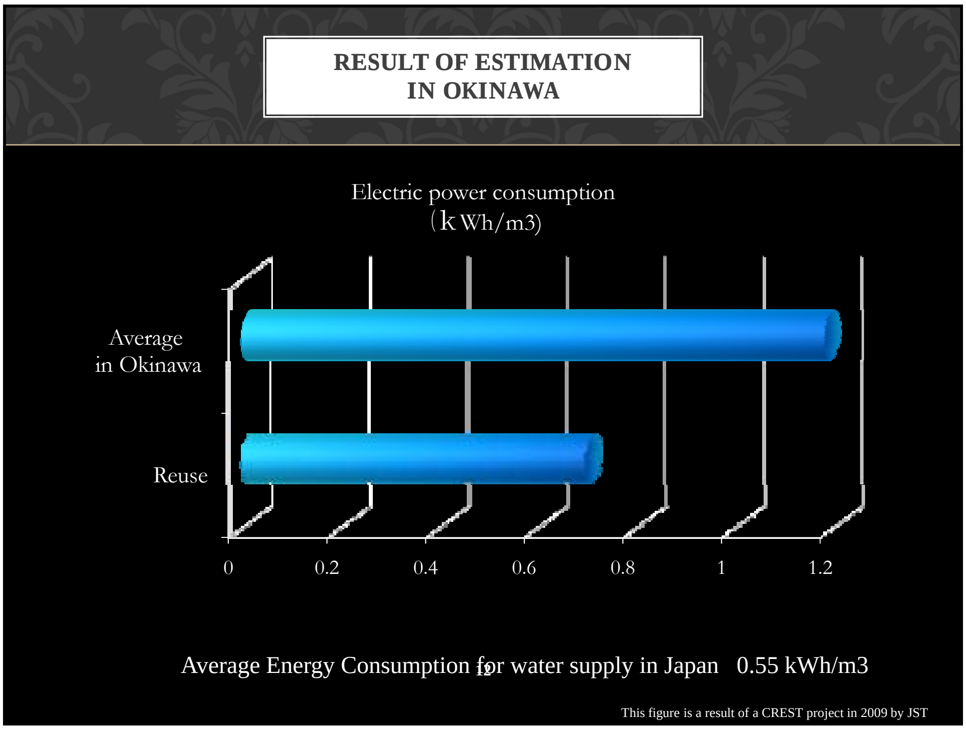
Save energy for water transport

Save energy for water treatment

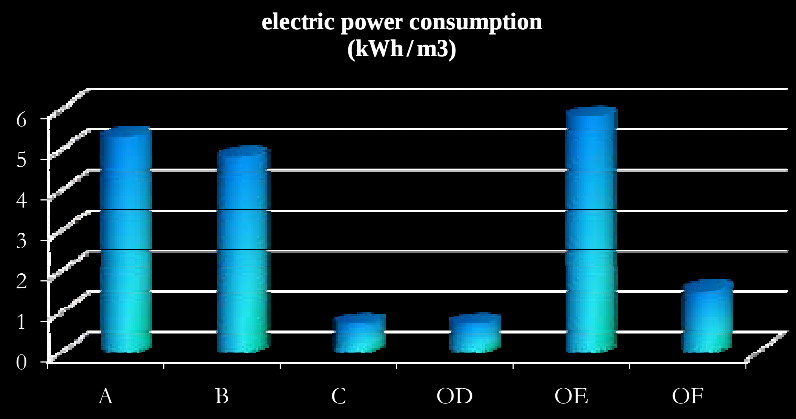
Regenerate water environment down stream the intake point

10


ESTIMATION OF ENERGY CONSUMPTION IN OKINAWA WATER REUSE FOR IRRIGATION
Naha MWTP
Max 50,000m3/d Area 15.3km2
Total length 88.5km GL 0 to 157m
Tertiary treatment (chemical treatment and rapid filtration with before and after chlorination)
Irrigation Area
This Figure is a result of CREST project by JST


RESULT OF ESTIMATION IN OKINAWA
Electric power consumption (kWh/m3)
Average in Okinawa
Reuse
0
0.2
0.4
0.6
0.8
1
1.2
Average Energy Consumption for water supply in Japan 0.55 kWh/m3
12
This figure is a result of a CREST project in 2009 by JST

OTHER EXAMPLE OF ENERGY CONSUMPTION FOR WATER REUSE



13

CONCLUSION OF WASTEWATER TREATMENT AND WATER REUSE

- We can control the water pollution due to excess BOD, Nitrogen and Phosphorus.
- We have still difficulties to control the pollution caused by pharmaceuticals and chemicals.
- Upgrading of wastewater treatment makes it easy to use the reclaimed water, especially application of membrane technologies. But membrane separation consumes a lot of energy.
- We have begun the study about energy saving new water system which is constructed by water works, sewer works and water reuse. Thinking about these 3 systems as one water system, it will be possible to get more efficient water utilizing system.
- Existing water reuse systems are not energy saving itself alone.

14

GLOBAL WARMING & SEWERAGE AFFECT TO WATER UTILIZATION

Increase of drought & flood

Increase of irrigation water for food production

Increase of water consumption in urban area related to temperature rising

↓

Increase of water needs

↓

Increase of assist by water reuse

15

MITIGATION OF GLOBAL WARMING BY SEWER WORKS

1. Reduce GHG emission from sewerage works.

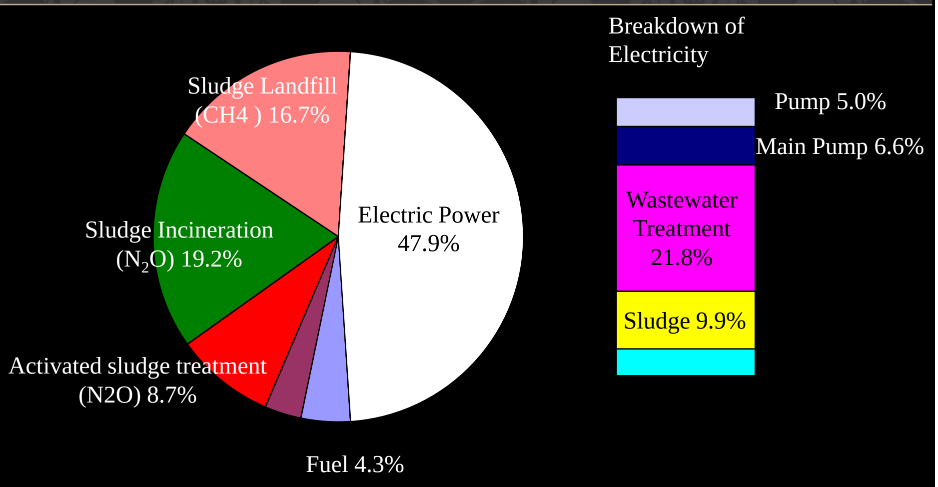
The major source of GHG emission in the MWTP is electric power consumption.

* Exchange energy saving machines from old and inefficient things.
* Refine control system to the smart one that works to reduce inefficient operation.
etc.

2nd big source is the furnace for sewage sludge incineration.

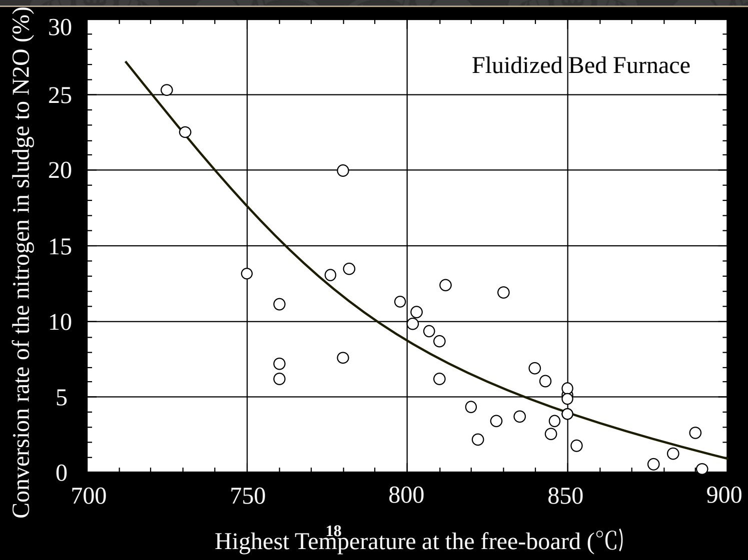
16

GHG EMISSION IN MWTP



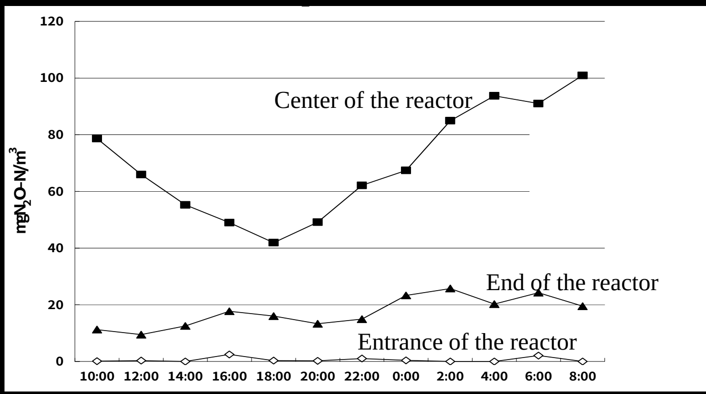
17

REDUCTION OF GHG EMISSION FROM MWTP



18

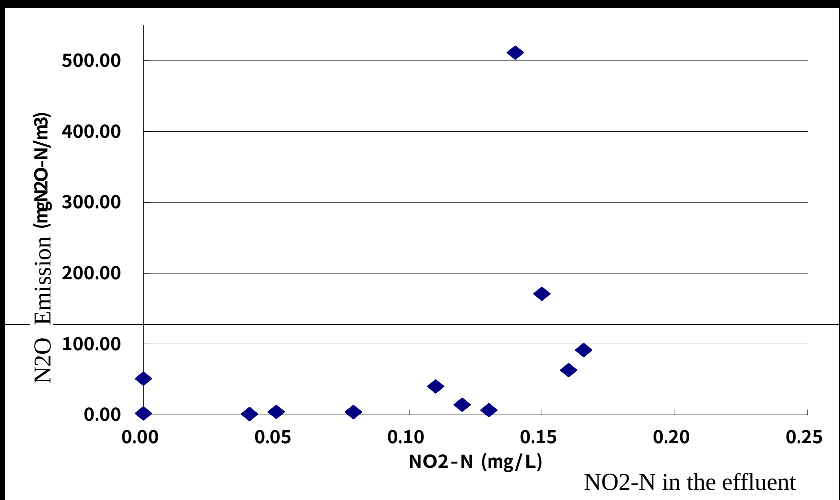
HOW TO CONTROL N2O FROM AERATION TANK



Time(hr)

19

HOW TO CONTROL N2O FROM AERATION TANK



20

EFFECTIVE USE OF BIOMASS ENERGY

Sewerage sludge is a bio-mass.

2. Use sewerage sludge as an energy resource and reduce fossil fuel utilization.

As Methane gas from Anaerobic digester
Additional biomass
House garbage,
Plant branches and leaves
Etc.

21

SLUDGE TREATMENT AND UTILIZATION

BOD, SS etc. are exchanged to sludge and removed from wastewater.

Thickening 2% solid 98% water → Anaerobic Digestion

Methane Gas

Dewatering, 20% solid 80% water → Composting, etc.

Fertilizer

Incineration

Landfill

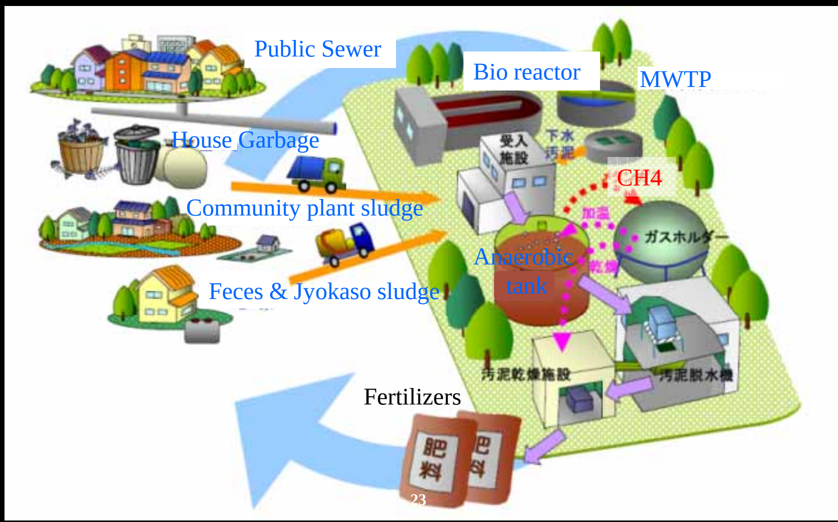
RDF

Bio Gass

Carbonization

22

EFFECTIVE USE OF BIOMASS ENERGY



23

OTHER GHG REDUCING TECHNOLOGY OF SEWERAGE

3. Waste Heat Recovery using sewer system

Waste Heat dispose to sewage

Sewerage transport waste heat

Heat Recovery from sewage

Areal Heating and Air-Conditioning Center
Office, Factory, Shops, etc.

24

CONCLUSION

About the control of GHG emission from sewerage system, we knew that

The temperature of the free-board in fluidized bed furnace should be higher than 850 ℃.

The nitrite nitrogen concentration in the secondary effluent should be less than 0.1mg/L.

We have seen various technologies to use bio-mass energy efficiently.

Combine with local biomass and sewage sludge, MWTP is possible to become a areal center of the low-carbon society.

Thank you for your kind attention.

25

Ⅴ-5. Lecture

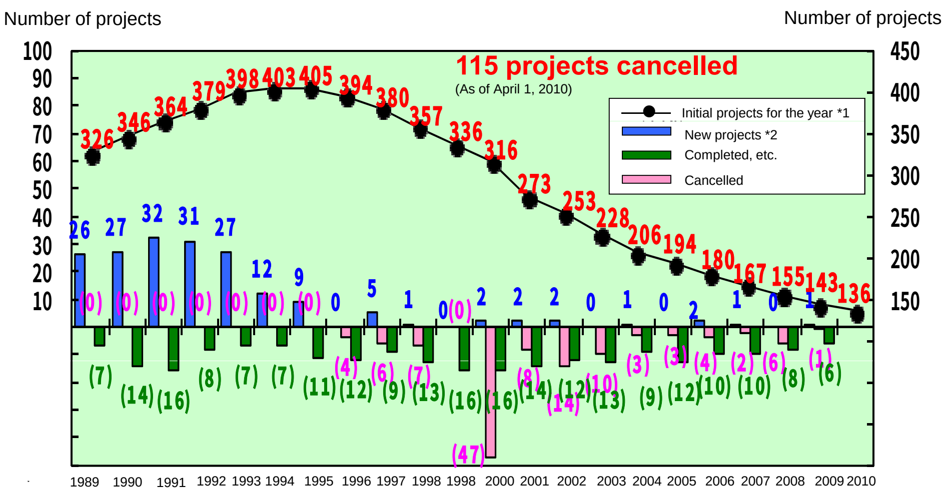
“Newly-Proposed Operation Rules against Floods Exceeding Design”

Mr. Shinya MITSUISHI

Newly-Proposed Operation Rules against Floods Exceeding Design.

Head of Water Management and Dam Division, River Department,
National Institute for Land and Infrastructure Management
Ministry of Land Infrastructure, Transport and Tourism, Japan
Dr Shinya Mitsuishi (D.Eng)

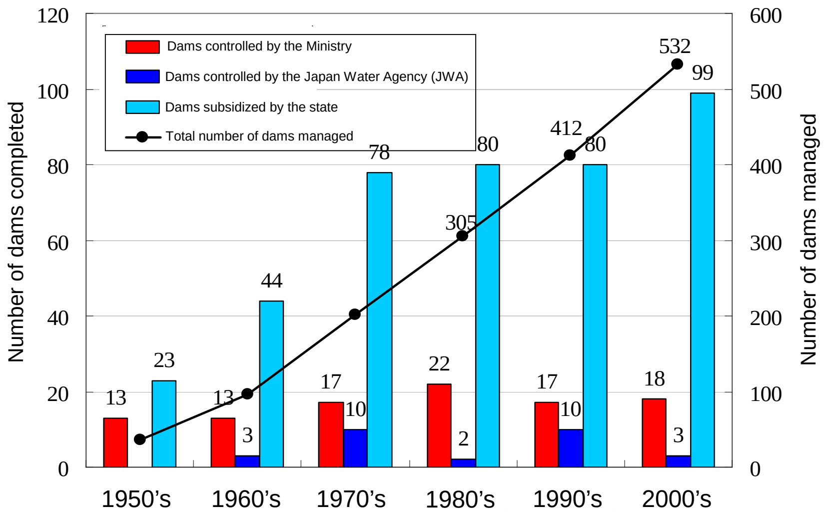
Dam Projects in Japan



*1 The number of projects implemented does not include projects in liquidation due to cancellation, existing ones during amortization by the Japan Water Agency, and those during refund of construction contribution of power suppliers, etc.
*2 The number of new projects does not include the total of new site investigation and new construction (changes in projects such as transition from site investigation to construction and from normal subsidized projects to those of reservoirs for domestic use.)

2

Dam Management in Japan

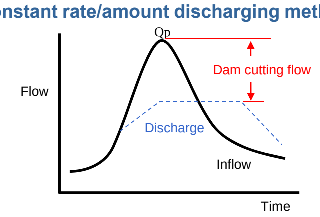


Basic Principles for Flood Control Operations

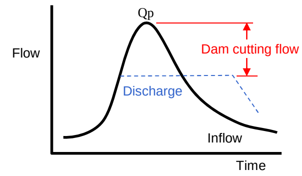
1. Reliable operations and definite effect
2. Ensured safety (safety of downstream rivers and facilities including dams)
3. Prompt response to flood changes
4. Per-flood adaptation and effect maximization

Dam Flood Control Methods in Japan

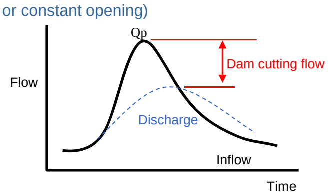
Constant rate/amount discharging method



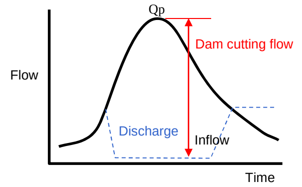
Constant discharging method



Natural regulation method (No gate or constant opening)



Inconstant rate regulation method



Constant rate/amount discharging method to be used in major dams

5

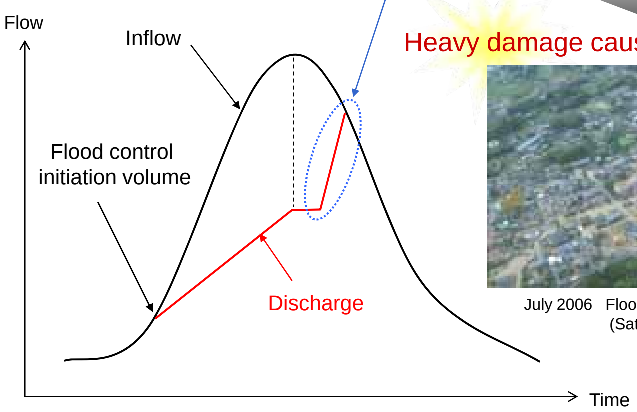
Dam Operations for Excess Floods

Special discharge operations

(Discharge volume is matched to inflow volume in response to insufficient dam capacity)

Significant increase in discharge

Heavy damage caused

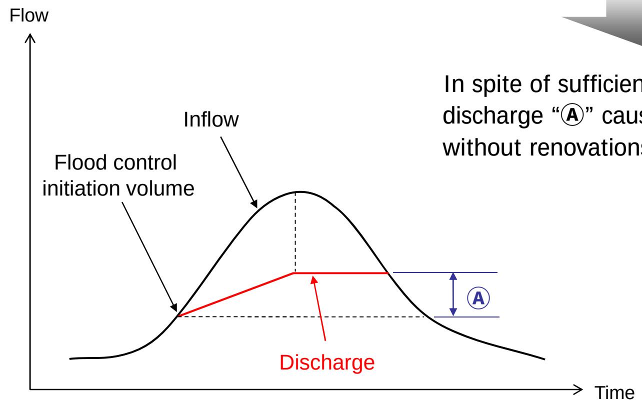


July 2006 Flood inundation in the Sendai River (Satsuma, Torai district)

6

Dam Operations for Smaller Floods

Flood control initiation volume :
Set based on the discharge capacity in sections without renovations



In spite of sufficient dam capacity, discharge "Ⓐ" causes damage in sections without renovations.

7

Dam Flood Control Utilizing Rainfall Prediction

Aim: To minimize discharge volumes by predicting total dam inflow volumes, based on rainfall predictions, and comparing this to available dam capacity

- Predict rainfall in area upstream from dam using WRF 48-hour rainfall prediction
- Deal with rainfall events much higher and lower than the rainfall prediction by setting large and small errors in the WRF model
- Accurately determine effective rainfall (runoff) volume by calculating basin infiltration capacity, including initial rainfall loss and ground water retention capacity
- Manage flood control capacity and water use capacity in an integrated manner
- Decide dam operations to apply by comparing predicted inflow volume with available dam capacity
- Minimize damage to downstream area by maximum utilization of available dam capacity

8

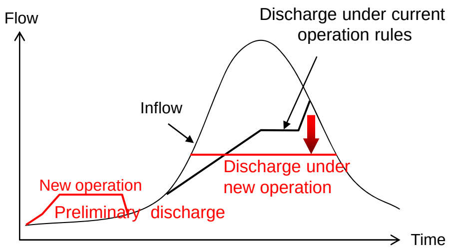
Merits of Dam Operation Methods Using Rainfall Prediction

If rainfall prediction is utilized...

Against excess floods

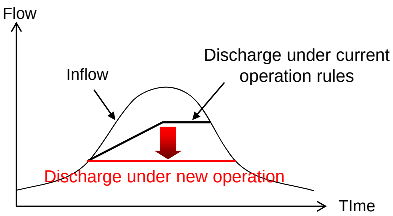
Preliminary discharge to secure greater flood control capacity together with constant discharging will lead to a reduction of maximum discharge volume, minimizing damage.

The ability to predict rainfall enables us to utilize water use capacity for flood control.

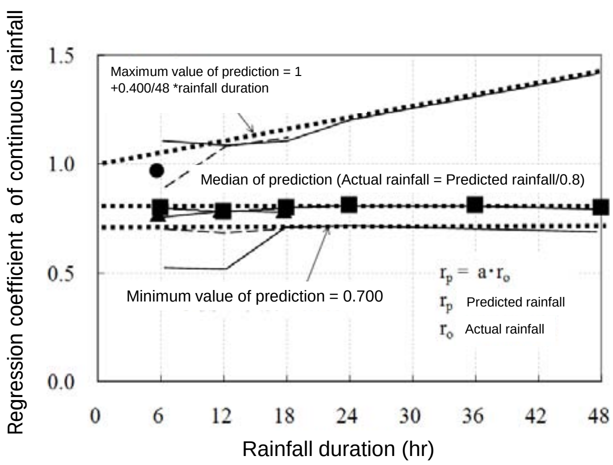


Against smaller floods

In cases where flood control capacity is deemed to exist, downstream damage can be eliminated by proactively storing flood water in this flood control capacity.

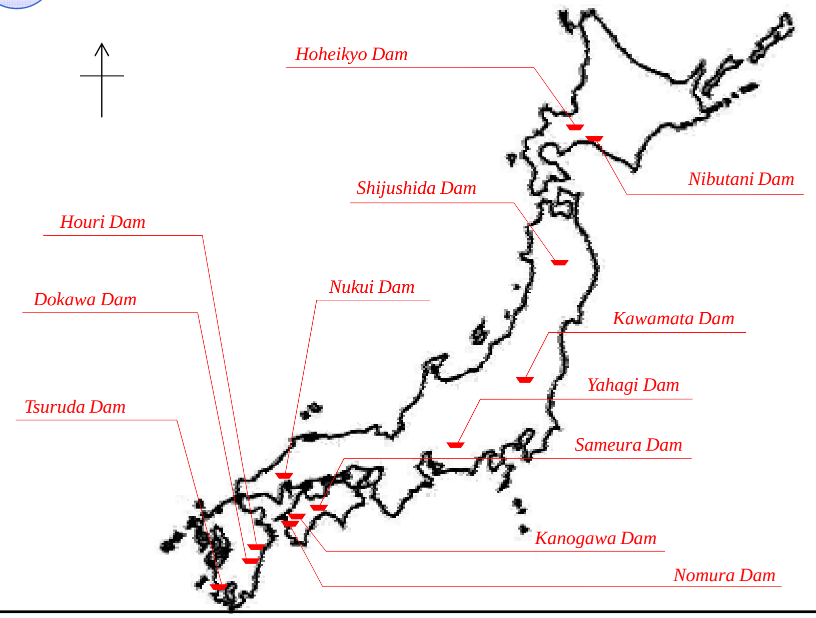


Setting of Errors in Rainfall Prediction



Relation between rainfall duration and predicted rainfall/actual rainfall

Simulation Conducted for 12 Dams



Summary of Simulation Results

Name of dam	Nunber of cases examined	Value used to judgge suitable operation	The discharge operation at a constant rate upto the harmless discharge rate was conducted	Preliminary discharge took place	The discharge operation above the harmless discharge rate took place	The discharge rate exceeded the design maximum discharge rate	The dam capacity was completely used up
Hoheikyo	12	maximum	11	0	1	1	1
		prediction	11	0	1	1	1
		minimum	11	0	1	1	1
		Actual operation	9	0	3	1	0
Shijyushida	7	maximum	6	4	1	0	0
		prediction	6	2	1	0	0
		minimum	7	0	0	0	0
		Actual operation	4	0	3	0	0
Kawamata	6	maximum	6	0	0	0	0
		prediction	6	0	0	0	0
		minimum	6	0	0	0	0
		Actual operation	5	0	1	1	0
Yahagi	14	maximum	13	10	1	0	0
		prediction	13	1	1	0	1
		minimum	14	0	0	0	1
		Actual operation	8	0	6	1	0
Nukui	4	maximum	4	0	0	0	0
		prediction	4	0	0	0	0
		minimum	4	0	0	0	0
		Actual operation	3	0	1	0	0
Sameura	10	maximum	9	1	1	0	1
		prediction	9	0	1	0	1
		minimum	9	0	1	0	1
		Actual operation	5	0	5	0	0

Name of dam	Nunber of cases examined	Value used to judgge suitable operation	The discharge operation at a constant rate upto the harmless discharge rate was conducted	Preliminary discharge took place	The discharge operation above the harmless discharge rate took place	The discharge rate exceeded the design maximum discharge rate	The dam capacity was completely used up
Tsuruda	11	maximum	3	11	8	1	1
		prediction	7	9	4	1	2
		minimum	5	3	6	1	5
		Actual operation	0	0	11	1	0
Nibutani	1	maximum	0	1	1	1	1
		prediction	0	0	1	1	1
		minimum	0	0	1	1	1
		Actual operation	0	0	1	1	1
Kanogawa	1	maximum	0	1	1	0	0
		prediction	0	0	1	0	1
		minimum	0	0	1	0	1
		Actual operation	0	0	1	0	1
Nomura	1	maximum	1	1	0	0	0
		prediction	1	1	0	0	0
		minimum	0	0	1	0	0
		Actual operation	0	0	1	0	0
Dokawa	1	maximum	0	1	1	1	0
		prediction	0	0	1	1	0
		minimum	0	0	1	1	1
		Actual operation	0	0	1	1	0
Hohri	1	maximum	0	0	1	1	1
		prediction	0	0	1	1	1
		minimum	0	0	1	1	1
		Actual operation	0	0	1	1	1
Total	69	maximum	53	30	16	5	5
		prediction	57	13	12	5	8
		minimum	56	3	13	5	12
		Actual operation	34	0	35	7	3

Patterns in Simulation Results

Cases of maximum values used

Many cases with preliminary discharge operations or discharges at volumes above harmless flow volumes

Cases of minimum values used

Many cases where entire dam capacity was spent completely

50 or so cases of smaller floods

Discharges limited to harmless discharge volumes by carrying out preliminary discharges and so on
(Actual discharge operations at harmless volumes were only conducted in 34 flood events)

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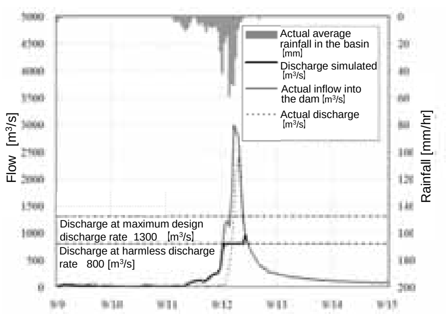
Simulation Results in Case of Excess Flood



Simulation result of flood in Yahagi Dam as of Sep. 2000

A comparison of operations utilizing the WRF model and actual operations

Name of Dam	Time of flood	Maximum inflow (m^3/s)	Maximum discharge(m^3/s) Actual	Maximum discharge(m^3/s) WRF use	volume reduced (m^3/s)
Yahagi Dam	H12.9	2,993	2,378	974	1,404
Nibutani Dam	H15.8	5,959	5,489	5,000	489
Dokawa Dam	H16.8	1,005	827	712	115

Appropriate preliminary discharge operation and decision to maximize discharge

Reduction of maximum discharge and significant mitigation of damage

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Application in Actual Dam Management

Integrated operations at the three dams in the Nabari River upstream area

- Heavy rain predicted in October 2009 from typhoon No. 18.
- Possible inundation of the downstream river area even if routine operating regulations were exercised at the three dams managed by the JWA
- The Ministry of Land, Infrastructure, Transport & Tourism instructed the 3 dam management offices to store above-operating regulation levels of flood water in the dams (called 'integrated dam operations')
- Flood damage in the urban area of Nabari City avoided

A photograph of Nabari Ohashi downstream in the Nabari River, taken on Oct. 8, 6:34)

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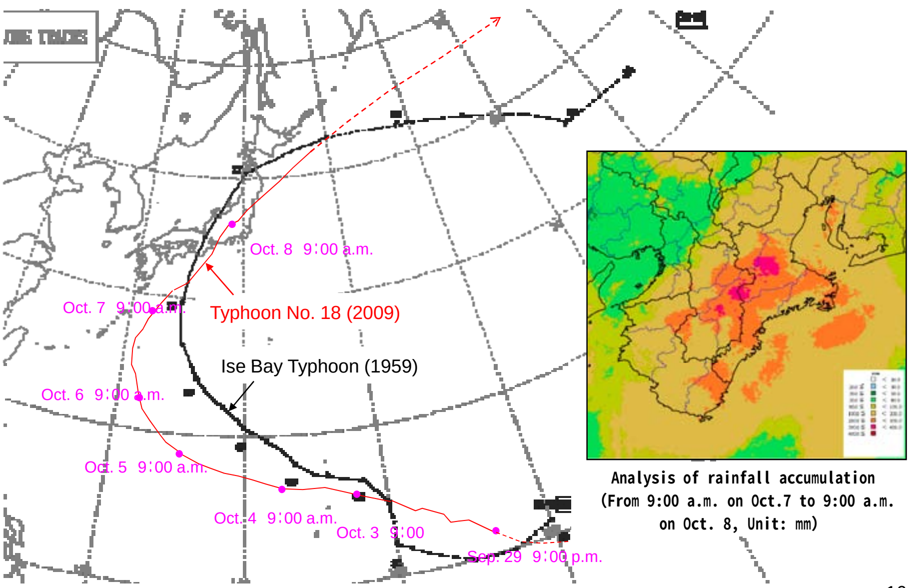
Course of the Ise Bay Typhoon (in 1959) and the Typhoon No. 18 (in 2009)



Analysis of rainfall accumulation (From 9:00 a.m. on Oct.7 to 9:00 a.m. on Oct. 8, Unit: mm)

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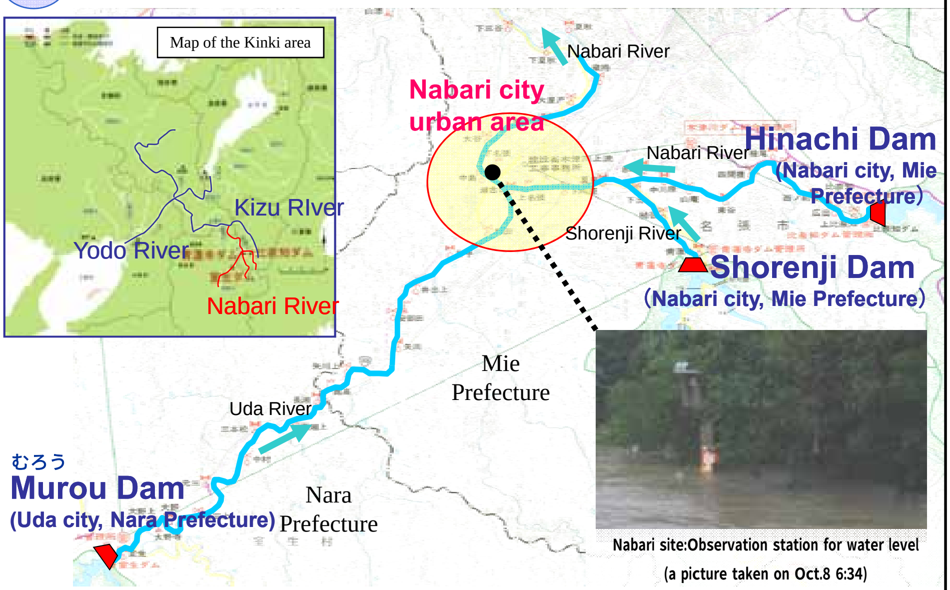
Location of Nabari City and Three Dams



この地図は、国土交通省国土地理院長の承認を得て、同院発行の5万分の1地形図を複製して作成した成果（承認番号 平9近繕、第259号）を転載したものである。

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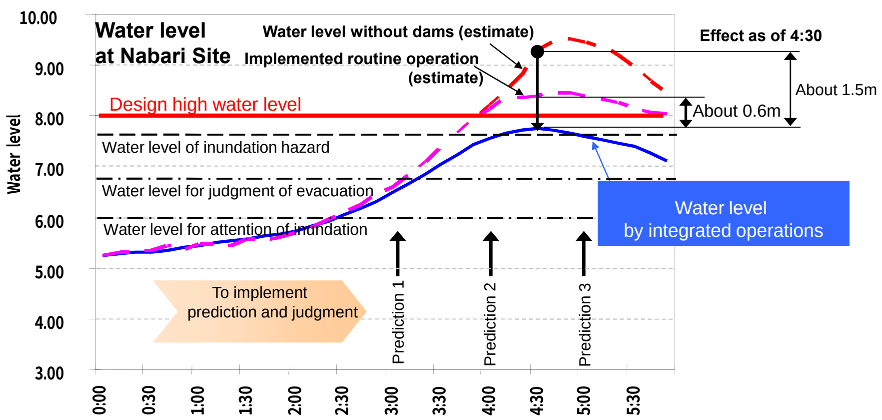
Overview of Integrated Operations by the Three Dams

Each routine dam operation based on control regulations could cause inundation of the Nabari River, which threatened to exceed the design high water level at the Nabari Site.

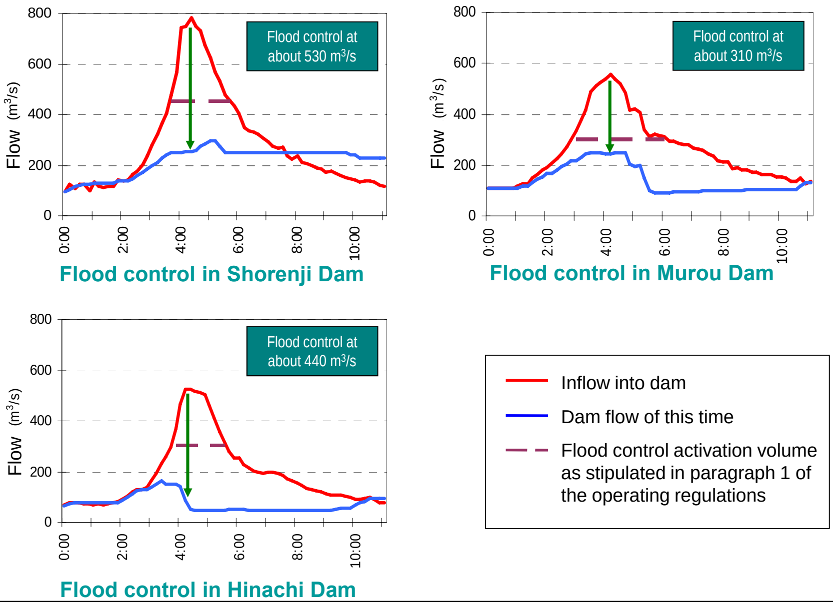
Implementation of integrated operations by the three dams

Water level of the Nabari River was kept lower than the design high water level, preventing flood damage to an estimated 1,180 houses.



18

Flood control operations carried out under the three dam integrated operations meant that expected flood damage to 1,180 houses in the Nabari urban area was avoided.



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A Comparison with the Ise Bay Typhoon

Details			Typhoon No. 18, 2009	Typhoon No. 15 (Ise Bay typhoon), 1959
Scale		Period	Sep. 29 2009 (21:00) to Oct. 9 2009 (15:00)	Sep. 21 1959 (21:00) to Sep. 27 1959 (21:00)
		Lowest pressure	910 hpa	895 hpa
		Maximum speed	55 m/s	75 m/s
	At time of landfall	Central pressure	955 to 960 hpa	925 hpa
		Maximum speed	40 m/s	50 m/s
		Radius of storm	220 km (South East), 170 km (North West)	250 km
Rainfall in the Nabari River upstream		1-hour rainfall	65 mm	58 mm
		3-hour rainfall	143 mm	137 mm
		Cumulative rainfall	315 mm	393 mm
Situation in Nabari city	Rainfall	1-hour rainfall	41 mm	43 mm
		Cumulative rainfall	239 mm	342 mm
	Damage situation	Death toll	-	11
		Number of missing	-	1
		Swept houses	-	102
		Demolished houses	1	180
		Partially destroyed	-	525
		Flood above floor	1	1,434
		Flood below floor	27	848

3-hour rainfall was equivalent to that of the Ise Bay typhoon!

Significant reduction in damage in Nabari City

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Articles Related to Typhoon No. 18


伊賀版

ダム調整で浸水回避

中日新聞(平成21年10月21日)


台風18号 県内にも爪跡

停電7万6900戸、道路寸断や床下浸水

産経新聞(平成21年10月9日)

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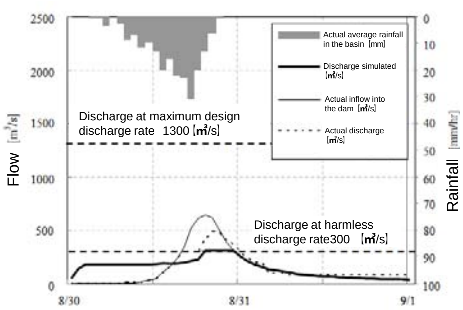
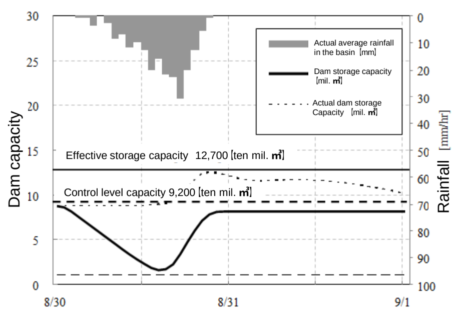
Example of Water Use Capacity Non-fulfillment





Simulation results for the flood at Nomura Dam in August 2004

Where the maximum WRF model error (1.43) was used, large preliminary discharge operations carried out based on excessive rainfall level predictions resulted in an inability to fulfill water use capacity after the flood.

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Improvement of the Method for its Practical Application to Dam Management

1. Improvement of operation methods
2. Clarification of rainfall prediction errors of the WRF model
3. Improvement of dam facilities

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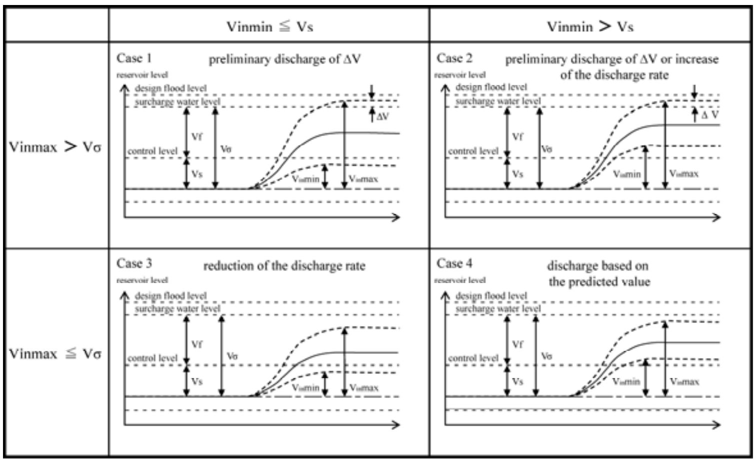
Reservoir Water Level and Discharge Operations Based on Rainfall Prediction Errors



Vf	:	flood control capacity
Vs	:	available capacity for water use at the time of prediction
Vσ = Vf + Vs	:	available capacity at the time of prediction
Vinmax	:	reservoir level based on the maximum WRF prediction value
Vinmin	:	reservoir level based on the minimum WRF prediction value

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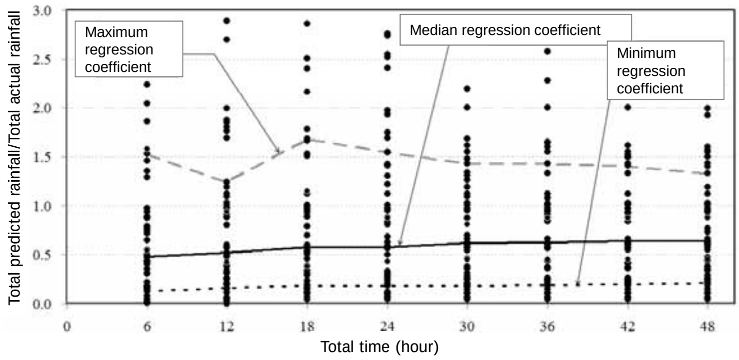
Clarification of Rainfall Prediction Errors of the WRF Model



WRF model rainfall prediction for 14 small to large floods in 10 dams

Compare to actual rainfall and examine error

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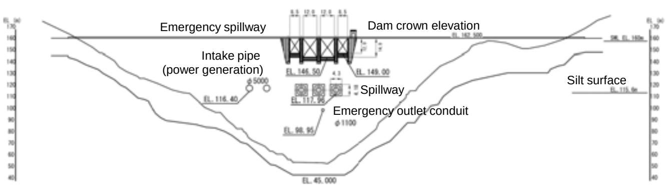
Improvement of Dam Facilities



Discharge facility in Tsuruda Dam

Only three conduit gates

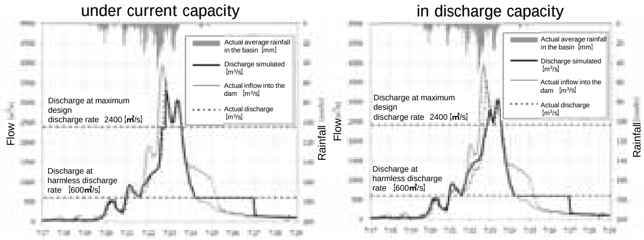
Not possible to smoothly carry out operations where discharge rate is increased to match the inflow rate, or preliminary discharge operations

↓

Add one conduit gate and examine effect

Simulation result under current capacity

Simulation result under assumed increase in discharge capacity



Matching operations can be carried out smoothly

Maximum discharge volume reduced by 243 m^3/s

Effect of improvements in discharge facilities at Tsuruda dam (July 2006 flood event)

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Conclusions

1. This method enables the control of flood damage for many flood events by reducing maximum discharge volumes through preliminary discharge operations and so on, even in the case of excess floods.
2. With this method, discharges can be kept to harmless discharge volumes for many smaller floods.
3. To minimize the risks posed by rainfall prediction errors, it is necessary to correctly understand the characteristics of such errors, and reflect that in any flood control decisions.
4. For those dams where the capacity of spillway gates and so on is insufficient, it is desirable to remodel them so that preliminary discharges etc. can be carried out effectively.

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Ⅴ-6. Lecture
“Sediment Disaster Forecasting and Warning System”

Mr. Masaki MIZUNO

Sediment Disaster Forecasting and Warning System

SABO (Erosion and Sediment Control) Division
Research Center for Disaster Risk Management
National Institute for Land and Infrastructure Management

Masaki MIZUNO

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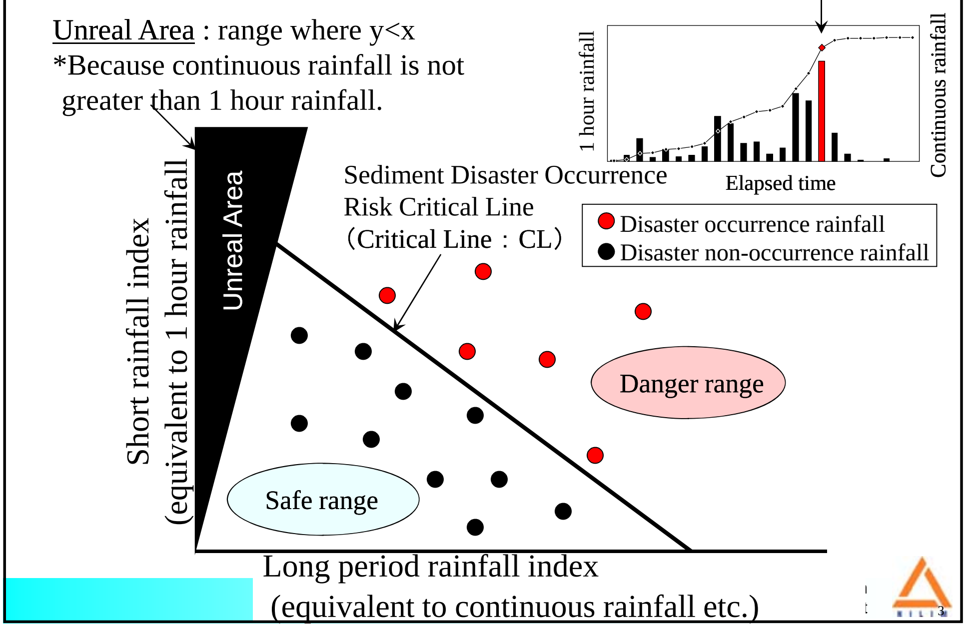
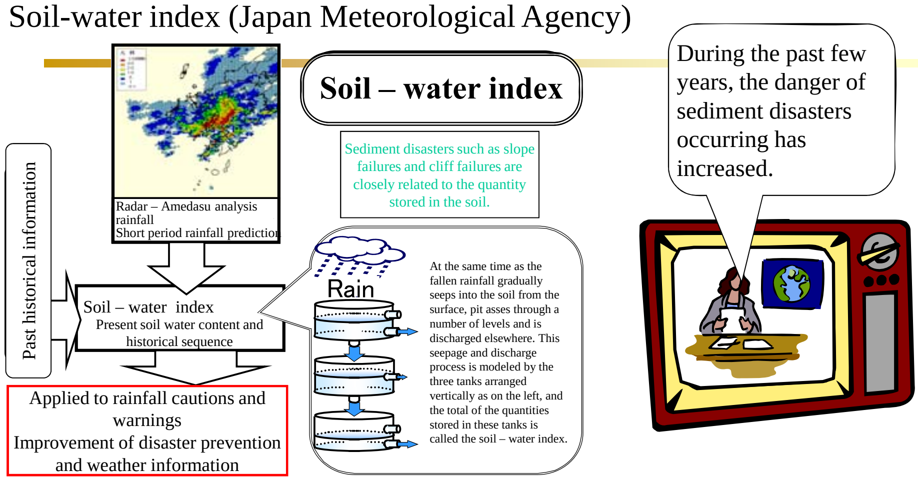
Today's topics

1. Sediment Disaster Warning and Evacuation Critical Rainfall Setting Method (The conventional method)
2. Study of a new CL setting method (Setting CL using RBFN)
3. Sediment Disaster Forecasting and Warning System in Japan (Preparation and Announcement of Sediment Disaster Warning Information)
4. Actual operation of sediment disaster warning information system

（The conventional method ）
Sediment Disaster Warning and Evacuation Critical Rainfall (sabo departments)

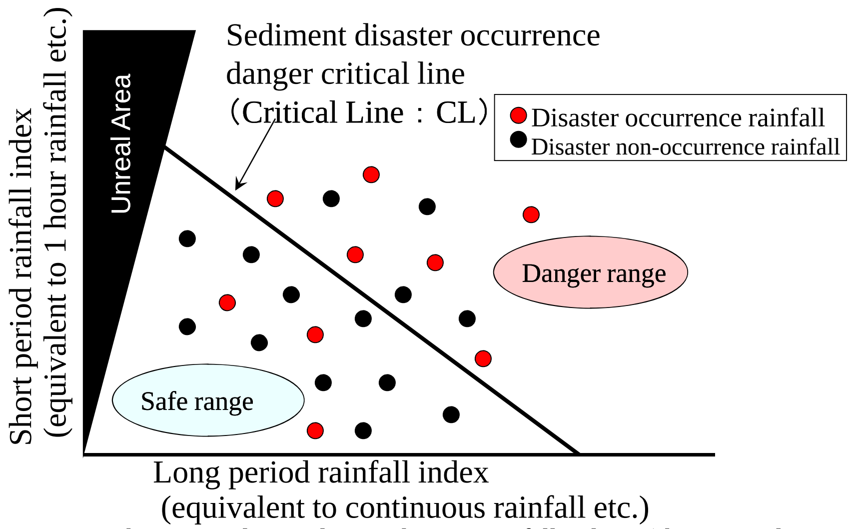


Soil-water index (Japan Meteorological Agency)



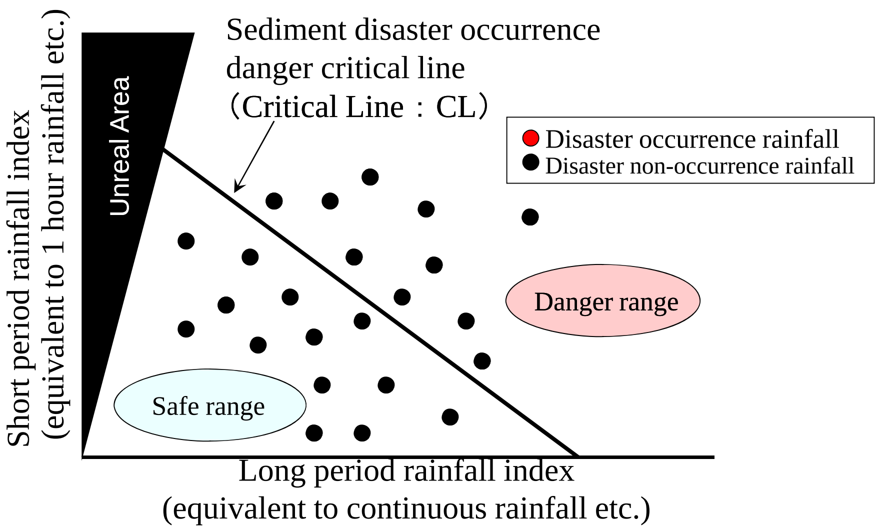
At a meteorological observatory, in circumstances where a heavy rainfall warning has been issued, a comprehensive judgment is made according to the soil – water index, meteorological conditions etc., and when the danger of a large sediment disaster occurring is extremely high, the above “key word” is used to change the warning to issue an even more urgent warning.

(The conventional method)
Strong points and weak points of the sediment disaster warning and evacuation critical rainfall (sabo departments)



- Danger can be assessed according to the two rainfall indices (short period rainfall and long period rainfall).
- Critical lines may be set subjectively.

(The conventional method)
Strong points and weak points of the sediment disaster warning and evacuation critical rainfall (sabo departments)

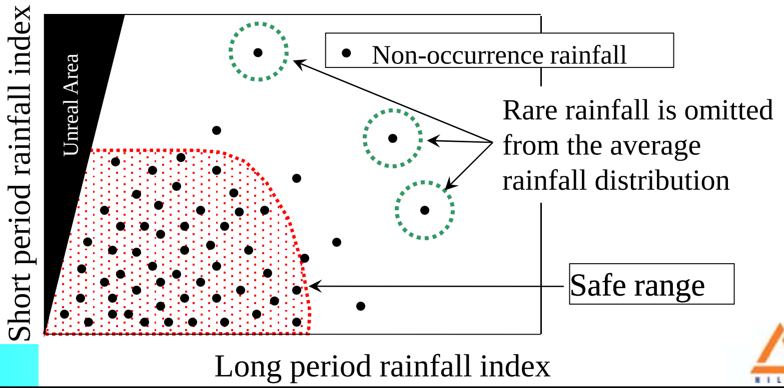


- manDisaster data is needed to set CL.

Study of a new CL setting method

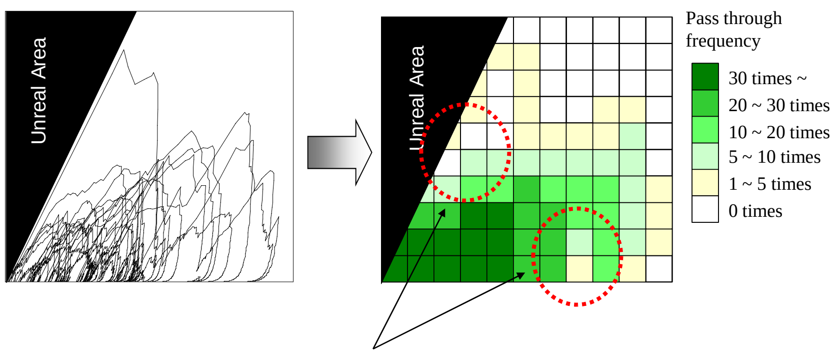
How is CL set in a case where occurrence rainfall is rare (non-existent)?

➔ Range where it is hypothesized that the sediment disaster danger is low based on rainfall experienced in the past (safe range) is specified (range with many experiences in the past).



Study of a new CL setting method

Meshes are set and the frequency that the non-occurrence snake curve passes through each is counted.



Because a snake curve does necessarily pass through all meshes, the pass-through frequency distribution is discontinuous (uneven).

⇒ Subjective judgments are made to set the safe range.

Isn't there a method of setting more objectively?

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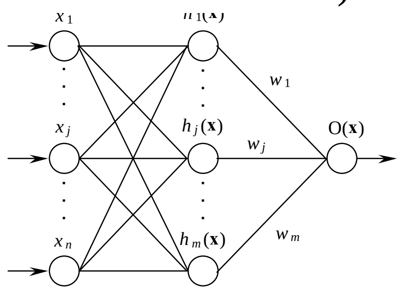
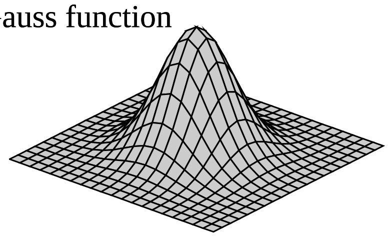
Study of a new CL setting method

Study of the applicability of the RBF network (Radial Basis Function Network)



Input layer (n) | Intermediate layer (m) | Output layer (1)

Gauss function



$$h_j(\mathbf{x}) = \exp(-\|\mathbf{x} - \mathbf{c}_j\|^2 / r^2)$$

Learning by an RBF network

$$E = \sum_{i=1}^{p} \left(y_i - O(\mathbf{x}_i)\right)^2 + \sum_{j=1}^{m} \lambda_j w_j^{\,2} \rightarrow Min$$

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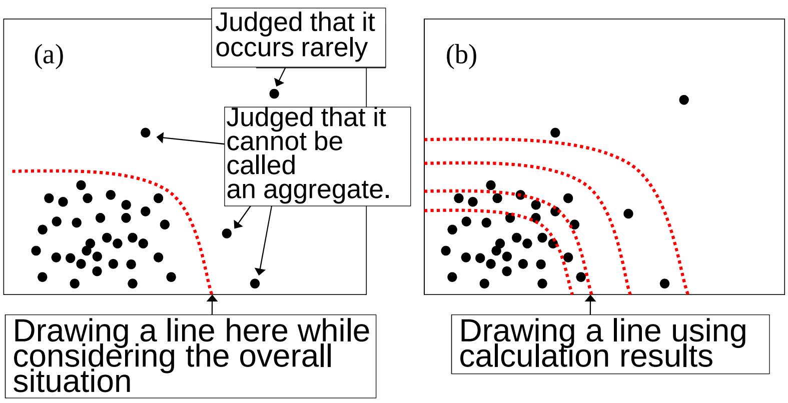
Study of a new CL setting method

Image of Task of Preparing the Range of the Aggregate of Points



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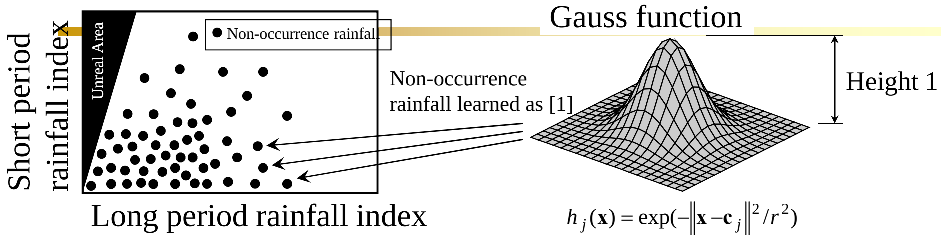
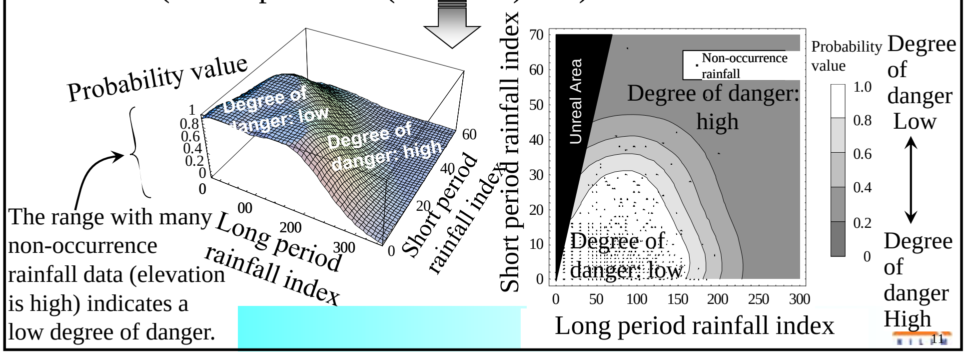
Study of a new CL setting method

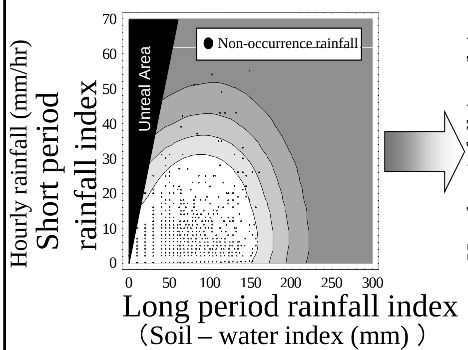


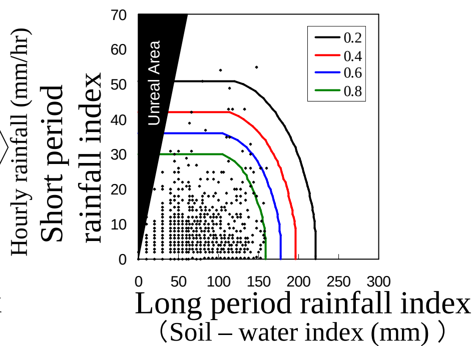
Gauss functions are superimposed to set the response curved surface (0≦output value (elevation) ≦1)



Study of a new CL setting method

From the response curved surface set based on non-occurrence rainfall, an optional equiprobability value line is abstracted (slightly corrected to prevent contradiction with phenomenon)





An equiprobability value line judged to be suitable according to its relationships with the false alarm rate, frequency warnings are issued, and rainfall warnings is set.

⇒ Objective CL can be easily set.

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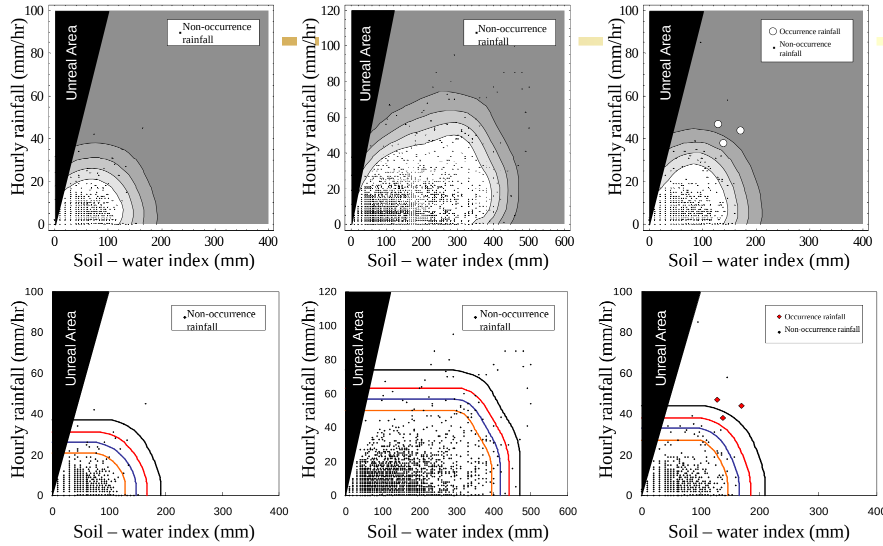
Results of applying the new CL setting method



For what kind of region can average rainfall distribution be easily reproduced
⇒ Using the RBF network to set CL is judged effective.

Merits of using an RBF Network

- CL can be set using multiple non-occurrence rainfall data, even in regions where there is little disaster data or where there is no disaster data.
- The safe range can be specified automatically based on rainfall distributions experienced in the past (extremely objective).
- The specification of the safe range can be automated to a certain degree using the RBF network, so efficiency can be greatly improved.

* CL must be set for all meshes (380,000 meshes nationwide: approximately 80,000 meshes/1 prefecture), and the conventional CL setting method is very time consuming and laborious.

The result ⇩

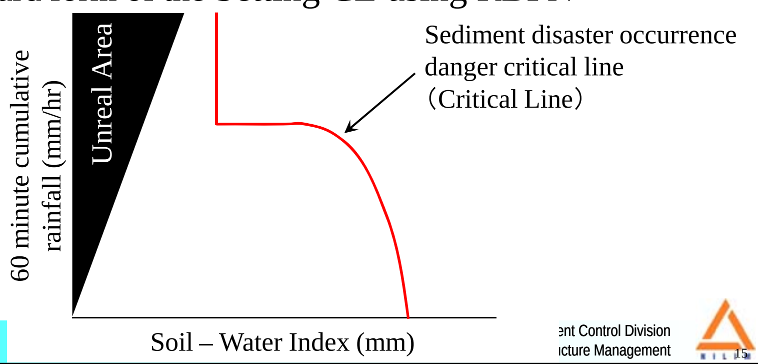
This method is adopted to set the sediment disaster warning information preparation and announcement standards.

CL setting methods using RBF Network

CL setting methods when using RBF network with sediment disaster warning information:

(1) CL is set for each mesh unit of the data provided by the Meteorological Agency
(2) CL is set for meshes without disasters applying the standard value set in municipality units with necessary modifications.
(3) CL is for meshes with disasters considering the captured disasters.
(4) CL is set considering the lower limit value of the soil – water index.

Standard form of the Setting CL using RBFN



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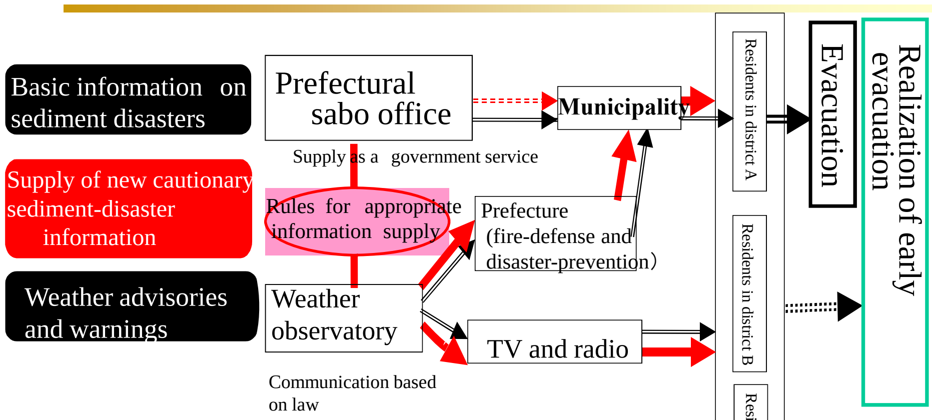
Sediment Disaster Forecasting and Warning System in Japan

preparation and announcement of sediment disaster warning information



Flow of information newly supplied through coordination and cooperation between the sabo office and Japan Meteorological Agency

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Example of cautionary sediment-disaster information

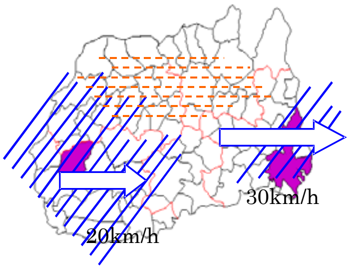
Cautionary sediment-disaster information for AA Prefecture, item No. X

Time: △△ Date:□□□□

Joint announcement by AA Prefecture and BB Regional Weather Observatory

Municipality in which warning issued:
CC district, DD City

It is expected that the danger of sediment disaster due to heavy rains will rise significantly within the next two hours. Please take thorough steps to provide warning in sediment disaster-prone areas and surrounding areas. It is expected that the maximum rainfall in municipalities targeted by this warning could reach 60 mm in some places over the next three hours.



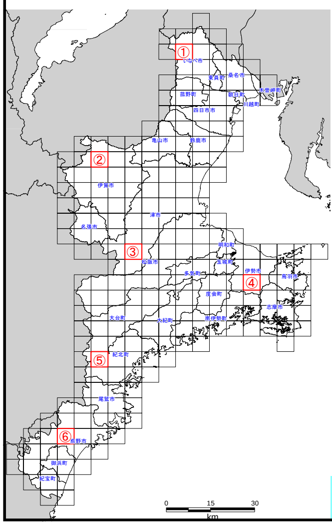
Explanation

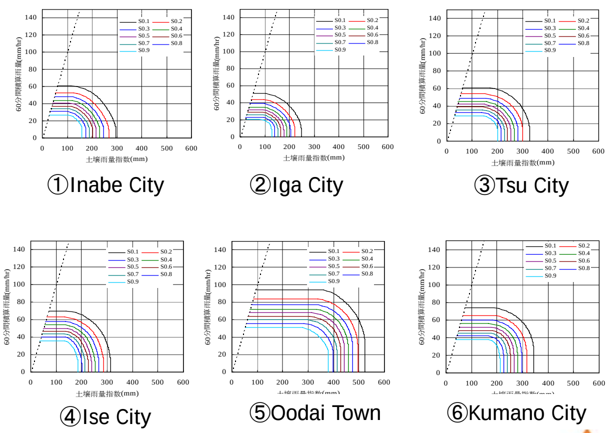
- Municipality in which warning
- Region in which seismic intensity was ?? or more during the EE Earthquake
- Area of actually measured heavy rain (30 mm per hour or more)
- Length of arrow corresponds to hourly movement distance

For inquiries, please contact:
Sabo Office, AA Prefecture: 111-111-1111
BB Regional Weather Observatory: 222-222-2222

Actual operation of sediment disaster warning information system

1. The CL is set for each 5 km mesh.

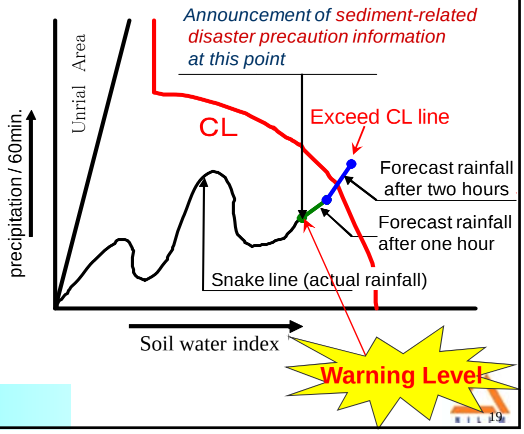




Actual operation of sediment disaster warning information system

2. The snake line is drawn using both actual (observed) rainfall data and predicted rainfall data.

- 1st Step: Draw a snake line
  X axis -> Soil rainfall index
  Y axis -> 60-minute rainfall
  Both are actual (observed) data.
- 2nd Step: Forecast a snake line after one hour and two hours
  Points in one and two hours later are estimated using rainfall-forecast data.
- 3rd Step: Judgment
  If the points in two hours later locates outside the critical line (CL), the sediment disaster warning information is issued.



Actual operation of sediment disaster warning information system

3. The sediment disaster warning information is issued for the unit of each municipality.

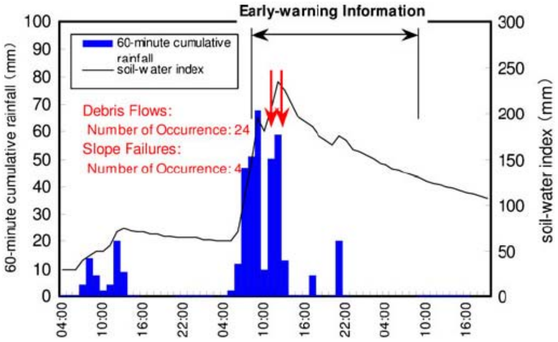
This is because the municipality has responsibility to issue emergency calls to the residents.

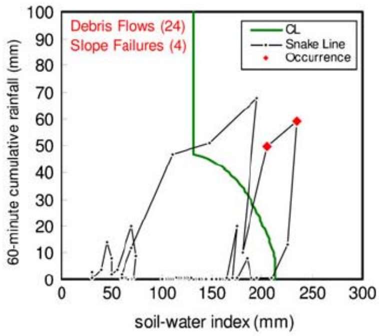
Example :Case of sediment disaster occurrence by heavy rainf in *Yamaguchi* Pref.

The case of actual sediment disaster happened on July 21, 2009 in *Yamaguchi* Pref.

Example of snake line progress using RBFN

• On 21st July 2009, 65 debris flows and 105 slope failures occurred in Yamaguchi Prefecture.
• 14 people died as a result of these mass movements.
• The time series of 60-min rainfalls and soil–water index, the timings of occurrence of debris flows and slope failures, and the period of early-warning information issue are shown in the left figure.
• The progress of the snake line and the timing of the disasters (red box) in the damaged area are shown in the right figure.





The disasters occurred when the snake line exceeded the CL and went into the danger range
→CL adequately captured the timing of these disasters occurrences

Thank you for your attention

Erosion and Sediment Control Division
National Institute for Land and Infrastructure Management

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Ⅴ-7. Lecture
"ITS Deployment in Japan"

Mr. Fumihiko KANAZAWA

The 19th Conference on Public Works Research and Development in Asia
Session on Intelligent Transport Systems
November 18th, 2010

SMARTWAY

ITS Deployment in Japan

November 2010

Fumihiko KANAZAWA
Intelligent Transport Systems (ITS) Division,
National Institute for Land and Infrastructure Management (NILIM)
Ministry of Land, Infrastructure, Transport and Tourism (MLIT), JAPAN

Definition of Smartway

Definition of Smartway

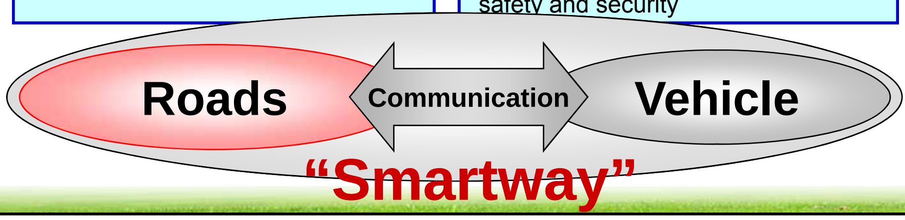
Smartway: a road system which can exchange various types of information among cars, drivers, pedestrians, and other roadway users.

Foundation for the deployment of various ITS services

- Realize integrated ITS to provide safe, smooth road transportation and positive environment.

Foundation for affluence and comfort in life and society

- Realize efficient mobility for people, goods, and information
- Realize comfortable living spaces
- Build infrastructure that provides safety and security



1

Joint Research by Public-private Collaboration

Smartway Project Advisory Committee established as the core of industry-academia-government collaboration (2000)

Smartway Project Advisory Committee

• Proposals based on social and technical trends

Working groups under the Smartway Project Advisory Committee

Smartway Partner Council

• Private companies and organizations

• Joint research on the Next-generation road service system (2005-2008)

• Public-private joint research with 23 companies

• Joint development of roadside equipment and onboard units

2

Hisory towards nationwide deployment

• "ITS Enter the Second Stage: Smart Mobility for all"

(A proposal by Smartway Project Advisory Committee: Aug. 2004)

• Public-Private Joint Research

(Drafting of technical specification)

• The Smartway open trial Demo 2006

(Tests on NILIM's test course: Feb, 2006)

• Publication of technical specifications

• Smartway 2007 Demo & ITS Safety 2010

(Tests and demonstration on public roads)

• Nationwide deployment

3

Development of Service Application

- Categorization of problems to be solved
- Service definition
- Setting service evaluation index and method

  → Development of service applications

↓

- Tests using driving simulators

↓

- Driving tests on test course

↓

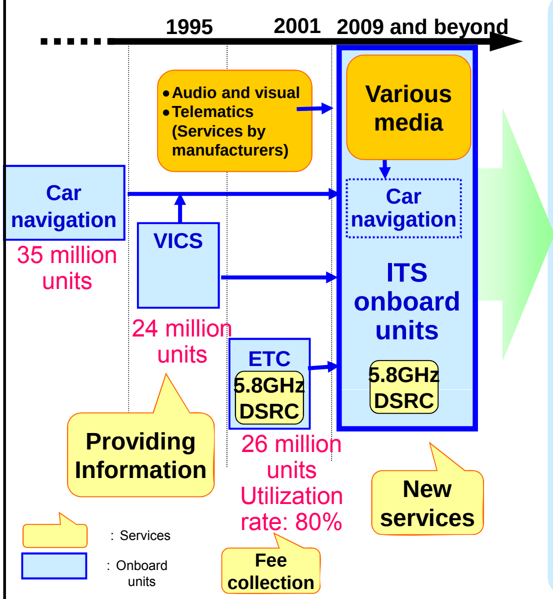
- System verification tests on public roads

↓

- Driving tests on public road

4

Various Services with Open Platform



<Various applications>

- ◆ Providing wide area traffic information
- ◆ Providing traffic information in easily understandable audio form
- ◆ Providing information to support safe driving
- ◆ Providing information at parking areas, and rest areas

\+

ETC

\+

Private sector services

- ◆ Providing information based on requests
- ◆ Cashless payments

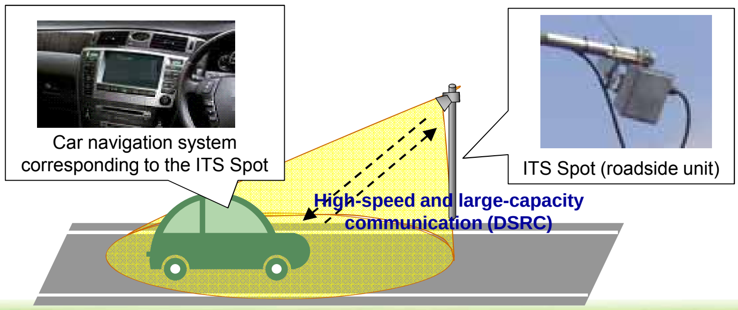
5

Expansion of Next-Generation ITS

- Car Navigation system and ETC evolve and integrate, then various services will be realized all in one.
- These services are realized by the high-speed and large-capacity communication (5.8GHz DSRC) between the "ITS Spot" installed on the roadside and the in-vehicle car navigation system corresponding to the ITS spot services
- Various services such as providing wide-area traffic information or image are realized by the high-speed and large-capacity communication

Car navigation system corresponding to ITS spot services have been released on October 2009

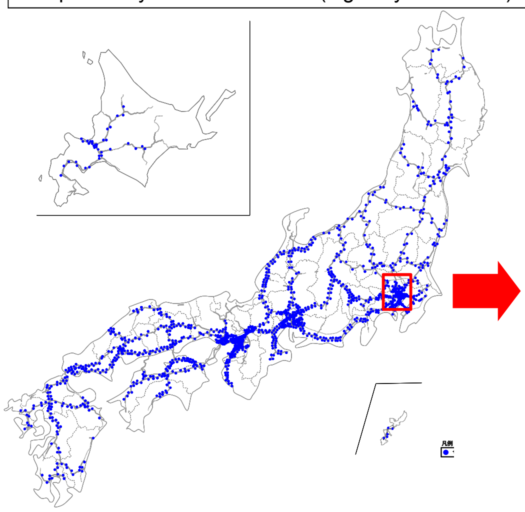
ITS spots are deployed nationwide (around 1,600 units are installed mainly on expressways)



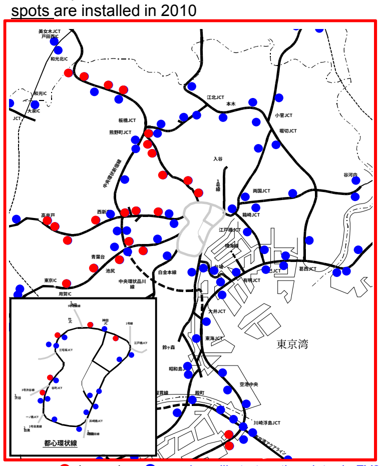
6

Deployment of ITS Spots

- Around 1,600 ITS spots are installed mainly on the expressways nationwide
- Around 50 ITS spots are installed at the expressway rest areas including Tomei and Meishin Expressway and Michi-no-Eki (highway rest areas).



For example, on the Tokyo Metropolitan Expressway, 32 ITS spots are installed in FY2009, and 166 ITS spots are installed in 2010



ITS Spot will be installed around every 10 -15 km including the points of before Junction (around 90 points) on the intercity expressways and around every 4 km on the urban expressways

●: in service ●: service will start on the winter in FY2010

7

State of Release of Car Navigation System Corresponding to ITS Spot

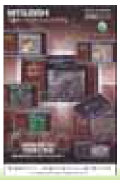
- 5 manufacturers release car navigation system corresponding to ITS Spot (as of June 2010)
- Around 10 million units will be shipped in 5 years (estimated by ITS Japan)

Toyota [released on October 2009]

Pioneer [released on October 2009]

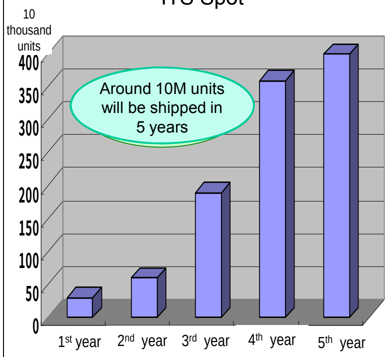
Panasonic [released on March 2010]

Mitsubishi Electric Co. [released on October 2009]



Mitsubishi Heavy Industries [released on March 2010]

Popularization Estimate of Car Navigation System Corresponding to ITS Spot



Source: ITS Japan

New Smartway services (ITS Spot Services) will be launched for comfortable and safety driving.

ITS Spot Services will be launched after winter of 2010.

- ITS Spot services include three basic services.

Three basic services

[Dynamic route guidance] Smarter route guidance considering wide area road traffic data

[Safety driving support] Preventing from scaring drivers by previous cautions

[ETC] Electronic Toll Collection

Other services

- Access to the Internet at highway rest areas (accepted by some car navigation products)
- Update digital road map database in car navigation system

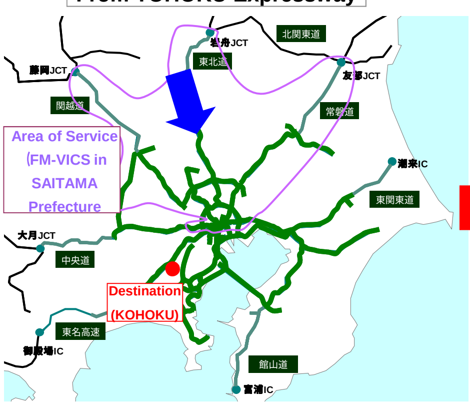
- More additional services including fee settlement, sightseeing guidance and commercial vehicle support will be deployed in the future.

【Dynamic Route Guidance】 Providing travel time data of broad area

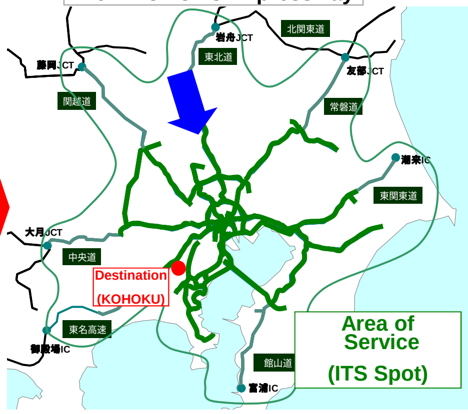
○ Required travel time data of the entire metropolitan areas is provided to enable car navigation systems to determine the optimum route with real time data.

○ Road networks can be utilized effectively.

From TOHOKU Expressway



From TOHOKU Expressway



About 830 km inside of Kenoudou Expressway

【Assisting safety driving】 Reducing close-call experiences by alerting drivers in advance

○ Though ITS Spot usually provides road traffic information, in unusual case, ITS Spot provides safety driving support information with considering road conditions.

Cautions of obstacle on road

★On the Metropolitan Expressway, about 50,000 obstacles are found every year.

(on average, 140 per day and one in 10 minutes)

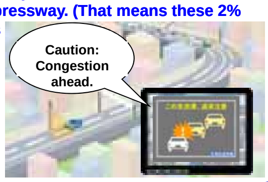
★TMC broadcasts caution simultaneously

(Cautions are provided previously)

Caution to notify traffic congestion beyond

★Traffic accidents occurring in only 2% of length of the Metropolitan Expressway account for about 20% of all accidents on the expressway. (That means these 2% sections

★60% of rear-end type collisions have been reduced at Sangubashi Curve.

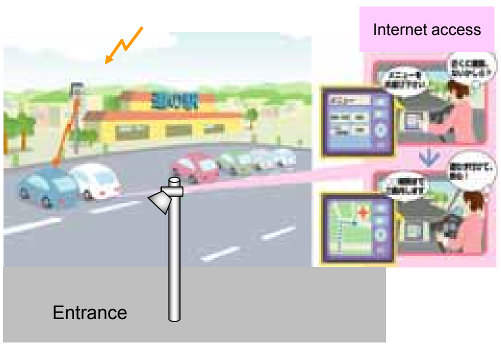


Providing still images of snow, fog and other weather hazards or traffic congestion in tunnels.

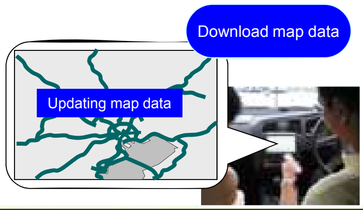
Internet Access in Highway Rest Areas (accepted by some car navigation products)

- Access the Internet via car navigation system in highway rest area
- Enable to update digital road map database in car navigation system

Function



Examples



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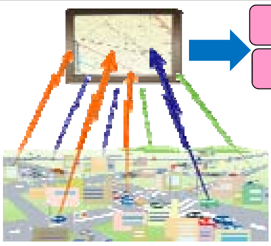
Collection of Probe Data

○ Collection of probe data* from vehicles will enable you to comprehend and to provide detailed and high accurate traffic information.



Providing Road Traffic Information

Managing roads and traffic

***Probe data: vehicle position and speed data which were acquired when each vehicle travelled**

Additionally
○ **Make levels of route services transparent in good accuracy**
○ **Grasp tasks in local transportations accurately then take advantage of it to low cost and efficient measures**

【 Conventional observation methods 】		[Continuous high-accuracy observation by ITS】
Speed: Point survey of travel speed	→	Speed：Collecting travel time data in survey section
Traffic volume: Manual traffic count survey Every-five-year Road Census (one-day survey in autumn)	→	Traffic volume：365-day 24 hours observation Use of traffic counters

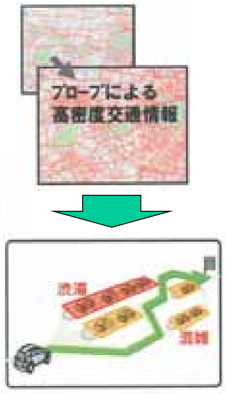
13

Expansion of ITS in the Future (Utilizing Probe Data)

■Utilize probe data for collecting and analyzing traffic flow information

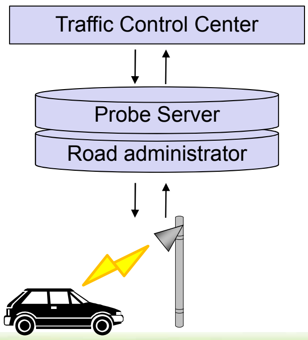
- ･Effective road plan
- ･Performance Measurement
- ･Information Provision for avoiding traffic jam
- ･Bus location system

High density traffic information using probe data

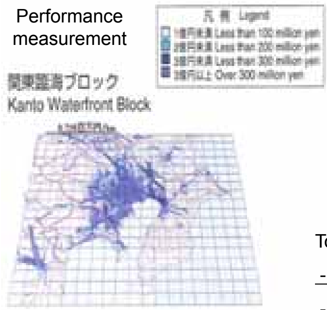


⇒ •High-developed operation and Management of road services

•Reduction CO2 emission and energy saving as optimizing traffic flow in the road network



Performance measurement



To use optimal route,

- 20% cut down travel time

- 17% cut down CO2 emission

Source: ITS Handbook

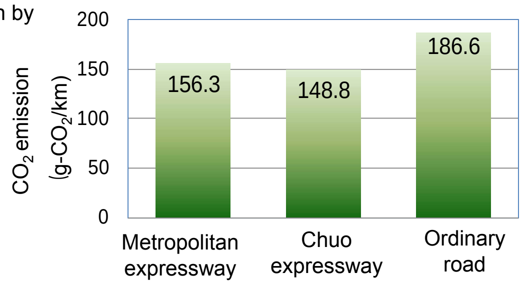
Source: Nissan

Expansion of ITS in the Future (Example of Utilizing Probe Data)

- Travel record of a vehicle installed an ITS on-board unit is acquired
- CO2 emission is calculated by a travel record

Calculation each route is possible (for example, each of urban expressways, intercity expressways, ordinary roads)

[CO_2 emission by each road]



[The calculation formula of the CO2 emission]

A gasoline-powered car (kg CO2) = d{2019/v - 2.087v + 0.01865v2 + 156.05}

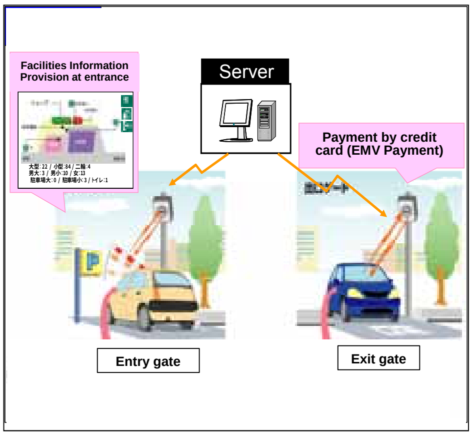
v: Average travel speed (km/h) d: distance (km)

The source：Fuel consumption rate in the vehicle travel and CO2 emission coefficient, Engineering works technical documentation 43-11(2001)

【Future Service】 Utilizing Open Platform

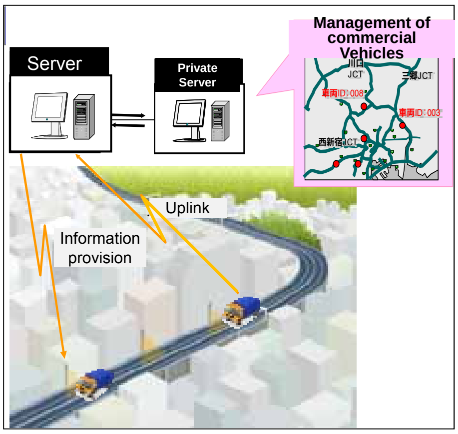
- ○ Public private joint services using networked ITS Spots (such as payment sightseeing guidance and logistics support)
- ○ Promotion of public-private joint research

Paying by credit card while in the vehicle



○Under establishing the standards of payment services

Utilizing management of commercial vehicles



○Under establishing data formats

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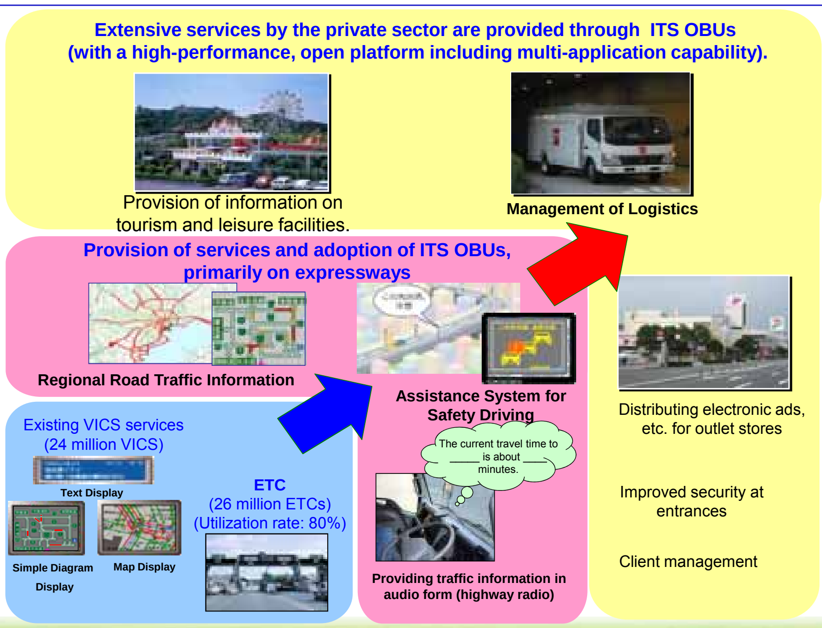
Deployment of Smartway Services



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Thank you for your attention
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Ⅴ-8. Lecture

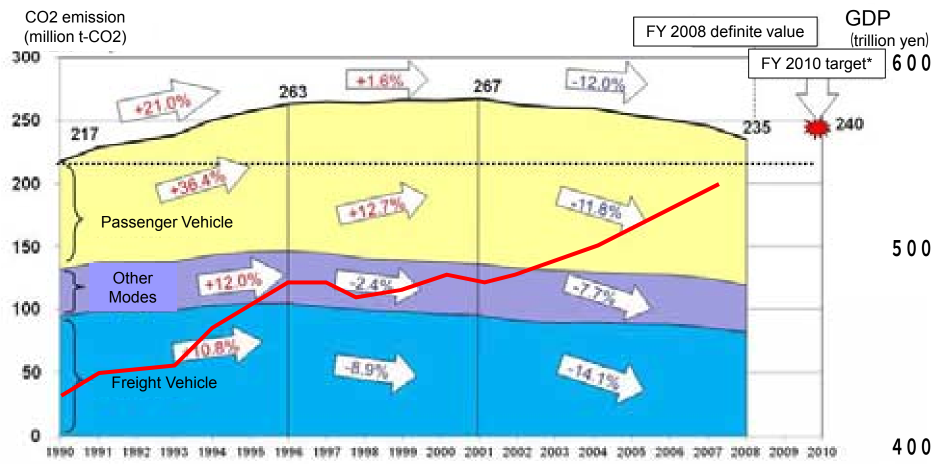
"Actions of road traffic measure to contribute reduction Greenhouse Gas from transport section and improvement of air quality on roadside in Japan"

Mr. Manabu DOHI

1. Reduction Green House Gas from transport section

(1) CO_2 emission from transport section in Japan

- CO_2 emissions from transport have been decreasing after peaking in FY 2001(-12%).
- GDP has increased 11% from FY 2001 to FY 2007.



Other modes : bus, taxi, railway, ship, aviation

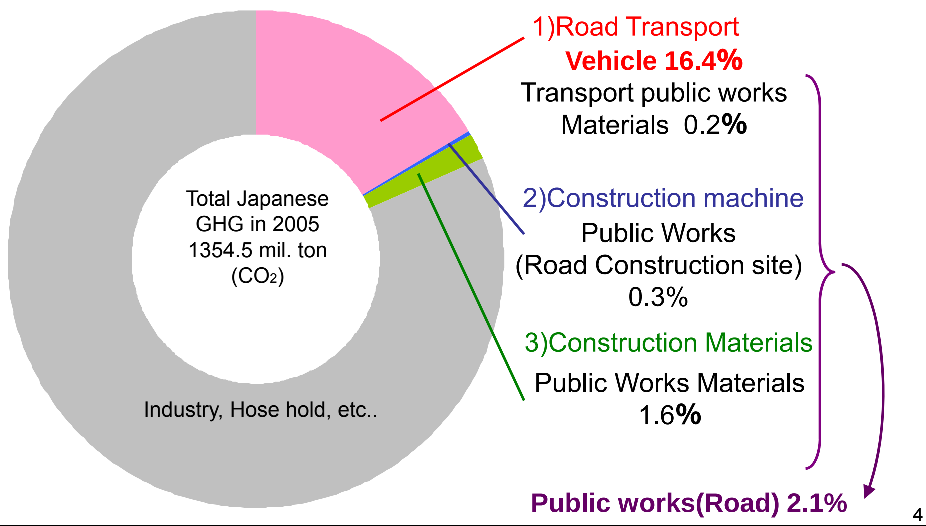
* FY 2010 target, the best-case figure under the Kyoto Protocol Target Achievement Plan (March 28, 2008 by cabinet resolition).

3

1. Reduction Green House Gas from transport section

(1) CO_2 emission from transport section in Japan

- 16% of CO2 emission is from Road Transport,
- 2% of CO2 emission is from Public Works(Road)



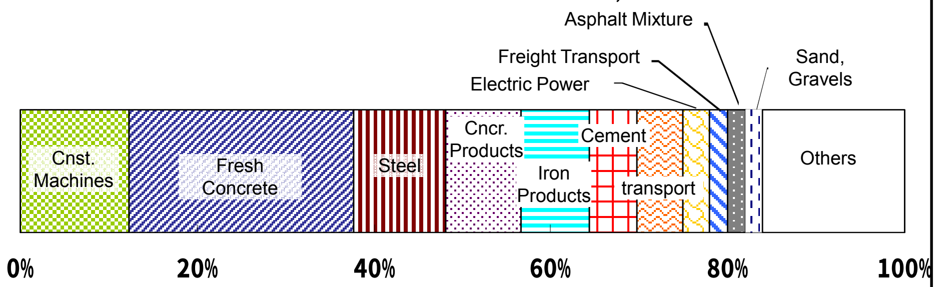
4

1. Reduction Green House Gas from transport section

(1) CO_2 emission from transport section in Japan

- Mainly from Cement and Steel
- LCCO2 is important

in Road Related Public works, 2005



1. Reduction Green House Gas from transport section

(2) Law system about prevention of global warming in Japan

○Law concerning the promotion of the measures to cope with global warming
- Setting of "Kyoto Protocol Target Achievement Plan"
- Requires enterprises with more than certain scale to report GreenHouse Gas emission

<Aim of CO2 emission reduction by sector based on Kyoto Protocol Target Achievement Plan>

	Base year	FY 2010 emission yardstick	
	Million t-CO2	Million t-CO2	Total emissions vs. base year
Energy CO2 emissions	1,059	1,079～1,089	1.3%～+2.3%
Industrial	482	424～428	-4.6%～-4.3%
Clerical and other	164	208～210	+3.4%～+3.6%
Household	127	138～141	+0.9%～+1.1%
Transport	**217**	**240～243**	**+1.8%～+2.0%**
Energy conversion	68	66	-0.1%
Non-energy CO2/CH4/N20	151	132	-1.5%
Three gases (e.g. HCFC)	51	31	-1.6%
Total greenhouse gas emissio	1,261	1,239～1,252	-1.8%～-0.8%

Greenhouse gas reductions at left, including carbon-sink measures and Kyoto mechanisms, will work to meet the Kyoto Protocol's obligation for a 6% reduction.

Road measures on emission reduction in the Kyoto effort：Targeted reduction 4+ million ton

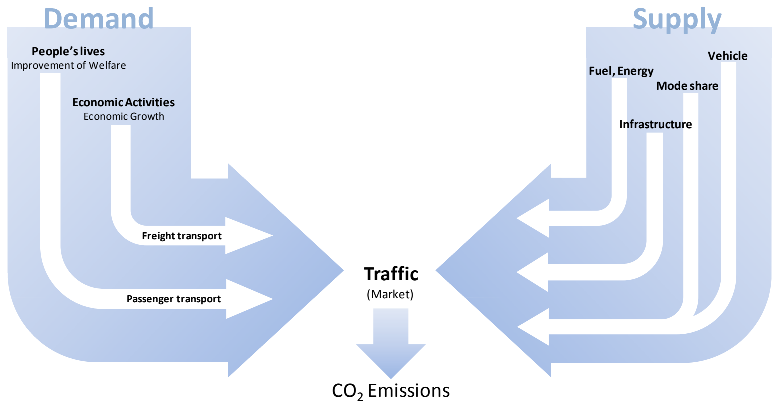
1. Various and flexible discount for expressway use: 0.2+ million ton
2. Development for better bicycle use: 0.3 million ton
3. Promotion of ITS including ETC and VICS: 2.6 million ton
4. Reduction of road work: 0.7 million ton
5. More efforts on eliminating bottleneck railroad crossings: 0.2 million ton

In addition,
- More environmentally vehicle
- Modal shift
(More use of public transportation)
- Smoother traffic flow
- More efficient logistics, etc.

1. Reduction Green House Gas from transport section

(3) Basic Idea of CO2 emission reduction from road traffic

- Demand : Traffic closely concerns to economy and life of people
- Supply : Mode share, Infrastructure, Vehicle and Fuel affect on traffic condition



CO_2 Emissions = Activity (passenger, freight) x Mode Share x Efficiency (tank to wheel, traffic efficiency) x Fuel carbon content (well/field to tank)

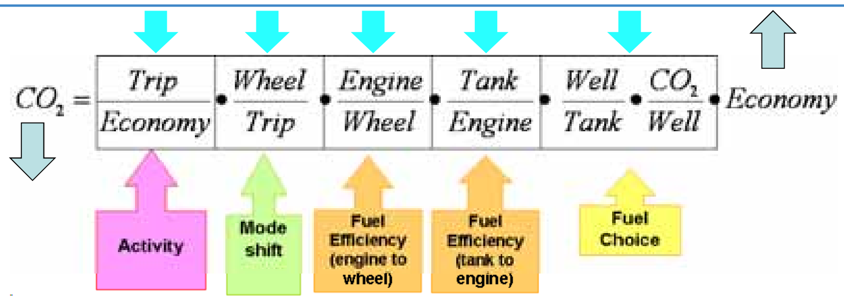
Source : OECD/International Transport Forum, REDUCING TRANSPORT GHG EMISSIONS Opportunities and Costs
URL:http://www.internationaltransportforum.org/Pub/pdf/09GHGsum.pdf

7

1. Reduction Green House Gas from transport section

(3) Basic Idea of CO2 emission reduction from road traffic

- Every Sector improve their indicators
- Reduction of GHG in not only for Vehicle Sector, but also for Road administration sector



Each Clause	Image of Clause	Example of Reduction measure
Trip / Economy	Traffic Demand with Economic Activities	Compact City, Car sharing
Wheel / Trip	Modal share	More use of public transportation
Engine / Wheel	Improve of Traffic Efficiency	Smoother traffic flow
Tank / Engine	Improve of Transportation Efficiency	Improved fuel economy of individual car
Well / Tank・CO2 / well	Fuel Choice	Hybrid vehicle, Electric vehicle

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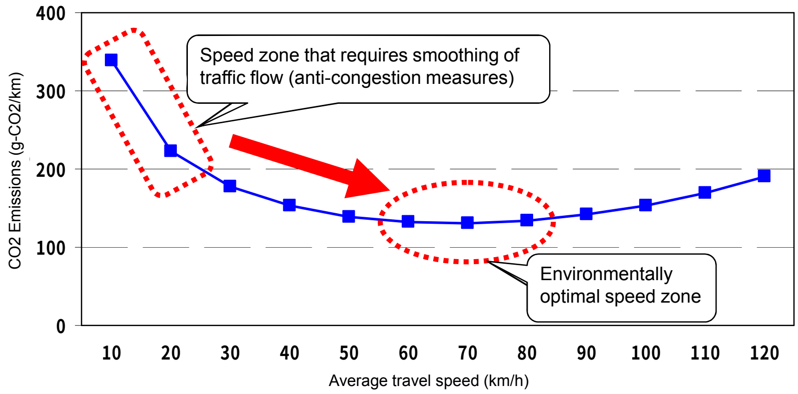
1. Reduction Green House Gas from transport section

(3) Basic Idea of CO2 emission reduction from road traffic

- Accouding to relationship between travel speed and CO2 emissions, CO2 emissions are higher in low-speed and decrease as travel speed increases.
- So, on congested roads, traffic flow smoothing to move traffic to optimal speed zones is an effective means of reducing CO2.



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2. Improvement of air quality on roadside

(1) History of Air Pollution in Japan

1) About 1885 : Ashio Copper Mine Mineral Pollution Incident
Farmland pollution by Cu included effluent, Lacked forest by poisonous gas, so efficient of soil collapse and flood expansion

2) 1950 - 1970 (high economy growth period in Japan)
Break out Four serious environmental pollutions :
Minamata Disease, Niigata Minamata Disease, Itai-Itai Disease (Water pollution by caused Hg or Cd included factory effluent) ,
Yokkaichi Asthma (Air Pollution by caused SOx discharge from petrochemical complex, Healthy influence on respiratory systems such as asthma)
So, in 1967 Japan established Basic Law for Environmental Pollution (Current Environmental Basic Law), and Introduced of air quality standard and regulation regarding factory effluent gas and automobile emissions etc.

3) 1970 – 2000 :
Occur several lawsuit about air pollution on roadside,
Inhabitants are concerned about healthy influence by caused automobile emission (NOx, PM)
Now Nation reach reconciliation with plaintiff, but carries out meetings about improvement action several times a year.

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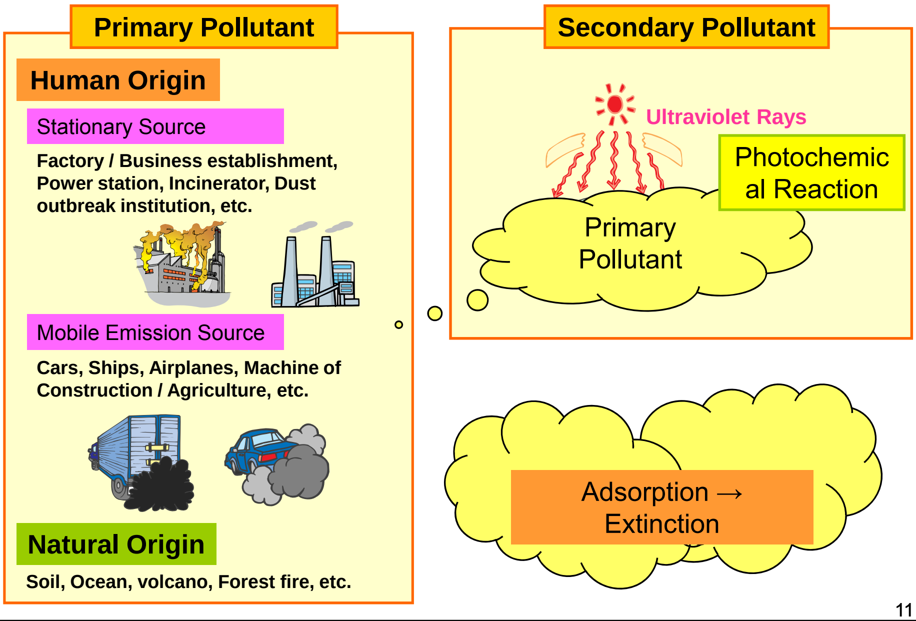
2. Improvement of air quality on roadside

(2) Discharge process of air pollution material



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2. Improvement of air quality on roadside

(3) Law system about Air pollution in Japan

○Basic Environmental Law
- Typical 7 environmental pollution (Air pollution, Water pollution, Soil Contamination, Noise, Vibration, Ground Subsidence, Offensive odor)
- Regulates environmental quality standards regarding air quality

○Air Pollution Control Law
- Regulates maximum permissible limits of motor vehicle exhausts
- Regulates maximum permissible limits on the quality of automobile fuel and on the quantity of substances in automobile fuel
- Requires local governments to monitor constantly and report the level of the air pollution

○Law Concerning Special Mesures for Total Emission Reduction of Nitrogen Oxides and Particulate Matter (Automobile NOx PM Law)
For areas where air pollution is remarkable (three major urban areas),
- Requires prefectural governors to formulate total emission reduction
- Regulates more intensive limit of motor vehicle exhausts
- Requires enterprises with more than a certain number of vehicles to submit emission reduction plans

○Environmental Impact Assessment Law
○Law Concerning Pollution-Related Health Damage Compensation

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2. Improvement of air quality on roadside

(4) Standard and Achievement about air quality in Japan

Substance	Year Started Standard	Environmental conditions	Achieve ratio of Standard (2008) General Monitoring Station	Achieve ratio of Standard (2008) Roadside Monitoring Station
Sulfur dioxide **(SO2)**	1973	Daily average for hourly values shall not exceed 0.04 ppm, and hourly values shall not exceed 0.1 ppm	99.8 % 1,169st. / 1,171st.	100 % 72st. / 72st.
Nitrogen dioxide **(NO2)**	1973 1978Update	Daily average for hourly values shall be within the 0.04-0.06 ppm zone or below that zone	100 % 1,366st. / 1,366st.	95.5 % 402st. / 421st.
Suspended Particulate Matter **(SPM)**	1973	Daily average for hourly values shall not exceed 0.10 mg/m³, and hourly values shall not exceed 0.20 mg/m3	99.6 % 1,416st. / 1,422st.	99.3 % 400st. / 403st.
Carbon monoxide **(CO)**	1973	Daily average for hourly values shall not exceed 10 ppm, and average of hourly values for any consecutive eight hour period shall not exceed 20ppm	100 % 73st. / 73st.	100 % 276st. / 276st.
Photochemical oxidants **(Ox)**	1973	Hourly values shall not exceed 0.06 ppm	0.1 % 1st. / 1,148st.	0 % 0st. / 30st.
particulate matter less than 2.5μm **(PM2.5)**	2009	Annual average shall not exceed 15μg/m³, and daily average shall not exceed 35μg/m³	During construction of Monitoring System	

※In additions, There are Standard of Benzene, Trichloroethylene, Tetrachloroethylene, Dichloromethane, Dioxins.

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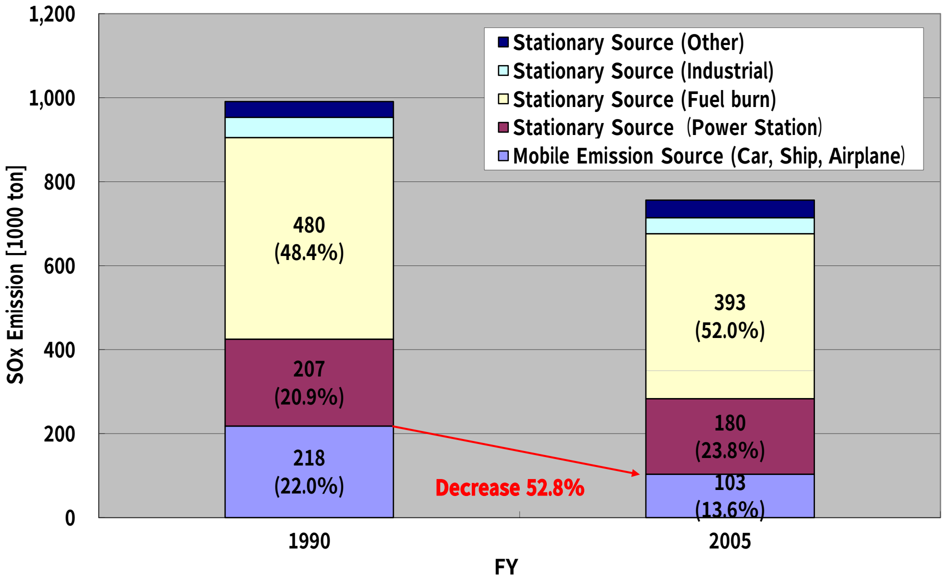
2. Improvement of air quality on roadside

(5) SOx (Discharge situation by source)



データ出典：OECD, OECD Environmental Data Compendium 2006/2007, Air

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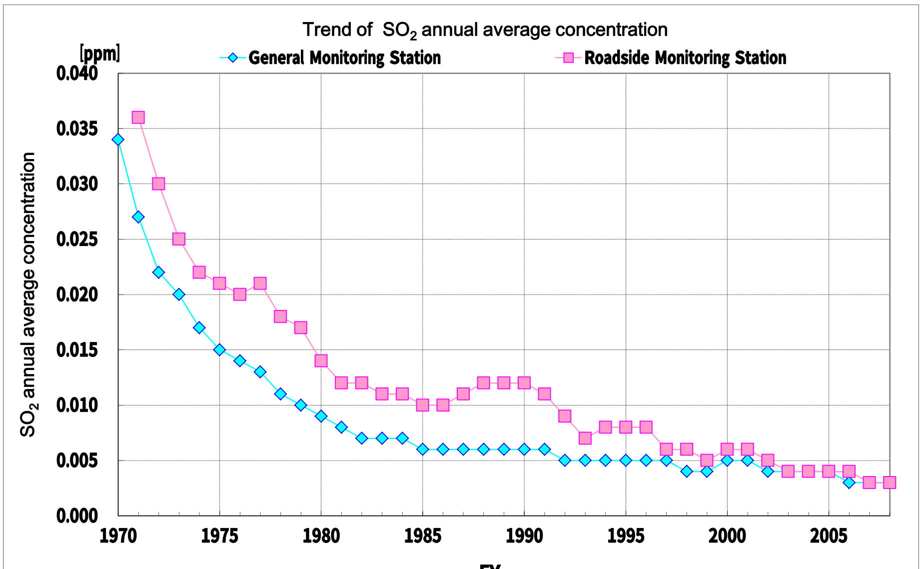
2. Improvement of air quality on roadside

(5) SO_2 (Trend of annual average concentration)



Reference: "Air quality Condition" MOE website

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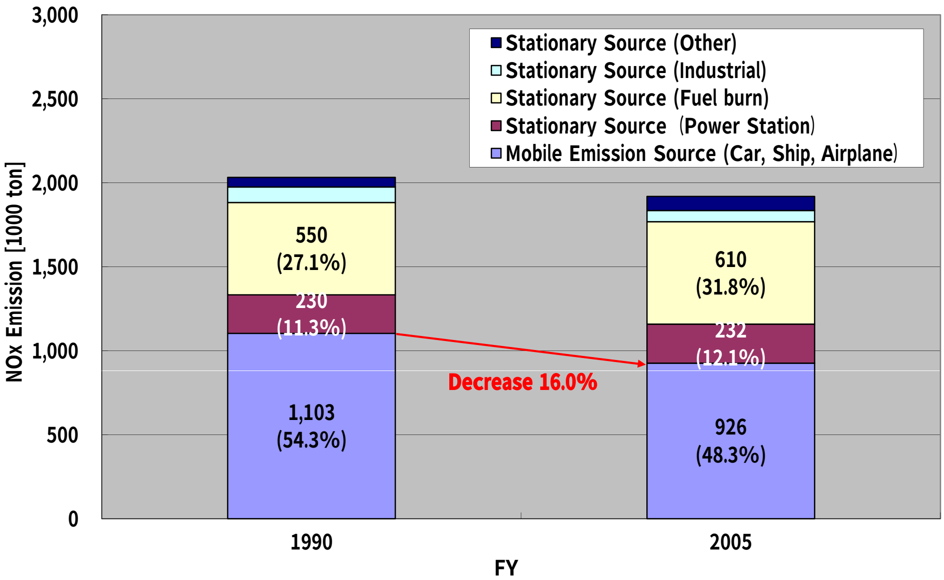
2. Improvement of air quality on roadside

(6) NOx (Discharge situation by source)

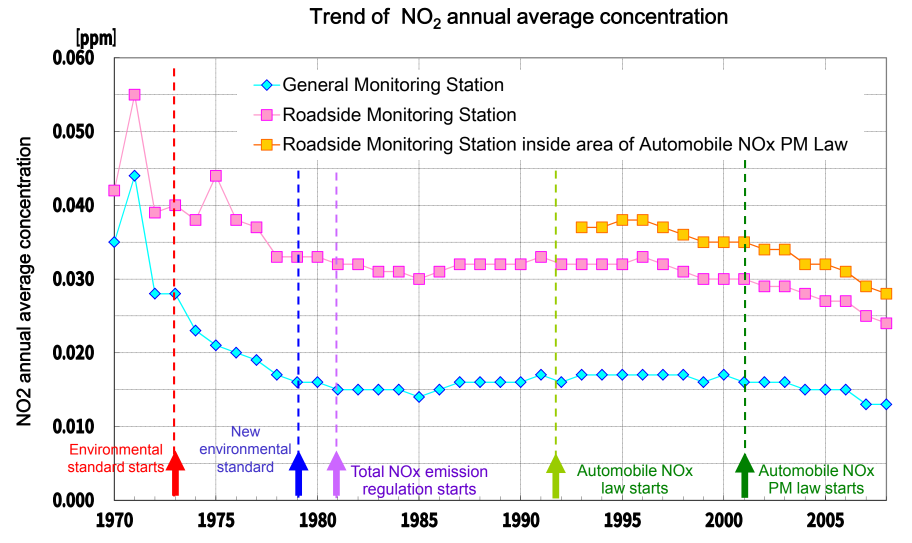


データ出典：OECD, OECD Environmental Data Compendium 2006/2007, Air

16

2. Improvement of air quality on roadside

(6) NO_2 (Trend of annual average concentration)

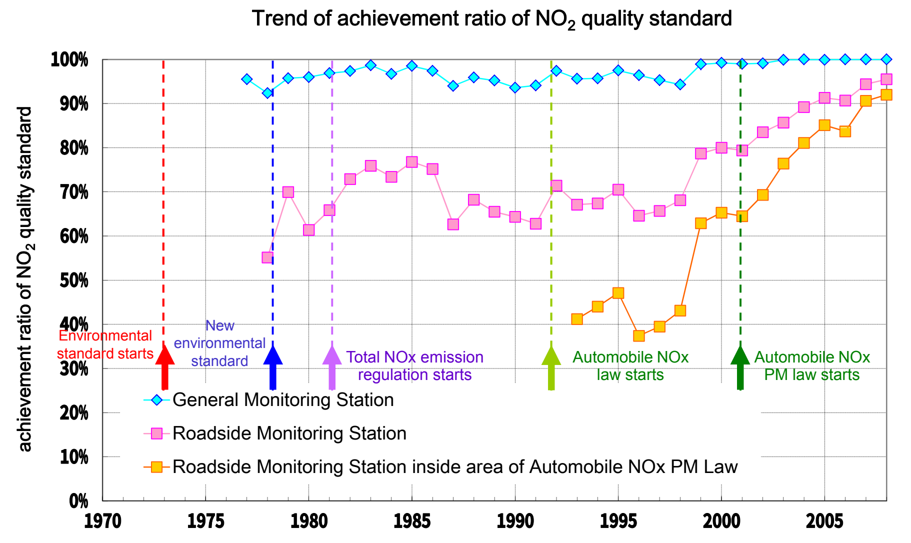


Reference: "Air quality Condition" MOE website

17

2. Improvement of air quality on roadside

(6) NO_2 (Trend of achievement ratio of standard)



Reference: "Air quality Condition" MOE website

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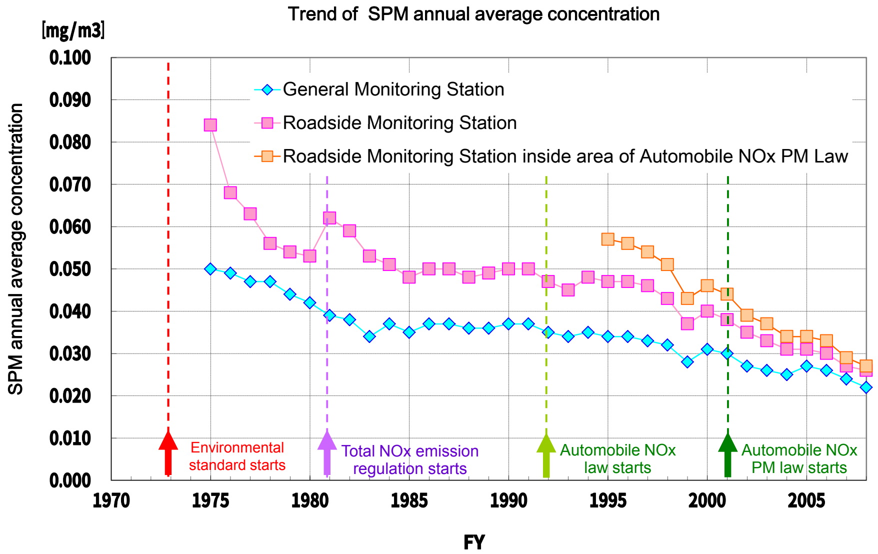
2. Improvement of air quality on roadside

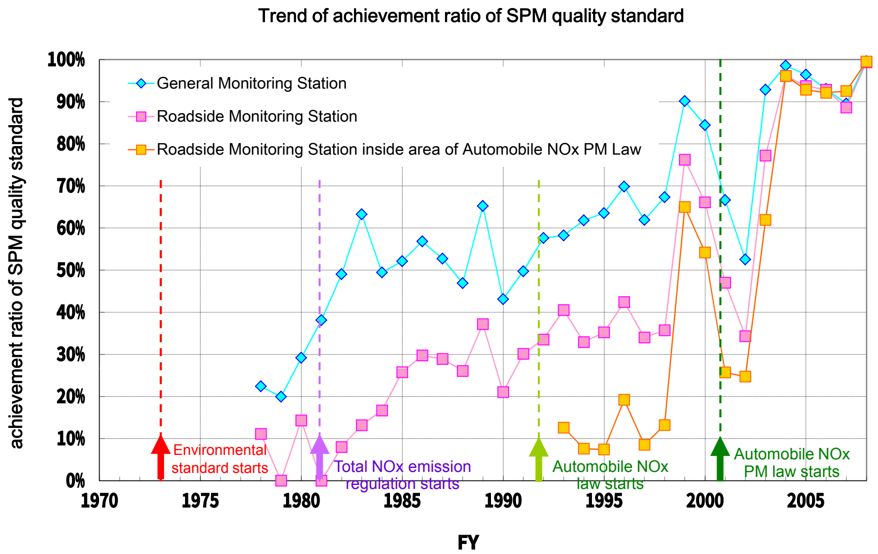
(7) SPM (Trend of annual average concentration)



Reference: "Air quality Condition" MOE website

2. Improvement of air quality on roadside

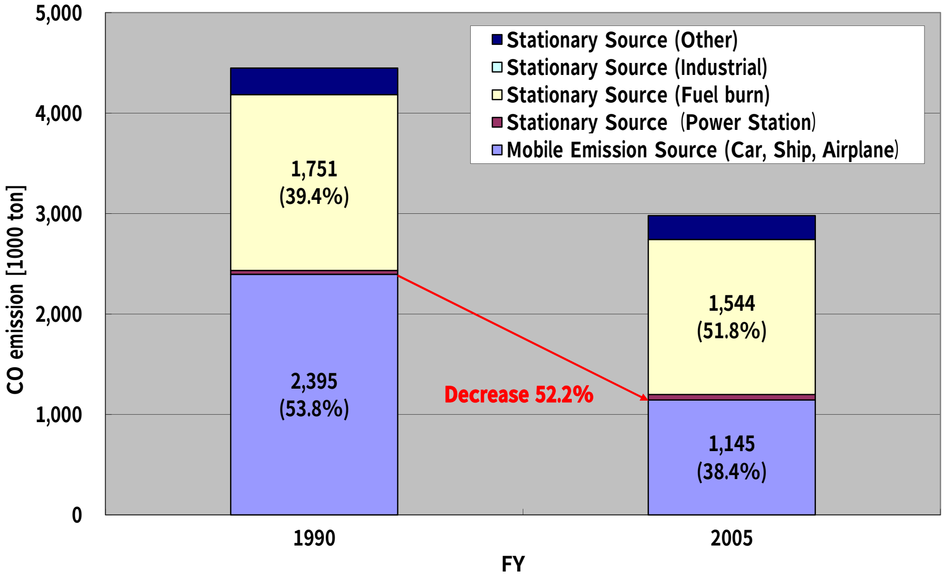
(7) SPM (Trend of achievement ratio of standard)



Reference: "Air quality Condition" MOE website

2. Improvement of air quality on roadside

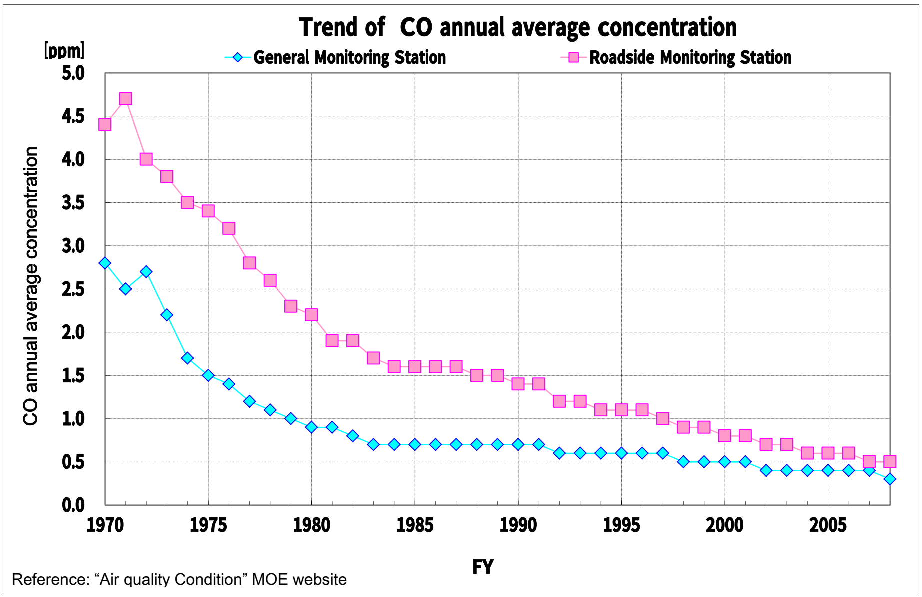
(8) CO (Discharge situation by source)



データ出典:OECD, OECD Environmental Data Compendium 2006/2007, Air

2. Improvement of air quality on roadside

(8) CO (Trend of annual average concentration)

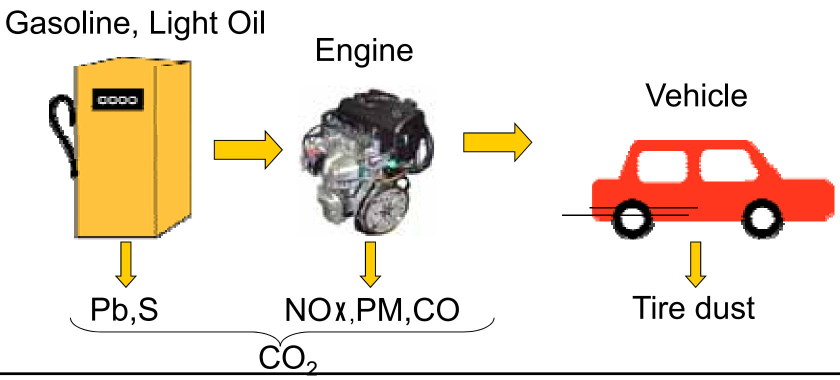


Reference: “Air quality Condition” MOE website

2. Improvement of air quality on roadside

(9) Basic Idea of improvement of air quality on roadside

- Basic idea is to restrain emissions in outbreak source.
- Factor of air pollution is lead (Pb) of gasoline, sulfur (S) of light oil and nitrogen oxide (NOx) , particulate matter (PM) , carbon monoxide (CO) occurring by engine combustion process. So regulations regarding these matters strengthen step by step after 1970's.
- Dust pollution of spike tire is recognized as a social issue in snow areas, so prohibited from sale in 1991.



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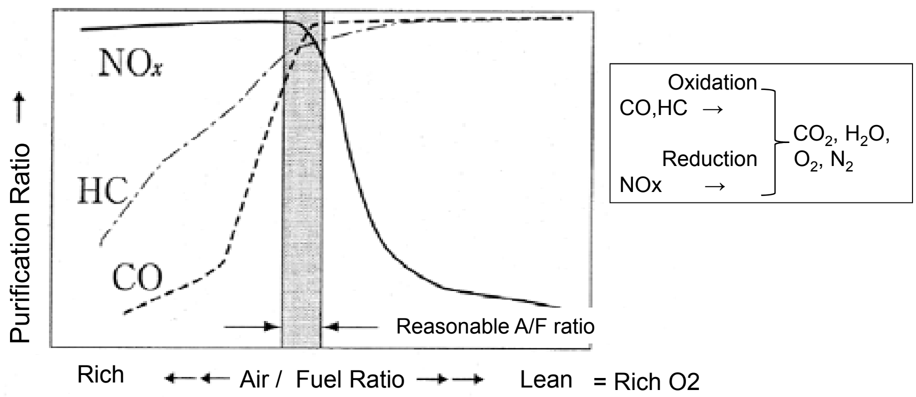
2. Improvement of air quality on roadside

(9) Basic Idea of improvement of air quality on roadside

- In exhaust purification, it is necessary to control air fuel ratio adequately.



Purification characteristic of Three-way Catalyst to reduce emissions

Source : The Handbook regarding Automobile Techunology, Japan Automobile Manufactures Association, Inc.

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3. (1) Improved fuel economy of individual car

1) Higher fuel efficiency standards

- Fuel economy’s standard of Gasoline passenger vehicle are intorduced in 1985, and strengthen step by step.
- About other car types, similar standard are introduced gradually.
- Japan adopt Top Runners Approach on discussion of fuel economy standard.

<History of fuel economy standard>

1979 :
Establish of Law Regarding Rationalization of Energy Use
Settle of Standard in 1985 for Gasoline passenger vehicle

1993 :
Settle of Standard in 2000 for Gasoline passenger vehicle

1996 : Settle of Standard in 2003 for Gasoline truck

1998 : Amendment of Law Regarding Rationalization of Energy Use, Introduction of Top Runners Approach

1999 : Settle of Standard in 2005 for Diesel passenger vehicle and truck, Standard in 2010 for Gasoline passenger vehicle and truck

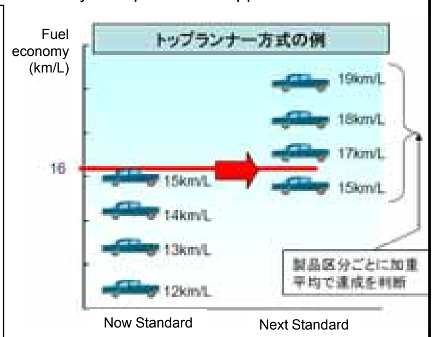
2003 : Settle of Standard in 2010 for Liquefied Petroleum Gas vehicle

2006 : Settle of Standard in 2015 for truck and bus

2007 : Settle of Standard in 2015 for passenger vehicle and small bus and truck

2010 : Now discussing Standard in more future

<Summary of Top Runners Approch>



Source : MLIT website

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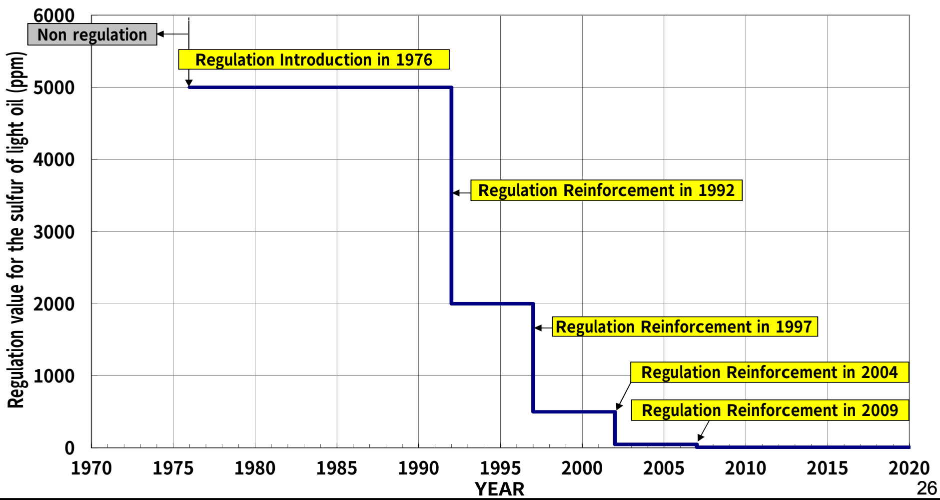
3. (1) Improved fuel economy of individual car

2) Regulation of Surfur in Light Oil

- About sulfur content in light oil, Japan reinforce step by step after regulation introduction in 1976. (2007’s content is about one-500th of 1978’s.)
- About lead of gasoline, Japan realize completely lead-free by 1987.



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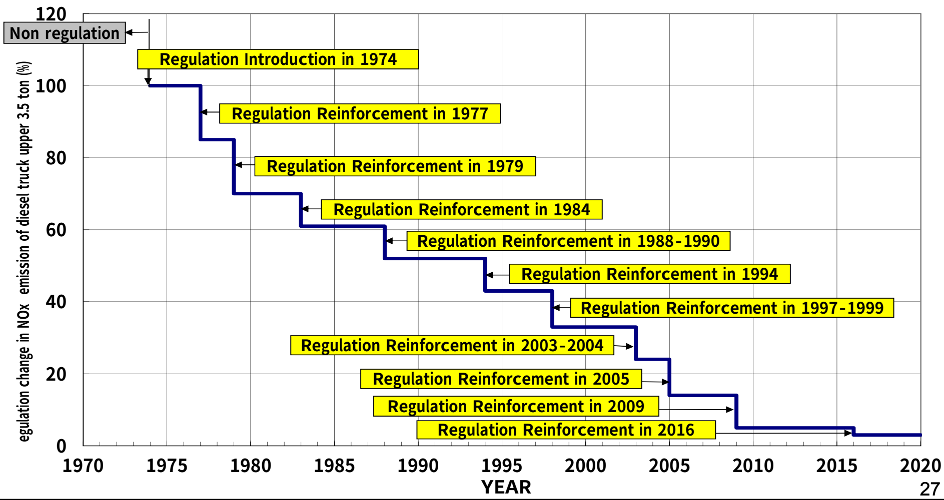
3. (1) Improved fuel economy of individual car

3) Regulation of car emissions (NOx, PM, etc.)

- About NOx emissions of Diesel large vehicle, Japan reinforce step by step after regulation introduction in 1974. (2016's value is about three-100th of 1974's.)
- About other car types, similar standard are introduced gradually.

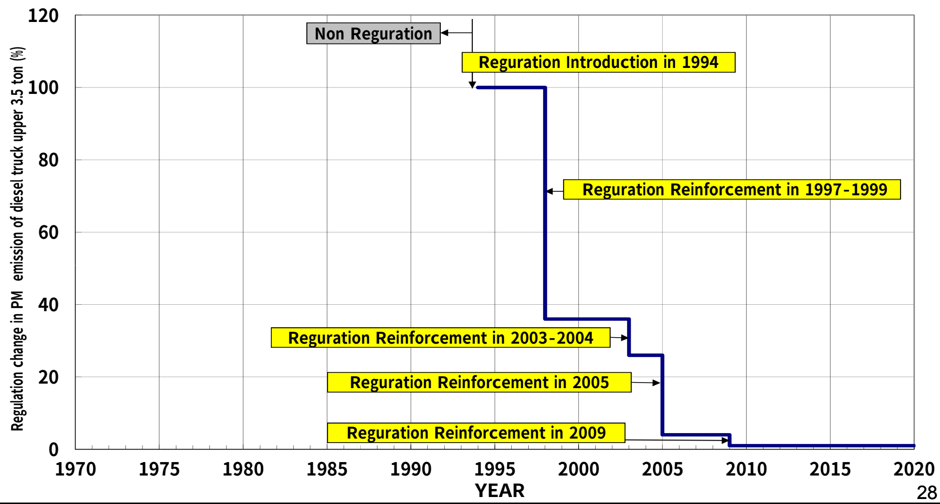


27

3. (1) Improved fuel economy of individual car

3) Regulation of car emissions (NOx, PM, etc.)

- About PM emissions of Diesel large vehicle, Japan reinforce step by step after regulation introduction in 1994. (2016's value is about one-100th of 1994's.)
- About other car types, similar standard are introduced gradually.



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3. (1) Improved fuel economy of individual car

4) Development of Next-Generation Vehicles

- For middle long term, it is necessary to shift to positive use of high electric energy of energy efficiency from conventional fossil fuel.
〇So it is important that technology development and spread about new generation vehicles such as electric vehicle, plug-in hybrid vehicle, fuel-cell vehicle.

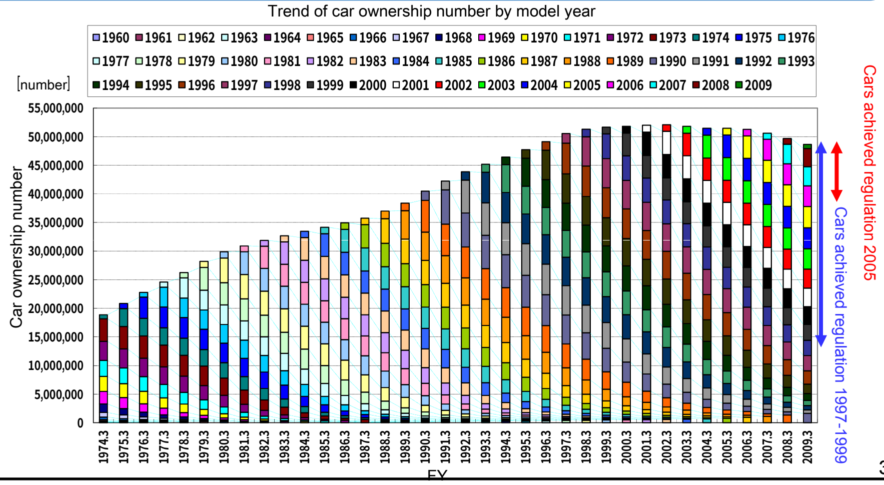
Source : Japan Automobile Manufactures Association, Inc. website 29

3. (1) Improved fuel economy of individual car

5) Promotion of spread about Eco-car

- Spread of vehicles satisfied latest emission reguration and fuel economy standards needs a long time, because replacement of vehicle is about 5-10 years.
- So diffusion rate of vehicle satisfied latest emission reguration conformity is about 20-30 percent in 2010.

Trend of car ownership number by model year



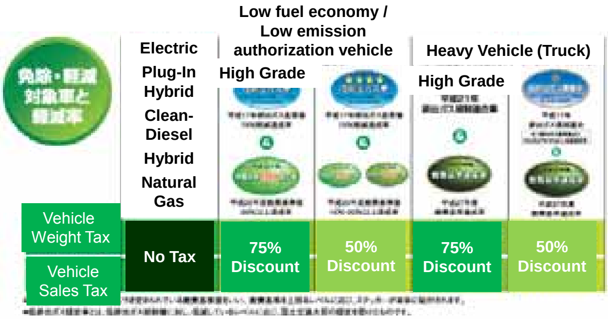
30

3. (1) Improved fuel economy of individual car

5) Promotion of spread about Eco-car

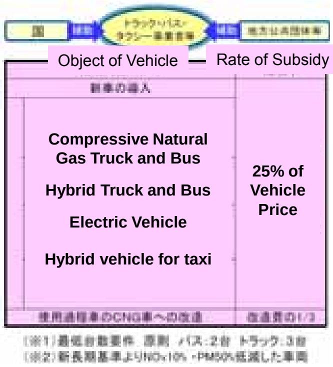
- To promote spread of eco-car, it is necessary courtesy to these.
- Japan intdoduced reduction of taxes and purchase subsidy for a period.

<Summary of tax reduction about eco-car>



Source : Japan Automobile Dealers Association website

<Summary of subsidy about eco-car to logistic enterprise>



Source : MLIT website

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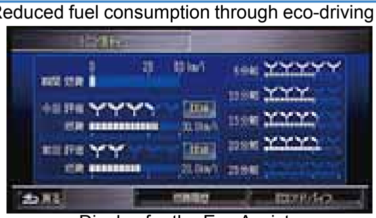
3. (1) Improved fuel economy of individual car

6) Eco-driving and other driving methods

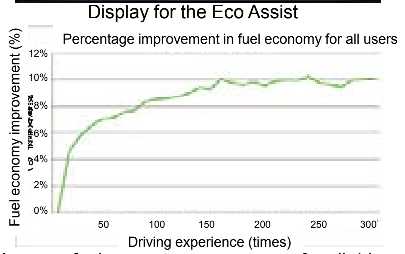
- Vehicle emissions change by characteristic of individual's driving and speed up-down.
- So it is effective to reduce of CO2 emissions that Accelerators gently, using engine braking, idling stop, etc.

＜Recommend about Eco-Driving＞

<Reduced fuel consumption through eco-driving >



Display for the Eco Assist



Average fuel economy improvement for all drivers

Source : Honda Motor Co., Ltd., website

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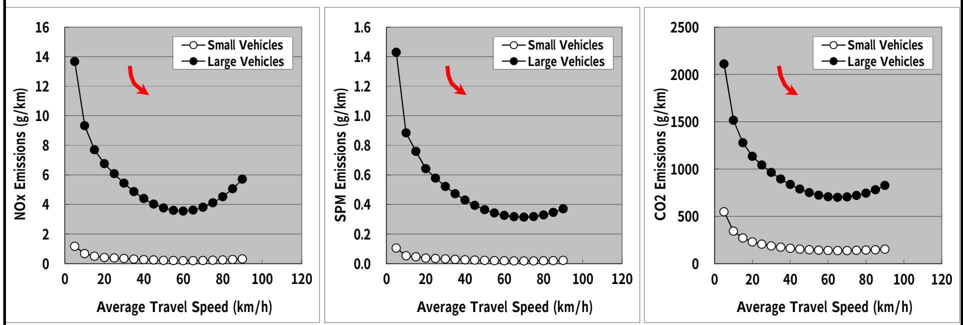
3. (2) Improved Traffic Flow

①Relation of travel and vehicle emission

- Vehicle emissions are higher in low-speed and decrease as travel speed increases, not only CO2 but also NOx and PM.
- So, on congested roads, traffic flow smoothing to move traffic to optimal speed zones is an effective means of reducing CO2 emissions and improvement air quality on roadside.

NOx PM CO2



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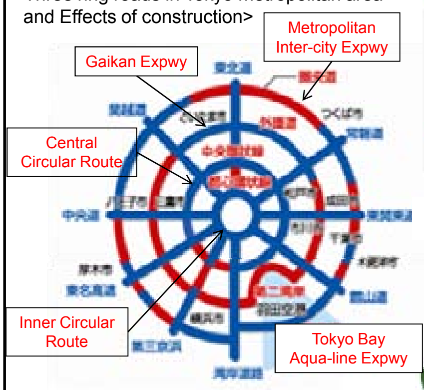
3. (2) Improved Traffic Flow

2) Construction of Ring Roads in Urban Areas and Bypass

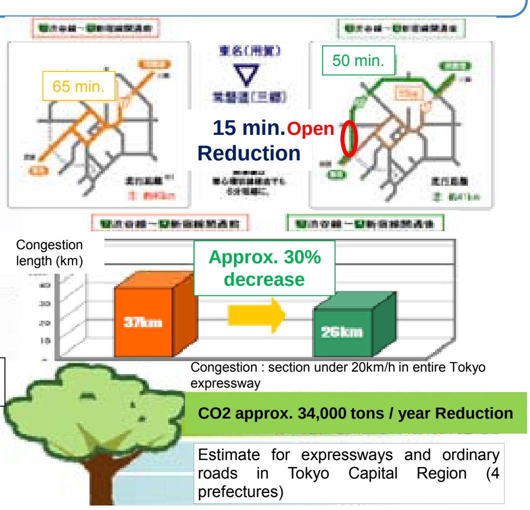
- Major cause of congestion in urban areas is traffic with no business in the city center. So ring roads contribute to rerouting of such traffic, easing traffic congestion and reduction of CO2 emissions.

<Three ring roads in Tokyo metropolitan area and Effects of construction>



(Blue : as of April 2010,
Red : not yet completed)

Source : MLIT website



Congestion : section under 20km/h in entire Tokyo expressway

CO2 approx. 34,000 tons / year Reduction

Estimate for expressways and ordinary roads in Tokyo Capital Region (4 prefectures)

Source : Metropolitan Expressway Co., Ltd., website

34

3. (2) Improved Traffic Flow

3) Elimination of Bottlenecks

- Grade separation project of intersection and Measures for bottleneck railroad crossings is effective of easing traffic congestion and reduction CO2 emissions.

＜Grade separation project of intersection (Ordinary National Highway Route 17)＞

Before intersection grade separation

After intersection grade separation

＜Measures for bottleneck railroad crossings (Keikyu Line grade separation projest)＞

Before elevated railway bridge

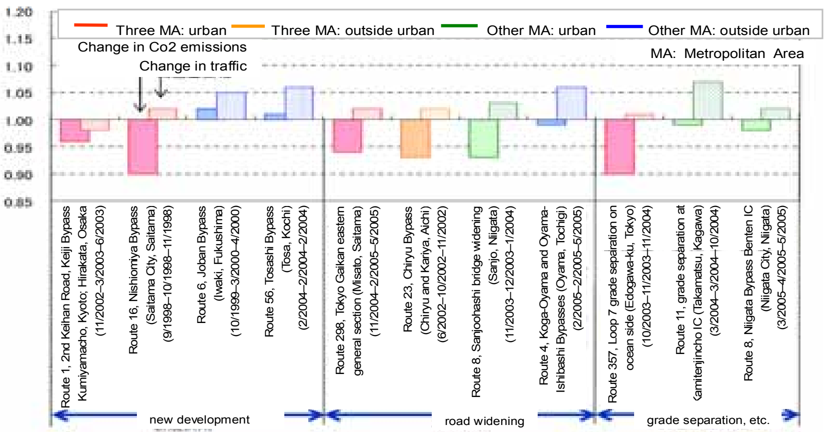
After elevated railway bridge

3. (2) Improved Traffic Flow

4) Effect of various measures to reduce congestion

- By measures to easy traffic congestion, although local traffic density tends to increase, total CO2 emissions f tends to decrease.

＜Changes in CO2 emissions due to bypass construction, lane widening and intersection grade separation＞



Note: dates in parentheses indicate: (Research before opening – Opened date–Research after opening).

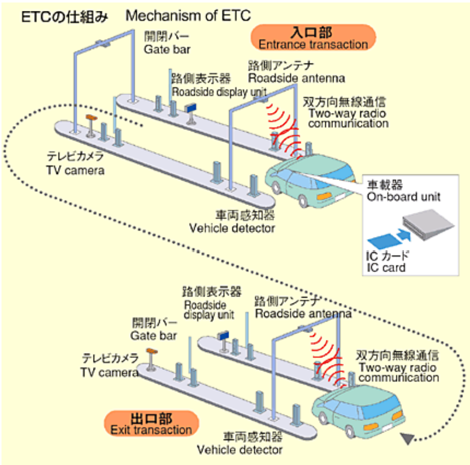
Source : Report by Council on Road Measures to Prevent Global Warming in Japan

3. (2) Improved Traffic Flow

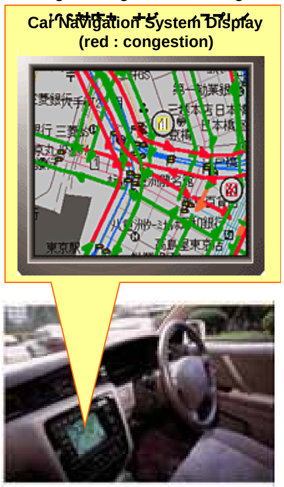
5) Utilization of ITS Technology

- Cancellation of temporarily stop on tollgate by ETC and offer of traffic congestion informations to drivers by VICS contribute to easy congestion and reduce CO2, too.

<Mechanism of ETC>



<Traffic congestion guidance using VICS>



3. (2) Improved Traffic Flow

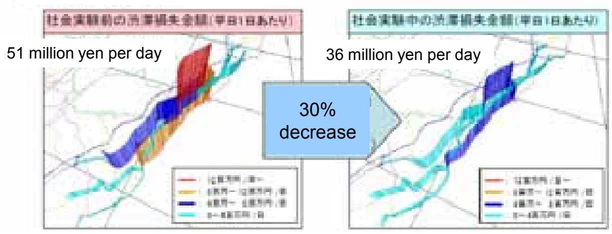
6) Various and flexible discount for expressway use

- In section where traffic congestion of general road is remarkable, reducing price for toll road side by side contribute to relax traffic congestion and reduce CO2 emissions.

< Example of various and flexible discount for expressway use >

Traffic volume : Expressway is 7% increase,
National road is 8% decrease
Time required : National road is 30% decrease

< Change of congestion loss cost >



Before toll discount　　After toll discount

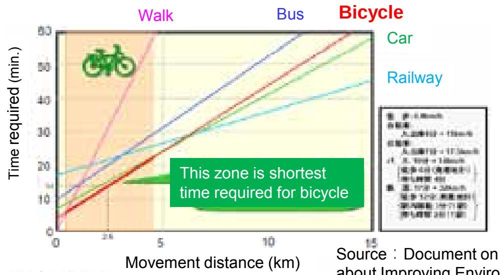
Source : MLIT website

3. (3) Diverting and Reduction of road traffic

1) Improving Environments for cycling

- Bicycle is most effective for trip within 5km.
- So Japan promote construction of bikeway and bicycle parking near stations.

<Relation of movement distance and time required by transport mode>



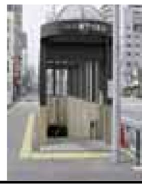
Source：Document on conference of new idea about Improving Environments for cycling

<Example of Improving Environments for cycling >

bikeway

Bikeway on sidewalk

bicycle parking near station



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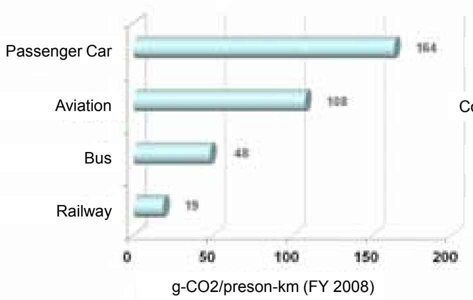
3. (3) Diverting and Reduction of road traffic

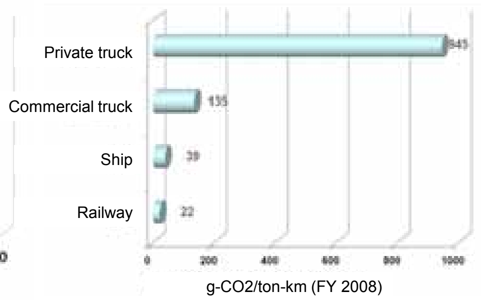
2) Promote Transit

- Buses and railways amit less CO2 per person-km than passenger cars.
- Commercial trucks emit less CO2 pre ton-km than presonal truck, ship and railway emit even less.

< CO2 emissions per person by transport mode >



< CO2 emissions per cargo volume by transport mode >



Source : MLIT website

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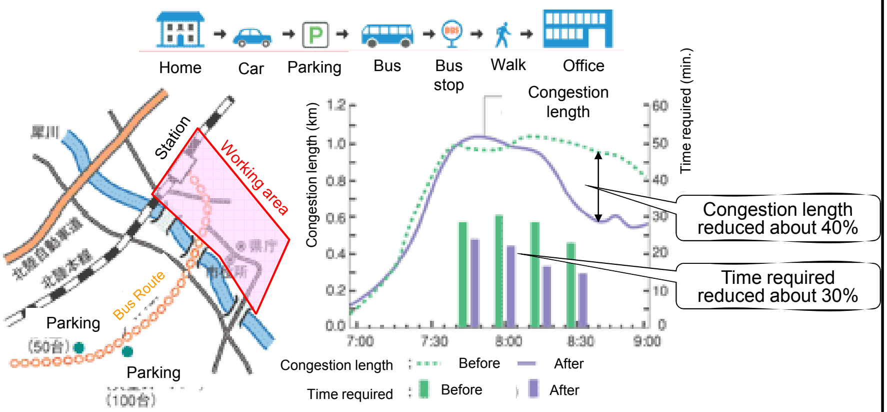
3. (3) Diverting and Reduction of road traffic

2) Promote Transit

- It is necessary for CO_2 reduction to shift automobile traffic to transportation mode such as buses and railways.
- “Park and Ride” is one of these measures (Traffic Demand Management).

< Traffic congestion reduction effect by adoption of park and ride >



Source : MLIT website

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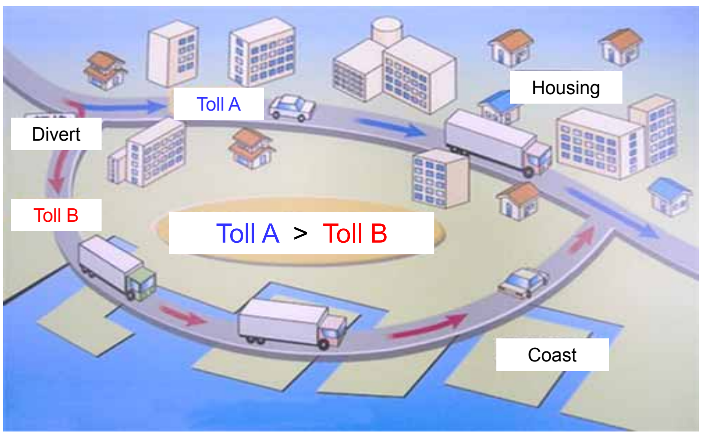
3. (3) Diverting and Reduction of road traffic

3) Environmental Road Pricing

- In areas where air is polluted with NOx etc. , particularly in sections where traffic congestion is remarkable, through truck traffic can be routed around by implementing environmantal road pricing to lower tolls on detour routes.
- This can shift traffic and contribute to easing traffic congestiion.

< Image of environmental road pricing >



Source : Hanshin Expressway Company Limited website

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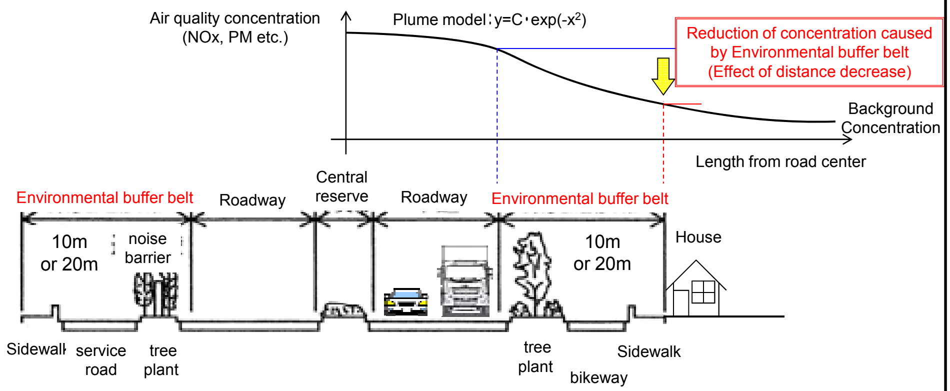
3. (4) Other measures for Air quality

1) Environmental Buffer Belt

- Construction of environmental buffer belt contributes to improve of air quality environmental on roadside by keep away distance of roads and houses.



Source : Commentary and use of road structure law, Japan Road Association, 2004

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3. (4) Other measures for Air quality

2) SPM / NO2 Removal System in ventilation towers

- SPM removal system (electrostatic precipitator) and NO_2 removal system (absorption) are installed in ventilation towers in areas where air quality is still bad.
- Effects: More than 80% of SPM and 90% of NO_2 are removed.

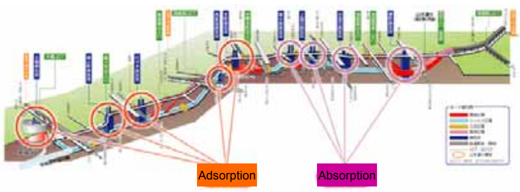
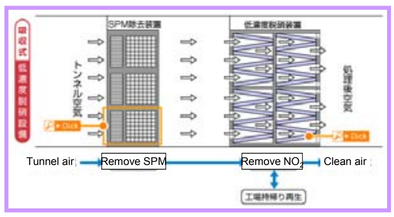
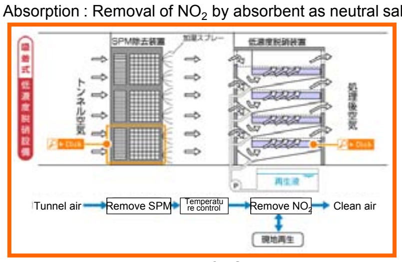


Figure of Central Ring Road Shinjuku Line

Figure of a ventilation station



Absorption : Removal of NO_2 by absorbent as neutral salt



Adsorption : Removal of NO_2 by adsorbent

Source: Metropolitan Expressway Co. Ltd website 44

November 18, 2010 The 19th Meeting on Public Works Research and Development in Asia
Presentation for about 30 minutes

Actions of road traffic measure to contribute reduction Greenhouse Gas from transport section and improvement of air quality on roadside in Japan

Manabu DOHI

Senior Researcher, Road Environment Division,
National Institute for Land and Infrastructure Management,
Ministry of Land, Infrastructure, Transport and Tourism

1

ABOUT TODAY'S PRESENTAION MENU

1. Reduction Green House Gas from transport section
    CO_2 emission from transport section,
    Law system about prevention of global warming,
    Basic Idea of CO2 emission reduction from road traffic

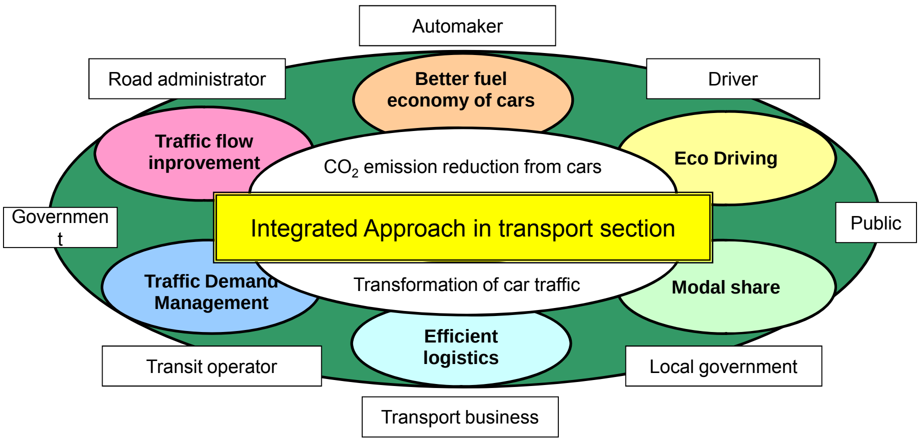
2. Improvement of air quality on roadside
    History of Air Pollution, Discharge process of material,
    Law system about Air pollution, Standard and Achievement,
    Basic Idea of improvement of air quality on roadside

3. Actions of road traffic measure in Japan, to contribute 1.&2.
    Improved fuel economy of individual car
    Improved Traffic Flow
    Diverting and Reduction of road traffic
    Other measures for Air quality

2

4. Conclusion

- In ordar to reduce CO2 emissions in transport section and improve air quality on roadside, it is important to take a integrated approach in which various sectors such as roads, automobiles, transport planning, logistics, and urban planning



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Ⅴ-9. Lecture

“Promotion of roadside noise abatement based on Environmental Impact Assessment”

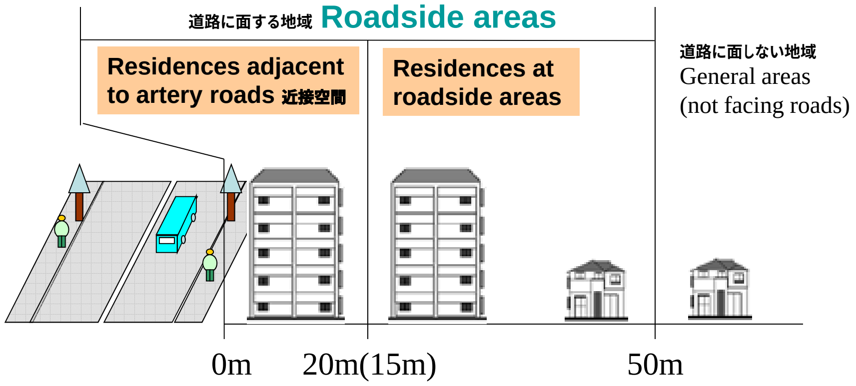
Mr. Hiroshi YOSHINAGA

13 Promotion of roadside noise abatement based on Environmental Impact Assessment

Mr. Hiroshi YOSHINAGA
Senior Researcher,
Road Environment Division,
Environment Department, NILIM

Promotion of roadside noise abatement based on Environmental Impact Assessment

騒音の環境基準 Environmental Quality Standards for Noise

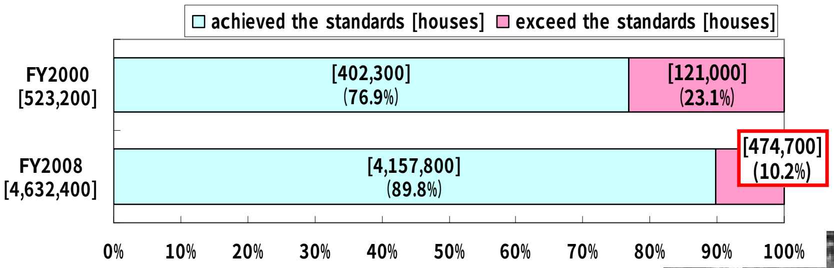


昼間 Daytime (6:00-22:00)	70dB	60 dB (A) 65 dB (B,C)
夜間 Nighttime (22:00-6:00)	65dB	55 dB (A) 60 dB (B,C)

(地域の類型 Area type)

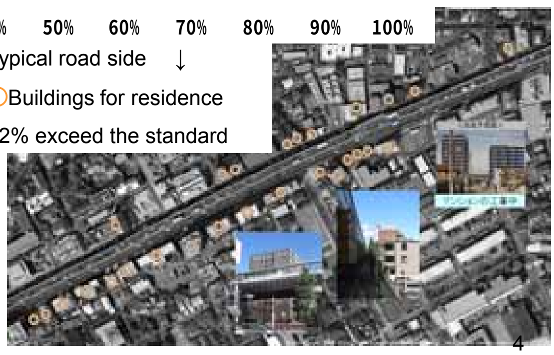
騒音の状況 Current status of road traffic noise in Japan

Evaluation of `Environmental Quality Standards for Noise'
at the Areas Facing Roads



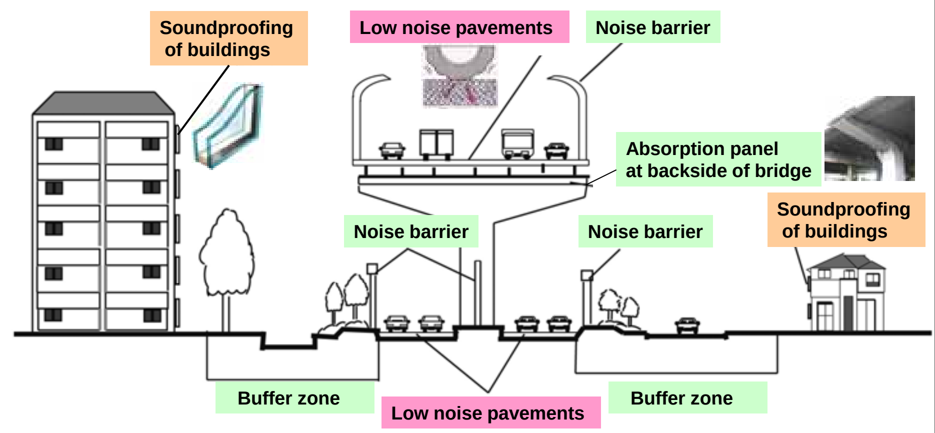
↑ Ministry of the Environment, FY2008
Express way(1,165km),
National Highway(9,687km),
State road etc. (15,302km)

Typical road side ↓
◯Buildings for residence
82% exceed the standard



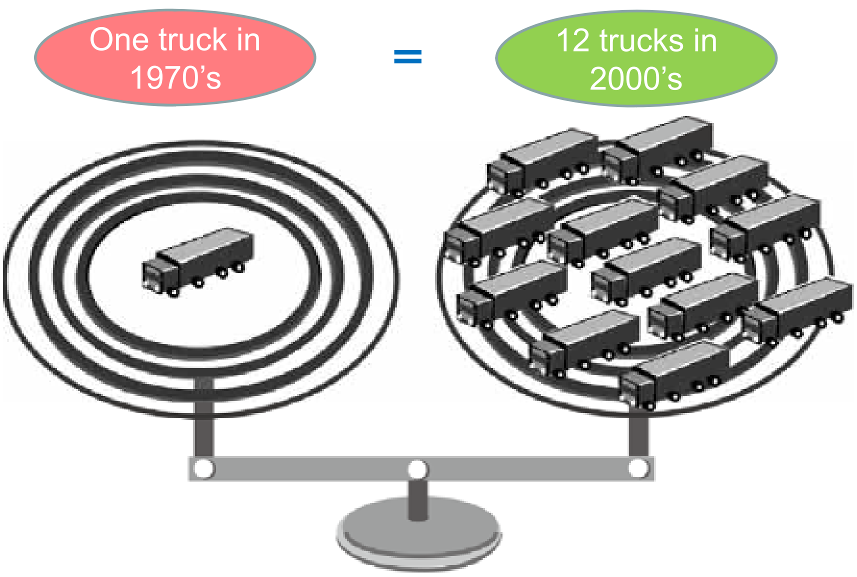
4

騒音対策 Noise Abatement Measures



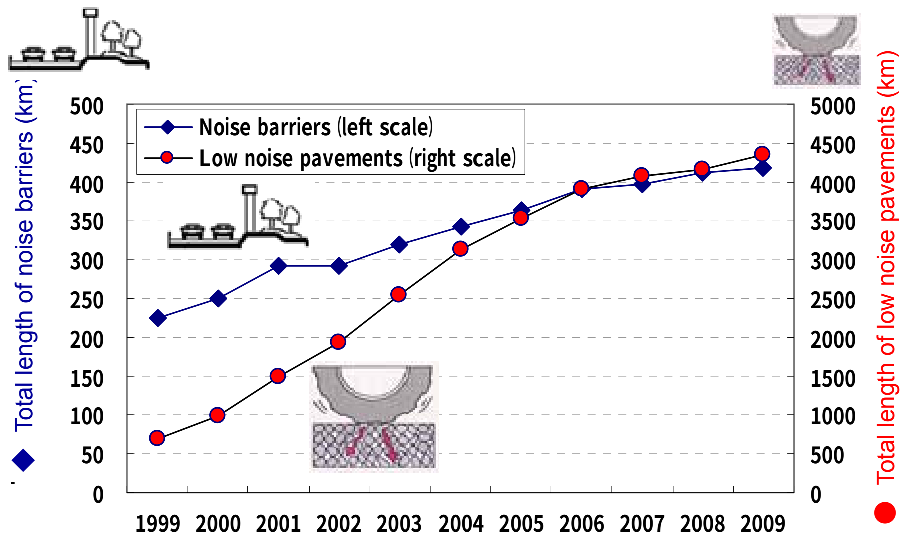
Noise control at sound source	Noise control on propagation route	Noise control at sound receiving point
Vehicle Unit Regulation Low noise pavements Regulation on speed	Noise barrier, Absorption panel at backside of bridge Adoption of underground road structure Buffer zone	Soundproofing of buildings

騒音対策 Noise Abatement Measures



Vehicle Unit Regulation – acceleration noise energy

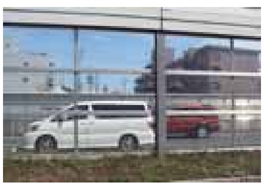
騒音対策 Noise Abatement Measures



National Highway under Direct Control of Ministry of Land, Infrastructure, Transport and Tourism. 8817 km in 2009.

騒音対策 Noise Abatement Measures – Noise barrier

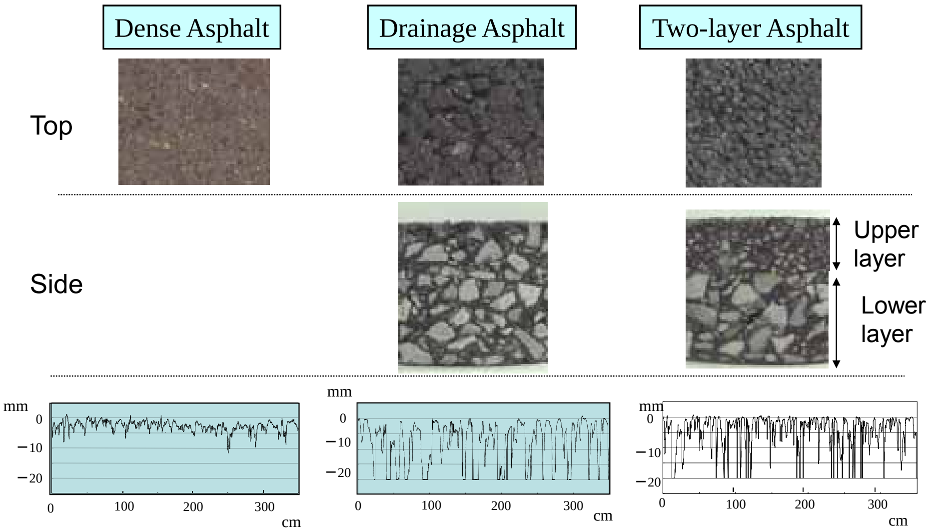
Noise barriers

 Translucency	 Large (8m high)	 Overhung
 Vegetation covered	 Edge modified	 Edge modified

騒音対策 Noise Abatement Measures – Pavement

Textures of Dense, Drainage and Two-layer asphalt concrete pavement

- Two-layer asphalt concrete pavement has middle smoothness



計画的に施された騒音対策 Systematically executed noise controls

based on Environmental Impact Assessment

Ⅴ-10. Lecture
"Pavement Technologies in Japan"

Mr. Kazuyuki KUBO

Pavement Technologies in Japan

~Measures against Environmental Issues~

Kazuyuki KUBO, Leader, Pavement Team
Iwao SASAKI, Advanced Materials Team

Public Works Research institute
Japan

1

Environmentally-friendly Pavement

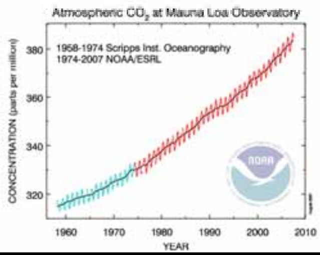
- Recycle use
  - Asphalt pavement
  - Byproduct
- Warm mix asphalt
- Cool pavement
  - Water retention pavement
  - Heat shield pavement
- Low noise pavement
- etc.

2

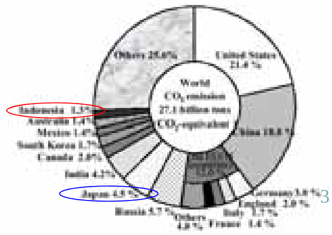
Global Warming

- IPCC Report
  - "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level."

CO_2 Monitoring in Hawaii

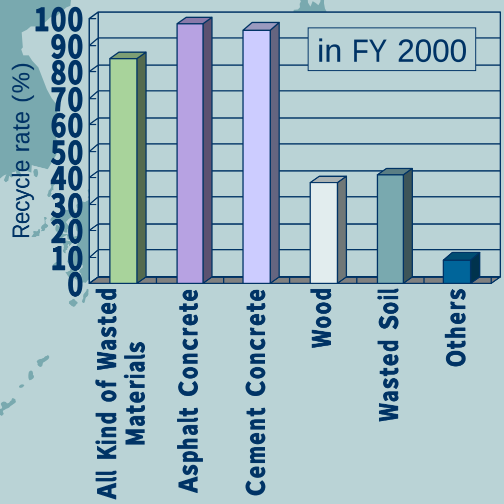


CO_2 Emission in each Country (2005)



3

Percentage of Recycling of Wasted Materials in Japan



4

Pavement Recycling Methods

- Plant recycling method
  - Surface (HMA), Base
- In-place base recycling method
- In-place surface recycling

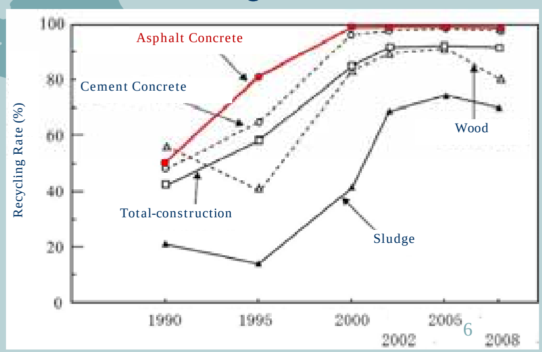
Plant recycling

In-place recycling

5

Current Status: Asphalt Mixture Recycling in Japan

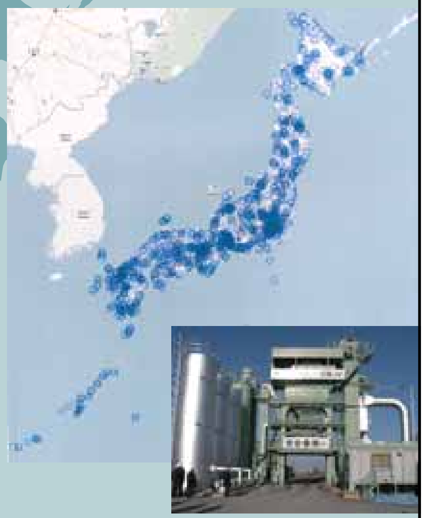
- Recycling techniques of RAP have spread.
  - Since 1970s
  - Technical guidelines
  - Law on Promoting Green Purchasing
- Recycling rate : 98 - 99 %



6

CO_2 Emission in Pavement Field in JAPAN

- Total amount of CO2 emission in Japan was 1.3 billion tons in FY2000.
- The amount emitted from road relating field was about 2%.
  - Mainly from material production process
- Asphalt Mixtures
  - The share of asphalt pavements : 95%
  - The number of facilities : 1,223 (2006)
  - The amount of asphalt mixtures : 58million tons (2006)



資料：(社)日本道路建設業協会、
全国アスファルトプラント(20kmサービス圏)地図

7

In-place Base Recycling Method

- At a roadwork site, crushing existing asphalt mixtures and mixing the product of this operation with existing granular base material and stabilizing agents such as cement and/or emulsified asphalt, then compacting this mixture to form a new base course.

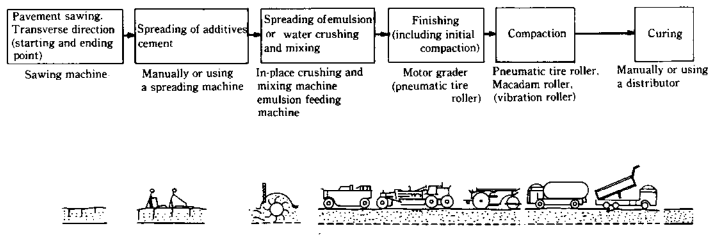


Fig.-6.7 Construction Procedure for the In-place Base Course Recycling Method

8

In-place Surface Recycling

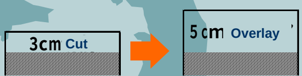
- At a roadwork site, heating the existing asphalt mixture, scarifying it to loosen the material, adding new asphalt mixture and/or rejuvenators as necessary, spreading and compacting it to create a new surface course or binder course.

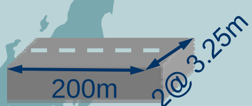
9

Simulation of CO_2 emission in case of plant recycling and in-situ recycling

-Case 1: Cut and overlay (new aggregates)
-Case 2： 〃 (Plant recycling 60%)
-Case 3：In-situ recycling

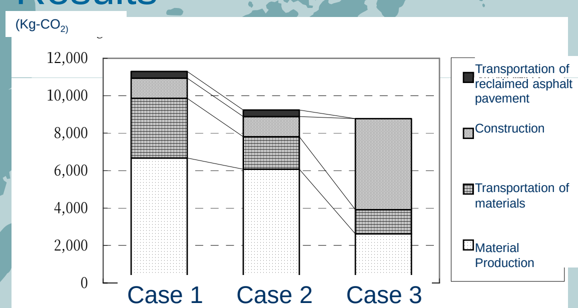
Plant recycling





In-situ recycling

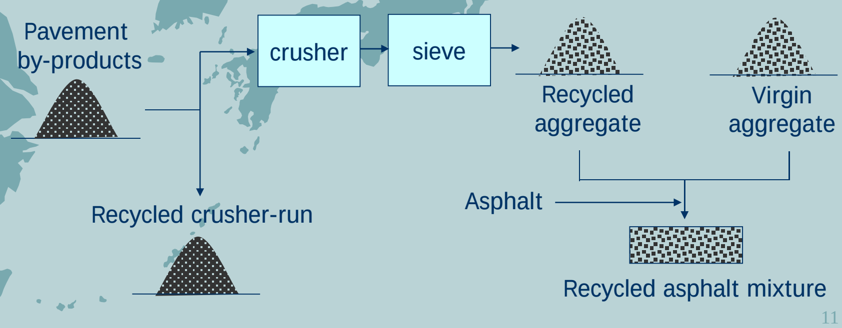
Results



10

Plant Recycling Method

- **Recycling pavement material etc. at a stationary mixing plant (recycling mixing plant), and using it as pavement material.**



Recycled aggregate production, QC/QA

- **Crushing**

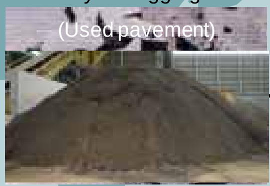


- **Recycled aggregate**

Density, asphalt binder content, asphalt penetration etc.


Asphalt concrete recycling procedures

Recycled aggregate



Rejuvenator

Virgin aggregate

Virgin Asphalt

Asphalt Mixture Recycle Plant

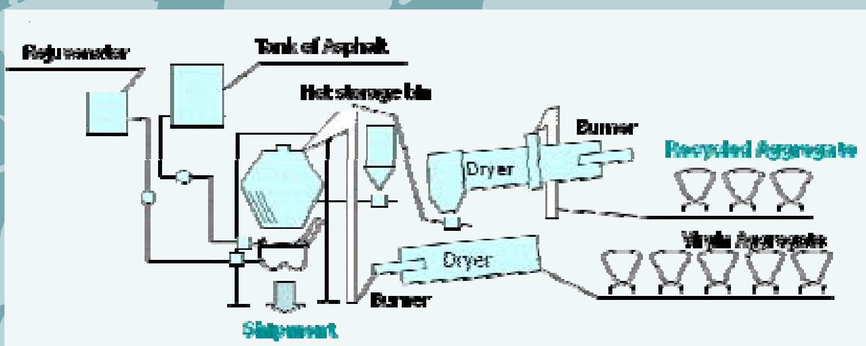
Recycled HMA

13

Asphalt concrete recycling plant

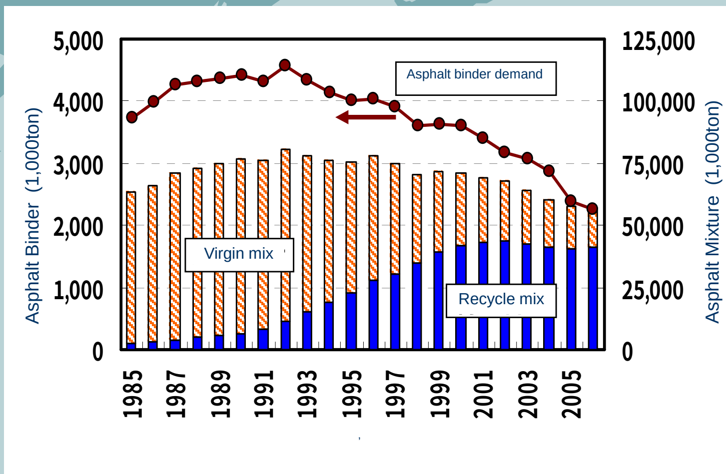
- Twin dryer heating system -

- Drum dryer system
- Twin (attached) dryer system <- Most popular in Japan
- Single dryer (indirect-heating) system



14

Plant Recycling



15

Problems

- Decline of penetration of aged asphalt contained in RAP.

  Pen<20 : can not use

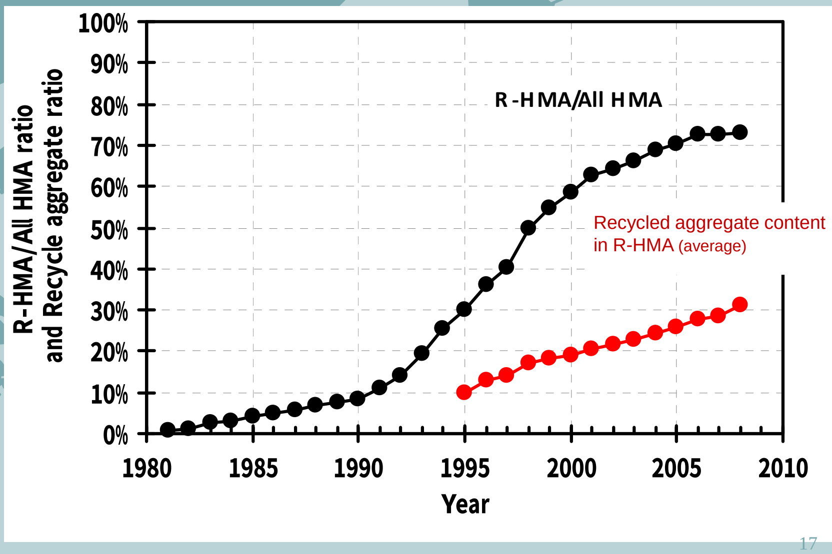
  Pen≧20 : OK

1. Repeatedly recycled RAP increases
2. Polymer modified asphalt increase.

- Recycled asphalt mixture has already been promoted to use according to the following law
  - Law Concerning the Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities (*Law on Promoting Green Purchasing*), enacted in FY2000

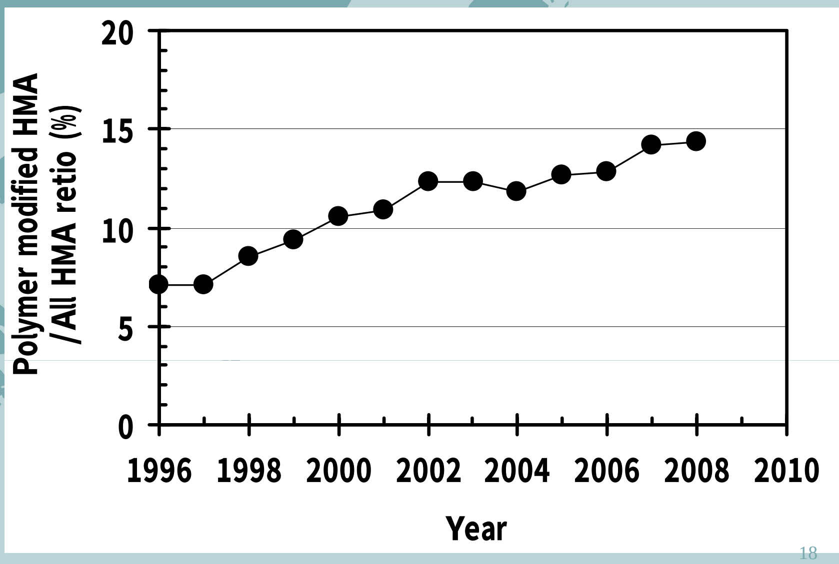
16

Changes in R-HMA / All HMA ratio and RAP content in Japan



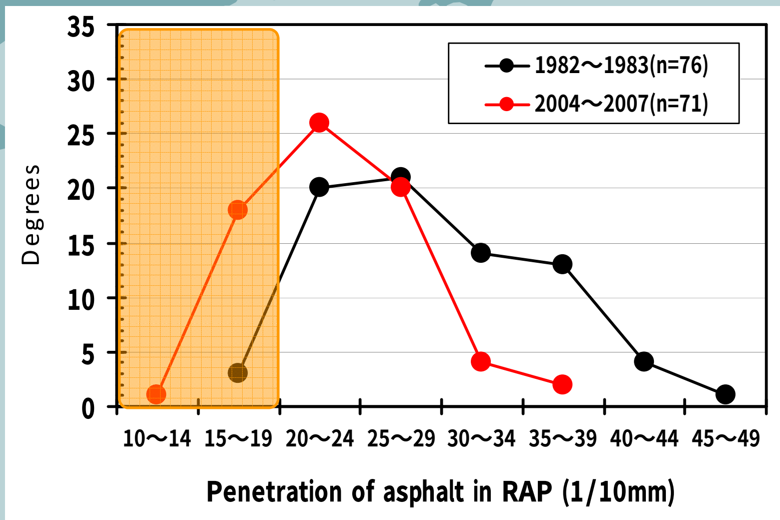
17

Production of **polymer modified asphalt mixture**



18

Penetration decline of asphalt in RAP (histogram)



19

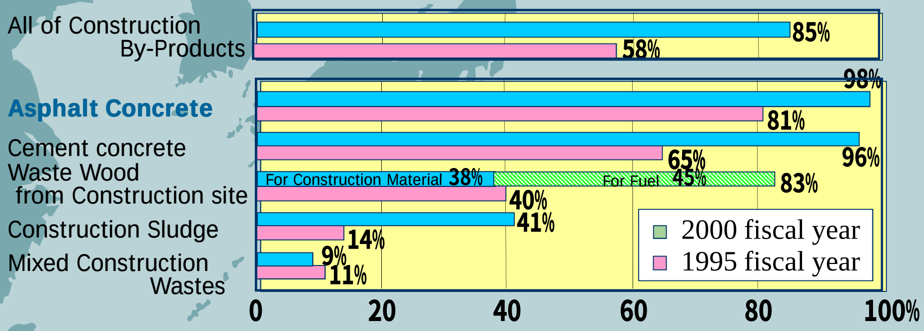
Environmentally-friendly Pavement

- **Recycle use**
  - Asphalt pavement
  - **Byproduct**
- **Warm mix asphalt**
- **Cool pavement**
  - **Water retention pavement**
  - **Heat shield pavement**
- **Low noise pavement**
- **etc.**

20

Recycling Ratio of Construction By-Products

- Recycling Ratio of Asphalt Concrete is Over 98%



21

Typical wastes from other areas

Wood

Molten slag made from municipal waste and sewer sludge

Glass

Steel slag

Used tire rubber

Fly ash from electric power stations

22

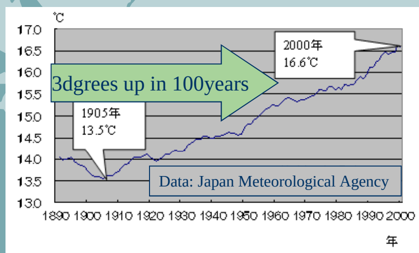
Attention to use waste from other areas

- Environmental Safety
  - No seeping out of any harmful materials such as lead, chrome, etc.
- Durability
  - Equal strength with natural aggregate, such as hardness, wear-resist, etc.
- Economical
  - Not so expensive rather than natural aggregate
- Stable supply
  - Can be supplied with constant quantity and uniform quality
- Sustainability
  - Can be recycled in several times

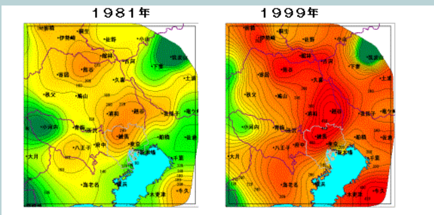
23

Heat Island Effects in Japan

- Caused by
  - Increasing artificial land surface area **(pavements etc.)**
  - Increasing heat generated by our daily life (waste heat)
  - Decreasing water surface area
  - Others
- Causes
  - Heavy rainfall in very narrow urban area
  - Damage on human life



Annual Mean Temperature of Tokyo



Data: Ministry of the Environment

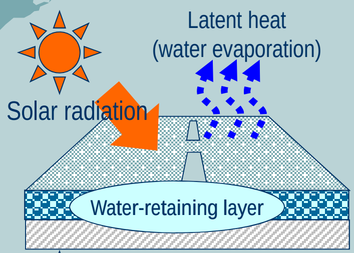
Days of Maximum Daily Air Temperature over 30 degree C

24

Cool Pavement to mitigate the heat island effect

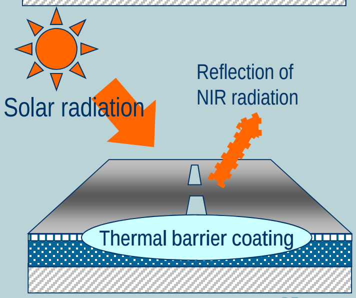
Water retention pavement

- Store water inside pavement
- Uses the mechanism of latent heat



Heat shield pavement

- Paint special coating
- Reflection of near-infrared ray (NIR)

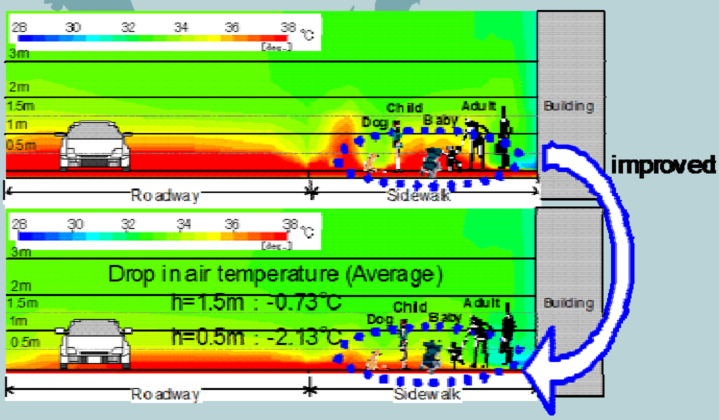


25

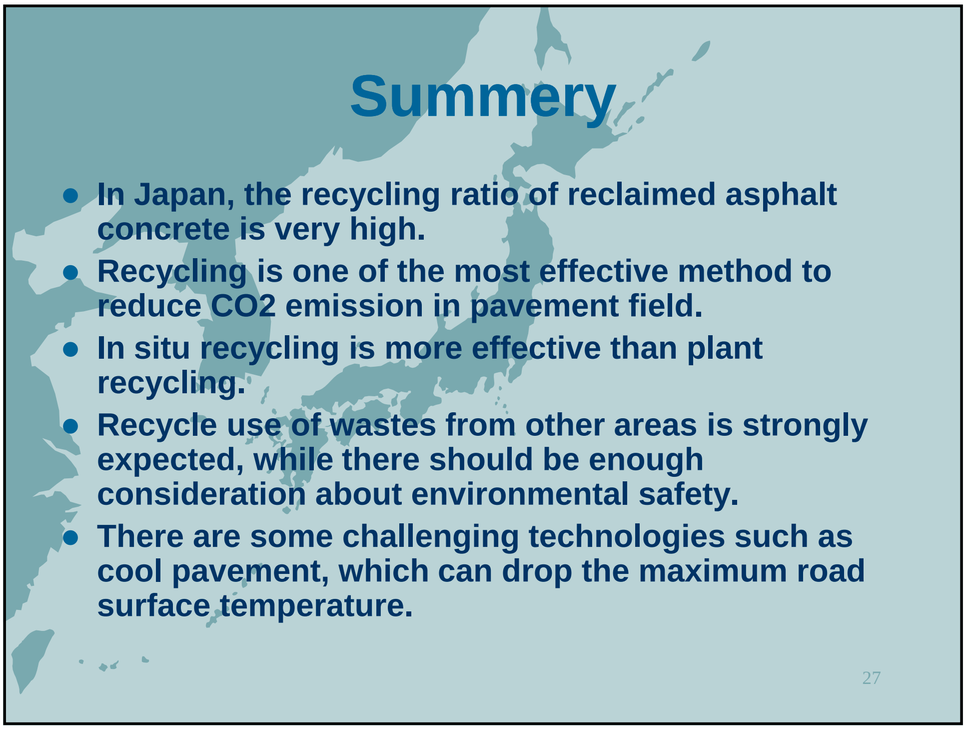
Simulation Result

Compare with general pavement

- Maximum surface temperature … about -10℃
- Maximum air temperature … about -1 ℃(at 1.0m height)



26


Summery
In Japan, the recycling ratio of reclaimed asphalt concrete is very high.
Recycling is one of the most effective method to reduce CO2 emission in pavement field.
In situ recycling is more effective than plant recycling.
Recycle use of wastes from other areas is strongly expected, while there should be enough consideration about environmental safety.
There are some challenging technologies such as cool pavement, which can drop the maximum road surface temperature.
27

Ⅴ-11. Lecture

“The external force estimation for adaptation measures of storm surge protection in Japan”

Mr. Kenzi NOGUCHI

The external force estimation
for
adaptation measures
of
storm surge protection
in Japan

Yoshio Suwa
Head
Coast Division River Research Department
National Institute Land Infrastructure Management
Ministry of Land, Infrastructure, Transport and Tourism
Government of Japan

1

Introduction

The reason why coastal protection are important in Japan.

2

Overtopping by wind-blown waves in winter

(Itoigawa Coast, Itoigawa City, Niigata Pref.)

Beach reclaim for road & Coastal erosion

Wave-induced damage to JR Hokuriku Line
(Omi Coast, Omi City, Niigata Pref.)

Coastal erosion

Beach cliff immediately after the passage of typhoon

(Kita-kujukuri Coast, Asahi City, Chiba Pref.)

5

Beach cliff formed by coastal erosion

(Kaike Coast, Yonago City, Tottori Pref.)

6

Seawall damaged by Typhoon No. 23

(October 20, 2004; Nabae Coast, Muroto City, Kochi Pref.)

Every year, 160 ha of beaches are lost to coastal erosion

7

Use of coasts (1)

Marine activities

Jet ski
(Tei Coast, Yasu-cho, Kochi Pref.)

Clam digging
(Tsuyazaki Coast, Tsuyazaki-machi, Fukuoka Pref.)

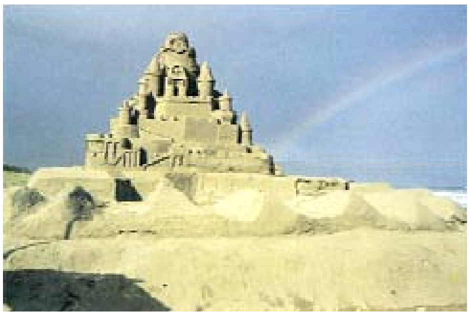
Windsurfing
(Numazu Coast, Numazu City, Shizuoka Pref.)

8

Use of coasts (2)

Tourism Events

T-shirt Fair
(Irino Coast, Ogata-cho, Kochi Pref.)



Sand art
(Irino Coast, Ogata-cho, Kochi Pref.)

9

Use of coasts (3)

Culture & Education

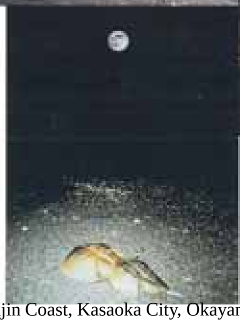
Gatalympics
(Nanaura Coast, Kashima City, Saga Pref.)

Seaside summer school
(Yomiyama Coast, Tomiyama-machi,Chiba Pref.)

10

Natural environments of coastal zones

Sea turtle laying eggs (Moto Coast, Muroto City, Kochi Pref.)



Horseshoe crab (Tenjin Coast, Kasaoka City, Okayama Pref.)
(taken from Soji, N. and Sato,
Y., *Kabutogani*, Sanyo Shimbun, 1993)

Small fish gathering around artificial reef
(Kanezaki Coast, Genkai-machi, Fukuoka Pref.)

11

Coastal conservation facilities

Revetment integrated with a park
(Kitamae Coast, Chatan-cho, Okinawa Pref.)

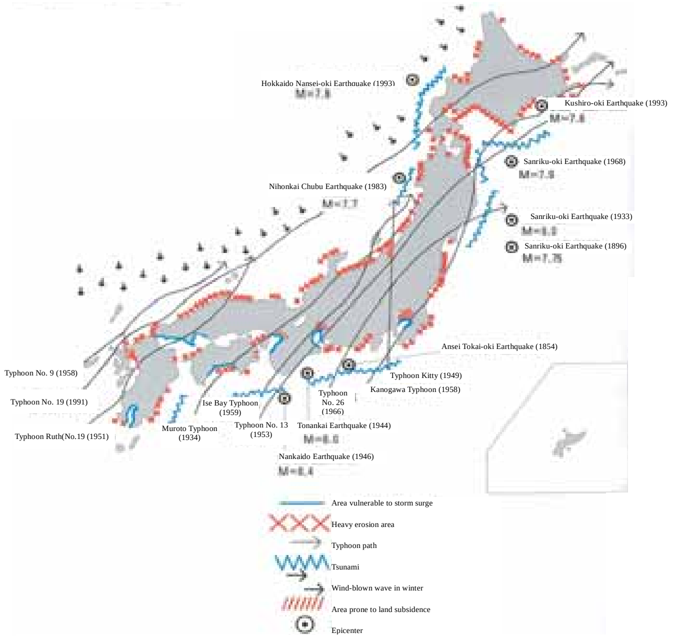
Gentle-slope levee
(Arao Coast, Arao City, Kumamoto Pref.)

Barrier-free slope
(Hoko Coast, Higashiura-cho, Hyogo Pref.)

Artificial Levee
(Ariake Coast, Higashiyoka-cho, Saga Pref.)

12

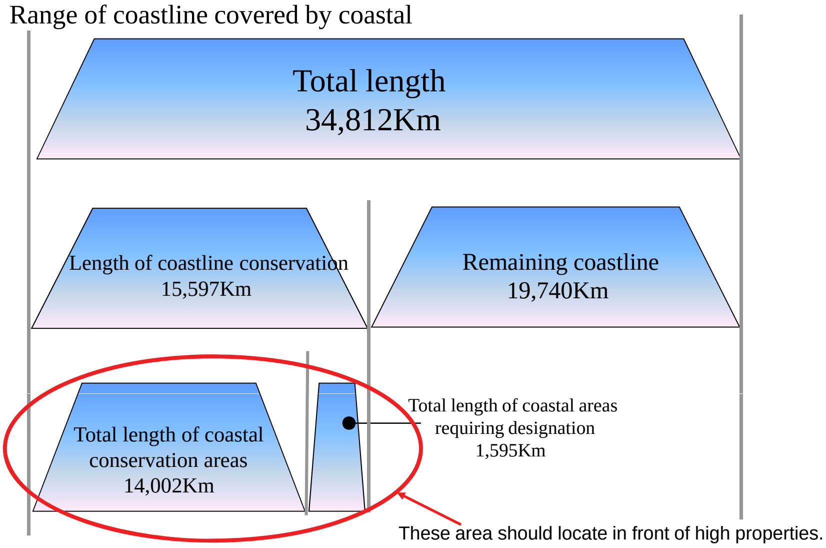
Characteristics of coastal disasters



13

Purpose and scope of coastal projects

■ Range of coastline covered by coastal



14

Climate Change Adaptation Action
by
Coast Area by Coast Division, River Bureau

- To raise crown height of sea wall

To cope with sea level rise and intensified typhoons, concrete storm surge barriers should be rebuilt higher to enhance their protection capacities against intensified external forces, especially at a time of renewal, so that inundation occurs less frequently. In practice, barrier heights should be raised in stages in step with the progress of research on sea level rise and intensified typhoons:

Phase 1: The increased sea level is taken into account.

Phase 2: In addition to increased sea level, sea level rises expected in the future are taken into account based on the trend in sea level rise and prediction calculation. The service life of facilities in also taken into account.

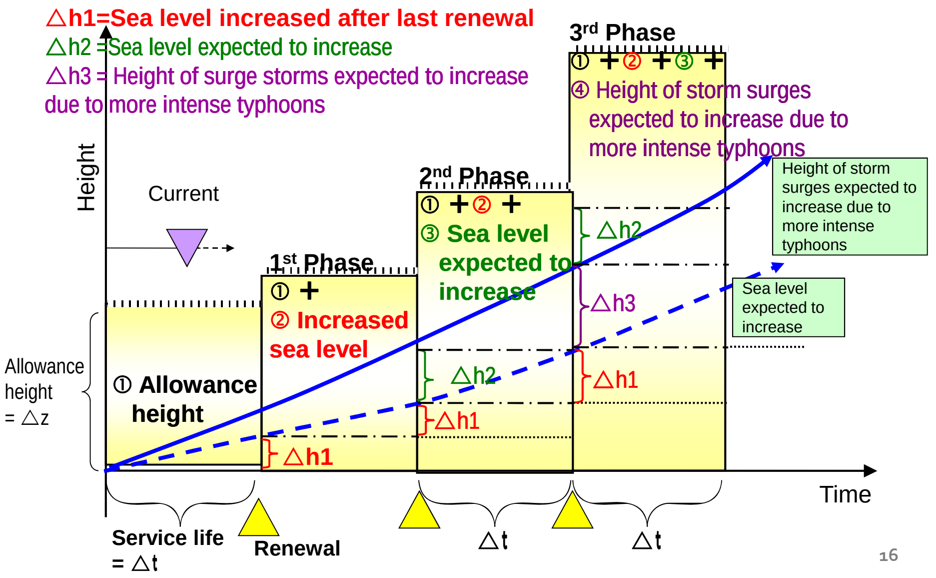
Phase 3: In addition, the height of storm surges expected to increase due to more intense typhoons is taken into account.

Storm surge barriers should be designed so that they are hard to breach even if external forces are more powerful than expected due to sea level rise.

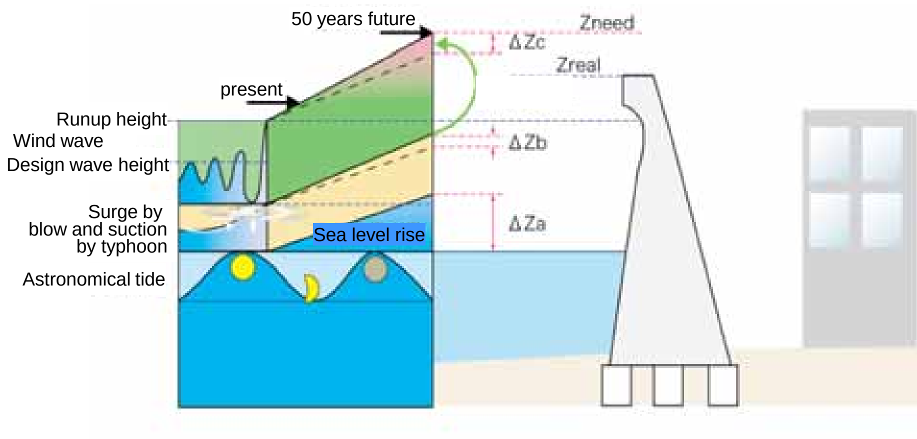
- Promotion of comprehensive sediment management

Comprehensive sediment control should also be promoted to cope with coastal erosion in progress.

Adaptation to increased external forces：
Staged measures for storm surges



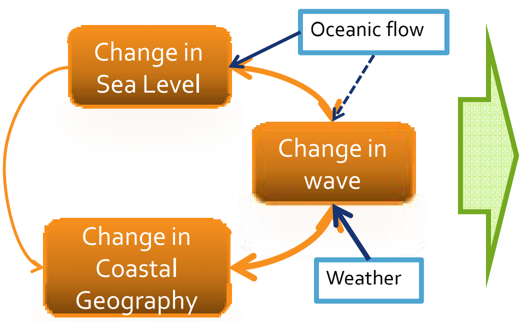
Parameter of crown rise



17

Will the change makes new "Waves"?

But tough to simulate



Simple Variation

Change in predominant wave

Rate of change in wave height

Mode Sift

Long waves

Coriolis transportation

Nonlinear interactions

Typhoons and Depressions

Changes in course or alignment

18

Changing of “Wave Climate”

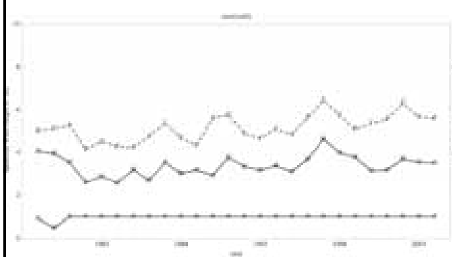
Detect signals !

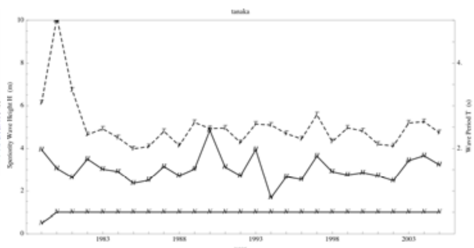
19

Detecting signal in Large waves

Annual Maximum Series

Average of Top Group



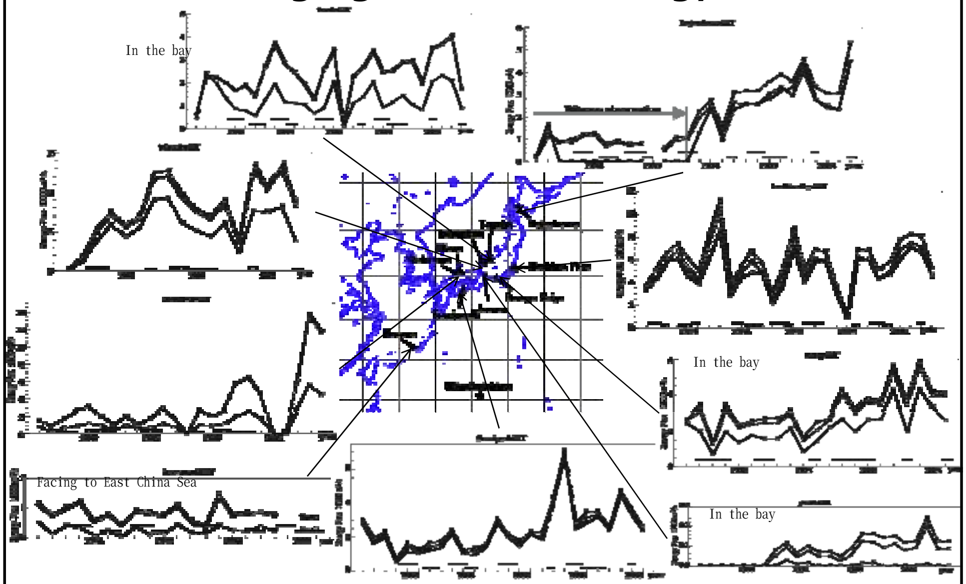


Sumiyoshi Coast

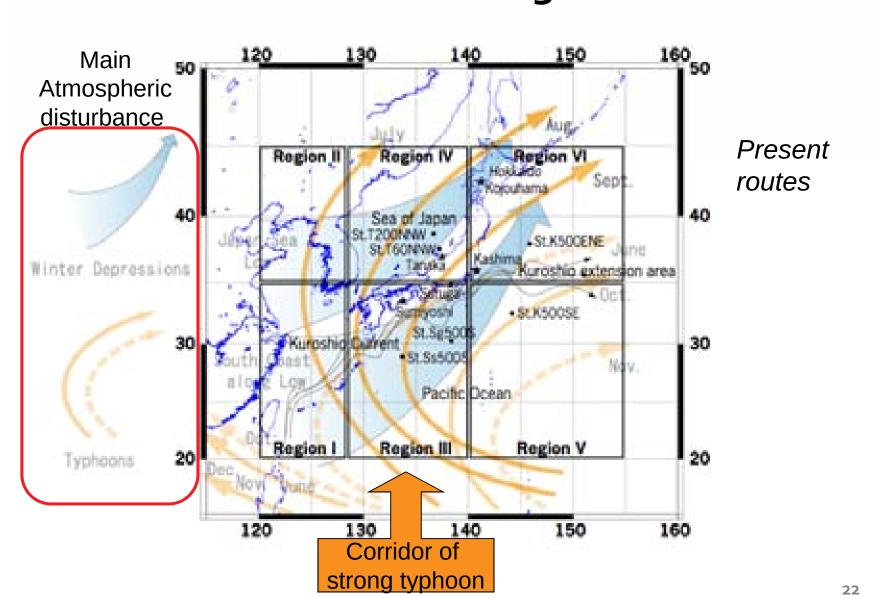
Shimoniikawa Coast

20

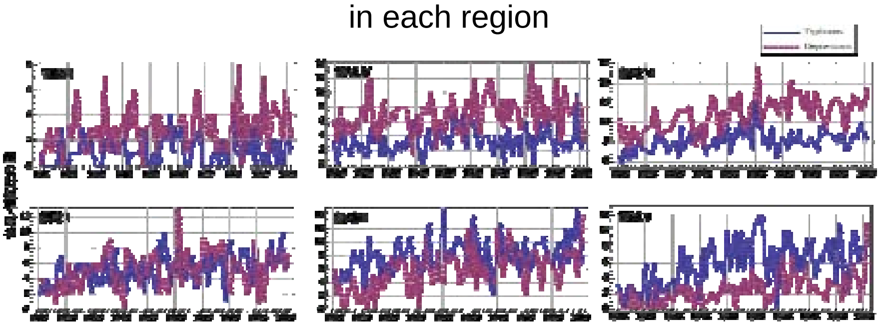
Detecting signal in wave energy fluxes

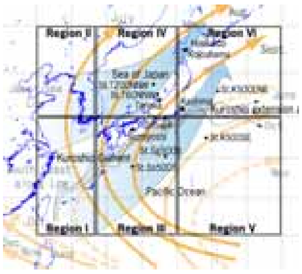


Definition of Regions



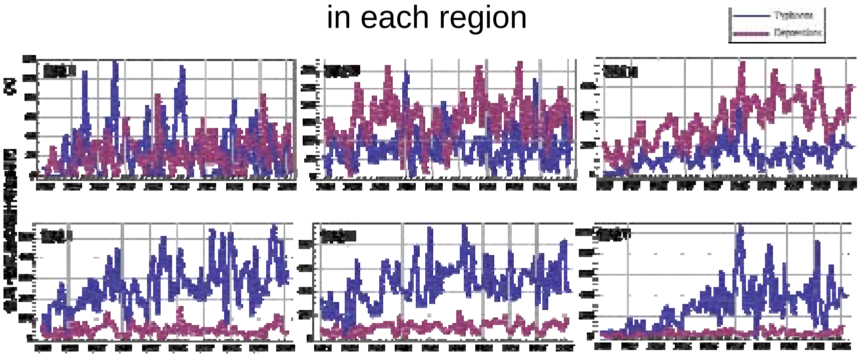
Annual track numbers typhoons and depressions thru in each region

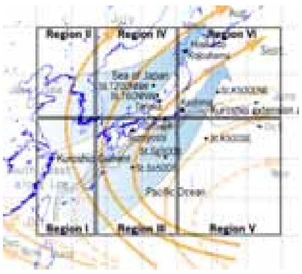




23

Annual total residence time of typhoons and depressions in each region

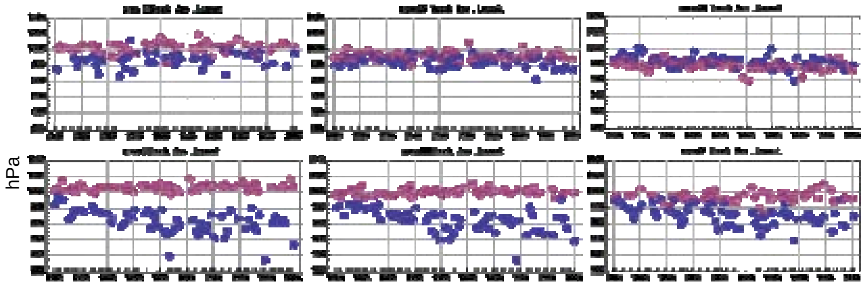


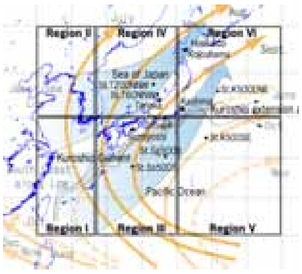


24

Annual average of the lowest pressure

of typhoons and depressions during each region

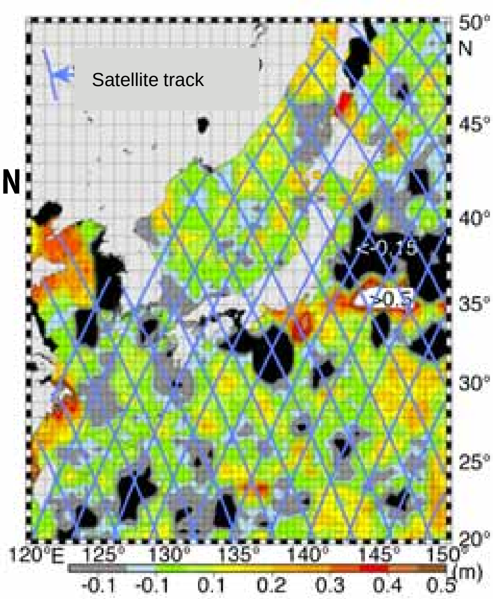




25

satellite altimeter

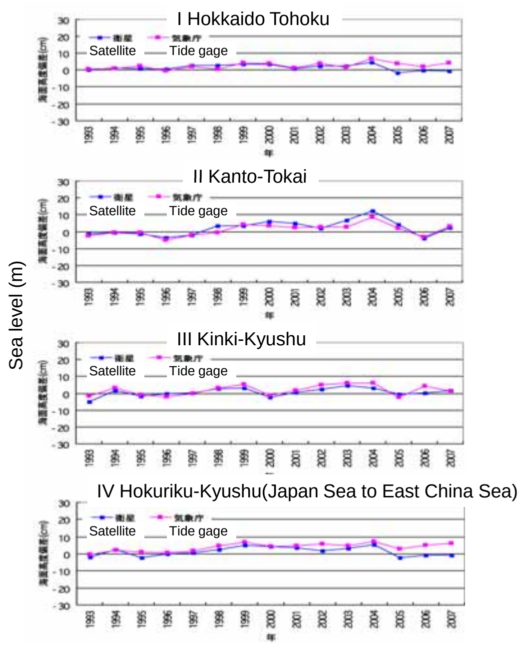
Topex/POSEIDON



験潮場が近隣にない場合はどう考えるか

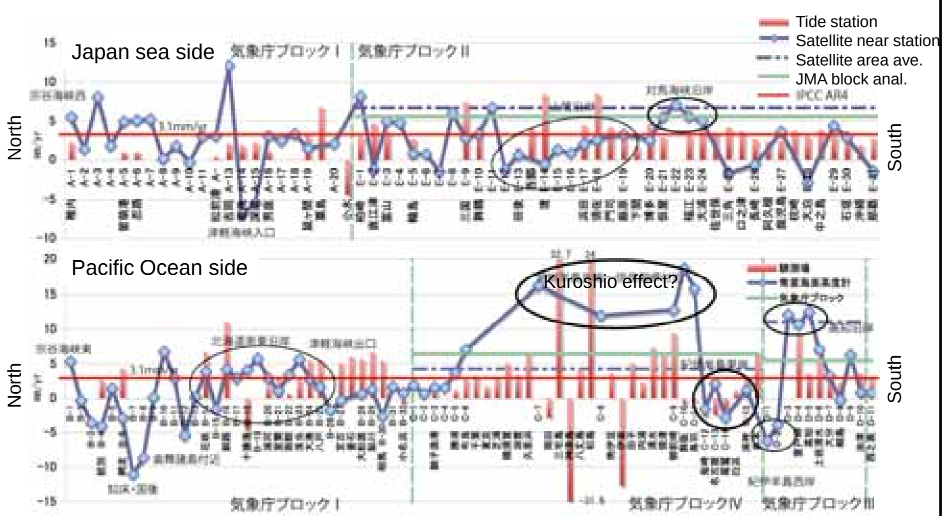
26

Area average of Satellite altimeter vs. Tide gage (Japan Metrological Agency)

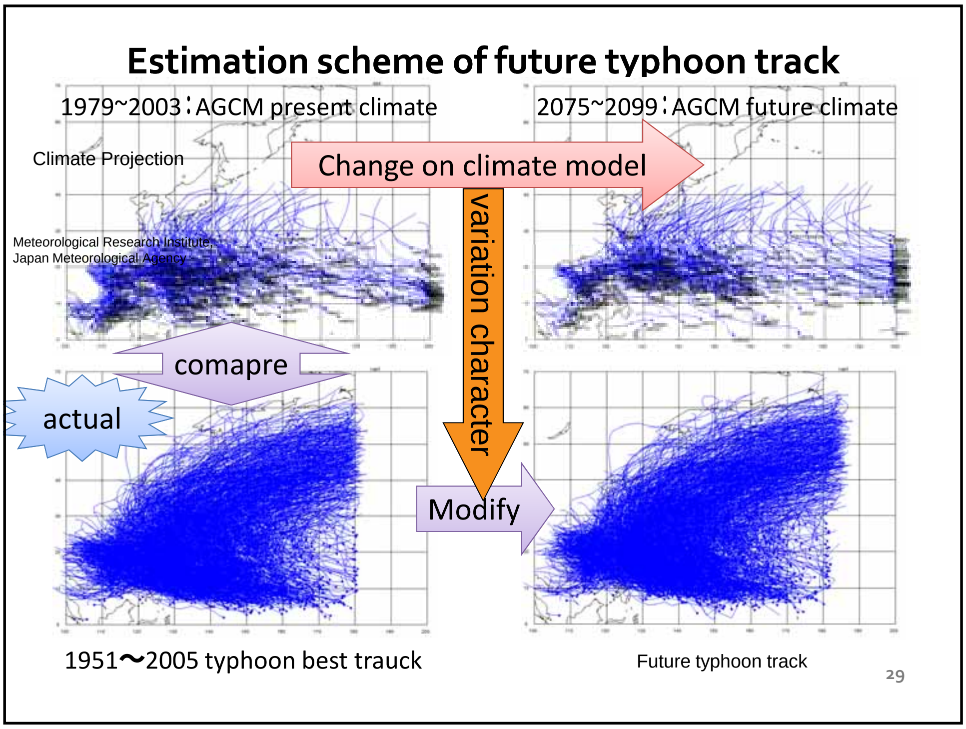


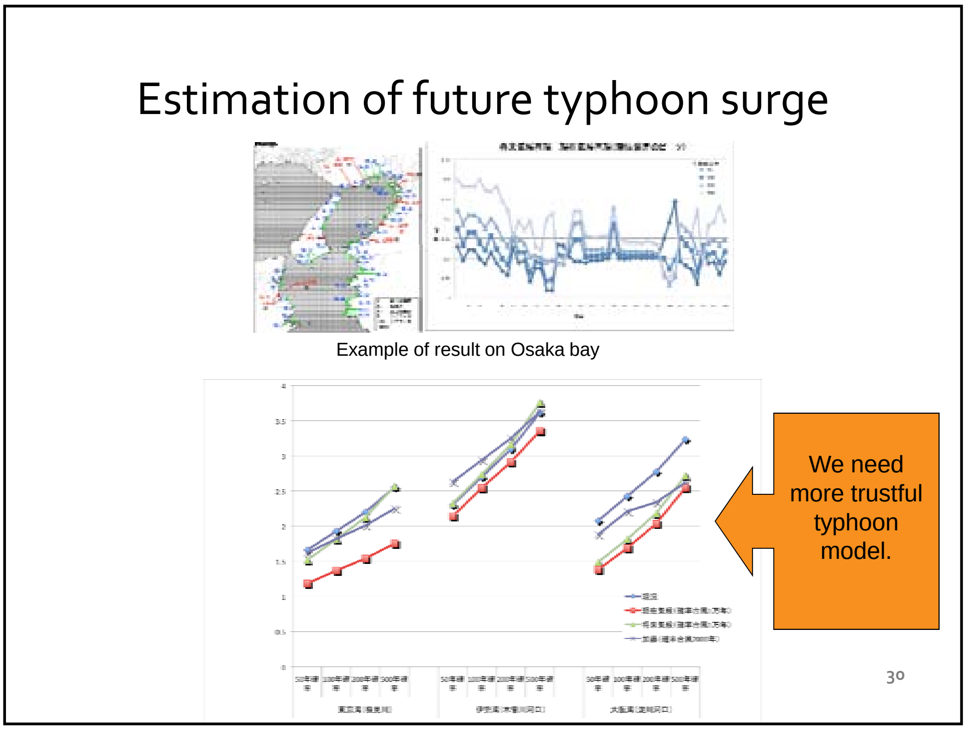
27

Anduration of sea level rise speed around Japan

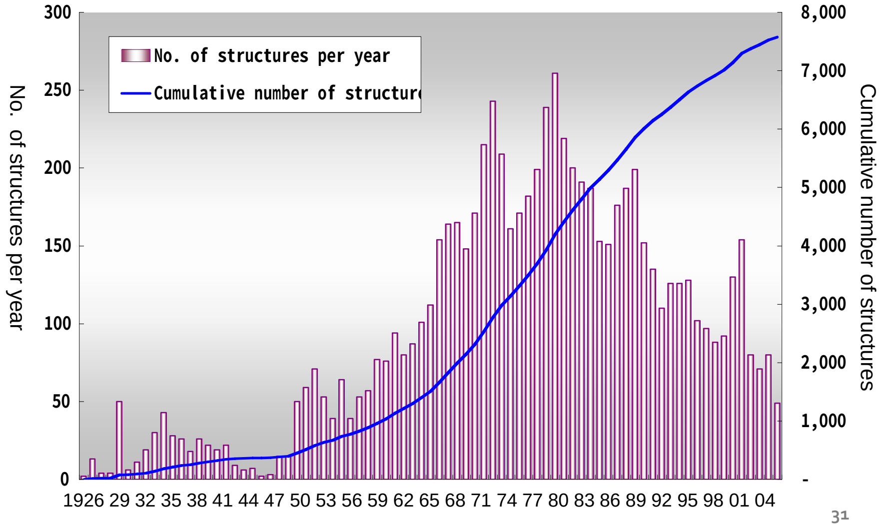


28


Estimation scheme of future typhoon track
1979~2003：AGCM present climate
2075~2099：AGCM future climate
Climate Projection
Meteorological Research Institute,
Japan Meteorological Agency
Change on climate model
variation character
comapre
actual
Modify
1951〜2005 typhoon best trauck
Future typhoon track
29


Estimation of future typhoon surge
Example of result on Osaka bay
We need more trustful typhoon model.
30

Maintenance/renewal cost is expected to increase for existing structures extensively built during the economic growth in the 1960s (1926-2004)

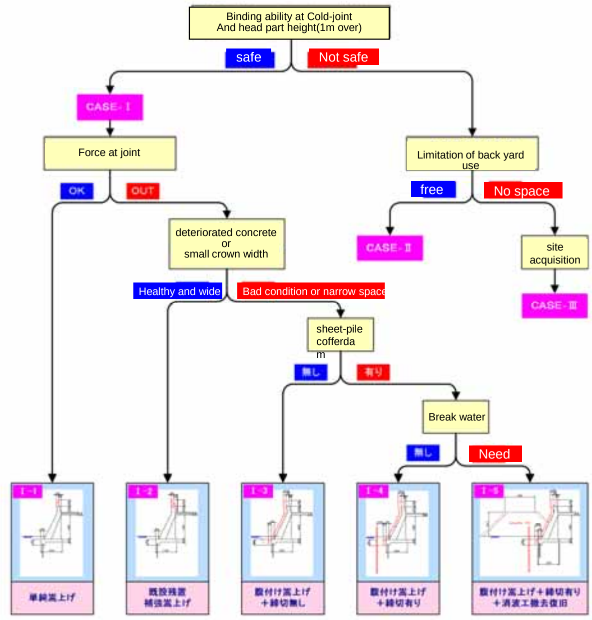


31

Maintaining and improving the reliability of existing structures: response to aging revetments

To avoid financial concentration on renewing structures, they should be inspected and assessed in terms of reliability, and maintained and managed systematically by taking preventive measures to prolong their service lives.

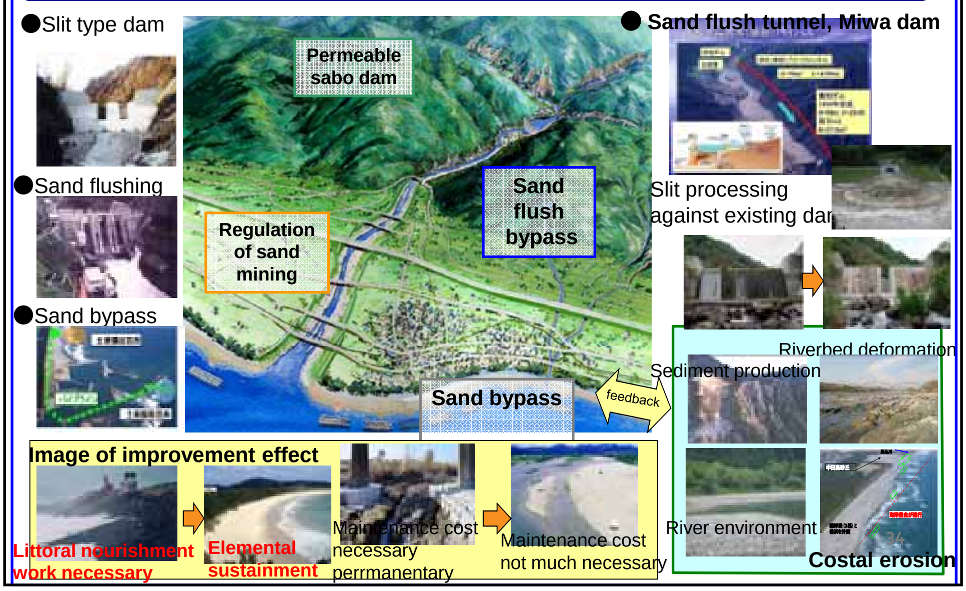
An example of trees to select HOKYOU method



33

Promotion of comprehensive sediment management

Comprehensive sediment management should be promoted to take measures for sabo, dam sedimentation, river-bed deformation, and costal erosion.



Ⅴ-12. Lecture

"Water Quality Improvement and Change of Environmental Concern for Rivers in Japan"

Mr. Kunihiko AMANO

Water Quality Improvement and Change of Environmental Concern for Rivers in Japan

Dr. Kunihiko Amano

National Institute for Land and Infrastructure Management

1

Beginning of Environmental Concern

- '70s Decade of Public Nuisance by Industry
- Outbreaks of Red tide in Coastal Sea
- Pollution of fish by Hazardous materials such as PCB

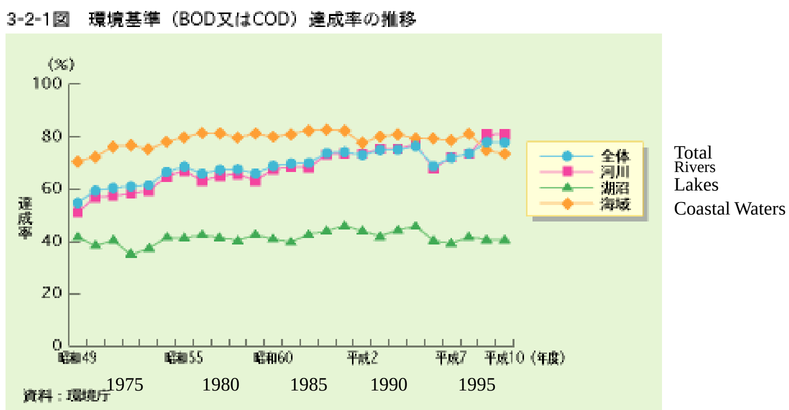
2

Legislation of Environmental Laws Regarding Aquatic Environment

- 1971 Water Pollution Control Law
- 1971 Environmental Quality Standards for Water Pollution
- 1978 Total Pollutant load Regulating Standards
- 1982 N, P Standards for Lakes
- 1984 Lake Water Quality Conservation Law
- 1993 THE BASIC ENVIRONMENT LAW
- 1997 ENVIRONMENTAL IMPACT ASSESSMENT LAW

3

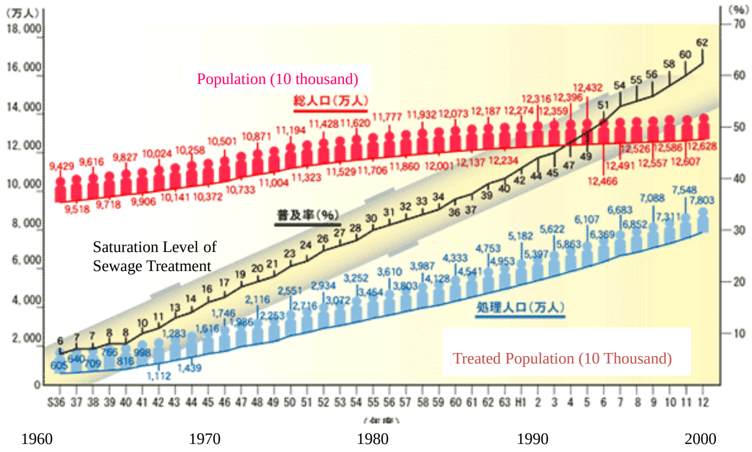
Achievement Rate of Environmental Standards (BOD/COD)



Good Achievement in Rivers; Poor Achievement in Lakes

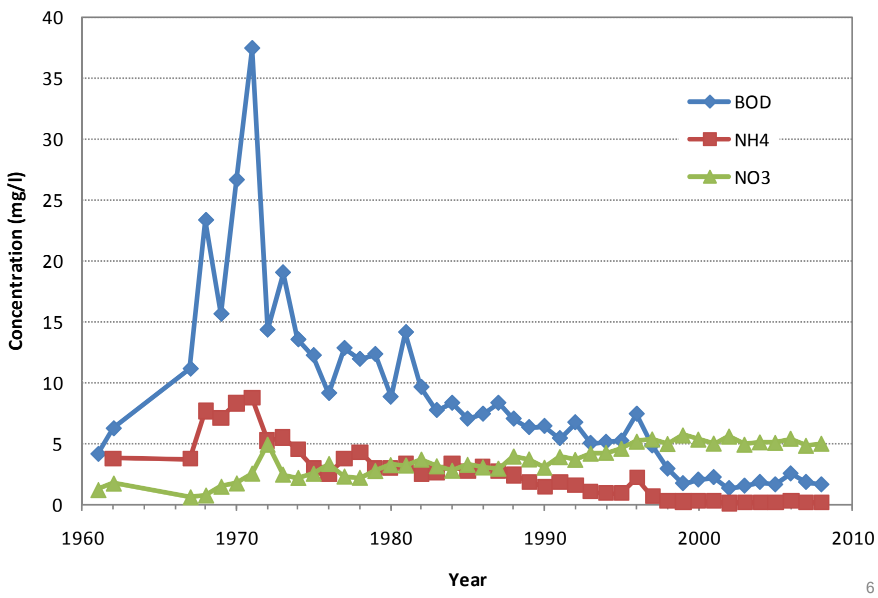
4

Progress of Sewage Treatment Works



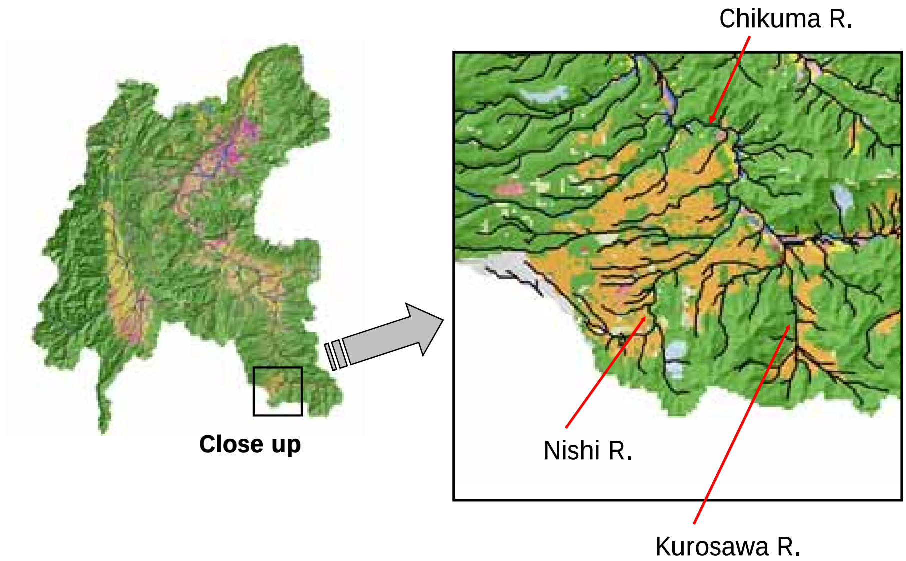
5

Water Quality Change in Tama River (Tokyo)



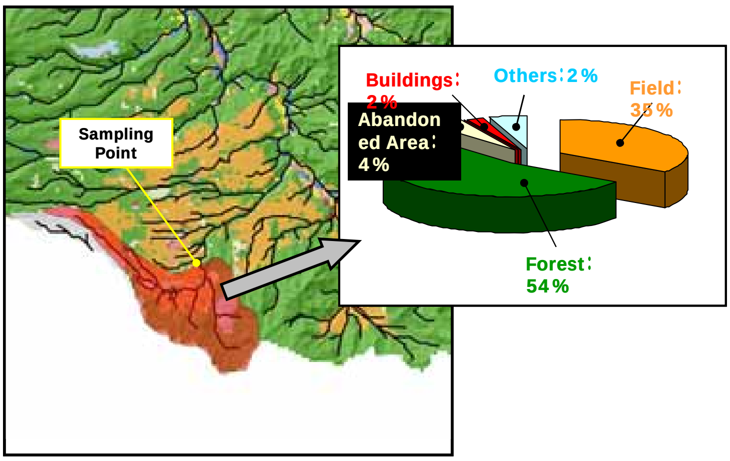
6

Water Quality of River and Basin Character



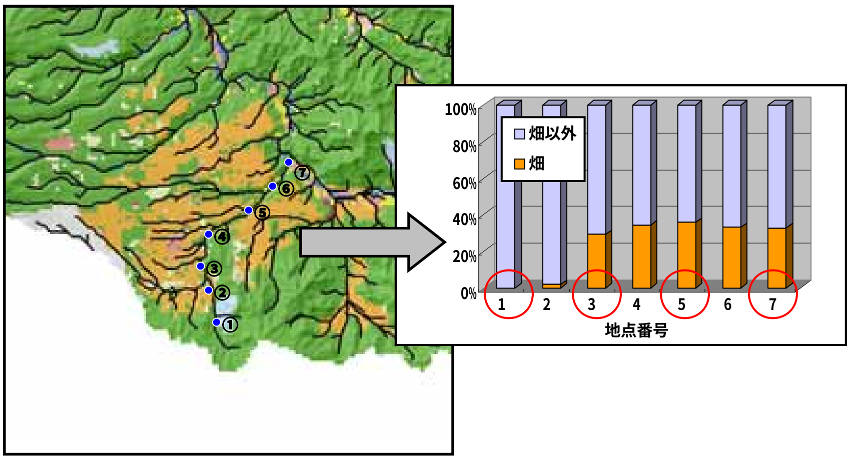
7

Land Use Effect on River Water Quality



8

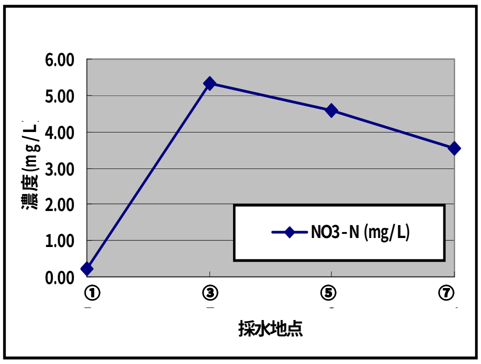
Land Use Effect on River Water Quality



9

Nitrate Concentration along Nishi R.

Samplings on Nov. 20, 2003



[point①]

[point③]

10

Water quality in rivers in Japan

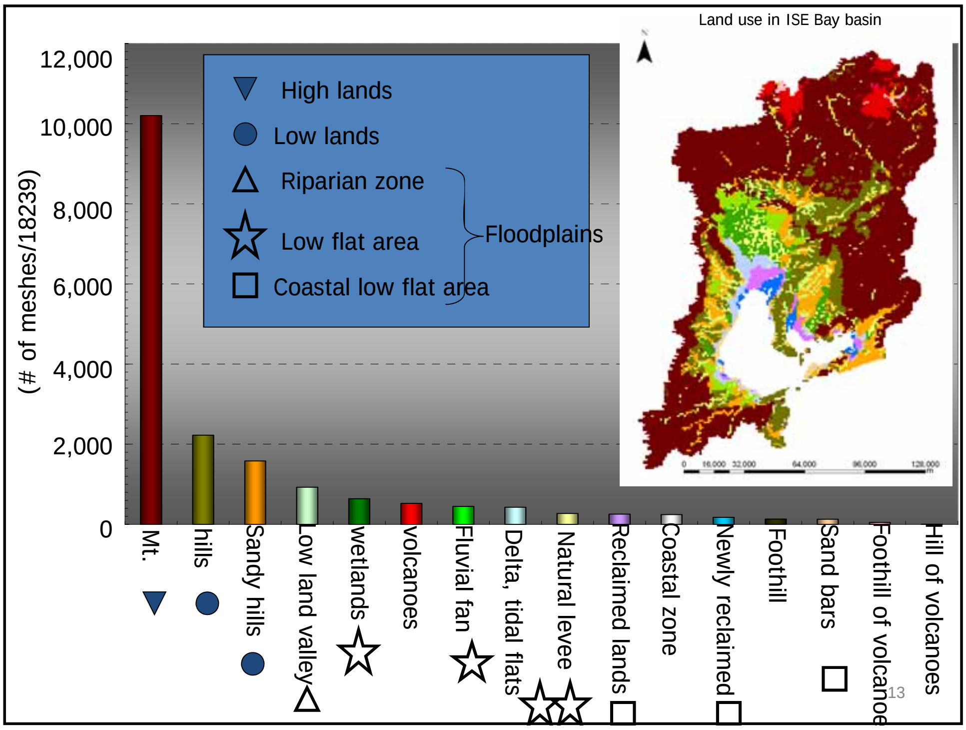
- Water quality has been improved significantly by the propagation of sewage treatment system (in rivers and in terms of BOD).
- Control of diffuse sources for nutrient control is still a major concern.
- Watershed management is the key for the success of water quality control.

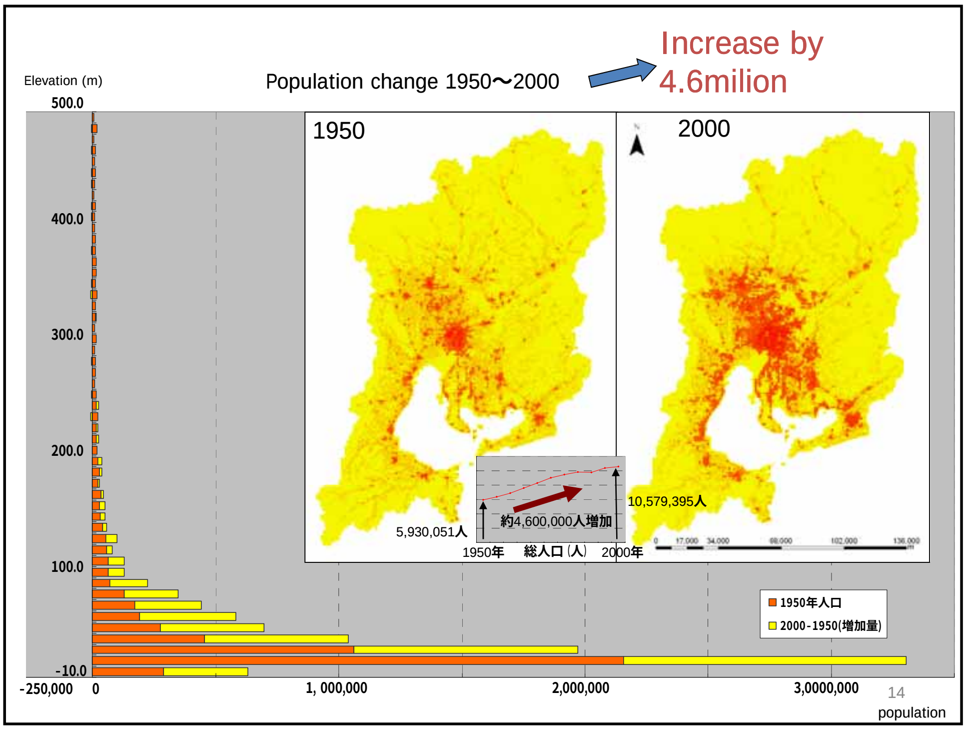
11

Watershed change of Ise Bay

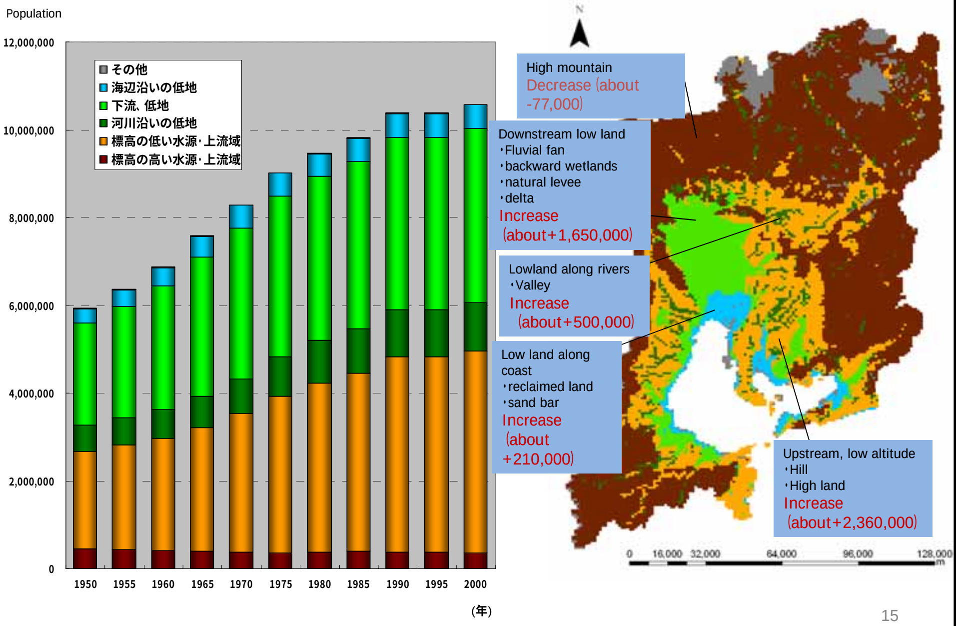
- Changes in population, land cover, water use, sediment supply and pollutant load were estimated from 1950 to 2000.
- Changes in ecological features were compared to those changes.

12


Land use in ISE Bay basin
12,000
10,000
8,000
6,000
4,000
2,000
0
(# of meshes/18239)
High lands
Low lands
Riparian zone
Low flat area
Coastal low flat area
Floodplains
Mt.
hills
Sandy hills
Low land valley
wetlands
volcanoes
Fluvial fan
Delta, tidal flats
Natural levee
Reclaimed lands
Coastal zone
Newly reclaimed
Foothill
Sand bars
Foothill of volcanoe
Hill of volcanoes
13

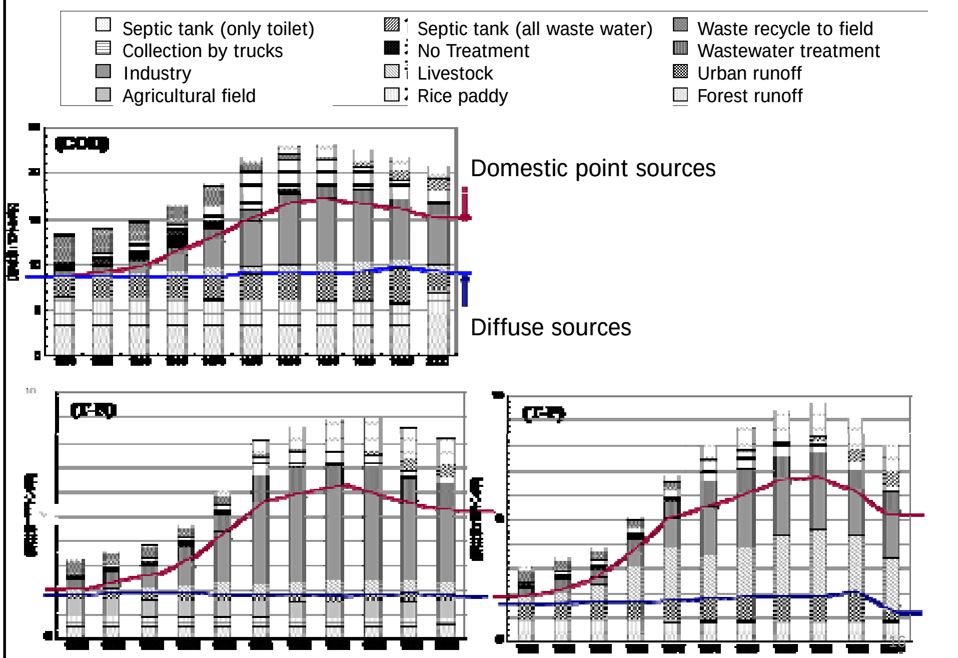

Elevation (m)
Population change 1950～2000
Increase by
4.6milion
500.0
400.0
300.0
200.0
100.0
-10.0
1950
2000
5,930,051人
約4,600,000人増加
10,579,395人
1950年
総人口 (人)
2000年
1950年人口
2000-1950(増加量)
-250,000
0
1, 000,000
2,000,000
3,0000,000
14
population

Population change among topological background

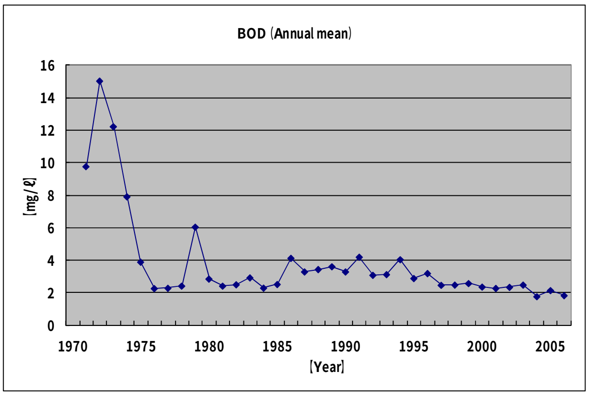


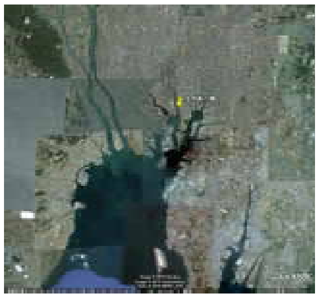
15

Estimated Change in total pollutant load from different sources



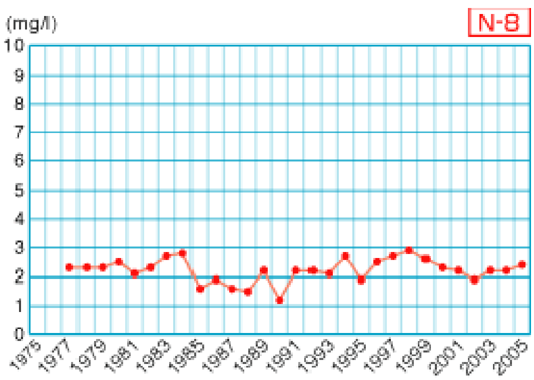
Improvement of WQ in a river



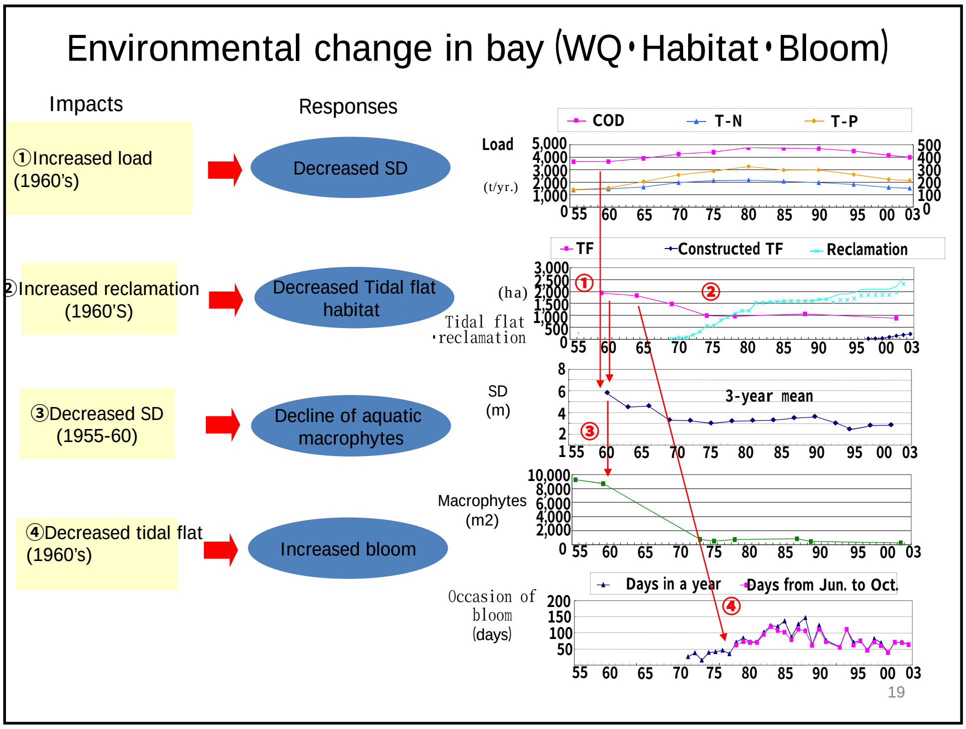


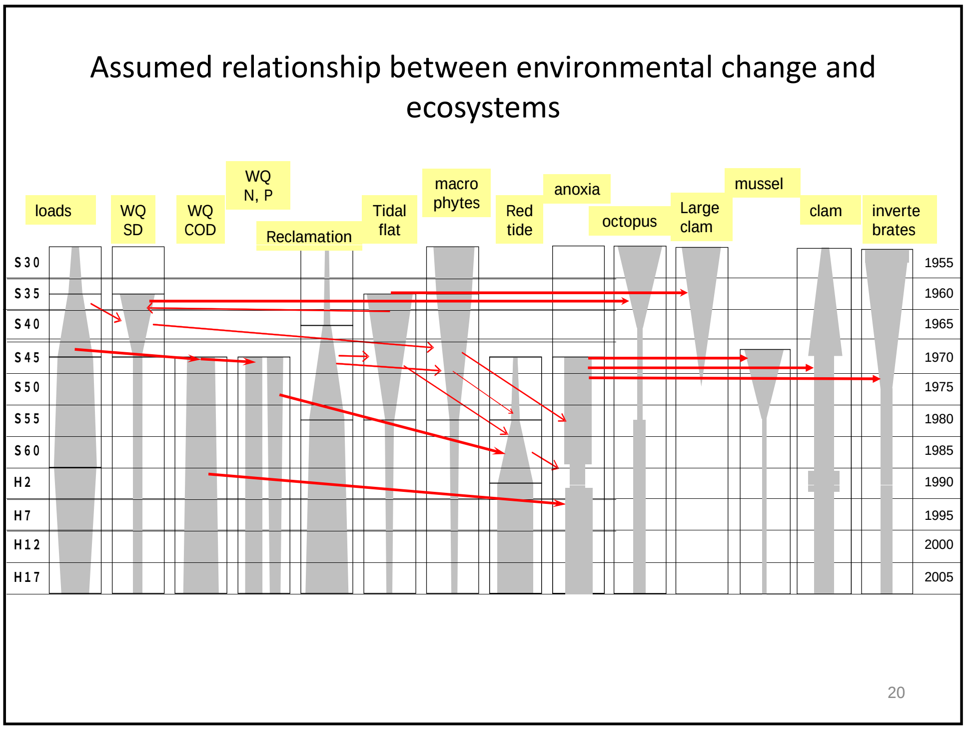
17

COD in ISE Bay (No improvement)



18


Environmental change in bay (WQ・Habitat・Bloom)
Impacts
Responses
①Increased load (1960's)
Decreased SD
②Increased reclamation (1960'S)
Decreased Tidal flat habitat
③Decreased SD (1955-60)
Decline of aquatic macrophytes
④Decreased tidal flat (1960's)
Increased bloom
COD
T-N
T-P
Load
(t/yr.)
TF
Constructed TF
Reclamation
(ha)
Tidal flat ・reclamation
SD (m)
3-year mean
Macrophytes (m2)
Days in a year
Days from Jun. to Oct.
Occasion of bloom (days)
19


Assumed relationship between environmental change and ecosystems
loads
WQ SD
WQ COD
WQ N, P
Reclamation
Tidal flat
macro phytes
Red tide
anoxia
octopus
Large clam
mussel
clam
inverte brates
S30
S35
S40
S45
S50
S55
S60
H2
H7
H12
H17
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
20

Historical Perspectives for River Environment

- Water Pollution by Industry (Point Sources) has been relatively well solved by the progress of waste water treatment.
- Progress of Sewage Treatment Works has improved River Water Quality in terms of BOD.
- Water Quality of Coastal areas and Lakes has not been improved well due to internal production caused by high nutrient loading. Thus, management of watershed became more important.
- Not only water quality but also ecosystem management has been paid much attention recently.

21

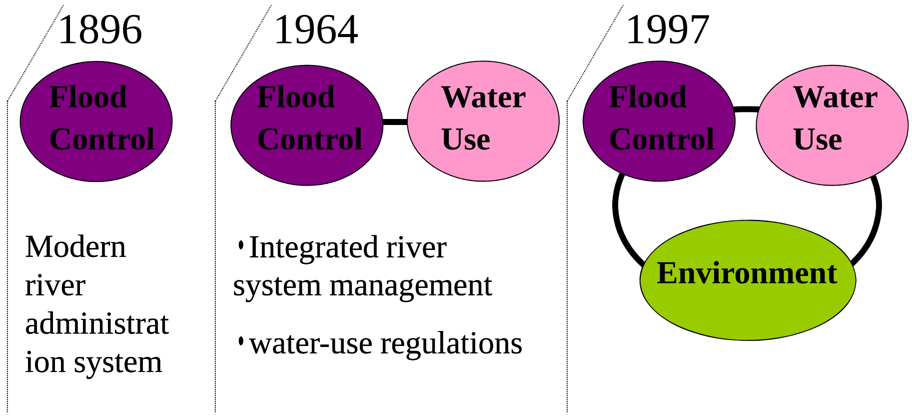
River Restoration, A New paradigm

- 1990: Naturally-diverse river works, Japanese version river restoration project
- 1997: Amendment (on River Environment) of River Law and enactment of Environmental Assessment Law

- More attention began to be paid on aquatic biota.

22

River Law for Environment



23

Naturally-diverse river works (Japanese version of river restoration)

- Officially started in 1990 by MOC(MLIT)
- Purpose

  Ecosystem with high biodiversity

  Beautiful landscape

24

Historical Progress in River Restoration

- Control of hazardous materials
- Control of organic pollutants
- Control of nutrients
- Improvement of environment in terms of habitat for wild lives and good landscape

25

5 Major Classes of Environmental Factors that Affect Aquatic Biota

- Energy Source (Food for Organisms)
- Water Quality
- Habitat Quality
- Flow Regime
- Biotic Interactions

26

Recent major human impacts on rivers in Japan

- Excavation and widening of low water cannel
- Change in sediment supply
- Decrease of flood discharge and frequency
- Construction of weirs and concrete shore protection
- Water quality change
- Invasion of exotic species

27

Excavation and widening of low water cannel

- Large amount of river bed material (gravels and sand) was excavated to use as concrete aggregates and to enlarge flow capacity of rivers from 1950's to 1970's.
- Excess erosion which can damage the foundation of structures and lowering of groundwater table occurred as the consequences. To prevent this, strict regulation has been enforced.

28

Change in sediment supply

- Construction of dams, check dams, and forest protection reduced the supply of sediments to downstream rivers.
- Otherwise, supply of fine silts increased in urbanized area.

29

Decrease of flood discharge and frequency

- Although dams in Japan do not have enormous capacity for flood control, they have reduced peak discharge and frequency of floods.
- Also, variation of flowrate is smoothened during non-flood period.

30

Construction of weirs and concrete shore protection

- Construction of weirs, shore protection, and dams have fragmented river networks and deteriorated the environment of river shore after 1960's.
- Construction of perpendicular concrete dikes has proceeded and it destroyed wildlife habitat of rivers in urban areas.

31

Water quality change

- Impoundment in dams has changed water quality.
- Urban runoff contains large amount of pollutants.
- Development of sewage works sometimes reduce the flow in rivers and river water quality is controlled by that of effluent from water treatment works if the discharge from water treatment works is large.

32

Invasion of exotic species

- Discharge of fishes which had been grown in other places (e.g. Sweet fish from lake Biwa) and invasion of exotic species such as large mouth bass endanger native species.
- Exotic plants such as pseud-acacia prevails in flood channel.

33

Emerged responses in river environment (1)

(Deterioration of habitat quality in rivers)

- Enlarged gaps between low water channel and flood channel lessened the inundation frequency of flood channel and shores along rivers. This lead to the invasion of dry land trees to river shore.
- Loss of sand from bed material occurred and this deteriorated habitat quality for benthos.
- Fragmentation of river networks interrupted fish migration.

34

Emerged responses in river environment (2)

(Changes following water quality and quantity change)

- Ecosystem shift due to water quality change (e.g. Species changes in periphyton, benthos, and fishes)
- Ecosystem shift due to water quantity change (e.g. Discontinuity of surface water in rivers and water quality deterioration due to longer retention time)

(Exotic Species)

- Exotic species accelerated the negative pressure on native species.

35

Major recent anthropogenic impacts on rivers in Japan

(Flow rate and its fluctuation pattern)

- Flood control by dams -> Less disturbance
- Water use for agriculture, power, and domestic purposes
  -> Less water in rivers

(Water quality)

- Water quality deterioration by agriculture, industry and urbanization

(River morphology (Habitat))

- Enlargement of low water channel by bed material excavation and/or river channel alteration for flood control -> Different inundation pattern and habitat loss

(Sediment transport)

- Sediment flux decrease by erosion control and building dams

(Network connection and distribution pattern)

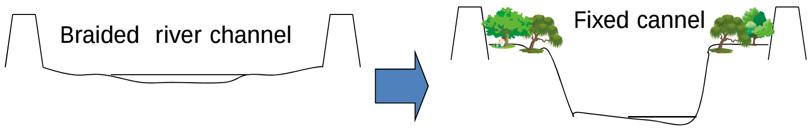
- Fragmentation of river system by weirs and bank protection
- Separation of rice field from river network by rice field reform

(Exotic species)

- Introduction of exotic species

36

Typical River Alteration in Japan during recent 50 years



Human Impacts

- •Gravel extraction
- •Construction of dams at upstream
- •Use of exotic trees to stabilize slopes

■Fixation of low water channel

■Decrease of gravel bars

■Less inundation onto flood ways

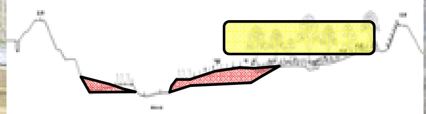
Environmental Responses

- •Shift in plant communities (increase of high trees, decrease of plants depending on gravel bars)
- •Less refuge for fishes during floods

37

Restoration project in Mibu River

Before restoration (2002)



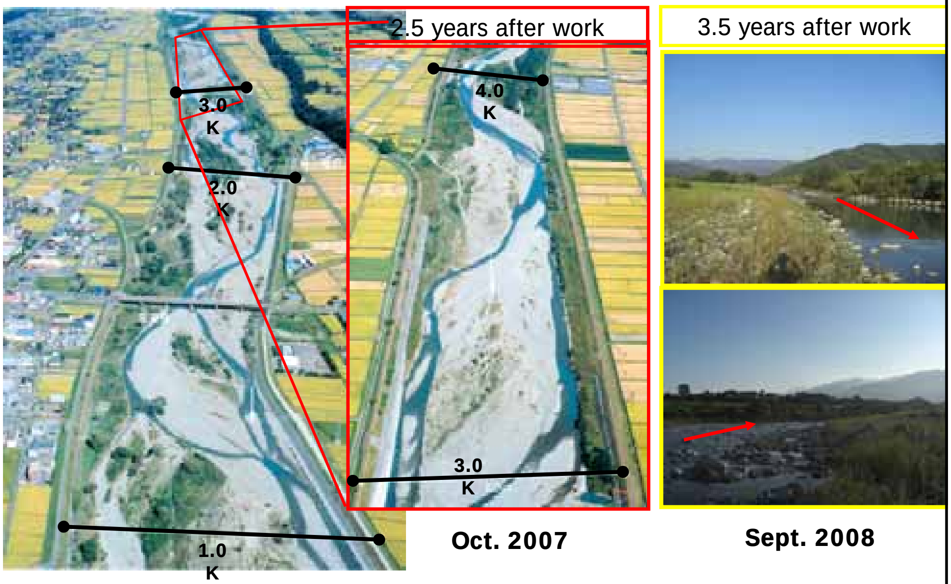
Restoration project (2005)

Procedure

- Lessening the gap between low water channel and flood way
- Cutting high trees on flood way
- Removal of exotic plants

38

Present status after restoration work



39

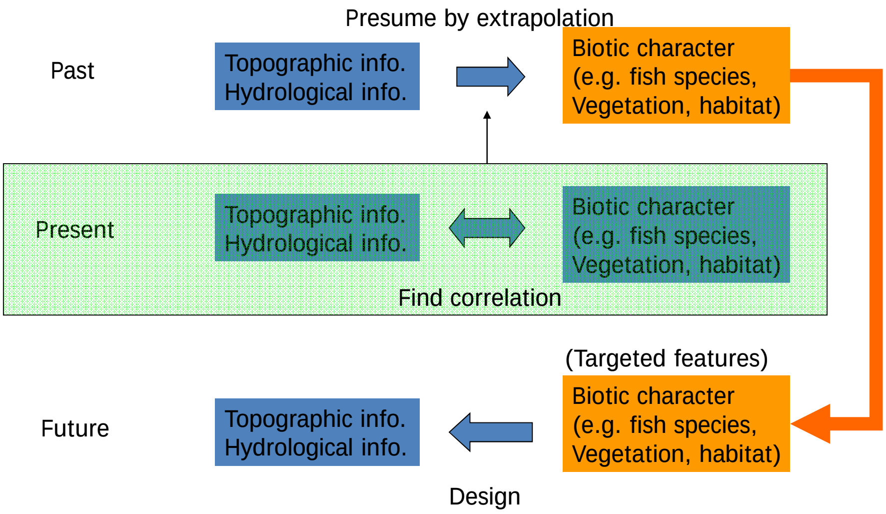
River Restoration, our approach

(Environmental situation)

- Pristine natural condition usually cannot be the goal of river restoration in Japan, since most rivers running through alluvial plains have been managed and altered by human society for hundreds of years (no pristine reference).
- The environment which had been managed in sustainable manners until modern economic development starts can be a candidate for the goal.

40

Our approach to set goals



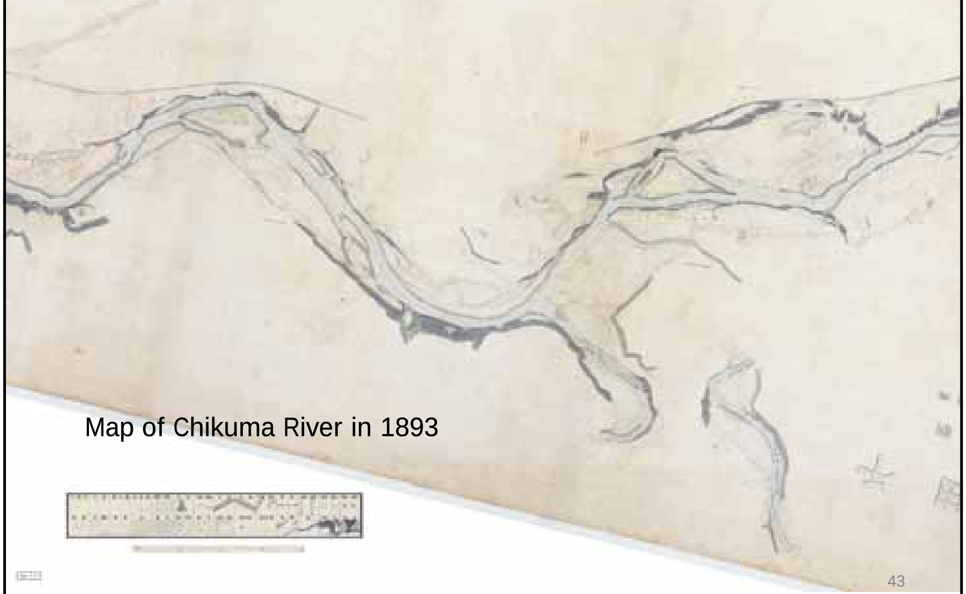
41

Our approach to set goals

- Past environment, which is supposed not to have faced significant modern environmental alteration should be estimated as quantitatively as possible.
- Since biotic information in the past is quite limited, we have paid attention on old geographical (topographical) and hydrological information.
- Based on the present correlation between local topographical and hydrological features and biotic characters found in rivers, we may be able to presume past environment in biotic sense.

42

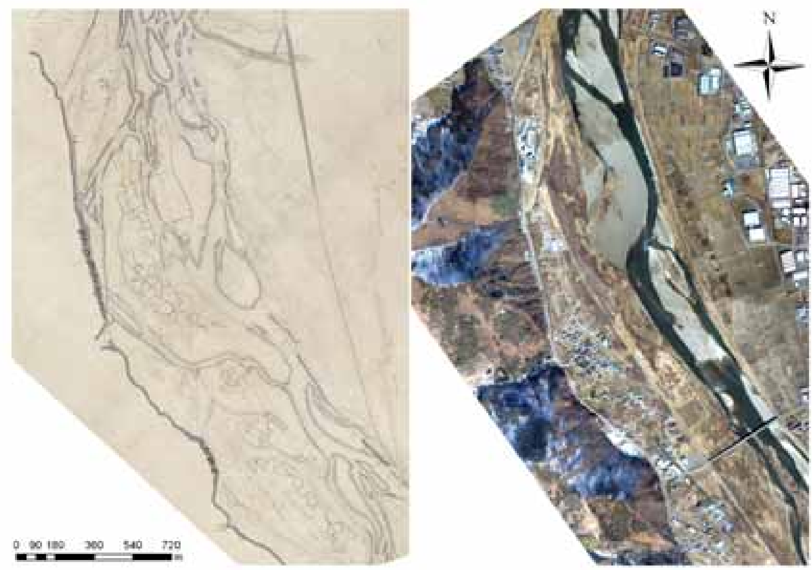
Hindcasting of past environment



Map of Chikuma River in 1893

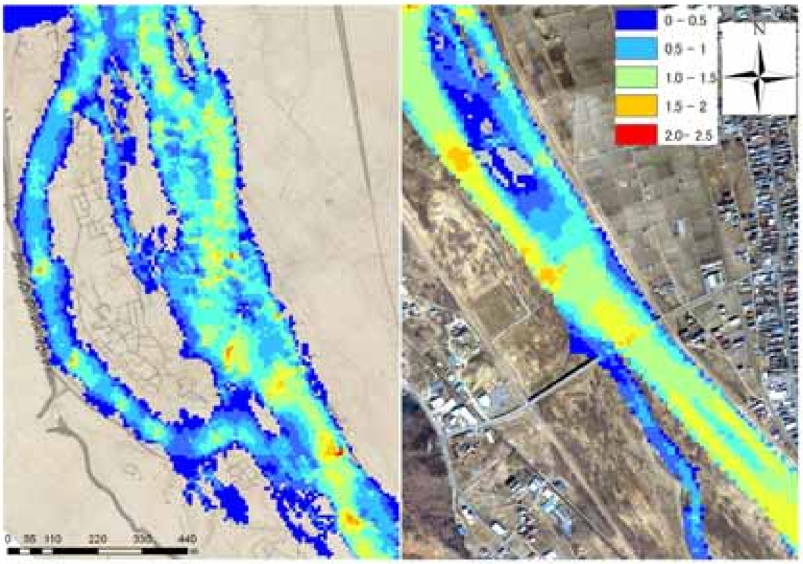
43

Topographical alteration from 1893 to present



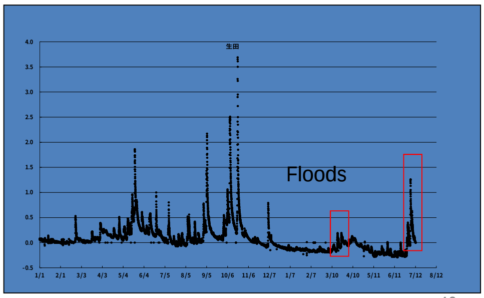
44

Hydrodynamic change due to topographical change



45

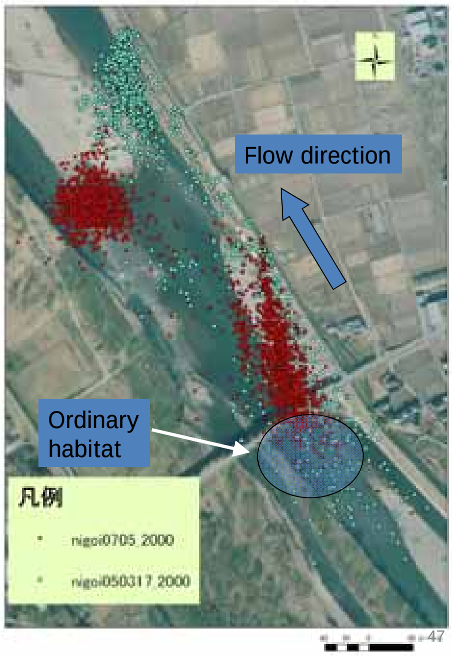
Tracking of fish behavior during floods using Advanced Telemetry System (ATS)



46

Tracking results of tagged carp

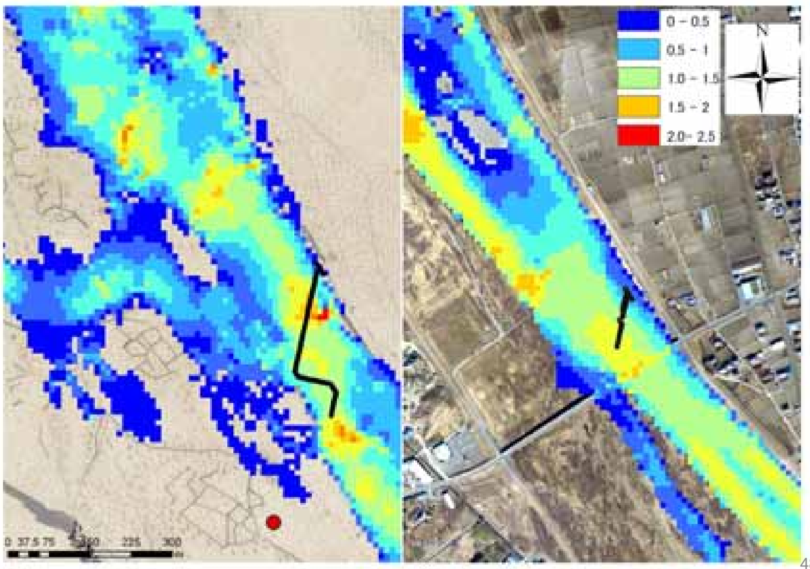
Tagged carp was flushed downstream during flood. However, it avoided to be swept further downstream by finding places where velocity is low (refuge at flood).



Legend:
- blue circle shows location of tagged carp during flood in March
- red circle shows location of tagged carp during flood in July

47

Fish behavior model combined with hydrodynamic model can hindcast the effect of floods on fishes during flood



48

Setting goal for river restoration

- Habitat evaluation based on present and past information must be proceeded in robust manners for quantitative estimation of restoration projects.
- Ecological monitoring for the restoration project of riparian environment should be performed in more detail (in particular, focusing on ecological function).
- Since traditional land use is a part of local environment in Japan, we have to take it into consideration in river restoration project.
- River ecology research groups which consist of civil engineers and ecologists have started joint study recently.

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Conclusion

- Water quality seems to be the first concern when the river environment begins to be deteriorated by human impact because it is clear to notice the change and somehow easy to find the cause.
- Environmental factors other than water quality should be taken into consideration to restore river environment.
- Broader temporal and spatial consideration should be paid.
- Social agreement is an important issue in environmental management. Establishment of good stewardship by residents in river basins will be more important in the near future.

50

Ⅵ REFERENCE

1. History

1) Conferences

The 1st Conference on Public Works Research and Development in Asia

Duration	February 15, 1993 - February 26, 1993
Place	Public Works Research Institute, MOC
Program	Keynote Lecture 1) Infrastructure Policies for Economic and Social Development of Asian Countries by Prof. Fumio Nishino, University of Tokyo 2) Progress of Civil Engineering and Its Contribution to Economic and Social Development in Modern Japan ― PWRI's 70 Years and Perspective ― by Mr. Yukihiko Sumiyoshi, Director-General, Public Works Research Institute 3) The Role of Research and Technology Development in International Technical Cooperation by Mr. Hiroaki Tamamitsu, Vice President, Japan Construction Training Center
	Country Report 1) Outline of Country 2) Public Works System 3) Description of the Department/Institute in charge of R&D of Public Works 4) Major R&D projects in the Department/Institute 5) International Research Exchange Programmes in the Department/Institute 6) Activities concerning "Disaster and Disaster Prevention" 7) Activities concerning "Harmony between the Environment and Improvement of Infra."
	Subject of Common Interests on "Future Perspective for R&D of Disaster Prevention Techniques against Disaster caused by Rainfall" 1) River-Related Disaster 2) Sediment-Related Disaster
	Specific Subjects 1) Sedimentation of Dam Reservoir （China, Japan） 2) Water Pollution Control （Indonesia, Japan） 3) River Environment （Korea, Japan） 4) Soil Improvement （Thailand, Japan） 5) Tunnel （Singapore, Thailand, Japan） 6) Volcanic Disaster, Debris Flow and Road Disaster Prevention （Malaysia, Philippines, Japan） 7) River （China, Japan） 8) Water Quality （Korea, Japan） 9) Soil Mechanics and Foundation Engineering,Traffic Engineering （Malaysia, Thailand, Japan） 10) Pavement （Philippines, Singapore, Thailand, Japan） 11) Highway Bridges （Philippines, Japan）
	Study Tour Hokkaido （Shin-Chitose Airport, CERI, Muroran Hakucho-Bridge, Seikan-Tunnel etc.） Kanto (Trans-Tokyo Bay Highway、Miyagase-Dam）
Participants	Overseas: 8, Japan:37, Guests:35 (Overseas:5, Japan:30)

The 2nd Conference on Public Works Research and Development in Asia

Duration	November 15, 1993 - November 26, 1993
Place	Public Works Research Institute, MOC
Program	Keynote Lecture 1) Role of Civil Engineers for Sustainable Development by Mr. Atsushi Hamamori, President, Japan Overseas Consultants Co. Ltd. 2) Socio-Economic Development and Construction Technology Transfer by Mr. Yukihiko Sumiyoshi, Director-General, Public Works Research Institute 3) Research in Japan -Focusing Civil Engineering- by Prof. Hiroyoshi Shi-igai, University of Tsukuba
	Country Report 1) Outline of Country 2) Public Works System 3) Description of the Department/Institute in charge of R&D of Public Works 4) Major R&D projects in the Department/Institute 5) International Research Exchange Programmes in the Department/Institute
	・Subject of Common Interests on "Disaster and Disaster Prevention" 1) Comprehensive Countermeasure against Floods 2) Countermeasure against Highway Slope Failure ・Subject of Common Interests on "Harmony between the Environment and Improvement of Infrastructure" 1) Measures for Water Quality Control of Reservoirs and Rivers 2) Countermeasures against Air Pollution and Noise caused by Road Traffics in Urban Areas
	Specific Subjects 1) Debris Flow （China, Philippines, Japan） 2) Materials of the Highway Bridges -Concrete- （Indonesia, Japan） 3) Flood Control （Korea, Japan） 4) Care for the Rivers （Malaysia, Japan） 5) Utilization of the Underground Space （Singapore, Japan） 6) Air Pollution （Thailand, Japan） 7) Materials of the Pavement （Indonesia, Japan） 8) Environment Improvement -Water Quality Control- Korea, Thailand, Japan） 9) Creation of the River Environment （Malaysia, Japan） 10) Traffic Management （Singapore, Japan）
	Study Tour Chugoku-Shikoku（Seto-Ohashi） Kyushu（Yoshinogari Historical Park, Rokkaku River, Mt.Unzen etc.） Kanto （Trans-Tokyo Bay Highway）
Participants	Overseas: 7, Japan:41, Guests:60 (Overseas:7, Japan:53)

The 3rd Conference on Public Works Research and Development in Asia

<table>
<tr><td>Duration</td><td>October 17, 1994 - October 28, 1994</td></tr>
<tr><td>Place</td><td>Public Works Research Institute, MOC</td></tr>
<tr><td rowspan="5">Program</td><td>Keynote Lecture
1) Viewpoints on Panama Canal Alternative Study
by Dr. Akira Ishido, Managing Director, Yachiyo Engineering Co. Ltd.
2) Vision of Construction Technical Research and Development to the 21st Century
by Dr. Takashi Iijima, Director-General, Public Works Research Institute
3) Economic Growth, Infrastructure Development and International Cooperation in Asian Counties
by Prof. Yuzo Akatsuka, Saitama University</td></tr>
<tr><td>Trend of Public Works Research and Development
1) Role and Outline of Research Organization in Public Works
2) Activities and Topics of Research and Development in Research Organization
3) Research Management
(Implementation of Research, Mid-term or Annual Research Plan, Research Budget, Improvement of Researcher)</td></tr>
<tr><td>・ Subject of Common Interests on "Environmental Policy of Rivers, Lakes and Marshes" (Improvement of Water Quality, Infrastructure Development with Considerations for the Environment)
・ Subject of Common Interests on "Infrastructure Development in the field of Roads" (Establishment of Road Network, Maintenance and Management of Roads such as Pavement and Bridge)</td></tr>
<tr><td>Specific Subjects
1) Flood Control (Bangladesh, India Indonesia, Thiland, Japan)
2) Highway Planning, Traffic System (China, Korea, Japan)
3) Soil Improvement (Malaysia, Japan)
4) Water Pollution Control (Philippines, Thailand, Japan)
5) Volcanic Disaster, Debris Flow (Indonesia, Japan)
6) Geological Survey (Malaysia, Japan)
7) Water Quality for Drinking (Philippines, Japan)</td></tr>
<tr><td>Study Tour
Kinki （Akashi Kaikyo Ohashi, Osaka Bay Highway, Kansai International Airport, Asuka Historical Park, Otaki Dam）</td></tr>
<tr><td>Participants</td><td>Overseas: 9, Japan:36, Guests:65 (Overseas:7,Japan:58)</td></tr>
</table>

The 4th Conference on Public Works Research and Development in Asia

Duration	September 25, 1995 - October 4, 1995
Place	Public Works Research Institute, MOC
Program	Trend of Public Works Research and Development 1) Role and Outline of Research Organization in Public Works 2) Activities and Topics of Research and Development in Research Organization 3) Research Management (Implementation of Research, Mid-term or Annual Research Plan, Research Budget, Improvement of Researcher)
	Subject of Common Interests on " Research and Development for Natural Disaster Reduction"
	Specific Subjects 1) Flood Control (Bangladesh, India, Indonesia, Thailand, Japan) 2) Highway Planning, Traffic System (China, Korea, Japan) 3) Soil Improvement (Malaysia, Japan) 4) Water Pollution Control (Philippines, Thailand, Japan) 5) Volcanic Disaster, Debris Flow (Indonesia, Japan) 6) Geological Survey (Malaysia, Japan) 7) Water Quality for Drinking (Philippines, Japan)
	Study Tour Kinki （Akashi Kaikyo Ohashi, Osaka Bay Highway, Kansai International Airport, Asuka Historical Park, Otaki Dam）
Participants	Overseas: 9, Japan: 36, Guests: 65 (Overseas: 7,Japan: 58)

The 5th Conference on Public Works Research and Development in Asia

Duration	October 25, 1996 - October 22, 1996
Place	Public Works Research Institute, MOC
Program	Keynote Lecture 1) Case Study from my Overseas Work by Dr. Yorio MURAKAMI, Vice President, Kawasaki Geological Engineering Ltd. 2) Report on the Disaster Caused by 1995 Hyogoken Nanbu Earthquake by Mr. Tadahiko SAKAMOTO, Director-General, Public Works Research Institute 3) Development Cooperation and Public Works in Asia by Dr. Akira TAKAHASHI, Professor Emeritus, University of Tokyo
	Subject of Common Interests 1) Harmony between Public Works and Environment 2) Securement and Training of Civil Engineers
	Specific Subjects 1) Earthquake Disaster (India, Philippines, Japan) 2) River Management (Malaysia, Thailand, Japan) 3) Road Technology (China, Japan) 4) Soft Ground (Bangladesh, Korea, Japan) 5) Air Pollution (Indonesia, Nepal, Japan)
	Study Tour Tohoku（Ichinoseki Retarding Basin, Onikobe Road, Sen-en Road)
Participants	Overseas: 9, Japan: 36, Guests: 65 (Overseas: 7,Japan: 58)

The 6th Conference on Public Works Research and Development in Asia

Duration	October 14, 1997 - October 21, 1997
Place	Harbor View Hotel, Okinawa
Program	Keynote Lecture
	1) Regional Development and the Environment Dr. Hosei Uehara, Professor, University of the Ryukyus
	2) Intelligent Transport Systems (ITS) Mr. Seizo Tsuji, Director General, PWRI
	3) Okinawa's Social Capital and Development Technologies Mr. Tamio Shimogami, Engineering General, Okinawa Prefectural Government
	Subject of Common Interests
	"Research and Development of Public Infrastructure Suitable to Environmental and Climatic Condition"
	Specific Subjects
	1) Soil Mechanics and Foundation .... Bangladesh, India, Japan 2) Flood Control .... Thailand, Japan 3) Traffic Management .... China, Nepal, Japan 4) Water Quality Control .... Indonesia, Malaysia, Japan 5) Volcanic Disaster, Debris Flow .... Philippines, Japan
	Study Tour
	Kinjo Dam Gushigawa Sewage Disposal Facility Haneji Dam Okinawa National Memorial Park
Participants	200

The 7th Conference on Public Works Research and Development in Asia

Duration	October 12, 1998 - October 23, 1998
Place	Okinawa Convention Center, Okinawa
Program	Keynote Lectures
	1)Surveyal,Planning,Design and Implementation of Bridge Construction in Japan's Grant Aid Projects Mr. Satoshi Watabe, Pacific Consultants International
	2)Disaster Preventive Project under the Consideration of Nearby Environmental Condition — The Project for Flood Mitigation in Ormoc City, Phillippines Mr. Hitoshi Kin, CTI Engineering Co., Ltd.
	3)Infrastructure Development and Management Prof.Masahiko Kunishima, University of Tokyo
	4)Okinawa's Coastal Waves and Outflow of Red Soil to the Seashore Dr. Seikoh Tsukayama, Professor, University of Ryukyus
	5)New Direction for Sustainable Development in Asia Mr. Yasutake Inoue, Director General, PWRI
	6)Promotion and Development of Okinawa and Its Public Works Technology Mr. Masamichi Shirahase, Vice Director General, Okinawa General Bureau
	Subject of Common Interests
	"Research and Development on the Comprehensive Disaster Prevention Measures Considering Ecological Environment and Social Condition"
	Specific Subjects
	1) Water Pollution .... Bangladesh, India, Japan 2) Flood Control .... Bangladesh, Philippines, Korea, Japan 3) Soil Improvement and Slope Protection...................India, Laos, Malaysia, Japan 4) Pavement .... Indonesia, India, Malaysia, Japan 5) Sedimentation of Dam Reservoir .... Malaysia, Korea, Japan 6) Earthquake Disasters .... Nepal, Japan 7) Coastal Erosion .... Thailand, Japan
	Study Tour
	Haneji Dam Okinawa National Memorial Park
Participants	Oveaseas: 11, Japan: 30, Guests: 60

The 8th Conference on Public Works Research and Development in Asia

Duration	October 12, 1999 - October 21, 1999
Place	Kariyushi Urban Resort Naha, Okinawa
Program	Keynote Lectures
	1)Present Situation and Tasks of Japan's ODA—Mainly on Infrastructures Mr. Kenji Kiyomizu, Development Specialist on Civil Engineering of JICA
	2)Infrastructure Development and Management in Asia Prof.Masahiko Kunishima, University of Tokyo
	3)Asian Concrete Model Code Asso. Prof. Tamon Ueda, University of Hokkaido
	Subject of Common Interests
	"Research and Development on the Construction Technology Which is Applicable to the Local Natural Environment and Social Condition"
	Specific Subjects
	1) National Disaster Prevention.. India, Japan 2) Soil Improvement..Bangladesh, Malaysia, Japan 3) Sedimentation of Dam Reservo..................................... Nepal,Philippines, Japan 4) Design Load of Bridges ....Thailand, Japan 5) Under Ground Use ....Indonesia, Korea, Japan 6) Pavement .... Laos, Japan 7) River Management...China, Japan
	Study Tour
	Okinawa National Memorial Park Haneji Dam Seawater Desalination Plant
Participants	200

The 9th Conference on Public Works Research and Development in Asia

Duration	October 10, 2000 - October 19, 2000
Place	National Institute for Land and Infrastructure Management, MLIT Bankoku Shinryokan, Okinawa
Program	Keynote Lectures
	Public Works Management Mr. Akira Fujimoto Research Coordinator for Public Works Management, Research Center for Public Works Management, PWRI Prof. Masahiko Kunishima, University of Tokyo Mr. Takenori Yamashita Head, Management Research Division Research Center for Public Works Management, PWRI Mr. Kenichi Matsui Head, System Development Division Research Center for Public Works Management, PWRI
	Subject of Common Interests
	"Research and Development on Promoting Technology Transfer in the Field of Construction Technology"
	Specific Subjects
	1) River Management...Laos, Japan 2) Water Quality Control.. China, Japan 3) Sedimentation of Dam Reservoir ....Malaysia, Japan 4) Traffic Management ....Nepal, Philippines, Japan 5) Soil Improvement..Thailand, Japan 6) Earthquake Disaster Prevention..India,Indonesia, Japan
	Study Tour
	ITS Information Center Haneji Dam Okinawa National Memorial Park Kanna Dam Historical Road
Participants	130

The 10th Conference on Public Works Research and Development in Asia

Duration	October 16, 2001 - October 25, 2001
Place	National Institute for Land and Infrastructure Management, MLIT Bankoku Shinryokan, Okinawa
Program	Lectures
	Public Works Management Mr. Kenichi Matsui Head, Construction Management Division Research Center for Land and Construction Management, NILIM
	Subject of Common Interests
	"Research and Development on Public Works Concerned with Reducing Environmental Impact for Sustainable Development"
	Specific Subjects
	1) Water Quality Management......India, Japan 2) River Management......Lao, Nepal, Japan 3) Coast Management......Malaysia, Japan 4) Traffic Management ......Thailand, Japan 5 Earthquake Disaster Prevention...... ......Bangladesh, India, Japan
	Study Tour
	1)Arakawa River Channel 2)Kobe Akashi Kaikyo Bridge 3)Okinawa ITS Information Center Electric Power Plant Kanna Dam Plastic Bridge
Participants	100

The 11th Conference on Public Works Research and Development in Asia

Duration	October 15, 2002 - October 24, 2002
Place	National Institute for Land and Infrastructure Management, MLIT Bankoku Shinryokan, Okinawa
Program	Keynote Lectures
	1) Hydrology and Water Resources in Monsoon Asia Dr. Katumi Musiake President, Japan Society of Hydrology and Water Resources Department of Human and Society, Institute of Industrial Science University of Tokyo
	2) Flood and Sediment-related Disasters in Japan Mr. Yasuo Nakano, Director Research Center for Disaster Risk Management, NILIM
	3) Comprehensive Water-Resource Issues of Island Communities Dr. Housei Uehara, Honorary Professor, University of the Ryukyus
	Subject of Common Interest
	"Water Resources and River Management for Sustainable Development"
	Specific Subjects
	1) Specific Subjets [1] a) Flood Control and Water Resources Management .... India, Indonesia, Laos, Philippines, Thailand, Japan b) Water quality.. Malaysia, Sri Lanka, Japan c) Groundwater.. Pakistan, Japan 2) Specific Subjects [2] a) Roads, Pavement, Traffic Management & Safety .... India, Indonesia, Laos, Pakistan, Sri Lanka, Japan b) Volcanic Disaster, Erosion Control & Debris Flow .... Philippines, Malaysia, Thailand, Japan 3) Specific Subjects [3] -Red Soil Erosion Countermeasures & Environmental Preservation in Okinawa- a) Integrated Operation of dams b) Road Construction.. Indonesia, Korea, Laos, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand, Japan
	Study Tour
	1) Kyoto: Ohtsu Auxiliary Conduit, Seta River Weir(Outlet Flow Control) Amagase Dam, Drainage of Lake Biwa and the Incline, 2) Osaka: Legacy of Sayama Pond 3) Okinawa: The Urban Monorail System, Le Village, Haneo Dam, Taiho Dam
Participants	130

The 12th Conference on Public Works Research and Development in Asia

Duration	October 20, 2003 to October 31, 2003
Place	National Institute for Land and Infrastructure Management, MLIT Tokyo International Center, JICA Okinawa Convention Center
Program	**Keynote Lectures** 1) Public Transport in Urban Areas Dr. Fumihiko NAKAMURA Associate Professor, Department of Civil Engineering Yokohama National University 2) Development Trend and Urban Traffic Problem in Okinawa Central and Southern City Area Dr. Takayuki IKEDA Professor, Department of Civil Engineering & Architecture, University of Ryukyus
	Lectures 1) Technical Standard for Pavement and Asset Management in Japan Mr. Masahide ITO Team Leader, Pavement Research Team, Road Technology Research Group, Public Works Research Institute 2) Maintenance of Bridge Mr. Shoichi NAKATANI Head, Bridge Division, Road Dept. NILIM 3) ITS and Transportation - What will be changed? Dr. Harutoshi YAMADA Director, Research Center for Advanced Information Technology, NILIM 4) Environmental Problems in Urban Transport Mr. Michio TANAHASHI Director, Environment Dept., NILIM 5) Promotion of International Mobility of Engineers - APEC Engineer Project Mr. Shigeatsu TAKI Representative, Taki Associates
	Subject of Common Interest Session Traffic and Road - Measures for Urban Traffic Problem in Asian Big Cities
	Discussions of Specific Subjects 1) Technical Standard for Pavement and Asset Management in Japan 2) Maintenance of Bridge 3) Environmental Problems in Urban Transport 4) Restoration of Environment
	Study Tour 1) Tsukuba: Tsukuba Express Railway Construction Site, Tsukuba Space Center 2) Tokyo: Japan Highway Public Corporation(Electronic Toll Collection System, Tokyo Bay Cross Highway: Tokyo Bay Aqua Line) 3) Okinawa: Okinawa Urban Monorail: YUI RAIL, Shurijo Castle, Okinawa Churaumi Aquarium
Participants	130

The 13th Conference on Public Works Research and Development in Asia

Duration	October 18, 2004 - October 29, 2004
Place	National Institute for Land and Infrastructure Management, MLIT Tokyo International Center, JICA Okinawa Convention Center
Program	**Keynote Lectures** 1) Appropriate Sewage Treatment Technology for Developing Region Dr. Hideki HARADA Professor, Environmental Biotechnology Laboratory, Nagaoka University of Technology 2) Water Issues in Ryukyu Islands Dr. Chokei YOSHIDA Board Member, Okinawa P. Public Health Association
	Lectures 1) Treated Wastewater Reuse in Japan Mr. Atsushi TAJIMA Senior Researcher, Wastewater and Sludge Management Division, Water Quality Control Dept. NILIM 2) Occurrence of Endocrine Disrupting Compounds in Wastewater and Their Fate in Wastewater Treatment Plant and Environment Mr. Yutaka SUZUKI Team Leader, Water Quality Team, Water Environment Research Group, PWRI Mr. Hiromasa YAMASHITA Senior Researcher, Recycling Team, Material and Geotechnical Engineering Research Group, PWRI 3) Water Quality Management in Japan Dr. Hiroyuki ITO Senior Researcher, River Environment Division, Environment Dept., NILIM 4) Comprehensive Flood Control Measures Mr. Koichi FUJITA, Head, River Environment Division, Environment Dept., NILIM 5) Urban Flood Management Mr. Tetsuya NAKAMURA Head, Flood Disaster Prevention Division, Research Center for Disaster Risk Management, NILIM 6) Urban Drainage and Inundation Prevention Measures in Japan Mr. Kazuya FUJIU (for Mr. Motoi NASU) Head, Wastewater System Division, Water Quality Control Dept., NILIM 7) The World Water Forum Mr. Hideaki ODA, Secretary General, Japan Water Forum
	Subject of Common Interest Session Management of Urban Water Environment
	Discussions of Specific Subjects 1) Water Quality 2) Flood Control in Urban Areas
	Study Tour 1) Tsuchiura: Kasumigaura Kohoku Regional Sewerage System / Kasumigaura Sewage Treatment Plant, Tsuchiura Bio-Park 2) Tokyo: Morigasaki Water Reclamation Center, Digestive Gas Power Facilities, Ariake Wastewater Treatment Plant, Purification Plant, Odaiba Marine Park, Shiodome Reclaimed Water & Sprincle Test Facilities 3) Okinawa: Naha Sewage Treatment Plant, A Building Using Reclaimed Water in Naha New Urban Center, Makabi Retarding Basin, Kinjo Dam, Shuri Castle
Participants	130

The 14th Conference on Public Works Research and Development in Asia

Duration	October 17, 2005 - October 28, 2005
Place	National Institute for Land and Infrastructure Management, MLIT Japan International Cooperation Agency, Sendai International Center
Program	**Keynote Lectures** (1) Disaster Mitigation Perspective – From Engineering to Citizen's Participation Dr. Yujiro OGAWA, Professor, College of Environment and Disaster Research, Fuji Tokoha University (2) Global Disaster – Lessons from the 2004 Sumatra Earthquake and Indian Ocean Tsunami Dr. Fumihiko IMAMURA, Professor, Disaster Control Research Center, Graduate School of Engineering, Tohoku University
	Lectures (1) Mitigation Measures and Risk Management against Flood and Coastal Disaster 1)Dr. Tadashi SUETSUGI, Head, River Division, River Dept. NILIM 2)Mr. Tetsuya NAKAMURA, Head, Flood Disaster Prevention Division, Research Center for Disaster Risk Management, NILIM 3)Mr. Fumihiko KATO, Senior Researcher, Coast Division, River Dept. NILIM (2) Procedure for Setting Area for Restriction on Land Use in order to Reduce Risk due to Sediment-related Disasters Dr. Hideaki MIZUNO, Senior Researcher, Erosion and Sediment Control Division, Research Center for Disaster Risk Management, NILIM (3) Development of Warning and Evacuation System against Sediment-related Disasters Dr. Nobutomo OSANAI, Head, Erosion and Sediment Control Division, Research Center for Disaster Risk Management, NILIM (4) Debris Flows Detection Sensors Mr. Jun'ichi KURIHARA, Team Leader, Volcano and Debris Flow Research Team, Erosion and Sediment Control Research Group, PWRI (5) Development of the Landslide Displacement Detection Sensor Using Optical Fiber Mr. Kazunori FUJISAWA, Team Leader, Landslide Research Team, Erosion and Sediment Control Research Group, PWRI (6) The World Water Forum Mr. Hideaki ODA, Secretary General, Japan Water Forum
	Subject of Common Interest Session Risk Management and Mitigation for Flood and Sediment Related Disasters
	Discussions of Specific Subjects 1) Mitigation Measures and Risk Management against Flood and Coastal Disaster 2) Risk Management and Mitigation for Sediment-related Disasters 3) Flood Forecasting and Warning
	Study Tour 1) Tsukuba Area: 1986 Kokai River Embankment Destruction Part, Kokai River Hakojima Retarding Basin 2) NILIM and PWRI: UNESCO-PWRI Centre, Current Meter Calibration Channel, River Model Test Yard, Coastal Hydraulics Laboratory, Smart Communication & Advanced Cruise-assist Highway Systems 3) Tokyo Area: Kanda River/Loop 7 Underground Regulation Pond Works, Tsurumi River Multipurpose Retarding Basin, Slope Failure Prevention Works in Yokohama, PARI's Large Hydro-Geo Flume and Intelligent Wave Basin for Maritime Environments, NILIM Yokosuka's Airplane Loading Test Systems 3) Tohoku Area: Ishibuchi Dam, Isawa Dam, Chusonji-Temple, Ichinoseki Retarding Basin, Satetsu-River Disaster Restoration Site
Participants	100

The 15th Conference on Public Works Research and Development in Asia

Duration	November 6, 2006 - November 17, 2006
Place	National Institute for Land and Infrastructure Management, MLIT Japan International Cooperation Agency, Aichi Art Center
Program	Keynote Lectures (1) Road Policies in Japan – Brief History and Recent Topics – Dr. Haruo ISHIDA Dept. of Social Systems and Management, Tsukuba University
	Lectures (1) Efforts Towards More Accessible And Functional Expressway System Mr. Kenta HAMAYA Researcher, Traffic Engineering Division, Road Department, National Institute for Land and Infrastructure Management (2)Evaluation of Freight Transport Network Mr. Tatsuo KONO Senior Researcher, Traffic Engineering Division, Road Department, National Institute for Land and Infrastructure Management (3)Comprehensive Implementation of Road Administration Management in Japan Mr. Tetsuya OWAKI Senior Researcher, Traffic Engineering Division, Road Department, National Institute for Land and Infrastructure Management (4)An Overiew of Road Traffic Survey in Japan and Utilization for grasping traffic congestion Mr. Shinji ITSUBO Researcher, Traffic Engineering Division, Road Department, National Institute for Land and Infrastructure Management (5)Trend of Road Accidents and Measures in Japan Dr. Susumu TAKAMIYA Senior Researcher, Advance Road Design Safety Division, Road Department, National Institute for Land and Infrastructure Management (6)Collection and Utilization of Date on Traffic Accidents Mr. Shinsuke SETOSHITA Senior Researcher, Advance Road Design Safety Division, Road Department, National Institute for Land and Infrastructure Management (7)Effects of Traffic safety Measures and Effective Development Methods for Traffic Safety measures Mr. Hiroki HASHIMOTO Researcher, Advance Road Design Safety Division, Road Department, National Institute for Land and Infrastructure Management (8)Environmental Issues of Roads in Japan Mr. Shinri SONE Senior Researcher, Road Environment Division, Environment Department, National Institute for Land and Infrastructure Management (9)Management and System of Road Structures in Japan Mr. Takashi TAMAKOSHI Head, Bridge and structures Division, Environment Department, National Institute for Land and Infrastructure Management (10)General Information on Deterioration of Existing Concrete Structures and Recent Research Topics on The Maintenance Techniques in Japan Mr. Hiroshi WATANABE Team Leader, Structure Management Technology Team, Construction Technology Research Department, Public Works Research Institute

	(11)Maintenance of Steel Bridges Mr. Jun MURAKOSHI Team Leader, Bridge Structure Team,Structures Research Group, Public Works Research Institute (12)Pavement Management Practice in Japan Mr. Kazuyuki KUBO Team Leader, Pavement Team, Road Technology Research Group Public Works Research Institute (13)State of the Art and Future Prospect of Maintenance and Operationof Road Tunnel Dr. Hideto MASHIMO Team Leader, Tunnel Team, Road Technology Research Group Public Works Research Institute (14)Control of Maintenance in Earthworks Dr. Hidetoshi KOHASHI Team Leader, Soil Mechanics Team, Material and Geotechnical Research Group, Public Works Research Institute (15)Capability of ITS for sustainable social infrastructure Dr. Tadashi YOSHIDA ITS deployment strategy Research team, special Committee Team, Japan Society of Civil Engineers
	Subject of Common Interest Session Economic and Social Effects of Road Network Development
	Discussions of Specific Subjects 1)Effect and Evaluation of Road Network Development 2)Road Traffic Safety and Environment a) Road Accidents and Measure b) Effort toward Road Environment 3)Road Structures Management
	Study Tour 1) NILIM and PWRI: Structural Aerodynamics Laboratory, Noise Control Laboratory, Low Noise Pavement and Noise Barrier, Test Track, ITS Laboratory, Pavement Test Field, Vibration Laboratory, Traffic Collision Test Field 2) Tokyo Area: East Tokyo Operation bureau, Harumi Route, Tokyo Wan Aqua-Line, Tokyo Outer Ring Road 3) Chubu Area: Linear motor train Base, Tokai Ring Expressway, Tsutsumi Plant of Toyota Motor Corporation, Nagoya Ring Highway 2, Tobishima Container Terminals
Participants	138

The 16th Conference on Public Works Research and Development in Asia

Duration	November 26, 2007 - December 7, 2007
Place	National Institute for Land and Infrastructure Management, MLIT Japan International Cooperation Agency, Hotel Shiragiku
Program	Keynote Lectures (1) Water-related Disaster Management for Adaptation to Climate Change Dr. Kuniyoshi TAKEUCHI Director of the International Centre for Water Hazard and Risk Management (ICHARM), PWRI
	Lectures (1) Predicted Effect of Global Climate Change on precipitation Characteristics in Japan and related research activities in NILIM Mr. Josuke KASHIWAI Research Coordinator for Watershed Management, River Department, NILIM (2) The Investigation on the Drought Risk Assessment in Japan Due to Global Warming Mr. Nario YASUDA Head, Water Management and Dam Division, River Department, NILIM (3) Policy Making and Implementation Processes for Securing Water Resources in the Tokyo Metropolitan Area to Cope with the Rapid Population Growth Mr. Koichi FUJITA Head, River Environment Division, Environmental Department, NILIM (4) The Evaluation of Flood Risk and Prevention of Flood Disaster Mr. Takayuki ISHIGAMI Senior Researcher, River Division, River Department, NILIM (5) Storm Surge Forecast System for Floodfighting Warning Mr. Masaya FUKUHAMA Head, Coast Division, River Department, NILIM (6) Support for Evaluation Ahead of Sediment Disasters - Using Rainfall Indices to Predict the Danger of Sediment Disasters - Mr. Kazuya AKIYAMA Senior Researcher, Erosion and Sediment Control Division, Research Center for Disaster Risk Management, NILIM (7) Planning Adaptation Programs for Future Climate Change Mr. Junichi YOSHITANI Team Leader, Disaster Prevention Team, ICHARM, PWRI (8) Outline of Sewerage Works and The Strategies for The Future in Japan Mr. Osamu FUJIKI Director, Water Quality Control Department, NILIM (9) Urban Stormwater Management Mr. Takashi SAKAKIBARA Head, Wastewater System Division, Water Quality Control Department, NILIM (10) Utilization of Reclaimed Wastewater Mr. Mizuhiko MINAMIYAMA Head, Wastewater and Sludge Management Division, Water Quality Control Department, NILIM (11) Beneficial Use of Biomass at Wastewater Treatment Plants Mr. Masaaki OZAKI Team Leader, Recycling Research Team, Material and Geotechnical Management, PWRI

	Subject of Common Interest Session Integrated Water Resource Management Adapting to the Global Climate Change
	Discussions of Specific Subjects 1) Water Resource Management 2) Water Disaster Management 3) Water Environment and Wastewater Management
	Study Tour 1) NILIM and PWRI: Oceanic and Coastal Experimental Facilities, River Hydraulic Experimental Facilities, Dam Hydraulic Experimental Facilities, Water Quality Experimental Facilities 2) Tsukuba Area: The Meteorological Research Institute 3) Kyusyu Area: The Seawater Desalination Center, Chikugo Ohzeki (The Chikugo River Weir), Suigou Yanagawa (River of Yanagawa)
Participants	111

The 17th Conference on Public Works Research and Development in Asia

Duration	October 21, 2008 - October 29, 2008
Place	National Institute for Land and Infrastructure Management, MLIT Chisun Hotel & Conference Center Niigata
Program	Keynote Lectures (1) Characteristics of Recent Natural Disasters and Their Reduction Ph. D. Yoshiaki KAWATA Director of Research Center for Disaster Reduction System, Disaster Prevention Research institute, Kyoto University
	Lectures (1) Seismic design of dams Mr. Shinya MITSUISHI Head, Water Management and Dam Division, River Department, NILIM (2)Policy and research for seismic retrofit of highway bridges Mr. Toshiaki NANAZAWA Senior Researcher, Bridge and Structures Division, Road Department, NILIM (3)Disaster information system Mr. Yasuhiro SHOJI Head, Earthquake Disasters Prevention Division, Research Center for Disaster Risk Management, NILIM (4)Coastal management against tsunamis Mr. Yoshio SUWA Head, Coast Division, River Department, NILIM (5)Prevention and countermeasures against flood Mr. Hirokatsu KANAZAWA Head, River Division, River Department, NILIM (8)Disaster mitigation of flood and countermeasure for recovery Mr. Hajime KOBAYASHI Senior Researcher, Flood Disaster Prevention Division, Research Center for Disaster Risk Management, NILIM (9)Wave runup forecast system for floodfighting Mr. Fuminori KATO Senior Researcher, Coast Division, River Department, NILIM (10)Practical use of the sediment disaster warning information in case of heavy rainfall Mr. Hideaki MIZUNO Senior Researcher, Erosion and Sediment Control Division, Research Center for Disaster Risk Management, NILIM (11)Countermeasures against natural dams Dr. Nobutomo OSANAI Head, Erosion and Sediment Control Division, Research Center for Disaster Risk Management, NILIM (12)Format for collecting Sediment disaster data” Mr. Shinichi KOJIMA Senior Researcher, Erosion and Sediment Control Division, Research Center for Disaster Risk Management, NILIM
	Subject of Common Interest Session Prevention and Mitigation of National Disasters
	Discussions of Specific Subjects 1) Earthquake and Tsunami Related Disasters 2) Flood and Storm Surge Related Disasters 3) Non-structural Measure for Reducing disaster Risk Caused by Sediment Movement

	Study Tour 1) Tokyo Area: Tokyo Bay Aqua Line Highway Metropolitan Area Outer Underground Discharge Channel 2) Hokuriku Area: Niigata Disaster Prevention Center Oogotsu Diversion Aqueducts, Shinano River Closed river channel(Yamakosi village) Yamakoshi Area Branch Office, Nagaoka City Municipal Office
Participants	107

The 18th Conference on Public Works Research and Development in Asia

Duration	November 9, 2009 - November 18, 2009
Place	National Institute for Land and Infrastructure Management, MLIT Kochi University of Technology
Program	Keynote Lectures (1)Highway Capacity, Operation and Congestion in Japan Dr.Eng. Takashi OGUCHI Professor at Infrastructure Planning & Traffic Eng. Lab., Division of Civil and Environmental Eng., Graduate school of Urban Environmental Sciences Tokyo Metropolitan University
	Lectures (1)Efficient development and operation of road net works Mr. Katsumi UESAKA Head, Traffic Engineering Division, Road Department, NILIM (2)Measures to secure road traffic safety Mr. Masahiro KANEKO Head, Advanced Road Design and Safety Division, Road Department, NILIM (3)Improvement of road environment Mr. Shinri SONE Head, Road environment Division, Environment Department, NILIM (4)Toward realization of smartway in Japan Mr. Hideto HATAKENAKA Head, Intelligent Transport System Division, Research Center for Advanced Information Technology, NILIM (5)Earthquake disaster management for Road Mr. Susumu TAKAMIYA Head, Earthquake Disaster Prevention Division, Research Center for Disaster Risk Management, NILIM (6)Strategy for maintenance of Road structures Mr. Takashi TAMAKOSHI Head, Bridge and Structures Division, Road Department, NILIM (7)Techniques for inspection and reinforcement of bridges Mr. Jun MURAKOSHI Senior Researcher, Bridge and structural Technology Research group, Center for Advanced Engineering Structural Assessment and Research, PWRI (8)Efficient maintenance of pavements and tunnels Mr. Kazuyuki KUBO Senior Researcher, Pavement Research Team, Road Technology Research group, PWRI Mr. Katsunori KADOYU Senior Researcher, Tunnel Research Team, Road Technology Research Group, PWRI (9)Risk Management Strategy in Privatizagion of Expressway Public Corporations in Japan Mr. Katsuhiko NAKAMURA Deputy Director, Planning Division, Japan Expressway Holding and Dept Repayment Agency

	Subject of Common Interest Session Unique Road-policy Applied to The Regional Condition and Issue
	Discussions of Specific Subjects 1) Road Network 2) Road Traffic Safety 3) Road Environment 4) Intelligent Transport System 5)Efficient Maintenance of Road and Bridges
	Study Tour 1) Tokyo Area Tokyo Bay Aqua Line Highway Oohashi Junction(Tokyo outer Ring Road) Hakozaki Operation Bureau, Metropolitan Expressway Company 2) Shikoku Area: Kita Bisan-Seto Bridge Akashi-Kaikyo Bridge
Participants	17

The 19th Meeting on Public Works Research and Development in Asia

Duration	November16, 2010 - November 19, 2010
Place	National Institute for Land and Infrastructure Management, MLIT
Program	Keynote Lectures (1) Impacts and responses of climate change - New challenge for infrastructure management - Dr. Nobuo MIMURA Director, Professor, Institute for water environment studies, IBARAKI University
	Lectures (1)Introduction to ICHARM and its Regional Cooperation activities on water-related disaster management - in partnership with ADB" Mr. Katsuhito MIYAKE Team Leader, Disaster Prevention Research Team, ICHARM, PWRI (2) The affection of the climate change on the flood prevention and the adaptation measures Mr. Atsushi HATTORI Head, River Division, River Department, NILIM (3)New Role of Sewerage System in the Low-carbon Society Mr. Masashi OGOSHI Head, Waste Water and Sludge Management Division, Water Quality Control Department, NILIM (4)Newly-Proposed Operation Rules against Floods Exceeding Design Mr. Shinya MITSUISHI Head, Water Management and Dam Division, River Department, NILIM (5)Sediment Disaster Forecasting and Warning System Mr. Masaki MIZUNO Senior Researcher, Erosion and Sediment Control Division, Research Center for Disaster Risk Management, NILIM (6)ITS Deployment in Japan Mr. Fumihiko KANAZAWA Head, Intelligent Transport System Division, Research Center for Advanced Information Technology, NILIM (7)Actions of road traffic measure to contribute reduction Greenhouse Gas from transport section and improvement of air quality on roadside in Japan Mr. Manabu DOHI Senior Researcher, Road environment Division, Environment Department, NILIM (8)Promotion of roadside noise abatement based on Environmental Impact Assessment Mr. Hiroshi YOSHINAGA Senior Researcher, Road environment Division, Environment Department, NILIM (9)Pavement Technologies in Japan Mr. Iwao SASAKI Senior Researcher, Advance Materials Team, Materials and Geotechnical Research Group, PWRI (10)The external force estimation for adaptation measures of storm surge protection in Japan Mr. Kenzi NOGUCHI Senior Researcher, Coast Division, River Department, NILIM (11)Water Quality Improvement and Change of Environmental Concern for Rivers in Japan Mr. Kunihiko AMANO Head, River Environment Division, Environment Department, NILIM

	Subject of Common Interest Session Infrastructure development considering global and local environment - For sustainable development of society -
	Observation Tour 1) River model experiment facility 2) Marine coastal experiment facility 3) ITS experiment facility
	Study Tour 1)Tokyo Bay Aqua Line Highway 2)Sewerage Exhibit Hall "RAINBOW" 3)ARAKAWA-KARYU river office
Participants	16

2) Symposium

The 1st Symposium on Public Infrastructure and Civil Engineering in Asia

Date	February 22, 1993
Place	Sapporo Grand Hotel
Host	Public Works Research Institute of MOC, Civil Engineer Research Institute of Hokkaido Development Bureau
Program	Keynote Lecture on "Development and Infrastructure of Hokkaido" by Prof. Hideo IGARASHI, Hokkaido University
	Panel Discussion on "Public Infrastructure Projects in Each Country and Their Technical Problems" Coordinator: Toshitaka OHTA, Director General, CERI, Hokkaido Development Bureau, JAPAN Panelists : Yukihiko SUMIYOSHI, Director-General, PWRI, MOC, JAPAN CHEN Bing Xin, Director, IWHR, CHINA BADRUDDIN Machbub, Director, RIWRD, ARD, MPW, INDONESIA LEE Sang Eun, Vice President, KICT, KOREA Abdul RAHMAN B. Abdullah, Deputy Director General, PWD, MALAYSIA Manuel M. BONOAN, Assistant Secretary for Planning, DPWH, PHILIPPINES TAN Siong Leng, Director, Building Control Div., PWD, SINGAPORE TEERACHARTI Ruenkrairergsa, Director, Road R&D Center, DOH, THAILAND
Participants	200

The 2nd Symposium on Public Infrastructure and Civil Engineering in Asia

Duration	November 22, 1993
Place	Soralia Nishi-Tetsu Hotel
Host	Public Works Research Institute and Kyushu Regional Construction Bureau, MOC
Program	Keynote Lecture on "Regional Development and Civil Engineering Technology in Kyushu" by Prof. Takeshi CHISHAKI, Kyushu University
	Panel Discussion on "Striving for a Better Environment -Regional Development Projects, Disaster Prevention, Environmental Issue-" Coordinator: Yukihiko Sumiyoshi, Director-General, PWRI, MOC, JAPAN Panelists: Eiki ARAMAKI, Director General, Kyushu Regional Construction Bureau, MOC, JAPAN WU Ji Shan, Director, IMHE, CHINA SOEDARMANTO Darmonegoro, Secretary, ARD, MPW, INDONESIA KIM Keung Hwan, Director, Planning & Coordination Div., KICT, KOREA TEH Siew Keat, Director of River Engineering, DID, MALAYSIA Jose H. ESPIRITU, Director, BRS, DPWH, PHILIPPINES KHOR Poh Hwa, Chief Civil Engineer, PWD, SINGAPORE ANUSORNANT Mahavinichaimontri, Director, Materials and Research Div., PWD, THAILAND
Participants	200

The 3rd Symposium on Public Infrastructure and Civil Engineering in Asia

Duration	October 24, 1994
Place	Mainichi Oval Hall
Host	Public Works Research Institute and Kinki Regional Construction Bureau, MOC
Program	Keynote Lecture on "Struggling to Develop the New Construction Technology" by Mr. Koutaro HASHIMOTO, Director General, Kinki Regional Construction Bureau, MOC Keynote Lecture on "Cultural Exchange in Global Age" by Prof. Nobuyuki HATA, National Museum of Ethnology
	Panel Discussion on "Public Infrastructure and Development of Construction Technology in Asia" Coordinator: Hiroji NAKAGAWA, Professor, Kyoto University, JAPAN Panelists : Takashi IIJIMA, Director-General, PWRI, MOC, JAPAN Abdul Wahed CHOWDURI, Joint Secretary, MHPW, BANGLADESH XIONG Qiu Shui, Senior Engineer, SPTD, Min. of Com., CHINA Kewal Krishan MADAN, Director General, CPWD, MUD, INDIA Mohamad Yusuf GAYO, Director of MIER, DGWRD, MPW, INDONESIA KIM Il-Joong, Director, Technology Promotion Div., MOC, KOREA Abdul KADIR bin Awang Hamat, Director, IKRAM, PWD, MOW, MALAYSIA Luis A. MAMITAG, Jr., Chief of R&D Div., BRS, DPWH, PHILIPPINES WIJARN Thunthithum, Senior Engineer, DWD Sub-Div., SED, PWD, THAILAND
Participants	300

The 4th Symposium on Public Infrastructure and Civil Engineering in Asia
（Session of Ministers' Forum on Infrastructure Development in the Asia-Pacific Region）

Duration	September 27, 1995
Place	Hotel New Otani Osaka
Host	Public Works Research Institute and Kinki Regional Construction Bureau, MOC
Program	Panel Discussion on "Research and Development and International Research Cooperation for Great N atural Disaster Reduction" Coordinator: Takashi IIJIMA, Director-General, PWRI, MOC, JAPAN Panelists : Yasuyuki KOGA, Director, Earthquake Disaster Prevention Dept. ,PWRI, MOC, JAPAN Abdul MAJID Khan, Director General, RRI, BANGLADESH Guowei YANG, Senior Engineer, CWRC, CHINA Digvijai SINGH, Director General, CRRI, MST, INDIA PATANA Rantetoding, Director General, IRE, MPW, INDONESIA Antonio A. STA. ELENA, Regional Director, DPWH, Region Ⅸ, PHILIPPINES SURAPOL Pongthaipatana, Deputy Director General, TTI, PWD, MOI, THAILAND
Participants	200

The 5th Symposium on Public Infrastructure and Civil Engineering in Asia

Duration	October 21, 1996
Place	Sendai International Center
Host	Public Works Research Institute and Tohoku Regional Construction Bureau, MOC
Program	Panel Discussion on "Harmony between Regional Development Projects and Environment" Coordinator: Tadahiko SAKAMOTO, Director-General, PWRI, MOC, JAPAN Panelists : Toshiki AOYAMA, Director-General, Tohoku Regional Construction Bureau, MOC, JAPAN MD. Siddique Ullah, Chief Engineer, Public Works Department, Ministry of Housing and Public Works, BANGLADESH Zhang Yuan-fang, Deputy Director, Research Institute of Highway, Ministry of Communications, CHINA Surinder Kumar Chawla, Chief Engineer, Central Public Works Department, Ministry of Urban Affairs and Employment, INDIA Joelianto Hendro Moeljono, Director General, Agency for Research and Development, Ministry of Public Works, INDONESIA Hong Sung-Wan, Vice President, Korea Institute of Construction Technology, KOREA Keizrul Bin Abdullah, Deputy Director General I, Department of Irrigation and Drainage, Ministry of Agriculture, MALAYSIA Nestor V. Agustin, Assistant Regional Director, Region IV, Department of Public Highways ,Region IX, PHILIPPINES Siripong Hungspreug, Director, Project Planning Division, Royal Irrigation Department, THAILAND Mohan Bahadur Karki, Director General, Department of Roads, Ministry of Works and Transport, NEPAL
Participants	200

The 6th Symposium on Public Infrastructure and Civil Engineering in Asia

Duration	October 17, 1997	
Place	The Busena Terrace Beach Resort	
Host	Public Works Research Institute Okinawa General Bureau and Okinawa Prefectural Government	
Program	Keynote Address	Prof. Kiyoshi UEMA "Okinawa's Heritage and Social Infrastructure"
	Panel Discussion	"Research and Development of Social Infrastructure Suitable to the Environment and Climatic Condition"
Panelists	Tamio Shimogami	Engineer General, Okinawa Prefectural Government, JAPAN
	Azizul Haque	Additional Chief Engineer, Public Works Department Under Ministry of Works, Govt. of BANGLADESH
	Qi Ji	Vice Director, China Building Technology Department Center, CHINA
	Krishan Kumar	Chief Engineer & Project Manager, Parliament Library Project, Central Public Works Department, INDIA
	Zulkarnaen Aksa	Executive Secretary Agency for Public Works' Research and Development, Ministry of Public Works, INDONESIA
	Ahmad Fuad Bin Embi	Director, Drainage Division, Department of Irrigation and Drainage, MALAYSIA
	Devendra Prasad Rimal	Joint Secretary, Ministry of Works and Transport, NEPAL
	Salvador L. Manto	Division Chief, Portworks & Shore Protection Division Bureau of Construction, Department of Public Works and Highway's, PHILIPPINES
	Vidhaya Samaharn	Director, Research and Laboratory Division, Royal Irrigation Department, THAILAND
	Coordinator Seizo Tsuji	Director - General, PWRI
Participants	200	

The 7th Symposium on Public Infrastructure and Civil Engineering in Asia

<table>
<tr><td>Duration</td><td colspan="2">October 18, 1999</td></tr>
<tr><td>Place</td><td colspan="2">Okinawa Convention Center</td></tr>
<tr><td>Host</td><td colspan="2">Okinawa General Bureau</td></tr>
<tr><td rowspan="4">Program</td><td>Theme</td><td>"R&D of Paving Technologies Suited to Environmental and Climatic Conditions"</td></tr>
<tr><td rowspan="2">Keynote Address</td><td>"Recent Development in Paving Technology"
Tamotsu Kobayashi,
Research Coordinator for Traffic Safety, PWRI</td></tr>
<tr><td>"R&D of Paving Technologies in Okinawa"
Kaoru Seto,
Sr. Officer, Planning & Coordination, Development Construction Department, Okinawa General Bureau</td></tr>
<tr><td>Site Visits</td><td>Test Site:
Semi-Flexible Pavement (Nakanishi Area, Urasoe City)</td></tr>
<tr><td rowspan="11">Paticipants</td><td>A. K. M. Mukitur Rahman</td><td>Additional Chief Engineer, Public Works Department, BANGLADESH</td></tr>
<tr><td>Indu Prakash</td><td>Chief Engineer, Ministry of Surface Transport (Road Wing), INDIA</td></tr>
<tr><td>Mohammad Sjahdanulirwan</td><td>Acting Director, Institute of Road Engineering,
Agency for Research and Development of Public Works, Ministry of Public Works, INDONESIA</td></tr>
<tr><td>Chai Sung Gee</td><td>Research Fellow, Korea Institute of Construction Technology, KOREA</td></tr>
<tr><td>Laokham Sompheth</td><td>Project Manager, Ministry of Communication Transport, Post, and Construction, LAOS</td></tr>
<tr><td>Haji Ghazali Bin Omar</td><td>Director, Drainage Division,
Department of Irrigation & Drainage, MALAYSIA</td></tr>
<tr><td>Abdul Razak Bin Dahalan</td><td>Deputy Director, Department of Irrigation & Drainage, Perak, MALAYSIA</td></tr>
<tr><td>Lekh Raj Upadhyay</td><td>Director General, Department of Building,
Ministry of Housing and Physical Planning, NEPAL</td></tr>
<tr><td>Manuel Agyao Y. Swegen</td><td>Regional Director, Cordillera Administrative Region,
Department of Public Works and Highways, PHILIPPINES</td></tr>
<tr><td>Thiraphan Thongpravati</td><td>Chief Engineer, Public Works Department, Ministry of Interior, THAILAND</td></tr>
<tr><td>Masamichi Shirahase</td><td>Vice Director-General, Okinawa General Bureau</td></tr>
<tr><td>Others</td><td colspan="2">70</td></tr>
</table>

The 8th International Symposium on National Land Development and Civil Engineering in Asia

Duration	October 18, 1999	
Place	Kariyushi Urban Resort Naha	
Host	Okinawa General Bureau and Okinawa Prefectural Government	
Program	Keynote Lecture	Prof. Takeshi OSHIRO "Corrosive Environment and Salt Induced Damage of RC Structures"
	Panel Discussion	"Research and Development on the construction technology which is applicable to the local natural environment and social condition"
Panelists	Ayumu Yasukawa	Engineer General, Okinawa Prefectural Government, JAPAN
	Morshed Uddin	Additional Chief Engineer, Public Works Department Under Ministry of Works, Govt. of BANGLADESH
	Qian, Min	Vice Director General, Huaihe River Commission, Ministry of Water Resources, CHINA
	Prabodh Gopal Dhar Chakrabartir	Director, Ministry of Urban Development, INDIA
	Supardiyono Sobirin	Director, Research Institute for Human Settlements, INDONESIA
	Hong, Sung Wan	Senior Research Fellow, Korea Institute of Construction Technology, KOREA
	Math Sounmala	Director General, Cabinet Office, Ministry of Communication Transport Post and Construction, LAOS
	Wahid bin Omar	Deputy Director General II, Public Works Department, MALAYSIA
	Kedar Prakash Rizal	Project Director, Water Induced Disaster Prevention Technical Centre, Ministry of Water Resources, NEPAL
	Eleno Uttoh Colinares,Jr	Regional Director, Department of Public Works and Highways, Region V, PHILIPPINES
	Samart Yolpak	Chief Engineer, Public Works Department, Ministry of Interior, THAILAND
	Coordinator Tomomitsu Fujii	Director - General, PWRI
Participants	200	

The 9th International Symposium on National Land Development and Civil Engineering in Asia

Duration	October 17, 2000
Place	Bankoku Shinryokan, Okinawa
Host	Public Works Research Institute Okinawa General Bureau and Okinawa Prefectural Government
Program	Lectures Dr. Tetsuya YABUKI, Professor, University of the Ryukyus "Case of Japan Ⅰ" —New Developments in Bridges— Mr. Takeshi HASHIMOTO, Deputy Director General, Okinawa General Bureau, Okinawa Development Agency "Case of Japan Ⅱ" —Infrastructure Development in Okinawa- Mr. Subhash Chander VASUDEVA, Additional Director General, Central Public Works Department, Ministry of Urban Development, INDIA "Case of INDIA" Ir. SAROSO Bambang Suksmono, Operation Management Director, The Research Institute for Road Infrastructure Technology, Ministry of Settlement & Regional Development, Republic of INDONESIA "Case of Republic of INDONESIA" Dr. Hyoseop WOO, Senior Research Fellow, Korea Institute of Construction Technology, Republic of KOREA "Case of KOREA" Mr. Jesus Pedro CAMMAYO, Assistant Secretary, Department of Public Works and Highways, Republic of the PHILIPPINES "Case of PHILIPPINES"
Participants	130

The 10th International Symposium on National Land Development and Civil Engineering in Asia

Duration	October 23, 2001
Place	Bankoku Shinryokan, Okinawa
Host	National Institute for Land and Infrastructure Management Okinawa General Bureau and Okinawa Prefectural Government
Program	Lectures Dr. Toshiya SHINJO, Professor, University of the Ryukyus "Case of Japan Ⅰ" －Foundation Work on the Limestone Ground Layer of the Southwest Islands－ Mr. Tadayuki TAZAKI, Director-General, National Institute for Land and Infrastructure Management "Case of Japan Ⅱ" －Public Works Environmental Technology in Japan－ Dr. Gyn-Jin Bae, Director, Civil Engineering Research Division, Korea Institute of Construction Technology, Republic of KOREA "Case of KOREA" Mr. Hin Seang SAW, Director, Coastal Engineering Division, Department of Irrigation and Drainage, MALAYSIA "Case of Republic of MALAYSIA" Mr. Amoda Nand MISHRA, Director-General, Department of Water Induced Disaster Prevention, Kingdom of NEPAL "Case of Kingdom of NEPAL" Mr. Oravit HEMACHUDHA, Chief, Public Works Planning Subdiv., Department of Public Works, Bangkok Metropolitan Administration, Kingdom of THAILAND "Case of Kingdom of THAILAND" Mr. Hirokazu MIYAO, Engineer General, Okinawa Prefecture Government "Case of OKINAWA" －Okinawa Prefecture's Infrastructure Development for the 21st Century－
Participants	100

The 11th International Symposium on National Land Development and Civil Engineering in Asia

Duration	October 22, 2002
Place	Bankoku Shinryokan, Okinawa
Host	National Institute for Land and Infrastructure Management Okinawa General Bureau and Okinawa Prefectural Government
Program	Lectures Dr. Housei UEHARA, Honorary Professor, University of the Ryukyus "Case of Japan Ⅰ" －Comprehensive Water -Resource Issues of Island Communities－ Mr. Haruhiko OKUNO, Director-General, National Institute for Land and Infrastructure Management "Case of JapanⅡ" －Tokyo Metropolitan Region and Tonegawa－ Dr. Lee Jang-Hwa, Senior Research Fellow Structural Materials Research Group Korea Institute of Construction Technology, Republic of Korea "Case of Korea" Mr. Kaushal N. AGRAWAL, Additional Director General, Central Public Works Department Ministry of Urban Development, India "Case of India" Ms. Sofia Torio SANTIAGO, Project Manager, and OIC Assistant Director Bureau of Design Department of Public Works & Highways, Philippines "Case of Philippines" Mr. Zubair Emran KHAWAJA, Director Road Research and Material Testing Institute/ Praivate Sector Project Investment Cell Communication & Works Department Government of Punjab, Lahore, Pakistan "Case of Pakistan" Mr. Tamio SHIMOGAMI, Deputy Director General, Okinawa General Bureau, Okinawa Development Agency "Case of Okinawa" －Integrated Dam Management and the Development of Okinawa's Water Resources－
Participants	130

The 12th International Symposium on National Land Development and Civil Engineering in Asia

Duration	October 30, 2003
Place	Okinawa Convention Center, Okinawa
Host	National Institute for Land and Infrastructure Management
Support	Okinawa General Bureau and Okinawa Prefectural Government
Program	**Keynote Speech "Development Trend and Urban Traffic Problem in Okinawa Central and Southern City Area"** Dr. Takayuki IKEDA Professor, Department of Civil Engineering & Architecture, University of the Ryukyus
	Lectures 1）Case of Japan Mr. Haruhiko OKUNO, Director General, National Institute for Land and Infrastructure Management 2）Case of Cambodia Mr. VONG Pisith, Deputy Director General, Ministry of Public Works and Transport 3）Case of China Mr. LU, Kangcheng, Professor of Tunnel and Underground Works, Chang'an University 4）Case of Korea Dr. KIM, Yeon Bok, Senior Research Fellow, Highway Research Dept., and Group Leader, Advanced Highway System Group, Highway Research Dept., Korea Institute of Construction Technology 5）Case of Laos Mr. Houngla SENGMUANG, Director of Luangnamtha Province, Department of Communication, Transport, Post and Construction 6）Case of Malaysia Mr. LAU Hieng Ung, Deputy Director Kuching North City Commission 7）Case of Nepal Mr. Sharad Kumar SHRESTHA, Senior Divisional Engineer, Maintenance Branch, Department of Roads, Ministry of Physical Planning and Works 8）Case of Pakistan Mr. Aziz Ul Haq MIRZA, Member（Operations）, National Highway Authority, Ministry of Communications 9）Case of Sri Lanka Mr. Ranasinghe Hewawasamge KARUMARATNE, Provincial Director, Road Development Authority 10）Case of Okinawa Mr. Hirokazu MIYAO, Engineer-General Okinawa Prefectural Government
Participants	130

The 13th International Symposium on National Land Development and Civil Engineering in Asia

Duration	October 28, 2004
Place	Okinawa Convention Center, Okinawa
Host	National Institute for Land and Infrastructure Management
Program	**Keynote Speech “Water Issues in Ryukyu Islands”** Dr. Chokei YOSHIDA Board Member, Okinawa P. Public Health Association
	Lectures 1) Case of Japan Mr. Tatsuo HAMAGUCHI, Director General, National Institute for Land and Infrastructure Management 2) Case of Bangladesh Mr. A. K. M. Jafar ULLAH, Superintending Engineer & Project Director, Water Supply System Expansion & Rehabilitation Project (WSSERP), Dhaka Water Supply & Sewerage Authority 3) Case of Bhutan Mr. Passang DORJI, District Engineer, Dzongkhag Engineering Sector(District) 4) Case of Cambodia Dr. Visoth CHEA, Assistant General Director, Phnom Penh Water Supply Authority 5) Case of China Dr. LIU Dongfang, Vice Chief Engineer/Director of R/D Center, Tianjin Capital Environmental Protection Company Limited 6) Case of India Mr. Sukamal BHATTACHARYA, Executive Engineer, Public Works Department, Government of Tripura 7) Case of Indonesia Dr. Ramalis Subandi PRIHANDANA, Senior Researcher, Research Institute for Human Settlement, Ministry of Settlement and Regional Infrastructure Development 8) Case of Korea Dr. Youngsug KIM, Research Fellow, Construction Environment Research Division, Korea Institute of Construction Technology 9) Case of Laos Mr. Phouthasenh ARKHAVONG, General Deputy Director, Urban Research Institute, Ministry of Communication Transport Post and Construction 10) Case of Malaysia Mr. Mohd Ridhuan Bin ISMAIL, Deputy Director General, Sewerage Services Department, Ministry of Energy, Water and Communications 11) Case of Nepal Mr. Bishnu Prasad TIMILSINA, Divisional Chief (Engineer) Water Supply and Sanitation Division Office, Department of Water Supply and Sewerage, Ministry of Physical Planning and Work 12) Case of Pakistan Mr. Tahir AZIM, Project Director, NWFP Urban Development Project, Local Govt. Elections & Rural Development Department, Government of North West Frontier Province 13) Case of Okinawa Mr. Masaki MATSUI Engineer- General, Okinawa Prefectural Government
Participants	130

The 14th International Symposium on National Land Development and Civil Engineering in Asia

Duration	October 27, 2005
Place	Sendai International Center, Miyagi
Host	National Institute for Land and Infrastructure Management
Theme	Flood, Sediment and Tsunami Related Disasters in Asia
Program	**Keynote Speech “Global Disaster – Lessons from the 2004 Sumatra Earthquake and Indian Ocean Tsunami”** Dr. Fumihiko IMAMURA Professor, Disaster Control Research Center, Graduate School of Engineering, Tohoku University
	Lectures 1）Case of Japan Mr. Tsuneyoshi MOCHIZUKI, Director General, National Institute for Land and Infrastructure Management 2）Case of Tohoku District Mr. Masaharu SHINOHARA, Director, River Department, Tohoku Regional Bureau, Ministry of Land, Infrastructure and Transport 3）Case of Korea Dr. Chang Wan KIM, Research Fellow, Korea Institute of Construction Technology 4）Setting up the International Centre for Water Hazard and Risk Management (ICHARM) under the auspices of UNESCO Mr. Akira TERAKAWA, Director, Secretariat for Preparatory Activities of UNESCO-PWRI Centre, Public Works Research Institute
	Panel Discussion “Flood, Sediment and Tsunami Related Disasters in Asia” - M.C.: Mr. Ryosuke TSUNAKI, Director, Research Center for Disaster Risk Management, NILIM - Panelists: 1) Dr. Fumihiko IMAMURA, Professor, Tohoku University 2) Mr. Tsuneyoshi MOCHIZUKI, Director General, NILIM 3) Mr. Masaharu SHINOHARA, Director, River Department, Tohoku Regional Bureau 4) Dr. Bunna YIT, Director, Public Works Research Center, Ministry of Public Work and Transport, Kingdom of Cambodia 5) Mr. Janak Jerambhai SIYANI, Chief Engineer (R&B) & Add Secretary, Roads & Buildings Department, Government of Gujarat, India 6) Dr. Chang Wan KIM, Research Fellow, Water Resources Research Department, Korea Institute of Construction Technology, Republic of Korea 7) Mr. Keophilavanh APHAYLATH, Director General, Urban Research Institute, Ministry of Communication, Transport, Post and Construction, Lao People’s Democratic Republic 8) Ms. Rebecca Trazo GARSUTA, Chief, Development Planning Div. Planning Service, Dept. of Public Works and Highways (DPWH), Republic of the Philippines 9) Mr. Akkapong BOONMASH, Director, Improvement and Maintenance Division, Office of Hydrology and Water Management, Royal Irrigation Department, Ministry of Agriculture and Cooperatives, Kingdom of Thailand 10) Mr. NGUYEN Xuan Hien, Deputy Director, Sub-Institute for Water Resources Planning (SIWRP), Ministry of Agriculture and Rural Development, Socialist Republic of Viet Nam
Participants	80

The 15th International Symposium on National Land Development and Civil Engineering in Asia

Duration	November 16, 2006
Place	Aichi Arts Center, Nagoya
Host	National Institute for Land and Infrastructure Management
Theme	Economic and Social Effects of Road Network Development in Asia
Program	**Lectures** 1) Automotive Safety Technologies Toward Achieving Sustainable Mobility" Mr. Takashi SHIGEMATSU, Managing Officer, Toyota Motor Corporation 2) Case of Japan Mr. Tsuneyoshi MOCHIZUKI, Director General, NILIM 3) Case of Chubu District Mr. Toshio SAKAI, Director, Road Department, Chubu Regional Bureau 4) Case of Korea Dr. Weon-Eui KANG, Director of Highway Engineering Research Department, Korea Institute of Construction Technology
	Panel Discussion "Economic and Social Effects of Road Network Development in Asia" - M.C.: Mr. Hiroshi SATO, Director, Road Department, NILIM - Panelists: 1) Mr. Tsuneyoshi MOCHIZUKI, Director General, NILIM 2) Mr. Toshio SAKAI Director, Road Department, Chubu Regional Bureau, MLIT 3) Mr. Guang-Tao YIN, Senior Engineer, Vice Director, Urban Transport Institute, China Academy of Urban Planning and Design, People's Republic of China 4) Mr. Hikmat ISKANDAR, Head, Traffic & Envir. Lab., Research and Development Centre for Road and Bridges, Republic of Indonesia 5) Dr. Weon-Eui KANG, Director, Highway Engineering Research Dept. Korea Institute of Construction Technology, Republic of Korea 6) Mr. Pothong NGONPHACHANH, Deputy Director General, Department of Roads, Ministry of Communication, Transport, Post and Construction, Lao People's Democratic Republic 7) Mr. Amrullah KAMAL, Deputy Director 3, Public Work Department, Malaysia 8) Mr. Ramesh Raj BISTA, Deputy Director General, Department of Road, Nepal 9) Mr. Bashir AHMED, Director (Roads), Ministry of Communication, Islamic Republic of Pakistan 10) Mr. Raul Conde ASIS, Assistant Secretary, Department of Public Works and High ways, Republic of the Philippines
Participants	120

The 16th International Symposium on National Land Development and Civil Engineering in Asia

Duration	December 3, 2007
Place	Hotel Shiragiku, Beppu
Host	National Institute for Land and Infrastructure Management
Theme	Integrated Water Resource Management Adapting to the Global Climate Change in Asia
Program	**Lectures** 1) Integrated Water Management under the Global Warming Scenario –Case Study of Northern Kyusyu with Scarce Water Resources– Dr. Kenji JINNO Professor, Faculty of Engineering, Kyushu University
	Presentation and Discussion “Integrated Water Resource Management Adapting to the Global Climate Change in Asia” - M.C.: Mr. Kazunori OODAIRA, Director, River Dept., NILIM -Panelists: 1) Dr. Kenji JINNO, Professor, Faculty of Engineering, Kyushu University 2) Mr. Shin TSUBOKA, Director General, NILIM 3) Mr. Yoshinori ASHIDA, Director, Planning Dept.,Kyusyu Regional Bureau, MLIT 4) Mr. Dhinadhayalan MURUGESAN, Assiatant Adviser of Public Health and Environmental Engineering, Central Public Health and Environmental Engineering Organization, Ministry of Urban Development, India 5) Dr. Seok-Young YOON Director, Policy Research Division , Korea Institute of Construction Technology, Republic of Korea 6) Mr. Wan Abd Rahim Bin WAN ABDULLAH, Director, Sewerage Services Dept., Ministry of Energy, Water & Communication, Malaysia 7) Dr. Judy Famoso SESE, Director Ⅲ, Bureau of Research & Standards, Dept. of Public Works and Highways, Republic of the Philippines 8) Ms. Paniyanduwage Nalanie Sriyalatha YAPA, Deputy General Manager, National Water Supply & Drainage Board, Democratic Socialist Republic of Sri Lanka 9) Ms. DANG Anh Thu, Expert (environmental management and urban planning), Department of Urban Technical Infrastructure, Ministry of Construction, Socialist Republic of Vietnam ,
Participants	100

The 17th International Symposium on National Land Development and Civil Engineering in Asia

Duration	October 28, 2008
Place	Chisum Hotel & Conference Center Niigata
Host	National Institute for Land and Infrastructure Management
Theme	Prevention and Mitigation of Natural Disasters in Asia
Program	**Lectures** 1) Feature of Ground Disaster in 2004 Chuetsu Earthquake Dr. Satoru OHTSUKA Professor, Department of Civil and Environmental Engineering, Nagaoka University of Technology
	Presentation and Discussion “Prevention and Mitigation of Natural Disasters in Asia” - M.C.: Mr. Haruo NISHIMOTO, Director, Research Center for Disaster Risk Management., NILIM -Panelists: 1) Dr. Satoru OHTSUKA, Nagaoka University of Technology 2) Mr. Akihiko NUNOMURA Director General, NILIM 3) Mr. Shinji YAMAGUCHI, Deputy Director Planning Dept., Hokuriku Regional Bureau, MLIT 4) Mr. Habibullah HABIB, Islamic Republic of Afghanistan 5) Mr. Katry PHUNG (Ph.D.), Kingdom of Cambodia 6) Mr. Amit JAIN, Republic of India 7) Mr. Dading SUGANDHI, Republic of Indonesia 8) Mr. Hojjat Ali SHAYANFAR, Islamic Republic of Iran 9) Mr. Mushtaq Ali ZAKA, Islamic Republic of Pakistan 10) Ms. Janette Mati SADIE, Republic of the Philippines 11) Ms. Huong Thi Lan HUYNH, Socialist Republic of Viet Nam
Participants	107

TECHNICAL NOTE of NILIM
No.625 February 2011

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