

# V MINUTES

**The 16th Conference on Public Works Research and Development in Asia**  
**Session on Subject of Common Interest**  
**“Integrated Water Resource Management Adapting to the Global Climate Change”**

**MINUTES**

**1. Date and Venue:** 9:30-15:00 Wednesday 28 November 2007  
International Conference Room, NILIM

**2. Participants:**

India	Mr. Dhinadhayalan MURUGESAN
Malaysia	Mr. Wan Abd Rahim Bin WAN ABDULLAH
Philippines	Dr. Judy Famoso SESE
Sri Lanka	Ms. Paniyanduwege Nalanie Sriyalatha YAPA
Viet Nam	Ms. Anh Thu DANG
Japan	Mr. Shin TSUBOKA, Director-General
	Mr. Jun INOMATA, Director, Planning and Research Administration Department
	Mr. Junji TAKAYANAGI, Director, Environment Department
	Mr. Kazunori OODAIRA, Director, River Department
	Dr. Ryutaro OOISHI, Research Coordinator for Evaluation
	Mr. Jyosuke KASHIWAI, Research Coordinator for Watershed Management
	Mr. Junzo INOUE, Head, International Research Division, Planning and Research Administration Department, NILIM
<b>Observers</b>	Mr. Resito DAVID, Project Director, Department of Public Works and Highways (Philippines)

**3. Opening of Session on Issues of Common Interest, Mr. TAKAYANAGI, Director, Environment Department**

Mr. Takayanagi, Director of the Environment Department opened the session and introduced Mr. Jun Inomata who is going to speak on the purpose of this session on the subject of common interest.

**4. Conference Report, Mr. INOMATA, Planning and Research Administration Department, NILIM**

It was approximately 16 years ago that we decided to gather experts in the field for a frank exchange of opinions on various challenges and to share ideas for improving disaster prevention. We are a diverse group with unique cultural differences among the 536 participants from 16 nations which have attended this conference, yet we have made significant advancements in the development of infrastructure in the various countries throughout Asia.

We have covered various issues over the course of the years under 16 themes such as flood disaster, landslides, urban traffic congestion, volcanic disasters and today's theme, “Integrated

Water Resource Management Adapting to the Global Climate Change” which are still major issues for all countries today.

Since 1993 we have dispatched 772 researchers and engineers from NILIM and have received 1,523 professionals from throughout Asia. The Sabo Technical Center in the Philippines and the project on cap building for regional road management in Indonesia are just a few examples of successful technological cooperation with JICA. We hope that your countries will continue to pursue further development and I hope today’s discussion will be fruitful and rich.

## **5. Summaries of the Country Reports**

### **Country Report for Japan by Mr. Shin TSUBOKA**

Japan’s alluvial plains are situated in low land areas and are extremely flood prone. Recently, flood damage areas are decreasing but in the past 10 years damage assets on average has increased. The water level in the Sea of Japan is rising. If sea levels continue to rise, and reach to IPCC’s maximum level of 0.59m, 2.7 million people will be forced to live in the zero meter area of Tokyo Bay.

So what needs to be done? Adaptation measures such as an understanding of soil mechanics in embankment bodies, the investigation of caves in storm surge barriers and land use revision are absolutely essential. Flood hazard maps are useful tools for disseminating information to the public. While improvement of adaptation measures and development of structures are important they have limitations; therefore it is essential to improve damage reduction capabilities in local communities.

Questions were raised on the Japan’s possibility of droughts, the frequency and source of information dissemination, and limitations of flood prevention methods.

### **Country Report for India by Mr. Dhinadhayalan MURUGESAN:**

India is a vast country with a dense population of more than one billion people and is experiencing a population growth rate of about 3.1% per year. India has sufficient utilizable water resources to meet the growing demand, but much of the water supply is not effectively available, therefore development and management are needed to balance the inequality in natural availability and growing demand.

At present, about 93% of the urban population has access to safe and clean water supplies however hours of water supply service have declined over time. For example, in Chennai water service is available only 1.5 hours per day. The most significant impacts of climate change are expected to be in water availability.

India is the most disaster prone country in the South Asian region. Every year, approximately 19 million hectares of land are inundated by floods and on average about 15,000 people are killed each year by earthquake. The Indian Government remains committed to achieving the targets set forth in the Millennium Development Goal (MDG) and has framed broad policies accordingly in line with the Tenth Fifth Year Plan.

Recently there has been a shift in focus from post-disaster management to preparedness and mitigation. The National Policy on Disaster Management was formulated in 2003 in line with this new focus but India still has very far to go. India’s per capita GNP is only \$500; one of the poorest in the world.

Questions were raised on the future plans to address growing water demands as India faces an explosion in population growth and development, and the priority that the Indian government places on flood prevention countermeasures regarding the massive devastation following the flooding of the Ganges River Basin.

**Country Report for Malaysia by Mr. Wan Abd Rahim Bin WAN ABDULLAH:**

Prior to the Sewerage Services Act in June 1993, sewerage management in Malaysia was overseen 87 out of 144 local authorities. However the Act empowered the Government to regulate the sewerage industry and a bold step forward was taken toward privatizing sewerage management. A concession agreement was established with Indah Water Konsortium Sdn Bhd (IWK) to undertake the implementation of a suitable and modern sewerage system in the interest of consumers in the hopes of ensuring high quality services at an affordable cost and to assist in the growth of the national economy through the development of a modern and eco-friendly sewerage sector. However the sewerage tariff is the lowest in the region and the company was not able to fully recover the OPEX and CAPEX tariffs, placing burden on the organization.

Sewerage technology in Malaysia has evolved from pour flush systems (1950'), septic tanks (1960') and biological filters (1990'), to a fully mechanized plant in 2007. The Sewerage Development Quality System (SDQS) was established to monitoring indicators and key indexes, policy, guidelines, best practice and enforcement.

Integrated River Basin Management includes river corridor management, flood mitigation and water resources management and sewerage management is now linked with IRWM for maximum benefit.

Questions were raised on the sewerage coverage per population in Malaysia, responsible organizations for sewerage facilities and the calculation and collection of waste water tariffs.

**Country Report for the Republic of the Philippines by Dr. Judy Famoso SESE:**

In the Philippines, the Department of Public Works and Highways (DPWH) is responsible for the planning, design, construction and maintenance of the country's infrastructure and is likewise responsible for the monitoring of the National Water Data Collection Program. This mechanism is an accepted adaptation method for the effects of global climate unpredictability.

In January 2006, the Philippines started the implementation of the UNEP-IWRM assisted South East Asia Project and the formation of the Project Steering Committee. We have also participated in the consultation workshops with various National Government Organizations and other government agencies to formulate framework and guidelines supporting the IWRM of the Philippines.

The Philippines has about 7,107 islands. The country is rich in water resources, consisting of 421 principal river basins of which 20 are major river basins. The Philippines boasts one of the longest coastlines covering about 36,789Kms in the world, with an average rainfall of 2,400 mm per year of which much are collected as runoff in natural river basins. However, despite abundant water resources, the Philippines is facing potential water shortages and deteriorating water quality due to increasing population, and faces challenges with respect to the sectoral water governance and regulation which over 30 government agencies are tasked to oversee.

In 2006, the Government of Japan dispatched a study team to the Philippines with the objective of selecting priority areas based on flood risk assessment and to development flood mitigation plans and technology transfer. The study covers 954 flood prone areas and will continue until mid-March 2008. The “Project for Enhancement Capabilities in Flood Control and Sabo Engineering of the DPWH” is a JICA assisted technical cooperation project enhancing the capability of the DPWH engineers and investigates damaged structures.

Questions were raised about the impacts of climate change in the Philippines, the use of flood hazard maps in disaster prevention and penalties for illegal water use.

**Country Report for the Democratic Socialist Republic of Sri Lanka by Ms. Paniyanduwage Nalanie Sriyalatha YAPA:**

The National Water Supply & Drainage Board (NWSDB) has considerably expanded the scope of its activities and is presently operating 291 water supply schemes with 30% of the population with pipe-borne water supply. In accordance with the United Nations Millennium Development Goals, Sri Lanka has set ambitious goals and it is anticipated to achieve 40% pipe borne coverage by the year 2011.

As a commercial organization, the NWSDB began consumer metering and billing in 1982. The water tariff at present is just sufficient to meet operational costs and debt service.

The last 15 years have seen a severe cycle of drought, flood, cyclones, landslides and oppressive heat waves resulting in the loss of property and life, and the displacement of thousands of people. Urban squatters are exposed to water-borne parasites and dengue epidemics. A sea level rise of just 0.3 meters could result in a land loss of six square kilometers with severe impacts on tourism, industrial output and fisheries. In Sri Lanka poor communities are heavily dependent on natural systems and therefore will be most greatly affected.

In response to climate change, Sri Lanka has prepared a National Strategy for Clean Development Mechanisms to implement the Kyoto Protocol. Fuel-efficient stoves, clean-fuel technology, facilitation of rain water harvesting in dry regions and identification of cost-effective utility scale wind power development are just a few of the environmentally friendly practices currently underway and the NWSDB hopes to exceed the United Nations Millennium Development Goals of 85% safe drinking water coverage by 2015.

Questions were raised on countermeasures in the aftermath of the devastating 2004 tsunami that wiped out many coastal villages in Sri Lanka, the progress of a proposed salinity barrier and countermeasures against siltation of dams.

**Country Report for the Socialist Republic of Viet Nam by Ms. Anh Thu DANG:**

Rapid growth followed the economic reforms of the 1980s. The road network in Viet Nam doubled in length since 1990 and access to water grew from 26% to 50% between 1993 and 2003 but as the population increases competition and conflict for fresh water resources is growing. In addition, deteriorating water source and water quality due to excessive water exploitation, unreasonable use, pollution influences upstream, calamity etc. threaten public health and the functioning of ecosystems. Currently, there is an abundant supply of water resources in Viet Nam but the demand for water is still not satisfied.

Water pollution is inherently connected with human impact and climate change. The country's canals have become dumping sites and in addition, increasing population, deforestation and droughts have negatively affected the water supply availability. The surface water capacity outside of the country occupies two thirds of total achieved water volume while exhaustion of natural water sources is anticipated to increase. As sea levels continue to rise, it is predicted that with each meter rise in sea level, approximately 10.8% of the population will be displaced.

Although most countries give top priority to water supply demand, water shortages and degradation and flood impacts require greater attention. Increasingly countries are challenged by safe water for food production, ecosystem protection and the variability of water resources in time and space. The effects of global warming may add further stress to an already delicate situation.

At now and coming time, IWRM findings and best practices have been received from key ministries of Viet Nam and will serve as guidelines and direction for future IWRM practices.

Questions arose on the reasons of water degradation in Viet Nam, cooperation with upstream countries to achieve IWRM and experiences of negative impacts from water use upstream.

## **6. Open Discussion**

Q: Have you actually felt any changes due to global warming particularly in the last 10 years in your country?

A: (India) The last 10 years India has seen a lot of climate changes. There were a lot of droughts in some areas while Bombay experienced heavy rainfall and subsequent flooding.

A: (Malaysia) Malaysia is also facing a lot of changes. After the tsunami hit in December, we had to spend a lot of money resettling a few housing schemes near the beach areas. This year very heavy rains caused flooding which continued for one month. We lost a lot of infrastructure and property during this time at a cost of US\$3-5 million.

A: (Philippines) In the Philippines, we were hit by one of the strongest typhoons this year. There was a great loss of life and property. Destructive landslides, flash flooding, rising sea levels and unpredictable volcanic eruptions are visible effects of global warming in my country.

A: (Philippines Observer) I think we are experiencing a very vicious cycle of flood and drought. But sometimes this is not all the fault of climate change; we also need to consider the effects of human impact and volcanic eruptions.

A: (Sri Lanka) This year there is significantly heavy rain and there are more landslides in the wet zones.

A: (Viet Nam) Viet Nam is one of the most disaster-prone areas in the world. Each year typhoons, flood and droughts cause loss of life, property and infrastructure.

Q: A number of our colleagues noted significant climate changes. Maybe we need to implement new ideas or initiatives. If you have any new opinions, please share these ideas with us.

A: (India) The Government of India has proposed a scheme for Bombay. They are going to design a system for very high return period to tackle the storm water management issue and continue promotion of rain water harvesting.

A: (Malaysia) Our Government has spent one billion Ringgit to build a small tunnel which will divert water from the capital city to the sea.

A: (Philippines) The Philippines has some countermeasures in place based on flood hazard maps. We have already identified flood prone areas that allow us to plan and construct an appropriate structure for that specific area but a lack of funds is the main reason for the lack of countermeasures in many developing countries.

A: (Philippines Observer) The Philippines does not have a river engineering course and we are just beginning to gain the public trust and interest through this JICA assisted project. We still have to revisit and strengthen our flood management functions. Our flood control infrastructure is only 16% after 30 years of effort; obviously there are many things lacking in our country.

A: (Sri Lanka) We are not doing much on flood control prevention.

A: (Viet Nam) We are facing difficulties in countermeasures. We have a lot of assistance from foreign organizations so we have the support of flood control but the technology is still weak.

Q: In urban areas, people do not have close contact with their neighbors, so especially in Japan it is important that people have more awareness about floods. Do you think the people in your country have a high awareness about the flood threat?

A: (India) Under the Ministry of Foreign Affairs there is a Disaster Management Division. They forecast disasters and flooding and alert the affected districts so people will be aware and can avoid disaster.

A: (Philippines) We have coordination with local government units to inform the public of coming disasters and organizations that help the government promote awareness and disseminate information.

Through the wealth of information from each country participants were able to gain deeper understanding of the importance of integrated water resource management in order to adapt to climate change.

## **7. Secretariat Affairs**

It was announced that Mr. Tsuboka would chair the final session on December 7, 2007.

The 16th Conference on Public Works Research and Development in Asia  
Session on Water resource management

## MINUTES

**1. Date and Venue:** 9:00-12:00 Thursday November 29, 2007  
International Conference Room

### 2. Participants:

India	Mr.Dhinadhayalan MURUGESAN
Malaysia	Mr. Wan Abd Rahim Bin WAN ABDULLAH
Philippines	Dr. Judy Famoso SESE
Sri Lanka	Ms. Paniyanduwege NALANIE
Vietnam	Ms. Anh Thu DANG
Japan	Mr. Josuke KASHIWAI Research Coordinator for Watershed Management, River Department, NILIM Dr. Nario YASUDA Head, Water management and Dam Division, River Department, NILIM Dr. Koichi FUJITA Head, River Environment Department, Environmental Department, NILIM

### 3. Discussion summary

(1) Change in rainfall characteristics in Japan due to global warming and related NILIM research activities

A study on changes in the amount of rainfall in Japan due to global warming based on the results of a 20km mesh simulation was presented. This study mainly focuses on the problem of flooding caused by extreme rain. The study uses a global computational model, which is able to possibly provide the same level of accuracy even for areas outside of Japan. In conjunction, NILIM research on flood related adaptation was presented.

#### Questions

- Q1 Regarding the return period of river planning, what are you deciding and what do you take into consideration?
- A1 This is different for each river; it is decided based on the degree of importance, which is established corresponding to the situation of the assets and so on of the population in the river vicinity. In order that floods which occur during the established return period are able to drain away, points such as the drainage capability of rivers are decided upon.



- Q2 What do you think of the handling of sections where data is not within a confidence interval of 95%? Are the future and present distribution of these sections judged to be different?
- A2 Investigation of this is currently being attempted, but regarding the results of GCM20, we think that the assumption that the future and present distribution will be the same possibly has substance. As for the fact that there are many sections in Hokkaido and Kanto where the confidence level is out of 95%, there can be considered a problem in regional division and that is something we are investigating further. So we would rather judge the handling of a few sections from an engineering and administrative point of view. There is also an issue with the reliability of the model, and when actually considering a plan we feel it is necessary to give due thought to things such as setting some margin for error.
- Q3 Are you saying that when investigating extreme rainfall levels, a 20km mesh is extremely large?
- A3 Well it is not extremely large but by the same token it is not sufficiently small. At present in the Meteorological Office and the Meteorological Research Institute calculations for a smaller mesh are being considered, but at this point in time 20km is the smallest, so we have no choice but to use the results of that.
- Q4 As the effects of warming will gradually appear, in what way will they be fed into the plan?
- A4 The question of how to respond is something that engineers and those in charge of administration must consider. Regarding that point, no sufficient policies are in place, so it is a future challenge for us. In MLIT, the River Bureau has established the “River subcommittee of the council on Infrastructure Development Board for investigating flood fighting measures to cope with climate changes” and is investigating basic countermeasures for climate change. The interim report is planned for release at the Asia-Pacific Water Summit that will be held in December in Beppu.
- Q5 Have these results been subject to examination?
- A5 They are under consideration at present, and in the future they will be subject to examination. What I wanted to say in the presentation is that the results of the model used, although required verification, could be used outside of Japan as well. In the event that the results are used in river planning there will be a necessity for some kind of analysis, and we have shown one method for that.

## (2) Approaches to drought risk assessment associated with global warming in Japan

Due to a shift in the balance of supply and demand for water arising from future climate and societal changes, a change in future drought risk is predicted. Consequently, with regard to drought risk assessments associated with global warming in Japan that the NILIM has hitherto undertaken, considerations for sound water catchment system indicators, research results on the effects of climate change on water resources in the Tone River basin and future initiatives was presented.

## Questions

- Q1 There are many dams in Japan, over 2000. As water resources, what are the most common areas they are used for?
- A1 They have water for use in irrigation, industry and cities etc., but the irrigation target is the larger.
- Q2 To what extent do you consider the effects downriver when constructing a dam?
- A2 The effects downriver are a very important element in dam construction, so they are sufficiently considered.
- Q3 I expect that depending on the situation, dispute can arise in the needs of water for agricultural and domestic use. How are you dealing with this?
- A3 In Japan there are acquired rights for agricultural water. Therefore, when there is a water shortage, we request effective use to the water rights holder so that no water is uselessly pumped into the sea.
- Q4 Is there a problem with sedimentation?
- A5 There is. In Japan we have carried out investigation into integrated sediment management in dams. I do hope you find it informative.
- Q5 What is the coverage of water piping in Japan?
- A5 It is 97%.
- Q6 Are there any problems in the quality of groundwater?
- A6 The groundwater pollution in California's Silicon Valley is serious, but that kind of problem does not exist in Japan.

## (3) Analysis of water policies aimed at securing water resources to cope with rapid population growth in the Tokyo Metropolitan area

From the late 1950's in Japan, centering on a high economic growth period, a concentration of people in large cities such as the Tokyo Metropolitan area took place, in addition to a rapid expansion of urban areas. In order to overcome flooding, irrigation and environmental problems, various water policies were formulated and implemented and were successful to a certain degree. Results of investigations and analyses of these processes was presented, providing subject matter for debate on the state of water policies for catchment basins that are under intense external pressures such as rapid population growth and urbanization.

## Questions

- Q1 In the water policy analysis that used the final graph you showed (Fig. 17), there are a lot of points

that should be considered. Which would you say in particular were the three most important?

A1 Ultimately, the fact that they should be considered in a unified manner is one answer I could give without forcing myself to narrow them down. However, if I dare to venture an answer they would probably be, evaluation of impact on the environment, how to draw out the mutualism between related water policies that have differing objectives, and then how to create a situation whereby many citizens actively participate in policy promotion, In particular, regarding the final point, as can be understood from consideration of global warming countermeasures, I think that it will become more and more important in future water policy promotion.

Q2 I would like to know more about the process of circulation and reuse of industrial water. Could you also say if there are a number of levels of water quality when it comes to reused water?

A2 I do not know the technological details regarding the circulation and reuse of industrial water. However, I am aware that improvements to the rate of recovering industrial water have basically been carried out internally at individual factories. I do not believe the reuse of industrial water in intermediate water supplies for general use is being widely approached.

Q3 How much are the water rates?

A3 This varies depending on the region; I do not know the entire picture.

Q4 Please tell us about standards relating to water quality.

A4 I have some handouts which I will distribute later which gather information regarding Japan's water environment preservation systems and water quality standards.

Q5 I would like to hear your thoughts regarding the degree of power the government can have, in the impetus of policy execution column on Fig. 17. Many influential sectors have emerged including the media, so does this mean it has become harder?

A5 This is a difficult issue. It is important for the government to carry out sound dialog with the various related sectors. In some cases the media can mislead people through inaccurate information, and even if the government puts out more appropriate information to redress this, people have a tendency to trust the media and the critics. How the government ensures its reliability and credibility is an important point in making policy-related dialog sounder.

Q5' That challenge applies to the "universality" in policymaking that has been expressed throughout the presentation, does it not?

A5' Exactly. It is also probably important to share the experience and coping techniques of each country relating to this.

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Session on Water disaster Management

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**2. Participants:**

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Malaysia	Mr. Wan Abd Rahim Bin WAN ABDULLAH
Philippines	Dr. Judy Famoso SESE
Sri Lanka	Ms. Paniyanduwege NALANIE
Vietnam	Ms. Anh Thu DANG
Japan	Mr. Takayuki ISHIGAMI Senior Researcher, River Division, River Department, NILIM
	Mr. Masaya FUKUHAMA Head of Coast Division, River Department, NILIM
	Mr. Kazuya AKIYAMA Senior Researcher, Erosion and Sediment Control Division, Research Center for Disaster Risk Management, NILIM
	Mr. Junichi YOSHITANI Team Leader, Disaster Prevention Team, ICHARM, PWRI

**3. Discussion summary**

(1) Flood risk evaluation and countermeasures

Presentation of the use of laser profilers for studying and evaluating how small and medium sized rivers can be maintained as an adaptive measure against climate change and concepts for flood countermeasures to deal with increased external pressures.

Q (India): What kind of flood management is being carried out in this region (Anpachi-cho)? (Regarding the information at the top of P12-10)

A: The area shown in the material is sandwiched between two major rivers (Ibi River and Nagara River), and it has suffered flood damage since long ago. River managers have built levees against the large rivers, but in this area the villagers themselves have built ring levees to protect their own villages. During the

floods of September 1976, these ring levees prevented the increase of damage to other areas. Therefore, it seems that in the future river managers should also implement countermeasures like these ring levees.

## (2) Construction of a storm surge forecast system

This session will present current developments in the construction of a real-time wave surge forecast system to ensure appropriate flood prevention warnings in coastal areas. This system consists of a typhoon model, storm surge model, wave models, and a wave surge model. A wave model for shallow water was improved by implementing numerical tests on precision and wave hindcasting. Results of tests show that an improved WAM that takes into consideration wave breaking and tides, is able to forecast waves in inner bays in real time with a high degree of accuracy.

Q (Philippines): By what kind of procedure are warnings sent by flood prevention managers delivered to flood fighting group.

A: It is not the same for every individual group, but methods such as telephone, FAX, internet and so on are used in urban areas.

Q (Philippines): Even if you forecast a typhoon 72 hours in advance, surely the significance of doing so is small. Why?

A: Well, if we look at the necessary forecasts, it actually takes one or two hours of preparation for example, in order for flood fighting corps to get to work two or three hours before a typhoon hits. This means it is vital to forecast it six hours in advance. If on the other hand, we look at it from the perspective of when to plan to start preparing for a typhoon, it is necessary to grasp the information even earlier, three days in advance.

Q : What is WAM an abbreviation of?

A: It is an abbreviation for Wave Analysis Model.

## (3) Managing landslide disaster warning data

Presentation of landslide disaster warning data that utilizes rainfall indices currently being implemented nation wide, in addition to differences with previous methods, configuration methods for warning data, transmission methods and the verification of data for recent disasters.

Q (Philippines): How are the areas that are in danger of sediment disaster decided upon?

A: This is decided on by referring to past disaster data. For example, a place in danger of slope failure is considered as somewhere with a slope gradient of 30°, a sloping cliff height of five meters and over (the ten meters given at the time of the answer was a mistake), and with buildings etc., established beneath.

Q (Sri Lanka): There are many sediment disasters in Sri Lanka as well. Are you doing surveys, such as soil investigation carried out on each of the danger areas in Japan?

A: Surveys are not carried out on each and every area. In our sediment disaster warning information, we predict the moisture content in the soil layers related to the occurrence of sediment disasters.

Q (Philippines): Could you tell us whether or not factors other than rainfall (such as topography and geology) are used as indices when judging degree of risk? Also, is monitoring carried out in areas in

danger of sediment?

A: In Japan there are an extremely large number of areas in danger of sediment, so monitoring is not carried out in all of them. In our sediment disaster warning information, we focus our attention only on the element that has the greatest effect on sediment disasters, rainfall. It is the rainfall itself as well as the moisture in the soil layers that we use as indices in forecast of sediment disaster occurrence.

Q (India): Discussion is going on that sediments deposited in the dam contributing GHG emission. Any study is going on in this regard?

A: I do not think this problem has occurred in Japan.

#### (4) Implementation planning for global warming measures

Flood control will be focused on during this session. Firstly, some examples of observed trends will be presented, such as rises in sea levels and increases in the occurrence of floods. Secondly, some examples of plans to cope with increased flooding will be explained. Thirdly, current discussions from the climate change adaptation committee of the MLIT will be presented. Lastly, the direction of countermeasures in Asia will be discussed and comparisons made with other regions.

Q (Philippines): In what way is ICHARM aiding developing countries?

A: It is not the kind of ODA technological aid of JICA; it is instead working to carry out support in policymaking.

Q (Malaysia): Is the Thames Barrier defending the Thames River area from flooding?

A: The proposed plan of the Department for Environment, Food and Rural Affairs in England that includes the option of abandoning defenses which I introduced, is something aimed at a region being partially developed in the Thames River basin. It is not a plan for the area alongside the Thames River itself.

The 16th Conference on Public Works Research and Development in Asia  
Session on Water Environment and Wastewater Management

## MINUTES

**1. Date and Venue:** 9:00-11:30 Friday November 30, 2007  
International Conference Room

### 2. Participants:

India	Mr.Dhinadhayalan MURUGESAN
Malaysia	Mr. Wan Abd Rahim Bin WAN ABDULLAH
Philippines	Dr. Judy Famoso SESE
Sri Lanka	Ms. Paniyanduwege NALANIE
Vietnam	Ms. Anh Thu DANG
Japan	Mr. Osamu FUJIKI Director, Water Quality Control Department, NILIM
	Mr. Takashi SAKAKIBARA Head, Wastewater System Division, Water Quality Control Department, NILIM
	Mr. Mizuhiko MINAMIYAMA Head, Wastewater and Sludge Management Division, Water Quality Control Department, NILIM
	Mr. Masaaki OZAKI Leader, Recycling Research Team, Material and Geotechnical Engineering Research Group, PWRI
Observer	Mr. Kensuke SAKURAI Researcher, Wastewater and Sludge Management Division, Water Quality Control Department, NILIM

### 3. Discussion summary

#### (1) Outline of Sewerage Works and the Strategies for the Future in Japan

The first part of the presentation summarized a brief history of the rapid development of sewerage and its dramatic effects on the water environment in Japan, followed by an overview of the institutional systems which have been facilitating the sewerage works of local authorities. The latter part of the presentation dealt with the newly-launched initiative "The Way to Recycling", and particularly focused on the mitigation and adaptation strategies of sewerage works in addressing climate change issues.

## (2) Urban Stormwater Management

In recent years, much flooding has occurred in association with localized torrential rainfall in Japan's urban regions, requiring countermeasures to be urgently drawn up. Based on this, in discussing stormwater management in urban regions, examples of flood damage brought about by urbanization in Japan and stormwater drainage plans were presented, in addition to discussions on improving combined sewer systems.

The following questions were asked regarding the presentations (1) and (2).

Q (Vietnam): Would it not be difficult to build new sewerage systems in large cities and densely populated areas? How was the sewage disposed of in times when such systems were inadequate?

A: It is certainly true that newly covering densely populated areas with sewer networks is no easy task. Even in Tokyo, 20 years ago there were still many areas where vault toilets and septic tanks were being used. A lot of funding was focused into sewerage improvement, and as a result sanitary conditions and the living environment got significantly better.

Q (Philippines): What is the best way to decide between centralized and individual disposal?

A: There are guidelines relating to this. Basically, they are criteria which emphasize economic evaluation. According to these guidelines for instance, if the average distance between residential buildings is greater than 60 – 70m then the introduction of an individual disposal system is judged to be appropriate. The points requiring consideration differ from place to place. It is not based solely on economic reasons though; autonomous bodies judge in accordance with their individual circumstances.

Q (India): What is the difference between “ordinary sewerage” and “innovative sewerage”?

A: In “Innovative sewerage” the objective is the recycling of sewage, as expressed in the catchphrase “The Way to Recycling”. Aims for example include reuse of the wastewater and effective use of the sludge. The concept is decidedly different from the past one of “Collect, treat, discharge into public waters, and dump the sludge”.

Q (Malaysia): What kinds of measures were carried out in the cleanup of Sumida River?

A: Strict standards were established for industrial effluent, and sewerage systems were built. Both the country and the Tokyo Metropolitan Government invested a large amount of money into construction of the sewerage systems.

Q (India): If it is a densely populated area but one where there is no spatial room to lay sewer network, what method should be considered as most appropriate?

A: The measures currently under consideration are so-called “simplified sewerage” solutions, such as community toilets and condominium sewerage. However this is certainly a difficult challenge.



Q (Malaysia): When it comes to sludge incineration, is there no opposition from local inhabitants?

A: Even in Japan sludge incineration is a sensitive subject. Technological development relating to atmospheric pollution countermeasures was an important element. At this point in time most people in Japan do approve. I think it is dependant on the circumstances of the individual country though.

Q (Vietnam): How are you deciding on sewerage charges?

A: Basically, it is determined on the “polluter pays principle”. In large cities the cost can be covered by the sewerage rates, but in most small autonomous bodies a great amount is paid out from general accounts. The repayment of municipal bonds is a big problem. In France, England and Wales, and in some areas of Germany there are watershed-based financial systems, so the fees are averaged out and disparity between autonomous bodies is small. I think this example can serve as a useful reference.

### (3) Utilization of Reclaimed Wastewater

From the perspective of one of precious water resources in urban regions, the importance of water reuse will increase in the future. During discussions, the recent state of utilization of reclaimed water in Japan was presented and a summary was given regarding the *Guidelines for the Utilization of Reclaimed Water*, released in April 2005 by the MLIT.

### (4) Beneficial Use of Biomass at Wastewater Treatment Plants

The objectives of sludge treatment include reduction and stabilization; however, in contrast to the use of mechanical dehydration, the past few years have seen more and more treatment plants not to adopting the use of anaerobic digestion. Approximately 2.2 million tons of sludge is produced every year, while the efficient use of this amount is around 70 percent. Currently, in terms of material uses, the utilization of sludge as a form of energy, such as digestive gas, is a topic of much discussion and there is much expectation for cars running on natural gas to be able to directly employ a biogas automobile system using purified gas.

The following questions were asked regarding the presentations (3) and (4).

Q (India): What is mixed into blended compost? Would urban refuse be suitable?

A: Sewage sludge and cattle dung are used. I am not aware of any instances of autonomous bodies making compost using urban refuse and sewage sludge.

Q (Philippines): To what extent are the guidelines to be revised?

A: The 2005 guidelines of MLIT were the first officially published guidelines. The proposal guidelines were published about ten years prior. I believe they will be revised as the state of society changes through the accumulation of technological innovation and scientific knowledge, or through some other means.

(5) Question and Answer for Session on Water Environment and Wastewater Management

Q (India): Which do you think are better, centralized or on-site sanitary systems?

A: There is no cure-all solution to the question. The most appropriate method is thought to differ depending on the area. Generally speaking, on-site treatment is superior in terms of cost in sparsely inhabited areas, but the management of them often does not run adequately. The advantages and disadvantages of each should be carefully considered before deciding the most appropriate system for the area..

Q (India): Could you tell us about return period for rainwater plans?

A: Five year plans are common; in Tokyo it is five years, and it is ten in Osaka. Japan stretches a long way from North to South, and as a result the patterns of rainfall also vary from place to place.

In this section, the presentations from the Japanese side helped participants gain a deeper understanding of the history, current status and future direction of Japan's sewerage works and water environment preservation. In particular, the discussion on diverse potential roles that sewerage is expected to play for the mitigation of GHG emissions as well as for the adaptation to anticipated climate change were recognized as very suggestive for the future. In addition, a fruitful discussion was held for the purpose of bringing the presented information to bear on each participant's actual situation in policymaking of the management of urban wastewater and water environment preservation We shared recognition regarding the importance of sharing information in this field throughout the Asian region.

**The 16th Conference on Public Works Research and Development in Asia**  
**The 16th International Symposium on National Land Development and**  
**Civil Engineering in Asia**  
**“Integrated Water Resource Management Adapting to the Global Climate Change in**  
**Asia”**

**MINUTES**

**1. Date and Venue:** 13:00-17:10 Monday 3 December 2007  
B1F “Garden Floor,” Hotel Shiragiku, Beppu City, Japan

**2. Participants:**

India	Mr. Dhinadhayalan MURUGESAN
Rep. of Korea	Dr. Seok-Young YOON
Malaysia	Mr. Wan Abd Rahim Bin WAN ABDULLAH
Philippines	Dr. Judy Famoso SESE
Sri Lanka	Ms. Paniyanduwage Nalanie Sriyalatha YAPA
Viet Nam	Ms. Anh Thu DANG
Japan	Dr. Kenji JINNO, Professor, Faculty of Engineering, Kyushu University
	Mr. Hiroaki TANIGUCHI, Vice Minister for Engineering Affairs, MLIT
	Mr. Shin TSUBOKA, Director General, NILIM
	Mr. Yoshinori ASHIDA, Director, Planning Department, Kyushu Regional Development Bureau, MLIT
	Mr. Kazunori OODAIRA, Director, River Department, NILIM
	Dr. Ryutaro OOISHI, Research Coordinator for Evaluation, NILIM

### **3. Welcome Address, Dr. Ryutaro OOISHI, Research Coordinator for Evaluation**

Welcome to the 16th International Symposium on National Land Development and Civil Engineering in Asia, “Integrated Water Resource Management Adapting to the Global Climate Change in Asia.” My name is Dr. Ooishi, and I am the Research Coordinator for Evaluation, NILIM. Unfortunately the representative from Georgia is not able to be with us but without further adieu, I would like to call on Mr. Shin Tsuboka to deliver the opening address.

### **4. Opening Address, Mr. Shin TSUBOKA, Director General, NILIM**

I would like to express my sincere gratitude to all the participants as well as our guests from MLIT, JICA and the Kyushu Regional Development Bureau. Today’s theme is Integrated Water Resource Management Adapting to the Global Climate Change. In Asian countries, increasing economic demands and population are straining the capacities of water supplies. This symposium is held as an opening event for the 1st Asia-Pacific Water Summit. I hope through this symposium there will be greater cooperation and deeper understanding amongst all the countries present.

### **5. Overseas Participant Address, Ms. YAPA, Sri Lanka**

I would like to thank the organizers of this symposium for the opportunity to represent my country and I look forward to a vibrant and meaningful discussion today. Thank you very much.

### **6. Lecture on “Integrated Water Management under the Global Warming Scenario” by Dr. JINNO, Professor, Kyushu University:**

Facing growing population and increasing urbanization the need to secure a stable water resource through environmental conservation and restoration has never been more critical. What does global warming really mean? There are no textbooks that can answer this; therefore we are rather overwhelmed because we have never faced this situation before. Until 1975 we saw a sort of “business as usual” approach to mitigation but we are now at a symbolic crossroad as to what type of direction we should take. We must identify where we are right now in order to adopt an effective approach to climate change.

Dr. Pachauri presented the IPCC Fourth Assessment Report in May 2007, which predicted that drought-affected areas and heavy precipitation events are likely to increase. Even so, some are still not convinced that the phenomenon of global warming is real yet we are at a dangerous turning point where we must take action if we are to have any impact on mitigating future climate change. The large effects of global warming will come and likewise sufficient investment for adaptation and small mitigation will see less of an impact on global warming. It is not yet possible to say whether or not adaptation buys time for mitigation, for example by deferring CO2 emissions. The method of analysis depends on the capacity however it is important to conduct this kind of analysis, particularly at regional, sectoral and specific socio-economic levels. More careful observation of water related indices seems to be necessary in order to implement concrete measures on a wide-spread scale.

A 102 year record of precipitation and temperature was measured at the Fukuoka meteorological station. The classification of climate indices by SOM identified a distinct change in climate patterns which have been observed since 1960. The fluctuation of the annual precipitation in Fukuoka seems to be correlated with the employed four indices.

Does urbanization bring the same effect as global warming? Before urbanization there is a gentle rise of discharge and sufficient base flow, but after urbanization the levels go up and down very sharply. We see more droughts and more flood occurrences, so in that perspective, similar consequences are induced by urbanization as by global warming. So the mechanisms may be different but the impacts of urbanization and global warming may be closely related. Urbanization without proper measures for water management will result in a worsened environment. Rapid urbanization in Fukuoka City has decreased the river base flow and increased flood peak. In order to improve these matters, the city is committed to take the necessary actions based on the aesthetic water cycle which is not yet sufficiently realized.

Regarding integrated water management at the basin level, 30% of the water used in urban cities comes from the Chikugo River Basin. The river basins are actually connected so through the effective use of water we can see an interrelationship between the different basins. The impact of drought and water scarcity affects all aspects of life. One Chinese noodle shop was forced to close periodically when water ran out, placing a negative impact on the livelihood of the shop owner. The basins are not independent, so we must manage water resources in an integrated manner and I think that is beginning to happen. When you develop water resources you have to think in a span of 50 years. Managing water resources takes decades if not longer, so we must act now or we will not have the mechanisms in place when it truly matters.

Cooperation is essential. You need federal and central government to develop technology and provide funding and the municipalities must also work on this. We have open dialogue on the various options with stakeholders and a competitive spirit could be the driving force which leads to more public concern.

Finally, urbanization is a negative index and we are going to have global warming on top of urbanization; in other words things are going to get worse, not better. But if we do what is necessary today we can turn the direction in a positive way. Mitigation does not just mean reducing CO2 emissions. We can reduce the impacts of global warming and urbanization by integrating surface water and subsurface water at the basin scale. Ultimately, only when we take responsibility for global warming as our own problem and decide what to do in cooperation with the stakeholders of that region will we be successful.

## **7. Case Study**

### **7-1. Case of Japan by Mr. Shin TSUBOKA, Director General, NILIM:**

There is a high concentration of population and property in the alluvial plains of Japan. About 10% of the land area is inundation-prone and there we have the concentration of about 50% of population and 75% of property. During the last 10 years we have witnessed an increase in the frequency of precipitation downpours. Currently 1.78 million people live in the average sea surface levels where even a 0.59 meter rise in sea level would force an estimated 2.7 million people to relocate. We have developed a model to predict wave run up which is provided to regional governments in the event of typhoon and other natural disasters.

Hazard maps require extensive rainfall and topography data but can serve as a support system in the development of flood hazard maps. Because of climate change, the difference of heavy rainfall and light rainfall areas varies greatly. The NILIM has preparedness measures in place to confront the threat of climate change but admittedly adaptation measures have limitations,

therefore it is necessary to improve damage reduction capabilities of local communities against flooding.

Q: (Mr. ISHIDA, Fukuoka Prefecture) Regarding the boring investigation of embankments, what were the rivers where you conducted boring investigations? Also, do you have monitoring investigation data for rivers managed by prefectural governments?

A: We are conducting the boring investigation from 2000-2009 but we cannot do the boring at a high density. It is impossible to conduct at all sites, so we are doing boring and infiltration calculations which may not be sufficient. I hope that the investigation will be further enhanced. Monitoring is a big challenge because if there is inundation you have to set up monitoring stations and the durability of the equipment is tested. And for water damage we accumulate water damages by calculations and we feel this is not sufficient so this is something we have to overcome.

### **7-2. Case of Kyushu District by Mr. Yoshinori ASHIDA, MLIT:**

Kyushu can be called the window to Asia as it is relatively close to the Korean Peninsula, Shanghai, etc. In recent years, Kyushu has frequently experienced abnormal weather. Eight large-scale disasters have occurred in the last 10 years with most of the landslide disasters in Japan occurring in Kyushu. Last year, the southern part of Kyushu received 1,000 mm of rain in just four days. Due to frequent concentrated downpours and an expanding urban district, the risk of flood disaster is increasing. Therefore, the provision of information and evacuation plans needs to be improved.

There is a large disparity in the precipitation rates between the North and South with Northern Kyushu facing frequent droughts. The water resources in Fukuoka City are scarce, about 60% is obtained within the region, 10% from ground water and the remaining 30% is brought in from the Chikugo River, outside the region. Water in the Chikugo River is used for irrigation in the largest agricultural production area in Kyushu. Still we suffer from water shortages, with droughts once every two years. Water resources become especially low in summertime. The flow condition needs to be improved. To address this problem we have implemented water provision facilities along the Chikugo River but this requires the support and coordination of the people for the promotion and success of these projects.

### **7-3. Case of India by Mr. Dhinadhayalan MURUGESAN, Ministry of Urban Development:**

India is surrounded by water on three sides. India's rivers carry 90% of the water volume during the period of June-November, therefore only 10% of the river flow is available during the other six months. The total water requirement of the country estimated at 694 BCM in 2010 is predicted to rise to 973 by 2050 while the available utilizable water resources are about 1,086 BCM. In the urban areas, 93% of the population enjoys access to a safe water supply and 72% in the rural areas have access, however the water supply by and large is intermittent, ranging from 3 to 10 hours per day.

The National Water Policy 2002 accords top priority to drinking water supply followed by irrigation, hydropower, navigation, industrial and other uses. Water stress exists in different regions due to peculiar rainfall patterns in the country. The situation could worsen substantially due to changes in precipitation patterns. Every year, an average of 19 million hectares of land

become flooded and the yearly loss of life is estimated at 2,590. In response, 173 flood forecasting and warning stations have been established throughout the country but rapid advances in all spheres must take place in concert for the management of water to be a prominent one. India has undertaken response measures that are contributing to the objective of the UNFCCC.

#### **7-4. Case of Republic of Korea by Dr. Seok-Young YOON, Korea Institute of Construction:**

Climate change is no longer a controversial issue in South Korea; it is real and evident South Korea was recognized as a developing country in 1992 when the UN Framework Convention on Climate Change was established therefore it is not required to reduce greenhouse gases (GHGs), however the effects of climate change can no longer be ignored. Climate change not only causes floods but also affects droughts. Unfortunately until now there have been no water resource plans or policies that reflect climate change.

The amount of precipitation in South Korea has increased by 7% while transpiration has decreased. Due to small land and overpopulation, intensity of land and water resource use in South Korea is much higher than other countries. Even a small change in climate can impose a serious problem to water resources. Both structural and non-structural design of water resource systems must consider potential impacts of climate changes.

The Water Resources Committee of Korea is implementing research projects to cope with climate change to which the Ministry of Construction and Transportation provides \$7 million. Additionally, we need a nationwide flood control plan based on national capacity, in conjunction with IWRM designed for each individual basin to effectively address the changing situation of water resource management. We also need improvement in the current flood forecasting system and we need to incorporate meteorological techniques in basin control.

Q: (Mr. YAMAMOTO, Fukuoka Prefecture) Regarding water disasters and rain water reservoirs in urban areas, I am interested in the building codes for new construction which require a storage system for drainage. Can you please elaborate on this?

A: The Government of Korea wants to change some of the building codes. We currently design building codes under a 1-in-100 or 200 year scenario but we are proposing a 1-in-500 and 1,000 year frequency building code design.

#### **7-5. Case of Malaysia by Mr. Wan Abd Rahim Bin WAN ABDULLAH, Ministry of Energy, Water & Communication:**

Sewerage treatment is a necessary service which has evolved from pour flush systems, septic tanks and biological filters, to a fully mechanized plant in 2007. The Sewerage Development Quality System establishes monitoring indicators and key indexes.

Integrated River Basin Management includes river corridor management, flood mitigation and water resources management and sewerage management is now linked with IWRM for maximum benefit. Effluent from treatment plants, overflow discharges, sludge disposal, and health and safety concerns are just a few of the potential environmental impacts of sewerage activities.

**In the local context of global warming, Malaysia contributes 2% of the total world CO2 equivalent. Indirect and direct sources of GHGs are emitted from sewerage and sludge treatment processing, such as the pumping and aeration of sewage (indirect) and N2O from the nitrification and denitrification process (direct). Sewerage, which is a vital service for**

**developed and developing countries alike has progressed well over the decades and sewerage planning is now regarded together in the context of IWRM for maximum benefit, but future adaptation and mitigation efforts are required to minimize the impact of global warming in Malaysia.**

#### **7-6. Case of Republic of the Philippines by Dr. Judy Famoso SESE, Department of Public Works and Highways:**

In the Philippines, the Department of Public Works and Highways (DPWH) is the country's engineering and construction arm, responsible for the planning, design and construction and maintenance of infrastructure, such as roads, bridges, flood control systems, water resource development projects and other public works in accordance with the national objectives. The DPWH is likewise responsible in the monitoring of the National Water Data Collection Program and recognizes the importance of Integrated Water Resource Management (IWRM) to ensure and secure sustainable water resources for all.

The Philippines archipelago has a population of about 80 million and consists of 7,107 islands and islets with a land area of about 300,000 sq. km. The country is rich in water resources, which has about 421 principal river basins of which 20 are considered major river basins. The total coastline is about 36,289 km and the average annual rainfall is about 2,400 mm of which 1,000 mm to 2,000 mm is collected as run-off. Despite having relatively rich water resources the Philippines is facing an eminent water shortage due to over population, urbanization and industrialization.

Other views and concerns dominating the water resources are the deteriorating water quality, declining access to safe drinking water, inadequate sanitation and sewerage facilities and degradation of major ecosystems. These concerns are aggravated by the increasing frequency and intensity of extreme climate events and variability.

In view of these water-related concerns and issues, in January 2006, the Philippines started the implementation of the United Nations Environmental Programme (UNEP)-assisted IWRM project to develop a plan framework. This plan framework has a broader focus that looks at water in relation to other dimensions, dynamic and adaptive, which is integrated and coordinated in all levels in a holistic manner. Four sustainable outcomes were identified and nine strategic themes were also identified to support the four sustainable outcomes.

#### **7-7. Case of Democratic Socialist Republic of Sri Lanka by Ms. Paniyanduwage Nalanie Sriyalatha YAPA, National Water Supply and Drainage Board:**

In Sri Lanka the agricultural sector accounts for 96% of water usage and 30% of national pipe borne coverage. Water access is 70% in urban areas and 15% in the rural areas. Climate change directly and indirectly affects economic activities, national environment of settlements and the health of resident and commuting populations while the collapse of health infrastructure and the displacement of affected populations would bring illness, injury and death.

The vulnerability of coastal areas due to sea level rises is a real and probable threat, leading to a loss of land area with negative impacts on industrial output, fish production, tourism and transportation infrastructure. The National Rainwater Harvesting Policy is to be adopted making rainwater harvesting mandatory, and the construction of salinity barriers and dams to prevent salinity intrusion are just a few examples of mitigation and adaptation measures currently in place.



Q: (Mr. MURATA, Fukuoka Prefecture) Do you have any data on the recent trend of sea level increase and mean temperature increase?

A: I do not have the data on the sea level temperature but as you know in 2004 we were hit by a devastating tsunami which resulted in an increase in sea level and caused contamination in the rivers and we are still experiencing hygiene problems.

#### **7-8. Case of Socialist Republic of Viet Nam by Ms. Anh Thu DANG:**

Viet Nam is divided into seven zones, each with unique characteristics in regards to geology, climate, natural resources, ecology and natural disaster patterns. It is predicted that global climate change will lead to a reduction in water resources while sea levels will increase considerably. With each one meter rise in sea level, about 10.8% of the population will need to be relocated. The Huong River is the biggest river in Hue Province with a 300 sq km catchment area. Currently the total demand of water utilization across all sectors is 444.4 million m<sup>3</sup>/year, with agriculture accounting for 390 million m<sup>3</sup>/year or 87% of the total. It was discovered that irrigation was not sufficient during the eight month dry season and reservoirs and water resources in the whole region were limited. It is predicted that by 2070, the annual flow will be reduced by 23-40% in the central region and increase by 49% in the south central region. To ensure water demand in the long term it is necessary to develop human resource capabilities for the management and exploitation of water resources in conjunction with policy improvement and community education.

#### **8. Panel Discussion**

Q: (Mr. Oodaira) What kind of adaptive policies do you have in place in your countries? We have discussed firstly about flooding from downpour and typhoons and inundation of areas including hygienic issues, secondly due to limited precipitation there can be a shortage of drinking water and a degradation of quality and thirdly with the sea level rise there could be an inundation of coastal areas and people would need to be relocated, so out of these threats, what is the most serious issue as you perceive it?

(India) First I would like to mention one of the methods proposed by the Government of India. In order to address the issue of flood damage, we are implementing the construction of reservoirs, canal improvements, embankment construction, etc. We still need to speed up the process and additional forecasting stations need to be established. Different parts of the country are facing droughts. We are promoting rainwater harvesting measures. Watershed management projects are being undertaken in rural areas and model building codes have been formulated for promoting rooftop rainwater harvesting. Regarding the rise of sea water level, mitigation measures need to be adapted. Measures including compressed natural gas to reduce pollution and energy efficiency vehicles have been undertaken.

Q: (Mr. Oodaira) Out of three threats what is your major concern? I stated three issues above.

A: The biggest threat is flood. We need to take immediate measures. Mumbai is experiencing severe flooding so now we are proposing a new storm water management system.

(Republic of Korea) We cannot ignore or delay water resource policies any longer. Since the late 1990s, major drought has occurred frequently in Korea. It is difficult to say that climate

change is solely responsible for the decrease in precipitation however it is important to recognize the concentration of population due to urbanization which may contribute to the occurrence of drought. Government countermeasures are currently being discussed.

(Mr. Ashida) We are having a lot of damage as a result of flood however compared to other Asian regions we have a smaller degree of casualties. One flood per 150 years is the planned frequency but we are unable to meet this target. Currently we are conducting 1 per 50 years with a 75% success rate. The highways are elevated which can aid in evacuation.

(Malaysia) The rising sea level is not a major problem in Malaysia actually but we are facing flash floods and a drinking water shortage crisis. The government predicts that by 2010 the capital city will face a very heavy dry season and a shortage of drinking water. We faced a similar problem in the early 1990s and the government launched a substantial project in cooperation with JBIC which transferred water from the largest river in Peninsular Malaysia to the dams in the urban areas (Gombak Dam).

(Philippines) In the Philippines, the most threatening and most serious phenomenon that I can see in the country among the three is flood damage. As experienced, there were about five La Nina episodes from 1970-2000 compared to only three La Nina episodes from 1950-1970. The most common extreme climate events with significant economic and social impacts in the Philippines are tropical cyclone occurrences of which typhoons and cyclones are the most destructive. Several typhoon extremes were observed from 1990-2006 which registered the highest 24-hour record of rainfall during this period. Hundreds of people died, agricultural production was greatly affected and several infrastructures were damaged. These historical data served as a basis among others for increasing flood control mitigation measures. The national and local governments and the National Disasters Coordinating Council (NDCC) worked hand-in-hand by giving priority to providing structural and non-structural measures to affected areas by constructing Sabo dams, dredging silted rivers, relocation of affected families, etc. On the other hand, the DPWH is currently undertaking two flood control mitigation research projects through a JICA-assisted Technical Cooperation Project, namely: the Study on the Nationwide Flood Risk Assessment and Flood Mitigation Plan; and the Project for Enhancement of Capabilities in Flood Control and Sabo Engineering of the DPWH.

(Sri Lanka) Sri Lanka is experiencing extreme climate events including major floods in the city and related landslides which cause damage and death forcing evacuation and relocation of a large number of people. We are also affected by droughts and sea level increases and various diseases related to flood and squatters in unauthorized make-shift dwelling living close to marshes.

Q: (Mr. Oodaira) In Sri Lanka, which do you think is going to be the biggest threat?

A: I think we will be impacted greatest by the threat of flood.

(Viet Nam) The major disaster is flood. From 1996-1999 the annual losses were US\$459 million. We are facing several challenges including the application of new scientific and technological achievements to forecast disaster and address the degradation of water, and the

**promotion** of policy awareness in the community. The Government has received strategy on disaster preparedness and mitigation but community level countermeasures and further international cooperation are needed.

Q: (Mr. Oodaira) Flood seems to be the major threat in many of the countries. Dr. Jinno, including Japan, seven countries pinpointed what should be done for prevention. In your opinion, what sort of research is necessary?

A: (Dr. Jinno) Is it the impact of global warming or the lack of infrastructure? If urbanization is posing a bigger threat we must have a reservoir; that is the viewpoint of Japan. In Fukuoka we have turned a park into a reservoir pond. So the point is how you pool the rain that comes and dams are another thing.

Q: (Mr. Oodaira) Dr. Sese, you mentioned that you are building dikes. Has that been successful? Also can you talk about the project to create the flood hazard map?

A: (Philippines) The flood hazard map is just one output of the research. In the hazard maps, we are able to identify the flood prone areas to ensure that the structure we want to construct would be an effective one. Likewise, hazard maps will be disseminated to local government units to inform them of the flood prone areas. So in the meantime we need to have immediate structures like dams to slow down the gravity of water, and then we can identify long term solutions using flood hazard maps and other considerations.

Q: (Mr. Oodaira) Can you give us more detail on how you use the flood hazard maps?

A: Flood hazard maps help us identify flood prone areas and then planners can identify the best structure for that specific area.

Q: (Mr. Oodaira) I would like to ask India about the melting glacier in the Himalayas. Is there currently any international cooperation to address this issue?

A: (India) As for the recent study, the Gangotri Glacier is melting causing heavy flooding. It is observed that the receding of glaciers is due to climate change and we need to address the issue with the cooperation of the international community. The government of India has an early warning system and evacuation plans in place but we need further international cooperation. However, widespread poverty in our country presents a financial barrier to addressing these issues.

Q: (Mr. Oodaira) I believe it was this year that the Ganges River Basin flooded. Judy talked about flood hazard maps, taking an aerial picture to create a map and using it to notify the local people in order to mitigate devastation. Does that sort of thing work in India too?

A: Yes, organizations under the Ministry of Water Resources have developed in-house capabilities to interpret satellite images in some of the facets of water resource planning that is sedimentation and river behavior. The capacity needs to be improved to cover other areas in water resource planning like land use, irrigated area assessment, salinity crop conditions, river morphology studies, etc.

Q: (Mr. Oodaira) As for Viet Nam, you are a specialist in city planning and I think you said that what you need is to mobilize the local citizens. You need to make plans and invite people to

participate. I suppose the Mekong River has to flood for the farmers' benefit, so are you doing something to mobilize the people? Do you use the hazard maps?

A: (Viet Nam) The Government has strategy on disaster and the main point is to implement flood solutions including non-structural solutions. It is very important to mobilize the support of local community for non-structural solutions like changing the timing of regional crops. The community plays an important role in living with floods.

Q: (Mr. Oodaira) Viet Nam has given us rich thought to live with floods. Regarding the use of hazard maps and developing international cooperation, those are very productive propositions. Mr. Tsuboka, what is your reaction on behalf of NILIM? What sort of cooperation is possible?

A: (Mr. Tsuboka) Every country has unique situations and priorities effecting disaster prevention. In the last 10 years, natural disasters are more wide-spread and frequent so old priority setting may have to change, and may need to be done quicker depending on the country. Opportunities like this are important to promote international cooperation and to exchange opinions.

Q: (Mr. Oodaira) Mr. Yoon, can you elaborate on countermeasures and research you are conducting in regards to drought?

A: (Republic of Korea) In Korea water resource problems are associated with climate change. For water resource management we are pursuing technological development in order to adapt to climate change so we can improve the quality of life.

Q: (Mr. Oodaira) In Malaysia the repeated use of rivers is being conducted and the water is put back into the river. What is the state of the plan for reuse of water in your country?

A: (Malaysia) Right now it is not economical to treat and reuse the effluent water from the sewerage treatment plant because of the small scale of the STP, but with the support of the JBIC loan, 13 regional treatment plants are under construction. We hope that after the project is complete we will be able to treat and reuse the effluent water.

Q: (Mr. Oodaira) We tend to think we have an abundance of water resources, but we need to come up with different measures to cope with climate change. I hear that dams are buried into the land at the same time I hear that you have a problem with water resources. What are the efforts made to secure water resources in your countries?

(Sri Lanka) We have some programs to secure the water boundaries and we are using ground water also as a water resource. Sometimes, mainly during the drought season, the sea water is coming into the rivers because of the sand mining. In rural areas there are more streams but they are polluted by human behavior.

Q: (Mr. Oodaira) Dr. Jinno, we have many countries represented here, so there are various problems. What is the most important stance a nation should have?

A: (Dr. Jinno) Mitigation means the reduction of CO2 emissions. If that is the case than the emissions have been produced by developed nations and the developing nations are experiencing the consequences. Then to a certain degree the infrastructure development should be transferred

to developing nations. Also, international cooperation is indispensable. We should make full use of organizations like the United Nations and the IPCC for those developing countries.

(Mr. Oodaira) All the countries have unique issues and challenges but we could understand that through venues like this information exchange and research cooperation among Asian countries, we can create effective countermeasures to adapt to climate change.

**8. Closing Address, Mr. TANIGUCHI, Vice Minister for Engineering Affairs, MLIT**

It is a great pleasure to deliver this closing address. Through this symposium we have come to recognize that there are common issues around the world and we must agree to establish efforts in order to allow people to live safely. Civil engineering has an important role to play taking into consideration, natural, social and economic situations of each country. The Kyushu region enjoys international exchange with many Asian countries. It is also a region that has close relations to water issues and I think it is significant that this symposium is being held in conjunction with the Asia-Pacific Water Summit. I hope this symposium will be instrumental in developing further exchange and with that I would like to close today's symposium.

**The 16th Conference on Public Works Research and Development in Asia  
Concluding Discussion Session  
“Integrated Water Resource Management Adapting to the Global Climate Change”**

**MINUTES**

**1. Date and Venue:** 9:30-10:30 Friday 7 December 2007  
International Conference Room, NILIM

**2. Participants:**

India	Mr. Dhinadhayalan MURUGESAN
Rep. of Korea	Dr. Seok-Young YOON
Malaysia	Mr. Wan Abd Rahim Bin WAN ABDULLAH
Philippines	Dr. Judy Famoso SESE
Sri Lanka	Ms. Paniyanduwege Nalanie Sriyalatha YAPA
Viet Nam	Ms. Anh Thu DANG
Japan	Mr. Shin TSUBOKA, Director-General
	Mr. Kazuhiro NISHIKAWA, Executive Director for Research Affairs
	Mr. Jun INOMATA, Director, Planning and Research Administration Department
	Mr. Junji TAKAYANAGI, Director, Environment Department
	Mr. Osamu FUJIKI, Director, Water Quality Control Department
	Mr. Kazunori OODAIRA, Director, River Department
	Mr. Shozo KOGA, Director, Research Center for Disaster Risk Management
	Dr. Ryutaro OOISHI, Research Coordinator for Evaluation
	Mr. Takenori YAMASHITA, Head, River Division
	Mr. Junzo INOUE, Head, International Research Division, Planning and Research Administration Department, NILIM

**3. Opening Remarks**

(Dr. Ooishi) Good morning ladies and gentlemen. Today’s closing session will be chaired by Mr. Tsuboka, Director-General of NILIM.

(Mr. Tsuboka) First we will review and wrap up the conclusions of the conference. Then I would like to ask the representatives to give their presentations on the contents and conclusions of each session after which we will invite all of you to comment and then adopt them.

**4. Review of Session on Subject of Common Interest, “Integrated Water Resource Management Adapting to the Global Climate Change”**

(Mr. Takayanagi) I would like to highlight the main areas of the minutes. The purpose and background of the conference was provided by the representative from NILIM. Country reports were presented under the theme of “Integrated Water Resource Management Adapting to the Global Climate Change” by Japan, India, Malaysia, the Philippines, Sri Lanka and Viet Nam.

Exchange of information took place on the impacts of global warming in the various countries, new ideas and concepts to cope with them and the measures for the improvement of awareness to cope with flood or water-related disasters. With this I close my report on the Session on Subject of Common Interest and ask for all participants' confirmation on the draft minutes of this session.

(Mr. Tsuboka) If there are no remarks? (No remarks.) We confirmed the minutes were an accurate reflection of the session. I would like to invite the next presenter to give his conclusion on the sessions on specific subjects.

## **5. Review of Sessions on Specific Subjects**

### **5-1. Session on “Water Resource Management”**

(Mr. Yamashita) The first session held on the morning of Thursday, November 29 discussed three themes pertaining to water resource management. Two of the three themes were related to global warming (i.e. the change of rainfall patterns, climate change models, etc.). The third theme addressed the measures being taken in the Tokyo metropolitan area concerning forest management and water utilization. There were additional questions and comments that exceeded the allotted time but a very significant exchange of information occurred.

### **5-2. Session on “Water Disaster Management”**

(Mr. Koga) The second session held on the afternoon of Thursday, November 29 discussed ‘flood risk evaluation and countermeasures’, ‘construction of storm surge forecast systems’, ‘managing sediment disasters warning data’ and ‘implementation planning for global warning measures’. The main questions were about the flood control in regions between the Ibi River and Nagara River, the media and timing of the information dissemination on storm surges, ways to identify hazardous areas for sediment disasters and the content of assistance to developing countries by ICHARM. Through the presentations and Q&A, the participants could get the common recognition about the main issues concerning water disaster management.

### **5-3. Session on “Water Environment and Wastewater Management”**

(Mr. Fujiki) The third session held on the morning of Friday, November 30 discussed the current situation of sewerage works and future strategies for Japan, emphasizing the rapid development of sewerage and its dramatic effects on the water environment of Japan. Four presentations were given on the outline of sewerage works and strategies for the future in Japan; urban storm water management; utilization of reclaimed wastewater; and beneficial use of biomass at wastewater treatment plants. We also discussed the potential role of sewerage in mitigation of GHG emissions. After the presentations fruitful discussions were held for the purpose of the application of relevant information to each participant's actual situation.

(Mr. Tsuboka) If there are no comments? (No comments.) We confirmed the minutes were an accurate reflection of the session. I would like to invite the reporter on the international symposium.

## **6. Review of the “The 16<sup>th</sup> International Symposium on National Land Development and Civil Engineering in Asia”**

(Mr. Oodaira) Mr. Tsuboka delivered the opening address and Mr. Ashida presented the case of Kyushu District. Professor Jinno stressed the need for discussion with central and federal

governments as well as stakeholders, and called for a sense of ownership to address global warming issues. There were presentations of specific cases by the participating countries which was followed by a panel discussion. Questions were raised regarding the biggest concern in the participating countries following the onset of global warming. Responses were made which indicated the concern of flood and water-related disasters. The session was concluded with an understanding of the respective problems of each country and the importance of establishing a cooperative network for tackling climate change problems was stressed and Mr. Taniguchi delivered the closing remarks. The participants noted that they found the panel discussion very meaningful to gain understanding of the various efforts being undertaken in the different countries.

(Mr. Tsuboka) If there are no comments? (No comments.) We confirmed the minutes were an accurate reflection of the session. I would like to proceed to the conclusions of the conference.

## **7. Conclusions of the Conference**

(Mr. Tsuboka) I would like to ask the Secretariat to deliver the Conclusion.

(Mr. Inomata) The 16<sup>th</sup> Conference on Public Works Research and Development in Asia was held mainly in Beppu and Tsukuba from November 26 to December 7 with participants from India, the Republic of Korea, Malaysia, the Philippines, Sri Lanka, Viet Nam and Japan. The 16<sup>th</sup> conference addressed Integrated Water Resource Management Adapting to the Global Climate Change as the subject of common interest as well as Water Resource Management, Water Disaster Management and Water Environment and Sewage Management as specific subjects. The participants gained mutual understanding through presentations, site visits and active discussion. The 16<sup>th</sup> International Symposium on National Land and Development and Civil Engineering in Asia was held in connection with the 1<sup>st</sup> Asia-Pacific Water Summit.

The Conference on Public Works Research and Development in Asia is summarized as follows; the participants gained and shared knowledge of the current situation and challenges facing “Integrated Water Resource Management Adapting to the Global Climate Change” and recognized the importance of continuing research on the matter. The participants affirmed the need to establish an international cooperative framework for research and implementation of adaptation measures and recognized the need for further cooperation to continue this conference in the future.

(Mr. Tsuboka) If there are no comments, I would like to confirm the adoption of the conclusions of the conference. Thanks to your cooperation we have been able to successfully conclude this conference and I would like to welcome your opinions in regard to the conference overall.

### **7-1. Comments by Participants**

(India) Through this conference, I have realized the need to initiate adaptation measures and continued research. I hope my country will further efforts in this regard and establish an international cooperation framework for research. I would like to express my sincere gratitude to NILIM and JICA for the opportunity to attend this conference.

(Republic of Korea) I was deeply impressed by the organization of this conference and I look forward to reporting the success and results of this conference to my President.



(Sri Lanka) This was a very useful conference. We gained valuable knowledge through the site visits and I would like to thank all of you for organizing this conference.

(Malaysia) I gained a lot of experience about the working environment and Japanese culture to enhance international exchange. All the presentations were very useful, but for me coming from the sewerage department, I would like to discuss further about how we can use effluent water in the future, sludge disposal, residential storage tanks, and so forth. I would also like to recommend a longer Q&A session for the next conference.

(Philippines) I would like to express my profound appreciation to NILIM and the organizers of this conference and emphasize the gratitude of the government of the Philippines for the support of JICA in our important research projects. Due to your efforts, it is possible that research will focus on water-related issues in the future.

(Viet Nam) I think through the lectures and discussion I have gained new information, ideas and concepts which will help me introduce new policies and transfer knowledge to the local authorities in Viet Nam. I hope to gain more information on cooperative river basins management efforts but I am very much grateful for this opportunity.

(Mr. Tsuboka) I would like to express our appreciation for your active participation and discussion throughout the session. Lastly, there are two more points that we must cover.

## **8. Others**

### **8-1. Proposal of the Networking of Researchers and Engineers**

(Mr. Nishikawa) I have two proposals. The first is a proposal to initiate mutual information exchange between NILIM and your organization. We propose an exchange of newsletters or manuals (i.e. publications by NILIM and your organization) to expand information exchange on a regular basis. Also we would like to utilize the Internet to build a more active information network among the countries. Secondly, we would like to ask you to communicate the significance and meaningful outcomes of this conference to your country's institutions and organizations, and JICA offices and Japanese embassies to ensure the continuation of this conference.

### **8-2. List of Contacts for Further Discussion after the 16<sup>th</sup> Conference**

(Mr. Oodaira) Now that you have heard the two proposals, for the sake of the future exchange of information and the continuation of this conference, I would like you to make use of the contact information on the list of contacts. If you have any questions, please feel free to contact any of these individuals and likewise these people may come to you for information sharing. Any other requests may be directed to the international research division of your organizations.

## **9. Closing Remarks**

(Mr. Tsuboka) We will continue to work very hard and make every effort to ensure the further development of this conference. With this we would like to close the general discussions and I would like to express my sincere gratitude to everyone for their cooperation and contribution.