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N I L I M

News Letter

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■ Message from the Director-General

Japan has suffered from a lot of natural disasters in 2003 as before. Large Earthquakes of a magnitude of 7 to 8 occurred in May and July in Miyagi Prefecture and in September in Hokkaido area. Owing to these earthquakes, two persons were missing, a number of people were injured and serious damage was caused to houses, buildings, embankments, roads, port facilities and other structures.



Meanwhile, the long early summer rainy season and several typhoons which directly hit Japan caused downpours and strong winds, resulting in the loss of precious lives and properties.

As Japan is situated near the boundaries of several tectonic plates, it has long suffered from earthquakes. It is said that the earthquake potential is now large enough to cause some plate type earthquakes and/or an earthquake directly underneath in the Kanto and Tokai districts as well as the southeast sea area in which there is a concentration of population and properties. If such an earthquake occurs, there is a possibility of suffering serious damage.

Not only Japan but also many other countries have repeatedly suffered severe damage caused by earthquakes, flooding and/or drought. Our predecessors made strenuous

efforts to prevent and overcome these disasters. Thanks to these efforts, the degree of security against natural disasters has greatly improved. Nevertheless, when a disaster once occurs, the damage may become remarkably big by the increase in population and properties, and more their concentration in urban areas.

It is, therefore, essential that we devote ourselves to our duties and continue our efforts to reduce the damage caused by natural disasters. These include further technological research relating to disaster prediction, information gathering, communication and exact evacuation and guidance in addition to technologies improving earthquake resistance and enhancing security against flooding and debris flows. It is the mission for those involved in research in the fields of housing and infrastructure to deepen the research securing the safety which is the basis of human activities.

Research on properly coping with various disasters is one of the most important themes of the NILIM and researchers of many different disciplines are concentrating their energy on it. In order to make such research even more effective, it is necessary to collaborate with researchers in many different countries. The NILIM is making its research outputs available by means of its Newsletter, Website and Annual Report, etc. We will be honoured if you, researchers around the world who are interested in our research activities, access such information sources and cooperate with us to establish an international research network.

OKUNO Haruhiko, Director-General, NILIM

■ Debris Flow Disaster in Houkawachi-Atsumari District of Minamata City in Kumamoto Prefecture on 20th July, 2003

The debris flow which ran down through the Houkawachi-Atsumari District of Minamata City in Kumamoto Prefecture on 20th July, 2003 killed 15 people and destroyed 15 houses completely. Photo 1 shows the complete view of the disastersite in Houkawachi-Atsumari District.

The Erosion and Sediment Control Division conducted a field survey with the Sediment Control Research Group of the Public Works Research Institute immediately after the occurrence of the disaster. The survey results suggest that (i) there were two flows: one mainly consisting of mud and another mainly consisting of boulders and gravel, (ii) the flow mainly consisting of mud preceded the flow mainly consisting of boulders and gravel, (iii) the flow mainly consisting of mud covered a distance of some 600 m from the landslide site to the outlet of valley in one or two minutes at a speed of 4.8 – 15.2 m/sec while the flow mainly consisting of boulders and gravel covered the same distance in two to four minutes at a speed of 2.9 – 9.1 m/sec and (iv) the volume of the sediment transported by the debris flow to the Houkawachi-Atsumari District was approximately 97,000 – 107,000 m³, including voids.

Further investigation will be conducted in the coming years by means of a channel experiment to analyse the mechanism of debris flow causing damage to buildings and to clarify the behaviour of debris flow at a S-bend section of a torrent to improve the accuracy of flow speed estimation.



Photo 1 Debris flow which occurred in the Houkawachi-Atsumari District of Minamata City in Kumamoto Prefecture (Full View)

■ Examination of Design and Management Techniques for Disaster Mitigation of Structures across river

Hiroshi Kawaguchi, River Division, River Department

Weir for irrigation and ground sill to make the fluctuation of riverbed stabilize are built as structures across river. The structures are mainly composed of falling works, aprons and bed protection works. The bed protection works are constructed for protection of local scour and as energy absorber in downstream of the falling works. If hydraulic gradient among bed materials were over criteria, seepage control seat would be designed for piping under the falling works. Piping is runoff from downstream end of the apron containing bed materials on bottom of falling works due to large seepage velocity and large hydraulic gradient of pressure and position head. These physical quantities are influenced by water surface. The hydraulic gradient among bed materials is estimated by use of difference of water levels in upstream and downstream of the structures and length of seepage path.

But the hydraulic gradient may increase by bed deformation in downstream of the structures. If flood run among concrete blocks of bed protection works, pressure would come down from assumption by separate flow in

downstream end of the apron. If piping under the falling works occurred and progressed, the structures would not function and be washed out with the piping.

Then, it was examined that causes of the piping and countermeasures of gravels among the bed protection works in downstream of the apron by large-scale (1/8) hydraulic experiments on movable bed (Photo 2). Condition of the experiments followed the Guidance for Structural Design of the Groundsill (1998). Hydraulic jump occurred on the bed protection works under this condition.

From the experiments, it is concluded for disaster mitigation of structures across river that (1) countermeasures of gravels among bed protection works in downstream of apron are useful to control piping progress under falling works after occurrence of piping and (2) countermeasures of gravels needs some layers to make small vertical seepage velocity among gravels and diameter to prevent gravels themselves and bed materials from going out of the concrete blocks.



Photo 2 Experiment of countermeasures of gravels among bed protection works in downstream of apron for piping under falling works

■ Coastal Hazards 2003: International Workshop on Natural Hazards in Coastal Areas

The NILIM and the Port and Airport Research Institute (PARI) jointly held the Coastal Hazards 2003, the International Workshop on Natural Hazards in Coastal Areas (WS), for three days from 20th to 22nd August, participating researchers from government research

institutions and universities in not only Japan but also the Netherlands, Australia, Korea, Bangladesh and the US.

Prevention and/or mitigation of the damage caused by such coastal hazards as tsunami and storm surge requires a combination of hard measures that rely on the ,

development and improvement of facilities such as dikes and sea walls, and soft (non-structural) measures, including provision of adequate precaution information, preparation of hazard map and development of effective evacuation guidance system. As coastal conservation in Japan has primarily focused on the construction of structures to improve the level of protection, the improvement of soft measures has been relatively slow. The severe storm surge damage caused by a typhoon in September, 1999 in the western part of Japan, however, has led to the serious reconsideration of the need for the application of soft measures to combat coastal hazards. At present, the Government of Japan is earnestly conducting technical development to prepare a storm surge and tsunami hazard map and to create a database which provides the basis for such a hazard map. In order to promote research to establish comprehensive measures which integrate hard and soft measures, the WS was held to learn about the latest research achievements in the countries of the participants, to exchange opinions and information and to compare the situation of the relevant research in Japan with that in other countries.

At the WS, researchers reported on recent examples of disaster damage, the latest research findings, efforts to



Photo 3 Opening ceremony of the WS

integrate hard and soft measures and proposals during five sessions entitled "Damage and Restoration", "Hazard Mitigation", "Countermeasure Systems", "Facilities and Storm Surge" and "Hazard Map".

The general proposals made during the plenary session of the WS featured (i) the need for comprehensive measures integrating hard and soft measures, i.e. the integration of measures based on risk assessment, the development of new technologies for protection facilities and the safety evaluation as well as maintenance of facilities, (ii) the importance of determining the preconditions for the preparation of a hazard map and (iii) consideration of people with disabilities.

In mid-September in the aftermath of the WS, Japan and Korea were directly hit by Typhoon Maemi. Areas along the southern coast of Korea in particular sustained severe damage due to the storm surge. Meanwhile, coastal areas of Hokkaido and other regions in Japan suffered due to the Tokachi-oki earthquake at the end of September. Cooperation through the international network strengthened as a result of the WS is expected to positively contribute to mitigating natural hazards in coastal areas not only in Japan but also in the rest of the world.



Photo 4 Keynote lecture by Dr. Jorissen of the Netherlands

■ The 12th Conference on Public Works Research and Development in Asia

The 12th Conference on Public Works Research and Development in Asia was held from the 20th of October (Monday) to the 31st of October (Friday), 2003 in Tsukuba, Tokyo and Okinawa.

The conference participants are executive engineers responsible for infrastructure management of administrative and research departments in some 10 Asian countries with the aim of exchanging views and opinions on such common subjects in Asia, including Japan, as the environment, natural disasters and infrastructure development and furthermore establishing research



Photo 5 The 12th International Symposium in Okinawa

exchange networks among participating countries by confirming the common understanding of the subjects.

The theme of the 12th conference was "Traffic and Road - Measures for Urban Traffic Problem in Asian Big Cities" and participants from Cambodia, China, Korea, Laos, Malaysia, Nepal, Pakistan, Sri Lanka and Japan (Mr. Okuno, Director General of the NILIM) presented their reports on case studies in their own countries, followed by discussions.

The "12th International Symposium on Land Development and Civil Engineering in Asia" held in Ginowan City in Okinawa during the latter period of the conference and supported by the Okinawa General Bureau of the Cabinet Office and the Okinawa Prefectural Government attracted some 100 participants, the majority of whom were involved in public works in Okinawa Prefecture. The overseas participants were introduced to the advanced technologies employed in public works in Japan and also to some application examples in Okinawa, including the construction of an urban monorail line (Yui Rail), and were able to obtain a deeper understanding of Japan's public works closely linked to the locality.

The conference concluded with a common understanding as follows.

- (i) The participants recognized the role and need for further improvement in "Traffic and Road" as well as the importance to conduct research to facilitate them.
- (ii) The participants recognized that each country should learn from insights and experiences of countries in Asia, to enhance and support the infrastructure development.
- (iii) The participants recognized the needs to cooperate with each other and continue the conference in the future.

The recognizing again the need for this conference, the NILIM will proceed with the preparations for the 13th conference.



Photo 6 The Symposium Participants

RESEARCH REPORT of National Institute for Land and Infrastructure Management (June, 2003)

| No. | Title of Paper | Names of Divisions |
|-----|--|-------------------------------|
| 8 | Short-Term Spatial and Temporal Variations in Abundance and Sizu-frequency Distribution of Planktonic Larvae of Clam Ruditapes Philippinarum in Tokyo Bay | Marine Environment Division |
| 9 | Methodology for the Valuation of Environmental Impacts and Feedback Analysis of the Effects of Environment Policy on Coastal Development | Coastal Zone Systems Division |
| 10 | A Model for Estimation Scales of Container Terminal Areas at the Stage of Port and Harbor Planning -A Standard for Designing Principal Size in Container Terminals:A Proposal- | Port Planning Division |

TECHNICAL NOTE of National Institute for Land and Infrastructure Management (June, 2003)

| No. | Title of Paper | Names of Divisions |
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| 73 | Strong Motion Array Observation Records(No.4) | Earthquake Disaster Prevention Division |
| 87 | Variation of Spatial Characteristics in Phytoplankton Bloom and Phosphorus Load from Rivers as Mixing Type Change in the Arakawa River Estuary,Tokyo | Marine Environment Division |
| 88 | Distributions of the Wave,Storm Surge and Tsunami Design Conditions On Japanese Nationwide Coastal Structures | Coastal Disaster Prevention Division |
| 89 | Motorization,Remote Sensing and Remote Operating of Water Gates in Harbor | Coastal Disaster Prevention Division |
| 90 | Verification of Wave Forecasting Model,SWAN,by Experimental Results with Wind Wave Flume | Coastal Zone Systems Division |
| 92 | Port Calling League of World Container Ships (2002) Analysis of the Statistics Concerning with Port Calling and Influence on New York Port of Terrorism | Port Planning Division |
| 93 | Effects of Surface Roughness of Rubble Mound On Section Force of Bottom Slab of Caisson (Part 2) | Port Facilities Division |
| 94 | Design Method for Bottom Slab of Caisson Considering Surface Roughness of Rubble Mound | Port Facilities Division |
| 95 | A Level-1 Reliability-Based Design Method for Caisson Type Breakwaters in view of Sliding Distance | Port Facilities Division |
| 96 | Analysis of Nationwide Economic Impacts by Airport Development - Computable General Equilibrium Model Approach - | Airport Planning Division |
| 97 | A Study on Systematization of Norms and Evaluation Axis of Spatial Developments at Waterfront - For Establishing the Principle and Methodology of Making Satohama- | Airport Terminal Division |
| 98 | A Study on Landscape Potential of Air Terminal and Airport Access Road -For The Establishment of The Development Method of Gateway Spaces Considering Value of The Region- | Airport Terminal Division |
| 99 | A Study on Systematizing the Indexes of Landscape Concerning Exterior Space at Waterfront | Airport Terminal Division |

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We publish the English version of "2003 Annual Report of NILIM" to show our research activities and accomplishments, and you can see all of its contents on our website, www.nilim.go.jp.



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