

Japan's new initiative to establish an International Centre on Water Hazard and Risk Management under the auspices of UNESCO **Public Works Research Institute (PWRI)** Tsukuba, Japan

> Hydrology in Asia 14th UNESCO-IHP Training Course October 11, 2004, Kuala Lumpur, MALAYSIA





Flood management in Japan

> About PWRI

> Trend of water-related disasters, especially floods

Planning to establish an international centre under the auspices of UNESCO, and its planning activities





淪水: Flood management or Flood control 淪政: Governing 政治: Politics

Words by a famous local lord - 16th Century "Those who govern its sovereign wisely govern water wisely."



Meteorology and climate





Precipitation is twice as much as that in western large cities. It concentrates from June to October. Typhoons hit Japan in summer. This year, already 18 typhoons were born near Japan, 7 of which landed and hit the country.



Topography

- Mostly mountainous,

- Dense concentration of population and property in the relatively small alluvial plains.
- Flash floods occur soon after intense rainfalls.





Characteristics of rivers



Generally, rivers in Japan are called as "Falls" or "Sprinters": very short and steep, bringing about high concentration of floodwaters.





Land use



High proportion of population (50%) and property (75%) is concentrated in relatively small (10%) and vulnerable flood plains.



Flood management before modernization (~ 1850's)

- Floods had been a long serious concern due to its natural and social conditions.

- Thus indigenous technologies & adaptive lifestyles were developed earlier and still effective even today.



Traditional groin to encounter against flood and strengthen bank with soil and sediment Riverside forest to decelerate flood and prevent mud flow intrusion

Adaptive lifestyle: elevated houses and evacuation boats



Flood fighting exercise

Today's flood management



 MLIT is primarily responsible for Class A Rivers (109 systems dominating 70% of national land).
 Flood control works conducted by MLIT under the River Law.
 Flood Fighting Law: prescribing "Flood Fighting Brigades", flood warning & hazard mapping.



Flood info via Web/ mobile



http://www.river.go.jp/

アドレス(URL) http://i.river.ao.jp/





Socio-economic damage due to water disasters: floods & high tides

Death and missing

Damage / GNP





Long-term investment on flood control works





Owing to long-term and continuous investment, the impacts of floods seem to decrease recently, but still recurrent flood disasters are occurring in many parts of Japan.



About PWRI



Public Works Research Institute (PWRI)

 History 1927: Established 1979: Relocated to Tsukuba 2001: Re-organized into two institutes (PWRI and NILIM)

- Staff: 219 (including 151 researchers)
- Land area: about 560,000m2
- Number of research topics: 200
- Budget (FY 2004): 6 bil. JPY (55 mil. US\$)









PWRI's organizational structure

Numerous water-related research & development projects being undertaken

- Hydrologic & hydraulic research
- Dam engineering
- Sabo and sediment control
- Water quality and environment
- River restoration and others...



Aqua Restoration Research Center



Large-Scale Laboratories (Dam hydraulic)

PWRI's achievements in hydrology (1) Developing radar rainfall gauging system





PWRI's achievements in hydrology (2) Study on infiltration facilities for urban runoff reduction

Detention ponds were popular in urbanized areas

Rainwater infiltration trenches proposed by PWRI engineers

Extensive research for evaluating infiltration ability in relation to soil types, configuration, clogging, etc.

Reflected on technical guidelines and manuals

Infiltration facilities are now very popular on-site runoff regulator.









PWRI's achievements in hydrology (3)
Global Warming Impact on Precipitation
- series of downscaling of global change to regional scale and river basin scale -







Interpretation of GCM outputs to regional scale

Mesoscale atmospheric model in consideration of heterogeneity in surface hydrology

IRSHAM with fully-coupled boundary layer model

Kavvas,M.L., Chen, Z.-Q., Tan,L., Soong, S.-T., Terakawa A, Yoshitani J., and Fukami K (1998): A regional-scale land surface parameterization based on areally-averaged hydrological conservation equations, Hydrological Sciences Journal, 43(4), pp.611-631, August 1998

Change in flow regime and water shortage by precipitation change scenarios

> Water distribution model as decision support



PWRI's Partnership

> Joint research, workshops and personnel exchanges through arrangements with:

- Korea institutes (KICT & KOWACO/KIWE)
- China Institute of Water Resources and Hydropower Research
- Mekong River Commission
- USA Bureau of Reclamation
- University of California, Davis and others...





Trend of water-related disasters, especially floods



Natural disasters of the world

Percentage of numbers of natural disasters Total: 2,730 (1992-2001)



NOTE: Flood and etc include storm and landslide. Other disasters includes earthquake, volcanic eruption, etc. Percentage of numbers of people affected by natural disasters Total: 20 billion (1992-2001)



Source: World Disaster Report 2002 (Red Cross /Red Crescent Societies)

Water-related disasters such as flood & drought are most serious in the world



Number of natural disasters by region





Floods in Asia









Already so many flood disasters have occurred this year in Asia.



And changing environment...

Overpopulation and urbanization in Asia.



 Population growth,
 Rapid urbanization,
 Overexploitation,
 Degrading environment (such as deforestation),
 Poverty aggravation,
 Impact of climate change



Extreme poverty in urban slum



Concern on increase in temperature and its impact



Japan is no exception...

Tokai heavy rain (2000)





Niigata-Fukushima heavy rain (2004)







Niigata-Fukushima heavy rain

maximum daily precipitation (mm/day) at Tochio



It was catastrophic & 15 deaths were reported (mostly over 60) but other heavy rains occurred in 1896, 1926 & 1961. → Repeated occurrences of heavy rains should be recognized



Water-related disasters as a major challenge

The number of water-related disasters is still increasing.

The water-related disasters will be ...



aggravated by population growth, rapid urbanization, and concentration of human settlements and assets in flood areas;

> hampering sustainable development on a global basis.

 Mitigating water-related disasters is vital for poverty alleviation and sustainable development.
 Immediate actions are needed.

Trend of the world

2nd WWF (The Hague) 2000→ "Managing Risk" as one of the 7 major challenges 2002 WSSD (Johannesburg) → Necessity to develop programs for mitigating the effects of extreme water-related events 3rd WWF (Kyoto, Shiga & Osaka) 2003 \rightarrow Water hazards as one of the 37 main themes Need to improve risk management measures and technologies & to promote capacity building on waterrelated disasters.

PWRI plans to contribute to this challenging area by establishing a new centre in this field.



Planning to establish an international centre under the auspices of UNESCO, and its planning activities



Framework of the Centre

- Proposed to establish within PWRI as a global center under the auspices of UNESCO in autumn 2005
- > Mission theme: Water hazard and risk management
- > Activities:

Research, Training, and Information networking

Partnership with UNESCO-IHP Networks, UN agencies & other key organizations of the world.





Pillar Activities





Research Activities

Scientific & academic research in the field of water-related hazards & its risk management;

- Contributing to major global initiatives
 (such as WWAP and UNESCO/WMO joint IFI/P)
- Developing hydraulic / hydrological prediction, observation, modeling and analysis
- Promoting risk assessment and risk management technologies for water-related hazards including the impacts of climate change

• • and others



Research Projects (1) World Water Assessment Programme (WWAP)

- Serving as "Umbrella" for coordinating UN initiatives on freshwater assessment & linking to UN knowledge base since 2000.
- Secretariat based at UNESCO HQ, Paris
- Phase 1: until March 2003
 - WWDR published at the WWF3



- Technical input from Japan and Tokyo Case study
- > Phase 2: toward 2006, the Centre contributes through:
 - Expansion of the Case Study & developing Indicator
 - Input on Risk in cooperation with WMO & ISDR

Flood Indicator to assess policy effectiveness







Target: Millennium Goals or others

Response: Investment to mitigate risk



Research Projects (2) International Flood Initiative/ Programme (IFI/P)

- Resolution adopted at 15th UNESO-IHP IGC in 2002
- Integrating scientific, operational, formal and public educational aspects of flood management in a holistic interdisciplinary fashion.
- Proposed as joint initiative of UNESCO and WMO: UNU & IAHS interested in involvement.
- Preparatory meeting held this
 July in PWRI to discuss basic
 direction & approach, summarizing
 a draft concept paper for further
 discussion.





Research Projects (3) Assessment study on climate variability and change

- Contribution to WWF3 in 2003 by establishing the "Exploratory committee in East Asia": developing knowledge base and conducting case studies.
 - Cooperating with global initiatives, the Centre plans to:
 - **Promote dialogues** between hydrologists and climatologist to share knowledge & information and to fill the recognition gap.
 - **Progress assessment studies** to mitigate impacts of climate variability of today and of the future.
 - Enhance risk communication with the general public by delivering appropriate messages.



Example of research findings on climate variability and change

Trend of frequency and intensity of heavy rains by analyzing the long-term precipitation data (1961-2001)





Research Projects (4) Other Key Research Activities

- Collaboration with IAHS to develop PUBs (Prediction for Un-gauged Basins)
- Intensive case studies of international rivers such as the Mekong and the Changjiang (Yangtze) Rivers.
- Development of Global Flood Alert System (GFAS) in collaboration with IFNet (International Flood Network)
- Research and development of hydrological models and water resources systems



Illustrative figure of GFAS





Information Networking

Creating knowledge base & information network - Collecting, compiling and providing useful information and practices relevant to risk management - Contacting UN-systems & any other international resource orgs. in collaboration with IHP and WWAP - Interacting with existing networks (IFNet, JWF, etc.) Information networking will generates synergies to research & training to enhance integration & coordination - Research outcomes will be widely disseminated, and feedbacks from regions will be sent back to research - Trainees will develop links in their own countries/ regions, and local needs for training will be recognized





Training Activities - PWRI's experiences and plans -

Long experiences for over 35 years, including River & dam engineering & Sabo engineering among others. Starting a new JICA training course on "Flood Hazard Mapping" & improving the existing courses in response to the mission of the Centre Pacific 1/1 Africa 1/1 Long- & short-term training for Latin America experts/ practitioners (Students/ 10/5professionals **Total Number of Trainees/Countries** exchange, 101/27 in FY 2003 Middle **Internship**) Asia Fast 57/13 32/7



Flood Hazard Map

Making residents prepared for flood risks by showing flood risk information & evacuation guide.





Effectiveness of Flood Hazard Map

Evacuation Ratio after 6 hours of Evacuation Announcement (Kohriyama City, Fukushima Pref. August 1998) Evacuation Peak after Evacuation Announcement (Kohriyama City, Fukushima Pref. August 1998)



Whether or not people saw the flood hazard map beforehand makes big differences to the way they evacuate. (Source: Assoc. Prof. Katada, Gunma University)



New training course on Flood Hazard Mapping (1)

- Acquire professional knowledge necessary to produce flood hazard maps
- Enhance understanding of its effectiveness

Understand the way to apply in his/her own country
Framework

- Regionally focused on East & Southeast Asia for 5 years (JFY 2004-2008) conducted by JICA and PWRI
- 16 trainees from 8 countries each year
- Targeting technical managers or engineers engaged in river/ flood management in the public sector (experienced more than 5 years and aged under 40)



New training course on Flood Hazard Mapping (2)

- Date: January 26 February 18, 2005 (4 weeks)
- Place: Tsukuba, Japan (PWRI / JICA TSUKUBA)
- Curriculum: Lectures, Field study and Site visits
- Lecturers: Professionals from MLIT, NILIM, IDI...
 Procedure
 - General Information (GI) already sent to the JICA regional offices, and application will start soon.
- Deadline of nomination to JICA and Embassy of Japan by November 22, 2004 (N.F & Flood report required)

We are welcoming active application!



Future milestones of preparatory works

- Now communicating with UNESCO on the Agreement and developing pilot projects, as well as actively participating in the international discussions as below.
- > Already launched the Website and just distributed the Newsletter
- November 2004: UNESCO-IHP RSC in Southeast Asia (Adelaide, AUSTRALIA)
- December 2004: IWRM International Conf. (Tokyo, JAPAN)
 & International Conf. on Water & Disasters (London, CANADA)
- > January 2005: World Conf. on Disaster Reduction (Kobe, JAPAN)
- > April 2005: UN CSD-13 (New York, USA)

& UNESCO Executive Board (Paris, FRANCE)

> Autumn 2005: UNESCO 33rd General Conference



Thank you very much for your attention.

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