Catastrophic Flood Risk Reduction

A UNU-PROJECT INTRODUCTION

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ICHARM and Expectations IFI/ICHARM ←→ UNU ICHARM

- Synthesis of global research
- > Address theoretical and practical needs
- > Networking
- Sharing Experiences



Networking and Case studies

□ INCEDE (1990-2000) > INCEDE network carried out a number of case studies and compiled reports > Available in digital form □ A Flood digital archive for ICHARM/IFI



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Current UNU Activity Extreme Flood – What if?

 Informal Discussions in 2002 with H.M organizations
 Round table discussion in 2003
 A flood that go beyond the design levels....



2002 July Flooding in Kathmandu



2002 floods in Kathmandu, Nepal has caused severe damage

Inundation due to flow capacity restriction

24 hour recorded rainfall - 177mm Return period -30 years



Some near misses !

- In 1992 there was a large flood in Colombo Sri Lanka
- □ A record rainfall 1/1000
- □ Rainfall 493 mm -> Total discharge 29 million cubic m.
- Drainage capacity 2 mil. cu. m, and it took 10 days to discharge the flood
- The rainfall was only limited to Colombo – No river overflow.
- □ If a river embankment breach occurs → A catastrophic loss





Initiative on Catastrophic Flood Risk Reduction

Bangkok Resolution:

The need for an Asia Pacific Initiative on Catastrophic Flood Risk Reduction, and pledged support for the mission and goals of this initiative by representatives from:

Bangladesh, Cambodia, <u>China</u>, Fiji, India, Indonesia, Lao PDR, Malaysia, Nepal, Pakistan, Philippines, Singapore, <u>Sri Lanka</u>, <u>Thailand</u> and <u>Vietnam</u>

at this Regional Workshop "Ensuring Flood Security for Sustainable Urbanization in the Asia Pacific Region", 2003



Initiative on Catastrophic Flood Risk Reduction

GOAL To integrate > Prior risk assessment (catastrophic flood) scenario) > Basic framework for response (action plan) into urban development and planning process for sustainable urban futures



Asia Pacific Initiative on Catastrophic Flood Risk Reduction

Components:

- Clarifying Catastrophic Floods and relations to physical and social conditions
- 1. Estimating extreme Rainfall for the basin
- 2. Inundation modeling and prediction
- 3. Risk Assessment (socio-economic) : <u>response</u>
- 4. Community participation
 - Focus on those who are subjected to hazard
 - The whole area of social vulnerability should receive strong attention
- 5. Capacity development: Institutional needs

Ha noi

Main Dike

Sub Dike

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Sub Dike Main Dike

□ Flood occur annually □ Historical great floods: 1945, 1964, 1966, 1971 (125 yr r.p.), 1986, 1996 □ Dyke breaks upstream







Institute of Meteorology and Hydrology, Hanoi



How do we prepare?

□ Financial and economic recovery > Spread the risk > Swap the risk \rightarrow **Loss estimation** □ An action plan > Warning > Evacuation

Challenges

□ As urban centers grow and develop, there will always be new risks

- Increased floods, <u>underground space flooding</u>, etc.
- **Ensuring human security in urban areas:**
 - Infrastructure development considering vulnerability
 - Guide lines for 'catastrophic flood' resistant urban communities

□ Modeling behavior (people, movement)

Thank you for your attention





Economic damage Distribution

Loss Functions for Structural Damage:

Scatterplot



Loss Function for Structural Damage (Residential Building, Hanoi)

Loss Function for Structural Damage (Industrial Building, Hanoi)

Scatterplot



Regression Standardized Predicted Value

Flood Loss Map





The recent underground urban expansion creates new flood risks. **Fukuoka flood: June 29th, 1999.**

R周辺は一時泥の海と化した 駅博多口交通センター付近)





THE PARTY NAMES IN

地下鉄博多駅出口より流れ込む濁流



Safety of Underground space **Salient features:** •Grid size: 20m •With DEM and DSM •Period: June 29, 1999:01.00 – 24:00 hrs. •Rainfall data: 10 min. interval •Number of entrances for water

to go in -25

1999

- > Maximum hourly rainfall is 77 mm/hr, total rainfall is 164mm.
- Subway was suspended for about 3.5 hours. :Water into subway is estimated about 2,000m³
- **2003**
 - Heavy rain in upstream of Fukuoka.104mm/hr at Dazaifu, less than 20mm/hr in Fukuoka
 - Subway stopped at 19th, resumed completely at 20th. Water into subway is estimated about 10,000m³



Beijing flood in July 2004

- A sudden strong rainstorm hit China's capital city in July 2004.
- Rainfall in downtown was more than 42mm/h and in western part more than 25mm/h.
- 55 pumps were used one whole night to drain the drainage system.

