Disaster Prevention Measures in
Global-Local Context

4th World Water Forum

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Outline of Presentation

- Up-to-date findings on global environment
- Global-local linkage - Case study in Japan
- Countermeasures – Structural/ Non- Structural
- Concluding Remarks
Up-to-date findings on global environment
Earth Simulator

- Reliability: Tropical cyclone off Brazil coast
  Good accordance (late summer ’04)
Up-to-date findings on global environment
Earth Simulator – Virtual Earth in 2100

- Calculation Condition: $\text{CO}_2 = 700\text{ppm}$
- Prediction: Rise in ave. Air Temp by 4.2deg C
Up-to-date findings on global environment
Earth Simulator – Virtual Earth

- Heat Wave – Loss of human lives
  2003: Paris 1,500 deaths, EU 30,000 deaths
  2100: Tokyo - 11 times, London - 47 times, NY - 43 times
  → Human body and city system can not function
Up-to-date findings on global environment
Earth Simulator – Virtual Earth in 2100

- Precipitation
  - Japan & China: South North (aridification)
  - Frequent locally concentrated heavy rains
Tropical cyclone

- Japan: Aug. 2096, strongest one
- Metro NY: Hurricane Trans. Study: loss unpredictable
- Bangladesh: 80% of people have no shelter
Up-to-date findings on global environment
Earth Simulator – Virtual Earth in 2100

- Dengue fever: 2005; 2.5 billion → 2100: 5.2 billion
- North pole: Aug. 2070, no ice
- Amazon: 2/3 of Amazon river basin turn into desert
- Rising of sea level: Max. 88 cm → 2.6 million refugees
Up-to-date findings on global environment

Global Warming Earth Summit, Montreal, Nov. 2005

- **Objectives**
  To find new framework after Kyoto Protocol

- **Conclusion**
  Objectives failed, but agreed to continue dialogue

- **Epilogue**
  Do we have wisdom to save earth? Temperature keeps on rising even at time of arguments. Crisis of human being is steadily approaching
Global-local linkage - Case study in Japan

Heavy rainfall in Niigata, 2004

- In 2004, Sea surface temp. in south was high → caused many heavy rains
- 423mm/d at Tochio, largest since 1935
- Global change affected local environment
Structural and Non-Structural Flood Control Measures

**Structural Measures**
- Dam Construction
- Improvement of River Function
  - Levee, Diversion Channel, Dredging, Small Reservoir
- Run-off Detention in River Basin
- Drainage/Infiltration Facility

**Non-Structural Measures**
- Public Awareness of Hazard Map
- Forecasting/Warning and Evacuation
- Flood Fighting and Zoning
Ohkouzu Diversion Channel

The Echigo Plains suffered devastating damage from frequent flooding.

Construction of the Ohkouzu Diversion Channel to allow excessive water to directly flow to the sea.

The Mainstream Weir and the Deversion Channel Weir jointly control the flow of the Shinano River.
Shinano River and Niigata City
Structural Measure
Small Reservoir for Inundation

Kurigaoka Inundation Reservoir
Structural Measures-Drainage Facilities

Sewer Networks and Underground Control Reservoir

Image of Underground Control Reservoir
**Structural Measures**

Beneficial use of sewer network

Before improve network

After improve network. Reduce flooding area

Image of sewer network

If the rain is small, we get huge reservoir
Beneficial use of sewer network
(Control pump start/stop by IT)
Real time monitoring and control system
Beneficial use of sewer network
RTC System (Monitoring)
Beneficial use of sewer network
(Model Verification)

Profile of Water level (Sewer network)
Beneficial use of sewer network
(Effect of operation by RTC)

Effect of RTC operation

Overflow volume from Pump station to River

Total Rainfall

20mm< 30mm< 50mm<
Non-Structural Measures

- Public Awareness of Hazard Map
- Forecasting/Warning and Evacuation
- Flood Fighting
- Legislative Support
  - Enforcement of Law, Land Use, Zoning
Non-Structural Measures
Public Awareness & Hazard Map

Fukuyama City, Hiroshima Prefecture

Legend
- 5m Area
- 2m<h<5m Area
- 1m<h<2m Area
- 0.5m<h<1m Area
- H<0.5m Area
- refuge shelter
- City office and Branch
- Kindergarten and Junior High School
- High School and University
- Public Housing

C へ移動
Non-Structural Measures
Forecasting and Warning

Image of Warning system
Global Flood Alert System (GFAS)

Data Processing System
- Data for climate forecasts (real time/near real time data)
- 3-hour global precipitation map (real time/near real time data)

Observation Satellite (TRMM/GPM)

Grand Stations

Raw Data

On-Line

Secretariat of IFNet

Rainfall Prediction

Flood Prediction

Organizations in Charge of Meteorology and Disaster Prevention

Global Rainfall Map

FLOOD ALERT

Global Flood Alert System (GFAS)

Heavy rain around the Upstream of ○○ River

Around the downstream of ○○ river

Rainfall information

Observation Satellite (TRMM/GPM)
Non-Structural Measures

Flood Fighting

Abukuma River
27-28/08/1998

Photo Image of Flood fighting
Disaster Measures Basic Law

Established as a comprehensive disaster mitigation and relief law through the experience of Isewan-Typhoon in 1961

All the disaster mitigation measures are taken within this framework.

Five Purposes
1. Stipulation of responsibilities demarcation among relevant organizations
2. Promotion of effective administrative system in an integrated manner
3. Promotion of planned framework in disaster mitigation and relief administration
4. Financial assistance to seriously affected area
5. Measures on urgent relief to disaster victims

Point
- Basic, most important and comprehensive disaster mitigation-related law in Japan
Concluding Remarks

Key Points for Disaster Prevention

- Natural disaster should be dealt with global-local linkage and in a comprehensive manner.

- Most effective and essential countermeasures against natural disasters are to reduce the source of disaster, namely the amount of CO$_2$.

- Sustainable and safe water supply can be realized when they are fully supported by structural and non-structural disaster prevention measures.

- More professional service by the consulting engineers should be introduced for the disaster prevention measures, and more collaboration should be made among the concerned agencies or organizations such as central government, local governments, communities, financing agencies, NGOs, and volunteers. (It can be said that various disaster prevention works be linked in a comprehensive manner.)
Thank you !!

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