Assessing the flood risk

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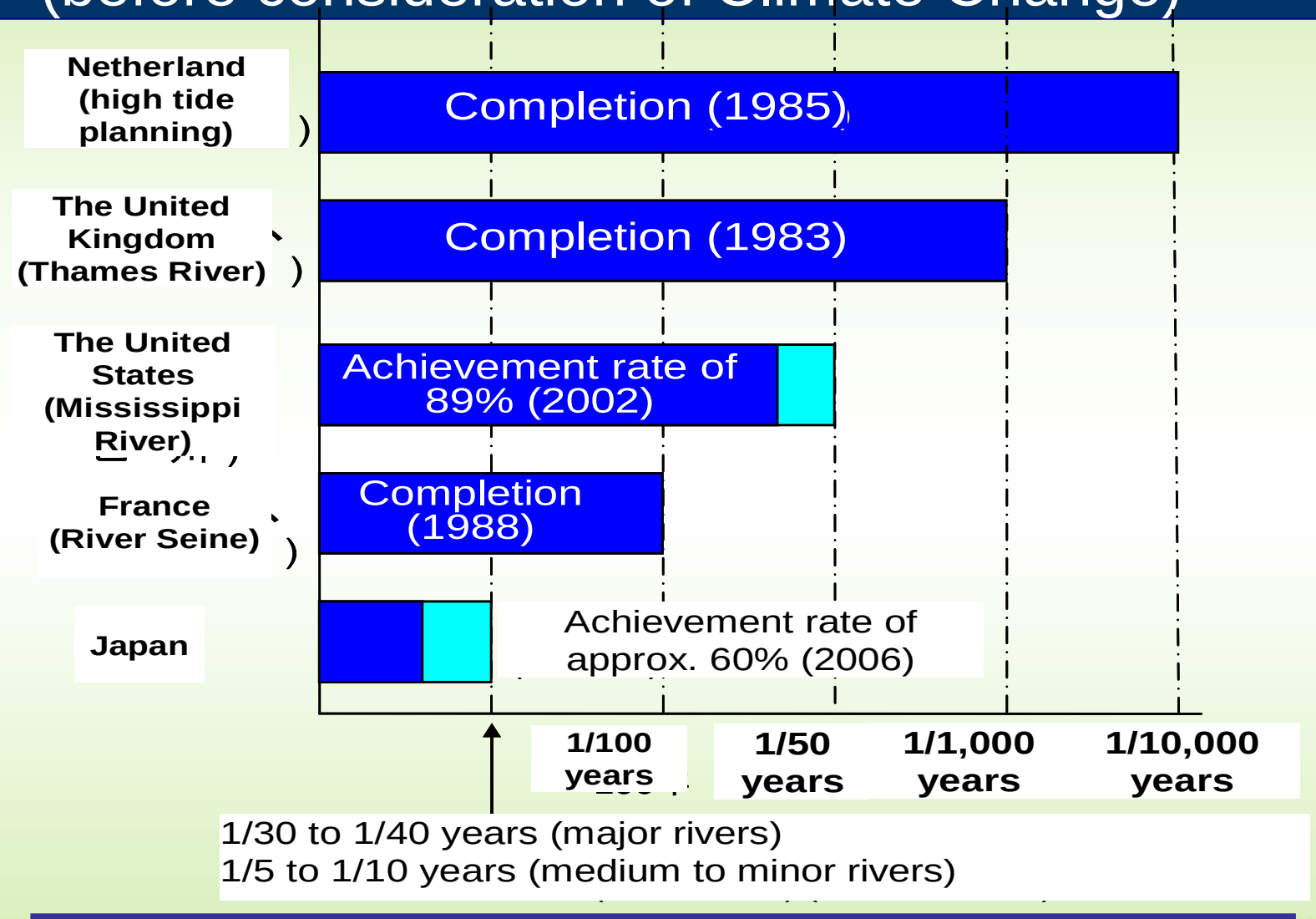
1. Are the existing policies and resulting infrastructures adequate within high-risk flood regions?

Situation in Japan

Physical Protection level for flood disasters (before consideration of Climate Change)



Compared with other industrialized nations, physical protection level against floods in Japan is much lower.

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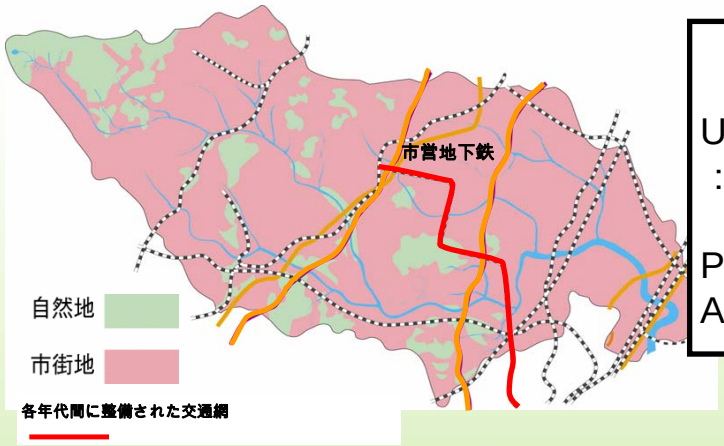
Increasing flood risk due to changes of social conditions 1

Urbanization in Tsurumi River bas

１９５８

Urbanization rate：About10％

Population：About 450,000



２００４

Urbanization rate：About 85％

Population：About 1.88million

(Source :MLIT)

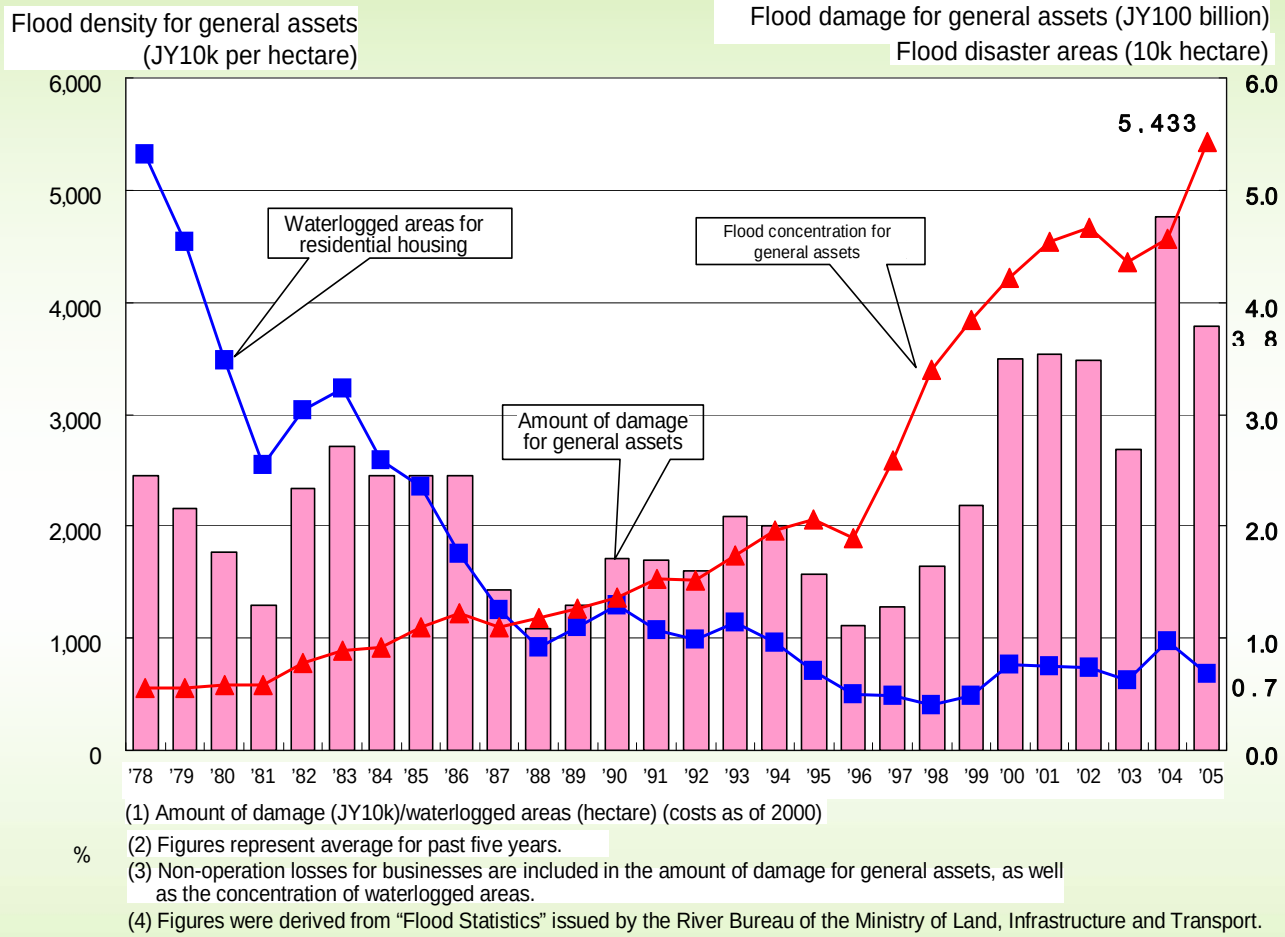
Occurrence of widespread submergence at the underground facilities in urban areas

July 2004 in Fukuoka City

Oct. 2005 in Azabu-juban Sta., Tokyo Metro

Progress of urbanization in flood prone area causes increase of flood risk and also causes new type of disasters, such as inundation of underground facilities.

Increasing flood risk due to changes of social conditions 2



Electronic equipments, once submerged in water, are no longer usable.

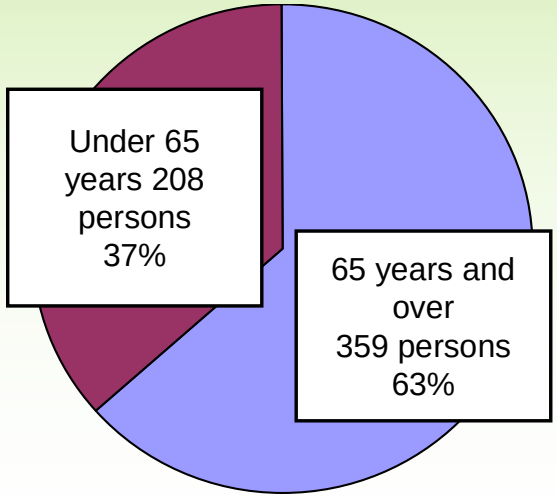
September, 2000
Heavy rain in Tokai region

(Source :MLIT)

Although the flooded areas are definitely decreasing due to flood control projects having been carried out over many years, the amount of economic losses in flooded areas has sharply increased due to increasing number of assets vulnerable to flooding.

Increasing flood risk due to changes of social conditions 3

Proportion of elderly among disaster victims



ヘリ救助 震える園児

新潟 豪雨

濁流、一気に堤防破壊

「津波のようだった」

Sashiki Town in Okinawa Prefecture, 2005

The slope behind a nursing facility collapsed in Sashiki Town, Okinawa Prefecture, in June 2005 due to the heavy rainfall, resulting in the evacuation of all 70 people in the facility.

(Source :MLIT)

77 children were trapped in school facilities by flooded water in Niigata.

Asahi Shimbun on July 14, 2004

Due to the aging population, a significant number of victims were among those who required assistance in case of disasters, such as the elderly or children in day care facilities.

In Japan, even under current situation, the level of protection against water-related disasters (flood, debris flow, tidal waves, etc.) is far from sufficient.

If sea level rise of 60 cm takes place,

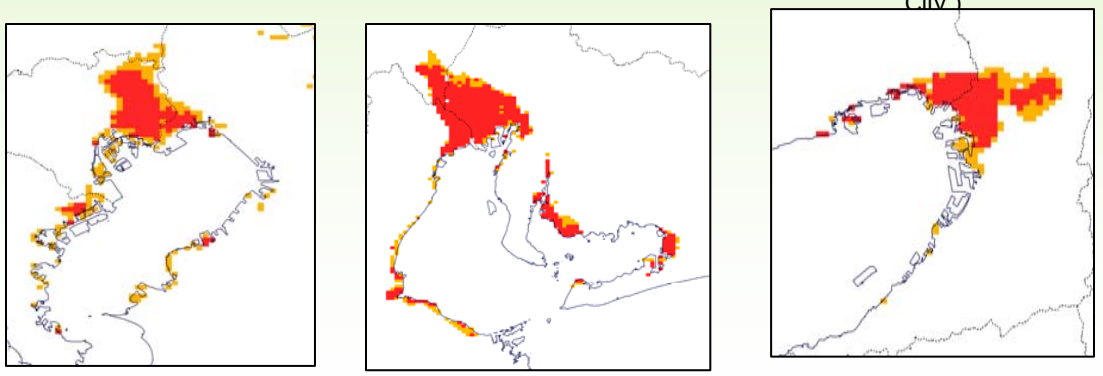
Expansion of areas below sea level when sea level rises 60cm

Sea level: average highest water level on Full and Crescent moon days

Tokyo Bay
(Yokohama City ~ Chiba City)

Ise Bay
(Kawagoe Town ~ Tokai City)

Osaka Bay
(Ashiya City ~ Osaka City)



176mil. (Today) → 333mil. (After sea level rise)

90mil. (Today) → 126mil. (After sea level rise)

138mil. (Today) → 260mil. (After sea level rise)

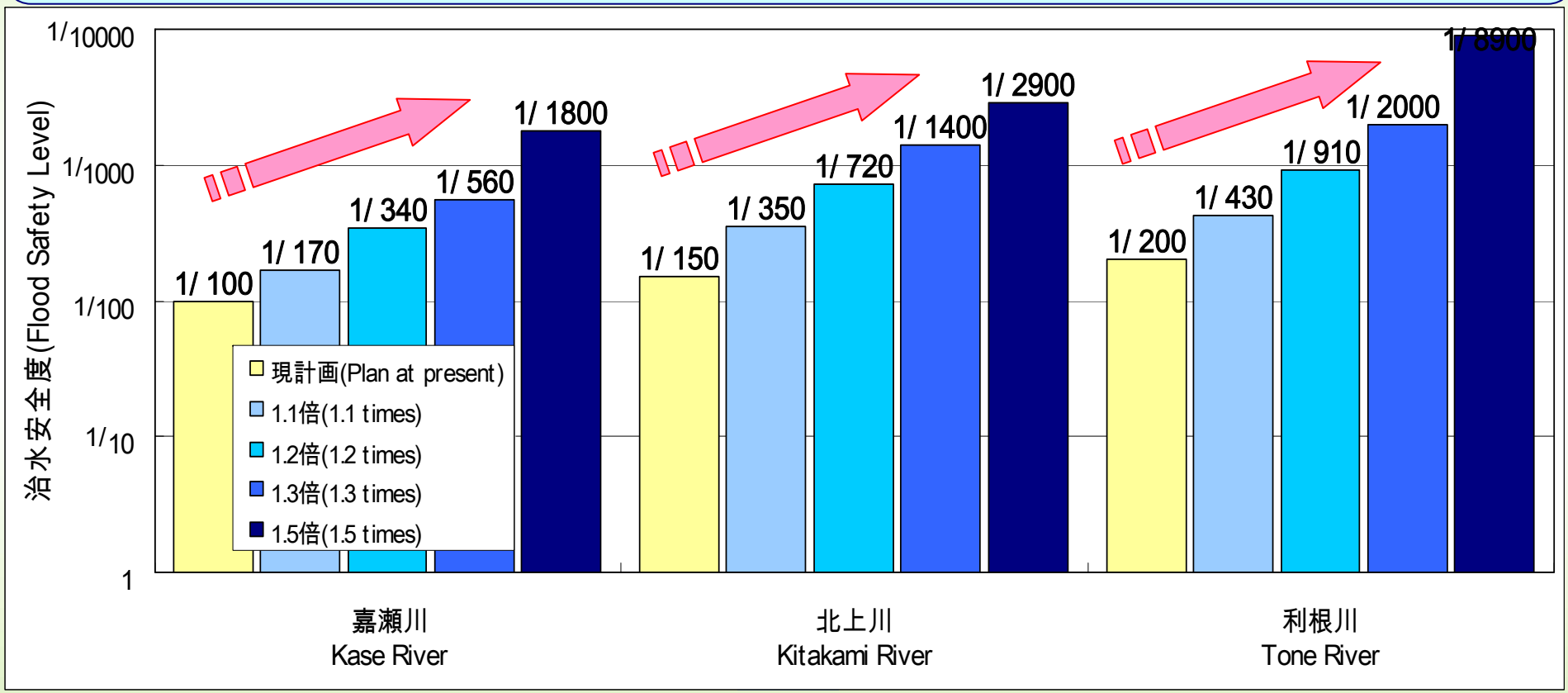
	Today	After sea level rise	rate
Area (km²)	577	879	1 . 5
Population (million)	40.4	59.3	1 . 5

(Source :MLIT)

If mean sea level rises 60cm due to global warming, area and population in the area below sea level increases 50% in 3 major bay areas.

Design Flood Safety Level in 100 years

Precipitation amounts in 100 years after are likely to be about 1.1 to 1.3 times (1.5 times the maximum) of today's amounts.



A very large flood safety level at present scale must be ensured in 100 years time if current flood safety level be unchanged.

The conventional flood control measures alone Cannot cope with the changes.

- Increasing risk by Climate Change will pose serious threats in Japan
- what to do?

Procedure for deploying adaptation measures

Because of a lot of uncertainties in current situation,
We decided to follow 2 step approach

【The first period : 5 years: until next IPCC Assessment report】

To intensively investigate external force design and basic concepts on how to secure safety of basin

To selectively implement priority on-going programs related to adaptation measures.

【The second period】

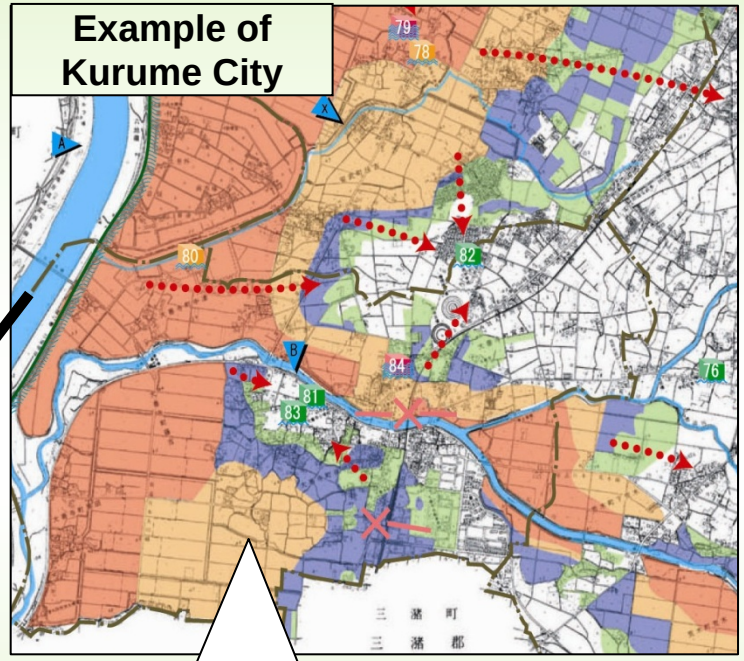
To reassess efforts taken in the first period and implement priority programs selected by the reassessment

To reflect adaptation policy and programs on master plans and river improvement action plans

Promotion of Flood Hazard Maps and regulatory measures

Publication of nationwide flood hazard maps

Example of Kurume City



Chikugo River

Evacuation assembly points available during waterlog disasters are obvious at a glance.

Time it takes from breaching of levee to being waterlogged

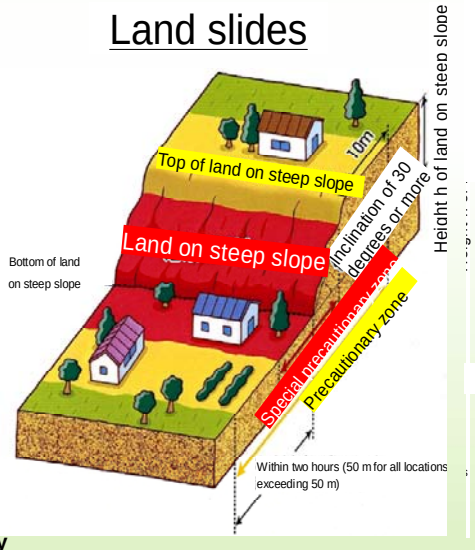
	Waterlogged above floor level within 30 minutes
	Waterlogged above floor level within 60 minutes
	Waterlogged above floor level in 60 minutes or more
	Waterlogged eventually

Designation of hazardous areas for sediment-related disasters

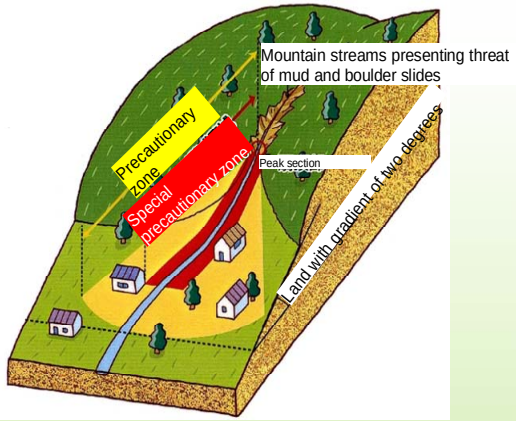
Dangerous locations clarified through zone designations

- Restrictions to land use
- Restrictions to structure of buildings
- Recommendations for the relocation of existing houses

Land slides



Mud and boulder slides

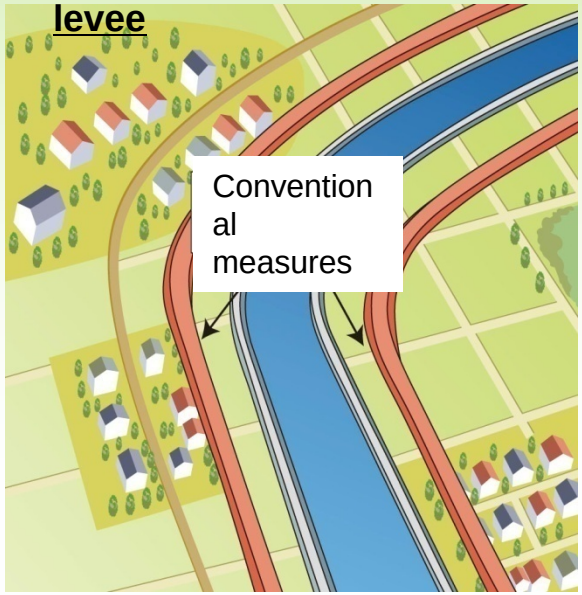


(Source :MLIT)

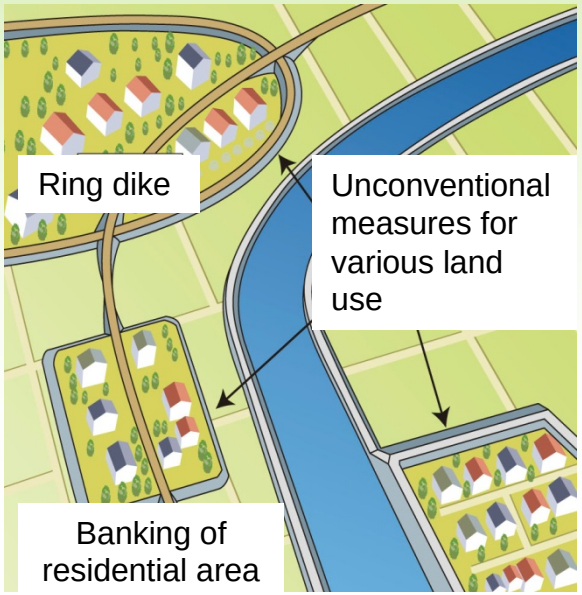
“Disaster Reduction” strategies by soft measures for minimizing the total damage

Unconventional flood management measures

Conventional flood protection by continuous levee



New concept of flood management measures



Hiji-river
Ohzu-city,
Ehime-Pref.

Conventional flood protection to construct continuous levee from downstream takes a long time for completion

Combination of various measures to minimize damage of floods

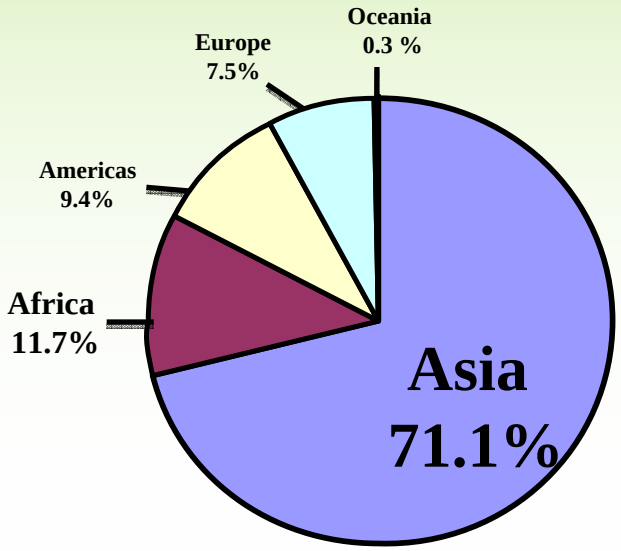
To prevent spreading of flooded water by second line levee

Introduction of disaster mitigation measures to minimize damage in addition to disaster prevention measures

1. Are the existing policies and resulting infrastructures adequate within high-risk flood regions?

Situation in the “Asia”: most High-risk flood regions

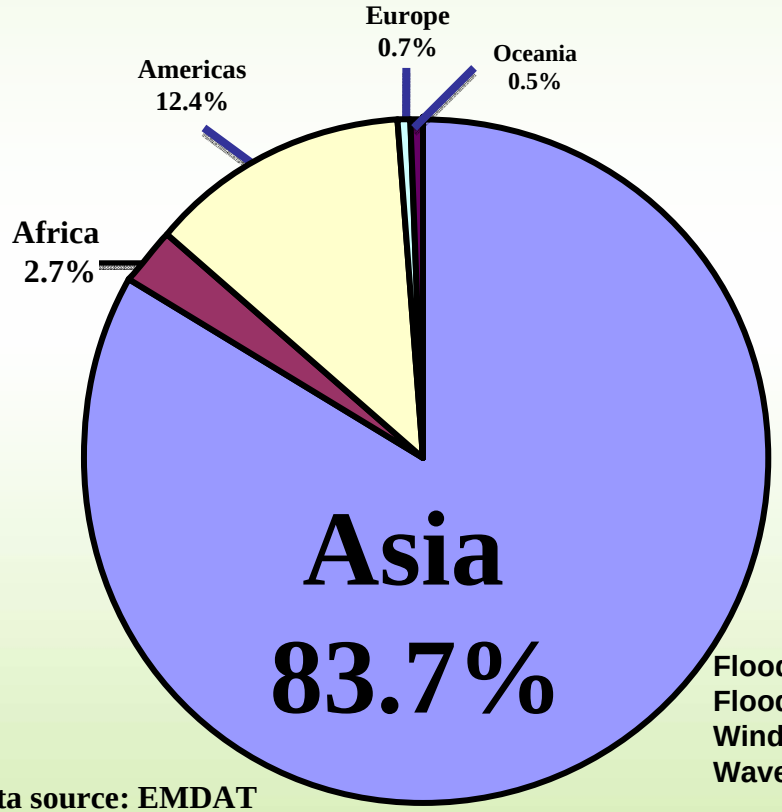
Global Total Fatalities of All the Natural Disaster from 1986 to 2006



Data source: EMDAT

Flood victims seek shelter as they wait for relief
Pakistan July 2007 Source- Canadian Red Cross

Global Total Fatalities of Flood-related Disaster from 1986 to 2006



Flood-related disaster:
Flood, Slides
Windstorm and
Wave/surge

Data source: EMDAT

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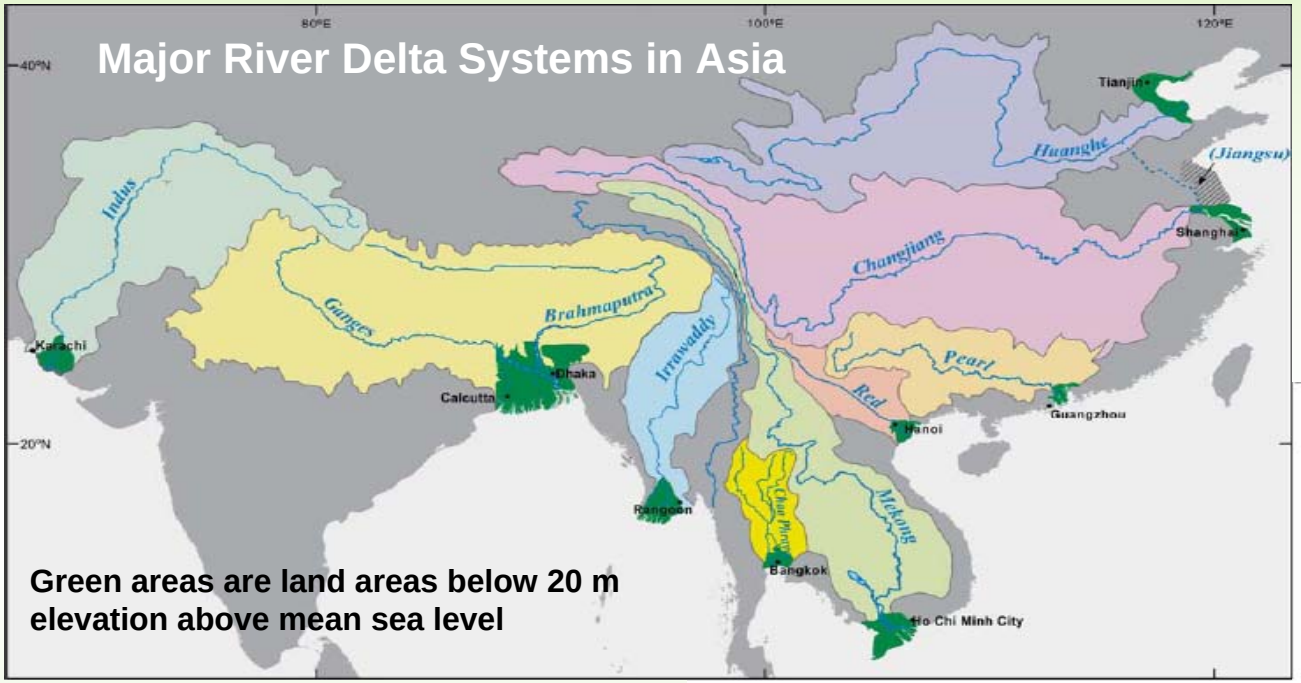
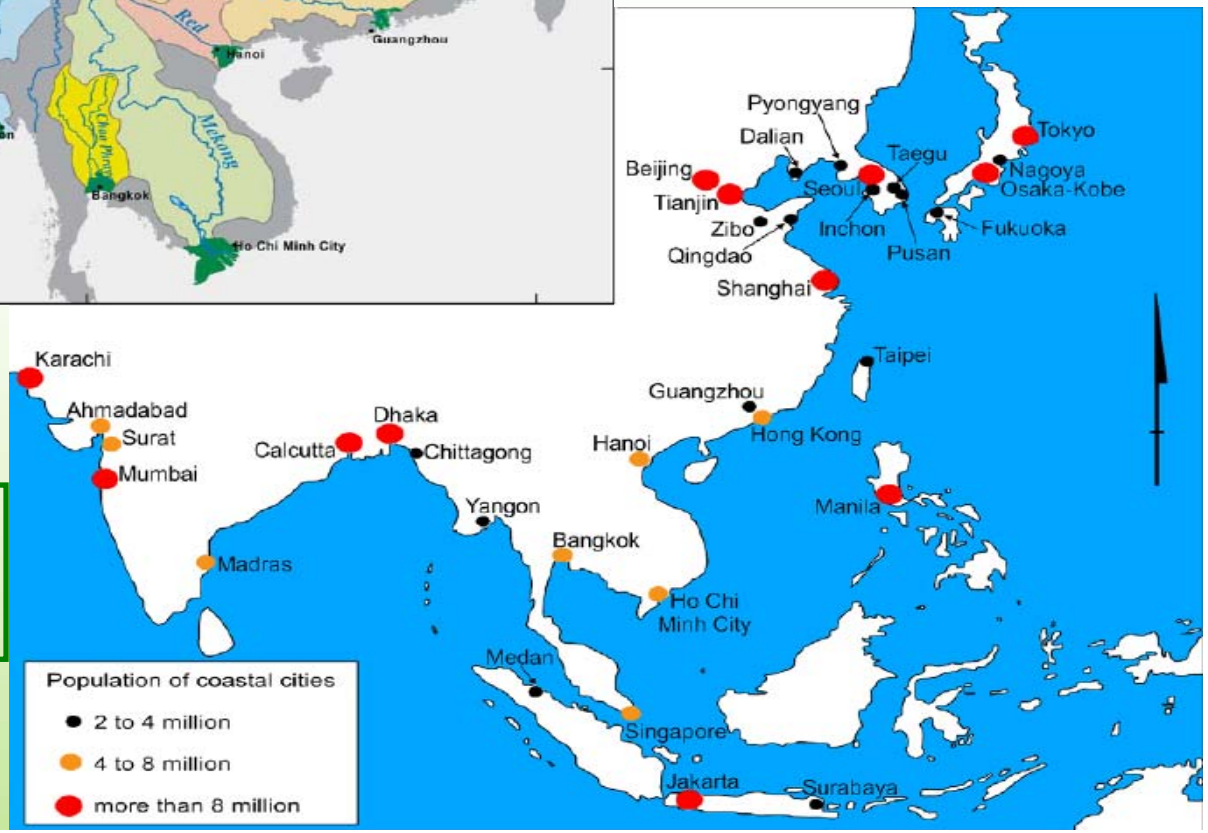
Major Asian Cities Located in Deltas



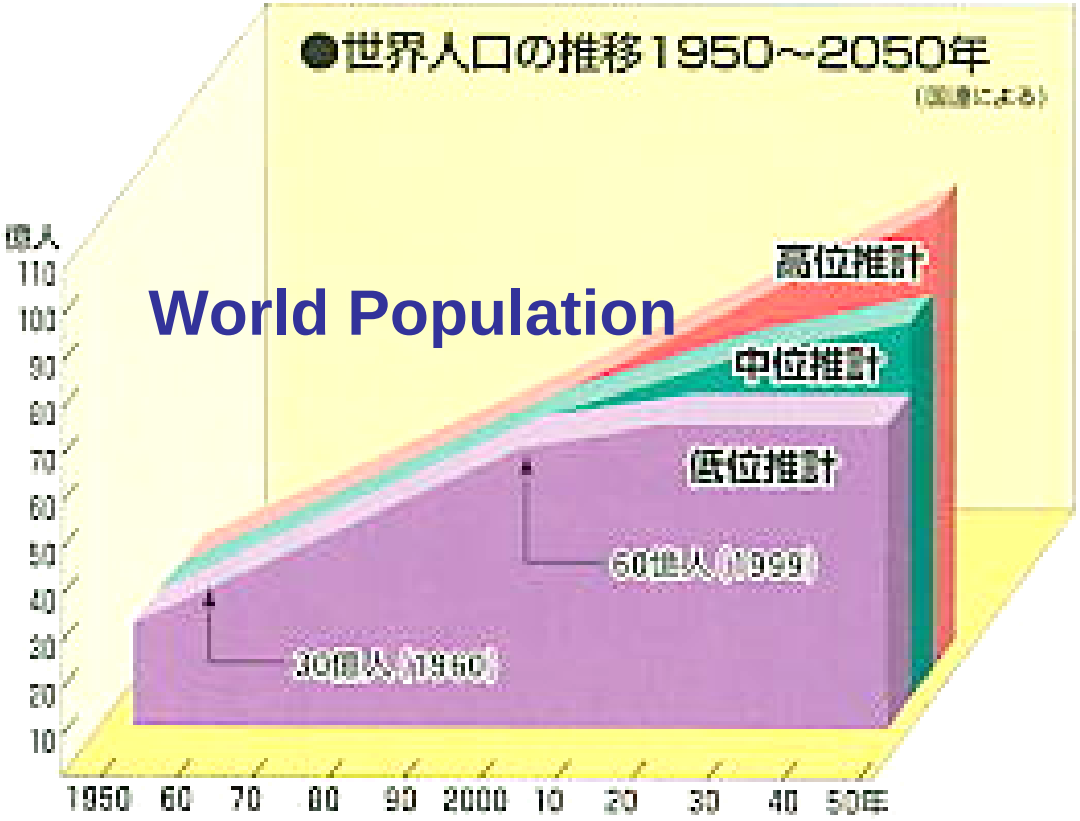


High Vulnerability to Any Flood Regime Change from Land and/or Ocean

(Source:ADB)

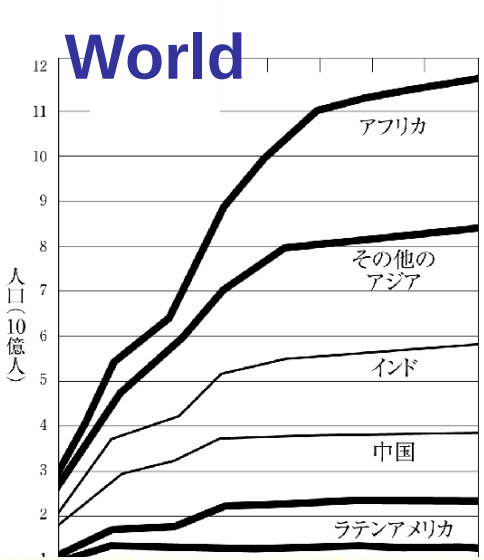
Population Growth

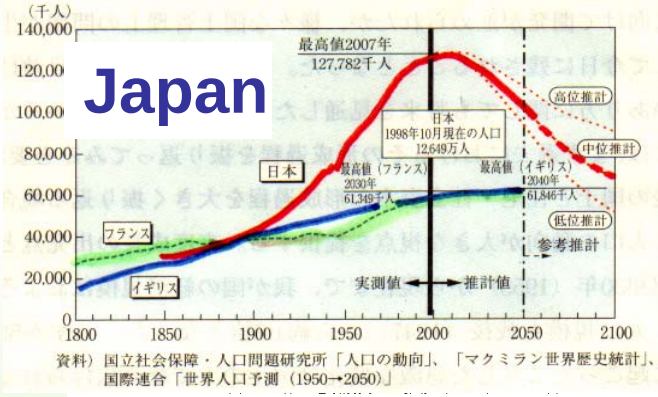
9 billion by 2050
(medium projection)

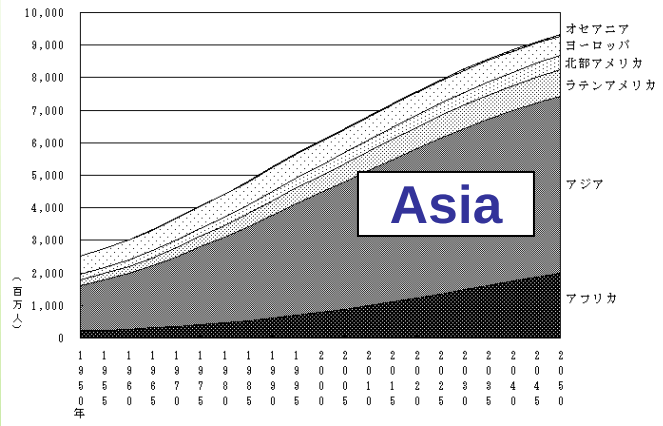


World Population

http://biz.nifty.ne.jp/nikkenkyo/4joho/738sokoniarukiki/jinkou.htm







http://www.stat.go.jp/data/kokusei/2000/topics/topics0

Modified from Various sources

In Japan and in Asia, “The level of existing policies and resulting infrastructures within high-risk regions” is far from sufficient.

We should move forward towards putting water-related disaster risk reduction in higher national and international agenda.

Policy Avocation for mainstreaming water-related Disaster management at Asia Pacific Water Summit (APWS)

3 to 4 Dec. 2007

Key Recommendations adopted for "Water-related Disaster Management" priority theme

1. **Integrate water-related Disaster Risk Reduction (DRR) into national development plans, recognizing adaptation to increasing risks from climate change as a "highest" priority issue**

2. **Establish national and local goals/targets for water-related Disaster Risk Reduction, taking the impacts of climate change into consideration.**

3. **Recognize the importance of IWRM for water-related DRR and the need to strengthen comprehensive structural and non-structural measures**

4. **Develop preparedness indices for water-related DRR for the Asia-Pacific region**

5. **Develop water-related disaster warning systems and human capacities**

2. What innovative approaches are available to assess risk within the context of complex interactions that arise from extreme events?

Risk?

(Risk Definition)

The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural hazards and vulnerable conditions. *(Source: UN/ISDR Terminology)*

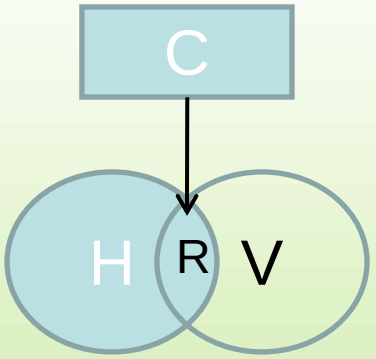
(Risk formulation)

Risk can be interpreted in many ways e.g.

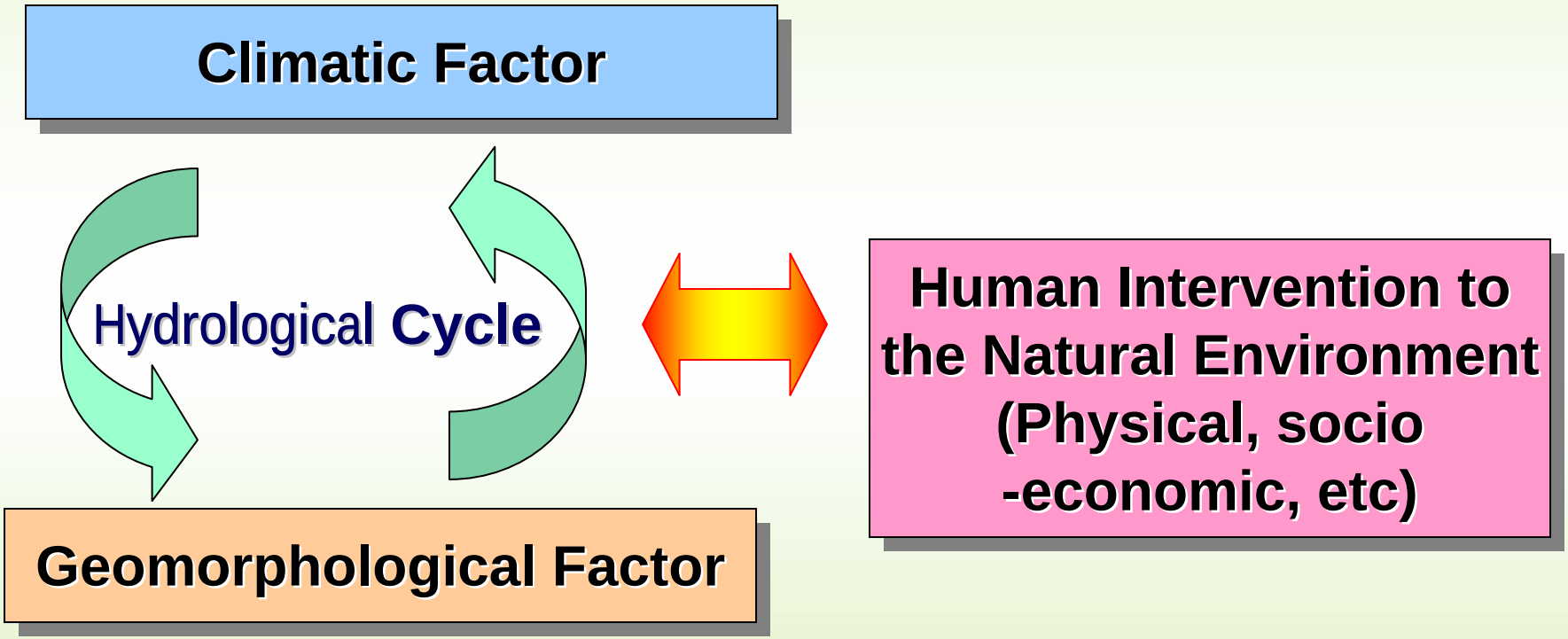
*Risk= Hazard * Vulnerability*

*Risk= Hazard * Vulnerability / Capacity*

*Risk= Hazard * Exposure * Vulnerability*



Risk Formulation is so complex!



A number of items can be adopted for assessing "Hazard ", "Vulnerabilities", "Capacities", "Exposure" <u>in quantitative and comparable form.</u> <u>Data acquisition</u> is always the problem for developing countries

Modified from Prof. Musiake slide

Then,
Where available, let's use state-of-the-art technologies

Satellite-monitored data

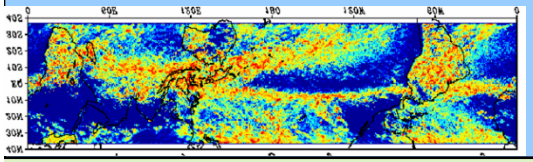
Core Satellite

Dual-Frequency Radar
Multi Frequency Radiometer

✧Observation of rainfall with more accuracy and higher resolution

✧Adjustment of data from constellation satellites

JAXA (Japan)
Dual-frequency radar, rocket
NASA(US)
Satellite bus, Microwave measurement

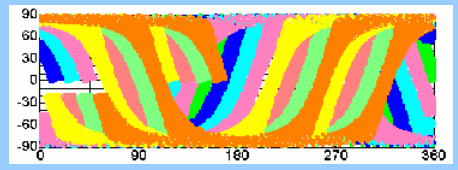


Constellation Satellites

Satellites with Microwave Radiometers

✧More frequent observation

Cooperation :
NOAA(US),NASA(US),ESA(EU), China, Korea and others



Global Observation

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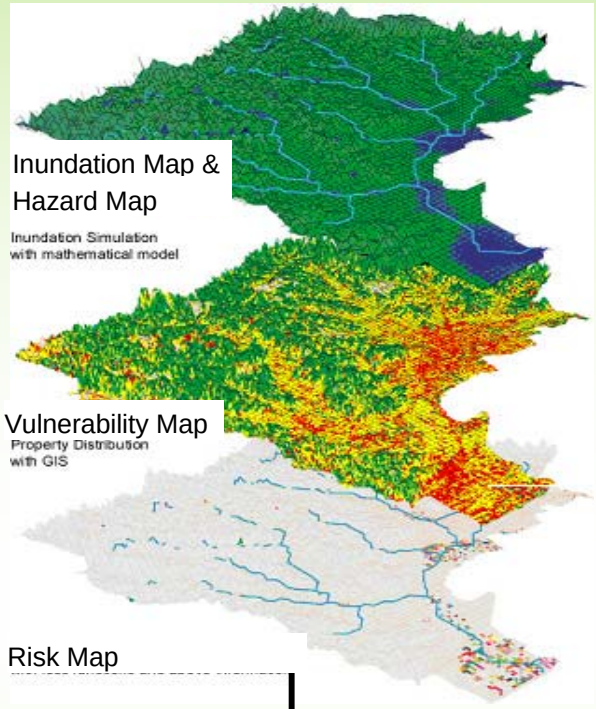
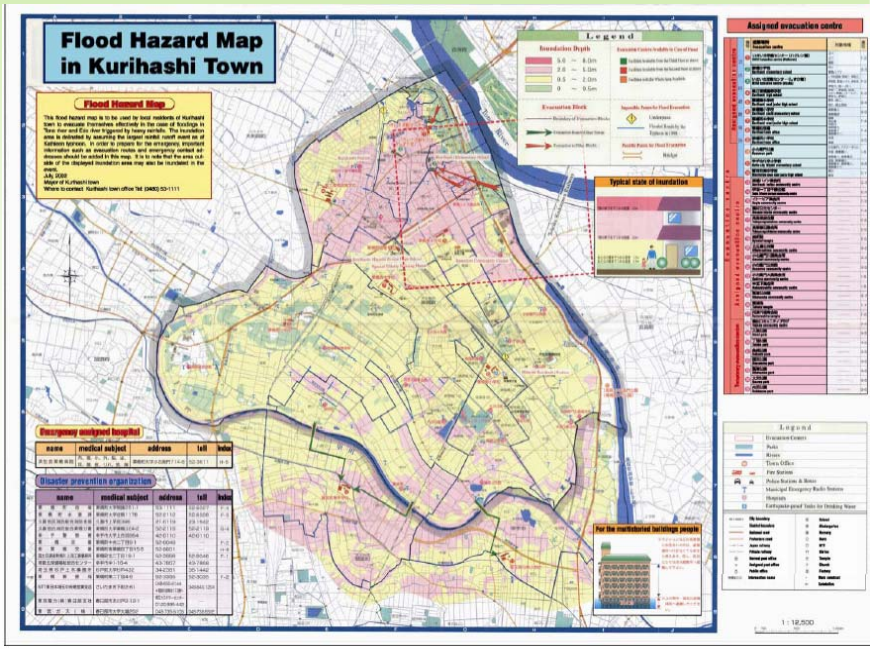
Where available, let's use state-of-the-art technologies

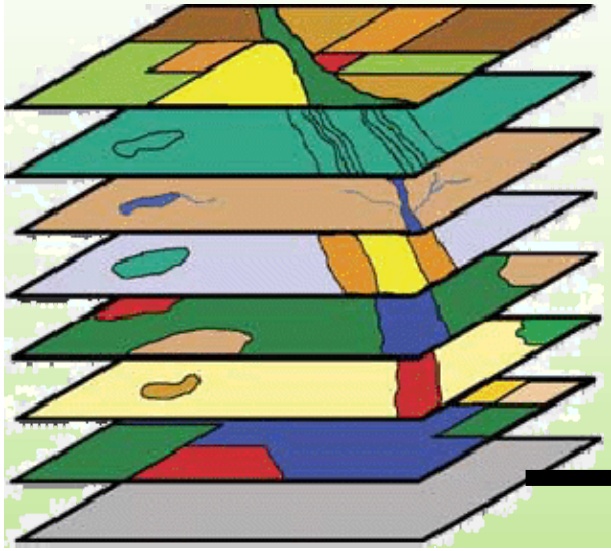


Use of GIS

Scale 1/10000-1/15000, Whole city or ward wise map can be published



Risk Map



Damaged (estimated) Map

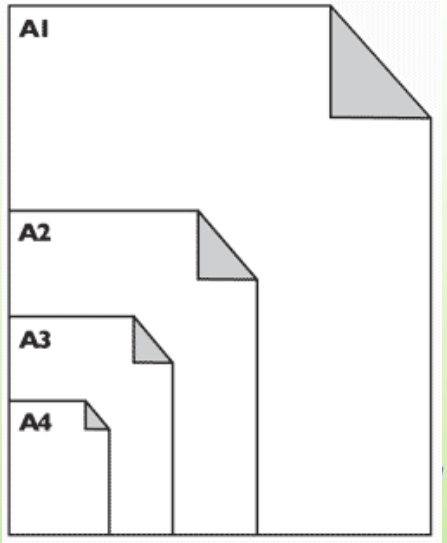
Flood plain zoning Map (administrative use)

Flood plain zoning Map (administrative use)

Flood insurance rate Map (administrative use)

Etc.

Synthesized and simplified Flood Risk Map



FHMap: Size of paper

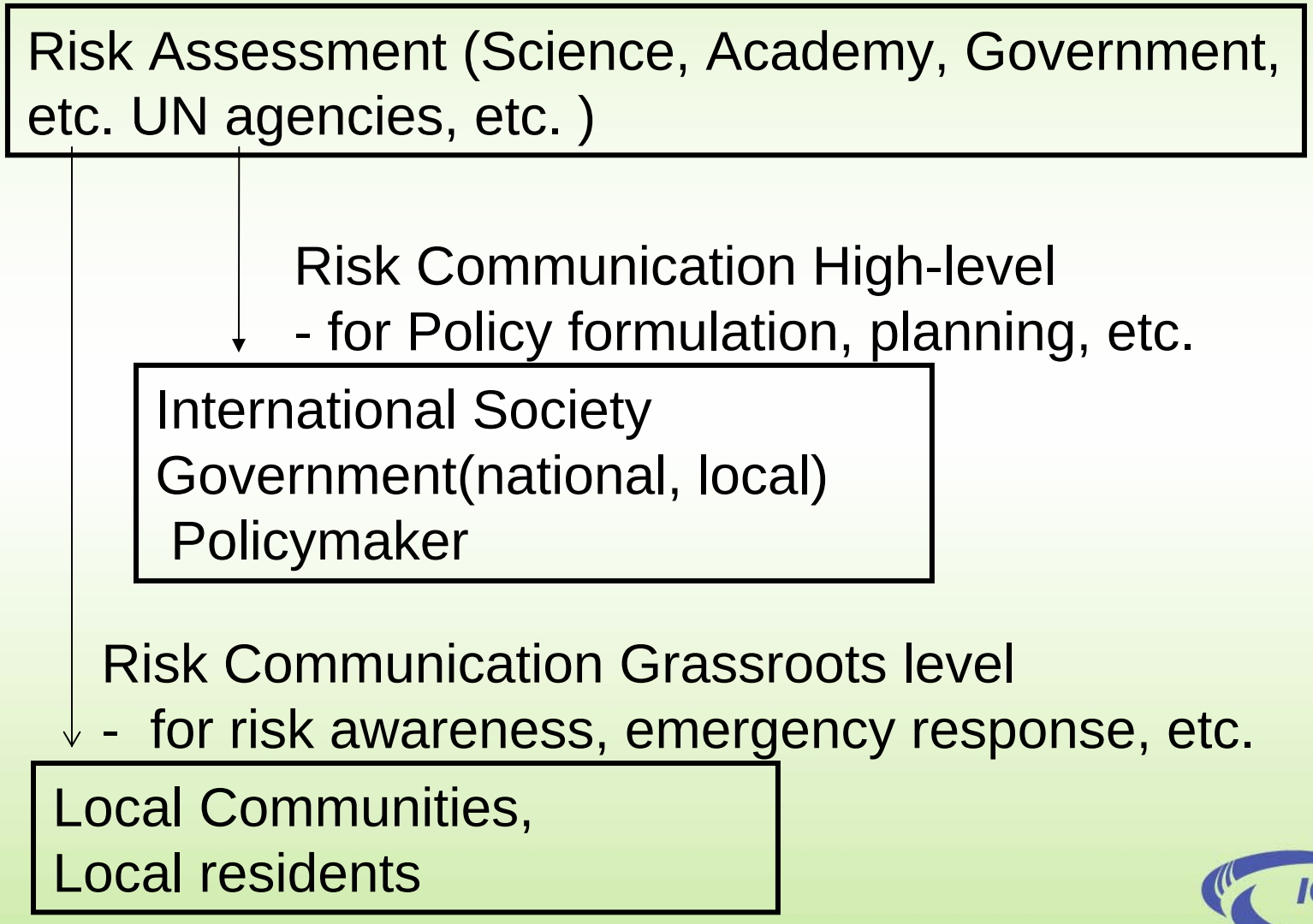
Risk Communication

A number of Risk Assessment methodologies could be invented. Effort should be made to identify the best (better) appropriate one to be used for specific objectives, target area, messages to be transferred, etc.

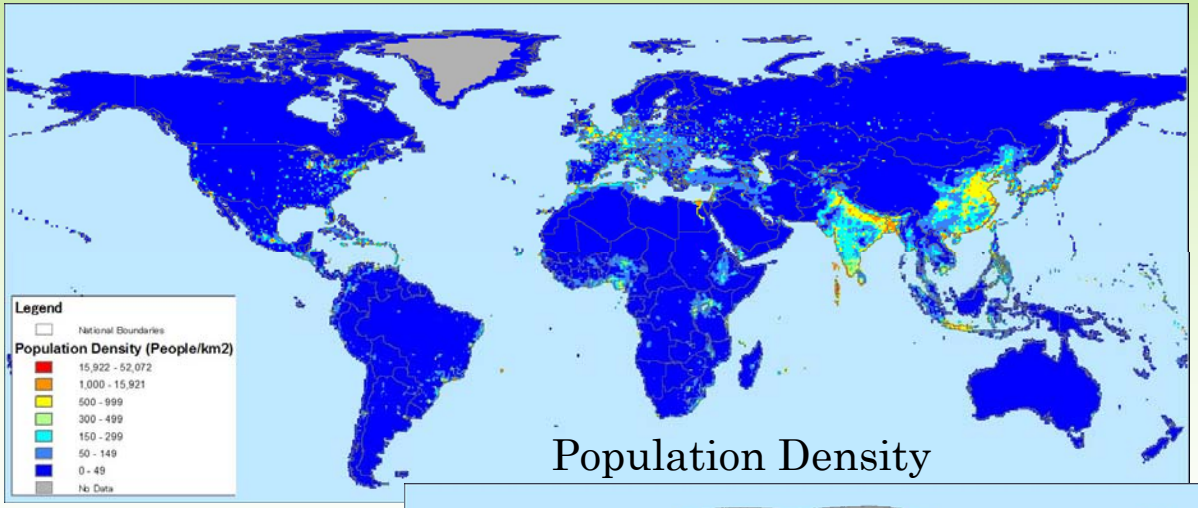
Risk Assessment is important, however ensuring appropriate Risk Communication could be as important as risk assessment.

Maps are normally used as most appropriate ways for risk communication.

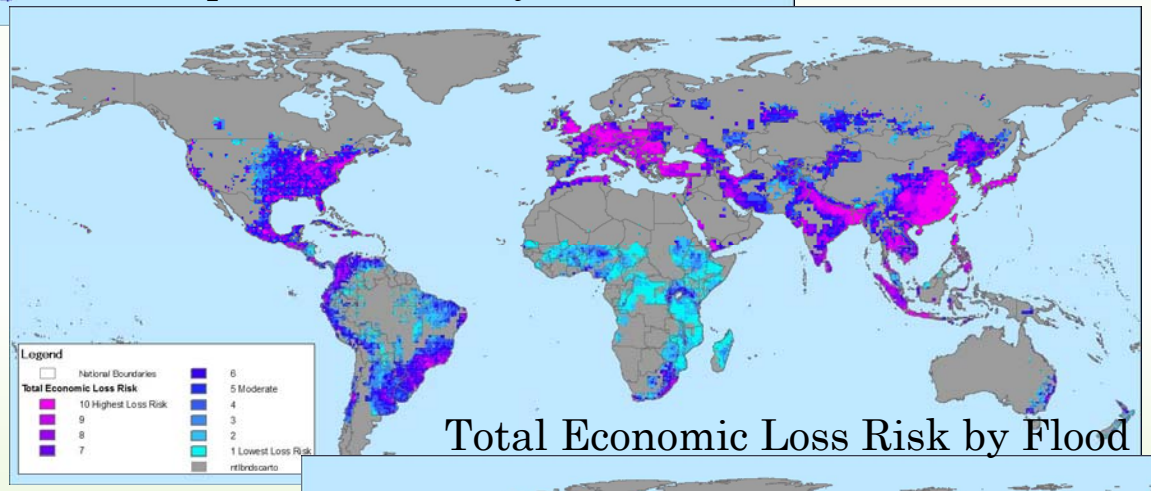
Risk Communication



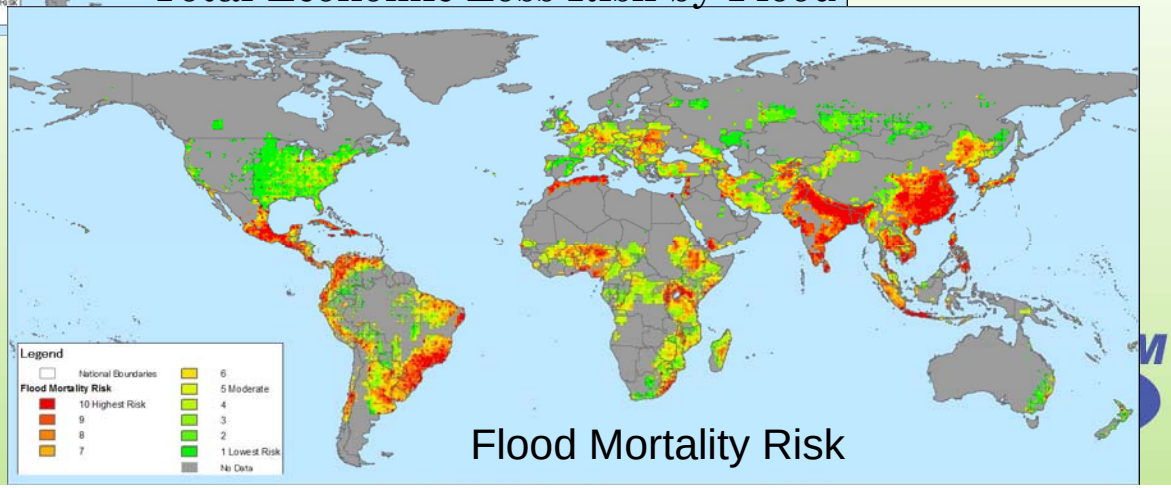
Global Hotspots for Floods



Population Density



Total Economic Loss Risk by Flood

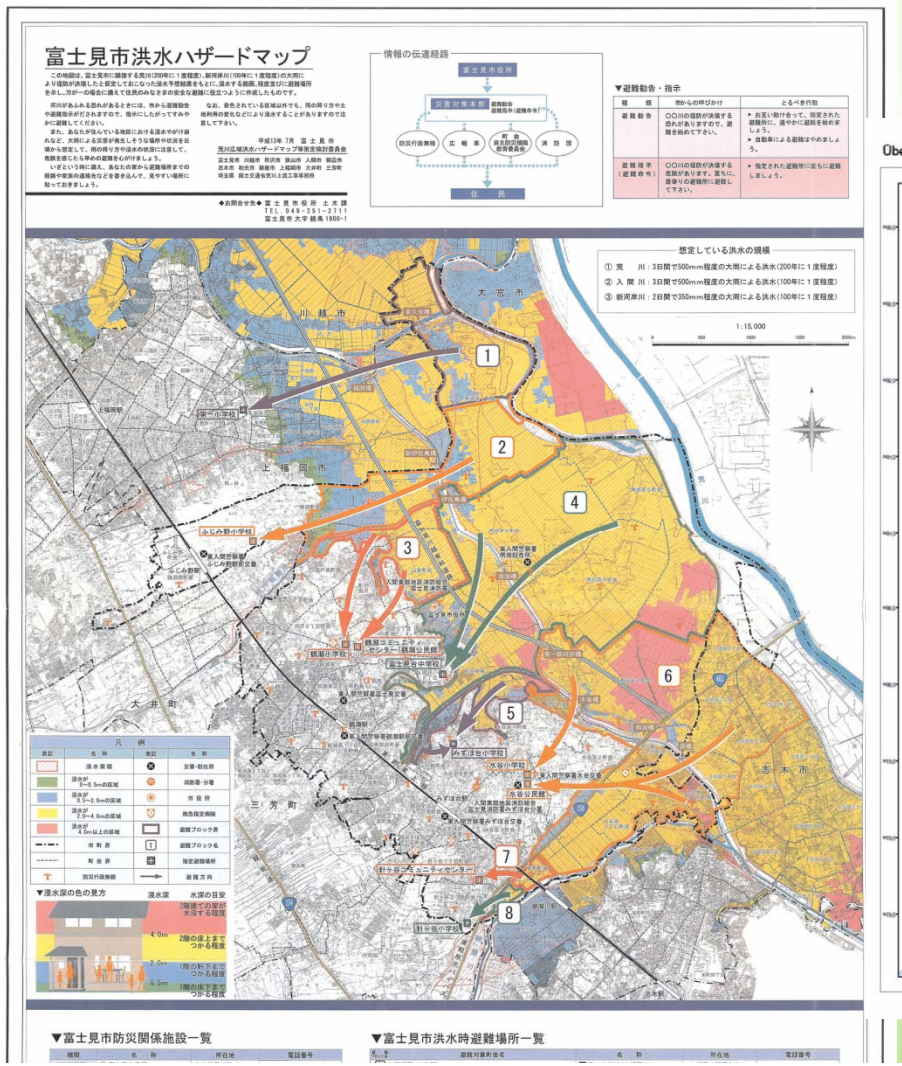


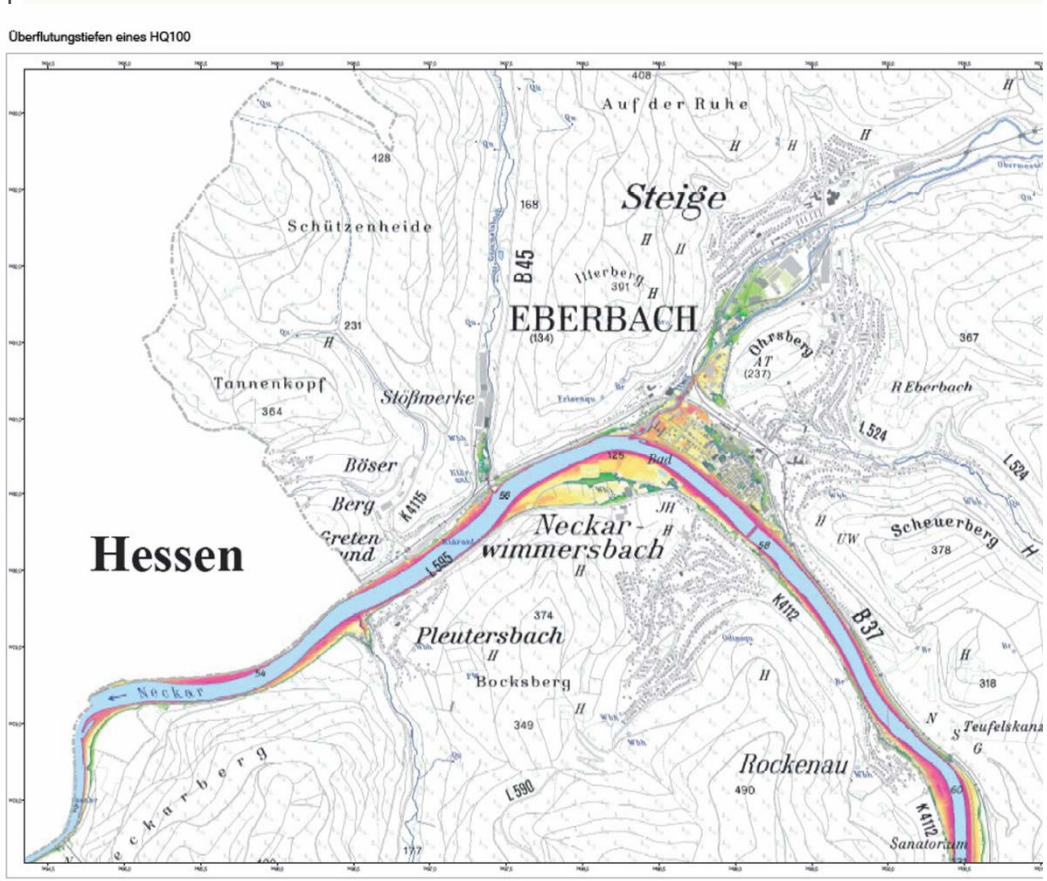
Flood Mortality Risk

Data source: The core data sets of Natural Disaster Hotspots - A Global Risk Analysis, Center for Hazards & Risk Research, Columbia University

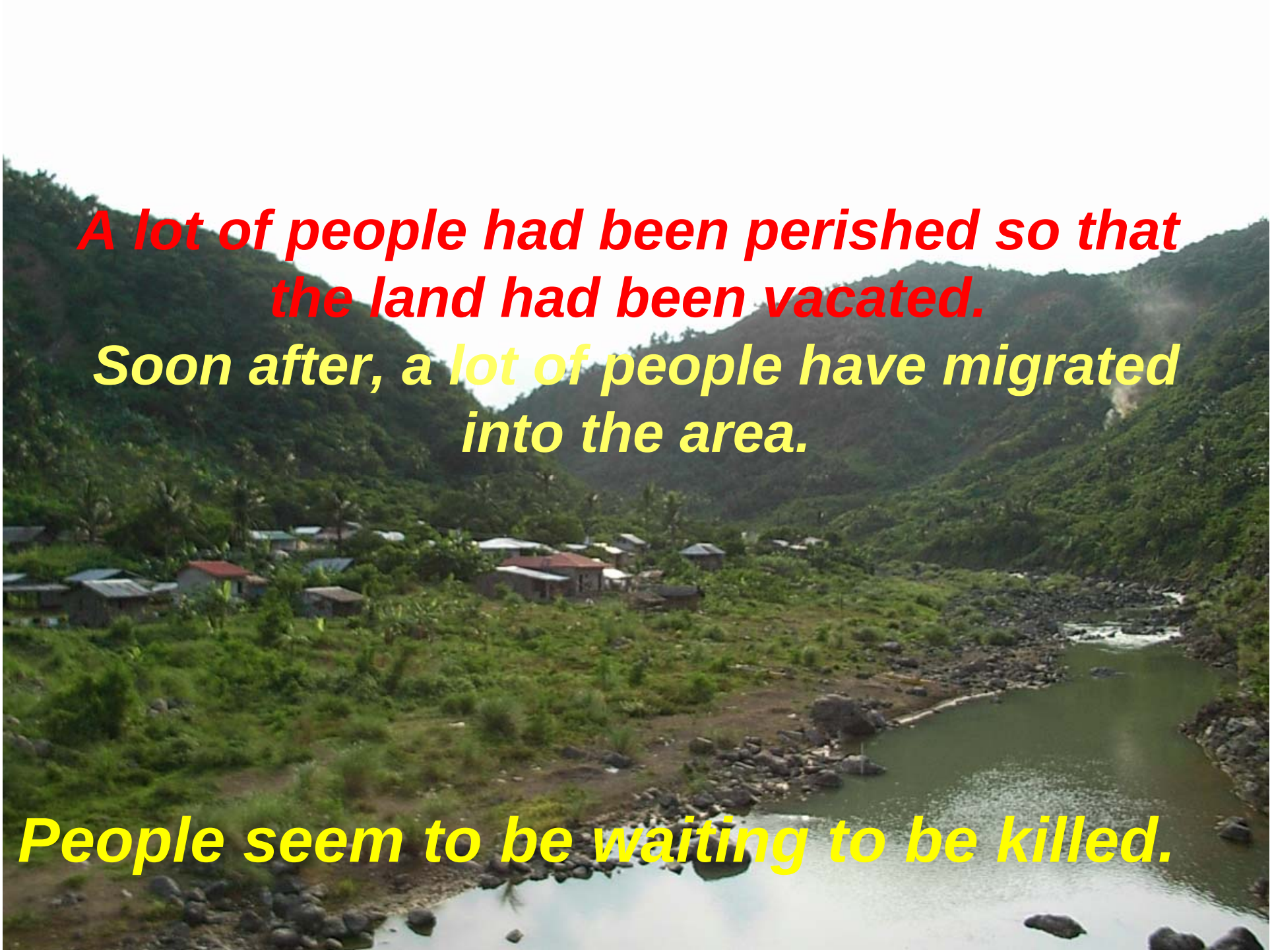
In developed countries, a number of flood risk maps have been publicized in various types

(past inundation, hazard, emergency response, etc.)






In many developing countries,
Situation is totally different
Without filling the stomach,
no disaster coping capacity.
Asahi Shinbun,1999 目撃者 I


A lot of people had been perished so that the land had been vacated.
Soon after, a lot of people have migrated into the area.
People seem to be waiting to be killed.

Dyke cutting by local people

Barrier cut off by local people in village B

Village A
(Developing One)

Village B
(Old One)

National Highway

Tributary

Rapti River

Nepalgunj
(Headquarter of Banke District)

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There are many other (potential) obstacles that hinder Risk Communication, especially in developing countries

Do people feel always stress due to Flood Risk Map?

Has it created conflicts? e.g. those who were trusted earlier will be no more trusted

Unnecessary pressure to the administration such as request to establish facilities, compensation to relocate,……

Do land owners/ real-states lose their incomes or their business?

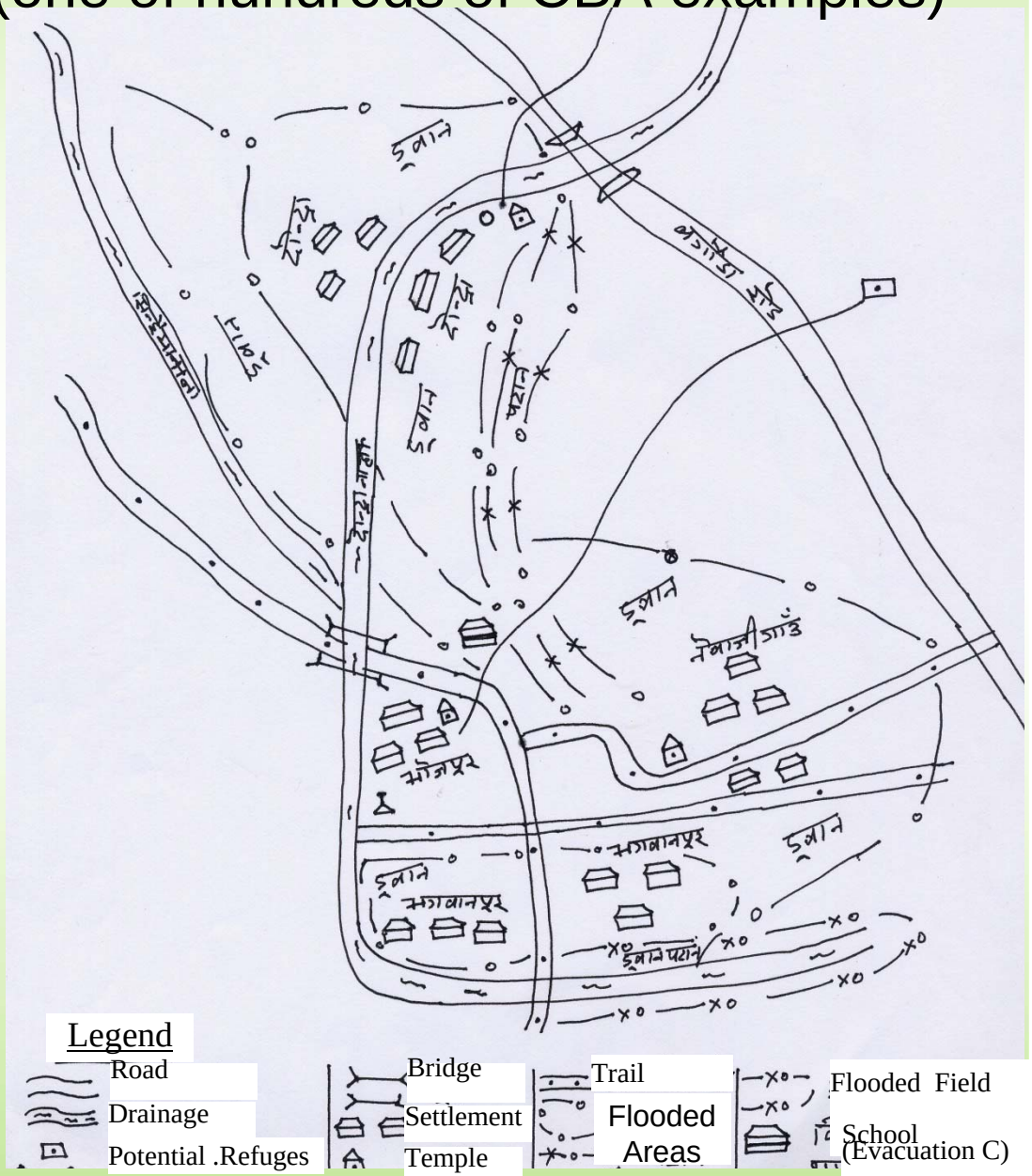
Managers

If there are not enough facilities such as routes and evacuation centers, can FRM still work?

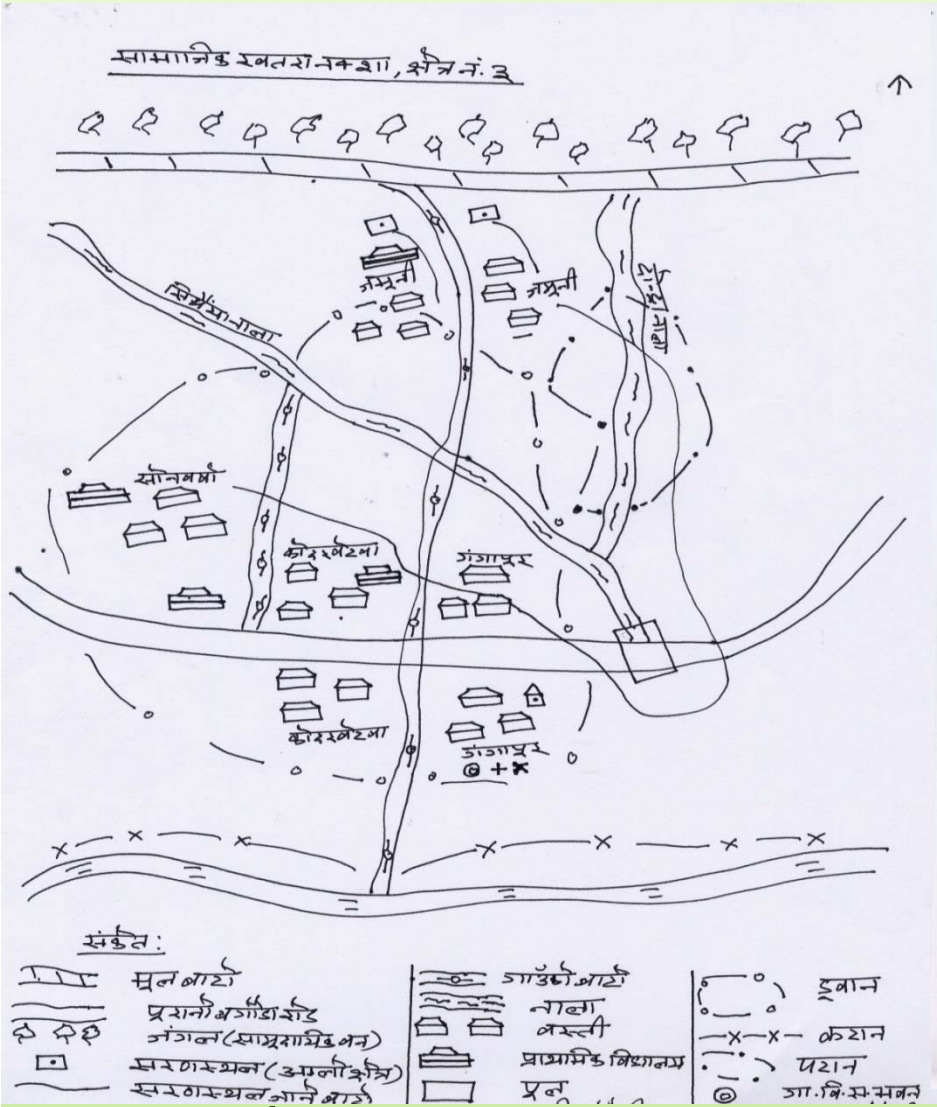
For many reasons, flood risk map publication in developing countries is still in very low-level.

In such a case, Community-based approach could work.

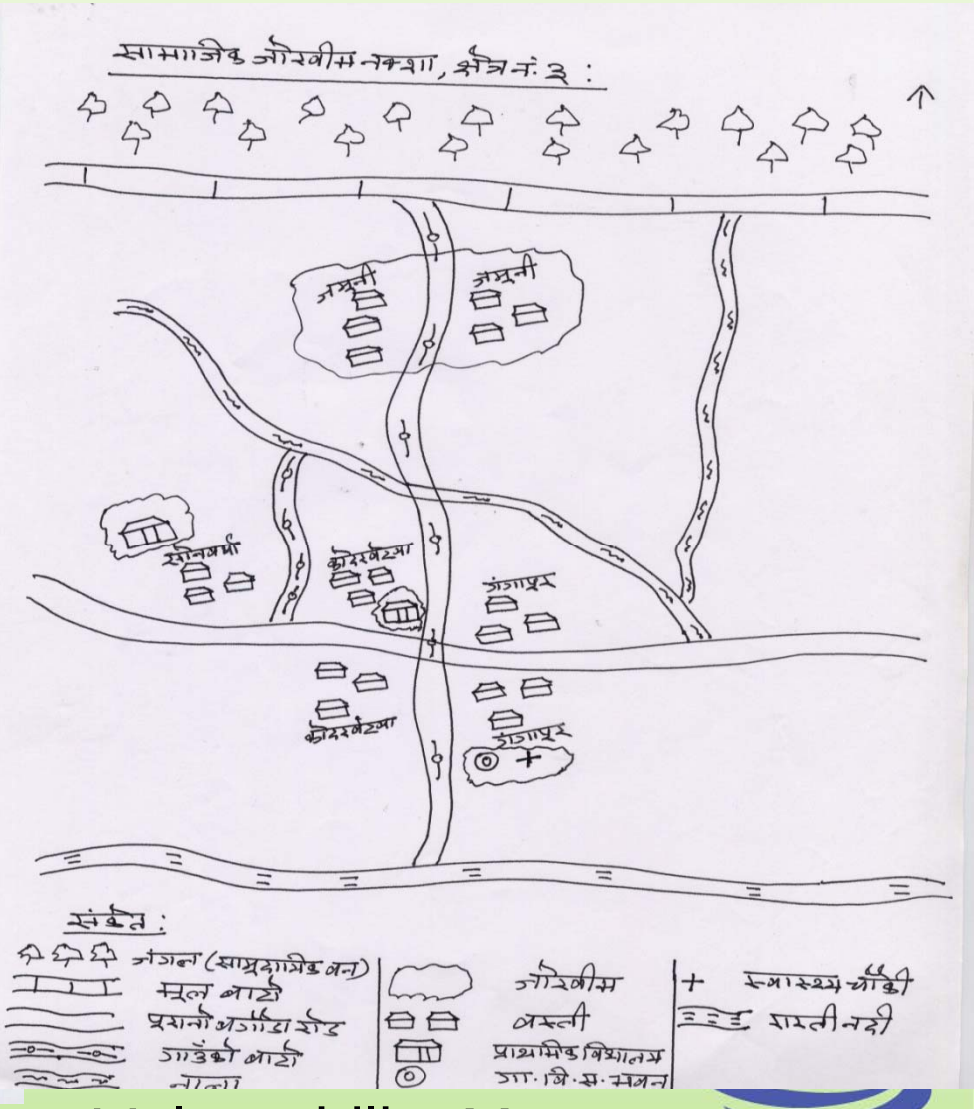
(one of hundreds of CBA examples)



Maps drawn by community-people – beautiful maps!
We can provide a little bit of scientific knowledge



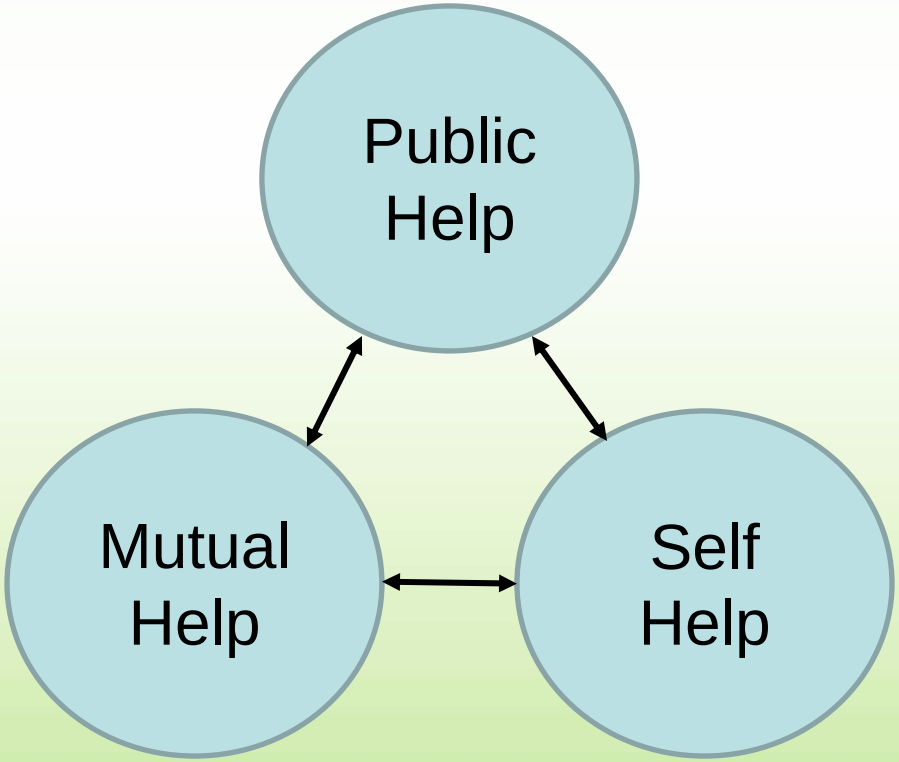
Hazard Map



Vulnerability Map

3. Who bears ultimate responsibility for ensuring that the right measures are in place?

Balanced combination of three forms of flood management



However, “Self help” should not to be used as excuse for non-action by Governments.

Ideally, national governments should take the overall responsibilities for planning, and coordination of the flood management measures.

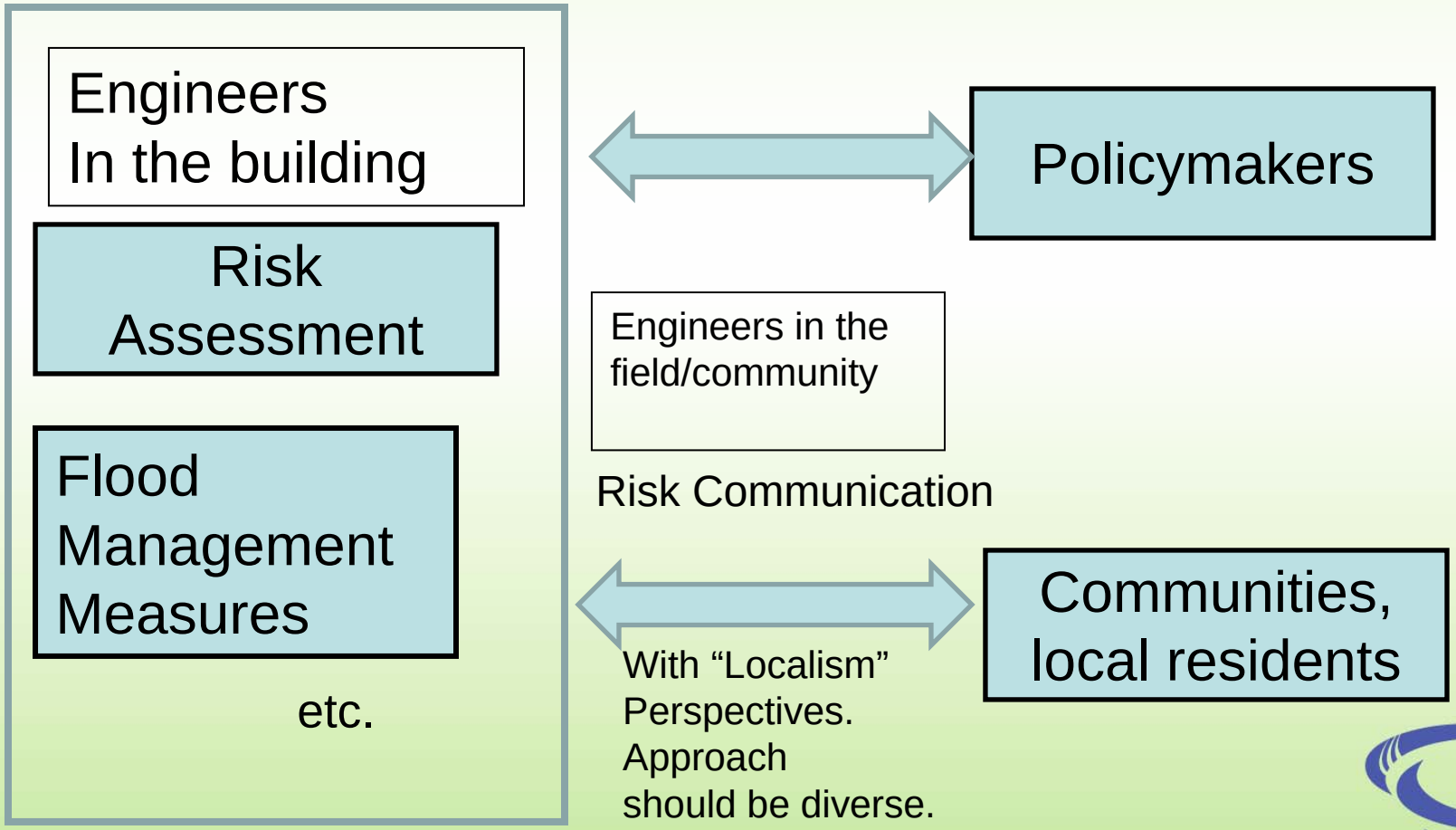
Resources are always scarce

Integrated Approach to Flood Management should be sought, thus making flood management everybody's business

(Policy Brief Paper, Asia-Pacific Water Summit)
It is important to look at whole water regime, which means both scarce and excessive water management must be done in concerted manner. IWRM is a broad concept promoting the integrated management of water in a sustainable manner and thus encompasses a wide variety of sectors such as physical, geographical, socio-economic, and cultural domains. The IWRM approach, therefore, must also be applied to water-related DRR.

Some movements in this direction are ongoing such as APFM (driven by WMO)

Role of engineers/scientists?




Last but not least,
It’s good to be with family/friends.

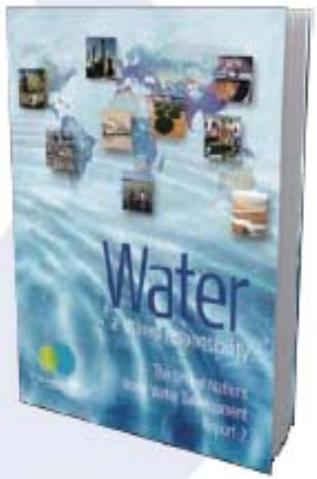
Let’s try together to minimize the number of flood victims.

Destruction by Cyclone Sidr in Chailtatoli, Bangladesh on November 20th, 2007
Source: AFP/Jewel SAMAD

Destruction by Cyclone Sidr in Chailtatoli, Bangladesh on November 20th, 2007
Source: AFP/Jewel SAMAD

Thank you very much for your attention!

ICHARM



UN WWDR II (2006)

ICHARM

Research

- Flood risk analyses in diverse localities in developing countries
- Development of flood warning systems that use satellite observations and other advanced technology
- Development of flood hazard mapping procedures able to meet various environmental and social conditions
- Development of community water hazards risk aversion systems with advanced flood warning and flood hazard maps as available means
- Promotion of basic research on hydrological measurement, analysis, and forecast to support ICHARM activities
- Participation in international research programs such as World Water Assessment Programme, International Flood Initiative, Group of Earth Observations and Predictions in Ungaged Basins

Data

Results

Curriculum

Participation

Knowledge

Network

Flood Hazard Mapping Training

Information networking

- Creation of a worldwide and inter-disciplinary network of practitioners, researchers and course graduates in the field of integrated water risk management
- Collection, analysis and dissemination of information and experiences regarding water-related disasters worldwide
- Timely organization of investigation teams when catastrophic water hazards occur
- Organizing and sponsoring workshops and symposia

Training

- Training courses on practical risk reduction systems incorporating existing social diversities, for public officers and decision makers
- Human resources development for integrated flood risk management in cooperation with universities and related institutes worldwide
- Training courses of flood hazard mapping and river and dam engineering for researchers and engineers
- Providing follow-up activities for course graduates in their home countries

International Centre for Water Hazard and Risk Management (ICHARM)
under the auspices of UNESCO

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United Nations Educational Scientific and Cultural Organization

PRESS RELEASE

A Master's Degree Program on
WATER-RELATED RISK MANAGEMENT

FHM training course

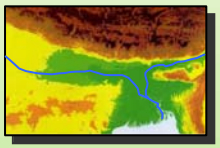
ICHARM/PWRI has been organizing FHM training course annually since 2004, usually accepting 16 trainees from 8 countries.

Development of Integrated Flood Analysis System (IFAS) Ver.1

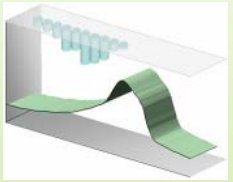
A computer software package specifically for flood runoff analyses with GUI using ground-based and satellite-based rainfall data

Being developed by joint research (FY2005-2007) at ICHARM/PWRI, Infrastructure Development Institute (IDI/IF-Net), and nine major civil-engineering consulting companies

Satellite rainfall



Global GIS data



Runoff analysis