

Sixth Annual IIASA-DPRI Forum on
Integrated Disaster Risk Management: Risks and Challenges for Business and Industry (IDRiM 2006)
August 13-17, 2006, Istanbul, Turkey

FLOODS

Tuesday, 1:50-3:50 pm, Topkapi - B

Chair: Charles Scawthorn

*Professor of Lifeline Earthquake Engineering
Kyoto University
Kyoto, Japan*

Rapporteur: Ufuk Hancilar

Bogazici University, Istanbul

FLOODS SESSION

1. Economic Hotspots: Visualizing vulnerability to flooding

A. van der Veen, C. Logtmeijer, Dept. Public Policy, U. Twente, The Netherlands

2. A Flood Risk Communication Support System to Promote Safe Autonomous Evacuation

M. Hatayama, K. Kawashima, H. Tatano, DPRI, Kyoto University, Japan

3. An Improvement and actual condition about gap between preparedness behavior and risk perception for flood disaster

A. Takagi, Y. Amao, Dept. Civil Engg., Gifu University, Japan

4. Flood-Risk Information Communication with PAFRICS

Y. Takeuchi, I. Suzuki, T. Sato, T. Fukuzono, DPRI, Kyoto University, Japan

• USACE Response to Hurricanes Katrina and Rita

I. Adiguzel, USACE Construction Engg. Research Lab., USA

INTRODUCTION

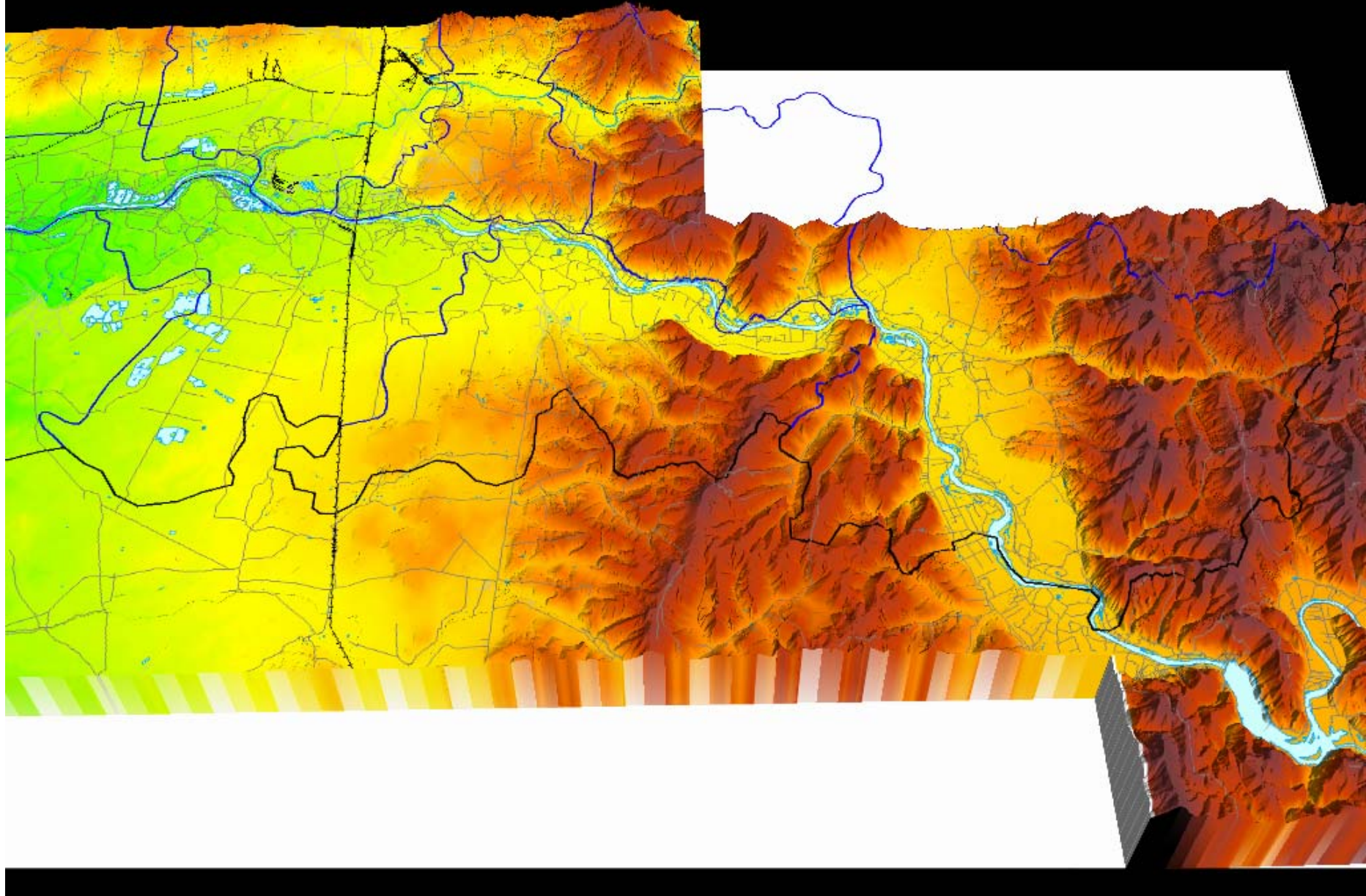
BY

CHARLES SCAWTHORN

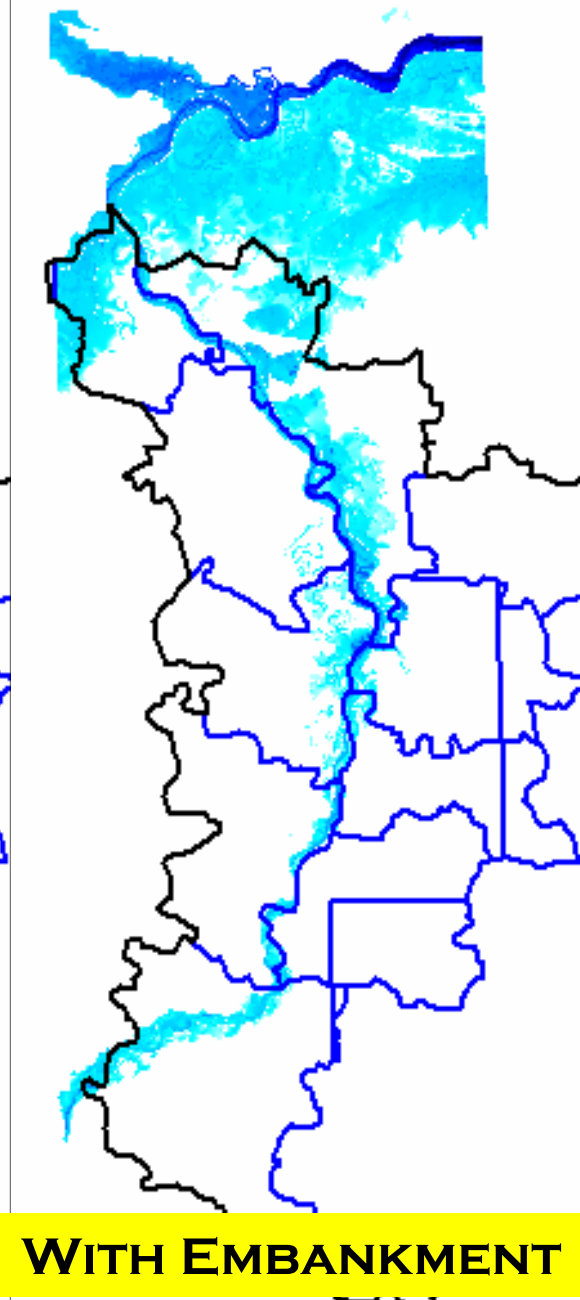
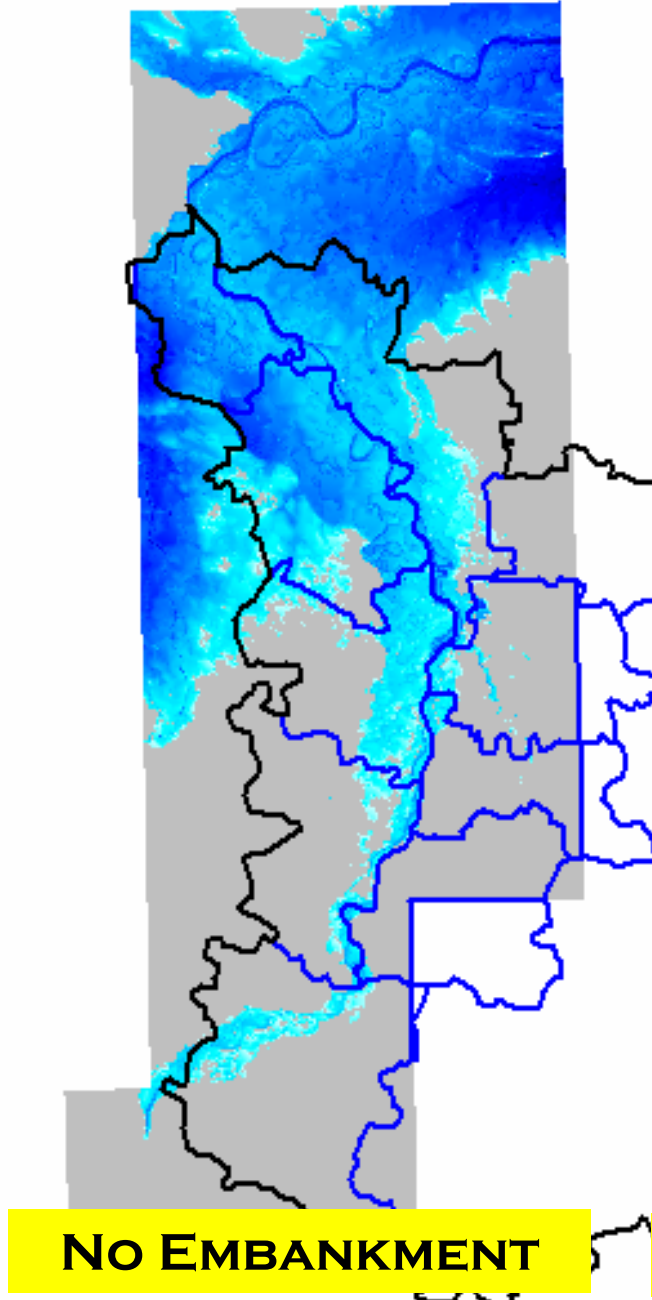
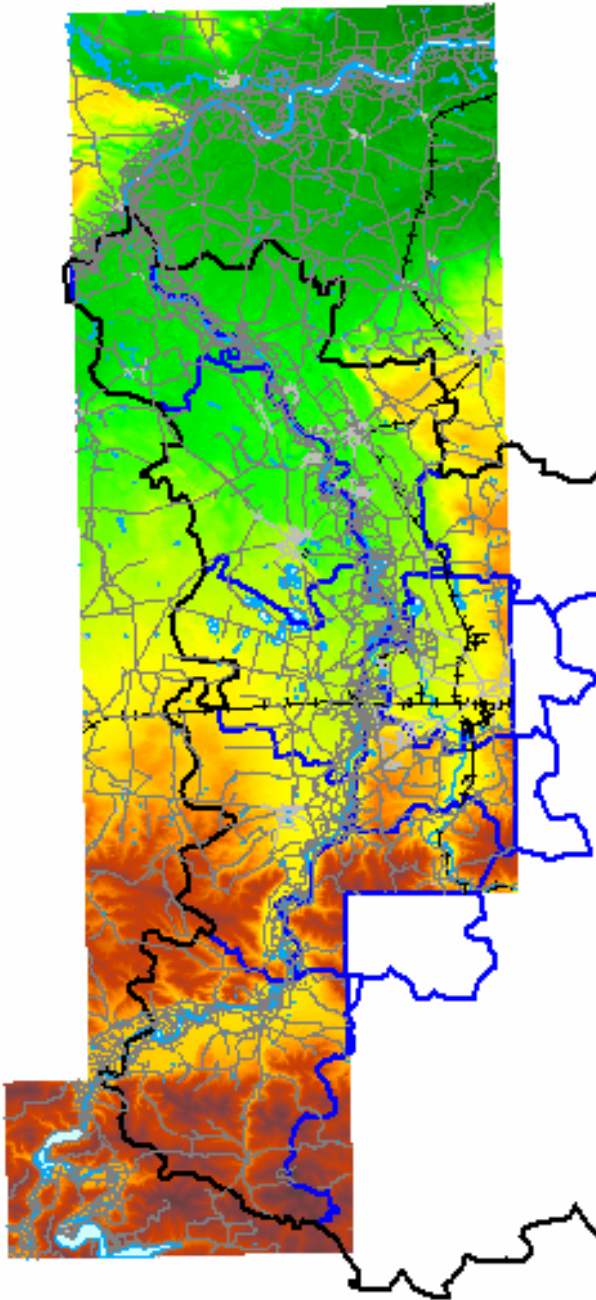
PROCESS

- **FLOOD DISASTERS**
- **ANALYSIS OF THE PROBLEM**
- **COMMUNICATION OF THE RISK**
- **MITIGATION**

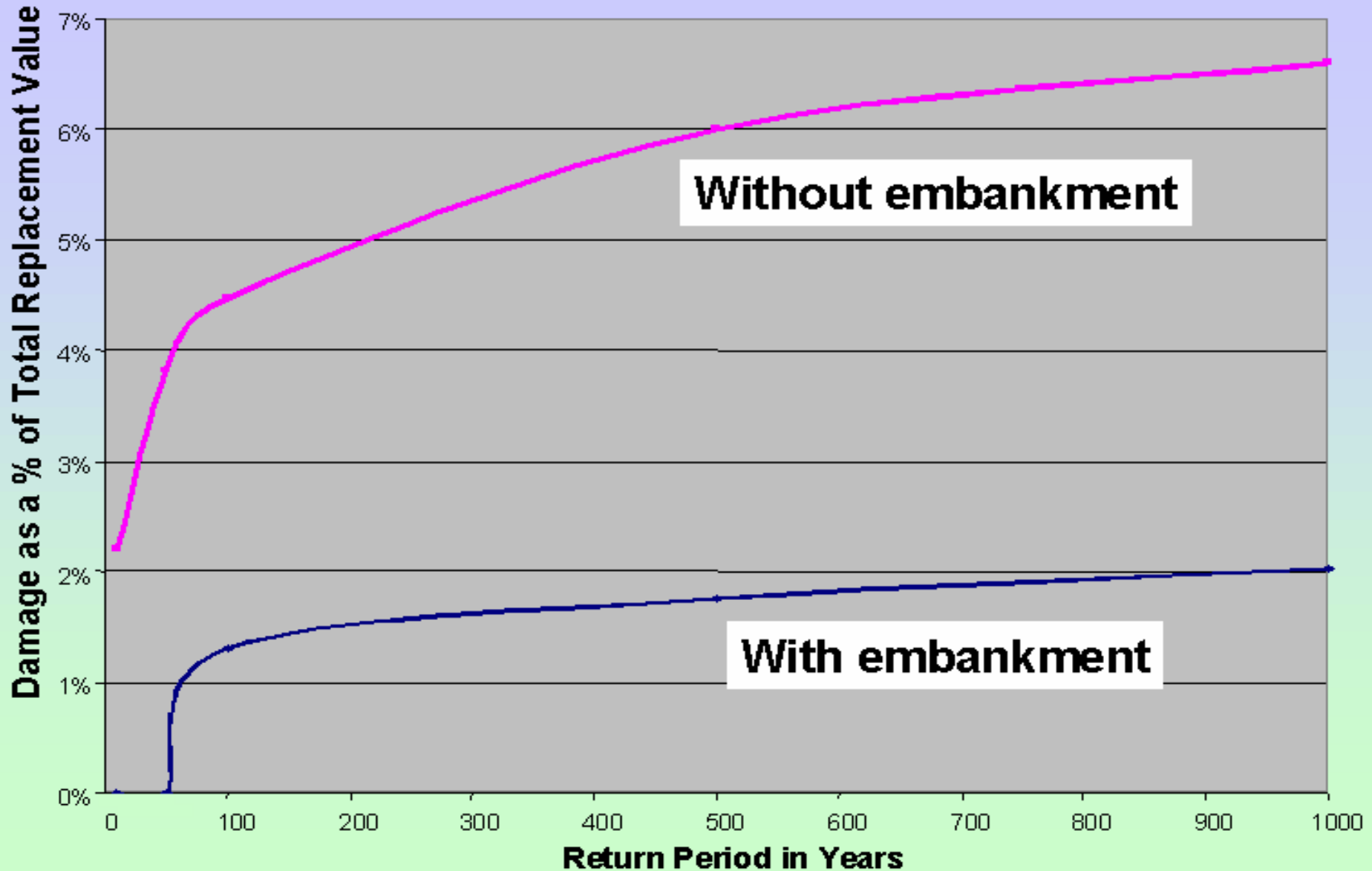
GIS Data of Study Region



0.001 ANNUAL PROBABILITY EXCEEDANCE (“1,000” YEAR FLOOD)



Flood Damage Loss Exceedance Curves



SPECIAL ISSUE: Multihazards Loss Estimation and HAZUS

SPECIAL ISSUE EDITOR: Charles Scawthorn

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Total
0
3,990
0
196
14
0
513,315
517,515
517,515

**VULNERABILITY TO A LARGE SCALE
FLOODING**

BY

ANNE VAN DER VEEN

The simulation of a large-scale flooding in the Province of South-Holland in the economic centre of the Netherlands.

In traditional research, damage due to flooding is computed with a unit loss method coupling land use information to depth-damage functions. Normally only direct costs are incorporated as an estimate of damage to infrastructure, property and business disruption.

Extension of this damage concept with the indirect economic effects on the rest of the regional and national economy on basis of a bi-regional input output table.

Broadening this damage estimation to the concept of vulnerability.

Definitions of

- Vulnerability
- Susceptibility
- Dependency
- Redundancy

They measure as the degree of centrality of an economic activity in a network. The more central an activity is, the less it encounters possibilities to transfer production and the more vulnerable it is for flooding.

Vulnerability of economic activities is then visualised in a GIS. Kernel density estimation is applied to generalise point information on inundated firms to sectoral information in space.

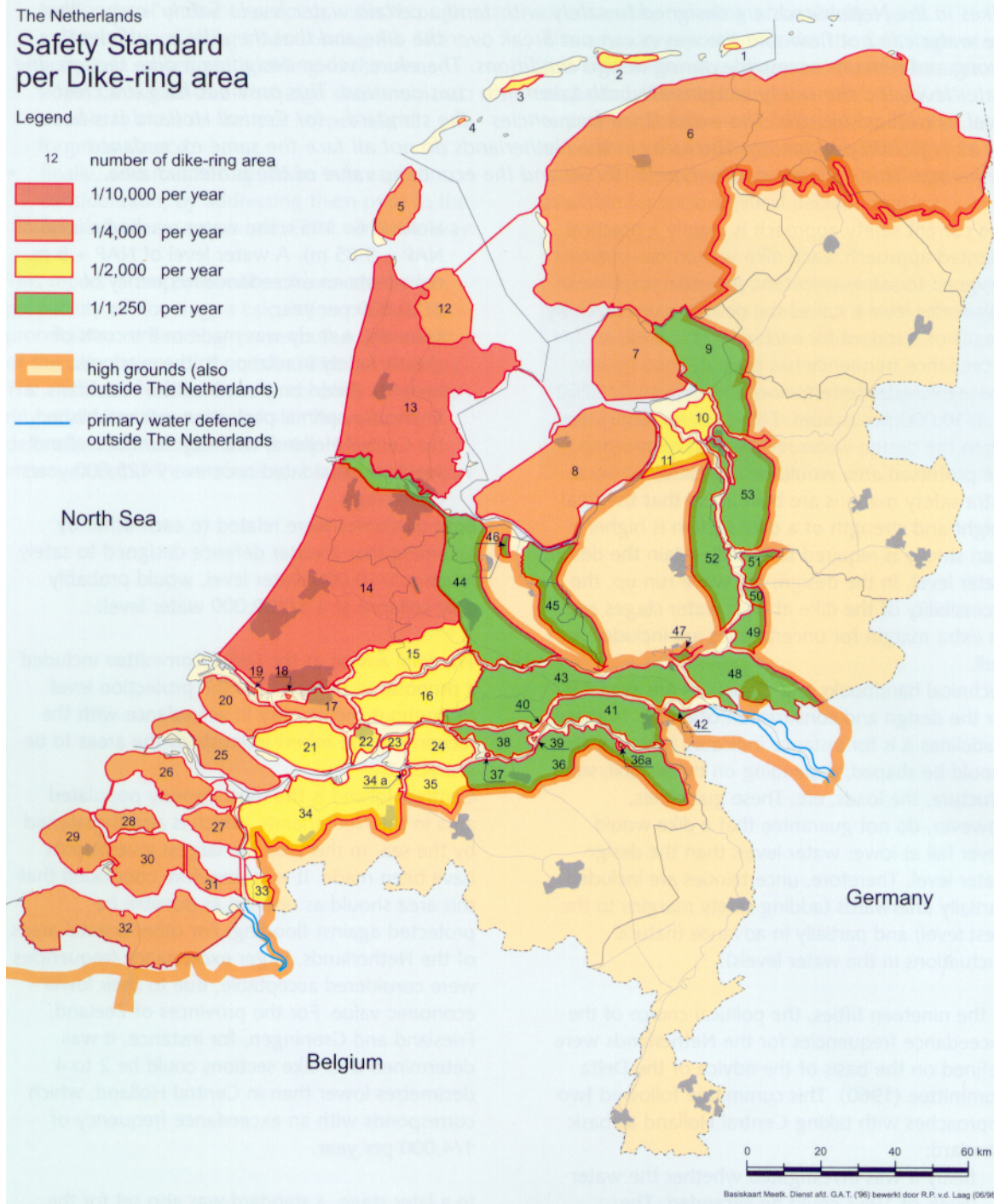
Application of spatial interpolation techniques for the whole of the province of South Holland. Combining information of sectoral data on dependency and redundancy, they are able to create maps of economic hotspots.

In this simulation of a flood in the centre of Holland reveals the vulnerability of a densely populated delta.

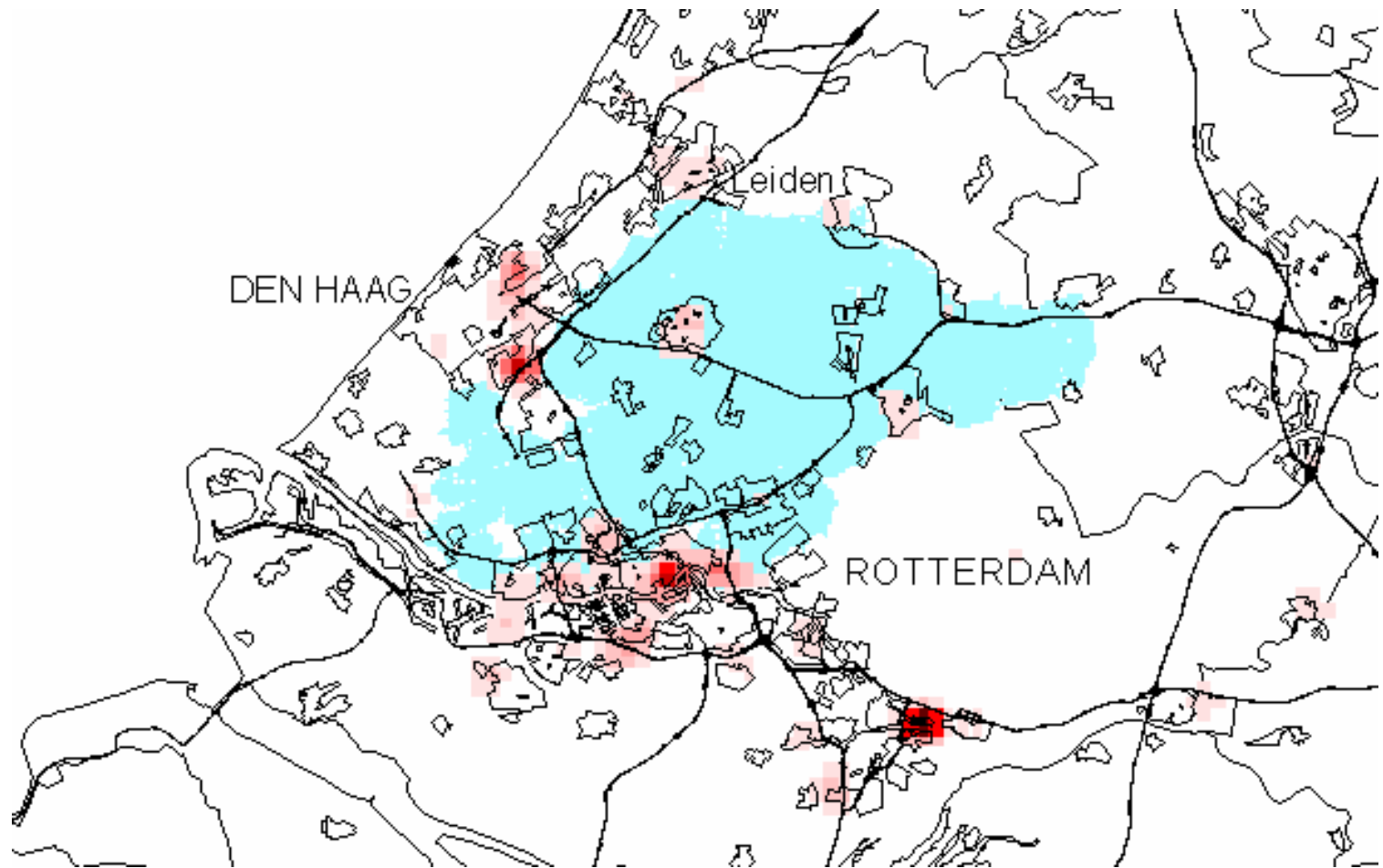
Case: Krimpen dike breakage

- No data available comparable to FEMA
- Aim: defining hot spots
- Vehicle: GIS data base
- Relation with Input-Output analysis
 - Bi-regional IO table; 28 sectors

- **Dike rings**



Final: inundation in the province of South Holland: the role of infrastructure in defining hotspots



**A FLOOD RISK COMMUNICATION
SUPPORT SYSTEM TO PROMOTE SAFE
AUTONOMOUS EVACUATION**

BY

MICHINORI HATAYAMA

- Modeling of human evacuation behavior as a mental model
- Development of GIS based support information system for construction and reconstruction of users' mental model
- Flood risk communication using developed support system in Kiyosu City, Aichi Pref., Japan

The system which is developed in this study is designed for assisting citizens to acquire appropriate knowledge and information for flood risk and helping them to develop their own voluntary evacuation plans.

Based on the systems assistance, flood risk communication between experts and citizens can be promoted and citizens mental model in terms of flood evacuation can be revised to more appropriate one than the one without such risk communication.

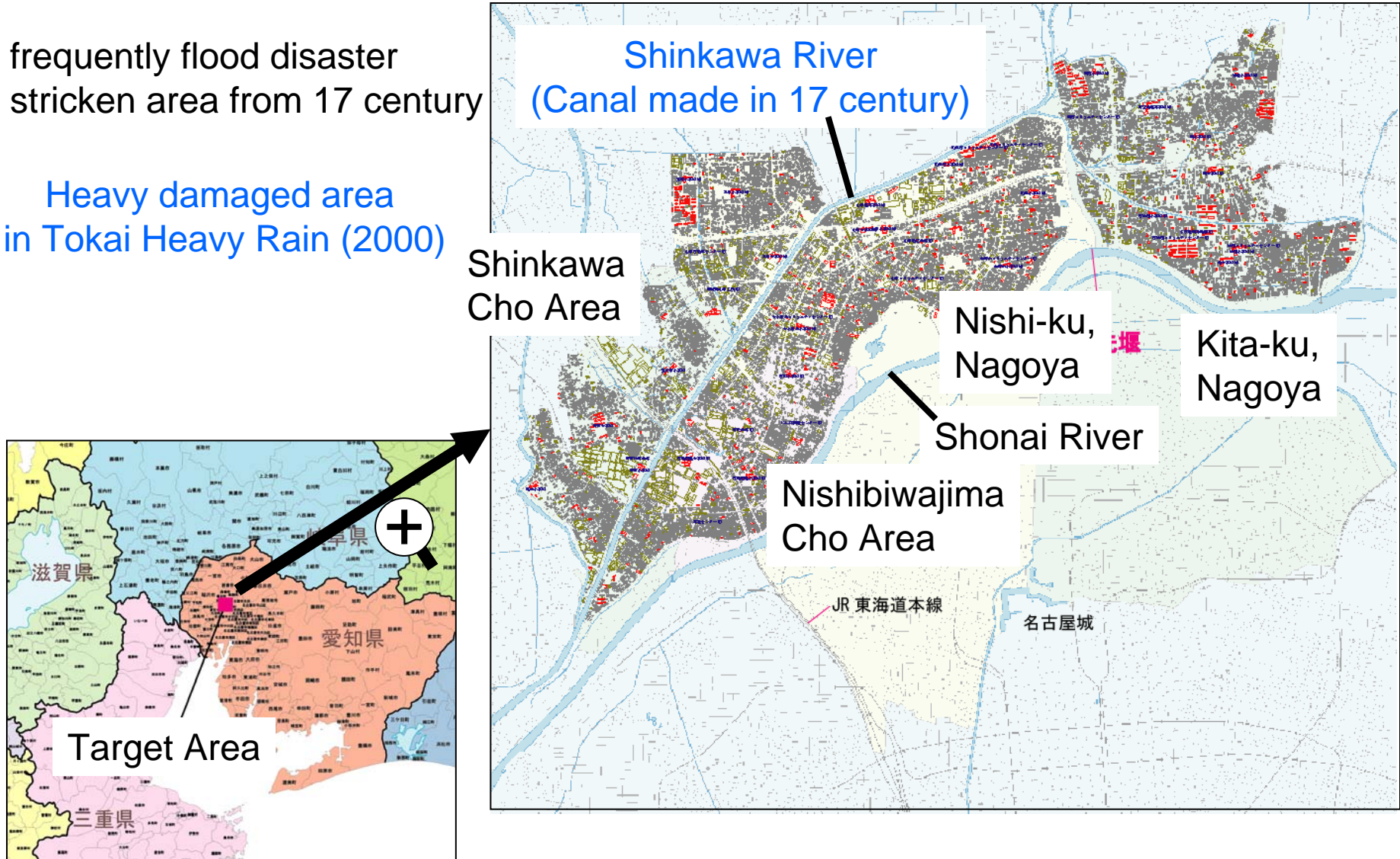
Target Area: Shinkawa River Basin in Kiyosu City

Nishibiwajima cho area (Population: 19,000, Area: 4.70km²)
Shinkawa cho area (Population: 8000, Area: 3.36km²)

2005

frequently flood disaster
stricken area from 17 century

Heavy damaged area
in Tokai Heavy Rain (2000)



Flood Disaster Simulation Data

Made by River Division of Aichi Pref.

- 50m Mesh Data
- Integrated 68 scenarios
 - 5 scale of rainfall (including Tokai Heavy Rain)
 - Break in dykes of Sinkawa River (Break point 1km pitch)
 - Inner water (Sewage: $w \geq 1\text{m}$, Waterway: $w \geq 3\text{m}$)

Evacuation Trigger

From this data and standard guideline of evacuation order of local government, they set following timing as “evacuation trigger”

- Evacuation Order
- Flood Prediction
- River Water Levels
- Rainfalls

Human Evacuation Behavior

They assume that HEB is regulated by the **place (from, to)**, **route**, and **trigger** to evacuate

When they make their own flood evacuation plan by use of the risk communication system, evacuation behavior may be simulated by their own mental model.

However, by only the distribution of flood hazard map by local governments cannot to provide enough information which can actually makes some changes in their mental model.

In order to establish and update people's evacuation mental model, information regarding possible patterns of flooding risk needs to be provided and the system that people should experiment their own evacuation plan need to be established.

**GAP BETWEEN
PREPAREDNESS AND AWARENESS
FOR FLOOD DISASTER RISK**

BY

AKIYOSHI TAKAGI

The evaluation model was built based on the fuzzy reasoning for describing the risk perception with the complexity and the fuzziness of the human thought, after some knowledge were selected and extracted from the existent investigation and research reports.

They evaluated the actual condition about 16 items, for example, to confirm the evacuation center and route, to prepare the evacuation goods and foods, to participate the emergency drill, to insure the flood disaster and so on, related to the preparedness behavior for the flood disaster at the Seika district in Gifu city.

The Field Campus is Gifu City



Procedure

15 kinds of preparedness

Characteristics of people and community

Number of household members
Vulnerable person for disaster
Property in house
Disaster experience
Collection of information for disaster mitigation
Knowledge for disaster mitigation
Activity for disaster mitigation in community
Connection in community

Questionnaire

Model based on
Fuzzy reasoning

Preparedness

Awareness

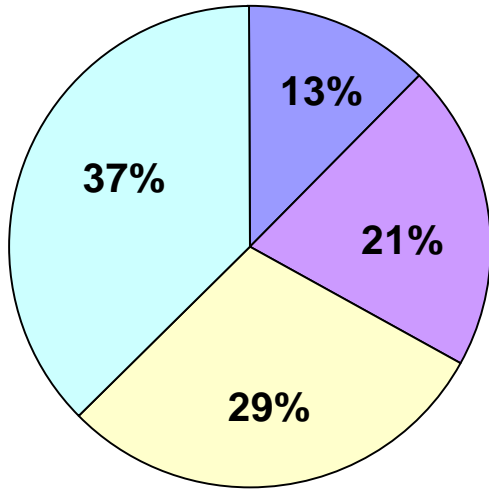
Gap

Analysis

Improvement

Questionnaire

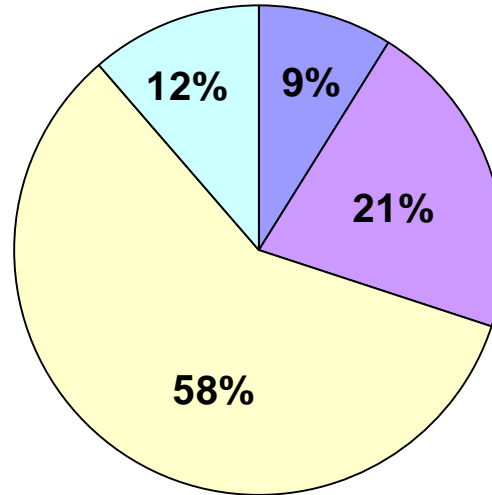
Have you checked your evacuation routes?



- I have passed.
- I have checked.
- I have not checked well.
- I have not checked.

preparedness

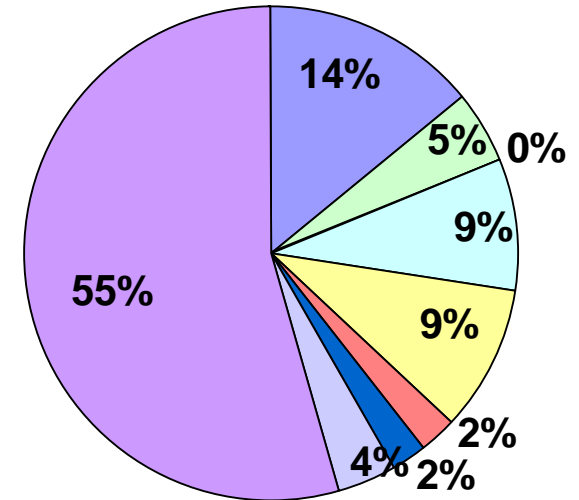
What do you think of your preparedness?



- enough
- not so bad
- not enough
- I do not know

self-evaluated preparedness

By which information source do you acquire the knowledge?



- hazard map
- person
- school
- event
- TV, radio
- newspaper, magazine
- internet
- the others
- I do not know

The averages and standard deviations were calculated from the degree of risk perception estimated by the model and the gap between the actual preparedness behavior and the risk perception.

The preparedness behaviors were grouped by analyzing these values. Then, they proposed and evaluated some improvement measures.

In order to improve preparedness

1. The awareness is not enough as a whole.
→ **The improvement of awareness is required in the whole community.**
 - 2.evacuation center, 3.evacuation route, 4.evacuation standards, 9.family meeting, 10.contact at emergency, 11.help each other, 15.flood insurance
2. Individual difference of awareness is large.
→ **The improvement of awareness is required to people whose awareness is not enough.**
 - 8.flooded records, 14.place furniture
3. People are not going to prepare. =People think that it's enough.
 - 2.evacuation center, 15.flood insurance
 - These are contained in 1 or 2 above.→ **First of all, the improvement of awareness is required.**
 - It is not sure whether their behaviors change or not.
4. **People are going to prepare, but have not prepared yet.**
 - **People agree in the general and particular, but do not practice. = perceptual discord**

**FLOOD - RISK - INFORMATION
COMMUNICATION WITH PAFRICS**

BY

YUKIKO TAKEUCHI

To support risk communication to prevent flood disasters, National Research Institute for Earth Science and Disaster Prevention (NIED) has developed a new system: the Participatory Flood Risk Communication Support System (PAFRICS).

The objective of PAFRICS is to supply knowledge concerning flood risk and integrated flood risk management.

The PAFRICS-based questionnaire survey results obtained from university's lecture and two workshops were given in this presentation.

PArticipatory Flood RIsk Communication Support System (PAFRICS)

Pafrics supports communication of integrated flood risk management for residents, local communities, and government agencies .

1. Flood risk literacy learning support

- Characteristics of flood risk
- New flood risk management
- Flood risk assessment methods
- Roles of community and residents in disaster prevention
- Disaster volunteer workers, etc.

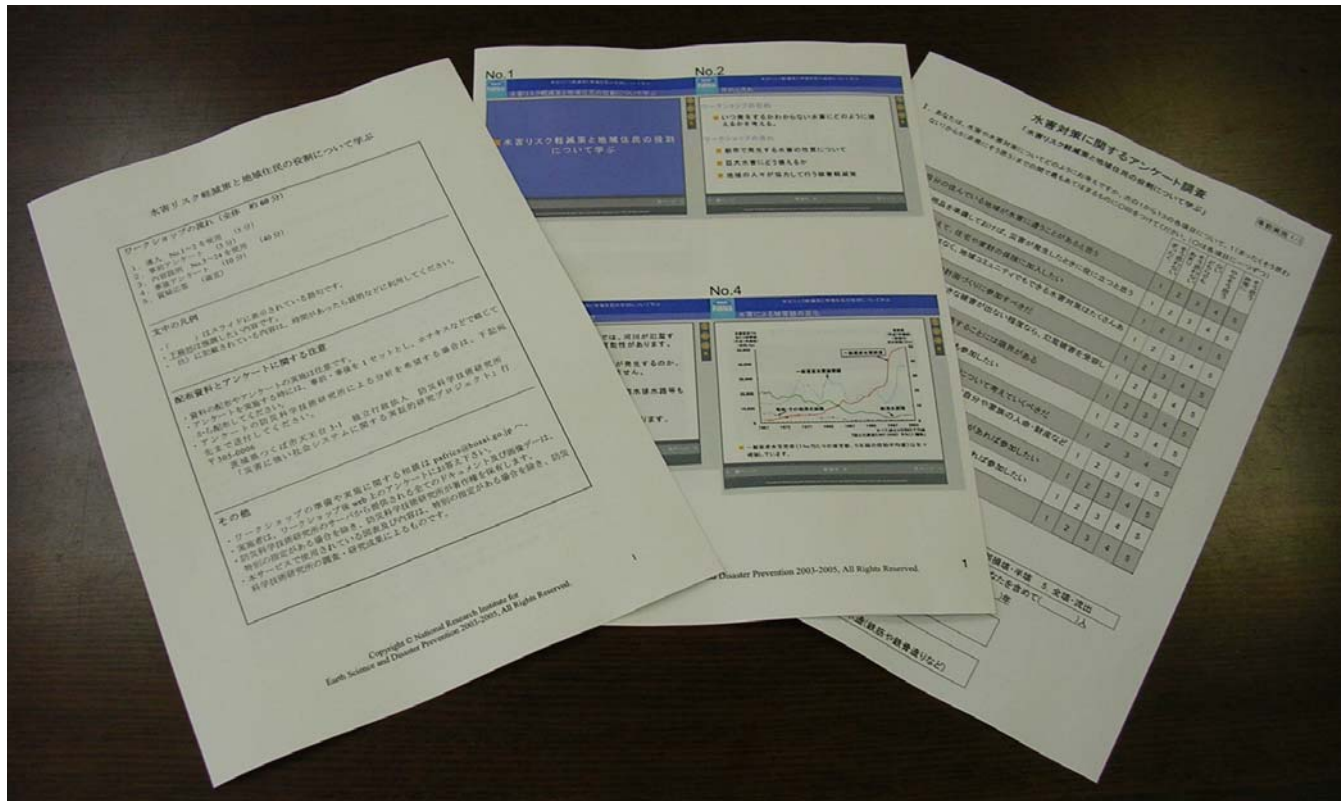
2. Consultation in selecting risk reduction options

- Case studies of risk communication
- Evaluation of cost and benefit of flood control measures

3. Support facilitators in the administration of workshops

- Facilitator support
- Development of workshop scenarios
- Facilitator development

The documents distributed by Pafrics



Pafrics prepare some scenarios. One scenario is for 60 minutes. Manual, handout and questionnaire comprise a set in a scenario. The facilitator is provided with terminology, references, and questionnaires by Pafrics.

Out line of university's lecture

Theme: A lesson on integrated flood risk disaster prevention and hazard maps

Date: 1/June/2004 16:15~17:45

Object : University students

Participants: 93 people

Using tools : PAFRICS and Flood hazard map(Nagoya city Aichi prefecture)

Flow of lecture

1. Mechanisms about flood disaster
2. Measure and timing of flood disaster
3. Flood hazard map

Primary Questionnaire

About Hazard map :14 items

About measure and flood disaster : 13 items

About attribute : 11 items

After Questionnaire

Same primary Questionnaire's items, about lecture method(6 items) and Free

Out line of work shop using PAFRICS

During the process to develop a river maintenance plan, which included the participation of area residents, our project conducted a PAFRICS-based workshop on risk communication. This workshop was called the Tokigawa-Shonaigawa Korekara Project.

First Workshop

Theme: How residents can prepare against severe large-scale flood damage

Data : 1/August/2004

Participants : six local area residents, two river administrators, three NPO members, and three NIED project members

Using tools: Basis maps, vellum paper, memo pads, and PAFRICS

Flow of workshop :

1. Before Questionnaire
2. Lecture using PAFRICS
3. Discussion
4. After Questionnaire

Discussed the theme: identify problems that could occur during abnormal times; such as emergency, disaster, and the recovery phases and were asked to examine possible countermeasures for each phase.

- When information was shared in a two-way exchange and the resident's wishes were heard, **both sides gained a deeper understanding of the present situation and the necessity of the river maintenance plan.**
- Awareness of risks was improved** through mutual dialog.
- An effort was needed to build up a **trusting relationship through the mutual understanding of participants.**
- An effort was needed **to ensure the river maintenance plan reflected the outcomes of discussions.**

The results from the lecture suggest that this learning support system serves **for improving flood risk literacy**, and is useful to understand provided information and **help organizing workshops for disaster prevention education**.

In addition, PAFRICS may well **promote two-way risk communication and serve as an effective aid for the facilitator during workshops**.

The performance of PAFRICS will be improved with repeated use.

THANK YOU ...