

Participatory Flood Risk Communication Support System (Pafrics)

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1 Introduction

A community-based approach is the key to success in integrated disaster risk management. The participation of local people in the design and planning processes in flood risk management, particularly with respect to soft policy measures, is important. For that reason, enhancement of individuals' disaster preparedness and flood risk communication among residents, regional communities, and administrative authorities are needed. In order to promote these activities, we have developed a new participatory type of decision support system that reflects the results of research into the flood risk perception and disaster preventive activities of local people obtained through recent questionnaire surveys. This is called the Participatory Flood Risk Communication Support System (Pafrics). The system facilitates the integration of soft and hard measures in local communities to be resilient against an unexpected scale of flooding. The system has been already used to conduct a kind of social experiment in schools and workshops of disaster prevention by collaborating with volunteer groups of NGO, administrative authorities, and so on. Some examples of use and results are introduced in detail in the following chapter. This provides both configuration and content of the system.

2 Basic Concept for System Development

Pafrics, a flood risk communication support tool, basically aims at popularizing a new concept of flood risk management based on theory of risk analysis. A concept of integrated flood risk management through the combination of physical and procedural disaster control measures taken by administrative authorities, regional communities, and residents will be widely applicable. The system is being developed from the following viewpoints.

- (1) Providing support in participatory decision-making.

- (2) Defining the responsibilities of administration, local communities, and residents.
- (3) Enhancing public and local disaster prevention capacity.
- (4) Integrating physical and institutional disaster management measures.
- (5) Increasing social and economic efficiency, preserving the environment and ecosystems and sharing costs fairly from a long-term viewpoint.
- (6) Applying fair and transparent processes.
- (7) Providing easy-to-understand flood risk information (estimating qualitatively and quantitatively the possibility of damage and the costs and benefits of damage mitigation).
- (8) Developing human resources for promoting new integrated flood risk management.
- (9) Building flood risk communication support methods tailored to Japan.
- (10) Taking comprehensive disaster prevention measures to build safe and secure local communities.

3 Content of Pafrics

Pafrics is one of the indispensable vehicles for facilitating flood risk governance based on an integrated framework. It helps users obtain a deeper understanding of a new approach to flood risk management and flood control strategies by learning about flood risk or having a simulated experience of the combination of specific measures to reduce the flood risks. The system is designed mainly for small-member workshops administered by facilitators, but can also be used for self-study. The system is therefore designed for use with mobile personal computers. Some of the system functions are already publicly available and the system is accessible via the Internet Web.

3.1 System environment

Requirements for the Pafrics system include the 1) sharing and rapid provision of research results, 2) accessibility via the Internet, 3) easy information update, 4) an edit function for changing the sequence of information displayed and 5) flexible system expansibility. To meet the requirements, the system is composed of contents (information), contents inventory (information catalogue database), and a contents authoring system (editing the sequence of

information display). The system environment consists of a database server and web server.

The system profile is given below.

Performance

- Simple mobile system (based on XML. A web server is available).
- Sharing of know-how and intellectual properties of researchers and experts.
- An edit function that provides for easy modification of the sequence of displaying contents and information.
- Easy update of contents.
- System expansibility for reinforcement.

Components

- Contents (information, and still and animated images).
- Contents inventory (information catalogue database).
- Contents authoring (editing the sequence of information display).

Environment

- Database server, web server, and client systems.

3.2 Configuration of Pafrics

The system configuration is shown in Fig. 1. Major functions are (1) flood risk literacy learning support, (2) information provision for participatory flood risk communication support in damage-reduction measures, (3) facilitators support to organize workshops or meetings, and (4) recording of workshop results.

(1) flood risk literacy learning support

The flood risk literacy learning support function (Fig. 2) aims at providing the assistance to users for learning a new approach or concept of flood risk management to make people more knowledgeable about flood risks. The function provides easy-to-understand information on the characteristics of flood risk, a new flood risk management concept, and flood risk assessment methods. It also supports flood risk literacy learning. Pafrics is superior to conventional systems in two respects. First, the system is designed based on a number of our social studies on disaster risks which include public risk perception, relationships among psychological variables such as risk awareness,

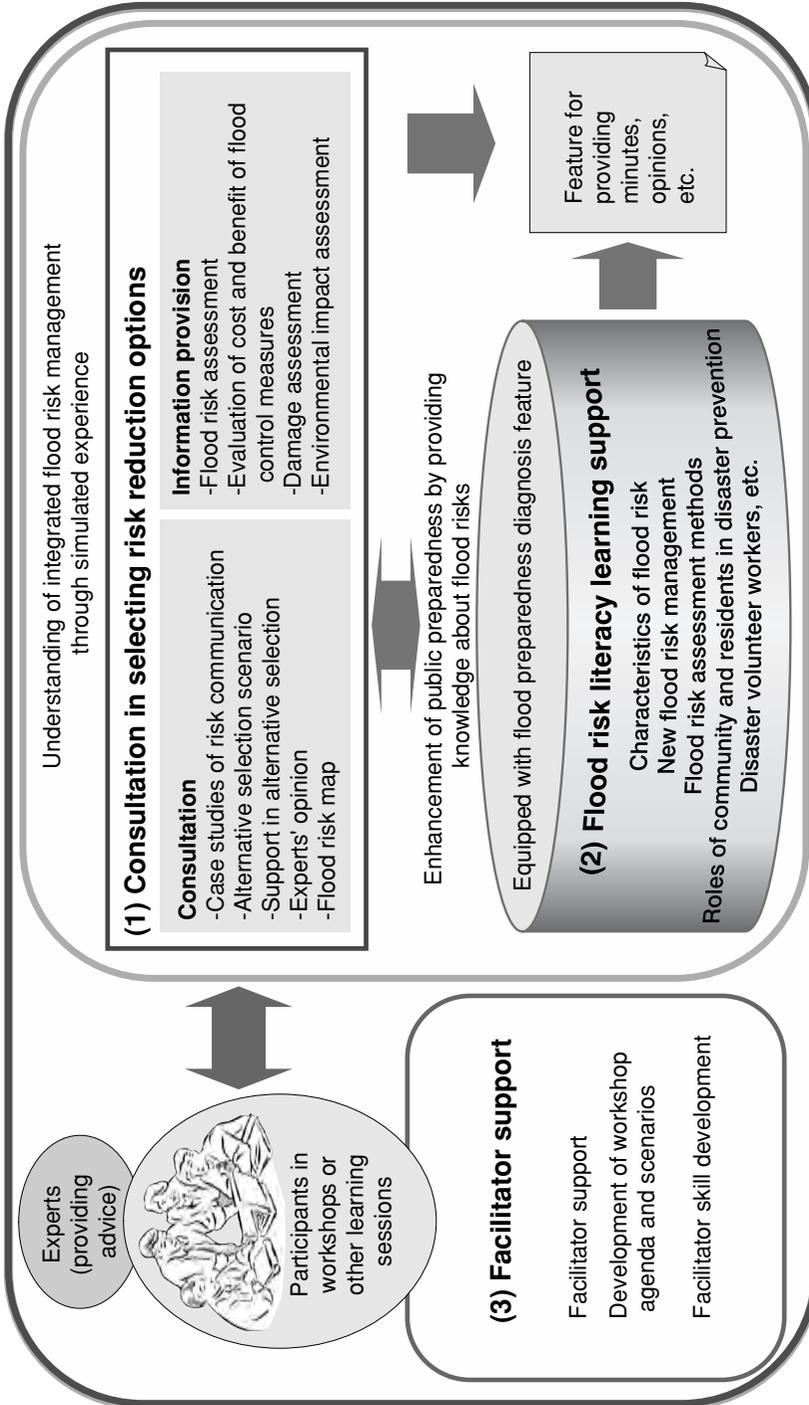


Fig. 1. System configuration.

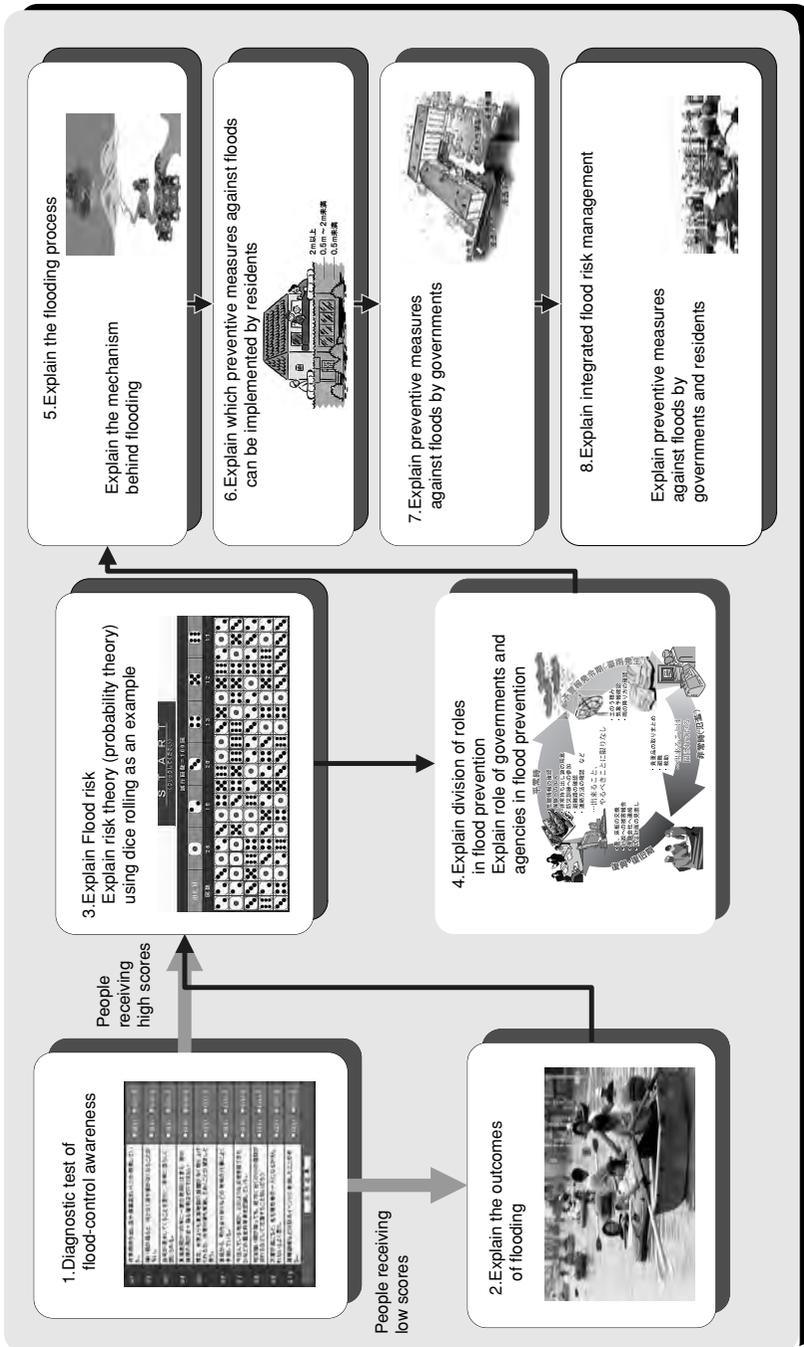


Fig. 2. flood risk literacy learning support function.

anxiety, sense of responsibility, and disaster risk reduction actions (Chapters 7–11). Second, the system emphasizes the understanding of probability, frequency, and statistical distributions of risks, which provides a foundation for considering acceptability of risks (Chapters 4 and 6).

For example, disaster risk preparedness of participants can be measured using questionnaires and contents can be provided according to the results. This is based on a research result that better recognition of flood risk increases self-responsibility, interest in flood damage, and finally the willingness to take flood risk control measures. System users can freely refer to different contents of the database for learning, and use contents according to the “scenario prepared for learning a new flood risk management concept” (Chapters 1–5).

(2) Consultation in selecting risk reduction options

This function provides not only straightforward information relevant to the selection of regional flood control measures, but also objective and detailed information related to flood risk analysis based on scientific knowledge and cost-benefit assessments of risk reduction measures. It also enables users to learn about new flood risk management strategies by simulating a decision-making process based on discussions among people who has diverse values (Fig. 3). The advice sub-function helps participants to select flood risk reduction measures in view of regional characteristics, and the consultation sub-function enables participants to address inquiries to experts regarding their comments concerning assessment results.

Annual precipitation exceeding the threshold, flood flow inside embankments, flood flow behind embankments, and spatial distributions of maximum inundation depths and damage in value that are required for flood risk assessment and cost-benefit analysis, are estimated by conventional, simple methods using an Excel macro code. For risk reduction, expected reduction of loss and expected total damage and loss are estimated and presented based on risk analysis framework.

(3) Facilitator support

This function provides materials or data for facilitators to organize public meetings or workshops regarding the new risk management approach and to lead the discussions between stakeholders such as government authorities, community representatives, NGOs, and local residents regarding the selection of local flood reduction measures. To that end, the function provides a number of important scenarios for learning about the new flood risk management approach and methods. Using these tools, facilitators can easily lead workshops enabling participants to learn about the problems of disaster risks. Another supporting function is also available to facilitators who are familiar with

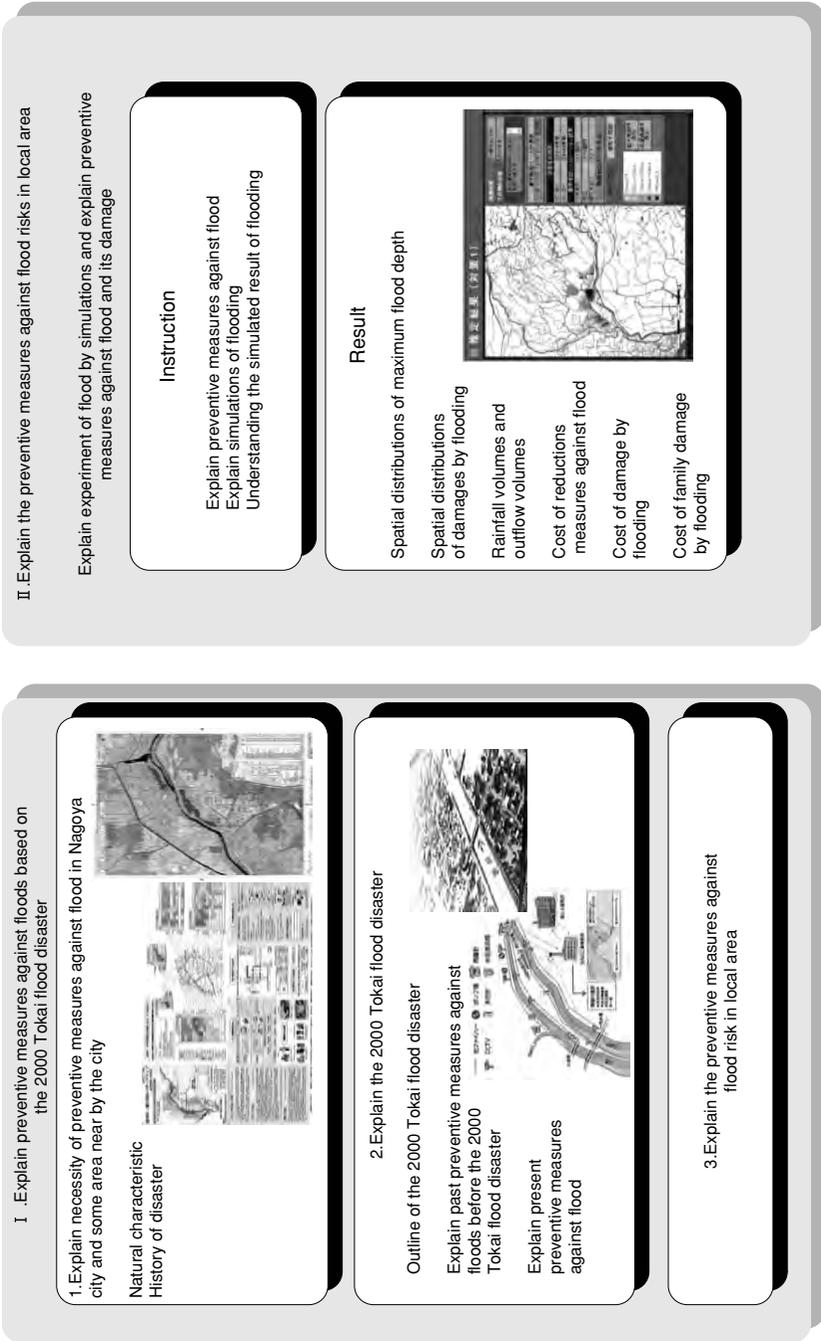


Fig. 3. Support function for consultation in selecting risk reduction options.

Support facilitators in the administration of workshops

I. Prepare for workshop

Learn about basics of workshop

What is workshop?
Role of a facilitator



Use developed scenarios for administering workshops

Objective
Considerations
Procedure



Learn using case studies



II. Develop scenarios for administering workshops

Develop scenarios for administering workshops

Edit contents according to the objective and conditions



Use developed scenarios for administering workshops

For residents
For disaster prevention
For NPO staff
For officials of administrative authorities
For students



Fig. 4. Facilitator support feature.

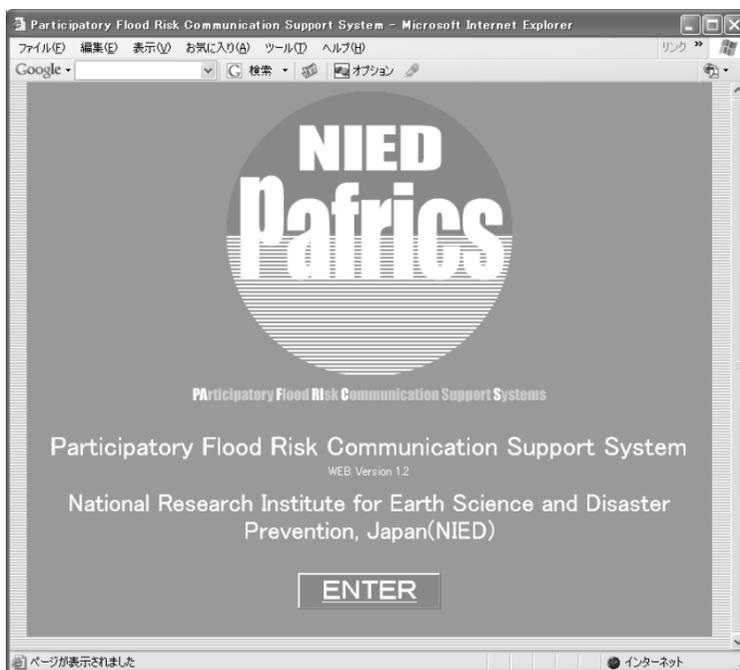


Fig. 5. Enter page of Pafrics (Original is in Japanese).

Pafrics. The facilitator can make his own workshop scenario by editing the sequence and content of the information accommodated in the Pafrics or by developing original contents of the scenarios according to the size, duration, and participants of a workshop. The facilitator support function also includes manuals on preparing and organizing workshops, and reporting outcome of the meetings.

4 Pafrics on the Internet Web

4.1 Outline

An Internet-accessible variation of Pafrics has been developed and is now publicly available. Users can access the contents prepared for workshops by simply selecting one of the desired scenarios using a general browser (e.g., Microsoft Internet Explorer). The website consists of two features of Pafrics, “flood risk literacy learning support” and “facilitator support”. The “flood risk literacy learning support” feature provides scenarios for operating workshops for teaching participants on flood risks by selecting contents. Descriptions

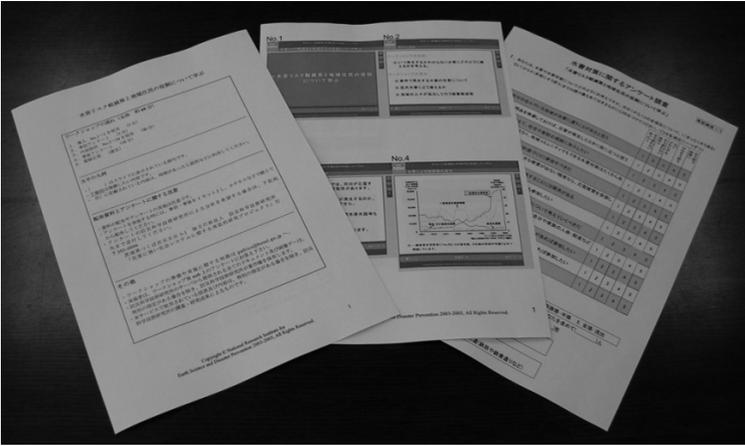


Fig. 6. Documents available at Pafrics website.

of the content for each scenario, guidelines on workshop operation methods, and questionnaires to be distributed to workshop participants are provided to organizers and facilitators of workshops. In the future, it will be made possible for users to register their own content to create new workshop scenarios. So far, we have installed the following six scenarios on the web site (<http://www.bousai.go.jp/sougou/shakai/index.html>) to have wider public accessibility to the social platform of disaster risk communication support system:

- (1) Flood risk reduction measures and the role of local residents.
- (2) Concept of integrated participatory flood risk management.
- (3) Local flood risks and hazard maps.
- (4) flood risk awareness and flood control measures taken by residents.
- (5) Characteristics of flood risks and damage.
- (6) Probable precipitation and flood risk.

Each scenario is designed to take 60 minutes to be given at workshops. Descriptions, material to be distributed, and questionnaires to be distributed to participants are provided in a package. Terminologies, references and questionnaires to be distributed to organizers are also available for facilitator learning support and information gathering for enhancing Pafrics.



Fig. 7. Sample contents at Pafrics website (Originals are in Japanese).

4.2 Scenarios in relation integrated flood risk management

Presented here are the scenarios under “flood risk reduction measures and the role of local residents” and “Local flood risks and hazard maps”.

(1) Sample scenario 1: Learning about flood risk reduction measures and the role of local residents

The objective of the workshop under the theme of this scenario is to “prepare for flood damage that could occur at any time”. The workshop consists of 1) “Characteristics of urban flood damage”, 2) “How to prepare for great flood damage” and 3) “Measures for reducing flood damage through the cooperation of local residents”. Twenty-four contents constitute the workshop. Under 1) “Characteristics of urban flood damage”, the structural vulnerability of cities to flood damage is described. 2) “How to prepare for great flood damage” educates participants on probabilities and probable precipitation, which are important when considering flood damage, and presents examples of flood control measures and flood damage prevention measures taken by flood affected residents based on the results of questionnaire surveys described in Part II. 3) “Measures for reducing flood damage through the cooperation of local residents” lists not only conventional physical measures but also flood damage control measures taken through the cooperation of local residents. The contents are designed to achieve the objectives of the workshop and provide participants with an insight into flood risk communication.

(2) Sample scenario 2: Local flood risks and hazard maps

This scenario has the objective of learning about hazard maps, one of the most important soft measures of flood risk reductions. The workshop includes 1) “Understanding the background to the preparation of the hazard map that has been distributed”, 2) “Understanding the allocation of flood risk reduction roles”, 3) “Requirements prior to taking flood risk reduction measures” and 4) “How to use hazard maps”. The workshop has 18 contents. In 1) “Understanding the background to the preparation of the hazard map that has been distributed”, types, mechanisms, and topographic conditions of flooding are explained. 2) “Understanding the allocation of flood risk reduction roles” shows that many of the flood damage control measures can be taken under normal conditions and that hazard maps are useful for damage prevention under normal conditions. The results of questionnaire surveys on the awareness and ownership of hazard maps among flood affected residents are presented. In 3) “Requirements prior to taking flood risk reduction measures”, the magnitude, frequency, and probability of flood damage are studied, and explanations are given about uncertainty, preparation process, and differences in presentation of hazard maps and from inundated area maps. 4) “How to use hazard maps”

describes considerations when using hazard maps and how to use them. These contents are designed to achieve the objectives of the workshop and enable participants to understand the importance of observing nature of flood risks in local communities under normal conditions.

5 Closing Remarks

The system is now being evaluated through verification tests at a number of disaster prevention workshops in Japan for local residents to find ways to make it easier to use. The knowledge and information required for effective risk communication have been gathered and compiled in this system through cooperation with local residents, disaster prevention NPOs, and other concerned groups. The system performance will be enhanced by strengthening the cost-benefit analysis function through the addition of GIS functions and incorporating the latest research results, and by improving the method of content presentation. The system will also be extended so that it can be used for risk communication regarding other types of disasters such as land-slides, sediment and seismic ones.

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