Toward Social Implementation of DX for Flood Disaster Prevention Activities

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River Department, Flood Disaster Prevention Division

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1. Background of Research

As of April 2023, Flood Prevention Groups had a total membership of approximately 765,000 persons, or about 60 % of the number of approximately 1.22 million in 1971. The increasing age of the members is also a serious issue, and in particular, about half of the full-time members are 60 years old or over.

On the other hand, flood damage has intensified in recent years, the role of Flood Prevention Groups organized in local communities in reducing that damage is becoming increasingly important.

Under these difficult social conditions, the Flood Disaster Prevention Division conducted interviews with Flood Prevention Groups throughout Japan to understand the problems they are facing and study support measures for achieving higher efficiency in their activities. Based on the interview results, we arranged the issues as follows, focusing especially on “exchanges of information.”

1)Coping with a huge volume of information (higher efficiency in information processing)

Because the flood disaster prevention activities that must be carried out in times of disaster are diverse and the location of activities has a wide spatiotemporal range, there were numerous opinions that excessive time is required to process diverse information because it is necessary to judge which activities are to be carried out next.

2)Speeding up individual information transmission

Although there are also some Flood Prevention Groups that use SNS message transmission functions for mutual contact within the group, many groups use telephone or wireless communication networks. Many expressed the opinion that transmission of status reports and instructions by telephone or wireless communications requires excessive time.

3)Centralized aggregation of information

Information on water levels, the amount of rainfall, etc. is necessary for understanding the situation and making judgments about instructions. However, because those various types of information are posted on separate websites, the task of switching between various websites and comparing information is a factor in the excess time required to collection information.

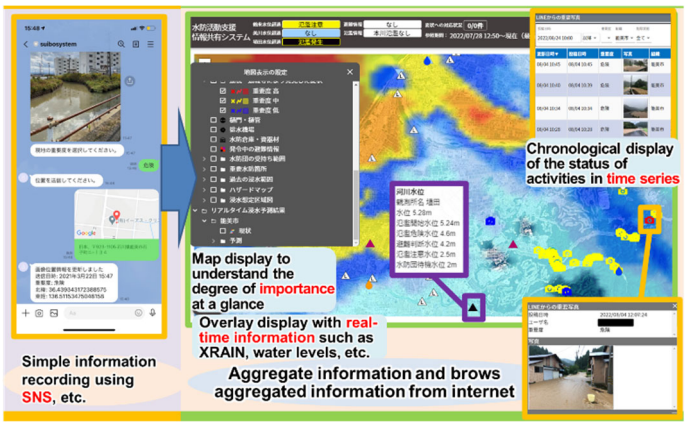

Fig.-1 Overview of the system

2. Overview of the Developed System

As a response to the issues arranged in the previous section, incorporation of ICT technology, which enables real-time, centralized aggregation and sharing of various types of information collected by those involved in diverse activities in the existing flood disaster prevention activities was considered effective. Therefore, in FY 2020, we constructed a “Flood disaster prevention activity support information sharing system” (hereinafter, “the system”). An overview of the system is shown in **Fig.-1**. The system can be broadly divided into the following functions.

1) Simple information recording using SNS

Simple recording and reporting of the condition at the site to the system in a dialogue format is possible from the SNS (LINE©) screen. Recorded information can also be browsed by Flood Prevention Groups and related organizations from the system website.

2) Map display to understand high-importance locations at a glance

It is possible to display reported information on a map on the system website and instantly share it with related organizations. Since screening and selection of information is easy, this function is expected to result in improved efficiency when processing large volumes of information.

3) Concentrated display of information necessary in flood disaster prevention activities on map

Dynamic information such as the condition of rain

(XRAIN), the level of rivers, etc. and static information such as the range of inundation in the past and critical

locations for flood disaster, which have been recorded in advance, can be displayed overlaid on maps. Centralized aggregation of the information necessary for flood disaster preventions is possible on the system screen.

Photo-1 Condition of demonstration experiment

3. Knowledge Gained from Demonstration Experiments

To verify the effectiveness of the developed system, demonstration experiments were carried out by 7 local governments over a 3-year period from FY 2021 to FY 2023 (**Photo-1**), and many opinions were obtained (**Table-1**). Based on these opinions, the functions of the system are being improved each year. **Table-1** also shows examples of the functions implemented to reflect opinions up to the present.

Thus, while continuing to reflect the opinions from the field in the functions of the system, we gained the following knowledge through this 3-year demonstration experiment.

1) Depending on the area, the information required in flood disaster prevention activities and the perspective on information and the content of activities differ, and various functions are required in the system.

2) For that reason, it is estimated that aiming at an all-purpose system that can be used in all regions has the opposite effect of making the system more complicated and difficult to use.

3) Based on the above, a combination of a basic system, which enables information transmission of items that are essential regardless of the region, and compatible supplementary packages suited to the way the system is used, corresponding to the region, is an effective approach. In addition, study of concrete methods of using the system and scenes of use, including its relationship with the existing telecommunication methods that are widely used in each region, is an important issue when envisioning future social implementation.

Where these points are concerned, further arrangement of the characteristics of each region, based on demonstration experiments in other regions, is demanded.

Table-1 Representative opinions and examples of functional improvement

Opinions on improvement	Improvements based on opinions
• In case inundation extends over a large area or scattered abnormalities exist in a series of districts, it should be possible to report for certain designated areas, and not a single point.	• The system was improved to allow reporting about locations not only as "points," but also as "areas" and "lines."
• To accumulate response histories of single disaster locations i.e., "Report"⇒ "Judgment/instructions"⇒"Start of countermeasures"⇒"Completion of countermeasures," it should be possible to arrange the condition of response at each location following the time series.	• A time-series aggregation function was added.
• In flood disaster prevention measurements, a large amount of information is recorded, so important information may be buried. This should be avoided.	• A function to prevent overlooking newly arrived information was added. • Function for changing the degree of importance.
• The large number of buttons on the screen makes it difficult to understand what I can do by pushing what button. Even assuming the system has many functions, it's meaningless if they are hard to understand.	• The menu composition was simplified.
• It should be possible to reload the information being displayed with the latest information at an optional timing.	• An update button was added.

4. Initiatives for Social Implementation

These initiatives using the system can be arranged with the following positioning.

The first is reducing the flood damage in the areas where activities of Flood Prevention Groups are carried out by making those activities more efficient. The second is stimulating to desire to conduct software development by the private sector related to support for flood disaster prevention activities. Although information sharing had not attracted attention until now, private-sector software development could be stimulated by identifying the needs in the field for information sharing support for flood disaster prevention activities by experiments, etc. using the system, and presenting those needs to society. This is expected to enable a free selection of software that suits the needs of each area by making software with various distinctive features available to the public.

The conceivable means for achieving the goals outlined above are considered to include ① Determining needs through demonstration experiments, etc. and presenting the functions required in the system in a collection of cases studies, guidelines or the like, so that they function as requirements based on the needs of the field in software development by private-sector companies, and ② Returning the know-how of system development and improvement widely to society by making the system available as open-source software, tie-ups between private companies and local governments, etc. In the future, the Flood Disaster Prevention Division will study the optimum measures for achieving this.

☞ For more information:

1) "Flood Disaster Prevention Support Information Sharing System" Wins the 24th Infrastructure Technology Development Award" (JICE/CDIT)
https://www.nilim.go.jp/lab/bbg/20220803_JICEhyousyou.pdf