

# "Techniques" for "Supporting" "Flood Prevention Activity" for Community to Take with a Unified Effort

(Study period: FY2017 to FY2019)

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*key words: flood prevention activity, flood prevention group, flood damage mitigation, supporting techniques*

## 1. Advent of an age to address floods with a unified effort

In recent years, a large scale flood exceeding the discharge capacity of river has occurred almost every year at many places in Japan and caused enormous damage to local communities including personal injuries, such as the 2016 Typhoon No. 10, July 2017 Northern Kyushu Heavy Rain, July 2018 Western Japan Heavy Rain, and October 2019 Typhoon No. 19. In the future, the frequency of a flood exceeding the discharge capacity of river is expected to increase due mainly to the impact of climate change. To address such floods, it is essential to advance comprehensively the reduction of flood frequency by active promotion of river development (disaster prevention) and damage control (disaster mitigation or risk management). To this end, river administrators (mainly the State and prefectures), flood prevention managers (mainly municipalities), and local communities need to make a unified effort to address floods. This paper focuses on "Damage control activity for community to take with a unified effort in case of a flood ("flood prevention activity"), which is one of the leading means of damage control as stated above. In order to implement flood prevention activity effectively and reasonably and thereby mitigate flood damage, i.e. reduce the impact on local community to the extent possible, what techniques ("flood prevention activity supporting techniques) should river administrators support"? This paper intends to propose flood prevention activity supporting techniques focused on "information."

## 2. Various contents of flood prevention activity

To propose flood prevention activity supporting techniques, it is requisite first of all to grasp the status of flood prevention activity. Then, in this study, we conducted hearings from a total of 12 flood prevention control groups and teams (including firefighting teams) in 3 years to grasp the status of flood prevention activity. Common matters obtained from the hearings are as follows. 1) Necessary to address water overflow from a branch river or inland water inundation before addressing a flood of major river or river levee deformation (sand bag stacking). 2) Various actions and much time and effort are required to address flood of a branch river or inland water inundation, including sand bag preparation and carrying, stacking them near the branch river / houses,

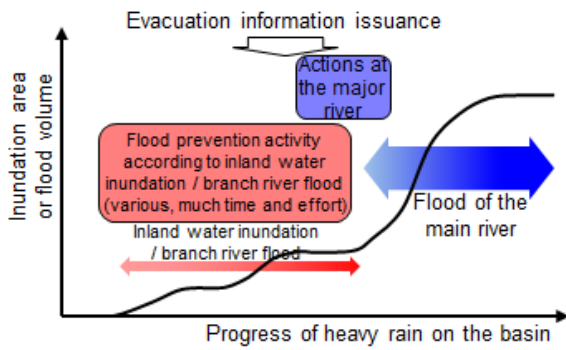


**Photo 1 Hearing about the status of flood prevention activity**

evacuation guidance, support of household goods protection, attention calling on the inundated road, relief activity with a boat, and drainage work. 3) Accordingly, a case could occur where it is difficult to address the risk of flood from a major river, which could cause enormous damage to the community once it occurs. In addition, there is a difference according to areas in terms of i) degree of recognizing sites prone to inundation / flood, ii) diversity of the entity of flood prevention activity (method of role sharing for various contents of flood prevention activity), and iii) substantial entity who makes a decision for implementation of floor prevention activity, and this difference seems to be related with the frequency of experiencing inundation damage or status of urbanization.

## 3. Flood prevention activity supporting techniques based on the status of community

From the status of flood prevention activity stated in the preceding section, flood prevention activity could be interpreted as "overall activity for preventing / mitigating damage from inundation etc. that occurred at the community in the process of increase in the risk of flood from a river due to heavy rain." **Fig. 1** represents the image of time series for this. According to this interpretation, the priority of providing information that is based on community and supports selection of the content of flood prevention activity and decision on implementation thereof would be considered high in flood prevention activity supporting techniques, such as "To what risk is this area exposed now?" "What risk will arise next in this area?"



**Fig. 1 Image of time series progress in local deformation and flood prevention activity required**

In consideration of the above, we propose flood prevention activity supporting techniques as follows together with the method of evaluating the effects obtained from the techniques. With these techniques, it is possible to conduct, effectively and efficiently, flood prevention activity to be required in the event of flood of branch river or inland water inundation, and to secure "time to address flood from a major river that could subsequently occur and cause enormous impact once it occurs," and thereby mitigate damage to the area is strongly expected.

- (1) Water level forecast information on branch and major rivers

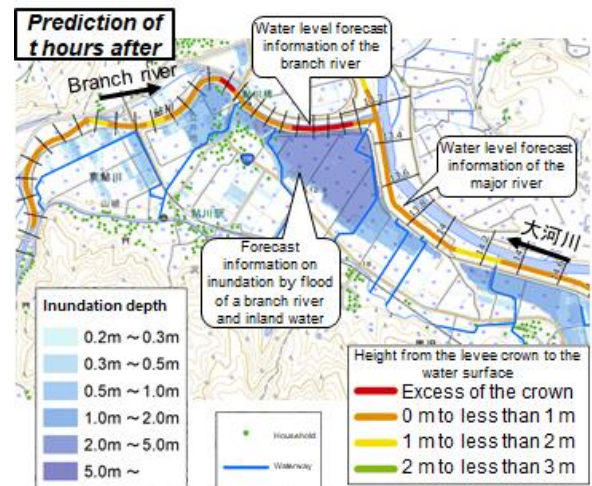
As Fig. 2 shows, once the water level forecast information on the sections where the risk of overtopping flood is high is provided, time to prepare flood prevention activity, time to consider arrangement of flood prevention activity personnel on the site, etc. will be secured and more effective flood prevention activity is expected from the screening of inspection points. Moreover, in the water level forecast of a major river, consideration of the extent of overflow depth on the levee would be useful for decision of whether to evacuate the field people engaged in flood prevention activity.

- (2) Forecast information on inundation by flood of a branch river and inland water

As Fig. 2 shows, delay in such activities as road closure or pump drainage can be prevented by providing forecast information on flood of a branch river and inland water inundation, which frequently occurs prior to flood of a major river. It is also possible to secure the time to consider how to guide residents to the evacuation route, which contributes to evacuation in a safer situation.

- (3) Status of water level in branch and major rivers  
Grasp of the status of water level in not only major rivers but branch rivers will prevent the timing of switching from preparation to implementation of flood prevention activity based on the forecast information in (1) above from being lost.

- (4) Risk information map focused on the relative possibility of human damage <sup>1)</sup>



**Fig.2 Image of overlapped forecast information as flood prevention activity supporting technique (forecast information on deformation in the "community")**

This risk information map was created by overlapping the estimated inundation map based on flood of a major river with the estimated inundation map based on flood of a branch river / inland water. The map will enable screening of relatively high risk areas, where moving is difficult in case of evacuation and possibility of human damage is high if a major river floods. The map will also enable prior grasp of areas where evacuation guidance by door-to-door visit is preferable, which is expected to lead more effective evacuation guidance, etc.

#### **4. Damage prevention in communities using flood prevention activity supporting techniques**

In order to realize damage prevention in communities by implementing the flood prevention activity supporting techniques we have found as stated above, we intend to build the foundation of local disaster prevention activity support information by applying these supporting techniques on a trial basis to the model river basins and identifying / solving new issues through practical use.

#### **See the following for details.**

- 1) Takeuchi, Kobayashi, Itagaki: "Proposal of flood prevention activity supporting techniques focused on grasp of the status of flood prevention activity and evacuation guidance," Collection of Papers on River Engineering, Vol. 25, pp. 145-150, 2019.