

For Elimination of Flood Risk Information Vacuum Areas in Small- and Medium-sized Rivers

(Study period: FY2017-)

MUKAIDA Kiyotaka, Researcher, ITAGAKI Osamu, Head,
River Department, Flood Disaster Prevention Division

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1. Introduction

In recent years, devastating flood disasters occurred in various places in Japan, including the July 2017 Northern Kyushu Heavy Rain, the July 2018 Western Japan Heavy Rain and the October 2019 Typhoon No. 19.

In order to respond to the frequent occurrence of large-scale heavy rain and flood including floods in excess of the design size of flood control facilities, for which the impact of climate change is indicated, it is further important to share flood risk information in society including the estimated inundation map in order to promote damage prevention / mitigation measures in case of flood, as well as promotion of the development of flood control facilities.

Hazard maps issued by local governments are used as one of the important tools for communicating flood risk information to local residents, and the estimated flood / inundation area maps, etc. prepared by the State and prefectures are used as flood risk information to be described on hazard maps. Social importance of such flood / inundation area map has been increasing as known from the mass media's reporting about the consistency of estimated and actual inundation areas.

2. Flood risk information vacuum area in small- and medium-sized rivers

Under the Flood Control Act, river administrators are required to specify estimated flood / inundation areas for some types of rivers (river required to forecast flood / river required to communicate water level). As of October 2019, a total of 2,063 rivers (preliminary value) have been specified.

However, most of the rivers administered by prefectures, totaling as long as about 110,000 km in length, are not specified as any of the rivers stated above and river administrators are therefore not required to prepare an estimated flood / inundation area map for them. The rivers not specified as stated above are hereinafter called "other rivers." Areas along other rivers (flood risk information vacuum areas) may be misunderstood as "safe area for flood" even if the flood risk of the area is originally high and a place or route of evacuation may be designated in the area. Therefore, provision of true information is extremely important for risk communication. In the

October 2019 Typhoon No. 19, devastating flood damage also occurred in the flood risk information vacuum areas of other rivers (Fig. 1, Table).

Note that as the main reason for non-provision of flood risk information including estimated inundation maps in other rivers, it is difficult with limited budget and personnel to acquire the data of longitudinal and cross sections of rivers, which is necessary to estimate inundation for target rivers of which total extension is extremely long.

3. Activities for eliminating risk information vacuum areas

Considering the limitation stated above, the Flood Disaster Prevention Division, giving top priority to the elimination of flood risk information vacuum areas, has developed a simple flood risk information preparation method¹⁾ using the longitudinal and cross sections of rivers based on LP (airborne laser survey) data, and is supporting the following researches and studies for field use.

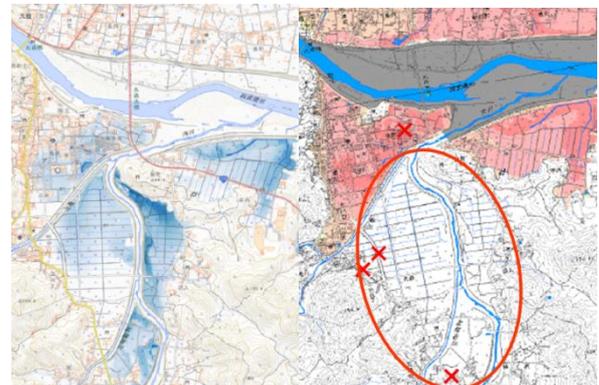


Fig.1 Events of inundation outside the estimated flood / inundation area (2019 Typhoon No. 19)
(Left: Estimated Inundation Gradient Tints Map (Geospatial Information Authority of Japan)
Right: Added to the Estimated Flood / Inundation Area Map (Sendai Office of River and National Highway)
Red "X": Site of personal injury based on the data of Professor Ushiyama at Shizuoka University. * From the Material of the Water and Disaster Management Bureau of the MLIT³⁾

Table: List of the numbers of rivers collapsed by the 2019 Typhoon No. 19

Prefecture	The numbers of rivers collapsed	Dry riverbed of the river required to communicate water level, etc.	Other dry riverbed
Miyagi-ken	18	4	14
Fukushima-ken	23	9	14
Ibaraki-ken	4	3	1
Tochigi-ken	13	6	7
Saitama-ken	2	0	2
Niigata-ken	2	2	0
Nagano-ken	5	0	5
Total	67	24	43

* From the Material of the Water and Disaster Management Bureau of the MLIT ³⁾

(1) Utilization by local governments when considering an evacuation plan

In order to support the examination of an evacuation plan in the risk information vacuum areas along other rivers, the NILIM is supporting the examination of an evaluation plan by local government by preparing a simple estimated inundation map (Fig. 2) on a trial basis for model rivers in two municipalities in cooperation with the Cabinet Office, Flood Risk Reduction Policy Planning Office, River Environment Division, Water and Disaster Management Bureau, MLIT, prefectures, cities, villages, etc.

In preparing the map above, we prepared it on a trial basis as shown in Fig. 2 considering the opinions in favor of an estimated inundation depth distribution map available in the event of a flood with the estimated maximum scale, rather than the overlapped map of estimated inundation areas for each flood of multiple scales, which had been prepared on a trial basis by the Flood Disaster Prevention Division up to the last fiscal year

In addition, we participate in meetings with local residents to exchange opinions with residents, local government personnel, etc. Some participants in the meetings stated that the image map of locations prone to inundation based on the past inundation events, site condition, etc. is consistent with the simple estimated inundation map, further, we confirmed that utilization of the simple map is effective to a certain extent in examination of an evacuation plan for the risk information vacuum areas of the river.



Fig. 2 Simple estimated inundation map (estimated maximum scale: Trial version)

(2) Engineering workshop on the flood damage risk assessment of small- and medium-sized rivers
 In addition, for elimination of the risk information vacuum areas along rivers, "Engineering workshop on the flood damage risk assessment of small- and medium-sized rivers" ³⁾ (Chairman: TAKEUCHI Koji, Professor of the University of Tokyo Graduate School) was established by the Water and Disaster Management Bureau of the MLIT in order to conduct technical review on the simple inundation estimation method using LP data, etc. and expand the "Guide" ²⁾. In the first Engineering Workshop, held on January 7, 2020, discussion was made about the calculation conditions in simplification, etc. and academic members stated their opinions about the importance of assessment on the accuracy of calculation and phenomena including back water, and local government members stated their opinions about the high social needs for provision of estimated inundation maps of other rivers. This review is going to be continued in order to expand the Guide by June 2020.

4. Study perspectives

We intend to prepare and release in turn simple estimated inundation maps for elimination of risk information vacuum areas along small- and medium-sized rivers in coordination with prefectures and continue to study the specific utilization method of the map, etc. in the disaster prevention and city planning fields.

☞ See the following for details.

- 1) Proposal of a simple flood risk information preparation method using aerial laser survey data for small- and medium-sized rivers, Collection of Papers on River Engineering, Vol. 25, pp. 31-36, June 2019.
- 2) Flood Risk Reduction Policy Planning Office, River Environment Division, Water and Disaster Management Bureau, MLIT and Flood Disaster Prevention Division, River Department, NILIM: Guide to simple flood risk information preparation for small- and medium-sized rivers http://www.mlit.go.jp/river/shishin_guideline/pdf/chushou_kaninarisuku_tebiki.pdf, December 2018
- 3) Engineering workshop on the flood damage risk assessment of small- and medium-sized rivers, https://www.mlit.go.jp/river/shinngikai_blog/tyusyokasen/index.html, January 2020