

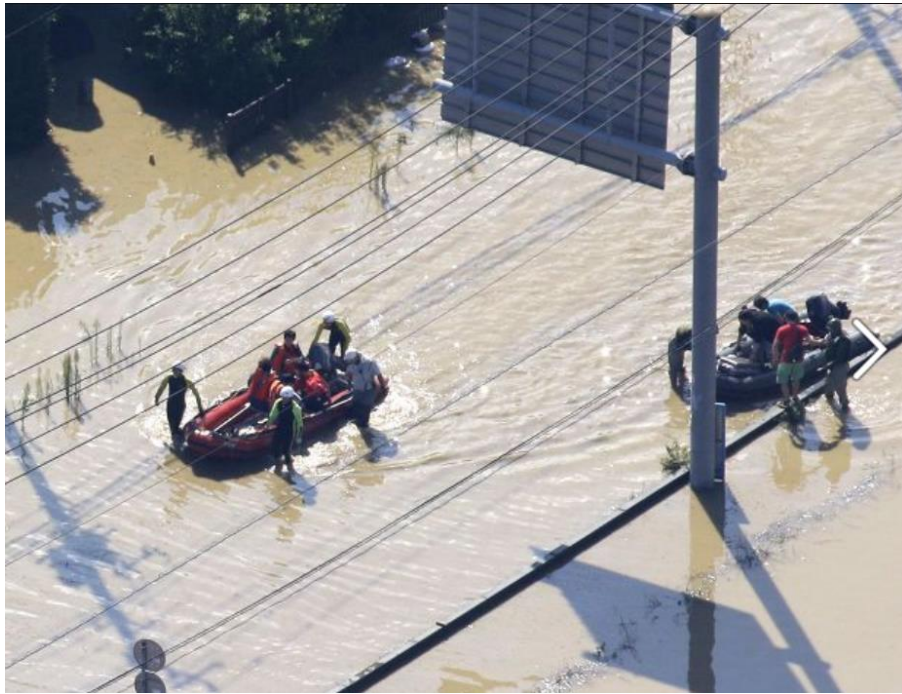


Hearing Survey on Evacuation Behavior of the Residents in Heavy Rainfall Disaster in Heavy Rainfall in Kanto and Tohoku District

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(Sep. 2015) Overview of the Flooding Kinugawa River Basin



Rescue operation (quoted from Mainichi web news)

In a heavy rain in Kanto and Tohoku regions, September 2015, the embankment of the Kinugawa river collapsed and a severe flood disaster occurred in Joso city, Ibaraki prefecture. The most part of Joso city was inundated. About 4,300 residents who had failed to escape were rescued by helicopters and boats.

Quoted from 「平成27年9月関東・東北豪雨」に係る
鬼怒川の洪水被害及び復旧状況等について(January 29th, 2015)
Kanto Regional Development Bureau, Ministry of Land,
Infrastructure, Transportation and Tourism

Overview of the Hearing Survey in Joso City, Ibaraki Pref.

Survey period : 21-23th November 2015

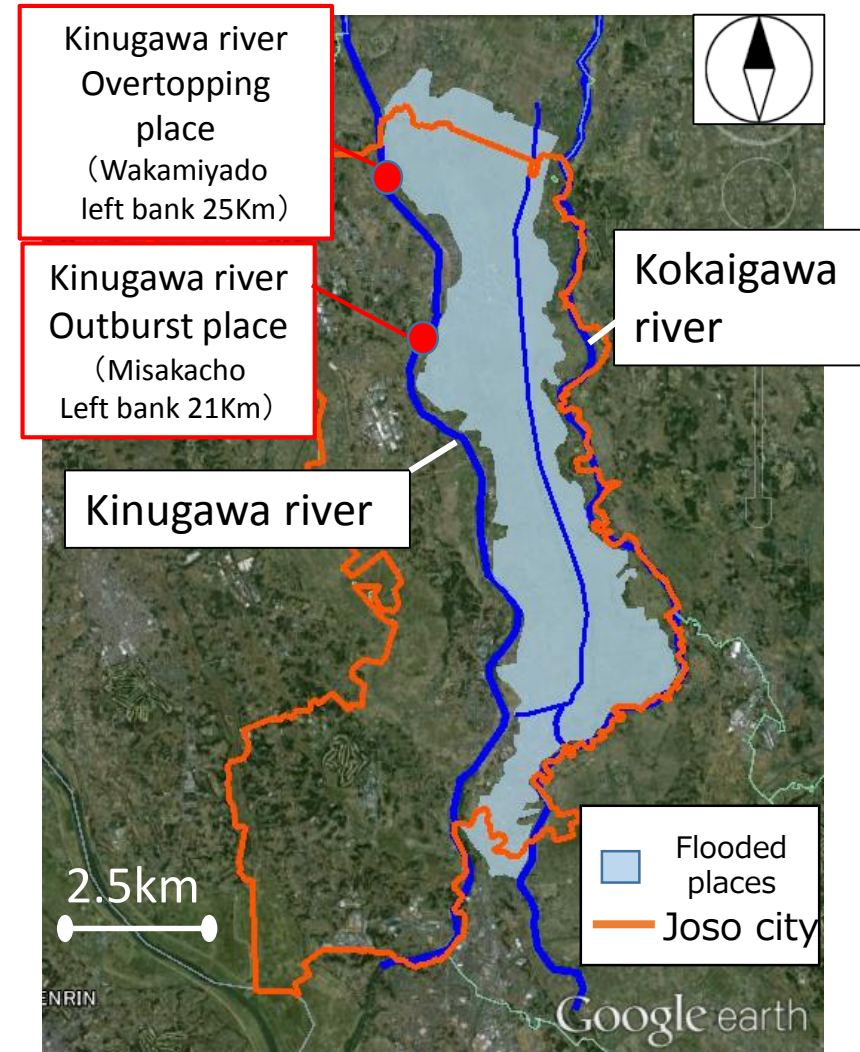
Target :

- Residents in the inundation areas
- Residents who live in the areas where evacuation orders have been issued

Surveyer : 20 students

The number of acquisition : **516**

Survey method : Visted houses



Population : 64,854人 (October 1st, 2015)

Population in basin : 43,195 (Joso city website)

The number of evacuees at the flood : 6,223人 (Ibaraki Pref. Disaster Countermeasure Office)

Maximum flooded area : 40km² (Geospatial Information Authority of Japan)

Questions

1. On the event of a disaster(13 questions)

- Inundation of home
- Situation of rescue requests
- Reason of rescue requests
- Situation of evacuation
- Reason of evacuation decision-making
- Trigger of evacuation
- The reason you were at home
- Disaster information you were hearing
- Ways of disaster information
- Ways and timing of evacuation orders
- Understanding of evacuation orders
- Ways to get information about the rivers
- Confirmation of the hazard map



The picture of hearing survey at home

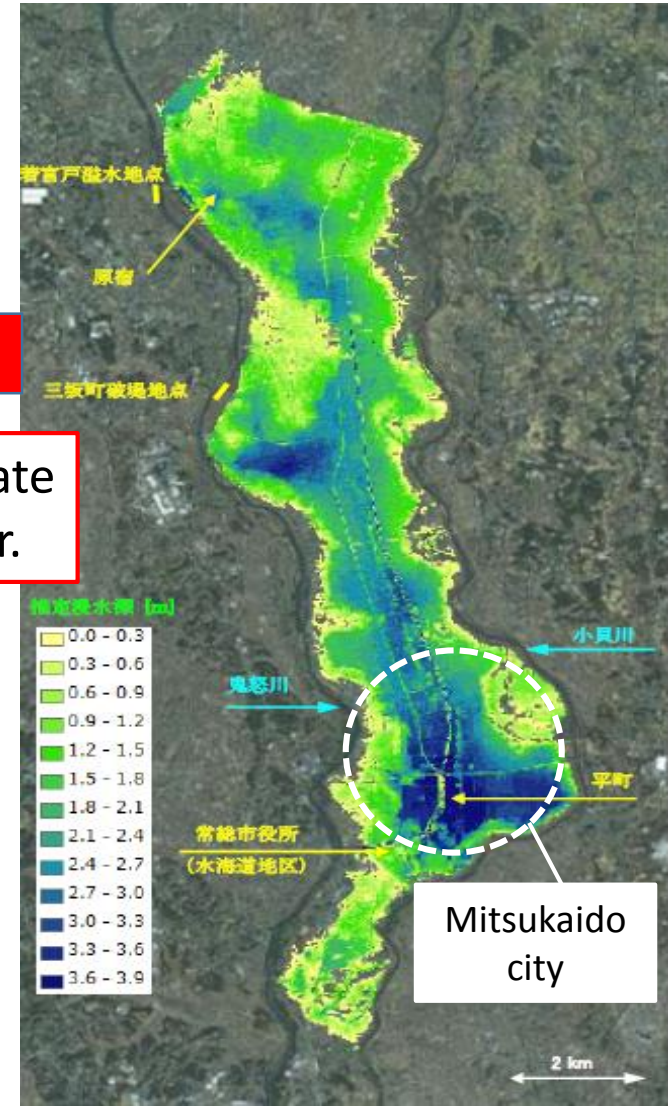
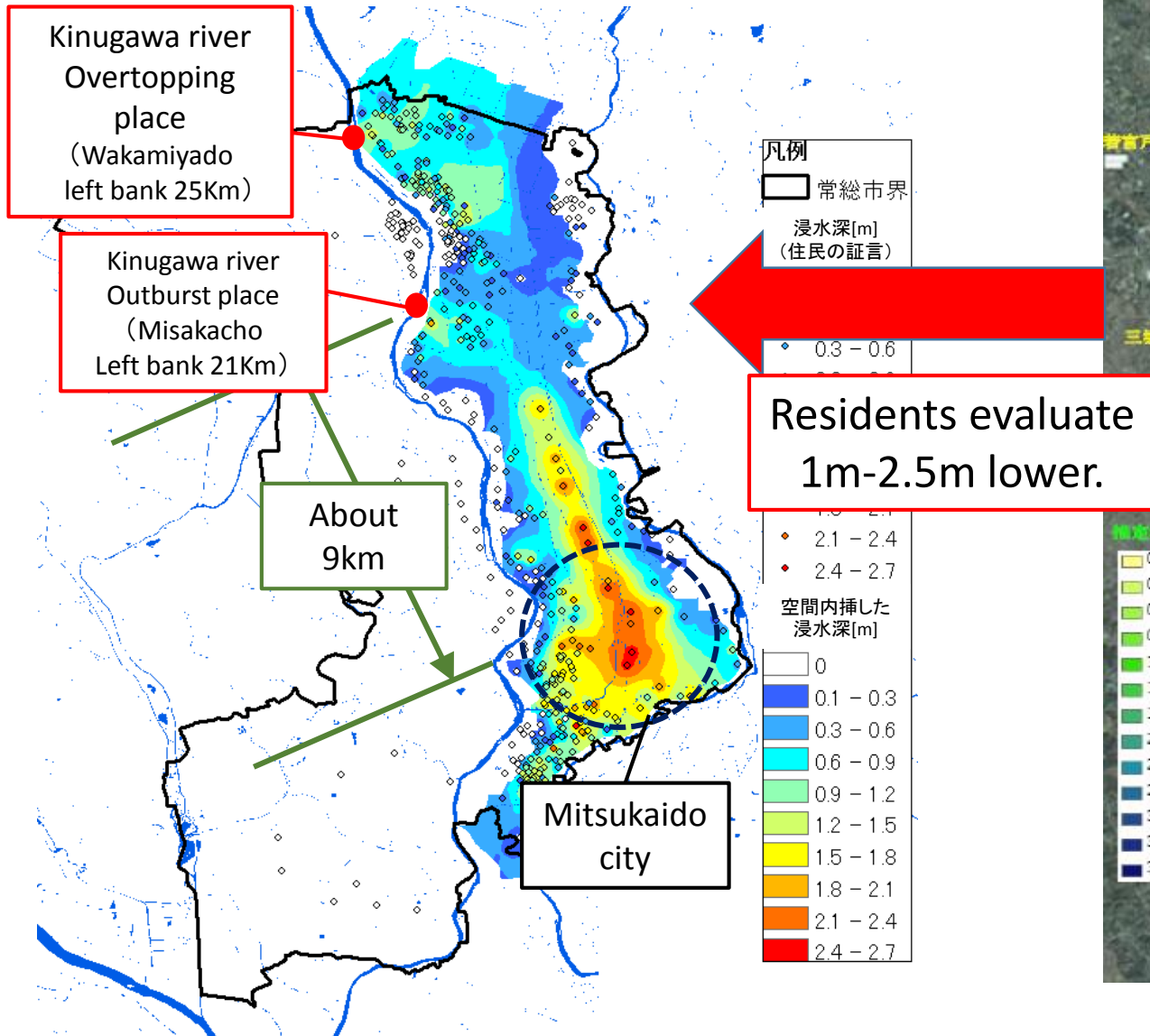
2. Awareness of the disaster and attributes (11 questions)

- Reviewing frequency of the hazard map
- Flood disaster experience
- Understanding of “Evacuation judgment water level” and “Flood danger water level”.
- Possession of go-to shelters
- Understanding the possibility of house floods
- Understanding the inundation depth of house
- How long they could withstand the flood at home
- Age
- Member of family
- Infants
- Type of house
- Duration of residence



The picture of the hearing survey at shelter

Comparison Maximum Inundation Depth Between the Estimation and Hearing Survey



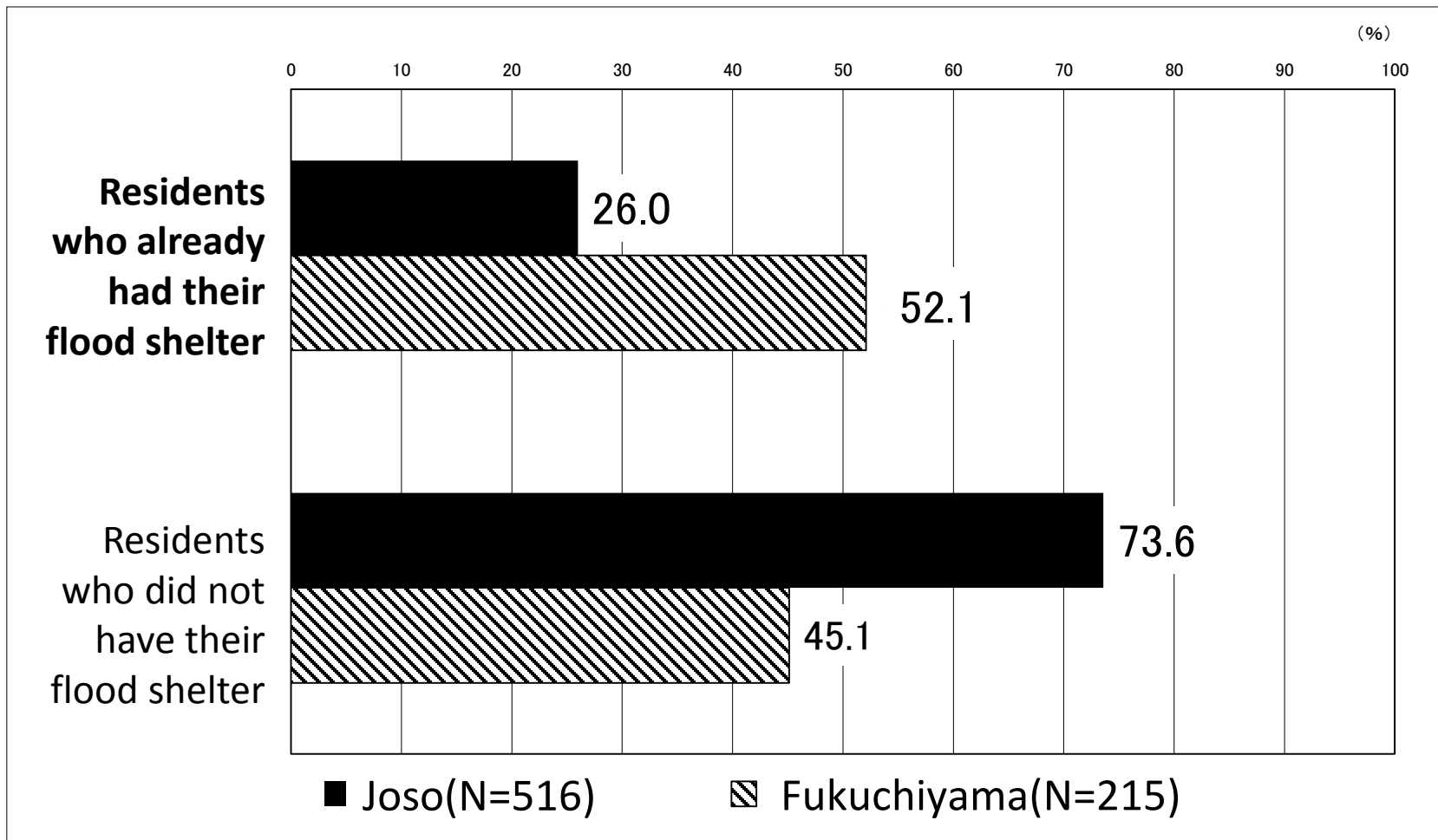
Maximum inundation depth by hearing survey

The estimation result of maximum inundation depth using GPS by Sayama*

(*平成27年関東・東北水害 鬼怒川氾濫による
常総市周辺の浸水深分布調査 第二報)

Comparison of the Possession of go-to Shelters between Joso Residents and Fukuchiyama Residents

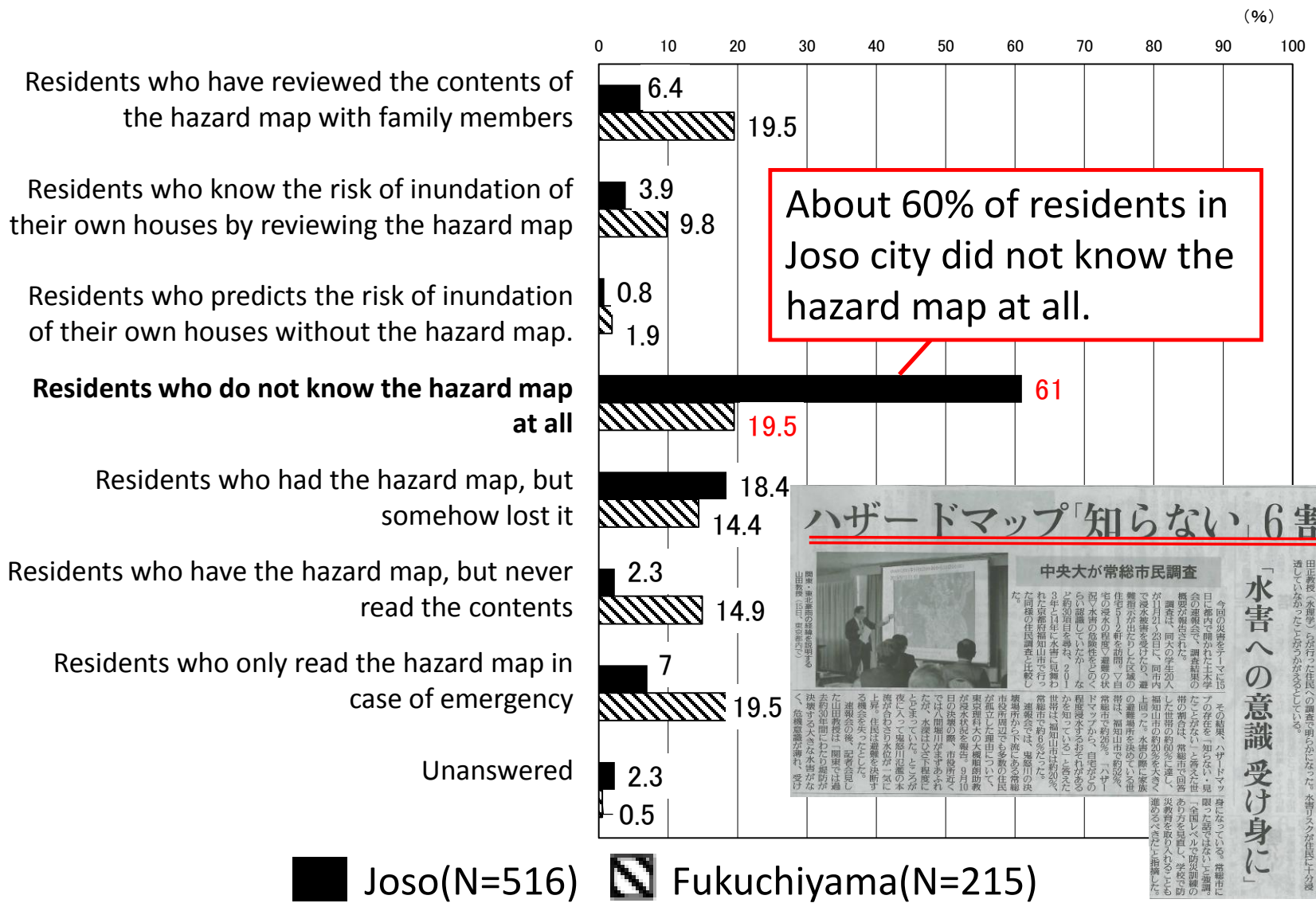
Question: Did you already had a flood shelter in your daily lives?



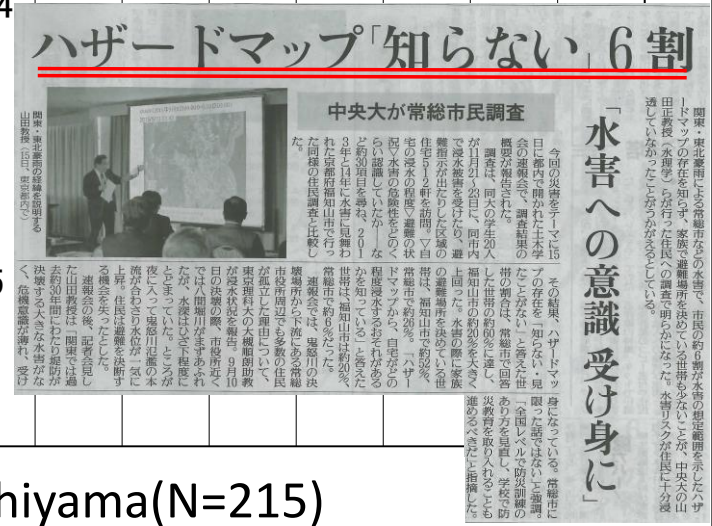
The percentage of residents who have chosen a flood shelter in Fukuchiyama is higher compared to Joso.

Comparison of the Awareness of the Flood Hazard Map between Joso Residents and Fukuchiyama Residents

Question : Have you read the hazard map?

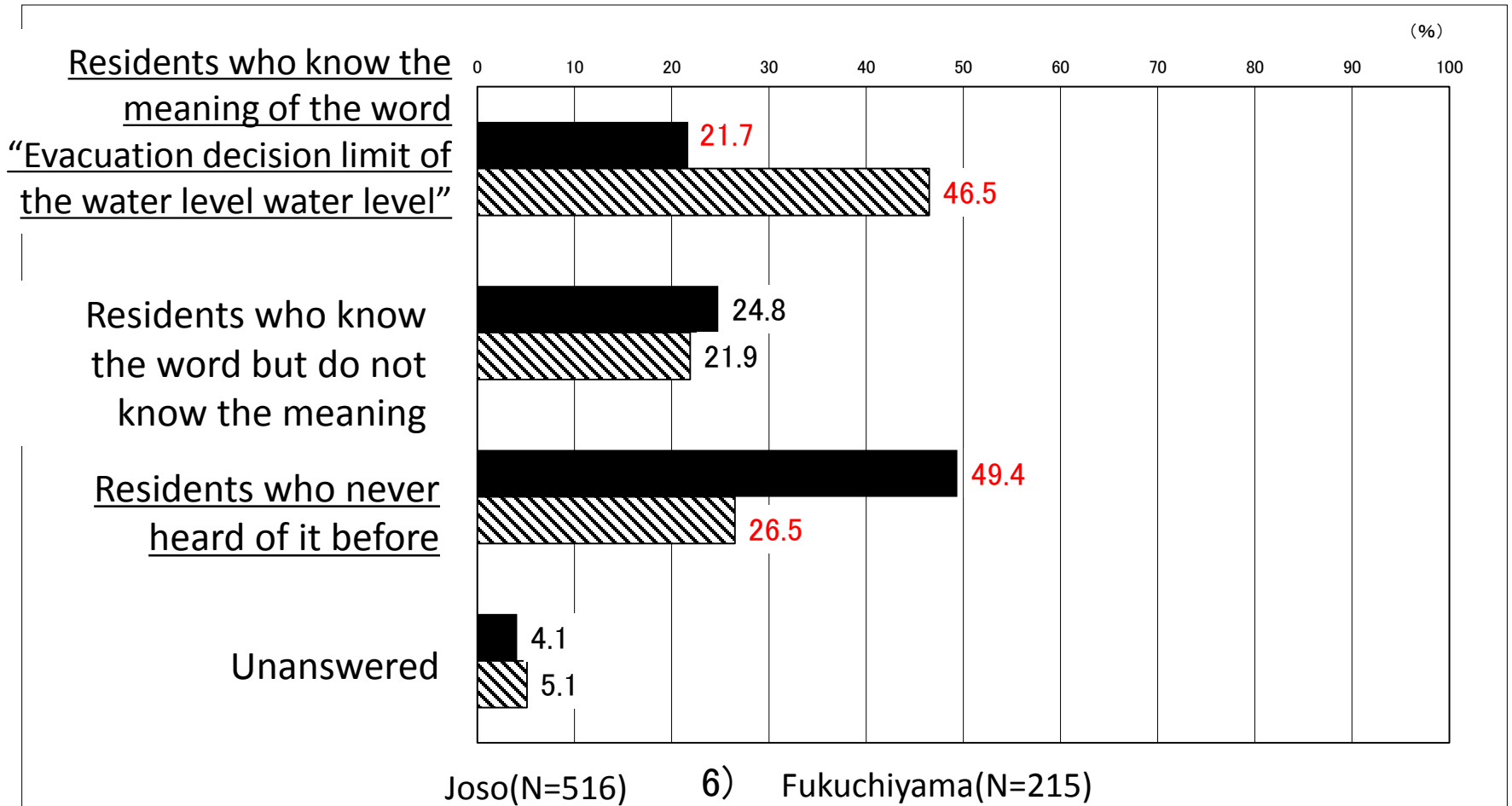


About 60% of residents in Joso city did not know the hazard map at all.



Comparison of the Understanding of “Evacuation Decision Limit of the Water Level” between Joso Residents and Fukuchiyama Residents

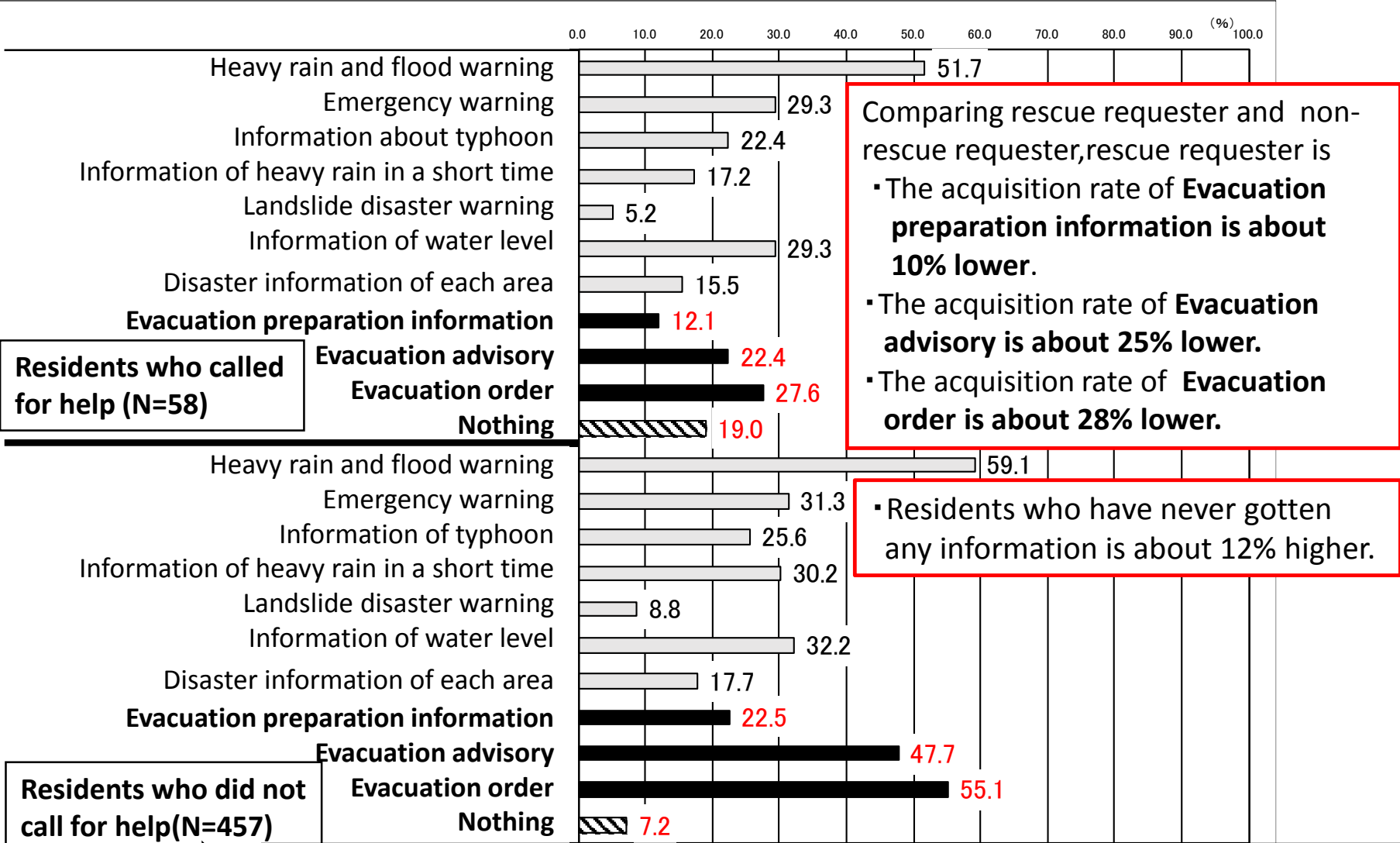
Question: Do you know the word “Evacuation decision limit of the water level”?



About half of the residents in Fukuchiyama city know the meaning of the word, while half of the residents in Joso city never heard the word before

The Relationship Between the Rescue Request Situation and the Reached Information During the Disaster in Joso City

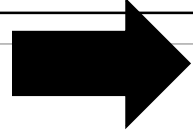
Questions: "Did you call for rescued?" × "What kind of disaster information did you hear at the time of flood?(answers can be multiple)"



Comparing rescue requester and non-rescue requester, rescue requester is

- The acquisition rate of **Evacuation preparation information is about 10% lower.**
- The acquisition rate of **Evacuation advisory is about 25% lower.**
- The acquisition rate of **Evacuation order is about 28% lower.**

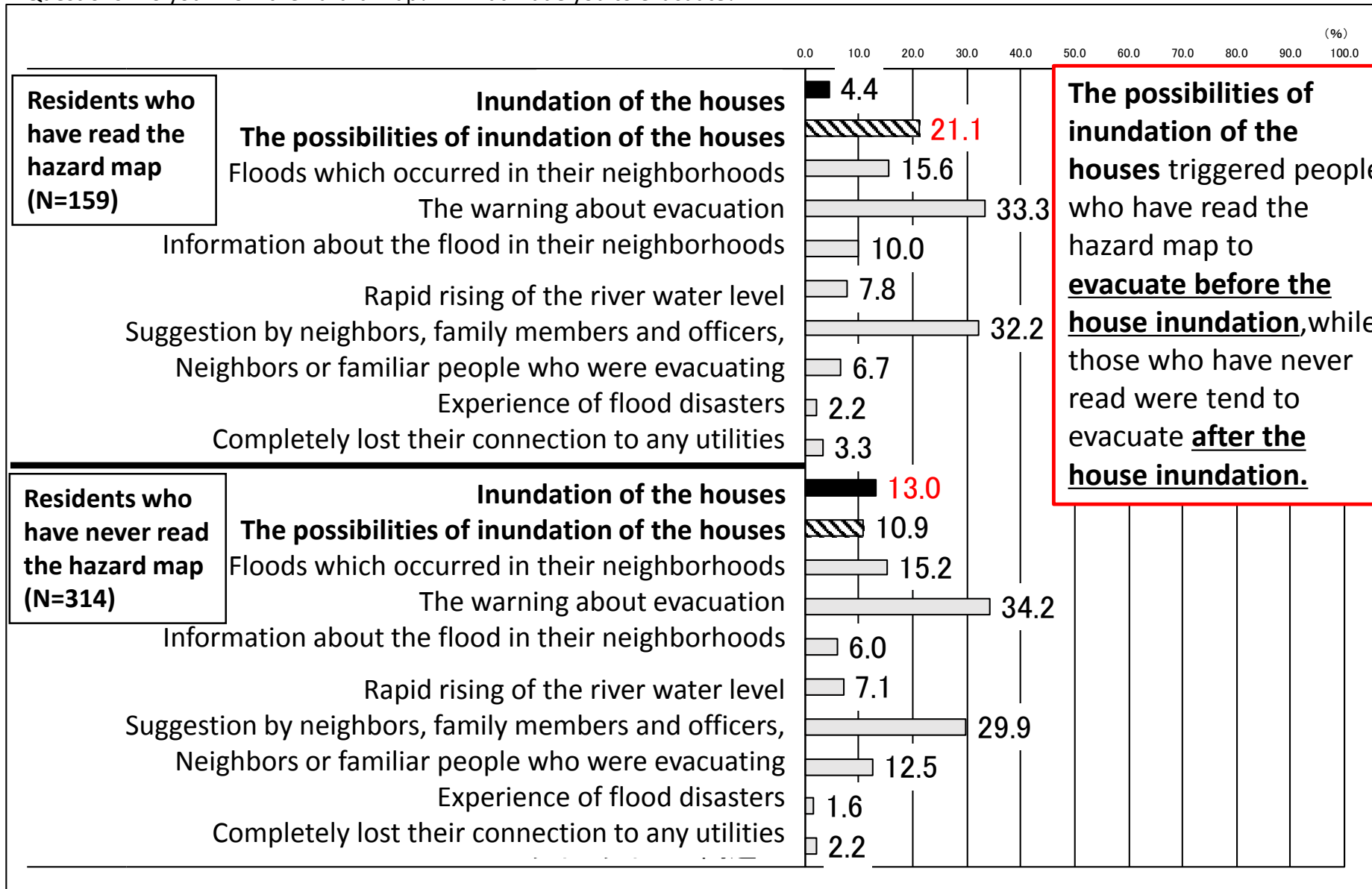
▪ Residents who have never gotten any information is about 12% higher.



The importance of reachability of information !

The Relationship between Understanding of the Hazard Map and the Triggers of Evacuation in Joso City.

Questions: Do you know the hazard map? × What made you to evacuate?



The possibilities of inundation of the houses triggered people who have read the hazard map to evacuate before the house inundation, while those who have never read were tend to evacuate after the house inundation.

Summary

- ① Comparison between the residents in Joso city and the residents in Fukujiyama city:
 - (1) The less numbers of Joso residents had a go-to shelter than Fukujiyama residents.
 - (2) The less number of Joso residents who know the word “Evacuation Decision Limit of the Water Level” than Fukujiyama residents.
- ② 60% of Joso residents do not know the hazard map at all.
- ③ Joso residents who were rescued during the flood had not had enough information about evacuation.
- ④ Joso residents who have read the hazard map before, tend to evacuate before inundation.

Suggestions by investigation team of the heavy rainfall disaster in Kanto-Tohoku region

- ① To raise the consciousness of flood disaster among the residents, it is crucial to improve the hazard maps to be more coherent, and to conduct evacuation drills in regional unit and school unit.
- ② Also, we have an urgent need to upgrade the system of flood forecasting, such as to meliorate the existing functions of numerical analysis and observation and to establish a function, which can unite and manage the vast amount of information of floods. We aim this upgraded system to be a functional evacuation support device for residents and administrative offices.

Suggestions by investigation team of the heavy rainfall disaster in Kanto-Tohoku region

- ③ Concurrently, we need to consider reinforcing and inventing technologies that are tenacious enough for long hours of flooding and overflow to gain time for residents to evacuate when it comes to flood. Those floods must exceed the estimated high-water level. Especially elaboration of a whole river levee against permeation and overflow is an absolute necessity. There is no use in improving just one block of the levee because the levee lies along the whole river. In order to put into practice, we promptly need to advance the river development in accordance with the blueprints.

Suggestions by investigation team of the heavy rainfall disaster in Kanto-Tohoku region

- ④ We should introduce a risk assessment of possible flood damages by considering the uncertainty of flood external force and the uncertainty of levee strength.
- ⑤ Furthermore, we ought to revise a flood evacuation planning that considers both inundation by river water and inundation inside the levee.
- ⑥ Building a system that is more efficient and appropriate flood prevention activities is vital; we do it by reconsidering of the existing flood prevention activities and the systems.