

## URBAN FLOOD IN JAPAN: THE LIMITS OF A MOUNTAINOUS-BASED PROTECTION

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### INTRODUCTION

This research, based on the study of the Tōkai flood in Nagoya during the 11 and 12 September 2000 event, tends to draw up the balance sheet of the flood risk management, its strengths and its weaknesses. The purpose here is also to put in light the important role of mountains in the preventive flood risk management and to explore a paradox: despite the fact that these mountains are very lightly populated, and thus that they do not represent an important stake in terms of vulnerability, they have been for a long time representing a key in flood management in Japan.

In Japanese mountains, numerous hazards can be found. Telluric risks as earthquake or volcanism are the most famous. But the geographical conditions, associating a large amount of precipitations during the “baiū” season (June to July) and “shūrin” season (September to October during the path of typhoons) and mountainous river basins, generate important hazards such as flood, debris flow, landslide, mud flow, rock fall, ... The river’s longitudinal profiles are often tense and very irregular. They are responsible for the speed of the flood propagation. The high slope of the mountainside generates the surface runoff in case of heavy rainfall, despite the continuous and permanent plant cover. But, as they are not very much populated, the mountainous regions include also few stakes. Even if mountains can be touristic regions known for their beautiful landscapes, and even if the mountain is a high ideological and artistic symbol, few people actually live in those regions. The risk thus can be considered as low in mountainous regions.

On the other way, population is concentrated in urban agglomerations, principally in coastal cities located at the river mouth, like Tokyo (35 millions of inhabitants for the whole agglomeration), Osaka (16 millions) and Nagoya (8 millions). The strong anthropic pressure and the postwar generalized access to property transformed Japanese plains in spaces nowadays entirely urbanized. As a consequence, rivers flow from the mountainous space where they have been strongly artificialized to a plain space totally urbanized where the risk can be considered as huge.

Considering the risk affecting the major cities, important works have been done along the Japanese rivers. The “sabō” works are the amount of structural measures concerning rivers upstream from the urbanized plains. Their purpose is to reduce hydrological hazards, as lahar, torrential flood, debris flow, etc. As an important security stake, they are directly managed by the sabō department of the Ministry of the Land, Infrastructure, Transports and Tourism (MLITT, (1)). The MLITT builds in the mountainside very strong infrastructures, as retention basins, dispersal dikes, control dikes, hard-surfaced channels in urban areas... Those structural measures have been accepted until the eighties. At that time, the State has been criticized by environmental associations and by taxpayers for the lack of efficiency of those measures considering their considerable cost.

Strong structural measures (“razor“ dikes, narrowing and dredging of the minor bed, destruction of meanders, ...) have also been taken downstream to protect directly the cities. But recent events, such as the Tōkai flood in Nagoya in 2000, have showed that these measures do not allow a water contention in the minor bed when the pluviometric discharge reaches or overtakes 60 mm per hour.

Non structural measures also reached their limits. For example, despite the fact that the minor bed of rivers always belongs to the State, there is no town-planning rule allowing to regulate urbanization in flood risk areas. Maps do exist, but they are called “Hazard Maps” and only have an informative

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purpose. They are sent to the whole population of a commune by the mayor office to keep the acknowledgement of flood risk in some areas. There is no coercive purpose in those maps as there may exist in the French “plan of risks prevention”.

In case of unusual pluviometric level, the JMA (3) is in charge of warning the river management service (in charge of flood risk) at the MLITT, and at the prefecture, according to the status of the different rivers on the region affected by the phenomenon. The MLITT, according to its own rainfall and discharge observation, and comparing its information with the one of the JMA, will inform the local authority in charge of flood management and of crisis management, if a flood is predicted. The authority in charge of warning and crisis management is most of the time composed by the agglomeration mayor, and its natural hazard managing staff. Mayors have the responsibility of the evacuation setup, but being the last ones to be informed, they sometimes receive the warning too late to act, especially in case of flash flood.

Moreover, the specific geographical situation (empty mountains with strong measures, populated plains with strong stakes depending from the mountains for their security, and above all presence of many risks with different origins, and which can sprawl on different geographical areas) sometimes creates coordination problems between risk managers. For example, different risk managers on a small territory can exist. The JMA, in charge of the volcanic, seismic and meteorological watch is not in charge of flood risk watch. The flood risk in mountainous area being largely related to the volcanic ashes deposit, some factors are not fully considered. As an example, the lack of communication between the sabô engineers, the JMA meteorologists and the flood risk managers complicates the forecasting of the consequences of a heavy rainfall (will it become lahar or remain torrential flood?) despite the fact that data do exist. Furthermore, for a single type of risk (flood), there can be different risk managers, having different means. Rivers are classified by their importance in different levels (A, B, no classification). According to those classifications, rivers will be handled respectively by the State (through the MLITT), the prefecture, or the commune. Despite the River Law and its will to set up a single manager for a basin, a certain lack of coordination remains between upstream and downstream.

The problems to be solved nowadays do not concern anymore the setting up of structural measures, discredited for their monetary and ecological cost, but prevention and “risk culture” development, upgrading of the warning system and cooperation between the different stakeholders who manage the rivers and the risk. If mountain may have been and remains a major area for risk reduction, its artificialization does not allow anymore to avoid torrential floods in urban areas, as it was the case of the Shônai River the 11 and 12 September 2000.

## REFERENCES:

Ministry of the Land, Infrastructure, Transports and Tourism [http://www.mlit.go.jp/index\\_e.html](http://www.mlit.go.jp/index_e.html)  
Japan Meteorological Agency (Kishôcho), which has a vocation to « contribute to the public welfare amelioration » via the management of some natural hazards <http://www.jma.go.jp/jma/indexe.html>

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