Point-based, probabilistic analysis and visualisation of flood hazard and risk: a case study in Japan

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In the process of political decision-making, the results of flood risk analysis are represented mainly in two different ways: 1) through an exceedance-probability loss curve (EPL curve), showing the relationship between the return period of disaster and the possible estimated damage on a whole target area, and 2) through a coloured map (commonly called a hazard map), showing the maximum potential hazard at each point of a target area. While these simple representations are useful for policy-making processes and macroscopic economic evaluation of flood control measures, the geospatial structure of flood hazard and risk are not fully described in a probabilistic way.

By adopting pin-point and probabilistic analyses of flood hazard and risk as an approach to dealing with the above-mentioned problems, this study evaluated flood hazard and risk as a geospatial structure and proposed a visualisation method of that structure. Based on the results, we also analysed the interaction between the geospatial distribution of hazards and that of land-use choice and asset exposure within a basin, to elucidate historical measures to mitigate or adapt the flood hazard by which locals controlled the flood risk.

The target rivers are the Mogami River and the Yoshino River in Japan. Their watersheds have contrasting characteristics: the Mogami River's watersheds consist of consecutive small basins and narrow valleys connecting them, and the Yoshino River's watersheds are composed of a long and straight valley-plain.