

Advisory Opinion

**New challenges in science and technology for future
urban land use to cope with the increasingly frequent
and intensified water-related disasters
due to climate change**



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Committee on Civil Engineering and Architecture

Subcommittee on Climate Change and Land

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EXECUTIVE SUMMARY

1 Background

Floods and landslides are becoming more frequent and severe due to climate change. Japan is extremely vulnerable to water-related disasters, such as floods and storm surges, as dense urban areas extend over low-lying areas which are the flood plains of rivers including lands below sea level.

2 Current Situation and Issues

The Japanese government has taken a major step toward disaster prevention and mitigation measures have been addressed by the society under a new policy called “River Basin Disaster Resilience and Sustainability by All.” In addition to the conventional measures to prevent flooding, the government aims to develop comprehensive and multilayered measures that address floods, landslides, storm surges, and other water-related disaster risks in society, including measures to mitigate damage, for early recovery and reconstruction, and to reduce the proportion of damaged areas. However, when the impacts of climate change intensify rapidly in the future, serious disasters will force frequent migration of people. Therefore, along with implementing measures at the municipality scale, large-scale planned land-use changes for the entire watershed should be undertaken to reduce damages.

However, implementing planned land-use changes, regardless of their scale, is not easy and takes a long time. Additionally, comprehensive measures cannot be taken smoothly without coordination among various sectors, including residents. Moreover, society should accept the land’s vulnerability to drastic changes in water-related disasters, which varies with the surrounding conditions. In such a case, how can science and technology contribute to enhancing the feasibility of planned land-use changes as an option for adaptation measures? We present our views on how science and technology can be applied to promote planned land-use changes and related water-resistance measures as adaptation measures for residential areas.

3 Advisory Opinion

(1) Clarification and disclosure of knowledge on water-related disaster risks that contribute to the study of land-use in urban areas.

① Indication of temporal changes in factors that contribute to water-related disasters

- Past and present temporal variations in the amount of rainfall and the probability of its occurrence causing heavy rain disasters, as well as changes in tide and sea level deviations leading to storm surge disasters should be plotted and future forecast values in each wide-area scale, such as regional blocks, should be predicted. This kind of chart can be a helpful guide for recognizing the time when land-use must be changed systematically and contributes to spreading water-related disaster risk awareness throughout society.
- Therefore, researchers in the fields of meteorology, hydrology, and on rivers and coasts, along with the Ministry of Land, Infrastructure, Transport, and Tourism and related academic societies, should promote such studies, update the information annually, and make the results widely available.

② Indication of the likelihood of heavy rainfall due to topographical characteristics

- Visualization of the likelihood of heavy rainfall caused by topographical characteristics according to meteorological phenomena causing heavy rains on a medium scale of municipalities or beyond these, is an effective tool for understanding the vulnerability of urban areas.
- Therefore, researchers in the fields of meteorology and hydrology, along with the Ministry of Land, Infrastructure, Transport, and Tourism and related academic societies, should promote such studies and make the results widely available.

③ Indication of flooding patterns depending on topographical characteristics

- Within an urban area, classifying the areas according to low- and high-velocity inundation patterns will be an effective tool for reviewing land-use in the areas, coupled with the effect of water resistance measures for houses.
- Therefore, researchers in the fields of rivers and coasts, architecture, and building construction, along with the Ministry of Land, Infrastructure, Transport, and Tourism and related academic societies, should promote such studies and make the results widely available.

(2) Establishment of a collaborative system with local communities

- It is extremely important to develop a system in collaboration with local communities including aiming at the promotion of new research based on an understanding of the regionally differing circumstances and further understanding of the issues by passing on such knowledge to the local communities as well as to disseminate the research findings among them.
- Particularly, in studying water-resistance measures for residential areas, it is necessary to accumulate research-activities, including acquisition of data on damaged houses under the system in cooperation of the local community.

- Thus, researchers in the fields of rivers and coasts, architecture, and building construction should collaborate with local experts in the building sector, related organizations, and NPOs and utilize River Basin Flood Control Councils to establish a system for collaboration with the local community.