Global River Flood Exposure Assessment under Climate and Socioeconomic Scenarios: How Many People Are Affected In Future?

Global River Flood Exposure Assessment under Climate and Socioeconomic Scenarios: How Many People Are Affected In Future?

*郭 栄珠[1]、馬籠 純[2]、長谷川 聡[1]、岩見 洋一[1]
*Youngjoo Kwak[1], Jun Magome[2], Akira Hasegawa[1], Yoichi Iwami[1]

1.国立研究開発法人　土木研究所、2.山梨大学生命環境学部環境科学科
1.National Research and Development Agency, Public Works Research Institute, 2.Yamanasi University

Floods are the most common natural disaster due to the frequency and intensity of heavy rainfall. In particular, human exposure to floods has been increasing to a greater extent in South Asia, East Asia, and Europe as well. This is likely to expand exposure of assets at risk and magnify flood risk, resulting in more human and economic damage, if population growth is sustained and valuable assets are continuously accumulated in river deltas. For global flood risk assessment, it is important to identify and characterize flood areas, locations, and durations. Thus, global flood mapping is an imperative process for risk management, as well as an effective tool for solving trans-boundary water issues at both national and international levels.
Although advanced hydrological inundation models have been developed and suggested that flood hazard, exposure, vulnerability, and risk are well revealed at the river basin to national levels, it is obviously hard to identify the distribution and locations of flood risk on the continent scale. The main concern is which parts in the Eurasian region can be found as high-risk areas in terms of population vulnerable to probabilistic 50-year cyclic flood events under the conditions of climate change and socio-economic scenarios, based on MRI-AGCM3.2S with the Representative Concentration Pathways (RCP8.5) emissions scenario.
In these regards, the purpose of this study is to propose an assessment method for flood exposure between the two periods, i.e., for Present (daily data from 1980 to 2004), and Future (daily data from 2075 to 2099), over the Eurasian region with a special interest in long-term changes due to climate change and socio-economic effects. We propose a methodological possibility to be used as a rapid flood exposure assessment despite low data availability. The method is designed to effectively simplify complexities caused by hydrological and topographical variables in a flood risk-prone area and then visually evaluate hazard occurrences and exposure under the condition of annual maximum daily river discharge with a 1/50 probability of occurrence.
The preliminary results show that inundation areas in Asia and Europe were identified as upward trends in both Present and Future by using GFID2M (global flood inundation depth 2-dimension model) that uses a rapid and straightforward method based on topographic calculation, and that the possible number of affected population may increase in the future by calculating with population change ratio from a distributed data of global population (Landscan 2009 by the Oak Ridge National Laboratory). As a result of the physical exposure assessment from Present and Future, potential hazards area and affected population are projected to occupy approximately 228,646 km^2 and approximately 305 million people respectively, because the population of Asia may increase by about 43% while that of Europe may decrease slightly in Future. Moreover, the results show that the cropland is likely to account for the largest proportion among the increased risk areas in Future in terms of socioeconomic impacts by probabilistic 50-year cyclic flood events.

キーワード：全球河川氾濫、洪水曝露人口、洪水浸水深、洪水影響人口

Keywords: Global river flood, Flood exposure, Flood inundation depth, Affected population

