Development of a Framework for Assessing Public Health Risk Due to Pluvial Flooding: A Case Study of Sukhumvit, Bangkok

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Abstract : When sewer overflow due to rainfall in urban areas, this leads to public health risks when an individual is exposed to that contaminated floodwater. Nevertheless, it is still unclear the extent to which the infections pose a risk to public health. This study analyzed reported diarrheal cases by month and age in Bangkok, Thailand. The results showed that the cases are reported higher in the wet season than in the dry season. It was also found that in Bangkok, the probability of infection with diarrheal diseases in the wet season is higher for the age group between 15 to 44. However, the probability of infection is highest for kids under 5 years, but they are not influenced by wet weather. Further, this study introduced a vulnerability that leads to health risks from urban flooding. This study has found some vulnerability variables that contribute to health risks from flooding. Thus, for vulnerability analysis, the study has chosen two variables, economic status, and age, that contribute to health risk. Assuming that the people's economic status depends on the types of houses they are living in, the study shows the spatial distribution of economic status in the vulnerability maps. The vulnerability map result shows that people living in Sukhumvit have low vulnerability to health risks with respect to the types of houses they are living in. In addition, from age the probability of infection of diarrhea was analyzed. Moreover, a field survey was carried out to validate the vulnerability of people. It showed that health vulnerability depends on economic status, income level, and education. The result depicts that people with low income and poor living conditions are more vulnerable to health risks. Further, the study also carried out 1D Hydrodynamic Advection-Dispersion modelling with 2-year rainfall events to simulate the dispersion of fecal coliform concentration in the drainage network as well as 1D/2D Hydrodynamic model to simulate the overland flow. The 1D result represents higher concentrations for dry weather flows and a large dilution of concentration on the commencement of a rainfall event, resulting in a drop of the concentration due to runoff generated after rainfall, whereas the model produced flood depth, flood duration, and fecal coliform concentration maps, which were transferred to ArcGIS to produce hazard and risk maps. In addition, the study also simulates the 5-year and 10-year rainfall simulations to show the variation in health hazards and risks. It was found that even though the hazard coverage is very high with a 10-year rainfall events among three rainfall events, the risk was observed to be the same with a 5-year and 10-year rainfall events.