

Research Highlights

Developing Intensity–Duration–Frequency Curves for Ho Chi Minh City, Vietnam

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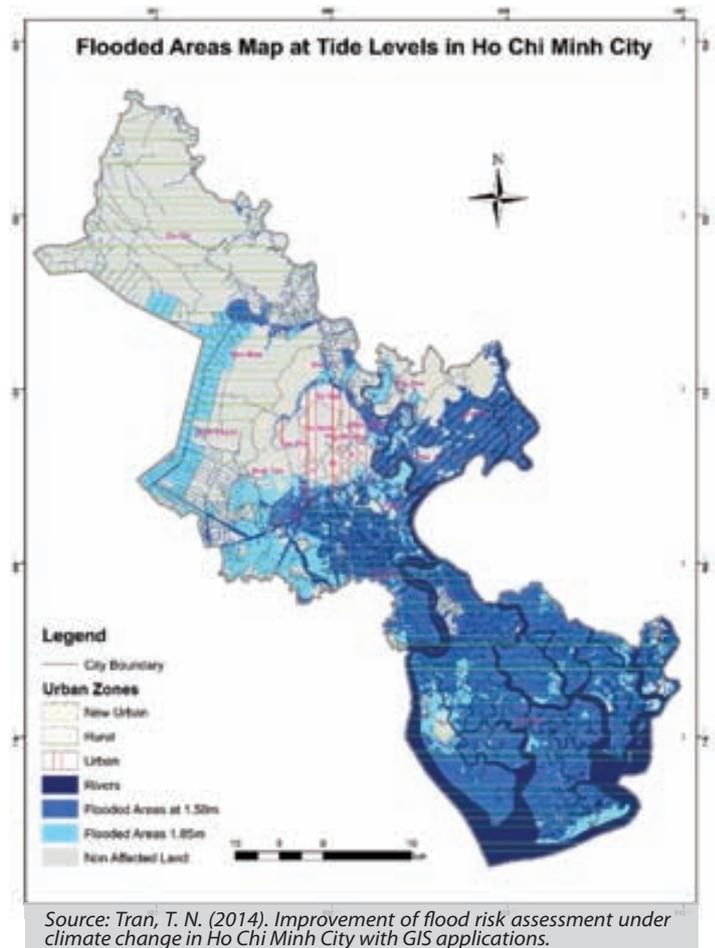
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Rainfall Intensity-Duration-Frequency (IDF) is a useful tool to determine the intensity of rainfall in any specific duration and return period. It is usually employed in water infrastructure designs to help in city management and planning. Nowadays, the use of rainfall IDF is very popular in many developed countries in the world such as USA, Canada, Germany, etc. In addition, in many ASEAN countries such as Malaysia or Singapore, there are also many research studies in rainfall IDF for specific regions or provinces.

Vietnam is considered one of the countries most affected by climate change. It is of great importance to anticipate the change of rainfall IDF in Vietnam. The magnitude and frequency of extreme events such as high intensity rainfall, flooding, severe droughts, etc. are expected to increase in the future due to climate change. The evaluation of the possible climate change influence on extreme precipitation is very interesting in megacities due to the usual and characteristically high intensities of its rainfall pattern. This study aims at developing IDF curves for Ho Chi Minh City (HCMC) in Vietnam for the present as well as future climatic scenarios.

Ho Chi Minh City is located in the delta area of the Saigon and Dong Nai rivers. It is Vietnam's largest city and an important economic, trade, cultural and research centre, both within the country, and in South-East Asia. Like most cities situated in deltas, HCMC faces serious challenges due to climatic change. HCMC is ranked among the top 10 cities in the world most likely to be severely affected by climate change. Major impacts of climate change are floods, and droughts as a consequence of water scarcity in the dry season. In addition, heavy rainfall and flooding can also contaminate surface water and affect environmental health in urban areas. Thus, the understanding of changes in precipitation extremes will also be useful for HCMC in managing water in urban areas and preventing urban flooding. The IDF curve is a very important tool used in the design and construction of different hydrological structures in water management, that could be altered by a presumed increase of intense rainfall caused by climate change. However, IDF curves for the future have not been developed for HCMC. The objective of this study is to assess climate change impact on rainfall IDF curves at HCMC. Firstly, the present IDF is analysed based on observed data.

Following that, the rainfall projections for future periods based on an ensemble of regional climate models approach are used to develop projected IDF curves and their plausible changes in the middle of the 21st century (2050s), and at the end of the 21st century (2090s) for HCMC. To cope with the uncertainty of climate change projection,



Source: Tran, T. N. (2014). Improvement of flood risk assessment under climate change in Ho Chi Minh City with GIS applications.

the ensemble of final results was divided into 2 cases: (i) the most-likely case (percentile 50%); and (ii) high-impact case (percentile 75%).

The results of this study will have significant and practical importance for the design, operation and maintenance of water management infrastructures for the changing climate in HCMC. By using rainfall IDF information, recommendations could be made. For example, rainfall IDF under current climate can represent the beginning of the century (2016-2035) to serve design and planning purposes because the difference in Green House Gas concentration is not significant. In other words, the impact of climate change on current climate conditions and the beginning of the century are nearly the same. In addition, information from the high-impact case may have significant contribution for the frequency and intensity of floods in HCMC in the future.