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URBAN DRAINAGE AND FLOOD PROTECTION DEVELOPMENT
IN TANGERANG CITY

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**Urban Drainage and Flood Protection Development
in Tangerang City**

Master of Science Thesis

by
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Summary

Tangerang City, the study area, is located in the plains between hilly land on the South and the North close to the Java Sea. The city is regularly flooded, especially during the wet season due to several causes. First, as a part of Jakarta, Bogor, Depok, Tangerang, Bekasi and Cianjur (JABODETABEKJUR) areas, which are related to one another with hydrology and flooding problems, Tangerang City is facing stress on land use change particularly when Jakarta – the capital city of Indonesia – becomes the primary growth machine of the nation. Among others, this resulted in suburbanization in Jakarta's neighbouring regions. Besides strengthening the economic growth of the city which is included in regional middle term developing planning will give further pressure to land use conversion, environment and inconsistency in urban spatial planning. Moreover, climate change is also contributing to the flood problem due to hydrology change to alter the magnitude and frequency of peak flows and sea level rise. In addition land subsidence which also occurs due to huge groundwater extraction is also taking into consideration. Lastly, topographic condition and insufficient existing drainage system and flood protection provisions are also recognised to add to this flooding problem.

Four main objectives are developed in this research. First is describing the existing urban drainage and flood protection systems in Tangerang and the correlation with DKI Jakarta and other satellite cities (JABODETABEK). Second is analysing the possible impacts of sea level rise and land subsidence on inundated area. Next are some measures that would have to be taken into consideration in order to reduce waterlogged area and provides adequate urban drainage and flood protection especially when the impacts of sea level rise and land subsidence are taken into account. The structural measures were studied by considering hydrologic and hydraulic conditions and by carrying out hydrodynamic and spatial modelling (DUFLOW and GIS) as tools for decision support which may evaluate options in developing urban drainage and flood protection scenarios for Tangerang City based on a design rainfall with a chance of occurrence of 4% per year. Simulating scenario on the macro urban drainage system and the selected river basin was developed as follows:

- First scenario where the urban drainage was considered as open drainage. This represents the existing condition and has been used as the basic case;
- The second scenario and third scenario dealt with improvement in the design of appropriate urban drainage and flood protection which are simulated using several alternatives flood control measures. Under the second scenario, the effect of flapgates together with pumping for flood protection and drainage outlet respectively in facing sea level rise scenario was modelled;
- The third scenario, as the second scenario, but it would investigate also the effect of the land subsidence.

Last objective is discussing in brief how O&M, institutional arrangements and stakeholders participation in urban drainage and flood protection have and key to support urban drainage and flood protection management.

The study shows out of 7109.6 ha from river basin simulated in Scenario 1.8% is severe from flooding. In addition because of scenario 2, it will increase 17.1% from 551.1 ha to 645.2 and it will more severe as a result of scenario 3 reaching 1806.2 ha (26%). Further

the study has proposed flood risk reduction measures in terms of structural and non-structural responses. For structural measures, the study has evaluated for different alternatives to propose possible solutions in facing three scenario explained above, in order to reduce flooding in the case study, naming: provision of storm water storages, installation of flapgates, dike and pumping. The results indicates that due to sea level rise and lowering topography condition in adjacent area caused by land subsidence, combine system between gravity drainage system and pumping are primed to meet the future condition of drainage system and flood protection in the future in Tangerang City. Therefore Urban Polder with its properties is proposed to be constructed. However, developing model for Operation and Maintenance (O&M), strengthening both institutional arrangements and stakeholders participation in urban drainage and flood protection are also a key to support urban and flood management as in related to non structural measures.

Keywords: GIS modelling, DUFLOW hydraulic modelling, polder system, urban drainage, flood protection