Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

MAG022-16 Room:国際会議室 Time: May 28 14:30-14:45

Change of Water Balance in An Urbanized River Basin during Flood Event

Mohammad Farid[1*], Akira Mano[1], Keiko Udo[1]

[1]Graduate School of Eng., Tohoku Univ.

Urbanization has been addressed as one of the contributing factor to flood. The increasing of impervious area will contribute to a higher flood discharge. Decision maker has been issuing regulation regarding land cover as one of the means to control flood. However, the affectivity of this action would depend on the river basin capacity itself. Water balance of the flood should be checked in order to evaluate the river basin capacity. In this study, evaluation of river basin capacity is conducted with the case study of Ciliwung River basin, Indonesia. The downstream area of this river basin runs through Jakarta, the capital city of Indonesia. The city has been flooded several times during past decades. Ciliwung River discharge from the upstream area has been attributed as one of the main cause. Recently, the flood problem is getting worse. It is said that the uncontrolled development in the upstream area has been intensifying the flood, thus resulting in a bigger and more frequent flood. The objective of this study is to evaluate the change of water balance in the upstream Ciliwung River basin in order to justify the upstream urbanization effect to flood. Evaluation will be conducted using numerical model. The model is developed by coupling shallow water equation and nearly calibration free (NCF) tank model. Shallow water equation is widely known for its performance in hydraulic modeling, while NCF tank model is also known for its performance in hydrology process modeling. Therefore, by coupling both model, hydraulic and hydrology process are simulated. The water balance equation is checked at each time step. For the above objective, flood event of 2002 is chosen. The event will be simulated using land cover in year of 2002 and 1996. The simulated actual peak discharge was 98.20 m^3/s and 41% of precipitation became outflow discharge. However, when the same event was applied to the 1996 land cover, the peak discharge was down to 58.51 m^3/s and only 25% of precipitation became outflow. By the end simulation time, the soil layer was filled around 21% of its capacity, and 27% of its capacity when simulated using the 1996 land cover.

Keywords: Urbanization, Flood discharge, Water balance