MODELING OF FLOOD FOR LAND USE MANAGEMENT
(Case Study of Ciliwung Watershed)

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MODELING OF FLOOD FOR LAND USE MANAGEMENT

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STATEMENT

I, I Putu Santikayasa, here by stated that this thesis entitled

Modeling of Flood for Land Use Management

(Case Study of Ciliwung Watershed)

are result of my own work during the period February 2005 until April 2006 and
that it has not been published before. The content of the thesis has been examined
by the advising committee and the external examiner.

Bogor, August 2006

I Putu Santikayasa
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Hopefully, this hardwork can be usefull.
CURRICULUM VITAE

I Putu Santikayasa was born in Pohsanten, Jembrana - Bali at February 24, 1979. He received his undergraduate from Bogor Agricultural University in 2002 in the field of Agrometeorology. Since 2005 until now, he works as lecturer in Department of Geophysics and Meteorology, Faculty of Mathematics and Natural Sciences, Bogor Agricultural University.

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ABSTRACT


Floods are one of the major disasters affecting many countries in the world year after year. It is an inevitable natural phenomenon occurring from time to time in all rivers and natural drainage systems. It causes damage to lives, natural resources and environment as well as the loss of economy and health. Floods represent complex problems because of its variety. Therefore, this variety cannot be studied or controlled only by one or two specific methods.

The objectives of this research are to understand the process of flood events and its interaction with hydrometeorological components, to develop flood model for watershed management and to determine the effect of land use change to watershed discharge which indicates flood event.

The research consists of four processes those are 1) Data Preparation, 2) Model Development, 3) Model Simulation and 4) Model Calibration and Validation. Data preparation was conducted for two kinds of data namely spatial data and tabular data. Model developed as numerical model of the hydrology of a river basin system. This model includes the response of watershed to precipitation, the actions of the river network as water flows through the river, the effect of land use changes, and the effect of engineering structures to the watershed. Model simulated by change land use as an input. Model calibrated by using water level data of field measurement in year 1996 and model validated by using water level data of field measurement in year 2000.

The result of this research showed how the process based modeling is useful to model hydrological processes over the watershed. Precipitation is the main input for hydrology simulation and land use change gives the effect of water level in the watershed. The model which is built in this research can be used to evaluate runoff from different land use areas. For assessing the hydrological effects of land use changes on floods, three hypothetical scenarios, namely urbanization, deforestation and afforestation scenario, were considered made. It was found from the model simulation that the urbanization scenario has the highest negative impact on increasing water level. Deforestation has the second largest negative impact, while afforestation causes positive impact shown by decreasing water level. The result indicated that the urbanization produce the highest peak flow, followed by the deforestation and afforestation scenario. The simulated water level for the present land use is 84 cm, for the urbanization scenario 135 cm, deforestation scenario 92 cm, and afforestation scenario 59 cm. Accordingly, the urbanization scenario increases the peak discharge by 61%, the deforestation scenario increase 15%, and afforestation decrease by 19%.
Research Title : Modeling of Flood for Land Use Management (Case Study of Ciliwung Watershed)

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