



Reference Book

***SPATIAL ANALYSIS MODEL  
TO SIMULATE THE LAND USE  
CHANGE SCENARIO***



Asep Denih, S.Kom., M.Sc., Ph.D.

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SCENARIO  
(A Case Study in Upper Ciliwung Watershed Bogor, West  
Java, Indonesia)

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## Preface

This reference book provides basic principles for carrying out spatial analysis related to geographic information systems (GIS) and spatial modelling analysis as a basis for development to make it easier to learn case studies on integration between GIS and modeling using spatial analysis methods.

The basis for this development is research in the field that starts with the introduction of the definition, context, goals and phases of the methodology used in this research.

Thank you to all the people who contributed to the preparation of this reference book.

Wish this reference book would be of help to the reader.

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# CHAPTER 1

## INTRODUCTION

The degradation of many watersheds or sub watershed was influenced by population pressure. The other reasons are the rate and the quantity of the water that infiltrates into the ground. The water that infiltrates into the ground is a function of soil type, land use, land cover, drainage conditions, soil moisture, and soil permeability.

Watershed is a fundamentally important area to manage, since land-use, water cycles, plant cover, rock and soil types, water demands and human impacts all work together to modify the quality and quantity of water draining through the watershed. The physical condition of watershed and the changes in land use pattern influence to the peak flow. Specifically they influence to the maximum runoff volume that flow on a particular location during a storm event. It is necessary to make measurements. Watershed characteristics that are often required for hydrologic design methods include the drainage area, linear measurements such as the watershed length, the shape of watershed, the slope of the watershed or channel, the drainage pattern, channel roughness, rainfall, soil types, land cover, and land use. Case study in this research

focused to the upper Ciliwung watershed, part of Bogor, West Java, Indonesia. Regarding to the case study, upper Ciliwung watershed hydrological characterization can give many information in planning and managing of the environment such as to make a prediction on how to repair the watershed, to estimate the volume of water that will flow into the downstream area, to give information to the government to do the treatments of upper Ciliwung watershed area and to monitor its hydrologic system.

Floods are still major unresolved problems, because of many factors, for instance, the slope of watershed, the soil type of watershed, the land cover and land use of watershed, as well as the amount of storage within the channel and vegetation. Beside hydrological reasons such as its geographical position, the flood problems are worsened by population pressure and socio-culture problem. Development of Spatial Analysis to Support Hydrologic Modeling will be the starting point for developing Flood Early Warning System in the future.

Upper Ciliwung watershed represents one of flood contributing area that happened in the downstream, such as in Jakarta. That is why a serious effort is need to support

the conservation and the environmental repairmen program of upper Ciliwung watershed area.

### **Objectives**

1. To develop dynamic spatial analysis model to simulate hydrologic responses.
2. To estimate the volume of runoff water from any rainfall input.
3. To simulate the land use change scenario to know the hydrologic response.