A Development and Application of GIS in Whanganui Catchment Based River Environment Classification System

A dissertation presented in partial
fulfilment of the requirements for the
degree of
Master
in
Resource and Environmental Planning

Massey University

Palmerston North
New Zealand

Qian Zhai

2002

Dedication

This thesis is lovely dedicated to my Mother and Father

Bao Zhen Cao and Guan Jun Zhai

Abstract

This thesis concerns a development and implementation of Geographical Information System (GIS) for the New Zealand Whanganui catchment, based on a new methodology for river environment classification systems in New Zealand. The Ministry for the Environment (MfE) and National Institute of Water and Atmospheric Research (NIWA) are developing this system with assistance from regional councils. The river habitat classification is sometimes called river "ecotyping". It describes the process of dividing rivers into similar or different physical classes based on the habitat requirements of the plants and animals that live there (Murray McLea, 1999). This project focuses on generating a Digital Terrain Model (DTM) for the Whanganui river catchment to determine Whanganui catchment boundaries and a series of hydrology parameters such as catchment patterns and channel slopes, etc. It comprises layers of elevation, rainfall, geology, land-cover and additional ecotyping related attributes for classification of each arc of the Whanganui River.

There are five sections in this thesis.

The first section introduces the basic concept of hydrology in environmental and ecological aspects. It reviews the hydrology model with GIS and DTM. It also briefly describes the river environment classification system ---- ecotyping methodology. Finally, it describes the aims and achievements of this project.

The second section focuses on the ARC/INFO software environment, using different ways to generate the DTMs and present criteria that will be used to test and analyse the accuracy of DTMs. Also the Whanganui catchment and catchment boundaries will be determined.

The third section focuses on the river analysis. The main target is to test whether the 1: 50000 topographic data can be used to determine the channel slope and channel sinuosity for river sections other than reaches (Snelder et al. 1999).

The fourth section describes the method of using ecotyping parameters and classification rules to classify each arc of the river into a database. These rules are introduced in the article "Further development and application of a GIS based river environment classification system" (Snelder et al. 1999).

The last section as a conclusion of the thesis will summary the achievements, the methodology of the processing and the results of the application of this research.

Acknowledgements

For professional guidance and assistance, I would first like to thank my supervisor, Mr. Derek Williams, who directed me throughout the project and helped me step by step. He always directed me to think logically and express my ideas more succinctly. Also he has been very patient with me. Without his support I would not have finished this project.

I am grateful to my second supervisor, Miss. Rachel Summers who continuously helped me to refine my solutions and simplify the methods used in this project. Her help has had a big impact.

Thanks to Mr. John Phillips and Ms. Marianne Watson. They provided me with this interesting project and supplied me with background information and reference material, which helped me to understand the project. They paid much attention to this research.

Thanks to Ms. Rosemary Krsinich who has proofread my thesis for English grammar.

For specific personal support, guidance, and assistance, I am very grateful to my husband Mr. Yong Qiu Liu who was always there to give me support. Also to thank my dear mother Mrs. Bao Zhen Cao who came from China to help me look after my family.

Contents

Figures and Tables

Figures

Tables