M CONTENTS

CONTENTS; – COMMISSION ON REGIONS
REF: 1/11/â\200\234. I,

INTRODUCTION

The ENPAT concept was developed by the Department of Environment Affairs, and was formulated because of the following factors, all of which have a pronounced influence felt by both the Department and others.

o Large amounts of geographically related environmental data is in existence.

This environmental information is widely disseminated between many different organisations.

The information has been captured on a variety of media, in a variety of formats which are not always compatible.

Access to all this information is difficult, and it can take literally months to gain access to, or acquire, certain information.

It was realised that these problems not only affected the Department, but all users and potential users of geographically represented environmental information. This led to the idea of an atlas wherein geographically represented environmental information could be contained in a user-friendly manner.

Modern computer technology made the implementation of this idea possible. By using computers, primary data sets can be processed to secondary and tertiary information levels, which then hold great benefits for users with complex needs.

Based on the findings of a feasibility study, the University of Pretoria was appointed to do the first pilot project. The Durban Functional Region (DFR) was chosen for this project, and resulted in this release of ENPAT for the DFR to users.

It is envisaged that the ENPAT concept would greatly contribute to increasing environmental awareness through its expanding user base, and assist in solving some of the environmental problems associated with the dramatic and expanding growth in and around the metropolitan areas of South Africa.

The goal of ENPAT is to provide decision makers across the spectrum of the public and private sectors including authoritative bodies, developers, planners, and interested and affected parties concerned with development in metropolitan areas, with a decision-support system based on environmental considerations in order to facilitate holistic and environmentally sound decision making.

The contract between the Department of Environment Affairs and the University of Pretoria has been extended for the development of similar products for the PWV and Cape Town metropolitan areas, as well as a broad national atlas. This study is related to the application of the ENPAT concept on a national scale.

PHASE ONE: DEVELOPMENT PROCEDURE

PHASE ONE: DEVELOPMENT PROCEDURE

There are two basic phases in the development and implementation of the ENPAT atlas. Phase one is the development of the procedures for establishing the atlas and phase two is the development of procedures for the implementation and utilisation of the atlas.

An understanding of these procedures is a prerequisite to the successful implementation of the ENPAT concept since the development procedure forms the basis of the utilisation procedure.

Step one: ENPAT Approach

The terminology used is important and will lead to an understanding of the procedural functioning of the atlas. Each heading is related to a sequential step in a process used to develop the atlas and then used in reverse order during utilisation of the atlas.

The development of geographic information systems (GIS) has made the establishment of a digital atlas such as ENPAT possible, and a good background understanding of GIS concepts will greatly enhance understanding of ENPAT concepts. The advantages of GIS have led to the realisation that an atlas such as ENPAT can be both functional and practical. The use of GIS tools such as ARCVIEWâ\204¢ forms the basis to the approach followed in the development of the ENPAT atlas procedure.

Step two: Atlas Type

The natural environment functions as an integrated whole with the various components contributing to the development of systems termed by ecologists as ecosystems. These systems can function at various levels leading from macro continental systems to micro systems such as small coastal dune systems.

To develop an understanding of these systems and how they function, the systems are normally subdivided and classified under separate headings. The sequence of these subdivisions is important to an understanding of each category since knowledge of each contributes to an understanding of the next category.

The climatic component of the environment and the physical component interact and combine with the biological component to create a framework within which a variety of processes operate at a variety of scales. To assist in understanding these systems the atlas is segmented into the following types:

Climatic (Air)
Landscape (Land)
Hydrological (Water)
Biological (Life)
Land use (Use)

These five headings are used to create a classification system for the environmental data inherent to the establishment of the ENPAT atlas.

PHASE ONE: DEVELOPMENT PROCEDURE

Step three: Data Categories

Various categories of information are grouped within each of the above atlas types. These information types are basic to the ENPAT concepts as they determine the type of data which will be collected and entered into the GIS on which the atlas will be based.

The following data categories are involved:

Atlas type: Air
Temperature
Rainfall

Atlas type: Land
Landscape
Soils

Atlas type: Water
Catchments
Rivers

Atlas type: Life
Vegetation
Wild life

Atlas type: Land use
Land use
Infrastructure

Step four: Category Attributes

Each of the data categories listed above has certain descriptive characteristics or attributes. Geographic features are stored in the computer as polygons (area features such as geology or land use), lines (line features such as roads and rivers) or points (point features such as wells and boreholes). The descriptive or non-geographic data is stored in database files referred to as attribute tables.

The geographic features and their attributes are combined or merged through a GIS overlay procedure to create a landscape facet database. The landscape facet database constitutes the heart of the atlas, containing the necessary geographic and non-geographic information required. Updating of this database is a prerequisite to its successful implementation and will ensure an ever increasing and improving information base.

Step five: Environmental Values
The attributes represent characteristics of the environment and as such represent

values. The most important goal for the management of the natural environment has been determined by the IUCN and its conclusions are as follows: ’

PHASE ONE: DEVELOPMENT PROCEDURE

Goals

The management of human use of the biosphere so that it may yield greatest sustained benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations.

Objectives

The following three objectives were identified:

to maintain essential ecological processes and life support systems
* to ensure the sustainable utilisation of species and ecosystems
* to preserve genetic diversity.

These issues can be considered to be important in regard to the development of a National Environmental Potential Atlas and the resultant values need to be identified in the determination of environmental boundaries and their contribution to regional delineations.

Step six: Land Use Potential

To relate the previously mentioned values to land use boundaries the following procedure should be followed.

i

Determine the most important ecological process and life support systems for Southern Affica.

The most essential ecological processes and life support systems for a country such as South Africa are hydrological processes related to the water production.

In this instance rainfall zones and catchment basins function as major contributors to the subdivision of South Africa into hydrological response zones. The most important landscape features influencing rainfall and runoff is the South African escarpment. This escarpment is the result of ancient historic erosion cycles relating to geological events of the past. The escarpment today forms a major subdivision between the westward draining Orange river basin and the southern and eastern catchment basins. It is only the Limpopo and Olifants river systems that have penetrated the Eastern Transvaal escarpment.

Subdivisions based on primary catchment areas would allow for the efficient management of the most limiting of all environmental resources - water.

PHASE ONE: DEVELOPMENT PROCEDURE

Determine the components of the eco-system resulting in the highest sustainable utilisation.

In this instance the crucial ecological process relating to sustainable utilisation are edaphic or soil related processes. These processes function over a long time span and their destruction can take centuries to repair. In this instance a combination of geomorphologic, soil and biological processes can be combined to illustrate the potential of South African ecosystems for biomass production. These resource boundaries are assumed to be secondary to that of the hydrological boundaries and form the delineations within each of the five major hydrological zones.

Determine the areas of the landscape where species diversitiy has been least disturbed.

The issue of genetic diversity is dealt with within an inter-regional fashion similar to the previously discussed biological productivity. Presently this issue is being researched by many universities and government departments and is not well developed. Due to the negative effect of land use especially farming and forestry, undisturbed species diversity today only remains as small remnants of once large natural regions. In biological terms these species had been effected to a large extent and these remnants are only protected in existing national and regional parks and in forest reserves. Species diversity contributes at a regional level similar to biological productivity.

PHASE ONE: DEVELOPMENT PROCEDURE

Step seven:.Atlâ\200\230as Types

The results of determining values for each land use type are now presented for each for the atlas types such as air, water, land, life and land use.

Step eight: ENPAT Atlas

The final linking of the various atlas classes constitute the final ENPAT atlas. The flow diagram illustrates the various steps discussed above.

This flow diagram is essential to understanding the procedures to be followed during phase two of the ENPAT atlas, the implementation phase. The final step in the development procedure would become the first step in the implementation procedure when the atlas is utilised by its users.

It is clear that an understanding of the development process is important to understanding the functions involved in using the atlas.

ACKNOWLEDGEMENTS

ACKNOWLEDGEMENTS

The main contributors to the national ENPAT database are the following:

Institute for Soil Climate and Water (ISCW)
Pretoria

Computer Centre for Water Research (CCWR)
Pietermaritzburg

Water Research Commission
Pretoria

Chief Directorate: Geological Survey
Pretoria

Chief Directorate: Surveys and Land Information
Mowbray

Department of Water Affairs and Forestry
Pretoria

Department of Agricultural Engineering
University of Natal
Pietermaritzburg

The Department of Environment Affairs expresses its gratitude to these organisations and individuals for their contribution towards more efficient utilisation of the Environment's potential.

APPENDIX A

ENPAT ATLAS FLOW DIAGRAM

ATLAS TYPE

DATA CATEGORY
& ATTRIBUTES

ECOLOGICAL VALUES

LAND USE POTENTIAL

ATLAS TYPE

RAINFALL
TEMPERATURE

VEGETATION
WILDLIFE

CADASTRE
SERVICES

- LIFE SUPPORT
SYSTEMS

SPECIES
DIVERSITY

WATER

PRODUCTION