DESIGN OF A COMMUNAL LAND TENURE INFORMATION SYSTEM FOR NAMIBIA

MSc Thesis

By

ANTWI ADJEI DANSO

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Department of Geomatics
University of Cape Town

Dedication

This thesis is dedicated to my
brothers and sisters who
financed me through out my course

.....with all my love.....

Terms of Reference

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Declaration

I certify that the thesis comprises
only my original work except where due
acknowledgement is made in the text to all
other materials used.

Antwi Adjei Danso

July 1998

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Abstract

This thesis describes some of the communal land tenure systems pertaining to Namibia. Understandably, lands held under communal land tenure have tended to be neither fully documented nor legally and explicitly formalised; communal land tenure systems have been through the mercy of arbitrary action by the state, private individuals or other institutions (S.A. Government, 1996: 43). The study attempts to examine the issues involved in the design of a communal land tenure information system for Namibia. It therefore seeks to examine the possibility of using information technology to plan and manage customarily held land, the requirement for an effective design and implementation of such a system and the method of designing such an information system to make room for continual improvement and the addition of finer detail.

The research begins with an in-depth literature review of the communal land tenure systems in Namibia and a description of similar information systems. This is followed by the research methodology, which describes the technique used for collecting, analysing and presenting the results of the study. The needs analysis and the data structure contained in the atlas are outlined. The fundamental concepts of database design and the various steps taken by the author to design and construct the land tenure database model for the dissertation are also discussed. The pilot project is analysed, taking into account the capability of the system, its success in terms of a needs analysis, and the adequacy of the data. It specifically analyses the design in the light of social relationships, person or group interests and the spatial component of communal land tenure systems with respect to each area. In addition, it seeks to answer the question whether the tool fits the communal land tenure system, discusses the strengths and weaknesses of the overall system design and the implementation strategies.

It is envisaged that, with the provision of the information system in union with its database, this will help to identify and document a communal land tenure system. For the rural dweller or farmer, this system will provide a pictorial image of what is really happening on the ground. The information system could later be upgraded and fully implemented, enabling individuals to effectively plan activities around the existing circumstances and conditions.

The recommendation that came out from the study was that given the limited information available on communal land tenure systems, more effort should be spent to study and gather data on the system. It is strongly recommended, therefore, that research into conditions in the communal areas be regarded as a top priority by the Government of Namibia. This could lead to a richer information base in the communal areas to be utilised to improve the lifestyle of the rural communities. Thus, the prototype project designed in this thesis should be implemented fully and later developed and incorporated into an information system which, in the past, has lacked communal land tenure input. The research could not touch on all the communal land tenure areas in Namibia. It is therefore advised that the rest should be investigated in more detail. The inheritance and conflict resolution mechanism which were not modelled effectively should also be reinvestigated.

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Glossary of Terms

Alienation: the transfer of ownership of land

Allodial: the opposite of feudal; sometimes referred to as the 'paramount', 'radical' or ultimate interest.

Attributes: the description of the properties of entities.

Cadastre: a public register usually recording the quantity, value and ownership of land parcels in a country.

Cardinality Ratio: The cardinality ratio constraints specifies the number of relationship instances that an entity can participate in.

Clan: is a group of relatives who cannot trace their origins to a single ancestor, but only to a mythical person.

CLTIS: Communal Land Tenure Information System

CLTS: Communal Land Tenure System

Communal Tenure: the holding of land by a community (Payne, 1997: 55).

Conceptual schema: the concise description of the data requirements of the users and, includes the detailed description of the data types, relationships, and constraints; these are expressed using the concepts provided by the high level data model

Customary law: unwritten law established by long usage

Customary tenure: 'rights to use or dispose of use rights over land which rest neither on the exercise of brute force nor on the evidence of rights quaranteed by government statute but on the fact that those rights are recognised as legitimate by the community, the rules governing the acquisition and transmission of these rights being usually explicit and generally known though not normally recorded in writing'.

DBF: Database File

DBMS: Database Management Systems: defined by Burrough (1986) as a set of computer programmes for organising the information in a database. A typical DBMS contains routines for data input, verification, storage, retrieval and combination.

Equity: fairness; recourse to principle of justice to correct or supplement law; net value of mortgaged property after deduction of charges.

Entity: an object about which disciplined information Is to be stored. it is capable of independent existence and can be uniquely identified. It is represented as rectangle in an Entity relationship diagram (ERM).

ERM: Entity Relationship Modelling

Formalised Tenures: tenures that have been clearly defined, statutorily registered and guaranteed by the state or government.

Freehold: ownership under individual title of the land and of any structure built on it or a fee simple estate

Geocoding: the activity of defining the position of geographical objects relative to a reference grid.

GIS: Geographical Information System - a system of capturing, storing, checking, integrating, analysing and displaying data about the earth that is spatially referenced. It normally refers to a spatially referenced database and appropriate application software.

"Induna": Headman

"Induna Ya Silalo": Ward Headman

"Ju/wasi": Community of Bushmen

"Khuta" : village headman; in Bushman language

"K"xau n!a": Literaly means "big owner" in Bushman language

"Kxei Kxaosi": It's a Bushman language when used for a core group of a band, means people who have inherited the rights to the resources of a n!ore where they live.

"/Kung": Community of Bushmen

Land Information System (LIS): a system for managing land information that uses modern technology to create an information database and disseminate land information, but is ultimately controlled by the surrounding institutional and social framework.

Land Ownership: the bundle of rights and interest in a parcel of land.

Land Register: a record of rights in defined units of land.

Land Tenure: an institution encompassing the rights, responsibilities, and restraints that govern the allocation, use and enjoyment of land or the mode by which land is held or owned.

Leasehold Tenure: occupation of property for a specified period covered by the terms of the lease. Under this form of tenure, the individual commonly owns the building but pays a site rent for the use of the land on which he is situated.

Lineage: a lineage is a smaller group of relatives, within a clan, who can trace their origin to a single ancestor

"Mafwe; Masubiya": traditional tribes in East Caprivi.

Mortgage: in English law, a conveyance of property by debtor to creditor as security for debt, with the proviso that it shall be reconvened on payment of the debt within a certain period

"Nkambela": Chief or Chief Official

N.N.F.C: Nyae Nyae farmers co-operation. an official local authority elected body comprising representatives from each settlement, which allocates farming space, undertakes communal projects, and manages communal reserves in Namibia.

"N!ores": is a ju/wasi word for the collection of natural resources - wild foods and water - on which a band depended for its livelihood (Marshall, 1976).

Normalisation: this process is concerned with finding the simplest structure for a given set of data. It deals with dependence between attributes. It also avoids loss of general information when records are inserted or deleted.

"Nyae Nyae": The traditional area occupied by the Ju/Wasi.

Participation Constraints: It specifies whether the existence of an entity depends on its being related to another entity via the relationship type.

RDBMS: relational database management system. "a scheme by which information stored on a computer can be input and retrieved independent from other related data.

Relationships: the relationship among entity sets is simply an ordered list of entity sets. The cardinality ratio constraints specifies the number of relationships instances that an entity can participate in. Note that relationships are always bi-directional: (1:1 / 1:m / m:m)

Right: thing (e.g. Property) a person is 'entitled' to (includes duties and privileges

Right of Use: the particular nature of a right to land under the communal system which is not right of tenure in the western usage. The traditional rights of use are three fold in nature viz.: the right of occupation, the right of tilling and the right of grazing which may be practised collectively (communally).

SQL: Structured Query Language - allows the writing of query instructions for a relational database. It provides a means to define and manipulate data, shielding the user from needing to know how the data are structured internally, that is, the user undertakes referencing by table and item names.

Usufructory rights (use right approach): this approach is based on the view that land in traditional villages belonged to the community and that individuals and families only had use rights or the right to use and enjoy another's property, though not to destroy it.

1. CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

Land is the habitat of man and its constructive use is crucial for the economic, social and environmental advancement of all countries - indeed for human survival. Natural resources are neither inexhaustible nor indestructible, and many countries have squandered their land resources or allowed them to waste away in a few decades. More recently, however, the need for thoughtful and careful stewardship of the land, together with a more intensive use and management of its resources, has emerged as a major global concern (Dale et al. 1988:1). This has led to a re-evaluation of both the needs for information about land and the strategies and programmes that may provide it.

It has been recognised that policy makers, planners, land administrators and individual citizens all need information about land and make use of spatial data on a day-to-day basis. The importance of information systems detailing the spatial extent of traditional land and documenting the process of land allocation, use and inheritance in a community in an easily retrieved format can not be debated. The rationale behind this is that, for every country land information can assist the planning and management effort without attempting to formalise a set of rights and interests in defined parcels. Namibia is no exception. Like many developing countries, it lacks this information system. Its proximity to South Africa makes it a relatively convenient subject for this study.

Some communal land tenure data exist in Namibia, but these are widely scattered between many different books and organisations. Therefore access to all this information is difficult and it could take months, literally, to obtain relevant information. These problems not only affect the state but all users of communal land tenure information. Prior to the introduction of computers in land administration, land-related information was gathered, stored, updated and distributed manually in land registers. Although the printed map is still useful, computerised systems offer improved ways

of acquiring, storing processing, and retrieving such information. Unfortunately, communal land tenure information is not only difficult to find; it is not even stored in different unrelated files. This has led to the idea of an information system in which communal land tenure could be documented and obtained in a user-friendly manner. Land tenure information is a prime requisite for making decisions related to land investment, development and management. In view of the foregoing, the need for combining information pertaining to land rights, restrictions and responsibilities, in which a particular system falls and the general relationship with land becomes obvious; this may be either in one unified system or through a network of smaller systems linked together. In this regard, proper documentation of the various communal land tenure systems in Namibia is essential. These and many other questions posed in Appendix 1 are often required by land information users such as academics, administrators, surveyors and planners. Representatives of these groups were interviewed during the study.

It is against this background that this research question emanates: 'Can a communal land tenure information system be created given an area with a few different land tenure systems?' The system design is centred around a theoretical hypothesis which answers the pertinent research question: given an area with a few different land tenure systems, how possibly can one abstract the folk geography aspect, man-man and man-land relationships (Bohannan, 1963) into a form which can be universally modelled in a land information system? An attempt to answer this questions takes a look at the Bohannan model in Section 2.2.4

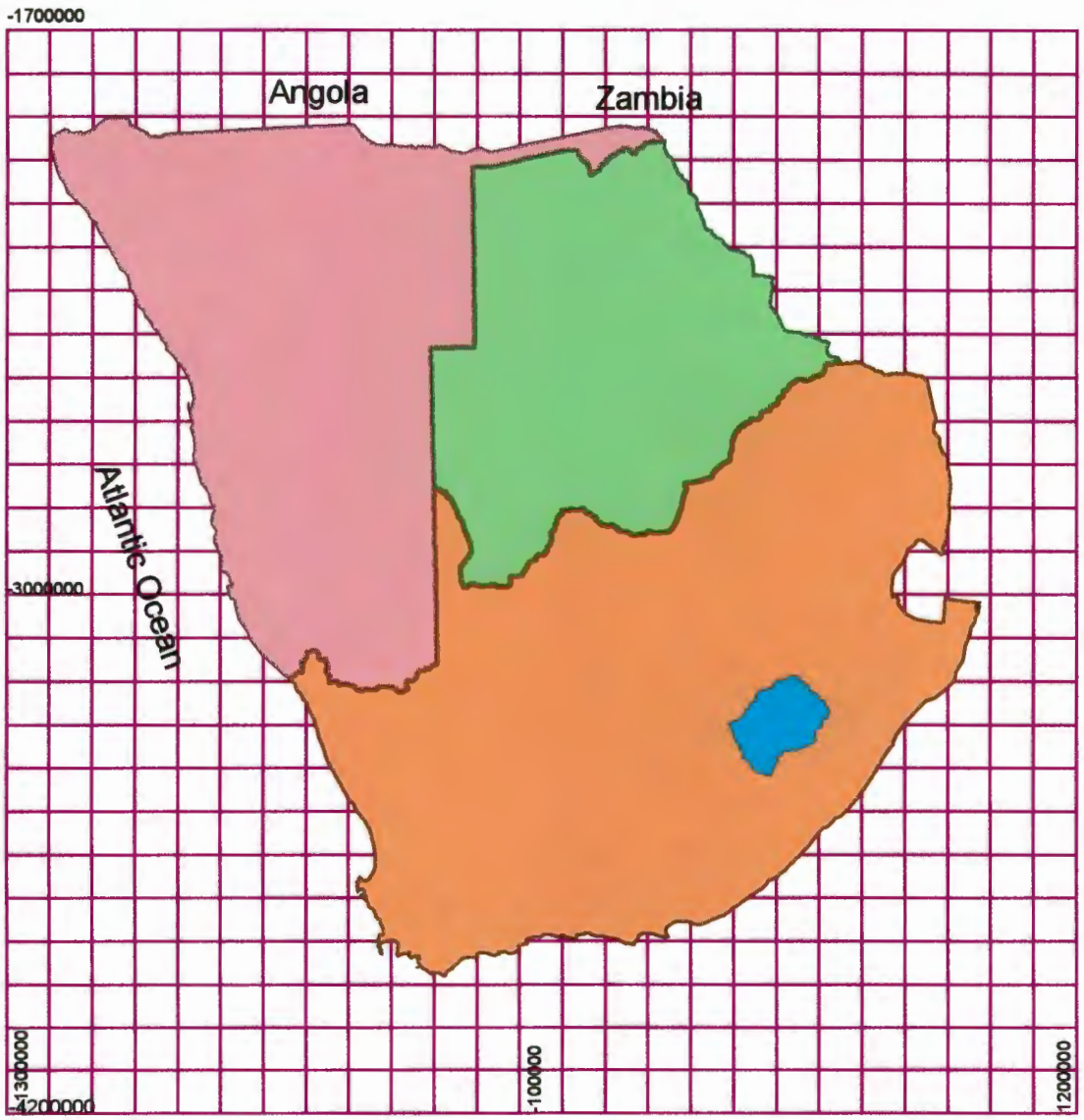
The research thus aims at exploring the concept of using modern technology to determine if a communal land tenure information system could be created for Namibia. The necessary steps have been taken into consideration to design and implement such a system. Provisions have also been made in the design of the information system to permit continual improvement and addition of finer details. This could strengthen the capacity of local governments to provide for the rural areas. This should ideally produce a system capable of integrating, reflecting, and analysing a variety of themes or layers of information, and providing a way of efficiently documenting and displaying Namibia's land tenure-related problem. It is envisaged that modern technology, which makes use of computers, may now make a greater contribution to land management than in the past.

1.2 Geographic Location of the Study Area.

Broadly speaking, the choice of the study area covers Namibia. Specifically, communal geographic areas of Namibia focused in this thesis are Caprivi, Damaraland and the Bushmanland. The choice of the study area was based on the following criteria:

- Diversity of tenure forms over a wide geographic area in Namibia;
- Namibia has a diverse set of indigenous tenure systems;
- Strong links to South Africa and therefore availability of information. The country provides a good cross-section of tenure that prevails in Southern Africa.

Namibia covers an area of 824,292 square kilometres and has a population of 746,328 - less than one person per square kilometre. It is bordered on the north by Angola and Zambia, on the east by Botswana and on the south-east and south by South Africa. The Atlantic Ocean lies along the entire western border. It is bounded approximately by the following geographical co-ordinates: 11^0E 17^0S, 25^0 30^1E17^0S, 25^0 30^1E 29^0S, 11^0E 29^0S (Figure 1.1).



LEGEND

Boundary
BOTSWANA
LESOTHO
NAMIBIA
SOUTH AFRICA
Grid

400 0 400 800 Kilometers

N

Figure 1.1 : The Study Area

1.3 Problems

Since Land Information Systems (LIS) are a product of industrialised countries, where lands are held under an individualistic, commercially oriented land tenure system, it has not been successfully introduced into, and accepted by, developing countries that practise customary land tenure systems (Rakai, 1993). In view of this, the following outstanding needs and problems in Namibia justify the research project:

- participation and strengthening of government at the local level, and indeed many other countries in Southern Africa;
- reduction of property disputes;
- flexible system of administering communal interest in land (the ability to accommodate individual and group interest);
- ability to deliver social justice.

A Communal Land Tenure Information System (CLTIS) should provide information for planning, managing and administering communal land tenure systems. Secondly, it could provide communal land tenure documentation to support land registration in future. The problem that arises from this is how we do this equitably to protect existing group rights against invasion?

1.4 Objectives of the Study

The main objectives of the present study are as follows:

1. to identify and document communal land tenure areas of the selected areas of Namibia by examining the historical background, and the sociological and administrative structures in the study area;

2. to design and implement a geographically referenced CLTIS for Namibia. This involves designing a database using the Entity-Relationship Model (ERM) and the relational data model as tools of the research. The relational database model has been chosen for the study because of its simplicity and flexibility;

3. to provide potential users with both spatial and non-spatial information on communal land tenure systems to aid land administration and management.

1.5 Research Method and Project Sequence

The following procedure outlines the methods used in this research:

- the establishment of the relationship between land and geographic information system, ownership, registration and the overall role and the need for CLTIS in development (Sections 2.1 to 2.3);

- the description of similar information systems, (Section 2.4);

- the identification and description of the communal land tenure systems in Namibia, (Sections 3.3 to 3.6);

- the design and implementation of the database model for the communal land tenure systems containing information required to establish spatial relationships between communal land tenure systems, (Section 3.2);

- the incorporation of these individual maps into an information system of land tenure maps linked to the database, (Section 4.3);

- incorporating descriptive data and attribute data from the different land tenure systems into a single data base, which is integrated with the spatial data base, (Section 4.4);

- updating the database to incorporate new and finer detail data, (Section 4.2);

- evaluating the system design in terms of the social relationships, personal/group interests in land and spatial components in African concepts of land tenure, (Section 5.2). Finally, the strengths and weaknesses of the design, and the strategies for implementation are discussed.

1.6 Data Sources

The following data collection methods were used:

- Interviews and written communication with key persons who are experts in communal land tenure and spatial information systems provided data for the author's broader understanding and analysis of CLTIS user needs for the system design specification.

- A desktop study of academic journals, books and maps in the libraries of the University of Cape Town and the South African Chief Directorate, Survey and Mapping in Cape Town. This provided real and simulated data for the pilot system.

- Internet searches were undertaken and correspondence used. The Internet was used extensively to obtain people's perceptions of the following: who could use such an information system and why they would use it; what questions the system would be expected to be capable of answering; and possible ideas of the technical functionality that such a system should possess.

1.7 Assumptions and Limitations

The assumption that drives the need for the information system is that population increase coupled with scarcity of land, (Barry 1997: personal communication) suggests that greater demand for land in the near future may lead to the registration of land at the tribal, ward and family levels as discussed in Section 2.2.3. It was revealed that the system could provide documentation for registration in the future. The rationale behind this is that some form of protection may be needed for unregistered land. It is also assumed with reference to Section 1.3 that there could be reduction of property disputes and the involvement of government at the local level. Thirdly, it is also assumed that both spatial and non-spatial information could be provided on communal land tenure from which potential users could benefit as stated in Section 1.4. On design choices, there is the need to consider simplicity in terms of the system being implementable within the region, a means to capture information in a non-standardised form that can be reviewed and perhaps standardised later, layering and nesting in the design itself.

Certain problems were encountered during the research. The major problem was that information at the kinship unit was difficult to obtain. However, the design has incorporated this aspect, should the information at the lower level become available. The concept of land (geo-cultural view) or the folk geography aspects of the Bohannan model, details of which are discussed in Section 2.2.4 which, in the African perspective, is quite a variable one, was difficult to model. Though inheritance and dispute resolution form a major component in communal land tenure systems, these aspects were also not modelled effectively. Certain attributes of these tenure systems are difficult to classify and model and they therefore cannot be put into relational tables. Consequently, an information system such as this does not support a large number of comparative or filter type queries. It therefore tends to take on the characteristics of a digital atlas or encyclopaedia. In view of this, textual description of communal areas has been incorporated to explain the situation that pertains to the study area.

1.8 Format of Thesis

The thesis is organised into six chapters. As well as providing a background and overview of the thesis, Chapter One states the problem to be investigated, objectives of the study and the research methodology.

Chapter Two provides an overview of key definitions and issues based on world-wide progress in understanding land tenure as a whole. It also reviews similar information systems and the need analysis of the information system.

Chapter Three describes some of the diverse forms of communal land tenure systems practised in different parts of Namibia.

Chapter Four examines the data structures of the design with reference to the spatial and the non-spatial data involved in the database as part of data acquisition.

Chapter Five reviews the fundamental concepts of database design. It outlines the various steps taken in the study to design and construct the land tenure database model.

Chapter Six deals with the system design analyses by evaluating the design in terms of the social relationships, right to land and the spatial regulation of land as stated in Section 1.5.

The Seventh and final Chapter summarises the conclusions that can be drawn from this research, and offers some recommendations. The chapter also looks at the strengths and weaknesses of the design, features of Communal Land Tenure and strategies for the implementation of the information system in Namibia.

2. CHAPTER TWO: LAND TENURE AND LAND INFORMATION SYSTEMS

2.1 Introduction

The mode of holding land communally differs from place to place. Therefore, any attempt to generalise the communal land tenure systems could be misinterpreted due to the following assumptions by the writer:

- tenure systems are different;
- attempting to generalise a number of characteristics of them is inadvisable because
  - characteristics unique to a particular system may be critical for land use planning, land policy development and land management;
  - omissions in information may result in unsustainable and perhaps damaging development;
- certain concepts and features are common to different systems; and
- certain types of information need to be categorised for land policy and development; examples being 'ownership' and inheritance information.

However, basic concepts and features are common to different systems. This chapter looks at the basic concepts of land tenure, ownership and registration which are relevant to the study. It also describes and examines other similar information systems that have been set up in related fields. Since this study looks at the issues of incorporating customary land tenure into an information system, the related areas selected are those that have, in various ways recognised the importance of Geographic Information Systems (GIS).

2.1.1 Land and Geographic Information System.

The similarities and differences between land and Geographic Information System discussed in this section highlights the role and the overall importance of information systems. The technology of computers, communications and data storage brings special problems to the design, implementation and effective operation of computer-based systems. This technology provides both opportunities for, and limitations to, the scope, scale and flexibility of information systems (Brookes et al., 1982). Rakai (1993) referred to an information system as a combination of human resources, technical resources, and organisational or institutional procedures that produce information to support some managerial requirements. Information about resources that are related to the land by virtue of their location are considered to be land-related - a major step towards assuring improved management of existing resources. This requires the organisation and storage of what is known and the provision of rapid information retrieval in forms acceptable to a broad array of users (Lodwick, 1987:12, citing Avery, 1987). Among these forms of information systems are Land Information System (LIS) and GIS. Land information systems are similar to management information systems, except that they involve an additional spatial element. Essentially, this brings in geometric (co-ordinate and topological) aspects, which add an additional degree of complexity. Thus, LIS covers the aspects of surveying, cartography, geography, computing and mathematics.

Land Information Systems aim to bring together all forms of spatial data by using modern computer technology, which has itself undergone dramatic developments in terms of power, speed, storage capacity and cost reduction over recent years. More recently, data types such as aerial photography, and especially satellite imagery, have stressed the need for the marriage between the two data sets, which has been made possible by the class of mapping tools known as Land Information Systems (Burrough, 1986).

Lodwick (1987) has defined land information systems (LIS) or land-related information system (LRIS) as

> *. . . a tool for legal, administration and economic decision making and an aid for planning and development which consists of a database containing spatially referenced land-related data for a defined area, and on the other hand, of*

> *procedures and techniques for the systematic collection, updating, processing and distribution of the data. The base of a land information system is a uniform spatial referencing system for the data in the system, which also facilitates the linking of data within the system with other land-related data.*

This definition was approved by Commission Three of the Federation International Des Geometres (FIG) at Montreaux in 1981 (Hamilton and Williamson, 1985). A geographic information system (GIS) has also been defined as follows:

> *Any system of spatially referenced information or data have a unifying characteristic - association with a specific place on the earth's surface. A GIS is designed to gather, and provide a wide variety of geographically referenced information that may be relevant for research, management decisions, or administrative processes (Lodwick, 1987:21, citing NRC, 1983).*

From the following analysis, it can be inferred that the type of information contained in the above three systems is all spatially oriented. Rakai (1993), compares LIS and GIS and notes that land information systems tend to be parcel-based, large-scale, dynamic, administrative systems having very high integrity and accuracy of data. They include cadastral systems as a key component and have almost always grown out of an existing cadastral system. They are typically major administrative systems which support government activities such as land registration, land tax, land subdivision, local government administration and the management of utilities and services.

Geographic Information Systems, on the other hand, are typically medium-to- small scale, generally one-off project-oriented and are usually concerned with a lower integrity and accuracy of data as is common in environmental and natural resource systems. Generally, they differ according to the map scale accuracy and applications that they are designed for. Thus the terms "Geographic Information System" and "Land Information System" will be used in this thesis since it is of small scale nature and could be used for land administration and management and they all have the basic aim of disseminating information to the general public.

2.2 Basic Concepts

2.2.1 Definition of Land Tenure

The word 'tenure', derived from the Latin *tenere* (French *tenir*), "to hold", indicates that land may be 'held' or owned. Margeot (1988) explains that land tenure represents a set of relationships that exist between categories of individuals (or groups of individuals) in reference to land and water, and their products.

Bohannan (1963) provides the framework for examining land tenure cross-culturally. He defines land tenure as a combination of three factors : a man-land relationship, a man-man relationship, and a concept of land or folk geography. In Western tenure systems, the man-land relationship (e.g. ownership) is dominant, whereas African tenure systems have traditionally been based on a strong man-man relationship. This means that membership in a community is a prior condition for gaining access to land, as opposed to the Western system, in which land ownership is usually a pre-condition for community membership (Barnes, 1993).

As stated earlier, land tenure therefore describes the terms and conditions under which land is held, and the rights, responsibilities and restrictions of a land holder regarding position and use of the land. It is concerned, for example, with the way in which land is spatially divided among groups and individuals and the way in which the benefits from the land are distributed within the society. Tenure systems have evolved over the centuries to cope with changing pressures on the land, such as population, which may create new relationships between groups of individuals and the land.

The identification of a land tenure system as part of the institutional structures of a society infers that tenure systems will differ between societies, and that a generalisation between societies could lead to incorrect specification of the characteristics of a specific tenure system. Because Western, socialist and traditional African societies differ, land tenure can be categorised into various forms, each of which can be distinguished by a name, for example, Communal, Customary, Community based, Agnatic, Cognatic, Feudal, Prebendary, Mercantile, Freehold, Quitrent, Fee Simple (Barry &

Fisher, 1996). Some of these are technical terms with fairly precise meaning; others are more general and properly describe a generic form of land tenure. Furthermore, societies are not stagnant, and as societal structures evolve, so do land tenure systems change.

2.2.2 Land Ownership

The Western notion of ownership does not apply to communal tenure. Consequently, there is a need to define ownership in the context of this research. Land is a basis of material and psychological security and the way in which the law determines a system of tenure is a matter of immediate consequence for all people. Land rights are frequently organised so as to achieve social, political and economic aims, and the group that is in a position to manipulate land rights is able to entrench its political hegemony (Bennett et al, 1986:V). In everyday language, land ownership denotes possession of all the rights and interests in a parcel of land (Wonderlich, 1992:80). In Roman-Dutch law, ownership is considered to be 'absolute'. This concept is difficult to define precisely but it connotes, inter alia, that ownership is the greatest right that a person can have in property, that it is inherently unrestricted (although admitting of voluntary restrictions) and that it is the only right of its kind, i.e. the law does not recognise 'lesser' forms of ownership (Bennett et al, 1986). However, this concept of absolute ownership no longer seems to reflect patterns of behaviour regarding land use. This has come about as a result of new technology in farming and mining, protection of scarce resources, etc. These factors have been responsible for the imposition of limitations on an owner's right to use and exploit his land, thereby eroding the 'absoluteness' of his ownership (Bennett et al, 1986).

Another concept, which also attempts to define ownership as being a set of rights, is the bundle of rights (Wonderlich, 1982). Barry and Fisher (1996), quoting Honore's (1961), lists the following as the incidents of rights among other things:

- the right to possess;
- the right to use;
- the right to manage;

- the right to the income;
- the right to the capital;
- the right to the security;

These rights might not explicitly apply directly to communal land tenure ownership as it is implicitly defined. Bennett et al (1986) point out that communal ownership, given its usual common-law denotation, might mean either that a right is held by a group of people jointly, i.e. by a single inseparable title, or by a group in common, i.e. each person having his own separate but the same title. Since this ambiguity is not explained, it becomes difficult to apply direct ownership as used in the Roman-Dutch law to a communal land tenure system. Ownership used in this study implies that the land belongs to the community and that the individuals do not have 'absolute' 'ownership'.

2.2.3 Land Registration

With reference to Section 1.3, which states one of the problems as reduction of property disputes, this can be realised by also achieving one of the objectives of identifying and documenting communal land tenure system (Section 1.4) in a specific area by considering land registration as a future follow-up. The relevance of land registration to the research is that population increase coupled with pressure on communal land requires an information system that will take registration into consideration. Therefore, the CLTIS is geared towards identifying individual or group interests in the land. It disseminates information about people, and the nature of interests in the land. In modern societies, the transfer of title and rights to land is typically recorded in land registration offices. Land registration, as defined by Nichols (1993:4), is the official systematic process of managing land tenure information. Nichols classifies the information in land registration as follows (Figure 2.1):

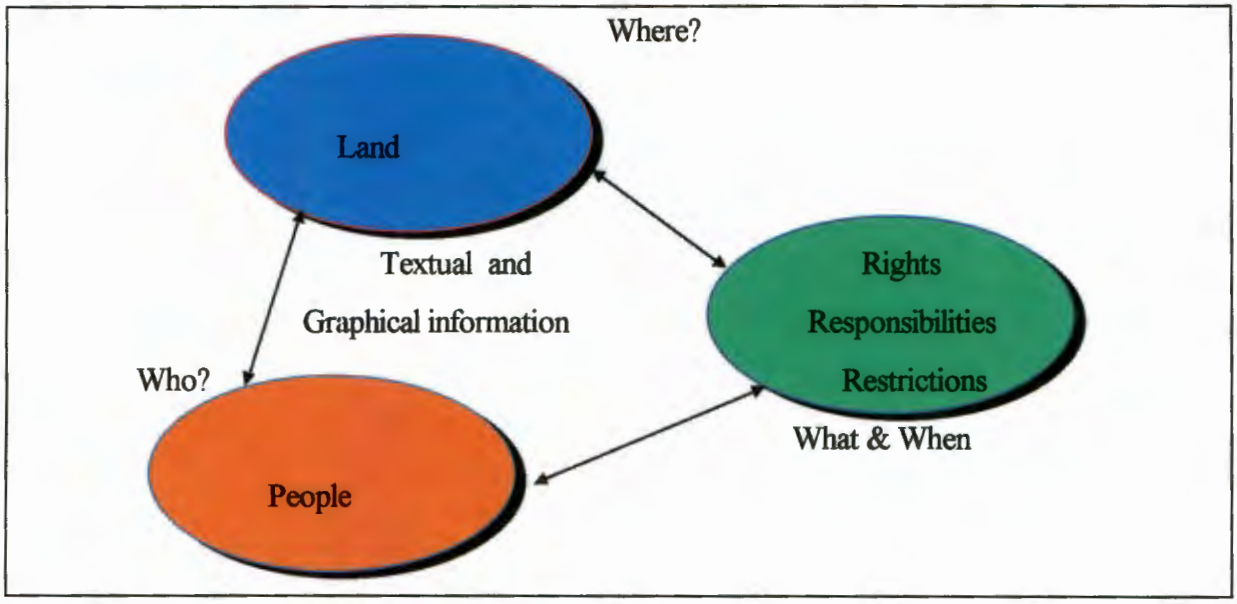


Figure 2-1: Land Tenure Information (adapted from Nichols, 1993)

- information about people - i.e. individuals and groups of individuals who have a recognised interest in land;
- information on the nature of these interests - i.e. the rights, responsibilities, and restrictions in land, including their duration and their effects;
- information about the land - i.e. the units of land, or land parcels, to which these interests apply, including location, value, resources, and use, where appropriate.

The information may be represented in a textual or graphical format and the medium may vary. Even an oral record of the history and status of community tenure might be considered a rudimentary form of land registration if the information is publicly recognised and consistently maintained (Nichols, 1993). Land registration must be official in the sense that the information may be used as evidence of interests in land, for example in resolving disputes or when land is used as collateral. To be systematic, there must be policies, standards, and procedures in place to collect, validate, maintain, and provide access to the information.

Nichols (1993:8) again classifies land registration systems as being either primary or secondary. In the former, the main function is to manage information on land tenure, usually for legal purposes.

Secondary systems include those in which creating and maintaining a record of land tenure is secondary to the purpose of the system (property taxation and land use planning). The key functional objectives of a land registration system are to provide the following (Alberts et al, 1995:25):

- security of title through maintaining an accurate system which corresponds as closely as possible with the actual rights people have in relation to immovable property. The aspect of security serves the interests of the holder of the rights to land. Registration is intended to protect the real rights (i.e. the rights to land which are, in principle, enforceable against the whole world) of those persons in whose names such rights are registered in the land registry, thus enabling them to prove such rights without difficulty and putting them in a position to exercise their rights;

- publicity in the sense of providing an accessible record of rights to the land. The aspect of publicity serves the interests of third parties by establishing who has title such as ownership of a specific unit of land and whether other restricted real rights (like mortgages and servitudes) exist in respect of the land. In this way, both prospective buyers and creditors are protected.

2.2.4 The Traditional Communal Land Tenure System

Customary land tenure arises as a result of the long established practices and traditions of a traditional society in obtaining, using, distributing and disseminating its land. Rakai (1993:27) defines customary land tenure system as the "rules accepted by a group of the ways in which land is held, used, transformed, and transmitted." According to Payne (1997:3), customary tenure systems have been defined by the United Nations as follows:

> *"The rights to use or to dispose of use-rights over land which rest neither on the exercise of brute force nor on the evidence of rights guaranteed by government statute but on the fact that those rights are recognised as legitimate by the community, the rules governing the acquisition and*

transmission of these rights being usually explicit and generally known though not normally recorded in writing."

Leisz et al (1995:6) extends the definition by pointing out that customary systems are the sum total of a community's conventions and rules which regulate the use of land and natural resources found within the community's territory. A major characteristic of customary tenure is that the land is often regarded as belonging not to the individual but to the whole social group. As the individual leaves that land, it reverts to the group (the individual here means the whole family, not the bread winner who is free to move in search for greener pastures).

In a patrilineal society, within the descent group, each male of marriageable age has a birthright to the possession and use of a portion of the group land. Communal tenure typically prohibited alienation of land rights through sale, particularly to persons from outside the local community and the dispossession of individuals and communities. There is a strong incentive for the individual to accept and obey the customary rules of social behaviour, for to be rejected from the group is to lose land, identity and security. Land holders who commit serious moral offences (murder and habitual theft) can have their tenure rights cancelled. With the consent of its members, a tribal group may grant the use of unallocated land to strangers - persons from outside the group. Such a grant is usually conditional on the payment of rent as a tribute in acknowledgement of the group's superior interest. The grant of such rights is often not transferable nor may it be passed on by succession (Barry and Fisher, 1996).

The Bohannan model which is based on three assumptions can be used to explain the situation. First, people, regardless of culture, have some form of representational map of their country or community. In Western societies this is usually a rigid permanent map whereas in African societies this may be flexible. Second, in all societies there exists a system which deals with the relationship between man and his physical environment. Bohannan (1963) calls this the man/thing relationship and includes in it the many ways in which people "hold" the land. Finally, rights against people, particularly with regard to land, are controlled by the social system, the man/man unit.

- **The Folk Geography Aspect**

The indigenous (traditional) mapped concept of land tenure in the study area is socio-politically determined. Rights to land are achieved by territorial membership of a group. This means that membership in a community is a prime determining factor for gaining access to land. This membership comes with it qualifying rights such as: occupation, tilling and grazing. Furthermore, the folk geography aspect which is difficult to model is overlapping rights coupled with shifting seasonal rights. This overlapping scenario might conflict with the Man-Land part of definition provided by the model. The seasonal claim to land in both time and space makes it difficult to model due to its nature and complexity though it is incorporated descriptively in the system in chapter Four.

- **The Man-Man Part**

The second aspect of the principles of Bohannan for the analysis of rights to land is the organisation of man/man relationships within the social systems (the so-called spatial regulation) with reference to rights to land. Descent seniority apparently applies only to persons in authority (tribal chiefs and ward headmen) and their immediate relatives and seniors as regards rights to land. All tribesmen (with the exception of tribal chief, ward heads, and certain relatives and a few 'other privileged persons') are treated without privilege owing to status or rank of seniority when it comes to the allocation or exercising of rights to land. In chapter Four an attempt is made to model the social system's spatial regulation of man-man relationships with reference to land in an African concept, as determined by the status within the group.

- **The Man-Land Part**

The third aspect of Bohannan's framework refers to the man-land relationship. In contrast to Western ownership (individual ownership right), the indigenous system of Africa south of the Sahara is popularly known as 'communal' or 'tribal' rights. An outstanding way of distinguishing and comparing rights to land is to analyse the various (types of) rights which individuals can obtain over different types of land. Although individual rights may show a lot of similarity within the different ethnic groups, the ways of combining, obtaining, exercising and losing the different rights may differ significantly. The common right of use available to the indigenous tribes are grazing,

water, hunting, gathering, felling cutting and digging. The two rights of accommodation, viz. the residential and the tilling rights, are usage rights with which tribesmen (tribal ward members) are endowed for the benefit of their respective families. The communal grazing rights are based on the natural rights of the tribesmen to free and communal grazing and water for their large and small stock on the communal land available for grazing on the commonage.

The above conditions should be seen as general principles guiding communal tenure systems. Clearly, these may not apply to each community and there may be a number of variations. These are based on anthropological observations and assumptions (Barry & Fisher, 1996). A more detailed investigation is conducted in Chapter Four in which some of the communal tenure systems prevailing in Namibia are examined. Considering, therefore, how the traditional system of rights to land is established, and the close connection it has with rural and agricultural development in Africa, its merits and demerits on indigenous people will now be discussed briefly.

2.3 The Role of Communal Tenure in Development

The traditional communal system of land tenure was part of a societal system which was predominantly rural-based; so a discussion of the role of traditional tenure in development is confined to rural development. The advantages of the traditional communal tenure system of land tenure are summarised by Jeppe (1980: 382-385). These include the maintenance of traditional power structures, the absence of speculation in land and the collectivist nature of traditional societies. The perception of economic organisations such as land tenure systems of working rules emphasises the fact that they are subsets of society (Parsons, 1978: 2), so that a change in the tenure system will lead to a change in the societal structure, and vice versa. The traditional land tenure system acts as an expression of group unity and territorial integrity and is basic to socio-political unity and therefore traditional authority structures.

The traditional tenure system has the further advantage of guaranteeing a subsistence retreat to each member of the tribe. The tribesman belongs to a group, and as a member of that group, he has the right to a piece of land, and thus the right to a subsistence level of income. The traditional

communal tenure system prevents the creation of large estates, and "absentee landlords". These are regarded as speculation in land and concomitant loss of sovereignty, a breakdown of tribal structures and a creation of large estates. Communal systems provide free or very cheap access to land to the poor. The social structure which goes with communal ownership also provides an important survival safety net function to the poor, as does the fact that the land cannot either be sold to raise cash in emergencies or foreclosed for debt (Tenure Reform Core Group, 1996).

Not withstanding the above benefits, the communal tenure system has some detrimental effects as explained by Vink (1986: 24). The communal land nature of ownership as well as the prohibition of alienation of land to people outside the traditional community, referred to as the corporate descent group by King (1974: 30), inhibits the formation of a market in land while the guarantee of a subsistence plot and access to grazing makes a market in the rights to land unnecessary. This absence of a market in land prevents the reallocation of land to its most productive users. The absence of a land market has the further effect of inhibiting capital formation in agriculture. The subsistence-orientation of agriculture implies small incomes, and therefore low levels of savings and investment, so that the major potential asset for crop farmers is land. Land cannot, however, be capitalised in the absence of a land market, and capital formation is therefore inhibited. Mshonga (1979) explains that the legal rights are usually usufruct, impermanent and governed by the traditional unwritten law. The system does not encourage investment by the individual exploiters of land and indeed by the whole community.

A further disadvantage of the communal tenure system is derived from the general succession rules. Descent claims in traditional societies in Africa usually follow matrilineal, patrilineal or cognitive lines (King, 1974: 32). Subdivision of property normally occurs when the land is inherited by a number of people, leading to subdivision of land which taken together with increasing population pressure on the land will lead to subdivision into uneconomic units. The argument is often advanced that communal grazing rights, coupled with increasing population pressure on the land and the absence of alternative investment opportunities, lead inevitably to overgrazing. Communal grazing removes any incentive for an individual to limit herd size in order to protect or conserve the carrying capacity of the grazing. Mshonga (1979: 42) adds that the customary communal land

tenure as presently practised in the former homelands would also be unsatisfactory for an independent Namibia due to the fact that, every livestock owner under the system has the right to graze animals where he wishes - no one is responsible for the maintenance of the pastures.

2.4 Review of Existing Information Systems

As discussed in Section 2.2.4, many characteristics of communal tenure systems cannot be generalised and modelled using conventional data modelling techniques. Consequently, a digital atlas combined with Database Management Systems (DBMS) was adopted. A study of similar information systems reveals the potential and capability of the systems and how it could be applied to the communal land tenure information system. As outlined in Section 1.5 that similar information system would be described, a number of existing atlases and GISs were examined to develop the system's functionality and good practice.

The Botany Department of University of Cape Town has developed the Protea Atlas. The ultimate objective of that system is to stimulate awareness and thus engender a conservation ethics. The project concludes that an atlas is the ideal way of achieving these ultimate objectives and goals. Beckett et al (1974) undertook a project to produce an atlas of Fungal Ultrastructure. The main aim of this atlas is to supplement information that is provided in existing mycology text books. They concluded that, presently, the knowledge of fungal Ultrastructure is not sufficient to permit identification of the 'typical type', therefore supplementing fungal information with the atlas is the ideal way. The purpose of Environmental Potential Atlases (ENPAT) undertaken by the Department of Environmental Affairs and Tourism, South Africa, is to show the potential of a chosen piece of land for conservation, development or agriculture, using environmental criteria (ENPAT, 1996). The ENPAT project concluded that, by querying the environmental and population sets together, the potential environmental impacts of broad planning actions or national policy decisions can be modelled and predicted.

From the above information system review, it could be noticed that atlases can be used to supplement information that is provided in existing information systems and books. The atlas is

therefore the ideal way of collecting and presenting information which has hitherto not been given the attention it deserves and that, CLTIS is not an exception. Comparative, limited information and literature exist; the CLTIS is therefore necessary to identify communal lands and to document the features peculiar to each area. Again, the communal land tenure information system is used from small to medium scale, i.e. kinship units to national level. Textual or descriptive information is attached to spatial data due to the fact that not all aspects of communal land tenure system could be modelled. Despite the small scale nature of the information system, if the system is used for broad planning and land use applications, then it may provide pointers for general information and detailed investigations on the ground should such a need arise. From the foregoing analysis, it is clear that atlases are becoming important in presenting and supplementing information in broader scale.

2.5 The Need for CLTIS

This section describes the societal forces that drive the need for communal land tenure. These include spiritual, services, democratisation or banking. A sensible approach to designing, evaluating, buying and using spatial information systems is to know what particular, preferably well-demarcated, problems - scientific or practical - have to be solved (Robert et al, 1992. By providing an up-to-date inventory of land rights, the system makes information available on the nature and extent of the available resources. The following are some of the system needs:

- Socially, land information may be used to effect a more equitable distribution of resources including a wide range of public goods such as utilities, clinics, schools and generally information about the land and its scarce resources. Politically, land administration may help to connect the government more closely to its citizens. The flow of information that is created through land administration can allow the government to be more responsive to societal concerns. Environmentally, land information protects scarce and fragile resources. Finally there is the economic factor: it may be used to foster economic development by using resources more effectively. Land information is therefore an instrument for implementing and monitoring specific policies with regard to the land (Barnes, 1993). Nichols (1993:26) argues that information is the foundation for making, implementing, and enforcing land management

decisions. The CLTIS will therefore help in land administration and may thus be required to serve a number of objectives - social, economic, environmental and political - as Alberts, et al (1995) explain.

- The system may help to document the communal land tenure system which is mainly based on oral tradition and goodwill. The capability of LIS to store historic data may preserve the customs of the rural people, bringing with it more cultural awareness, and thus, less conflicts with land developers and foreigners. Spiritually, there may be compliance with customary taboos over sacred areas, e.g. burial ground and worship sites, to ensure that these sites are preserved, and not desecrated by land developers;

- The CLTIS can be linked to other databases. As outlined in section 5.4 the system gives interactive access to the database for spatial and non-spatial queries, display and extraction of information. It can be linked to other information systems such as health, education or infrastructure depending on needs. The system could be networked and made accessible for querying by authorised users.

Moreover, with the reliability of socio-economic and other planning information, it can promote development, land reform and consolidation. This development enables users to select land properties based on any of their various attributes stored in the database. Trenchard (personal communication, 1996) of the Rural Development Division at Food and Agriculture Organisation (FAO) of the United Nations suggested that such a system may be used by national and local governments, project planners, international bilateral and multilateral donor organisations and local private sector institutions (credit and banking agencies). The information system would be of value to the state as well as private companies and individuals (Professor Larry Zietsman, Stellenbosch University: personal communication, 1996).

The state would be interested in tenure for planning and development purposes, in order to assess how much land is owned, where and by whom. In addition, this information combined with other data sets could be used to assess productivity and potential. Private companies need to know whom

the land belongs to for possible investment and development reasons. One can come out with many reasons why there should be the need to know ownership and tenure type, according to Professor Zietsman. It is envisaged that, the user base will continue to expand so as to include a variety of users across the spectrum of public and private enterprise.

2.6 Discussion

This chapter has looked at the elements of communal land tenure, the need and uses of CLTIS. Land tenure is the relationship between man and the land. Communal land tenure systems are the sum total of a community's conventions and rules which regulate the use of land and natural resources found within the community's territory. The essence of communal land tenure is that members of a village share certain rights in the land attached to their village. They all graze their stock, cut thatching grass, and gather firewood on one portion of the village land or commonage. The balance is sub-divided into fields which are allocated to individuals to cultivate, and over which they have exclusive rights for so long as they are domiciled in the village and without committing any serious moral offence.

Within the context of Roman law, dominion means predominantly exclusive 'ownership', a right free from all restriction. With the passage of time, this concept of absolute 'ownership' has changed, and today, the right of 'ownership' is in itself composed of a set or bundle of lesser rights. Composed in these bundle of rights, as mentioned in the chapter, are the right to possess; the right to destroy; and the right to alienate. 'Ownership' split into a bundle of rights as above can now be applied to communal land tenure system. For example, individuals have the right to the income (to take the fruits), the right to use their farm produce, the right to possess and take the fruits of the property but they do not have the right to reduce the substance of the property. On the contrary, the right to the capital and the right to alienate on the communal land is limited. In addition, the holder has very little control over the disposal or transfer of his land.

One of the most important components of the bundle of rights as discussed in Section 2.2.2 is the right to use and take the fruits but not alienate or destroy (usufruct). The individual therefore has

easy access to the usufructory rights to land by virtue of his membership of the group, but he shares these rights with other members of the group, and does not have access to many other rights (Vink, 1986). The traditional rights of use are threefold in nature; viz. (a) the right of occupation, (b) the right of tilling, which are fairly strong individual rights, and (c) the rights of grazing, which is practised collectively (communally) mentioned in Section 2.2.4.

Since these rights relate to all persons, there is the need to advise all people. The legal means of informing all people is to record the rights in a register which is open to the public for inspection (Margeot, 1988:289). The object of registration is to give notice of ownership and rights to all concerned, and in particular to the creditors and the owner and the prospective buyers. This discussion of the concept of land tenure system leads to the conclusion that forms of tenure can be distinguished by looking at who holds which rights to land, and in what manner these rights are held. Such a classification is according to a jural interpretation of the rights to land. Other methods of classifying land tenure systems are according to usage and labour. From the above discussion, review and the perceptions of the people interviewed, the major conclusion drawn is that CLTIS could be used effectively and profitably as supplementary information to assist in management and decision making in a broader scale.

3. CHAPTER THREE: NAMIBIA'S COMMUNAL LAND TENURE SYSTEMS.

3.1 Introduction

This chapter describes and analyses some of the communal land tenure systems in Namibia and identifies issues that could be relevant in determining the attributes for designing the communal land tenure information system. Included in this review is the historical background to Namibia's communal land tenure systems. The purpose is to portray how the systems have been modified by varying colonial policies. Specifically, communal land tenure systems in Caprivi, Damaraland and the Bushmanland have been modelled pertaining to the study are as stated in Section 1.2.

3.2 Historical background

The process of the colonisation of Namibia (Figure 3.1 below) began in the mid-nineteenth century with the arrival of immigrants of Whites who came as traders, prospectors, hunters, missionaries and adventurers. Many of these Whites finally settled in the territory as cattle farmers after securing land and cattle deals with headmen and chiefs (Mshonga, 1979: 9).

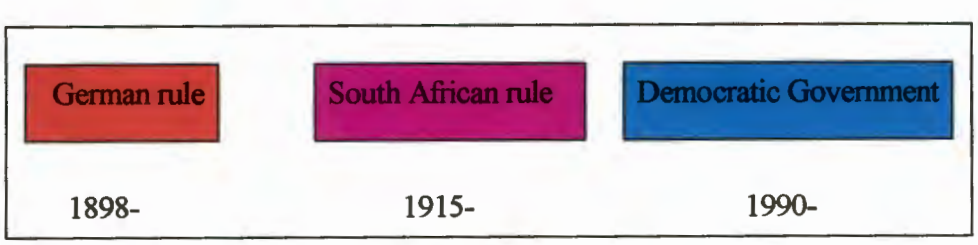


Figure 3.1: History of Colonisation and Government.

(Sourced from Adams, 1990.)

In 1898, Governor Leutwein issued a decree establishing "Native reserves" - the areas to which the Black inhabitants of the country were to be confined (Mshonga, 1979:9). The main reason for establishing the Native reserves was to make room for the large-scale farms for the Whites. Africans were permitted to 'own' land or breed cattle only with the permission of the governor of the territory (Mshonga, 1979: 9). It was against this background that the indigenous population took up arms to drive off the Germans in what turned out to be a bitter war from 1903-1907.

After the defeat of the German army in Namibia by South Africa in July, 1915 the League of Nations granted South Africa a mandate over the territory. However, in spite of the UN Security Council resolutions 264 of 1969 and 276 of 1970 and the International Court of Justice's advisory opinion, South Africa continued to rule Namibia illegally until its independence in 1990. The most commonly practised tenure arrangement for the Blacks was labour tenancy whereby farm labourers were permitted to graze a certain number of cattle on White farms in lieu of wages (Mshonga, 1979). This effectively prohibited Africans from owning land in any area of the territory outside the reserves.

3.3 Namibia's Communal Land Tenure Systems

Namibia has three main types of land holdings: freehold, state land and communal lands. It is on the native land that communal land tenure systems are practised. The pie chart below (Figure 3.2) illustrates the comparison of land tenure by areas in Namibia.

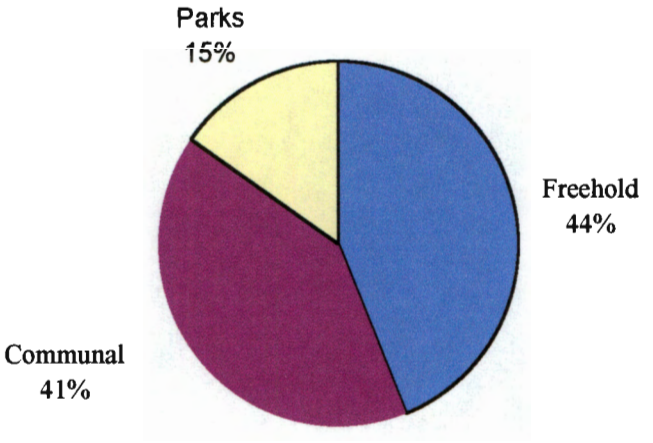


Figure 3.2: Geographical Distribution of Land by Tenure Type

(Adapted from Adams et al, 1990)

'Communal areas' in Namibia (Figure 3.3) were formerly known as the reserves or homelands. They comprise ten (10) different former homelands created by the proposal of the Odendaal Commission (Adams et al, 1990). The commission proposed certain changes to the constitutional ownership of land and its recommendations to grant self government to the 'homelands' provided for the transfer of all land with homeland boundaries to respective ethnic legislative assemblies for the people. As mentioned earlier, Caprivi, Damaraland and Bushmanland are selected from the communal areas as sample areas.

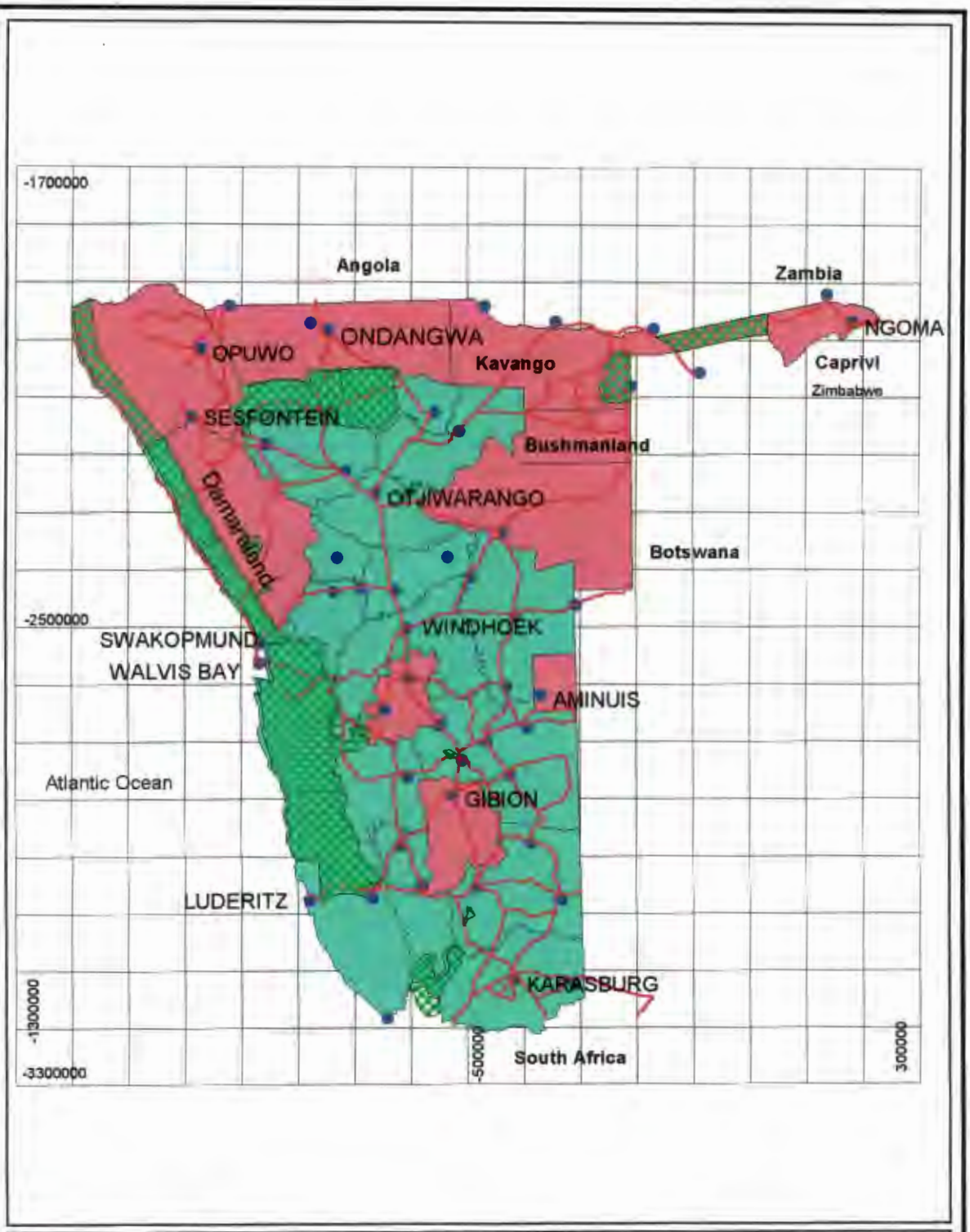


Figure 3.3 : Namibia Communal Land Tenure distribution

3.4 Land Tenure in Caprivi

The beginning of this chapter has highlighted some general details of land tenure in Namibia. The next aspect is a brief outline of some of the characteristics of the traditional systems in the East Caprivi shown below in Figure 3.4. The West Caprivi is the subject of considerable controversy, in essence involving a conflict between the land needs of farmers in the East Caprivi and in Bushmanland to the south, and conservation needs identified by the Department of Nature Conservation.

East Caprivi is chosen for the study due to its strong cultural background. Discussion of communal land tenure issues in Caprivi would therefore be centred in East Caprivi which is divided into two tribes: Mafwe and Masubiya. Each tribe has a Chief or King. The population of East Caprivi is characterised by high levels of mobility within the region, as a result of changing water levels and availability of pasturage (Adams et al, 1990). A number of villages together constitute a ward, headed by an *induna ya silalo* (ward headman), whose appointment is made by the tribal council, *Khuta,* after consultation (Figure.3.5). Each village is under the authority of an *induna* or headman, who is usually the male head of the first family to settle in a particular area. A new headman is elected if it is considered that the current headman is unsuitable or upon his death. Women are not restricted from holding this position, but in practice, it seldom happens (Adams et al, 1990). As Adams et al (1990) explain, the highest legislative administrative and judicial body in the traditional system is the *Khuta* or traditional council. It comprises a number of *silalo indunas* and is headed by the *Nkambela* or chief (or chief official).

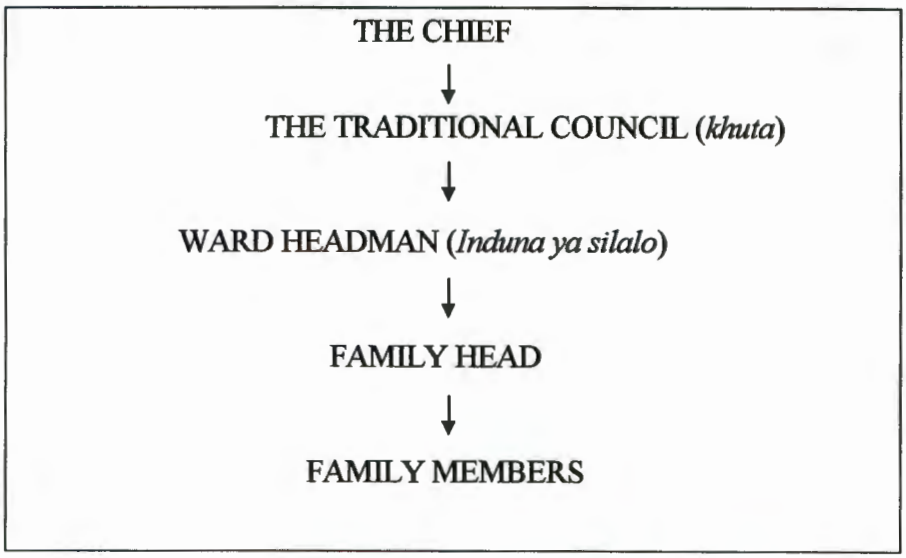


Figure 3.5: Communal Hierarchical Order of Rank

The *Khuta* acts as a link between the community and the chief, and it also has the power to remove the chief from office if it is felt his conduct is unsatisfactory, although the chief's position is hereditary. The authority has the right to allocate land, and becomes, in a strict legal sense, the "owner" of all land in Caprivi. In practice, however, the traditional process of acquiring land still predominates. Each communal area has clearly defined rules regulating the access to, and control of, land. Two distinct types of access to land generally exist in Caprivi. Namibia. The first is individual or family access to residential plots and arable land (Figure 3.6); the second involves communal use of the same land for individuals (Adams et al, 1990:130).

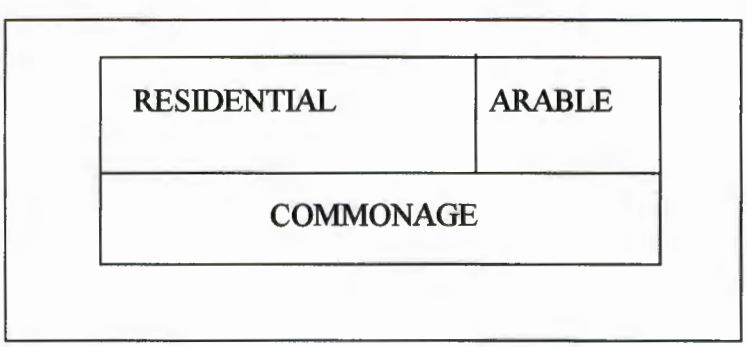


Figure 3.6: Ward Set Out

An adult is entitled, under traditional law, to a residential plot, an arable allotment, and access to a communal land for grazing, wood, and thatch collection. The amount of land allocated depends on the availability of land in that area and the anticipated needs and capabilities of the applicant. The following rights are then observed (Figure 3.7): the right to water; the right to gathering drywood, grass and fruits; the right to hunting of game; the right to felling certain types of wood and cutting grass. Once an individual acquires permission to cultivate a piece of land, he or she is required to pay a once-off lump sum in cash or in kind to the *Khuta*. The amount varies and is determined by the size of the land and what its new 'owner' can afford (Adams et al, 1990:131).

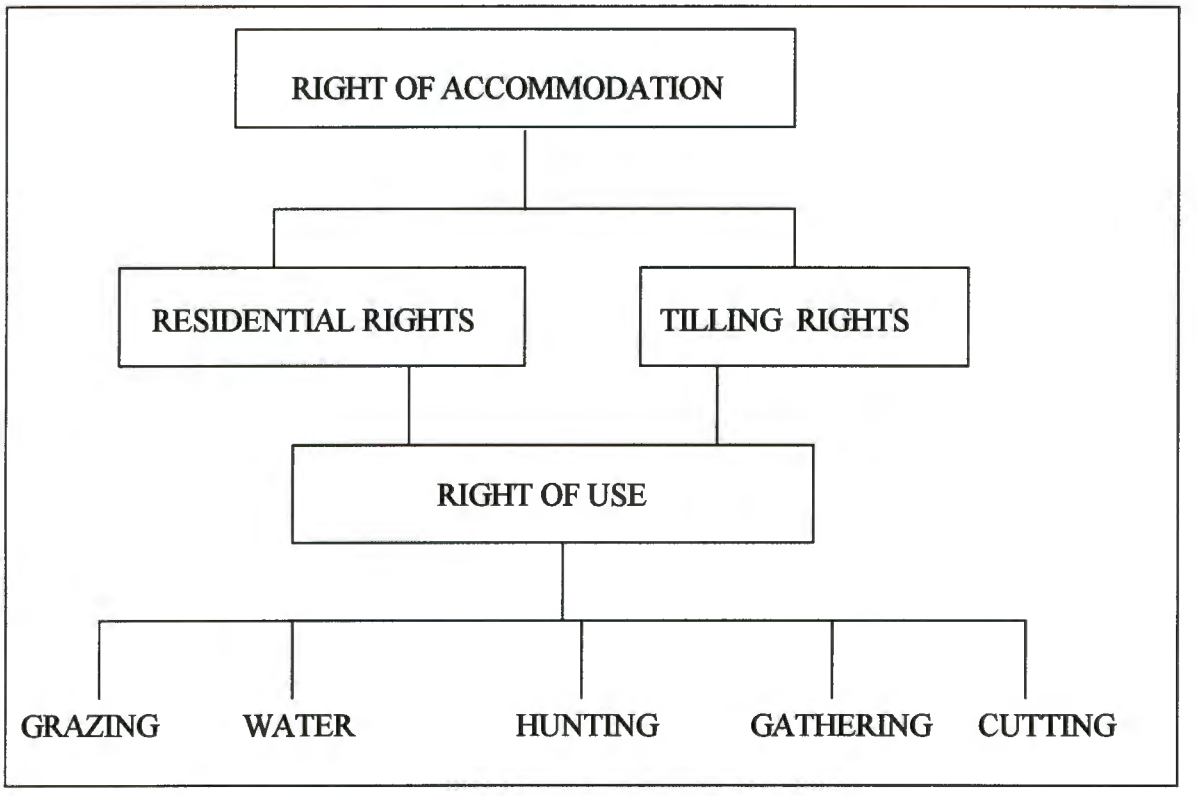


Figure 3.7: Tribal Rights in East Caprivi

This practice is particularly common in Caprivi. The first criterion in determining eligibility is membership of the tribe under whose area of jurisdiction a plot falls. An affiliation to a different tribe within the Caprivi or Namibia is not an impediment to the acquisition of land. The main proviso is that an applicant for land in a "tribal" area other than his or her own must be willing to accept the authority of the *Khuta* and must also be acceptable to the community in that area (Adams et al, 1990:130).

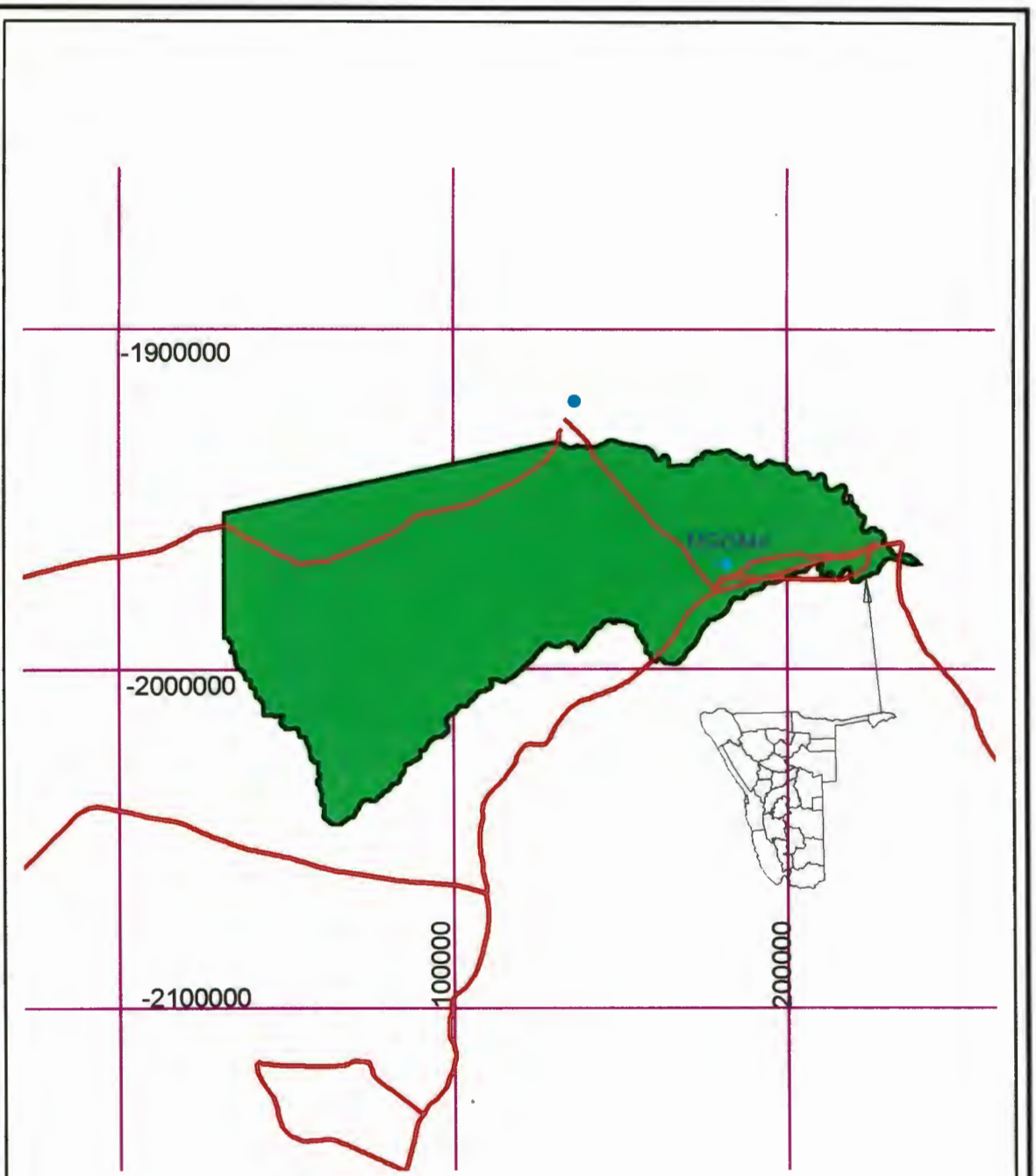
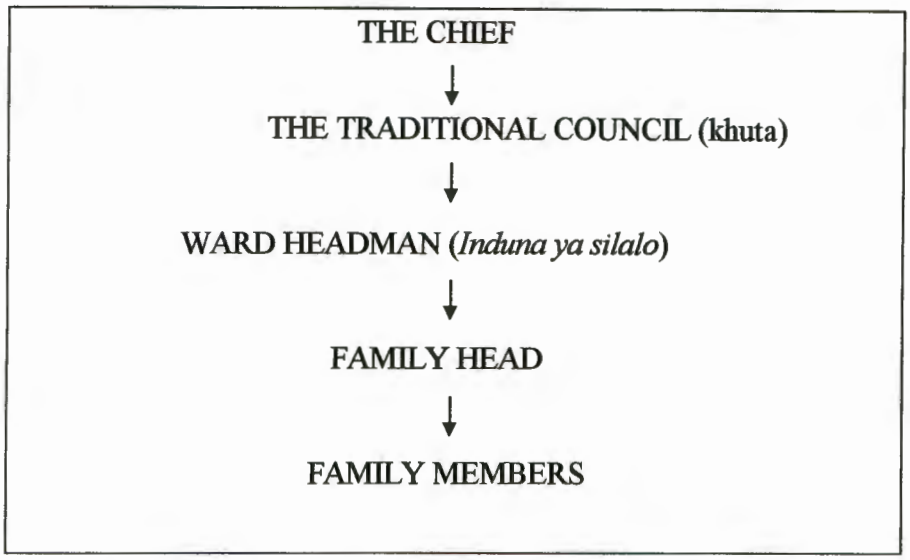


Figure 3.4: Caprivi Communal Land



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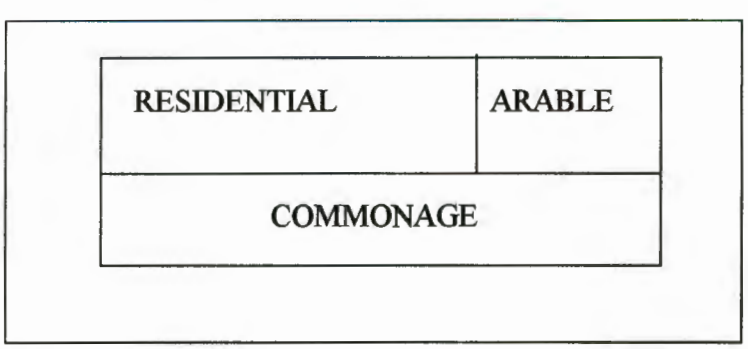

Figure 3.6: Ward Set Out

An adult is entitled, under traditional law, to a residential plot, an arable allotment, and access to a communal land for grazing, wood, and thatch collection. The amount of land allocated depends on the availability of land in that area and the anticipated needs and capabilities of the applicant. The following rights are then observed (Figure 3.7): the right to water; the right to gathering drywood, grass and fruits; the right to hunting of game; the right to felling certain types of wood and cutting grass. Once an individual acquires permission to cultivate a piece of land, he or she is required to pay a once-off lump sum in cash or in kind to the *Khuta*. The amount varies and is determined by the size of the land and what its new 'owner' can afford.

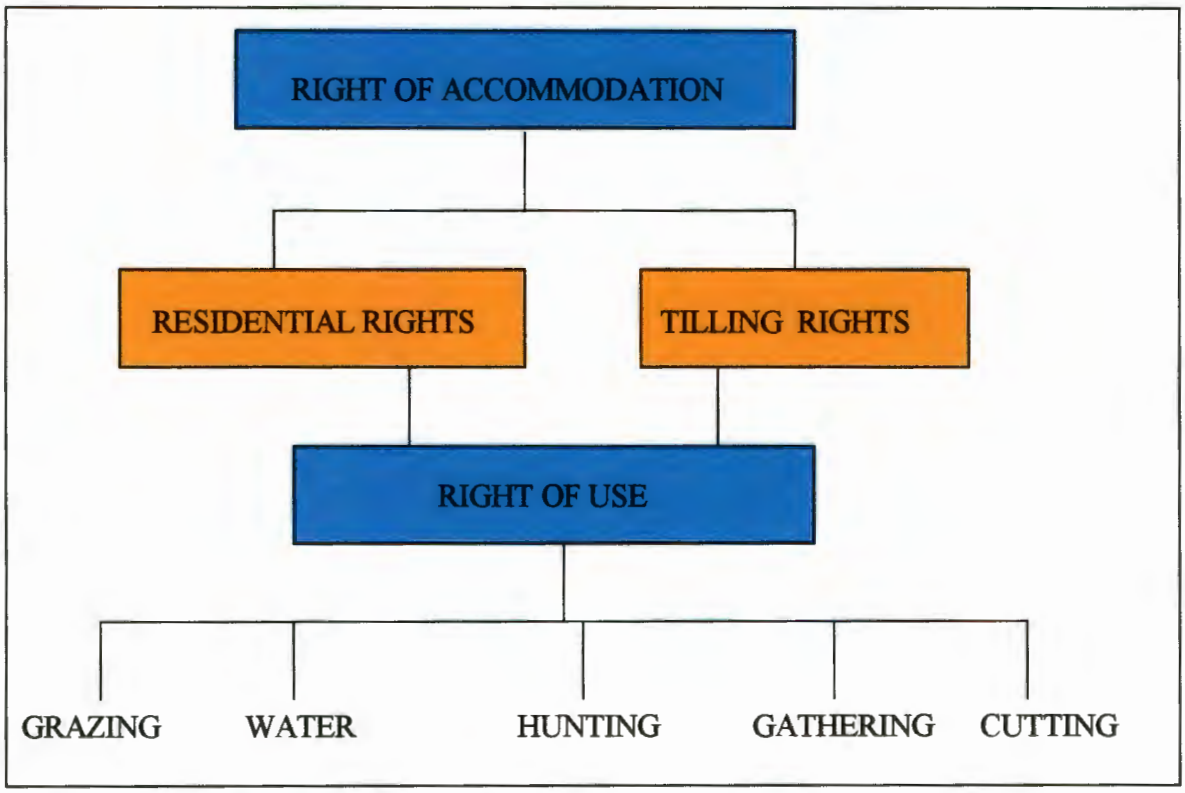

Figure 3.7: Tribal Rights in East Caprivi

This practice is particularly common in Caprivi. The first criterion in determining eligibility is membership of the tribe under whose area of jurisdiction a plot falls. An affiliation to a different tribe within the Caprivi or Namibia is not an impediment to the acquisition of land. The main proviso is that an applicant for land in a "tribal" area other than his or her own must be willing to accept the authority of the *Khuta* and must also be acceptable to the community in that area.

Secondly, whether an individual originates from outside the Caprivi or is 'classified' as a member of either the Mafwe or Masubiya, the ability to live harmoniously with the existing inhabitants of a particular area is an important criterion in determining whether he or she is to be granted access to land in that area. In this regard, the *Silalo induna* (or the village headman) will normally consult with the village community to determine whether a prospective newcomer is acceptable.

Thirdly, the village headman and *Silalo induna* have to determine whether prior claims exist to a particular piece of ground. If land has been temporarily vacated by its 'owner', or if it has been inherited but not yet been cultivated by the heirs of a deceased member of the village, or has been earmarked for some other development by the *Khuta*, such prior claims take precedence. In addition, the land applied for must be demonstrably suitable for cultivation and must have adequate access to water. Finally, the amount of land allocated depends on the availability of land in that area and the anticipated needs and capabilities of the applicant. Factors such as family size and available pool of labour are considered.

As mentioned earlier, different customary methods of dealing with the inheritance of property exist among different people. Among the people of Caprivi, the vast majority of marriages are customary. In the Caprivi, children can inherit from either their father or their mother. Children of informal unions do not have equal rights as the children of the formal unions. Among the Caprivi people, children of a woman living with their biological father, whether or not he has paid damage compensation, can inherit from their father

3.5 Land Tenure in Damaraland

Damaraland (Figure 3.8) is a former ethnic 'homeland' in north-west Namibia. In 1992, regional boundaries were redrawn between the Erongo and Kunene regions (Rhode, 1994). In spite of this, the entity of Damaraland continues to exist as a communal area with a strong social, economic and cultural character. The population breakdown is as follows: Damara speaking: 66%, Ovahereres:

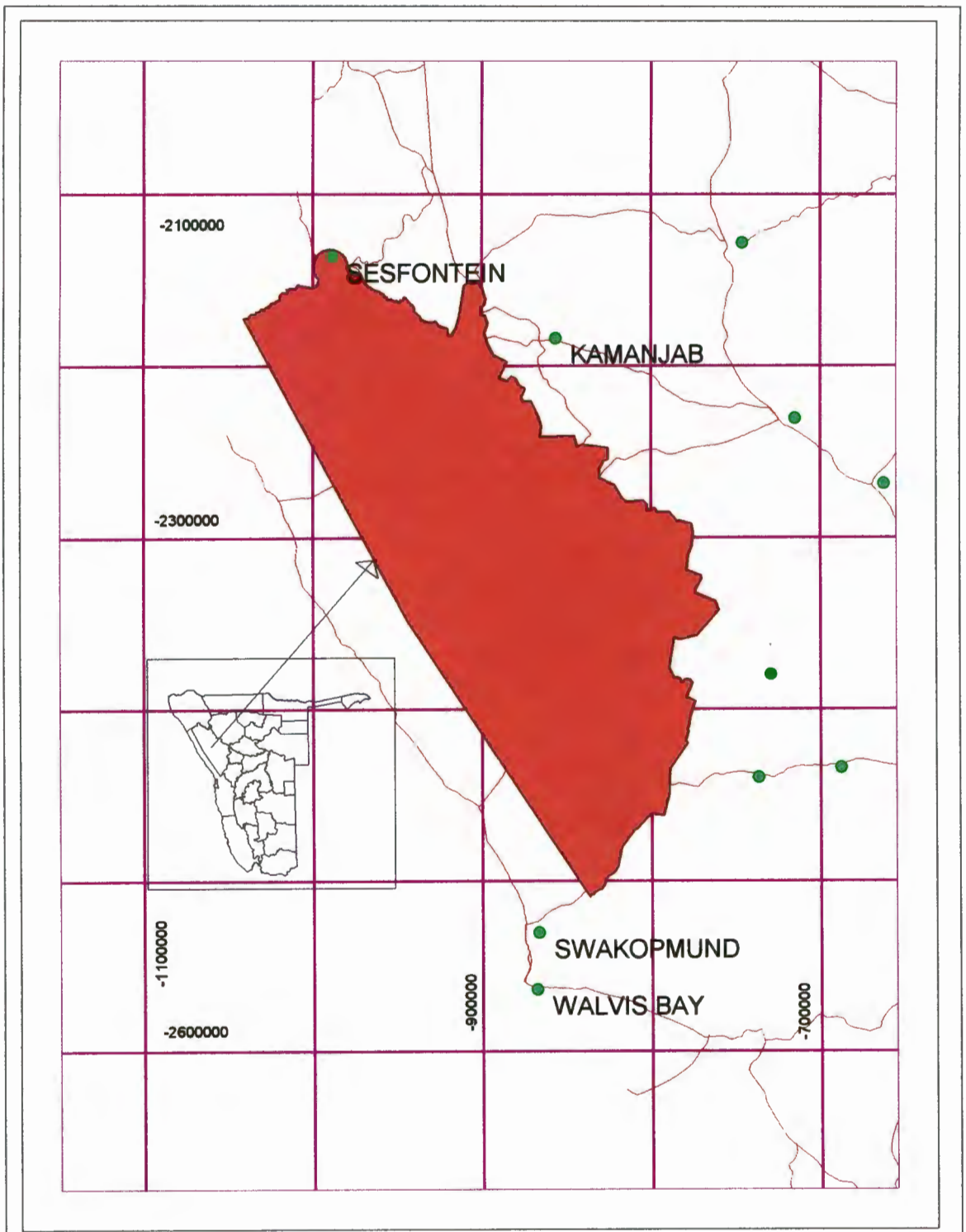

Figure 3.8: Damaraland Communal Area

18%, Ovambes: 7% (National Population and Housing Census data, 1991). Land tenure in Damaraland is communal. Upon the recommendations of the Odendaal commission (1964), two million hectares (or 43%) surveyed and fenced farms formerly owned by Whites were added to the Damara communal area. They were amalgamated into the existing reserves and state land, thereby expanding the size of Damaraland by a factor of five.

There was no 'traditional' land allocation system in place, unlike most other communal areas of Namibia. It took until 1978 to set up a 'second tier authority' in Damaraland and only in 1985 did the Damara Council begin codifying the structure of 'tribal authority', which obsessed the South African Government (Rhode, 1994). A form of 'traditional leadership' was created through the establishment of twelve wards (each with ward head) and councils. The ward leadership would have a certain degree of independence in exercising local powers. In terms of allocating land, grazing and water rights, various headmen and councillors were consulted on rights of residence, although these powers were not, legally speaking, 'legal'. This was regulated by the tribal leaders through the 'second tier' administrative framework of agricultural officers working within the Damara Council's Department at Khorixas.

Disputes were settled through arbitration by councillors, then headmen, and finally, if consensus could not be reached, through the Damara Council, in consultation with agriculture extension workers. Generally, rights of access to land were negotiated on an informal basis. Headmen consulted their councillors and community before granting or denying rights of residence to a newcomer. Refusal of applicants was uncommon, as membership of a specific community conveyed automatic rights to land. Women were included in this right (Rhodes, 1994).

At independence in 1990, the laws which constituted the so-called 'second tier' authorities were repealed and their powers removed. All property under the control of the Damara Authority reverted to the Government of Namibia. Hence, communal land, along with water installations and most of the permanent infrastructures, came under the control of the central government (Rhodes, 1994). Despite the above changes, land allocation procedures are still done by headmen and councillors though they have lost much of their 'official' status. Yet, in the absence of authority to

replace their powers, they retain a strong advisory role in matters of land allocation and land disputes. The general procedure for land allocation which was operative before independence continues to have some relevance.

On the subject of inheritance, Herero people live in matrimonial property regime. By custom they divide their property between spouses in marriage out of community. Nowadays, among the Herero, children inherit from the patrician as Alberts et al (1996) explained. 'Informal union' children belong to the mother's father if bride price has not been paid; if it has been paid, they are raised by the father and/or the mother. Traditionally, when the head of the household dies, older relatives determine who should take over the land. They choose a custodian, generally the most able man, who becomes responsible for the land, shops, livestock and the bereaved household members and close relatives.

3.6 Bushmanland

The term "Bushman" had come to mean

> ***"someone who speaks a Khoi or San language at home ....whose great grandparents may have hunted and gathered around the Etosha pan, who has neither communal land nor land rights and who lives in abject poverty in the commercial farming districts of in the "homeland's" of other Namibians'"***
>
> **(Marshall, 1984).**

In 1970, the small Bushman reservation, called Bushmanland, was established in accordance with the recommendation of the Odendaal Commission. The "homeland" was proclaimed in 1976. Bushmanland (Figure 3.9) lies east to west. The western two thirds of the reservation is mantled in deep sand. No one has ever lived in western Bushmanland, where neither hunting and gathering nor subsistence agriculture are possible.

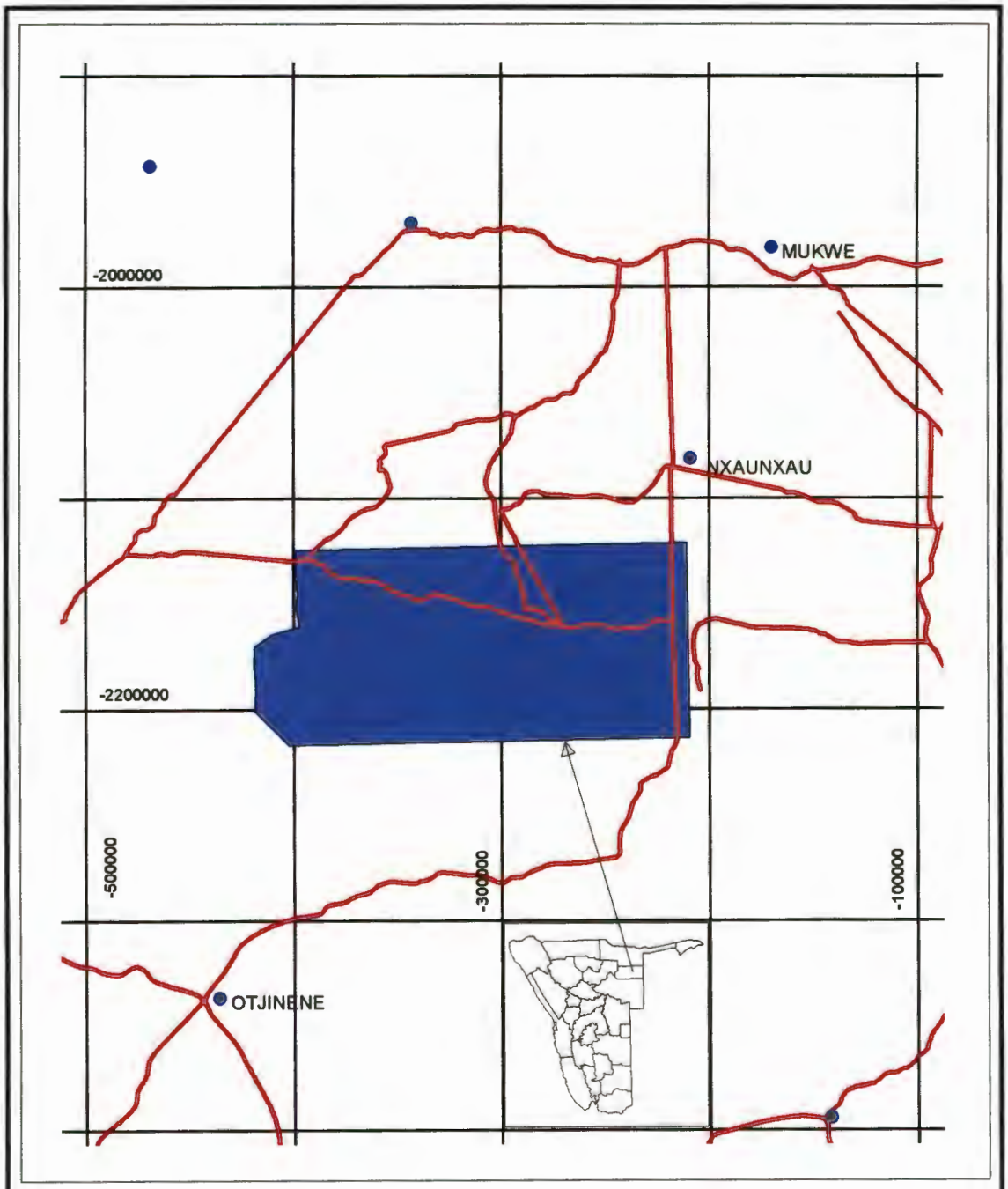

Figure 3.9: The Bushmanland

Only in eastern Bushmanland, where the reservation interacts with the *Nyae Nyae* region, are there open water holes. The water table is in many places close enough to the surface to be reached by digging, and makes subsistence possible. The Namibian census of 1970 recorded 21000 people classified as "Bushmen" (Marshall et al, 1984). The life of the Ju/wasi (community of Bushmen) in *Nyae Nyae* like the existence of all peoples living in or around the Kalahari basin, was dominated by the availability of reliable water. For Ju/wasi in *Nyae Nyae,* right of access to permanent water was probably the most important underlying principle around which their society was organised.

During the dry months in *Nyae Nyae* the small living groups of Ju/wasi hunted and gathered in the vicinity of their waters. When the first rain fell, people would estimate their amount and location and decide if sufficient water had been collected in hollow trees in the *mangetti* forests in *Nyae Nyae* and if there was enough. Supplementary water sources, such as water roots, supported the group while gathering *mangetti* nuts. When water was exhausted in the forest, Ju/wasi returned to their water holes bearing loads of *mangetti* nuts. Hunting and gathering have sustained a slowly growing population in a difficult environment. As basic productive activities, hunting and gathering imposed conditions on Ju/wasi culture and behaviour, influencing the way Ju/wasi saw themselves and what they expected from each other. Among these conditions were mobility, self-sufficiency and small living groups (Marshall, 1976).

Ju/wasi social structures and concepts of ownership are open, individualistic and flexible (Marshall, 1984). On the other hand, flexibility means that there are socially-imposed limits on the number of people who can live together. Ju/wasi inherit rights from both their mothers and fathers to drink and gather from certain waters and to collect *mangetti* nuts and *tsi* beans in certain areas. N!ore is the Ju/wasi word for the collection of natural resources - wild foods and water - on which a band depended for its livelihood. The band's ownership of the resources is strictly recognised and adhered to. The *!kung* (community of Bushmen) have several different concepts of ownership. Artifacts are owned outright by an individual. Marshall has reiterated that there is no communal ownership of property in movables. Each arrow, each bag and each bead is owned personally by an individual man, woman or child. Another concept of ownership applies to a meat of a big animal whereby the person who owns the meat is responsible for its distribution and he does not own it

exclusively as artifacts are owned. The expression *Kxei Kxaosi*, when used for the core group of a band, means people who have inherited the rights to the resources of a *n!ore* where they live. Because the rights to the resources of a *n!ore* cannot be alienated, large numbers of Ju/wasi own rights to several *n!ores*. A *n!ore* is primarily an idea, a collection of rights that a person carries in his mind. What the *kxei kxaoxi* of a *n!ore* really own is the right to drink at a water hole and gather in the country around it. No higher grouping unites the bands into a structured unit such as a tribe with a paramount chief.

No band has higher status or authority over another (Marshall, 1976). No social rule, however, has set the bands apart. Although there is some form of *k"xau n!a* ("headman"), there is no political authority. Though the *!kung* do not have a council of elders, everything is talked over, and the actual plan adopted is more likely to be a consensus than the decision of the *k"xau n!a*. A leader has no authority and receives no honours or rewards. The *!kung* do not have lineage, but a patrilineal inclination can be detected in the way the *Nyae Nyae !kung* use the designation k"xau n!a (Marshall, 1976). Women among the Nyae Nyae !kung were not called k"xau n!a.

Jurisdiction over Bushmanland was formerly vested in the Administrator-General, who also had the right to allocate land as no second tier representative authority was established for the area. This control system only worked theoretically. The Ju/wasi have adopted a strategy of establishing mixed subsistence settlements in Eastern Bushmanland to demonstrate the reality of Ju/Wa local government and communal land rights. Settlements are established and organised with assistance from the *Nyae/Nyae* Farmers Co-operative (NNFC). The NNFC is an elected body comprising a representative from each settlement, which allocates farming space, undertakes communal projects and manages communal resources (Marshall et al, 1984). The system of operation of the NNFC is based on traditional Ju/Wa concepts of land ownership. The "face of the earth" comprises the land and water on Nyae/Nyae. Ju/Wasi, as individuals, acquire the right to land and to reliable sources of water by descent. According to Marshall and Richie (1984), the right to live on the Gxa/kxo and use its resources are exercised in the following ways:

- freedom to travel: all Ju/Wasi can travel freely throughout Nyae Nyae while supporting themselves by hunting and gathering on their journey;
- freedom to hunt and track game: any Ju/Wasi can shoot an animal anywhere in the territory and track it anywhere it wanders. An animal belongs to the person who owns the arrow that strikes it first, not to the owner of the *No're* territory where it is hit or where it dies from the poison;
- freedom to use major resources of bush foods like *tsi* beans and *mangetti* nuts;
- freedom to live near a permanent water hole in periods of drought: no group can be denied the right to settle near one of the permanent water holes of the area.

The essential features of the *N'oresi* rights as listed by Adams, et al (1990) follow:

- The right to residence in a *N'oresi* are inherited from both parents and involve a choice by adults of the *N'ore* if they wish to claim it as their home.
- It confers the right to reside permanently in a *N'ore* and includes the right to drink the water, gather the bush foods and trap small game. Absentee owners are recognised.
- *N'ore* rights are exclusive: no group may settle permanently in an inhabited *N'ore* without the owner's consent.

The NNFC acts as a unofficial local authority which functions as a mouthpiece for those engaged in subsistence farming. Though this co-operation has no official recognition, it has been able to settle some 14 communities (which support about 500 people) despite official policy in Bushmanland (Adams et al, 1990). Its purposes and policy are, among others, listed below:

- to allocate farming areas;
- to own and allocate farming infrastructure (boreholes);
- to assist as many Ju/Wasi groups as possible to settle and farm in Eastern Bushmanland without destroying the grazing and environment.

3.7 Comparison of the Communal Land Tenure Systems

The administrative structures operating in East Caprivi is divided into two tribes, each with a chief or king. Each village has a headman who allocates land. A number of villages together make up a ward under a ward headman. A number of these ward headmen make up a council which advises the king and at the same time serves as a mediator between the people and the chief. There is also a chief of the council. If land allocation is not approved at the local level, it is pushed up this hierarchy. The network of authority under which residents of both tribal areas live begins at the village level with individual headmen and extends through the *silalo* or ward level to that of the *khuta,* while the final authority rests with the chiefs of the two areas. The two *khutas* command considerable authority in the area and are the *de facto* controllers of access to land.

With respect to Damaraland, there is no formal 'traditional' land allocation system in place. Ward heads and councils came into being after a form of 'traditional leadership' was created. The administrative structures operating in Damaraland regulated land and grazing by the established tribal leaders through the 'second tier' administrative framework of agricultural officers working within the Damara Councils Department of Khorixas. Land administration order therefore runs through headmen, ward councils and Damara councils in consultation with agriculture extension workers. In the absence of effective traditional authorities, rights of access to land were negotiated on an informal basis. It can therefore be said that the administrative structures operating in East Caprivi is more of customary tenure as compared to Damaraland. The Damara council is the highest authority in Damaraland while in East Caprivi it is the chief who controls land affairs. The involvement of agricultural officers has limited the powers of the headmen on the ground. The traditional CLTS therefore does not operate wholly on the ground.

The similarities that can be inferred from the Damaraland and Caprivi are such that tribesmen have usufructory rights to land. Women are not barred from holding land though it seldom happens. The right of residence, tilling, commonage, water, gathering and hunting all show significant similarities between the two tribes. The land is apportioned in huge blocks among the wards and subdivided among the families. Each adult member of the Mafwe and Masubiya in East Caprivi is

entitled, under the traditional law, to a residential plot, an arable allotment and an access to communal land for grazing, wood and thatch collection.

Land allocation is done by headmen in Damaraland in consultation with agricultural officers and the Damara Council. In matters of inheritance, Owanbo- and Herero-speaking people of Damaraland are matrilineal. However due to the changing nature of the world today, both the Caprivi- and the Herero-speaking people inherit from either their father or their mother (Alberts et al, 1996). Strangers are considered for some status in the communities of Damaraland and Caprivi upon consultation between councils and the community concerned. In any case, the strangers ability to live harmoniously and his full acceptance of the tribe's customs are a prerequisite for admittance.

Among the Bushmen, neither of the two administrative structures described above applies. They are by instinct hunters and gatherers, and do not settle at one place. They are characterised by mobility, self-sufficiency and small groups. Among the Bushmen, the accessibility to water determines land use and settlement patterns. Essentially, social structures and units do not exist. There is no social rule. Bands do not have authority over others though there is a form of headmanship. There is no classification of status within a group. In the absence of defined social systems, an official association, the NNFC, has been formed to serve as a mouthpiece for the Bushman. This has in some way helped in land settlement.

The separate bands, as whole units, do not engage together in any organised way in economic, ritualistic, or other activities. The interaction of the *!kung* population as a whole in the *Nyae Nyae* region is governed by a kinship pattern (Marshall, 1976). A kind of leadership, *k"xau n!a,* that exists among the *!kung* focuses on the ownership of the resources of plant foods and water holes that a band lives on. While meat is owned communally, there is no communal sharing in immovable properties. Rights cannot be alienated. On inheritance among the Bushmen, lineage could not be discerned, though patrilineal inclination is subtly evident (Marshall, 1976).

3.8 Discussion

An attempt has been made to review Namibia's CLTSs, particularly Caprivi, Damaraland and Bushmanland. With the colonisation of Namibia by the White settlers, the traditional land tenure system that was practised started changing. The present tenure systems of Namibia rural areas are the product of historical processes which have defined alternative forms of tenure in Namibia as a whole. The description of some of Namibia's CLTSs revealed a number of complexities as well as influences that the colonial masters have had over the land in terms of right to land, allocation and occupation. Despite these influences, some areas had a strong social and cultural character.

ATTRIBUTES	CAPRIVI	DAMARALAND
Forfeiture and Restriction	Abandoned land	Abandoned land
	Serious criminal or moral offence	Excess land
	Death of holder without an heir	
	Excess land	
Ownership	Used individually(Residential,Tilling)	Used individually
	Used communally (Communal land)	Used communally
Allocation	Chief or King	Damara Council
	Wardheads, Councils	Ward Councils
	Headmen	Headmen/Agric. Ext. Officers
Rights	Inheritance	Inheritance
	Right of use (cutting, hunting,	Right of use (cutting, hunting,
	Gathering water)	Gathering water)
	Residential (building site)	Residential (building site)
	Tilling (arable farming)	Tilling (arable farming)
	Grazing (on communal land)	Grazing (on communal land)
	Can not sell, mortgage or convey.	

Table 3.1: Attributes of Communal Land Tenure Systems in the study area

Most inhabitants of the study area are rural dwellers practising communal tenure. For this information system to benefit the rural dwellers, it must also accommodate the land that they cultivate under customary tenures. The previous discussions above on communal land tenure systems in Namibia helped to identify the attributes that will be necessary to be incorporated into the information system. The Table 3.1 above extracts the non-spatial attributes of the communal land tenure systems in Caprivi and Damaraland and does not apply to the Bushmanland. The term "forfeiture" and "restriction" have been used here to imply that, an occupant can lose his or her land based on the descriptions indicated in the table above.

4 CHAPTER FOUR: THE STRUCTURE OF THE DATABASE

4.1 Introduction

The first steps in developing the database for an information system are to acquire the data and to incorporate them into the system (Star et al, 1990:61). Bonham-Carter (1994:83); Jackson et al (1991, citing Konecny, 1988) analyse a range of mature LIS projects and conclude that acquisition of the data for the database constitute the single largest expenditure element, between 38 and 84 percent of total cost. The information system must be able to accept a wide range of types and formats of data for input. Data to be inputted into an information system are typically acquired in a variety of forms (e.g. digital form, ascii text and maps). These would include spatial data, such as computer records of land ownership data. Often these data will require manual or automated data processing prior to data encoding. For example, tabular data may need to be entered into the computer system and a digitising process to convert the data into digital form.

Star et al (1990, citing Kennedy and Meyers, 1977) have stated that an important and sometimes overlooked issue of data acquisition is to obtain information regarding the accuracy, precision, currency and spatial characteristics (such as the geo-referencing system and scale) of the data themselves. Chapter three described the communal land tenure systems in Namibia particularly Caprivi, Damaraland and Bushmanland. The current chapter abstracts the main elements with reference to the Bohannan model. It describes the organisation of data sets that comprise the information system database - the structure, accuracy, reliability and capture methods used in constructing the Namibia communal land tenure database.

4.2 The Database Structure and Data Sets

The intended use of a database determines its design and structure. The structure of a database refers to the data sets incorporated and their interrelationships. Structured design and organisation

of data sets are crucial to the success of a communal land tenure information system (CLTIS) project because they govern the analysis and queries that can be supported by the database. Following the analysis of the communal land tenure systems, the pilot database consists of a series of ARC/INFO coverages residing in sub-directories. The database includes national and district boundaries as well as major roads and the location of major cities and towns for map orientation and reference The following layers constitute the database constructed during the study. Naming convention for the CLTIS data coverages in the sub-directories are as follows:

LAYER	FILE NAME	DESCRIPTION	FEATURE
COMMUNAL LAND TENURE MAP	CAPRIVI Mafwe Masubiya DAMARALAND Damara Ovambes Ovehereres BUSHMANLAND	Communal land tenure map	Polygon Polygon Polygon Polygon
TOPOGRAPHICAL	BOUND NAMIBIA DISTRICT ROAD SETTLEMENT PARKS	Southern Africa Administrative & regional boundaries Namibia map District map Roads & Highway Town & Villages National & Game parks	Polygon Polygon Polygon Line Points Polygon

Table 4.2: Description of Coverages

Each of the above coverages consists of two main components: the spatial features, such as polygons representing communal land tenure, and descriptive information, such as the land tenure classification system residing in a tabular format in an alphanumeric database. The attribute data are designed in a relational data model as described in detail in the next chapter. The overlay of these layers are easily handled by the software.

4.2.1 Topographical Layer

4.2.1.1 Spatial Data

The Topographical layer includes 1:2500000 maps purchased from the Surveyor General's office, South Africa, showing the study area and its immediate neighbours. A sub-regional level of the administrative boundaries of the neighbouring countries are shown. Included are major roads, towns and cities to help with map orientation and map reading. National parks and nature conservation's are also captured.

4.2.1.2 Attribute Data

Attribute data contained in relational tables include road types and national park types. Descriptive data for towns and other settlements include their names and functions.

4.2.2 Communal Land Tenure Layer

4.2.2.1 Spatial Data

The communal land tenure map was compiled using fourteen 1:500 000 topographical sheets published by the Chief Director of Surveys and Mapping, South Africa (Mowbray, 1985). The communal land tenure map was digitised in vector format from 1:500 000 as explained earlier. The

communal land tenure maps are represented by polygons which have topological relationships established during the data capturing process. Each polygon has a unique identifier used to attach attributes related to communal land tenure areas. Information at the tribal level was obtained. For example, Caprivi is divided into different kinship groups, which needed to be digitised. Therefore not only information at the kinship groups is needed; individual families' places of occupation, such as residential, farming and commonage should be located and fed into the system as information becomes available. The design took into consideration the information needed at the lowest level, should it become available.

4.2.2.2 Attribute Data

Once a vector database was established, attribute data may be entered into the spatial objects in the digital map by simply adding extra fields of attribute information as they become available. Digitised polygons of communal areas are linked to attribute data via unique identifiers. These, together with other descriptive information, are stored in relational tables. Descriptive data for communal land tenure include information at the tribal and kinship units. From the foregoing, the following set of entities with their attributes have been identified and are represented below(Table 4.3). Representation of the Entity-Relationship (ER) in a diagrammatic form of the entities is explained fully in the next chapter.

ENTITIES	ATTRIBUTES
Tenure	Acquisition, Forfeiture, Restriction, Inheritance
Commonage	Commonage_ID, Area, Perimeter
Worship_Land	W_ID, Name, Area, Perimeter
Allocation	Primary, secondary, tertiary
Residential plot	Plot_ID, Name, Area, Perimeter
Farms	Farms_ID, Name, Area, Perimeter
Kinship_Land	ID, Name, Area, Perimeter
Strangers_Land	Name, Area, Perimeter, ID

Table 4.3: Entities and their attributes

4.3 The Data Format

The communal land tenure database was created in a micro-computer (PC) version of ARC/INFO™ from Environmental Systems Research Institute (ESRI), Redlands, California, USA. All data sets comprising the CLTIS are in the form of data coverages, which are essentially sub-directories containing the geographic and descriptive data files. The format of the geographic data or graphics is the ARC/INFO proprietary graphics type, and the descriptive data are stored in dBASE™ format database files. Both the graphics and descriptive data files which comprise the data coverages are directly accessible by ArcView, viewing and querying software. The original objective was to provide CLTIS databases on a wide variety of hardware and software platforms, but the ArcView option was selected because of the wide user base of ARC/INFO™ GIS software in the field of natural resources management, and the subsequent release of low cost viewing programs for ARC/INFO data in ArcView.

4.4 Requirements for Hardware and Software

The supporting software has the functionalities to store locations and topology of spatial features, together with their associated attributes. The relational database modelling is chosen for the study because of its simplicity and flexibility to design and construct as stated in section 1.4. The software has the functionality to transform geographical co-ordinates to plane X, Y co-ordinates. The supporting software can perform a variety of projections as the project becomes larger to cover the whole country. The two softwares were compatible as the ARC/INFO was used during the data capture process and ArcView was also used during the process of displaying and querying the database.

4.5 Discussion

It was stated in Section 2.2.2 that land tenure describes the rights, restrictions and responsibilities of a land holder regarding position and use of land. Data structures and attributes of a CLTIS could be based upon this statement. The underlying features of communal land tenure could be incorporated

into the information system. Acquisition rights of females, chiefs, land use rights and rights of individual by inheritance are important components which should be critically examined at the implementation phase. The rationale behind is that, this could improve efficiency in resolving disputes and claims. Recording land use rights could allow monitoring of land use for land conservation and allocation of land rights based on land usage. Incorporation of land use rights could monitor land conservation, problems of access, topography and soils and can evaluate the effectiveness of existing land tenure.

The restraints of customary tenure to be taken into consideration are traditional customs and spiritual concern if any. These could bring more cultural awareness, thus fewer conflicts with land developers and foreigners. The responsibilities associated with customary tenures are basically financial, social, environmental and spiritual. Socially, there could be compliance with customary taboos and traditional customs which could subsequently result in fewer conflicts with land developers and foreigners due to cultural awareness. The strengths and weaknesses of such practices can be assessed.

5 CHAPTER FIVE: COMMUNAL LAND TENURE SYSTEMS DATABASE DESIGN

5.1 Introduction

This chapter begins with an overview of database design. It then discusses conceptual modelling as well as Entity-Relationship modelling (ERM) and how these concepts are applied to the database design. In addition, relational data modelling, which is the logical modelling, is closely examined and applied to the design. Finally, part of the database is implemented and the role of the Structured Query Language (SQL), which is the procedure of retrieving data from the database, is examined.

5.2 Data Modelling

For data to be useful, they need to be organised. The quality of a database system is significantly influenced by the quality of the data model, and thus data modelling occupies an important position in the database life cycle. The purpose of data modelling is to develop a global design for the database with the ultimate objective of achieving an efficient implementation which satisfies the user's requirements.

The first step shown in Figure 5.1 is requirements collection and analysis. Here, the database designers interview prospective database users to understand and document their data requirements. The result of this step is a set of users' requirements written down in a concise way. These requirements should be specified in as detailed and complete a form as possible. Once all requirements are collected and analysed, the next step is to create a conceptual schema for the database, using a high level conceptual data model (Elmasri et al, 1989:39). This step is called the conceptual data model. The conceptual schema is the concise description of the data requirements

of the users and includes the detailed descriptions of the data types, relationships, and constraints. These are expressed using the concept provided by the high level data model. Because these concepts do not include any implementation details, they are usually easier to understand and can be used to communicate with non-technical users (Elmasri et al, 1989:39). The goals of a conceptual data model are therefore to understand the data, to manage the complexity of the data and to document the data requirements. Example of this form of modelling is the Entity-Relationship model (Appendix 2).

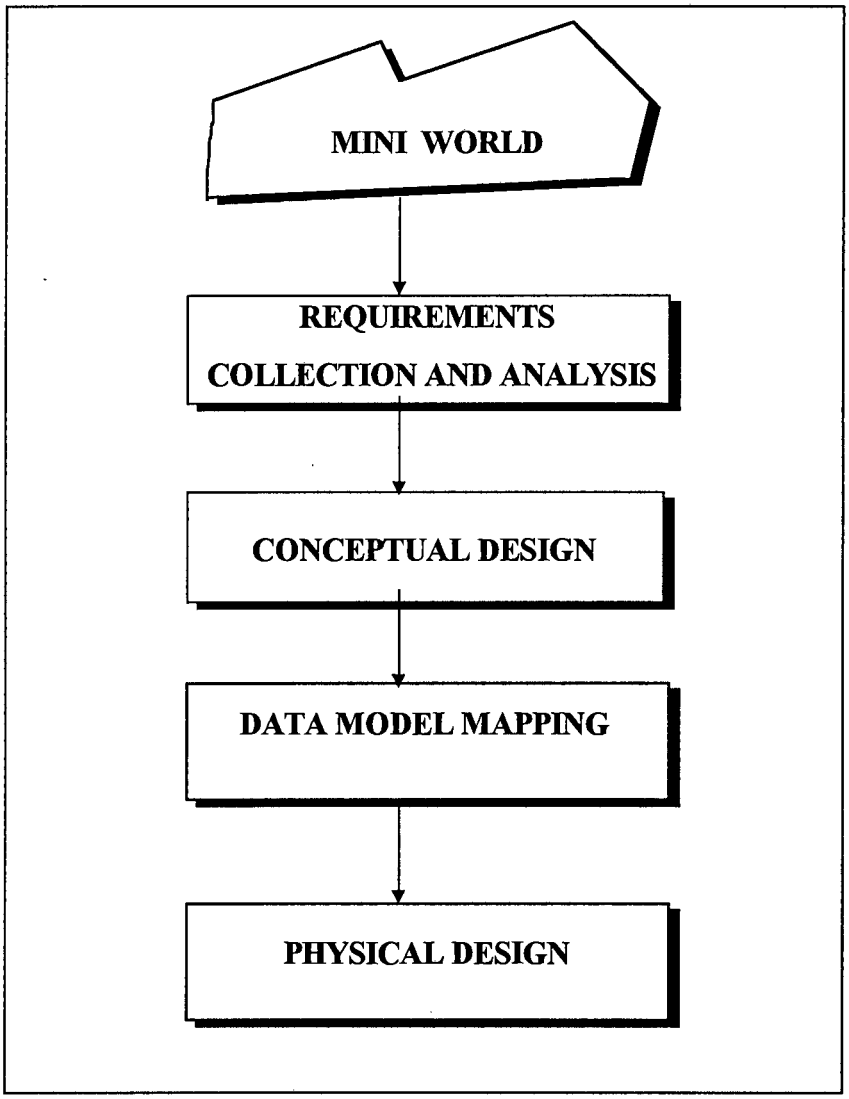

Figure 5.1: Phases of Database Design (simplified)

(after Elmasri & Navathe, 1989)

The next step in the design process is the actual implementation of the database using a commercial database management system (DBMS). Most current commercial DBMS's use an implementation data model, so the conceptual schema is transformed from the high-level data model to the implementation data model. This step is also called data model mapping. The last stage is the physical database design phase, during which we specify the internal storage structures and organisation of the database (Elmasri et al, 1989:39). This last stage of the database design process (Figure 5.1) is beyond the scope of this study as outlined in the objectives in Section 1.4.

5.2.1 Entity Relationship Modelling (ERM)

In the ERM (Appendix 2), information is represented by means of three concepts: entities, attributes and relationships between entities. Integrity constraints, cardinality relationship and the above-mentioned terms are explained later. The tribes under consideration are the Mafwe and the Masubiya located in the East Caprivi of Namibia as mentioned in Sections 1.2 and 3.4. Land use patterns change day to day, and it will again be assumed that the system is portrayed as existing and taken as generally static at the time of preparing this document. However, this assumption is a limitation to communal land tenure system database design. Once a communal area is digitised and the topology is created, map delineations become polygons. These polygons are independent entities and they represent a number of tenure characteristics. Considering the two tribes mentioned above, the following set of entities with their attributes were identified in the previous chapter.

Referring to the entity relationship diagram and tables in appendix 2 and 3 respectively, the entity type TRIBE represents all polygons on the digitised tenure map. The attributes of these entities are Polygon_ID, Area, Perimeter and the name of the tribe. The attribute Polygon_ID is unique for each polygon, and serves as an identifier of the corresponding area in the spatial database. Each instance of TRIBE contains information about the tenure as practised by the set of relationships PRACTICE; here each instance relates one entity from each of the participants' entity sets (TRIBE and TENURE). The attributes of TENURE are inheritance, acquisition, forfeiture, restriction, and tribe. The participation constraints for this relationship imply that a tribe entity participates once in the relationship (1:1). It must be noted that relationships are always bi-directional. Therefore the

tenure entity participates exactly once in the relationship if stated the other way around. The entity set STRANGERS refers to the outsiders who have come to reside on the tribal land. The entity set TRIBE has already been described. The entity sets are related through the CONTAIN RELATIONSHIP. The constraints for the participating entity sets indicate that each entity TRIBE participates one or more times. This means that a TRIBE can have one or more strangers and those strangers are part of exactly one TRIBE (Appendix 2). The entity type KINSHIP_LAND is the sum total of the tribal land. It has the attributes of a Name, Area and Perimeter. The constraints for the participating entity sets indicate that each entity TRIBE participates exactly once in the relation (1:1), whereas a KINSHIP_LAND entity participates one or more times. This means that a tribe may be broken down into several units, whereas KINSHIP_LAND can be part of only one tribe.

The entity type RESIDENTIAL is the sum total of the residential area available at the kinship unit. The attributes are Residential_ID, Area and Perimeter. The residential site is further divided into plots among occupants. The entity set KINSHIP_LAND is related to RESIDENTIAL by DIVIDED INTO. The participating constraints for the entity set KINSHIP_LAND and RESIDENTIAL indicate that each LAND participates once and RESIDENTIAL_LAND many times. The relationship between residential and plots is one to many, and vice versa. The other interest of communal land tenure system is the place of commonage. Therefore, the entity type commonage has the attributes Comonage_ID, Caretaker, Area and Perimeter. The relationship between KINSHIP_LAND and COMMONAGE is one to many. The entity type ARABLE is the place of farming and it has the attributes Arable_ID, Name, Area and Perimeter. This bigger area is further sub-divided into individual farm lands.

The entity sets ARABLE_LAND and FARMS_LANDS are related to KINSHIP_LAND by DIVIDED INTO. This means that several farms are found in an arable land, and subsequently many arable lands are divided among kinships. The attributes of Farm are Owner's_Name, Farm_ID, Area and Perimeter. Within a kinship group, again the other entity type is WORSHIP_LAND. This is the place reserved for worship and it has the attributes Worship_ID, Name, Area, Caretaker and Perimeter. The participation constraint is that one KINSHIP group may have a lot of places of worship, and vice versa. Land allocation in the kinship unit plays a vital

role in a communal land tenure system. The mode of allocation of communal land is based on a hierarchical structure. The entity type ALLOCATION has the attributes Primary, Secondary and Tertiary. The entity set is related to KINSHIP_LAND by DISTRIBUTED BY. The participating constraints for the entity set KINSHIP_LAND participates once, and ALLOCATION as an entity also participates once. The entity relationship tables are presented in Appendix 3.

5.3 Mapping of the Conceptual Schema into the Relational Model

The relational data model was developed by E. E Codd in 1970 (Laurini et al, 1993). Each record has a set of attributes. The range of possible values (domain) is defined for each attribute. The records of each type form a table or relation. Each row is called a relation or tuple, while each record is an attribute. The two aspects of integrity in Codd's model are entity integrity and referential integrity. Entity integrity dictates that each table has exactly one primary key. A primary key is a combination of one or more attributes whose value unambiguously locates each row in a table. Referential integrity requires that the Relational Database Management Systems (RDBMSs) keeps each foreign key consistent with its corresponding primary key. A foreign key is a primary key of one table that is embedded in another (or the same) table ((Laurini et al, 1993).

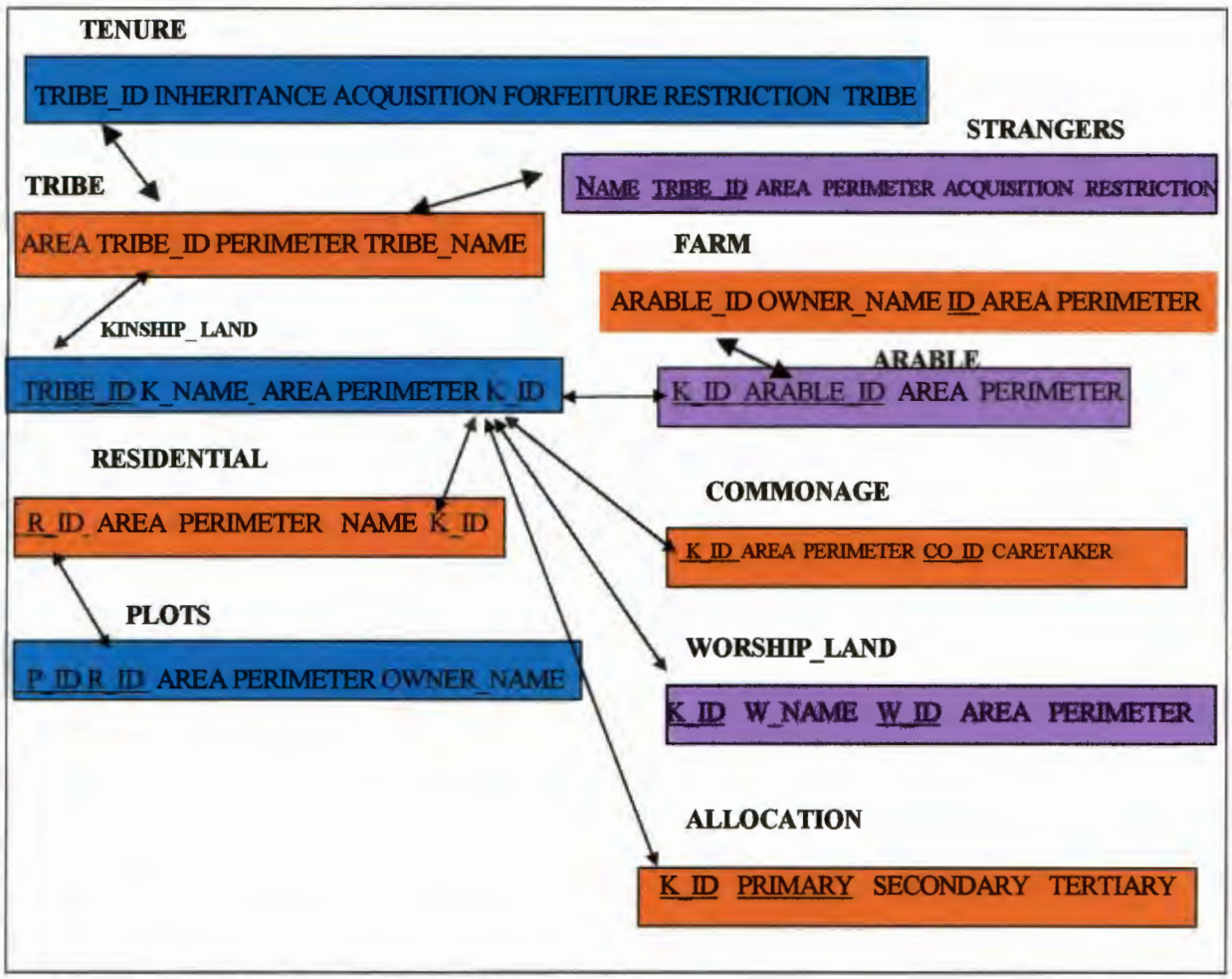

Figure 5.2: Conceptual-to-Relational Mapping

The conceptual schema presented in Appendix 3 was mapped into the relational model Figure 5.2 and the following relations were obtained: TRIBE, TENURE, KINSHIP_LAND, COMMONAGE, ARABLE_LAND, FARMS, WORSHIP_LAND, RESIDENTIAL, PLOTS, ALLOCATION and STRANGERS. The primary key for each relation is underlined. Depending upon the participation constraints, the relationships between entity sets can be represented in different ways in the relational scheme. A binary one-to-many relationship can be implemented by including the primary key of the parent (one-) entity type into each tuple of the child (many-) entity type. Following this rule, the key attribute TRIBE_ID of the relation TRIBE, was included as a foreign key in the relation TENURE to connect both relations and minimise the amount of data duplication during the implementation step. Similarly, the key attribute TRIBE_ID in the TRIBE relation is included as foreign key in the LAND relation. The primary key for each relation is underlined. Depending upon the participation constraints, the relationships between entity sets can

be represented in different ways in the relational scheme. The major relationships between entities are one-to-one and one-to-many. These relationships can be implemented by including the primary key of the parent (one) entity type into each tuple of the child (many) entity type. Following this rule, in a one-to-many relationship, the primary key of the entity type KINSHIP_LAND has been included as a foreign key in the relation COMMONAGE, RESIDENTIAL, WORSHIP_LAND, ARABLE and ALLOCATION, which represent the participating entity type on the "my-side" of the relationship type. Finally, the key attribute of RESIDENTIAL_ID in RESIDENTIAL relation becomes the foreign key in the PLOTS relation and the key attribute ARABLE_ID of ARABLE relation participates in FARMS relation to satisfy one-to-many relation. These relationships are illustrated in Appendix 4.

5.4 Data Retrieval from the Communal Land Tenure Database.

In solving problems, it might be helpful to establish relationships between different tables, so that queries can access multiple tabular sources. Tables are linked or joined on the relationship of the records in the tables using their foreign keys so that they can be cross-referenced. Retrieval of data from the GIS database is by means of Structured Query Language (SQL). Generally, a relational query is made up of three parts (Laurini et al, 1992): (1) a list of attribute names for which values are to be retrieved by the query, (2) a list of the names of relations containing the data required to process the query, (3) a list of search conditions, mainly Boolean expression, that identifies the tuple to be selected by the query. The output of a query is presented to the user as a table or map in which each row (tuple) is a collection of values for retrieved attributes. Sample queries have been devised to show how data is retrieved from the database in Appendix 5.

5.5 Conclusion

The database was mainly designed for the purposes of identifying and documenting communal land tenure to facilitate easier assessment of land information. The application of the ER model in the conceptual schema design of a communal land tenure database was discussed. The conceptual

schema was then mapped into the relational data model for implementation. The high level of the abstraction of the ER model helped to visualise all database concepts, the different relationships among data, and the need to express database constraints. The flexibility of the ER model permits modification during the design process and also facilitates the incorporation of future changes in the database without substantial modification of the design in the basic schema. Queries were raised by making use of SQL which were formulated as expressions that must conform to the syntax of the language. Implementing part of the database design using data from the project allows early assessment of the integrity of the database and a way of checking if the design satisfies the requirements. A descriptive text field has been incorporated into the design as a pop-up to describe the system where it can not be modelled effectively (Appendix 5). Despite these shortcomings, an aspect of communal land tenure system pertaining to the study area have been modelled - Viz. the Man-Land part, the Man-Man part and the folk geography aspect of the African concept of the right to land as elaborated in Section 2.2.4.

6. CHAPTER SIX: SYSTEM DESIGN ANALYSIS

6.1 Introduction

The goal of this chapter is to evaluate the system design in terms of the social relationship, person or group interest and the spatial component of each CLTS sampled in this study. It specifically measures the rights, restrictions and responsibilities of the inhabitants against the system design. In addition, it seeks to answer the question if the tool fits the CLTS and discusses the strengths and problems of the system. Features of CLTIS for implementation, and strategies for implementation are also discussed.

6.2 Relationship of the Design to the Study Area

One of the objectives of the research is to use information technology to document, plan and manage customarily-held land as stated in Section 1.4. Due to many issues involved with CLTS, the ideas and aspirations of the people and the way in which they relate to the land have to be given major consideration. A study of land tenure should examine the political, economic, sociological and administrative structures in that society (Barnes, 1988). The underlying sub-topics discuss the relationships of the design to the specific features of the communal land tenure system operating in each study area.

6.2.1 Caprivi

Adams et al. (1990) have reiterated that East Caprivi is divided into 'tribal areas': the Mafwe people live in the west part of East Caprivi and the Masubiya in the east, and the traditional system of authority is the same in each area. For an effective traditional system, land is partitioned among the tribes. At the kinship and ward level within a group, land use patterns

have been defined. These are the places of commonage, arable farm lands, residential lands and places of worship (e.g. shrines). Two distinct types of access to land exist. The first is individual or family access to residential plots and arable land; the second involves communal use of the same land for individual benefit. Within the residential and arable farm land, at the ward or kinship level, some parts of these lands have already been distributed among individual families as farm lands and plots through matrilineal inheritance or to young males at the time of their marriage.

The spatial components of East Caprivi CLTS based on tribes are defined in the design. The spatial feature of Kinship-Land in East Caprivi is identified and the name of that Kinship attached. The division of the Kinship-land among the wards into huge blocks of residential, arable and commonage have been defined. The arable and the residential blocks have been subdivided into farm-land and plots among the families (Section 3.4; Figure 3.6). These plots have been spatially accounted for in the design. In all cases, the specific attributes obtained during the system design in Chapters Five and Six have also been incorporated. The information system has taken into account all unoccupied land at the tribal or kinship levels which have the potential of becoming more fragmented as the need arises. As population increases, so does pressure on the limited land. Residential sites then increase as arable and commonage or the reserve land decrease, resulting in new attributes to be added to the system. Subsequently, the number of features stored also increases.

The problem arising out of this subdivision is fragmentation. This problem has been taken care of by the design to absorb new spatial and non-spatial entities. Flood plain dwellers in the east of Caprivi, for example, followed a seasonal migration to dry land further west in order to ensure summer grazing for cattle (Adams et al, 1990). Another problem associated with the spatial dimension of the database pops up as a result of mobility, which is a marked characteristic of these people. Levels of mobility are a major complication. Addressing the problem of mobility is a difficult one, but what can be done to rescue the situation at this stage is the attachment of text attribute as a pop-up.

The administrative structures operating among the Mafwe and the Masubiya tribes are determined by social systems. These are the headmen, ward headmen and the chief officials heading traditional councils. The council acts as a link between the chief and the people. The way of administering CLTS is manifested in the mode of allocation which is determined by the social hierarchy at the primary, secondary and tertiary levels described in Section 3.4. This means that, membership in a community is a prime determining factor for gaining access to land. CLTS in East Caprivi lays more emphasis on the social systems or relationships. With regard to the people of East Caprivi, rights over land in tribal areas are determined by people's status within the group.

The membership of groups at different levels (in hierarchical order; Section 3.4, Figure 3.5), provides the structure within which rights to land of the traditional system of East Caprivi should be understood. It is in this sphere of social relationships that it is difficult to model. Modelling a database for a community which has strong social systems and culture is a great challenge. These social and cultural features expressed in Section 3.4 can also be very subjective and not easily viewed objectively. Therefore, communal land tenure systems should be viewed in the context as it is practised in a specific area.

The major rights to land identified in the East Caprivi were the land use rights, stranger's rights and reversionary rights. As a result of changing water levels and availability of pasturage, seasonal claim to land in search of pasture in this area becomes a set-back to the database design. As mentioned above, tribesmen have the right of arable, communal grazing field and residential status. The attributes inheritance, acquisition, restrictions and forfeiture have been given special attention in the cause of the database design to reflect the Mafwe and the Masubiya tribes. These terms specifically describe the CLTS operating in each region. It must be stated that inheritance and conflict resolution mechanism were difficult to incorporate fully; therefore textual information was attached to the spatial data to explain the situation. Another point of interest which was taken into consideration was the inclusion of strangers, where the spatial and the non-spatial aspects were modelled. Strangers have access to land based on the condition that they live peacefully with the inhabitants in a particular area. In any

case, the hierarchy of the social system is consulted before the stranger is accepted into the society.

6.2.2 Damaraland

The CLTS operating in Damaraland is quite different from that in the East Caprivi with respect to the administrative structures as compared in Section 3.7. This is reflected in the mode of allocation, which is given a hierarchical order in the database in Section 5.3. This is regulated at the root level by headmen in consultation with agricultural officers operating within the Damara Council's Department of Khorixas. The structure is illustrated in the database design. Upon the formation of the Damara Council the codification of the traditional council structures started. It then resulted in the establishment of wards (each with a ward head) and headmen at the village level. The powers of the headmen and wardmen are limited. It is noted that land allocation in Damaraland is informal. Though the social systems within that community are not strong, membership is a prior condition for access to land. The jural community described in Section 3.4 and 3.5 conducting itself from within, coupled with status within the group, becomes difficult to model. What was done to save the situation was the application of text field to explain the context. As already mentioned, modelling a social relationship aspect of a community is a great challenge.

Inheritance and dispute mechanism play a very important role in Damara's CLTS. Disputes were settled by headmen and traditional councils though the Damara Council in consultation with agriculture extension workers. These aspects could not be modelled and again text as a pop-up was employed as a remedy. Though it was difficult to model the inheritance aspect of CLTS, an attempt was made to incorporate it into the database design in Appendix 3 and 4 (Table 7.1 and Figure 5.2). The representation of the spatial components of Damaraland is based on a uniform layout. The layout consisted of residential, arable and commonage features described in Section 3.4 (Figure 3.6). Spatial modelling was effectively supported because 43% of Damaraland consisted of surveyed fence which formerly belonged to the Whites. These have been further divided among individuals and family heads (person entities). Though the result will resort in eventual fragmentation as established in East Caprivi, the design has been structured in such a way to accommodate new attributes such as farm, arable and

residential land. These have been described in Chapter Five, Appendix 2, 3 and 4. The attributes such as restrictions, forfeitures, responsibilities and rights which define a particular CLTS of a specific tribe have been particularly incorporated. Individual family residential and arable sites were also incorporated into the design. CLTS features of rights, restrictions and responsibilities have been considered in the database. It was difficult to model the above attributes because communal land tenures are generally flexible and therefore rigidly defining these terms posed some problems. Strangers are considered as members of that community and therefore their rights were subsequently modelled. It must be emphasised once again that where it was impossible to model an aspect of communal land tenure system, a textual field as a pop-up was applied to reflect the present situation.

6.2.3 Bushmanland

Today, the independence and individualism fostered by hunting and gathering continue to pervade Ju/wa life. Spatial components which are residential, arable and commonage do not apply to these people. Their life is characterised by mobility, which makes it difficult to abstract entities for modelling. Strong social relationships between bands could not be detected as described in Section 3.6. Socially, Nyae Nyae was defined by the rights Ju/wasi inherited from their parents to use the waters, with their local resources of bushfoods and game and the *tsi* fields and *mangetti* forests of the region. Rights of persons or bands of traditional and spiritual nature, and those of strangers were all not determined. The right to each waterhole, *mangetti* forest and *tsi* fields were inherited by Ju/wasi. These rights to a specific water or food resource became weakened or diffused as each generation inherited functions inherited by their parents from preceding generations. The person entity has been devised in the design to cater for the waterhole, *mangetti* forest and *tsi* field. Where it was difficult to model, text field was employed in all cases.

For Ju/wasi in Nyae, the right of access to permanent waters was probably the most important underlying principle on which their society was organised (Marshall et al. 1984). This situation has resulted in the Ju/wasi life seasonal migration (Section 3.6) determined by wet and dry seasons. Consequently, certain individuals and bands have shifting seasonal rights in a

particular area of water point. This way of life, characterised by mobility, makes it difficult to extract attributes for database design. The best solution at this stage was the text field attached to the spatial data which has already been described. The same approach was used when modelling the Bushmanland.

6.3 Strengths and Weaknesses of the Design

The needs of CLTS, with its basic aim of identifying communal lands, have been achieved. Some aspects of man-man, man-land and the geo-cultural framework of right to land of the study area have been extracted. Incorporating communal land tenure into GIS implies recording all its inherently flexible features which varies with time, place and circumstance. Obviously, not all aspects of customary land tenure system could be easily computerised, modelled effectively and incorporated into the system. The major problems associated with the information system were the social and the cultural issues. In general, the major problems that stemmed from the design of the information system were the following:

- lack of information;
- social relationship within a group;
- fragmentation of communal land tenure data;
- inheritance and dispute resolution mechanism;
- mobility of inhabitants of the study area;
- shifting seasonal claims to particular areas.

Lack of data at the study area, particularly at the kinship level, caused a considerable hindrance to the effective design of the system. CLTS places much emphasis on the social relationships between groups. It looks for membership and status within a group. Incorporating this in the modelling posed problems. Young male persons were allotted plots at the time of their marriage which then resulted in fragmentation. The other elements which were also not modelled effectively were inheritance and dispute resolution mechanisms. A look-up table is another option which could be experimented. Communal land tenure has a

very strong mechanism of dispute resolution. In fact, these aspects of their social life were not incorporated effectively because it was difficult to model. Seasonal claims to land by the people of Caprivi and the Bushmen retreating to base during the dry season created other problems for the system design. Mobility was a marked characteristic of the study area. At this stage, text field as a pop-up has been applied where necessary to describe the situation.

In any case, social justice has been done to the rural community by portraying what is happening around them. Because land use patterns have been identified, the information system could aid the implementation of land use and land administration. With the system identification of land use pattern by individual and groups, these lands could later be registered. The strength of this information system far outweighs the weaknesses. However, sight should not be lost of the social and the geo-cultural aspects of the information system, which were not modelled effectively.

It is essential to have good land information to ensure the efficient and effective management of land. Dale (1997) stresses that the availability of good information is however not an end in itself; rather, it is a means whereby the risk associated with decision making can be minimised. Since LIS is a tool for administration and economic decision making and an aid for planning and development, the beneficiaries of the CLTIS should be able to sacrifice some of their social value systems in order to benefit from the system. The idea of an information system for communal land tenure should be encouraged and investigated further to deal with the limitations.

6.4 Strategies for Implementation

A strategy is a plan or a carefully designed method to reach a goal - in other words, putting all of the selected options together in an organised sequence of events. It also involves organising various component options together in a logical arrangement, such as problem recognition and technological awareness, developing management support, project definition, system evaluation, and system implementation. The following key success factors of the GIS project

should be taken into consideration in order to facilitate effective implementation as outlined by Goodchild et al (1990):

- The authorities involved must come out with carefully developed implementation plans and a controlled mechanism to check project progress. There should also be plans to check productivity, cost and benefits analysis.

- There should be continued promotion of the benefits of the GIS after it has been given the green light to ensure continued financial and political support. Strategies for the CLTIS should be designed to achieve short-term improvements, in addition to meeting long term objectives to maintain political and community support.

- The project should be decentralised from district to local level in which, in both situations, the authorities involved must take a more active role than just providing money and other resources. There should be developed active systems where the state has an increasing degree of responsibility for the reliability of land tenure information. This could be achieved by the state of Namibia government becoming actively involved participating and supporting the following:

    - long term involvement;
    - interagency agreement to assist in data acquisition and sharing;
    - development of strategies cutting across internal political boundaries;
    - formation and implementation of GIS project teams.

- Regular training opportunities must be provided to staff and management for them to be kept abreast with current technology and application. The skill mix within the project must be continually enhanced and adapted to meet changing legal, political, social, and economic pressures. Strategies should include development of appropriate support programme options – training.

- Focus of the purported project should always be visited and never lost sight of. The requirements and user needs should be responsive. Strategies for the system design should be incremental, each improvement contributing to a logical progression objectives.

The future strategies for implementation of this project would partly be based upon the reasons for change or moving in a direction. These directions might be documenting and establishing relationships between communal land tenure systems for smooth land administration, for land loans or for government stability. Those bigger issues will help to choose the critical elements and better design for the audience (Von Meyer, personal communication, 1996). For example, if the driving force moves to education, there is the need to consider some of the relevant issues tied to the system so that it can be determined, for example, at what age and for how many years a pupil will be in school; if it is banking, there is the need to capture some financial information on the land, such as value in a Western sense and commitment to staying on a known parcel.

In addition, and for the purposes of Food and Agricultural Organisation (FAO) (Trenchard, Personal Communication, 1996), in the future, the system should be able to indicate relations between land, crop use, socio-economic profiles and tenure, etc. (i.e. who grows what, where and under what tenure arrangements, and whether there is a correlation between crop, tenure profiles, and income). The long-term use of this system would basically be determined by the system's agenda: why is it needed, who is asking for it, who will use it and who will be served by it? These principles are essential to the successful future implementation of the CLTIS.

6.5 Discussions

The main aims of the system design have been to identify communal tenure lands, and document the information pertaining to communal systems which are to be placed into an information system. It is, therefore, an attempt to identify the attributes of communal land tenures and incorporate them into an information system to facilitate easy access to information for land administration and management. The ability therefore of the information

system to integrate, reflect, and analyse a variety of themes or layers of information provides a way of efficiently documenting and analysing communal land tenure-related problems. The design and implementation of the portion of the CLTIS for selected areas in Namibia have thrown more light on how feasible it is to abstract the man-man, man-land and the geo-cultural aspect of the Bohannan conceptual framework of rights to land and model. At the barest minimum, hands-on experience has been achieved in implementing a GIS project. It has opened a gateway for others to follow suit to model, design and implement a CLTIS database.

In general, the pilot project has investigated and minimised the range of risk for the project before final commitment to full scale production. As a result of the major successes, the project has been able to model some aspects of the CLTS systems and attach descriptive information to each system to help land administration and management, and above all, the documenting of CLTS. It must be emphasised that the designed system is not a land registration system, in which features once recorded and codified become legally recognised. Instead, the CLTIS is only a medium or tool for taking inventory of information that will enable them to make more informed decisions. It must also be noted that land information is no panacea for the ills of communal land tenure system but a catalyst for a change. Dale and Mclaughlin (1988:228) have argued that better information increases the chances of making and implementing better decisions and are the intelligence networks by which land may be successfully administered.

7 CHAPTER SEVEN: CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

The main purpose has been to design a communal land tenure information system to facilitate easy access to land information. This has centred around a small but essential subset of the information required for land management and administration in Namibia, viz. land tenure information, and particularly communal land tenure information.

The research has explored the concept of using technology to plan and manage customarily-held land. More importantly, it has tried to examine how possible it is to design a communal land tenure information system. Given the problem involved in creating such a system, some steps are suggested for its design and implementation. Provision is made in the design of the information system for continual reviews and improvements and the addition of finer details. This chapter summarises the findings of this research, forms conclusions based on the findings and makes recommendations arising from the study. In order to arrive at these, the following objectives needed to be fulfilled:

- to review basic concepts of communal land tenure information and to describe similar information systems (Section2);
- to review Namibia's land tenure systems, particularly its communal land tenure systems;
- to describe the data structures contained in the database (Section3);
- to design and implement a portion of the database model (Chapter Four and Five);
- to analyse the system design in terms of social relationships, person or group interests and the spatial component of communal land tenure system with respect to each particular area (Section 6).

7.2 Summary and Conclusions of the Thesis

Land tenure is an important factor in the use and management of the land resources of a country. However, communal land tenure, has generally not been given much attention. Currently, lands under customary land tenure are seldom identified and documented. This thesis therefore seeks to identify communal land tenure system and examine the issues involved in the designing of a communal land tenure information system which has hitherto not been given the attention it deserves. An information system such as the one envisaged could later be upgraded and implemented fully with which individuals will therefore be able to effectively plan activities around the existing circumstances and conditions.

Chapter One dealt with the introduction to the study. It outlined the background, objectives, and problems to be investigated. It was found that some communal land tenure data existed, but were widely scattered in different books and organisations. Access to all this information is difficult and therefore can take much time. It was realised that these problems not only affected the Ministry of Land but all users of communal land tenure information, such as managers, planners and administrators. This led to the idea of a system which could identify, document and design communal land tenure information that could be obtained in a user-friendly manner. The research methodology outlined the project sequence and lineage of the data. The basic project sequence was to identify and describe communal land tenure areas, design a database and implement portion of the database. Data for the above project were not readily available, and various methods of literature search and interviews were used to obtain more information. The Internet was also used extensively to gauge people's perceptions on the research as a whole.

Chapter Two described the research methodology and other similar information systems that have been set up in related fields. The underlying aim has been to examine the importance of different ISs, particularly, the degree of importance placed on GIS. It was found out that land tenure information is vital to the success of any land-related development project, and therefore an important factor in a successful information system. The other main purpose was to examine the basic concepts of land tenure systems. As stated previously in Section 2.4, land

tenure was a combination of three factors: a man-land relationship, a man-man relationship, and a concept of land or folk geography. This means that membership of a community is a prior condition for gaining access to land, as opposed to the Western system in which land ownership is usually a pre-condition for community membership. In traditional societies in most parts of sub-Saharan Africa, land was occupied by the tribe as a whole and was held in trust for the people by the chiefs or other traditional authorities. An essential element that came out from the basic concepts was that, 'ownership' used according to the Roman law, in which an individual has an absolute ownership, does not apply to communal land tenure. However, when 'ownership' is applied as consisting of bundle of rights, some of the rights could then be applied. The legal means of informing all people about these rights is to record the rights in a register which is open to the public for inspection. The object of registration is to give notice of ownership and rights to all concerned.

The review of Namibia's communal land tenure systems in Chapter Three placed more emphasis on its communal nature. This was to determine how the peculiar features could be extracted and incorporated into the system and the attributes that could go into the database. In traditional customary tenure systems, the basic sovereign ownership is vested in the local group or tribe. A major characteristic of communal land tenure is that the land is often regarded as belonging not to an individual but to the whole social group. The individuals have only usufructory rights and these rights can be claimed by persons by virtue of their membership in the group. The basic rule of customary tenure is that rights to land are not alienable: ordinarily land cannot be sold or mortgaged. Land is seldom looked upon as a commodity; it is not considered available for purchase; or land is regarded as community property and exploited in kinship units.

It was realised that the communal system supports the socio-political unit of the tribes and the tribal wards, hence the traditional position of the authority. It generally symbolises unity and territorial integrity among the tribes. All families are entitled to arable land and grazing rights and therefore the right to a subsistence level of income. However, inhabitants have no right to sell, lease or mortgage. There is no commercial value to land, and this discourages investment. Nevertheless, the identification of a land tenure system as part of the institutional structure of

a society infers that tenure systems will differ between societies, and that generalisation between societies could lead to incorrect specification of the characteristics of a specific tenure system.

Chapter Four outlined briefly the various steps used in the process of capturing or geo-coding the data into the computer. The first steps in developing a GIS were to acquire the data and to place them into the system. This would show how the attributes of communal land tenure would be incorporated into an information system. It was found that communal system was more of social, cultural and sovereign integrity protection. Map co-ordinates which were geographic were projected into plane co-ordinates. Once the vector database was established, attribute data were inputted to the spatial objects in the digital map by adding extra fields of attributes information as they became available.

The communal land tenure systems database designed in Chapter Five sought to model the available attributes obtained from the in-depth review of the communal land tenure systems in the study area. It was realised that communal land tenure had not had the attention it deserved and for that reason had not been incorporated into an information system; therefore the design of the database was an attempt in the right direction, and could later be upgraded. The chapter began by describing land tenure database problem as a whole. An overview of database design was outlined and took into account the need for database design. The conceptual level of abstraction was used to decide what information was to be kept in the database. This helped to understand the data, manage the complexity of the data and to document the data requirements. The ERM was then used to model the data. The relational data model, was used in the implementation process. The database was implemented with GIS software. SQL was used to access data and to perform some operations on them. The role of SQL was to allow the writing of query instructions for a relational database. It allowed users to pose queries to data according to the model previously described. The inherent form of spatial data representation and organisation was designed to support effectively and efficiently the kinds of query and analysis required by many users. The integrated information in the land tenure database were then manipulated and retrieved. The major problem encountered was modelling data with some social meaning and this was a great challenge. The third concept of land (geo-

cultural) view or the folk geography aspects of the Bohannan model which, in African perspective, is variable, one was difficult to model. Inheritance and other spiritual aspects of communal land tenure were also difficult to model. The best solution at this stage was to attach a descriptive text as a pop-up to explain the situation. Digitising and data processing caused other problems but these problems were insignificant based on the scale of the source data.

Chapter Six looked at the analysis of the system design. The major conclusion that could be drawn from the system design and implementation was that not all features of the Bohannan conceptual framework of rights to land could be modelled. It was found that most attributes of communal land tenure had inherent meanings, e.g. spiritual, and further implications which a single word could not express. Clearly, not all aspects of customary land tenure could be easily computerised and incorporated into the system. Some social and cultural features may not have a readily definable spatial dimensions to them, if they are based, for example, on spiritual perceptions and beliefs. These social and cultural features can also be very subjective - not objective. For instance, the concept of exposing some culturally sensitive areas such as shrines where ancestral spirits are worshipped could be an insult to the indigenous peoples. To address some of these issues, places of worship were clearly defined and set aside.

The ability of an information system to integrate, reflect, and analyse a variety of themes or layers of information, therefore provides a way of efficiently documenting, displaying and analysing Namibia's land tenure-related problems. It is important to remember that the system is only a tool to be used by administrators, planners, academicians and land users, and to help them in planning their work. It thus offers the opportunity of compiling inventories of all interests in land (e.g. social and spiritual interests), and at the same time to study the existing land tenure system. Therefore it will not, in itself, directly improve or reform the communal land tenure system but the data it provides will provide users with reliable information to understand the current situation and to manage and administer communal land tenure system. As a result of the major successes, the project has been able to model some aspects of communal land tenure system for the first time and attach descriptive information to each system to help land administration and management. Finally, if a balance can be struck

between maintaining the strength of the existing traditional social links, and enhancing the economic development of the country, incorporating communal land tenure system into an information system should be encouraged.

7.3 Recommendations

Communal land tenure system has come a long way to be examined critically and recognised by governments, relevant agencies and organisations. Now one can model communal land tenure in an information system, thereby fostering land management, administration and above all delivering social justice. Based on the findings of this research the following recommendations are made:

- that given the limited information available on communal land tenure system, more efforts should be spent to study and gather more data on the system. It is strongly recommended, therefore, that research into conditions in the communal areas be regarded as a top priority by the new government of Namibia. This could lead to richer information base in the communal areas to be utilised to improve the lifestyle of the rural communities;

- that the prototype project designed in this study be implemented fully and later developed and incorporated into an information system which, in the past, lacked communal land tenure input. This could help to identify, document and present communal land tenure information in a user-friendly manner.

- The study does not cover all the communal land tenure areas in Namibia. It is therefore suggested that the rest should be investigated greater in the future. The inheritance and conflict resolution mechanism which were not modelled effectively should also be reinvestigated.

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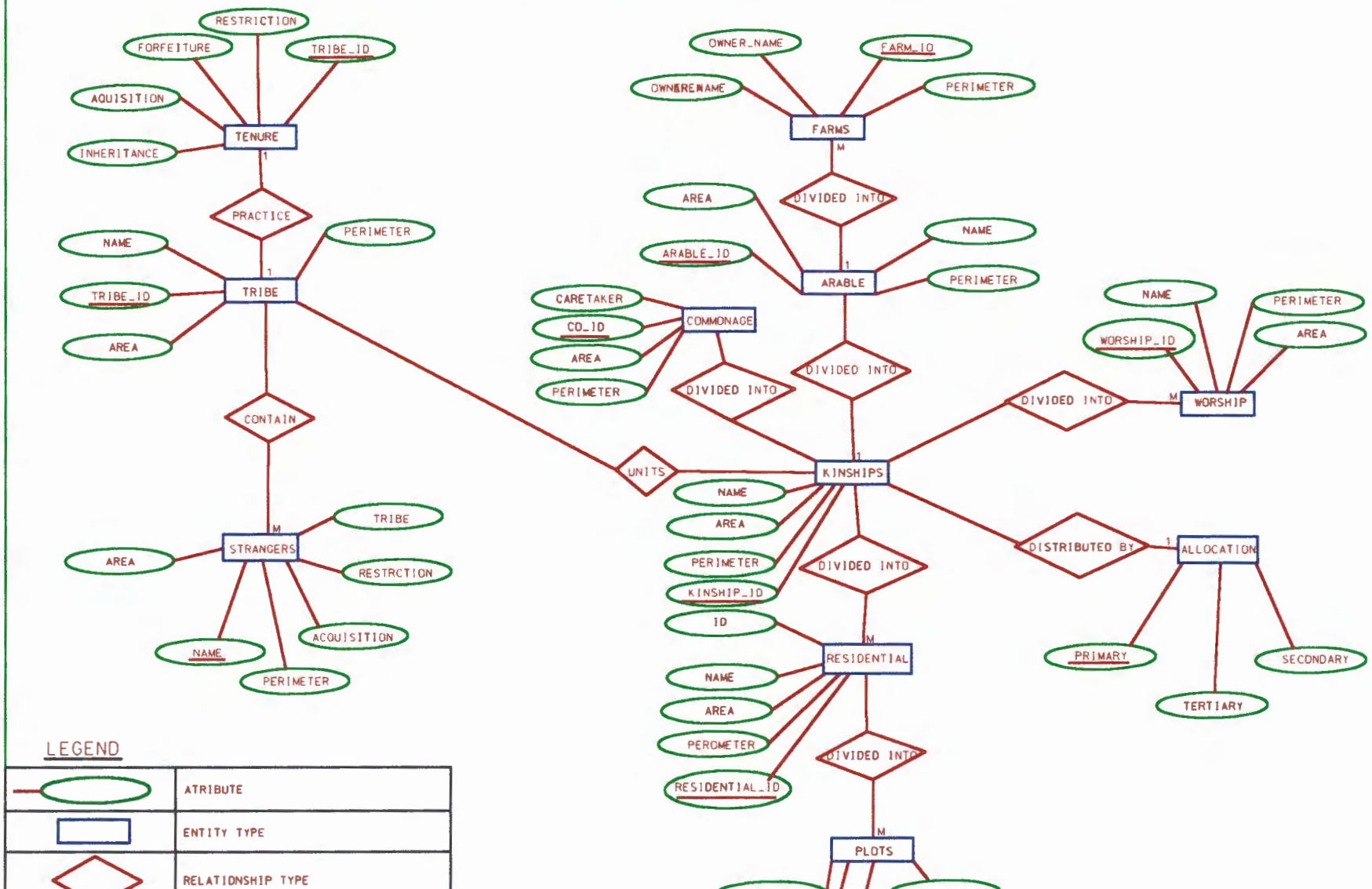
APPENDIX 1

Formulation of Queries

Information about land tenure is an essential resource for both government and administrators and the private sector. The designed information system provides answers to the following fundamental questions when queried:

- Select all communal areas in a region where allocation is done by headmen ?
- What right does an occupant have on a tenure system?
- Who allocates land on a particular tenure at the primary level, secondary and tertiary level ?
- How is land acquired in a particular tribe?
- What are the rights and restrictions imposed on a particular tribe?
- How does one forfeit land in a particular tenure system ?

Appendix 2: Entity Relationship Diagram



LEGEND

	ATRIBUTE
	ENTITY TYPE
	RELATIONSHIP TYPE

APPENDIX 3

TABLES OF ENTITIES

Table 5-1: TENURE

TENURE	*INHERITANCE*	*ACQUISITION*	*FORFEITURE*	*RESTRICTION*

Table 5-2: TRIBE

PERIMETER	*AREA*	*NAME*	*TRIBE_ID*

Table 5.3: KINSHIP

AREA	*PERIMETER*	*K_ID*	*NAME*

Table 5.4: ALLOCATION

PRIMARY	*SECONDARY*	*TERTIARY*

Table 5.5: COMMONAGE

CARETAKER	*PERIMETER*	*AREA*	*COMMONAGE_ID*

TABLE 5.6: ARABLE

NAME	*PERIMETER*	*AREA*	*ARABLE_ID*

TABLE 5.7: RESIDENTIAL

NAME	*PERIMETER*	*AREA*	*RES_ID*

TABLE 5.8: WORSHIP

NAME	*PERIMETER*	*AREA*	*W_ID*

TABLE 5.9: FARMS

NAME	*AREA*	*PERIMETER*	*FARM_ID*

TABLE 5.10: PLOTS

NAME	*AREA*	*PERIMETER*	*PLOT_ID*

APPENDIX 4

RELATIONAL DATA TABLES

TABLE 5.11: TENURE-TRIBE

TRIBE_ID	*TENURE*	*ACQUISITION*	*FORFEITURE*	*TRANSFER*	*INHERITANCE*

TABLE 5.12: KINSHIP-COMMONAGE-ARABLE-RESIDENTIAL-WORSHIP

K_NAME	*COM_ID*	*ARABLE_ID*	*RES-ID*	*WORSHIP-ID*

Table 5.13: ALLOCATION-KINSHIP

PRIMARY	*SECONDARY*	*TERTIARY*	*GROUP*

TABLE 5.14: FARM ARABLE

FARM_ID	*F_NAME*	*AREA*	*PERIMETER*	*ARABLE_ID*

TABLE 5.15: PLOT-RESIDENTIAL

PLOT_NAME	*PLOT-ID*	*AREA*	*PERIMETER*	*RES_ID*

APPENDIX 5

GIS Database Analysis

This section illustrates manipulation and retrieval of the integrated information in the communal land tenure database. Spatial relationships between different data sets such as parks, communal areas, roads, towns, topographic features can be modelled in the database. Three sample queries have been devised to address some of the needs and objectives of the project listed in Section 1.4 as provision of information to assist in land administration. The solution of each query is given as a map and/ or a table with comments on the significance of each result. Following Appendix 2, Queries are formulated in SQL, which is a standard for the relational data model. The SQL queries consist of SELECT.., FROM…, and WHERE.. The attributes to be retrieved follow the keyword SELECT, the relation(s) from which the retrieval is to be performed are in the FROM clause, and the retrieval conditions are specified following the WHERE key word.

Query No. 1:

To select communal land where allocation at the primary level is by a Chief.

Project "DANSO" is created. Communal land tenure theme (Namibia) is loaded into the project. Non-spatial attribute table of allocation database file (dbf) is also retrieved. The two tables are joined together using a common field of district. Query is made by selecting [PRIMARY]= "CHIEF"

COMMENT

The authority responsible for the allocation of land either for residential or farming depends on the locality of the area. Knowing the chief who allocates land can aid development. In some areas, it becomes difficult to know who to contact for land. The local inhabitants also find it difficult for instance to know the process of allocation and, who to contact at the primary, secondary and

tertiary level. All these information need to be recorded and made available to would be potential users. It depicts what is happening really on the ground.

Query No. 2

Locate a communal land where acquisition is by inheritance.

A set union of all communal lands are retrieved. The Tenure table (database file) is joined to the communal land tenure table by the field tenure_type. Query is made by selecting communal lands where acquisition is by inheritance. The results of this query are polygons and tables which describe tribes that inherit land matrilineally. The same results can be obtained by joining the different tables/relations and then formulating the queries.

Comment:

All rights pertaining to the specific communal land tenure are retrieved. This information is important for the rights of inhabitants on a communal tenure to be well recorded. This again determines the limits of rights and restrictions of inhabitants. The special relationship between people and the land is manifest in the right to the land and the restrictions that may be placed on its developments and use. Land tenure records will thus be of primary importance.

Query No 3:

How does one forfeit land in a particular land tenure system?

As above, tenure database file and spatial data of communal lands which comes with its polygon attribute table are joined together. Tenure_type is used as a common link. Query is made by selecting areas on how land is forfeited.

COMMENT

Under the traditional form of tenure, when there is a removal of village from one place to another, the land reverts back to the chief for re-allotment. This constitutes absenteeism which is defined as the absence of the whole family, not merely the bread winner who was therefore free to migrate. Land holders who commit serious moral offences (murder or habitual theft) may have their tenure rights cancelled. This information system therefore states it clear that, abandonment and serious moral offence may lead to forfeiture of land.

Association of Text Field as a pop-up

Designing a CLTIS to conform to ERM is a problem as expressed in Section 6.3. The design was enhanced by attaching a text as a pop-up to describe the region. This is achieved by including text as a field in the communal land tenure table. The path to the text file was also incorporated as an attribute. The Hot Link button is then activated upon clicking the three study areaa in Section 1.2. This then describes what is really happening on the ground.