THE COMMUNAL LANDS IN EASTERN NAMIBIA

John Mendelsohn and Selma el Obeid

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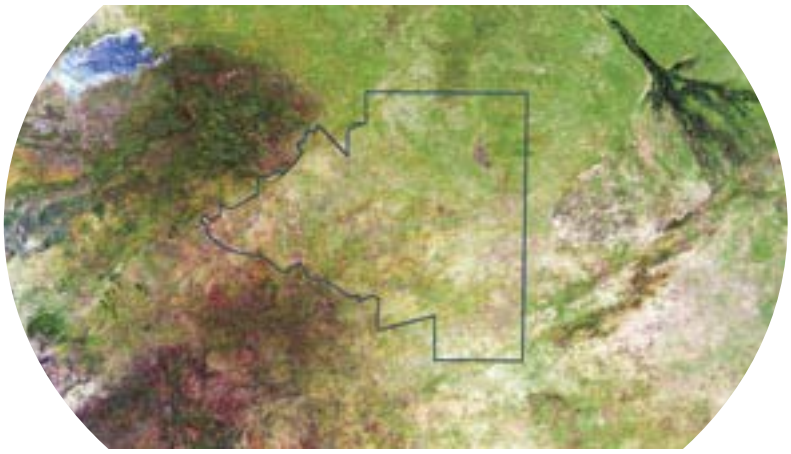
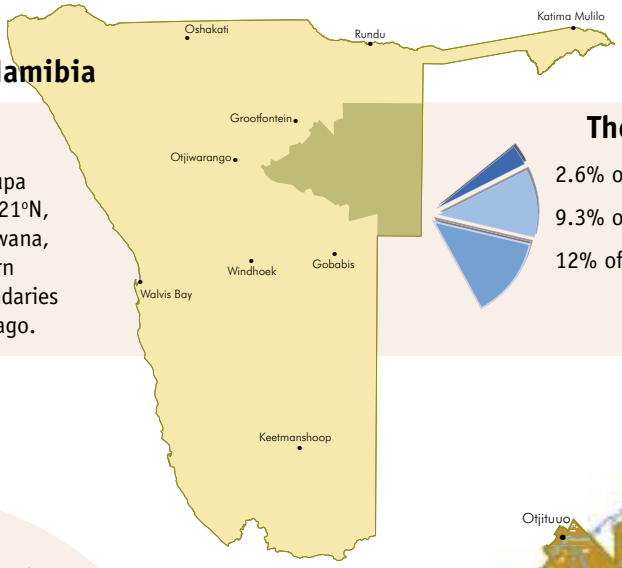


an overview

A large expanse of eastern Namibia

The block of communal land in eastern Namibia covers about 76,800 square kilometres, and forms part of Otjozondjupa and Omaheke. Its eastern border, along 21°N, is the international boundary with Botswana, while the northern, western and southern borders were those declared as the boundaries of tribal or homeland areas many years ago.



The region has:

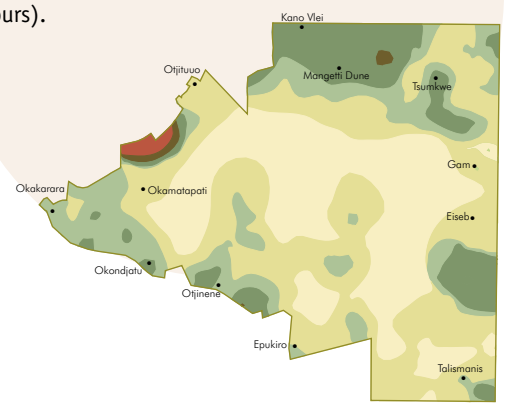
2.6% of Namibia's population

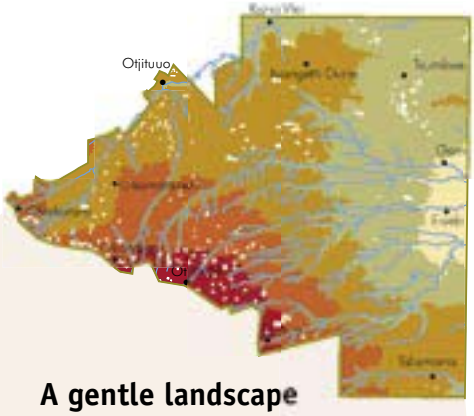
9.3% of the area of Namibia

12% of the cattle in Namibia

Thirst land

There are no permanent rivers in the region. Dry omuramba drainage lines may carry water for very short periods after heavy rain. Almost all water for people and livestock comes from underground, pumped from boreholes within the region or piped in from groundwater reserves at Berg Aukas and Kombat. Yields from boreholes are low in most areas (pale colours).



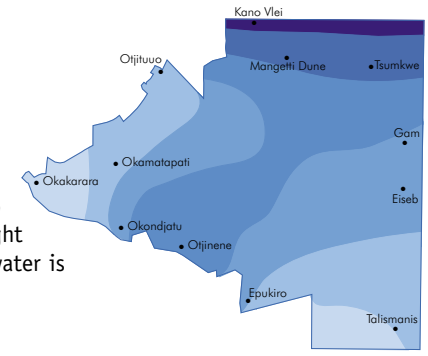


A gentle landscape

The region lies at the edge of the Kalahari Basin, and much of the surface is thus covered by windblown sand. The landscape is generally flat, dropping from about 1,400 metres above sea level (dark brown areas) in the west to less than 1,100 metres above sea level in the east (pale areas). Most omuramba drainage lines (in blue) flow east as a result.

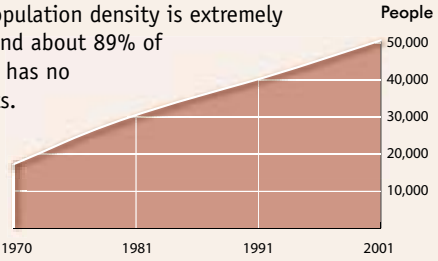
The rains

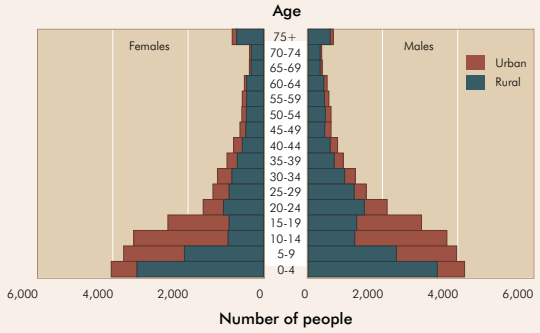
Most rain is in summer, especially in January and February. Average falls per year vary from about 350 in the south and far west (pale blue) to 450 millimetres in the north (dark blue), but totals also vary greatly from year to year. Many showers are too light or isolated to benefit plant growth, and a good deal of water is lost as a result of high evaporation rates.



A growing and youthful population

The total population in 2001 was 50,600, having grown by 2.6% per year since 1991. There were an estimated 8,300 households in 2001. More than a third of all people live in towns. Almost half the population is less than 15. The population density is extremely variable, and about 89% of the region has no inhabitants.

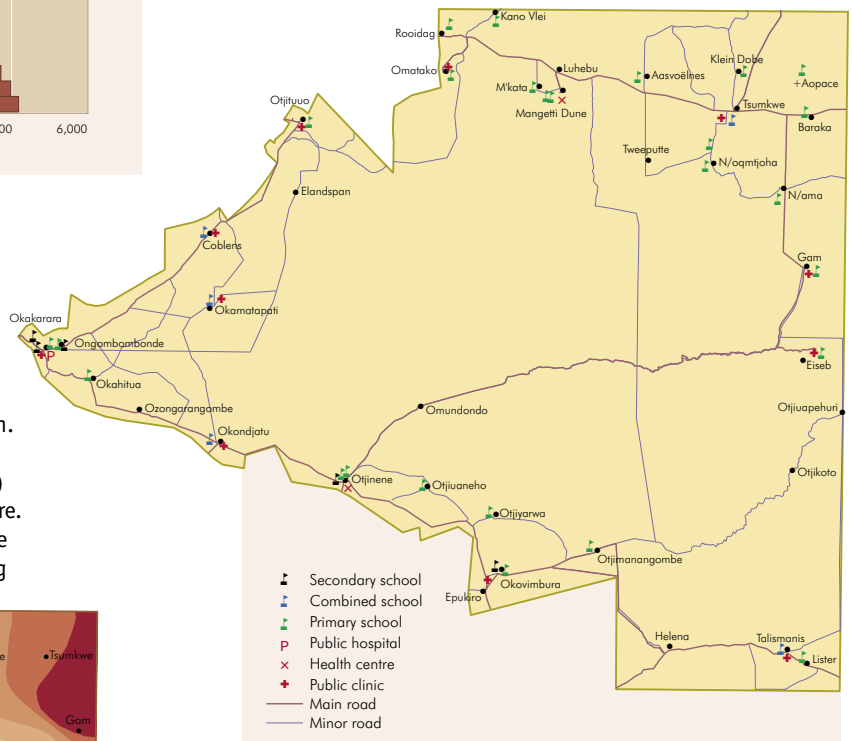




Land and economy

Land uses and the region's economy are dominated by farming, especially cattle ranching. Very large areas are fenced as exclusive farms. Maize and mahangu crops are seldom productive, and subsistence farming is difficult. The total number of livestock in 2001 consisted of 305,000 cattle, 132,000 goats and 53,000 sheep. About 800 farmers each own more than 100 cattle. There is much variation in household wealth, and many of Namibia's poorest people live here.

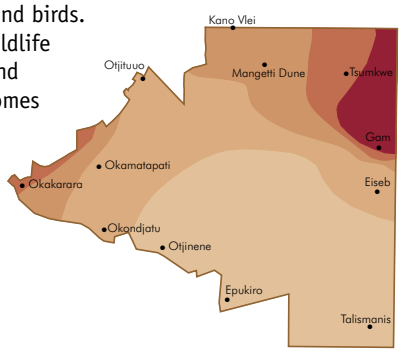
Education and health



About 12,600 pupils were enrolled during 2001 in 36 primary, 6 combined, 4 secondary and 1 vocational school. About 55% of people live further than 5 kilometres from schools. There are 11 clinics, 2 health centres and 1 hospital, but only about 44% of people live within 10 kilometres of health facilities.

Plant and animal life

Savanna woodlands dominate the vegetation. The diversity of plant and animal life is greatest in the northeast (dark brown areas) where there are more habitats than elsewhere. Flooded pans and woodlands in the Tsumkwe area are of great importance as a breeding site for wetland birds. The use of wildlife to improve and diversify incomes should be promoted.



Contents

Preface

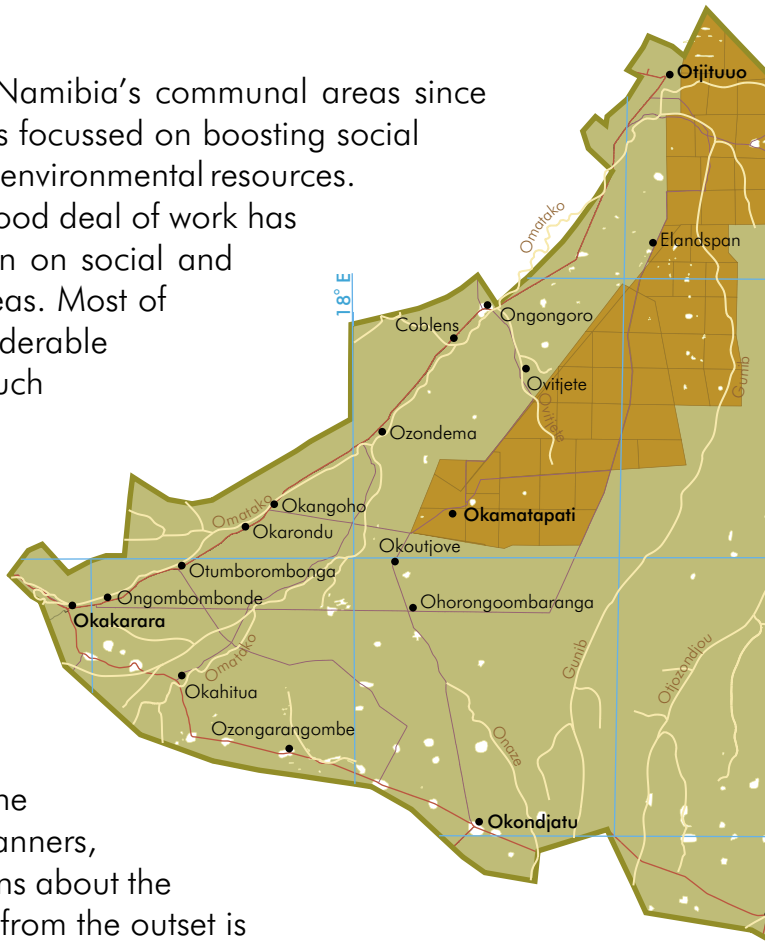
Most visitors to the eastern communal areas of Namibia are probably struck by the rather flat landscape covered largely with fairly uniform woodland. The climate is hot and dry for much of the time, and there is not a great deal of wildlife to be seen. The roads are dusty at best, and the worst of them are furrowed tracks of soft, deep sand of the kind that makes any vehicle grind and groan. There are no casinos, no scenic beaches, and no rugged mountains.

And so, by several counts this may not be a terribly inspiring place, and it is an area that many people indeed pass by. However, a good number of fascinating people live here, and they do interesting things in pursuit of livelihoods that largely depend on three commodities: land, water and cattle. Who are these people, what land is at stake, where is water to be found, why are cattle important, and how did things come to be this way? There are many other questions to be asked, of course.

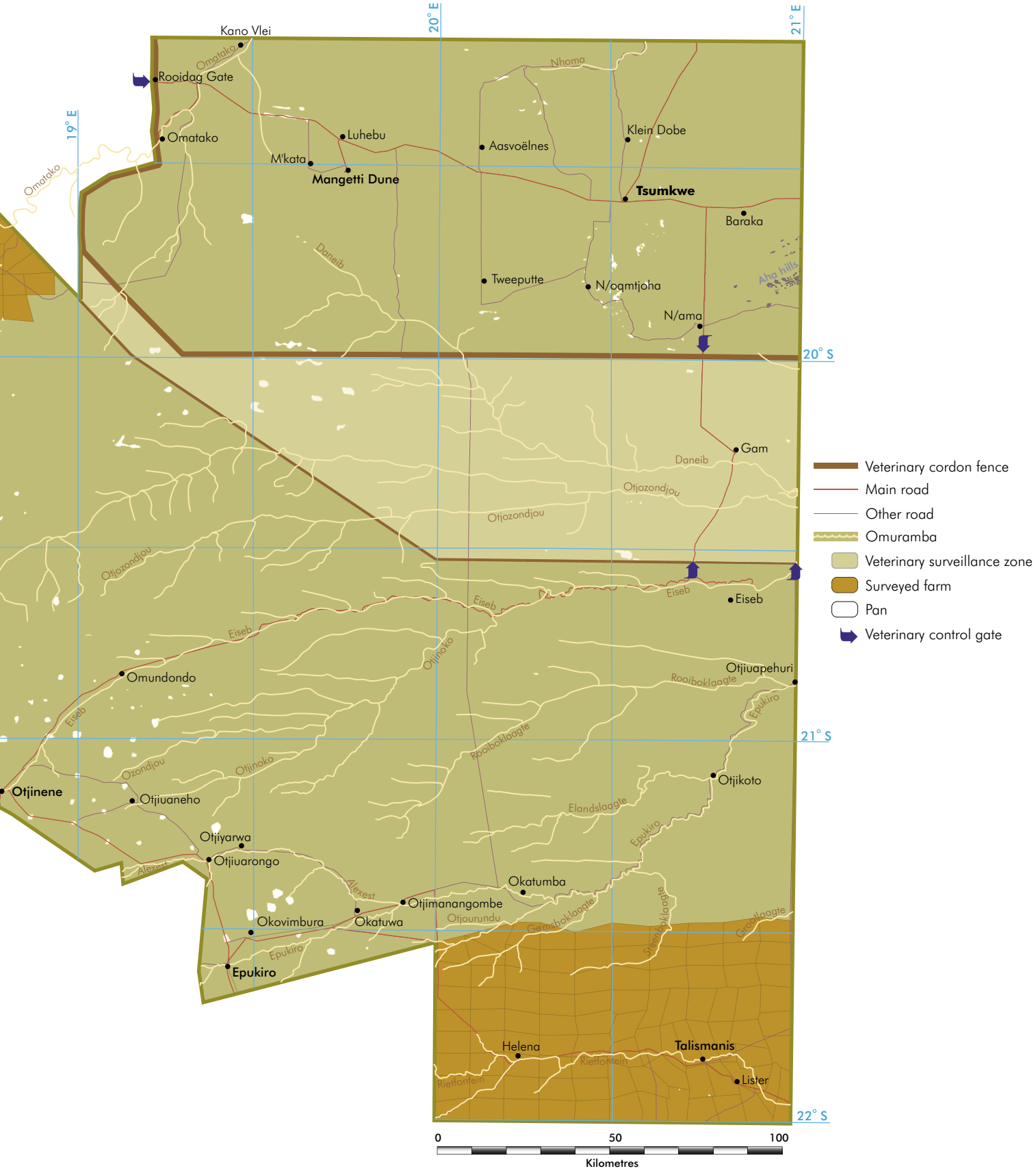
As an overview of the region, this book gives answers to some questions. But much more work is needed to document more thoroughly the region and its people, in particular relationships between land, water and cattle. There is also a special challenge to better understand the dynamics of land declared as communal but that increasingly verges on commercial use and control.

The book was commissioned by the Namibia Nature Foundation as part of its goal to provide broad audiences with information to better understand and manage Namibia's natural resources. We are particularly grateful to Chris Brown who recognised the need for this work, and he gave the project his encouragement throughout. The following people helped by providing valuable information or by pointing us in the direction of useful sources: Arnold Bittner, Melitta Bosshart, Marina Coetzee, Katharina Dierkes, Jasper La Cock, F.H. Maercker, Festus Marenga, Milton Maseka, E.M. Midzi, Erwin Muradwika, Archie Norval, Greg Stuart-Hill, Jo Tagg, Axel Thoma, Piers Vigne, Christine Viviers, Chris Weaver and Wolfgang Werner. Finally, the Agricultural Extension Officers and Animal Health Inspectors of the Ministry of Agriculture, Water and Rural Development in Omaheke and Otjozondjupa provided much information.

Introduction



Considerable attention has been devoted to Namibia's communal areas since independence in 1990. Much of that effort has focussed on boosting social and economic development, and on conserving environmental resources. To support and guide these developments, a good deal of work has also been done to assemble basic information on social and environmental conditions in the communal areas. Most of this information has been published in a considerable number of reports and books. However, much more information has been compiled for the northern communal areas than for communal areas elsewhere. This book is an attempt to reduce this imbalance for one area: the region of communal lands known previously as Hereroland and Bushmanland. Specifically, the book aims to provide fundamental and descriptive information on these areas in the hope that it will be of benefit to managers, planners, politicians and other people who make decisions about the region. One aspect that should be recognised from the outset is the region's complexity and diversity. These are features that stem from quite different historical, demographic, social and economic conditions within the area. Differences in these features are especially great between what were Hereroland and Bushmanland, as described in the next section.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Omatako
Rooidag Gate
Omatako
Luhebu
M'kata
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Aasvoëlnes
Klein Dobe
Tsumkwe
Baraka
Daneib
Tweeputte
N/oamtjoha
Aha hills
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Gam
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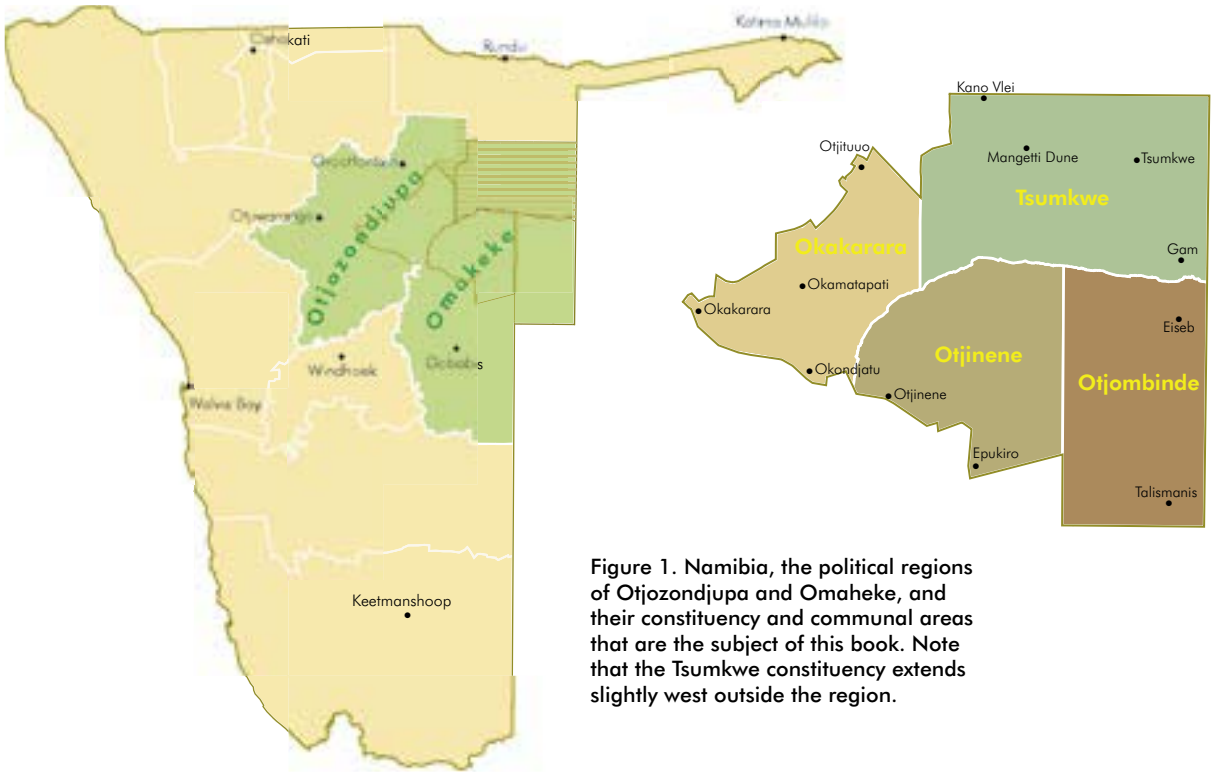


Figure 1. Namibia, the political regions of Otjozondjupa and Omaheke, and their constituency and communal areas that are the subject of this book. Note that the Tsumkwe constituency extends slightly west outside the region.

The areas described in this book now make up the communal lands in Otjozondjupa and Omaheke (the Amunius block in southern Omaheke is, however, not included in the book). Taken together, they comprise a large area of approximately 76,780 square kilometres, about 9.3% or just under 1/10th of Namibia's total land surface. The area is occupied by about 50,600 people, a total that amounts to only 2.6% or about 1/40th of the total population in Namibia. These figures reflect the area's very low overall density of people, with an average of about 1.5 square kilometres per person. Very large areas are indeed completely uninhabited, and these are in contrast to the many villages and small towns along the western and southern margin of the area that are home to the majority of people.

Approximately 60% of the area is in the region of Otjozondjupa and its constituencies of Okakarara and Tsumkwe, while the remaining 40% is in the Omaheke constituencies of Otjombinde and Otjinene, as shown in the table below. Otjiwarongo is the regional capital of Otjozondjupa while the regional government for Omaheke has its head office in Gobabis.

Constituency[1]	People	Number of households	Area (square kilometres)
Otjinene	14,932	2,195	14,638
Otjombinde	6,378	1,037	17,180
Okakarara	21,336	3,653	18,951
Tsumkwe	7,913	1,455	26,010
Total	**50,559**	**8,340**	**76,779**

Two societies

"Bushmanland" and "Hereroland" are labels that were created for purposes of political control of two areas before independence. Most people now reject these terms, but the names remain useful as shorthand labels for the two main areas in the region. The two names also reflect the very obvious fact that the region is inhabited by two very different societies.

One of these is the San, a group of people that have been here for a very long time. Their traditional livelihoods as nomadic hunter-gatherers reflect their occupation of a landscape of vast open spaces, where there is little water and where food often has to be obtained from sources spread far and wide. Their population density has been low and they have never been structured into tribal leadership systems. Over the past 50 years, a host of outsiders from government and non-government organisations have attempted to "develop" the San, essentially trying to move them into modern society. Schools, clinics and many permanent water sources have thus been established, and they have been given cattle and introduced to crop cultivation in efforts to turn the San into resident, subsistence farmers. The influence of these outsiders has been considerable and we now see a society very much in transition. The transition is uncomfortable in many ways, perhaps because it is happening so quickly and because no one really knows how to manage it. This is a society that is being thrust into the 21st century.

The other very different society consists of the Herero people. This is a society that is "new" to the region, indeed one that was "thrust" into what was Hereroland by the South African administration and by the provision of hundreds of water points. Traditionally, Herero people lived as pastoralists and many have now adapted that livelihood into successful cattle farming. Their success in the region can be measured in several ways: in their occupation of large farms, in the substantial cash incomes they obtain from cattle sales, in the large herds they own, and in the large areas of the region that they control. The area known as Hereroland is thus comparatively well developed, with a good deal of economic activity and infrastructure in several small towns. The Herero people have indeed embraced a modern cash economy rapidly and successfully, making their role in the region powerful and dominating. This has often been at the expense of the San people who have lost access to many natural resources. Indeed, many San now work as poor labourers for Herero families and farmers.

In summary, the Herero people dominate much of what happens in the region while San people struggle to adapt to new ways of living. An irony in compiling this book is that much more has been recorded about Bushmanland and San people than about the Herero areas and people.

Aspects of the past

Little appears to be known of human occupation in the region before the 1920's. Most maps produced during the late 1800s or early 1900s show the region as a waterless open expanse, devoid of names of places or features. This reflects the fact that few explorers or administrators visited the area. But it is also true that much of the region was indeed only sparsely and sporadically populated because of the absence in most areas of dependable water sources around which people could live permanently.

It is likely that the only inhabitants were San hunter-gatherers. The original Nyae-Nyae area occupied by Ju/'hoansi people reportedly stretched from Eiseb and Gam in the south, north of what is now the Khaudom Game Park in Kavango, far to the east into Botswana, and west to about the 20°E line of longitude. !Kung people lived in the area to the west of this, while people speaking a slightly different Ju/'hoan dialect, known as Au//eisi, lived south of the Nyae Nyae area.

From the view of governments and cartographers at the time, however, most of the area was simply treated as unoccupied or unallocated government (often called crown) land. The only exception was part of the block of Herero reserve that the German administration recognised before the 1904-1907 war (***Figure 2***). That war had two severe consequences for Herero people. The first was the killing of perhaps as many as 80% of all Hereros by the Germans forces. Many of the survivors fled to Botswana. The other was the declaration in 1907 that no Herero person could own land or cattle. These were huge losses to the Herero people, and they had followed the death of most Herero cattle during the rinderpest epidemic in 1897. Taken together, it is reasonable to assume that all these losses could have done much to develop a culture of resolve and entrepreneurship amongst the survivors and their descendants.

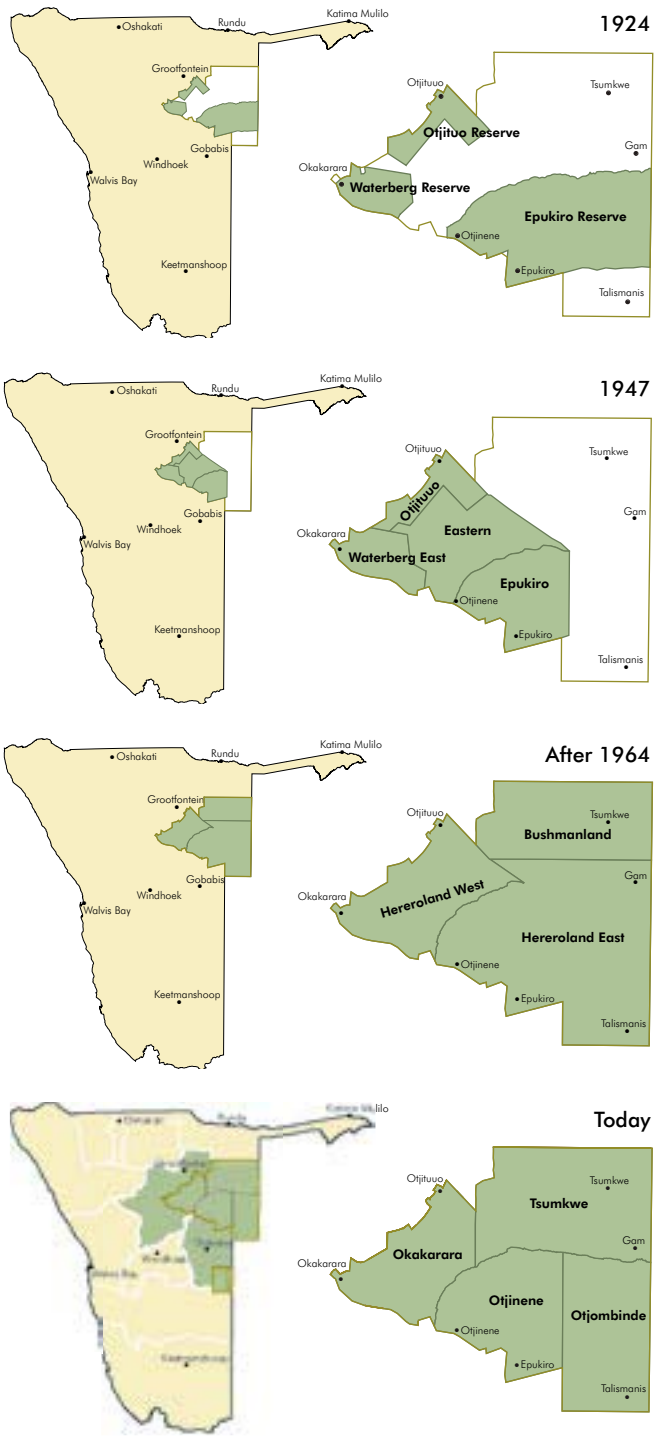
The South African administration later demarcated and allocated various areas as "native reserves" during the 1920s in a series of declarations on land distribution. Three reserves were thus established in 1923 and 1924 specifically for Herero people in the region: the Otjituuo, Waterberg and Epukiro Reserves. A further reserve - known as the Eastern Reserve - was added in 1947.

The formal land allocations for native reserves shown in the map for 1947 remained in place until the Odendaal Commission recommended the consolidation of the reserves into so-called homeland areas. It was the Commission's recommendations, published in 1964, that gave rise to what was called Bushmanland and Hereroland as homelands for San and Herero people, respectively. Hereroland was further divided into the magisterial districts of Hereroland West and Hereroland East, which included the Aminuis block south of Gobabis. It was also these homelands that the Namibian Government recognised as communal lands after independence.

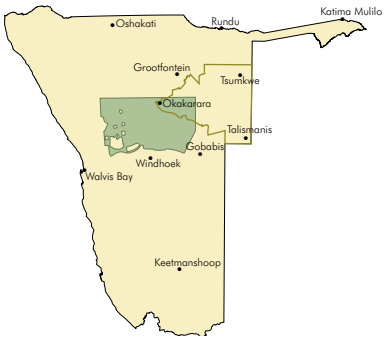
Although the Odendaal Commission recommended that Bushmanland be a homeland, it only became a magisterial district in 1970 and was then promulgated as a "homeland" in 1976 for the "exclusive use and occupation of the Bushman Nation". Tsumkwe was established as an administrative centre in 1959, and the first school in Bushmanland was opened in Tsumkwe in 1962.

More and more of the region has been settled as the number of residents grew and farmers expanded their activities to establish new cattle posts. But there have also been several important waves of immigration. The first started after the formation of the "native reserves" in 1923 and 1924 when large numbers of Herero people, scattered on small "temporary" reserves or living as squatters on crown land, were moved (often forcibly) onto the reserves. However, people could only be settled on these new reserves once boreholes had been drilled to supply them with water.

Figure 2. Land allocations over the past 100 years, showing the increasing areas (in green) declared first as "native reserves", then as "homelands" and now as "communal" land. Areas shown in white were unallocated, crown lands.[2]



Before 1904



The second movement was a resettlement programme by the South African Defence Force, which relocated about 4,000 San people from southern Angola, Kavango and what was Owambo to military bases in western Bushmanland. This happened over a number of years from 1974 onwards. However, about 2,000 of these people left to be settled in South Africa in 1989, just before Namibia's independence. Before these resettlements started in 1974, just a few hundred San people apparently occupied the whole of Bushmanland.

The third major group of immigrants consisted of Herero people from Botswana who were resettled at Gam. A first, small group arrived there in 1985, while about 3,000 people in 423 families were resettled there between 1993 and 1996. Gam had previously been occupied by small numbers of San people, since it was one of the very few permanent sources of water in the region.

A fourth group of immigrants has consisted of the variety of people, largely from Kavango and Hereroland, who have moved into Bushmanland on their own accord. Many of these people settled in Tsumkwe, while others established themselves as cattle farmers in western Bushmanland. One significant point is that large numbers of cattle have also been brought into the region, both by these farmers who settled in Bushmanland and by people being resettled at Gam.

These immigrations brought people into the region. However, large - but unknown - numbers of people have also left, especially to seek jobs in towns and on freehold farms, or to attend schools elsewhere in Namibia.

Land uses

All land in the region is communal in terms of the Communal Land Reform Bill of 2002, and is thus formally owned by the government. However, Okakarara is now a declared town with an elected town council, and Okamatapati and Talismanus are settlement areas that are earmarked for local government development. In addition, the Ministry of Agriculture, Water and Rural Development controls a quarantine camp between Eiseb and Gam, and a breeding or demonstration farm west of Tsumkwe.

For the remaining areas, there are two major categories of usage and control. The first consists of the large communal areas that are not fenced and where access to resources is open to people living and farming locally. In fact, no people live in most of these areas, especially in the large open areas to the south-west of Tsumwke and south of the veterinary fence ***(Figure 3)***. Other areas with open, communal access to resources are around villages where they are mainly used for small-scale farming and hunting and gathering in the Tsumkwe constituency or for cattle farming further south in the region.

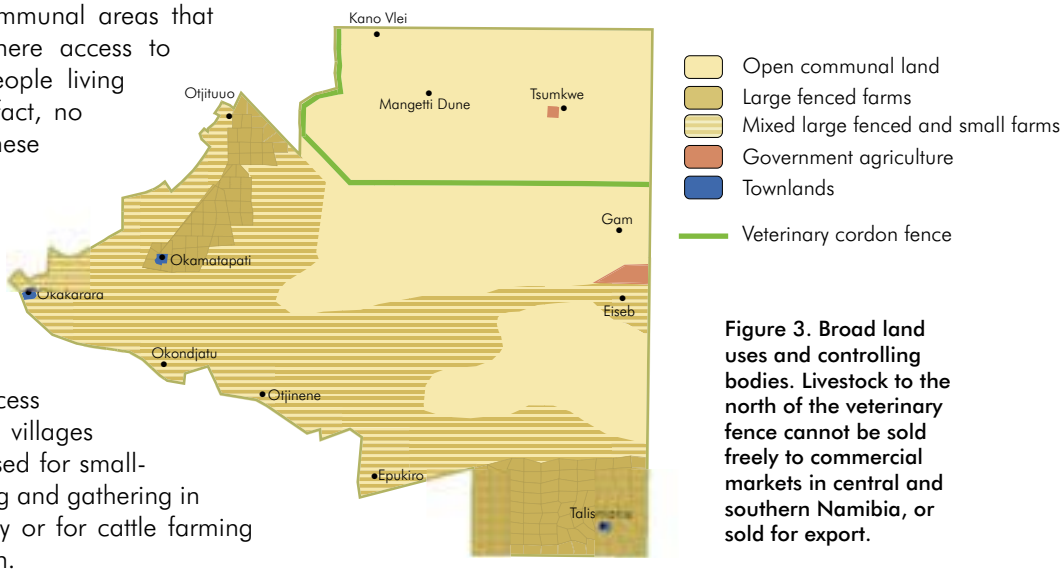


Figure 3. Broad land uses and controlling bodies. Livestock to the north of the veterinary fence cannot be sold freely to commercial markets in central and southern Namibia, or sold for export.

The second category consists of the many large fenced farms, both those that are mapped and registered as surveyed units and those that have been enclosed informally. The surveyed farms are those in the so-called Okamatapati and Rietfontein blocks, where most farms range in size between 4,000 and 6,000 hectares ***(Figure 3)***. Together, the two blocks cover an area of about 8,800 square kilometres, or 11.4% of the whole region. The 91 Rietfontein farms were surveyed in the late 1950's for potential use by white farmers, but were largely left unoccupied because of a scarcity of water and their remote location. The Odendaal Commission recommended that the farms be incorporated into Hereroland and the first Herero farmers settled there in 1966. Some 25 to 30 farms are presently allocated to individual families and about 50 farms are occupied by groups of farmers. Most of the farms that remain are unoccupied (because they do not have water) are along the northern border of the Rietfontein block.

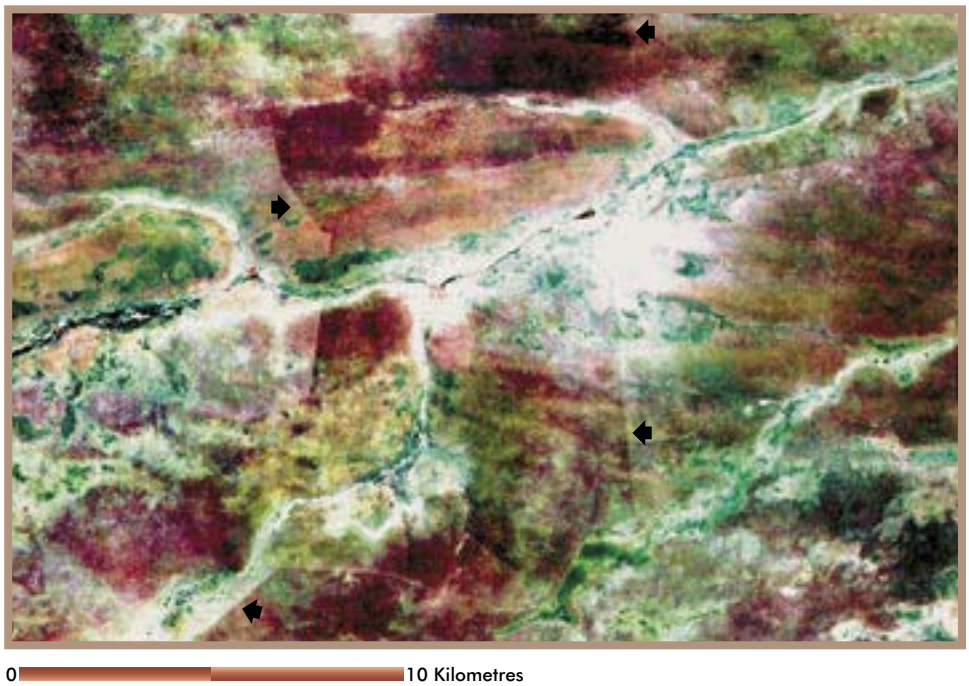
The fencing of about 65 Okamatapati farms began in 1979 following a decision that all land in that part of the region be fenced for cattle farmers. This was also after the start in 1978 of a scheme to pump water from Berg Aukas for livestock in the Okamatapati area. Each farm was planned to cover an area of 7 by 7 kilometres and fencing of most farms had been completed in 1982. The farms were allocated to wealthy individuals. Some additional farms were claimed in the Okamatapati area in 1988 after the then Herero Administration instructed a land surveyor to mark out large farms in all open areas of what was Hereroland. These events followed the promulgation of legislation allowing the executive committee of the Herero Administration to allocate farms which would be given over to their owners with full title deed after 15 years. Neither the legislation nor the surveying of all of Hereroland was ever put into practice, however.[3]

The development of these two blocks of farms was formal and legal in terms of regulations that held at the time.[4] However, the development of these farms stimulated the fencing of hundreds of other large farms in Hereroland. This was because other farmers saw the benefits and opportunities of obtaining their own farms for free, simply by claiming for themselves large, exclusive grazing areas. It is also clear that there are few, if any, controls to stop people enclosing large farms. Local leaders or chiefs evidently exercise no control over issues of access to land. The emergence of these local leaders in recent decades also appears to have undermined the stronger, traditional and communal controls of grazing and water by pastoral farmers. Moreover, the majority of people who have claimed their own fenced farms are wealthy, giving them both the resources to fence land and greater powers of leverage to obtain land.

Most of the informally fenced areas are interspersed with open, communal grazing areas in the area labelled as "mixed large fenced and small farms" in ***Figure 3***. No attempt has been made to map or count these farms, but most of them are hundreds or thousands of hectares in size. Some of the largest farms, belonging to the wealthiest people, now have their own boreholes that the farmers have installed themselves. Some farms are also now being bought and sold, the prices being fixed largely according to the agreed value of infrastructure such as fences, buildings and water pumps.

Some communities have fenced off large areas around their villages in what is called "defensive fencing" with the aim of protecting their grazing from wealthy farmers who might otherwise claim and enclose the pastures.

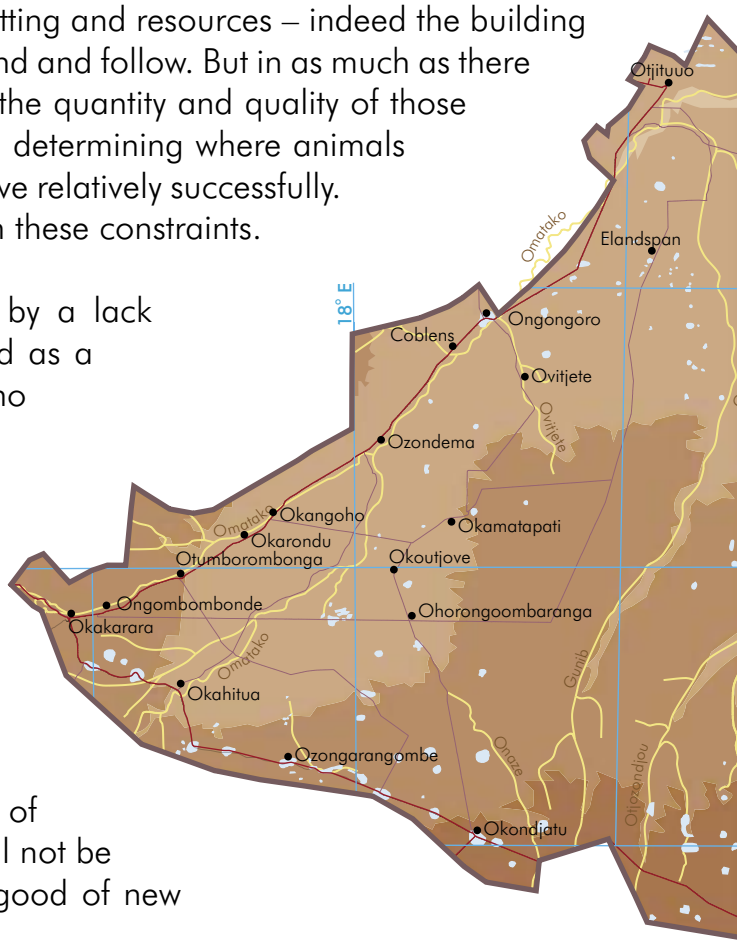
Local leadership in the region is provided either by Regional Councillors or by a variety of traditional leaders. Each Regional Councillor represents one of the four constituencies, but they currently appear to have little influence on land uses and control. Several areas in Hereroland are represented by two traditional leaders, elected by different and competing political interests. These leaders also seem to have no significant role in determining how land and other natural resources are used or allocated. There are some self-appointed leaders in Bushmanland but, more importantly, the Nyae Nyae Farmers' Co-operative appears to be playing an important role in representing the interests of San people in eastern Bushmanland. It is important to recognise that neither San nor Herero societies have had a long history and tradition of local leadership.



Satellite image of an area along the Otjinoko Omuramba, about 50 kilometers north of Epukiro. Fences run along the lines or edges where there are sharp changes in colours, some of which are indicated with arrows. The colours represent different grazing patterns. Note from the scale bar that some of the fences run for many kilometres and thus enclose very large areas.

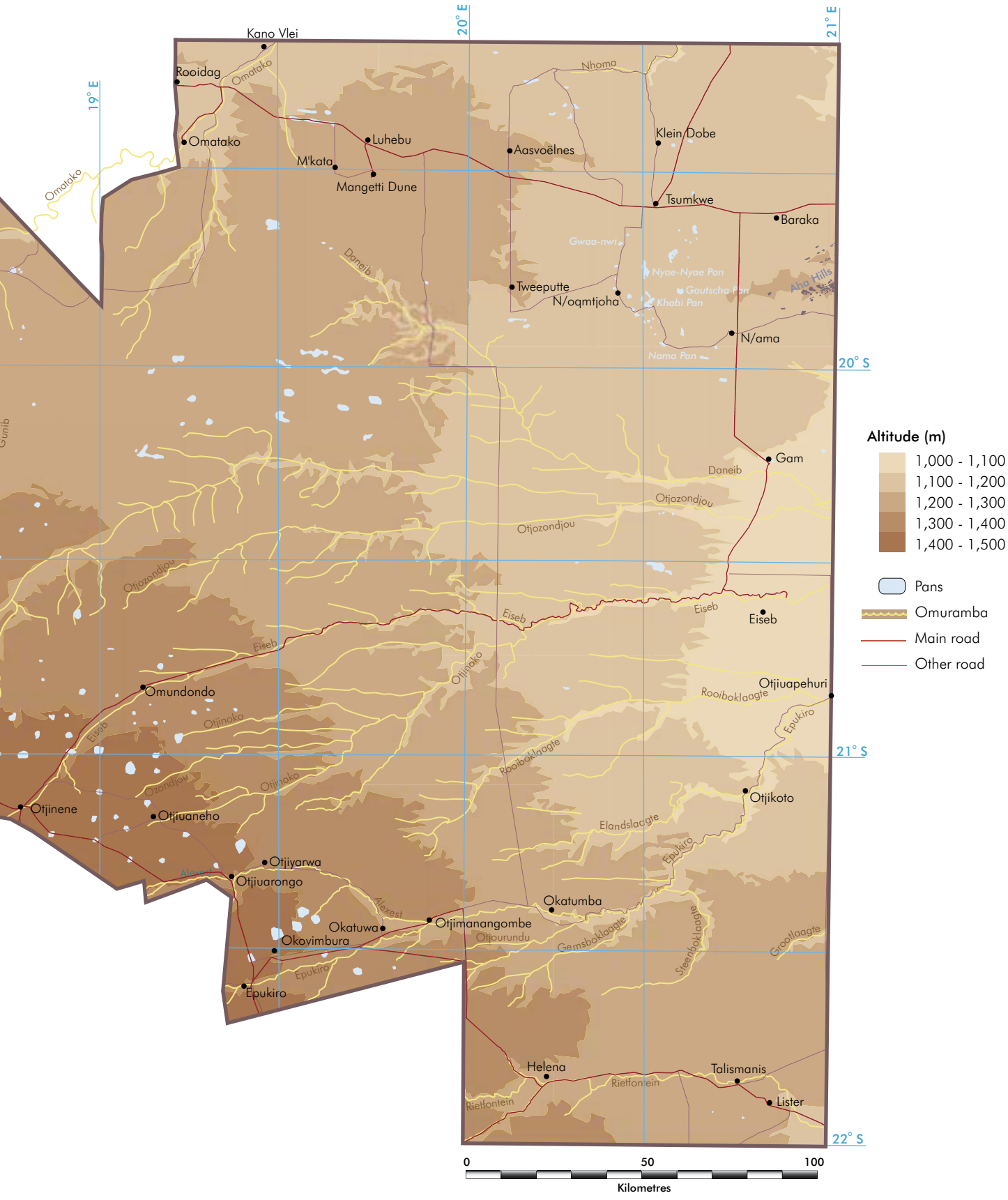
The natural world

The region's natural environment provides the setting and resources – indeed the building blocks – upon which almost all other things depend and follow. But in as much as there are natural resources, so too are there limits to the quantity and quality of those resources. These limits set important constraints, determining where animals and humans can live or, at least where they can live relatively successfully. There are two reasons to recognise and focus on these constraints.



First, this is hard country, made most difficult by a lack of water. The region was known as a thirst land as a result, and it was home to just a few people who could live in permanent settlements close to water. Other challenges include the low and unpredictable rainfall, high temperatures and evaporation rates, and the predominance of soils that are not well-suited to the growth of crops. These constraints may now be less limiting for many people as a consequence of modern services and the diversification of household of incomes, but new developments in the region will not be easy, and hard work will be required to make good of new enterprises.

Second, the presence and severity of such constraints means that new developments should be planned carefully. Clear and objective assessment is needed to ensure that natural resources are used appropriately and sparingly. This will provide benefits and incomes for poorer members of society, people who really need the security and natural resources that communal lands can offer. Careful planning and uses of resources will also leave room for future generations to enjoy similar, if not better lives.


19° E
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Kano Vlei
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M'kata
Mangetti Dune
Nhoma
Klein Dobe
Aasvoëlnes
Tsumkwe
Baraka
Gwaa-nwi
Nyae-Nyae Pan
Gautscha Pan
Khabi Pan
Aha Hills
Daneib
Tweeputte
N/oqmtjoha
N/ama
Nama Pan
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Okatumba
Otjourundu
Gemsboklaagte
Steenboklaagte
Elandslaagte
Epukiro
Rooiboklaagte
Rooiboklaagte
Epukiro
Otjiuapehuri
Otjikoto
Grootlaagte
Helena
Rietfontein
Rietfontein
Talismanis
Lister
Altitude (m)
1,000 - 1,100
1,100 - 1,200
1,200 - 1,300
1,300 - 1,400
1,400 - 1,500
Pans
Omuramba
Main road
Other road
0
50
100
Kilometres

Climate

The region's climate is typical of sub-continental areas within southern Africa that are some distance from the coast. Accordingly, most rains fall during the summer months when moist, subtropical air feeds southwards from more tropical zones to the north. Summer days are warm to hot and, sometimes when the air is relatively humid, clouds may build up during the day to deliver afternoon thundershowers. The winter climate, by contrast, is dominated by anti-cyclonic conditions or high pressure systems which only circulate dry air over the region. Winter days are therefore cloudless, the air is very dry, and temperatures are low during the night and in the early morning. Throughout the year, winds are generally light and more frequent from the north-east than from other directions.

The only meteorological data that have been collected from within the region are rainfall records from a handful of recording stations. Some information collected nearby and at similar altitudes in Grootfontein and Gobabis has therefore been used as being representative of conditions in the region.

Within the region itself, there is rather little climatic variation because of the flat landscape. However, northern areas tend to be warmer in winter and they receive more and earlier rain in the summer ***(Figure 4 and 5)***. Tsumkwe thus receives more rain in January than in other months, while February is the peak month for rain at Okakarara. The highest totals per year in the north are about 100 mm (or 25%) higher than the lowest totals in the south and extreme west. These are only general trends which emerge when rainfall records are averaged over a period of years. A much more significant feature is for rainfall to be sporadic and erratic: from day to day, from month to month and from year to year. Such unpredictability means that rains often fail to fall frequently and regularly enough for crop production. Even good rains that fall over one or two days may produce no crop or other plant growth if they are followed by weeks of hot, dry weather.

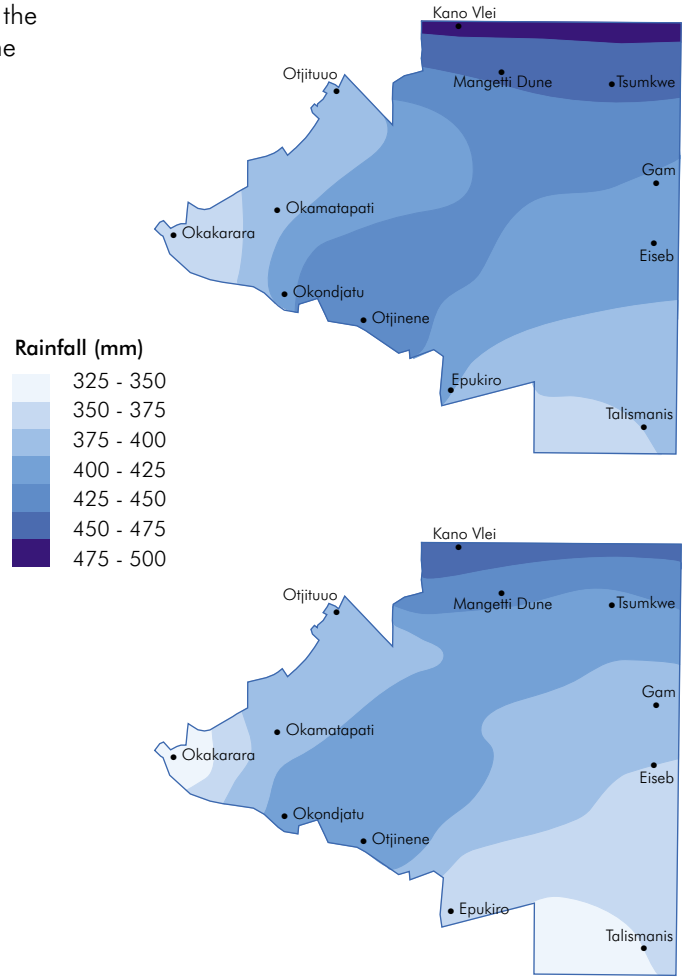


Figure 4. Average (above) and median (below) rainfall per year. Most people are more familiar with an average than a median, but median rainfall is a better measure of what annual totals can be expected normally. This is because the average is distorted by occasional very high totals. In this area of Namibia, average rainfall is about 5-10% higher than the median.[5]

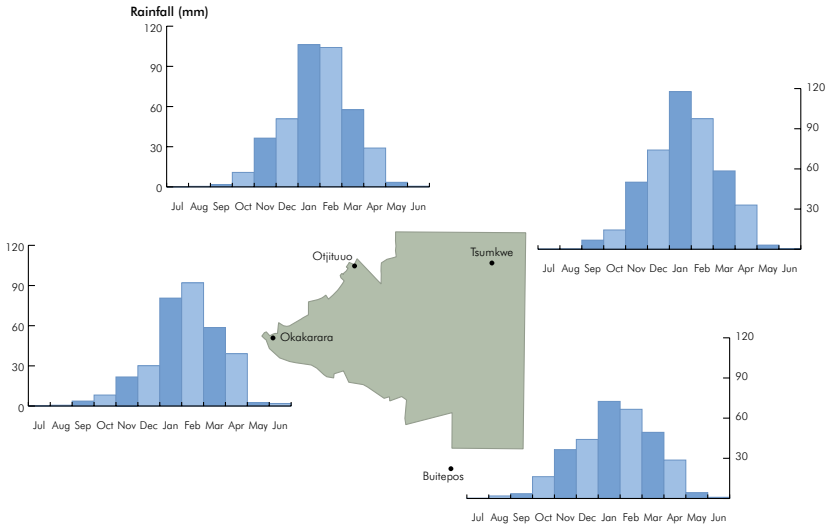


Figure 5. Average rainfall per month at four recording stations in and around the region.[5]

Year to year variation in rainfall is shown in the two graphs of annual totals at Grootfontein ***(Figure 6)***. The top graph shows how annual totals vary from year to year, from years with the lowest totals of less than 300 mm to the best years with totals of more than 700 millimetres. Some decades, notably the 1950s and 1970s, generally received better rains than other decades, and most of the last 25 years have been rather dry. The lower graph shows that annual rainfall varied between 300 and 600 millimitres in 54 out of 82 years, with totals above or below this range being received in the other 28 years.

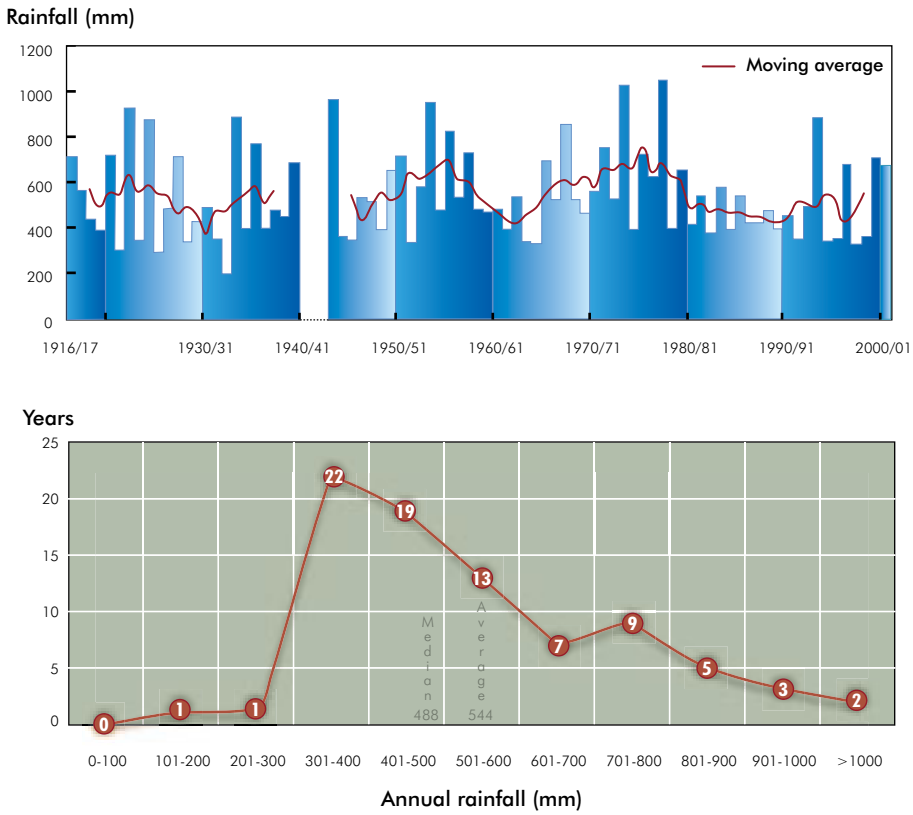
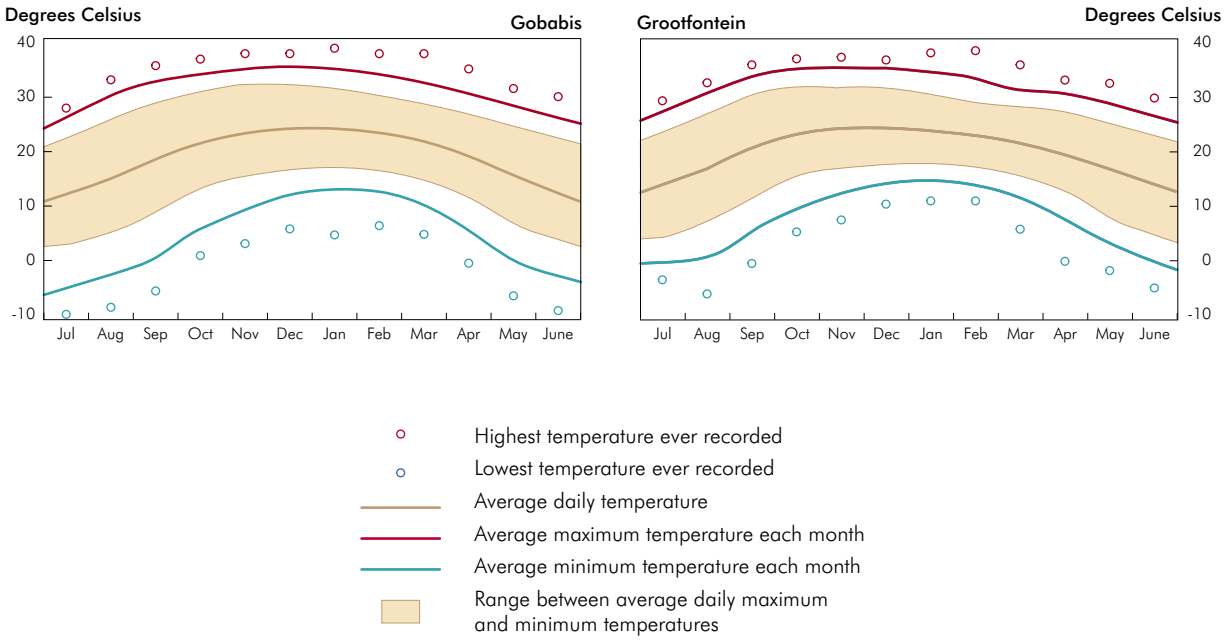


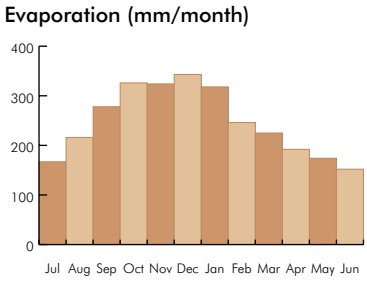
Figure 6. Total rainfall per year (as measured between 1 July and 30 June) at Grootfontein over the past 85 years (top) and the number of years during which different total rainfalls were recorded there (bottom).[5]

The region typically enjoys warm summer weather, the days often being hot with temperatures above 30°C. Summer nights are mild, with temperatures usually ranging between 12 and 18°C. By contrast, winter nights and early mornings are generally cold, with temperatures close to or often below freezing point in the southern areas. Temperatures then rise rapidly to between 15 and 25°C, producing warm weather during most daylight hours in winter. These patterns are shown in the graphs showing changes in temperature during the year at Gobabis and Grootfontein ***(Figure 7)***. The colder conditions during winter mornings in the southern areas are reflected by the much lower minimums recorded at Gobabis where winter mornings are much colder.

Figure 7. Changes in temperature at Gobabis (left) and Grootfontein (right) during the year, showing long-term averages (the average of every day's maximum and minimum temperature), average daily maximums and minimums, the highest monthly maximums and lowest monthly minimums, and the highest and lowest temperatures ever recorded.[5]



One consequence of the high temperatures, low levels of humidity and cloudless conditions is that evaporation rates are extremely high. The highest rates, of about 2,200 mm of water per year are in the south of the region while those in the north are about 1,800 mm per year. Comparing these figures to annual rainfall means that several times more water potentially evaporates than falls as rain. The highest rates of evaporation are between October and December when the total amount of water lost is more than double that in June and July.



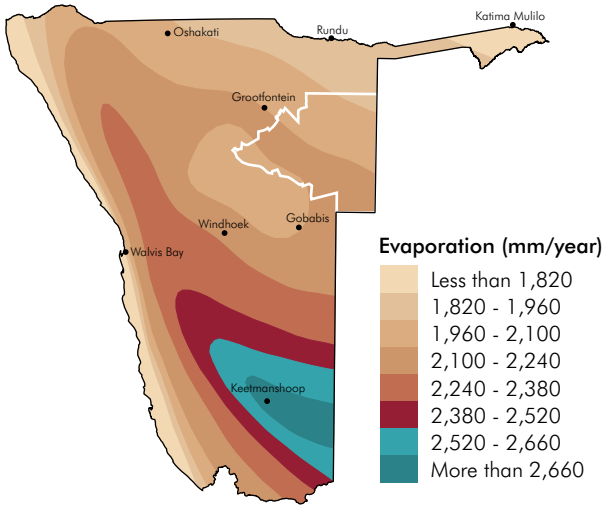


Figure 8. Average amounts of evaporation (in mm of water) per year across the country and region, and average rates of evaporation at Gobabis per month.[2]

Landscapes

The region lies on the western edge of the vast Kalahari Basin of deposits that cover much of the interior of southern Africa ***(Figure 9)***. Over the last 70 million years, wind and rivers have carried and deposited sediments - such as sands, silts and clays - into the Basin. However, the upper layers of deposits and surface soils in this part of the Basin in Namibia are dominated by windblown sands, and it is these sands that have important influences on plant and animal life (see page 23), and on farming practices (see page 35). The region also lies midway between two massive wetland features, the Etosha Pan and Cuvelai Delta in the west and the Okavango Delta. Both wetlands are at the ends of large river systems that drain substantial areas in Angola.

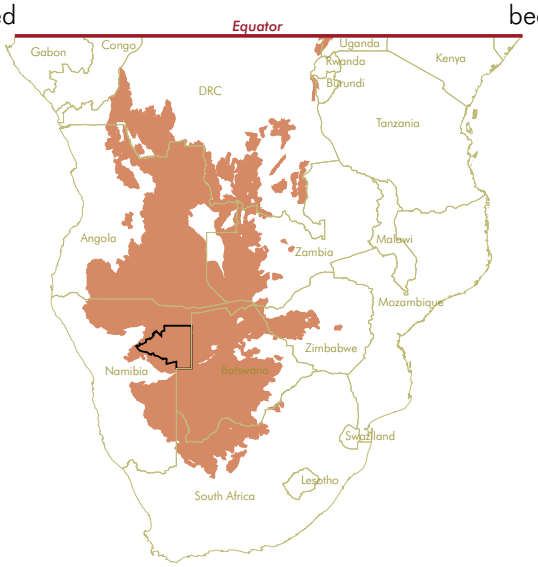


Figure 9. The overall extent of the Kalahari Basin and its deposits of sediments.

There are no active sand dunes present in the region today, but there are many old dunes that were formed long ago during more arid periods ***(Figure 10)***. The orientation of the dunes was determined by the direction of winds prevailing during those drier times, when the winds must have been predominantly from the north-east in the western parts and from the east elsewhere in the region

Figure 10. The distribution and orientation of sand dunes formed during more arid periods long ago.[2]

A simplified map of geology ***(Figure 11)*** shows that most of the region is covered by sands of the Kalahari Group. Most of the few rock formations that are exposed or that lie just below the surface of sands were formed about 550 to 600 million years ago, and consist of sandstones, marble, dolomite and limestones that are part of the Damara Supergroup. Basalts (north of Tsumkwe) and sandstones (north-west of Okondjatu) are some 180 to 200 million years old, and belong to the Karoo Supergroup. A complex mixture of various metamorphic rocks east of Tsumkwe was formed very much earlier, perhaps about 1,800 million years ago. The only geological features with any potential economic value are kimberlites to the north and west of Tsumkwe. However, exploration work has yet to provide any clear conclusions on whether or not there are diamonds to be mined in these rocks.

The valley of the Eiseb Omuramba.

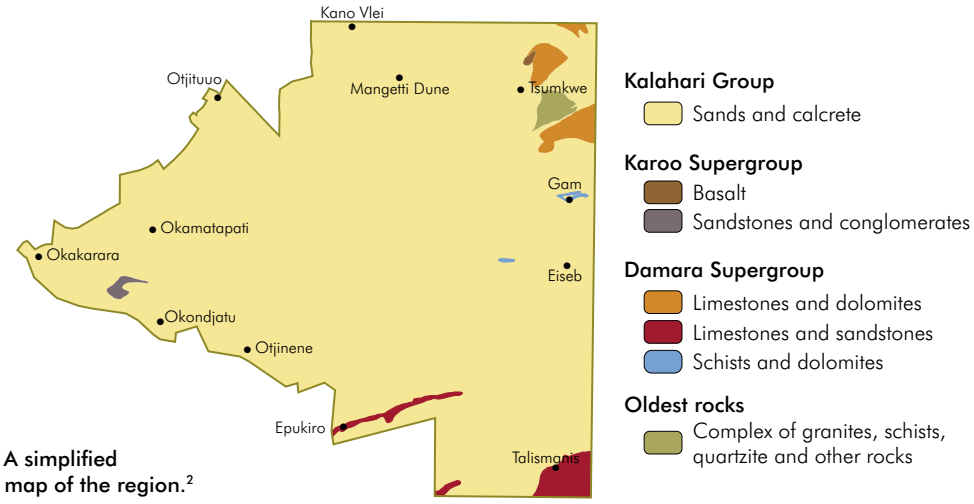


Figure 11. A simplified geological map of the region.[2]

The landscape is generally very flat, the only local relief being the omuramba valleys and the Aha Hills east of Tsumkwe. However, being on the western rim of the Kalahari Basin, there is an overall drop of about 400 metres from the highest elevations (of over 1,400 metres) in the south-west to the lowest levels on the Botswana border in the Eiseb valley ***(Figure 12)***. While the Aha Hills are prominent local features south-east of Tsumkwe, the highest of the hills rise only 250 metres or so above the surrounding plains.

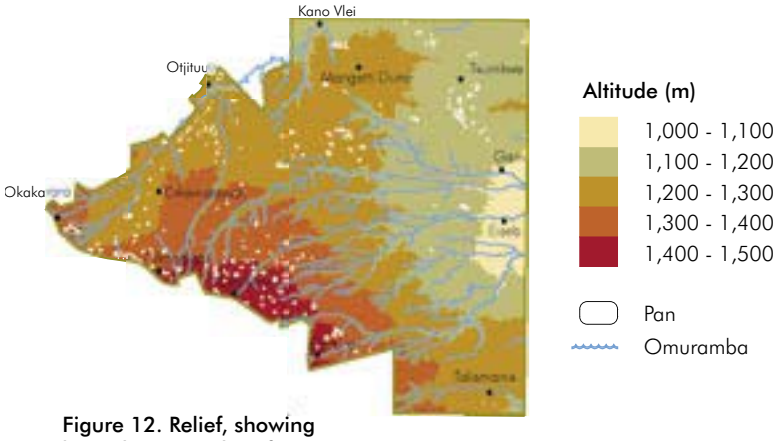


Figure 12. Relief, showing how elevations drop from the south-west to the north-east and east.

Kalahari sediments and an ancient surface of bedrock lie beneath most of this rather flat surface. The thickness of the layers of Kalahari deposits varies a great deal, with the thinnest layers being around the appearance of bedrock at the surface in eastern Tsumkwe constituency. The deepest layers are over 450 metres in thickness in the Coblenz area. Other sediments over 250 metres deep in the north-west areas of Tsumkwe constituency and in the Eiseb area near the Botswana border are at the ends of a broad valley in the bedrock that runs in a north-west to south-east direction.

None of the water courses or omurambas in the region really ever flow, and any surface runoff from even the heaviest falls of rain is local and short-lived. This differs from the west-flowing ephemeral rivers elsewhere in Namibia, which often carry water over considerable distances for a few hours or days after heavy rain. The omurambas form two drainage systems or basins ***(Figure 13)***. The first is the Omatako, which covers a distance of 635 kilometers on its north-eastward path from its upper catchment north of Okahandja to its

confluence with the Okavango. The second drainage system consists of all the other omurambas, which flow eastwards into Botswana where they either disappear or flow into the Okavango Delta. All the omurambas were formed as true river courses during much wetter periods when they obviously carried enough water to carve their paths through the Kalahari sediments. However, the flows were probably always gentle because of the shallow drop in slope along the lengths of the omurambas.

A large number of pans are present in the region ***(Figure 14)***. Those in the south and west evidently formed during wetter periods and seldom fill with water nowadays. Many villages have been established in and around these pans because the soils are better suited to crop growth than the surrounding sands.

The other major group of pans are those in the Tsumkwe constituency, and these include the well-known Nyae Nyae, Dobe and Gautscha pans. These pans apparently owe their existence to the nearby Aha and other hills to the east in Botswana. The hills deflected prevailing winds so that thick layers of sand were not deposited in the area, thus leaving exposed the impermeable bedrock features on which the pans lie. Some of the larger pans have been scoured out by wind, the wind eroding their dry surfaces and depositing some sediments in lunette dunes on the western margins of the pans. Many areas surrounding the pans also become flooded during years with exceptionally high rainfalls. The flooded grasslands and woodlands then attract large numbers of breeding water birds, making this a wetland sanctuary of great importance in a southern Africa context for breeding water birds.

Figure 13. Dry river courses or omurambas in the region. Only the largest channels are shown here.

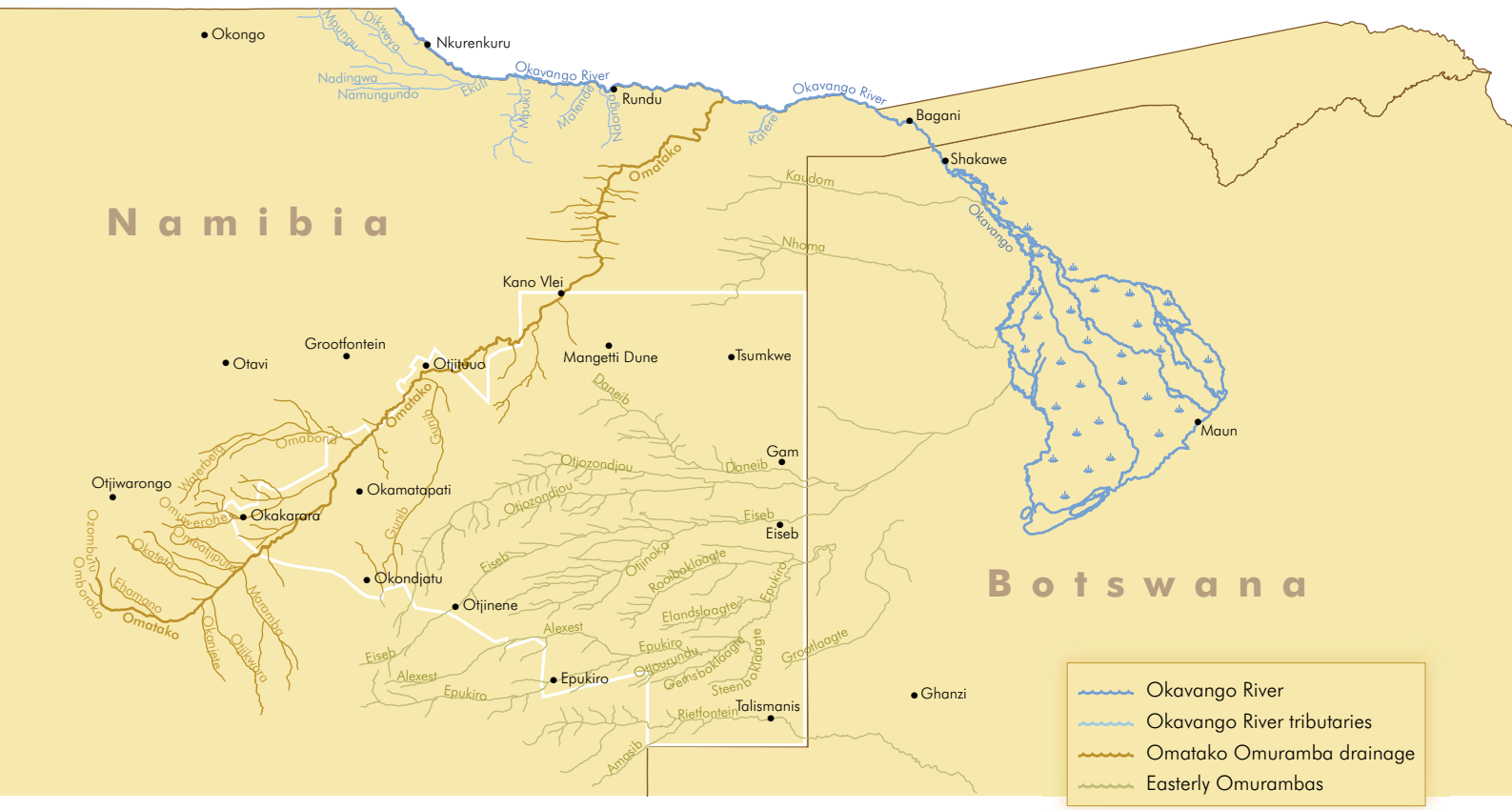


Figure 14. The distribution of pans.[2]

The combination of geological and climatic features in the region have produced three broad landscapes. The first, and biggest, is the broad mantle of Kalahari sands that extends across the region. The sands are poor for crops because of low water retention (rain water rapidly percolates through the sand) and low levels of nutrients. They support a variety of trees, shrubs and grasses, but the structure of the vegetation community in any one area is often rather uniform. As a result of lower rainfall, trees are smaller and dominated by thorny species in the south, while the wetter, northern areas have more broad-leafed species, some of which grow into tall and useful timber trees, such as kiaat (also known as *mukwe* or *Pterocarpus angolensis*) and teak.

The second landscape consists of the many omuramba valleys that cut across the region and through the zone of Kalahari sands ***(see Figure 13)***. Soils in the valleys tend to be more clayey than the surrounding sands, and many people live in the valleys because the soils are better for crop growth. Vegetation in the valleys tends to be dominated by thorny, acacia shrubs, often with open areas of grasslands and copses of tall trees.

The third landscape is eastern Bushmanland, where there is a much higher diversity of topography and soils as a result of the area's varied geology. The variety of habitats in the area include pans, flooded woodlands, ridges of tall woodlands, the Aha Hills, and broad-leafed woodlands. The area's vegetation and wildlife is thus also much more diverse (see page 24). The absence of sands means that underground water comes to the surface in a number of artesian wells. It is these wells that allowed San people to live there long before the drilling of boreholes started. These surface waters also attracted wildlife to the area.

Nyae Nyae Pan dry as it is usually, and then flooded after heavy local rains. Great numbers of water birds are attracted to breed in this and other local pans, making their nests in the flooded grasslands, shrubs and trees. The productivity of the wetlands – in providing enough food for the birds to breed – is probably so high because the pans flood only sporadically. The pans and surrounding flooded woodlands provide a breeding site of major importance for water birds in the whole of southern Africa.

Ground water

The lives of people and animals are affected more by water than by any other natural resource, and it is especially upon water from under the ground that the great majority of people and livestock in the region depend. The water is supplied either by pumps at single boreholes or from bulk water schemes that draw water through groups of boreholes (see page 42).[6]

Underground water is pumped out of aquifers, which are bodies of water that are trapped either in fractures in the bedrock or in the Kalahari sands. The aquifers lie at variable depths below the surface, and the quantity and quality of water available in the aquifers also varies. The maps presented here explore aspects of this variation to identify general trends within the region, but it is important to note that a great deal of local or small-scale variation overlies the trends. For example, two boreholes very close to each other might supply water of different quality because they draw water from separate aquifers that lie at different depths.

In most areas in the centre of the region, the Kalahari sands contain very little water. This is reflected by the low yields of less than 1 cubic metre of water per hour ***(Figure 15)***. In fact, about 90% of boreholes have proved not to yield any water in these central areas. Low yields in the western part of the central areas are also the reason why water is piped to towns and fenced farms between Otjituuo and Okamatapati. The piped water now comes from rich aquifers near Grootfontein, but all other water is supplied from aquifers in the region (see page 42).

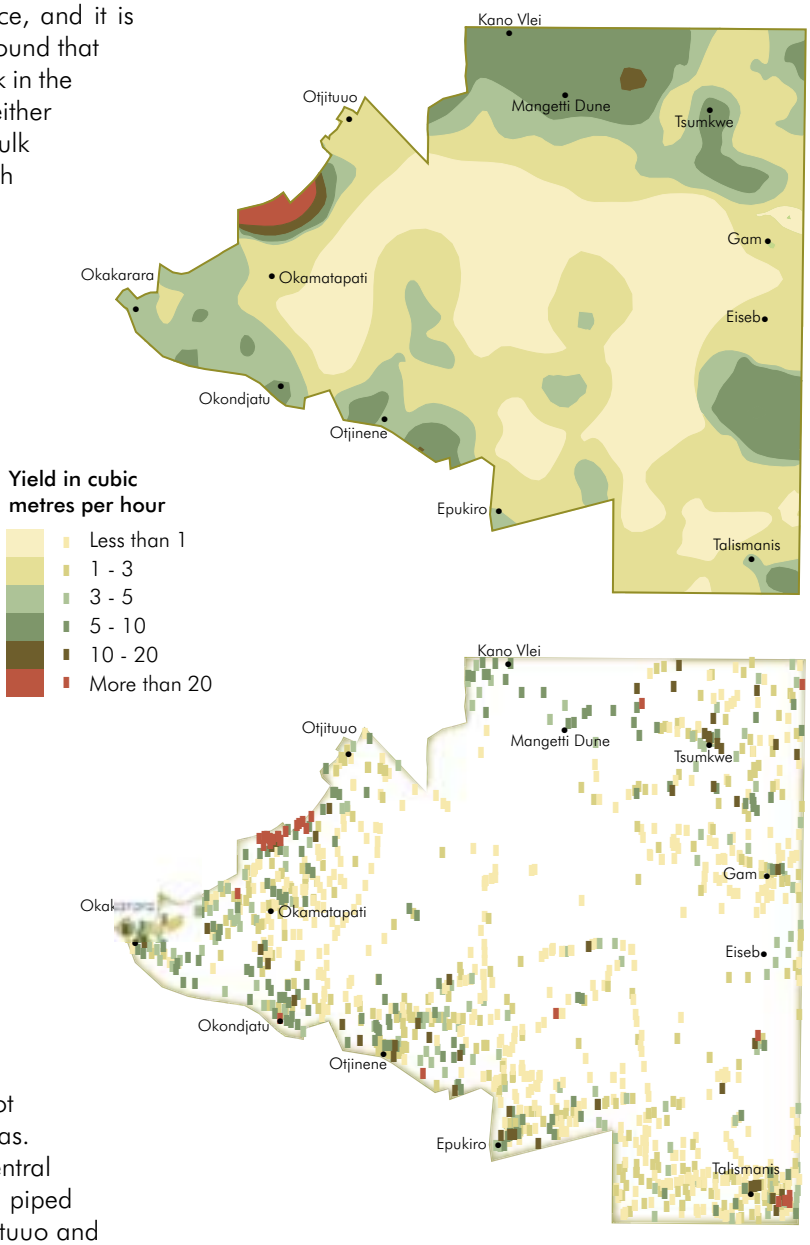


Figure 15. Yields from underground water pumped to the surface. The top map shows areas where yields are generally high or low, while the map below shows yields at each borehole.[7]

Yields are generally higher elsewhere, where enough water (1 – 10 cubic metres per hour) can often be pumped to supply a small village and its livestock. This is the case in many areas of the Tsumkwe constituency. Even though several boreholes with good yields have been drilled near Gam, an overall scarcity of underground water has been a major factor hampering the development of resettlement schemes in the Gam area.

Aquifers supplying rather higher yields are to be found in north-western Tsumkwe constituency and south of the town of Tsumkwe, between the Rietfontein farms and Eiseb, and at scattered places along the south-western border around the towns of Otjinene, Okandjatu and Okakarara. Boreholes in and around the town of Coblenz yield very much more water than any others in the region, and the possibility is being considered of pumping water from this rich aquifer into the pipeline network between Otjituuo and Okamatapati.

Much of the region's groundwater lies at considerable depth, where it is often more difficult to find and more expensive to drill and pump than water at shallower levels. The deepest aquifers lie in a broad and very deep valley that stretches from the north-west to south-east ***(Figure 16)***. Arrows on this map also show how most water flow converges from the north and south into this valley, and then permeates eastwards into Botswana. The little water to be found in the centre of that valley is in bedrock lying deep beneath the mantle of Kalahari sand. By contrast, aquifers in the Eiseb area and in western Tsumkwe constituency consist of water trapped in the Kalahari sand.

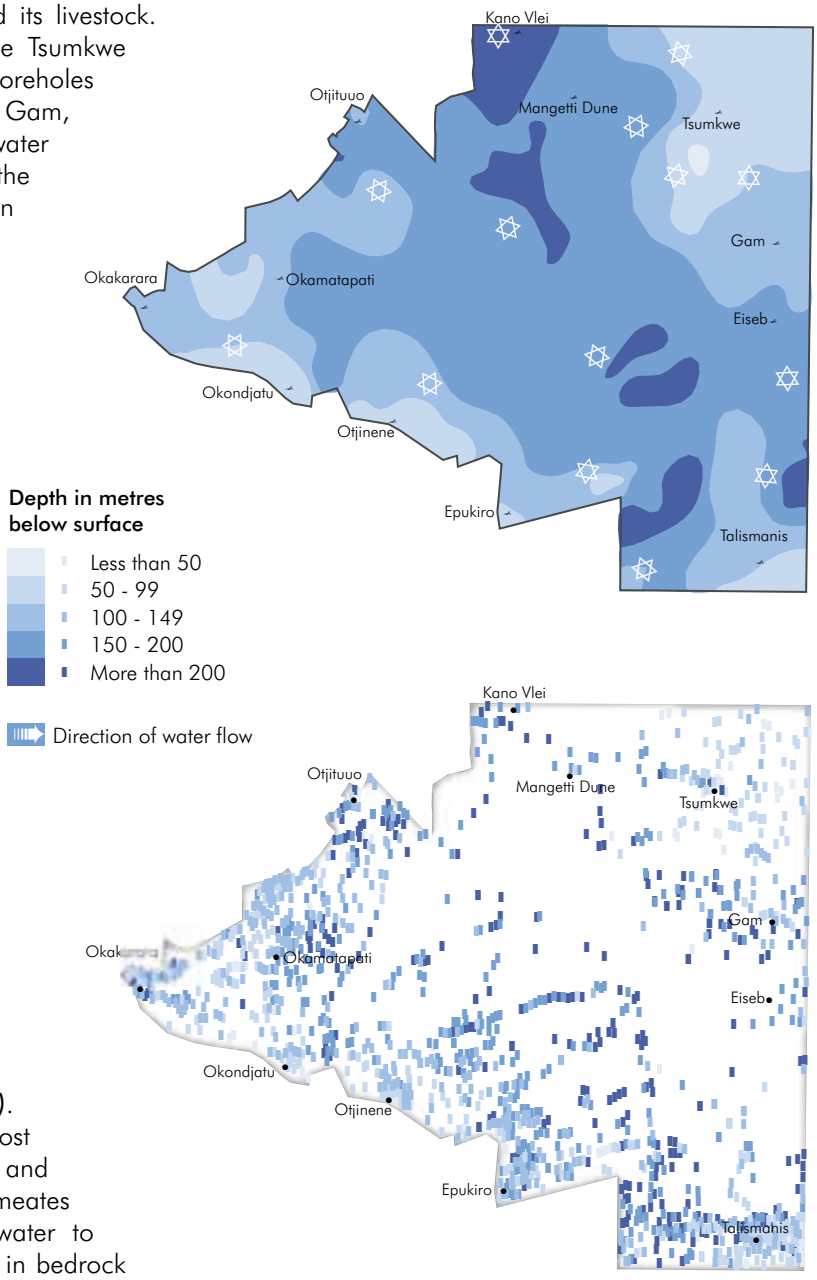


Figure 16. The depth of underground water below the surface. General trends are shown at the top where the arrows also indicate the direction of water flow below the ground. The map below shows the depths at which water was found at each borehole.[7]

With the exception of an area north-east of Okakarara, underground water in the region is generally of good quality and quite suitable for human consumption *(**Figure 17**)*. However, some isolated boreholes supply water that is not of good quality, sometimes for reasons of high salt, sulphate or flouride concentrations.

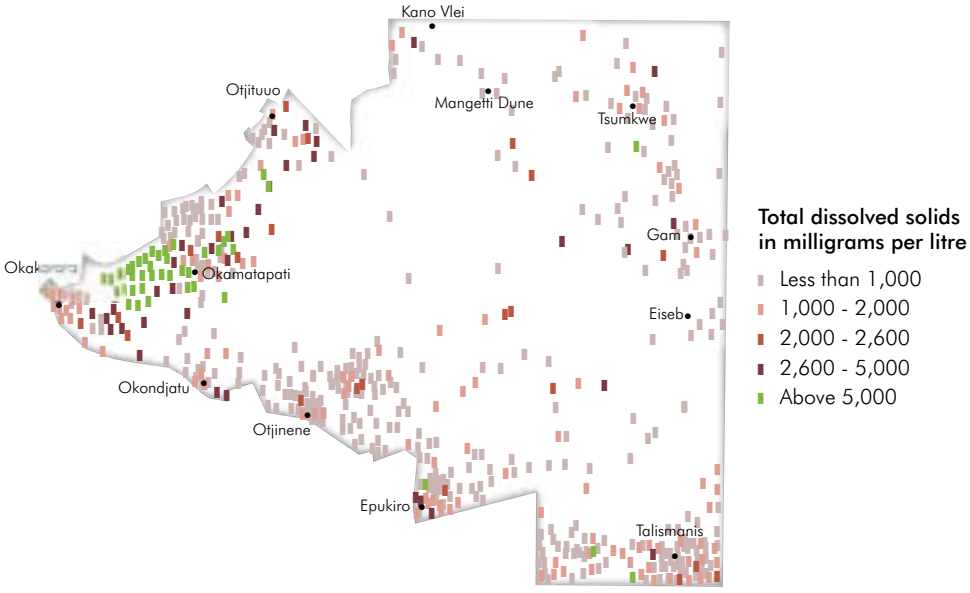


Figure 17. The quality of underground water as reflected by the amount of total dissolved solids (TDS) at individual boreholes. The purest water has low TDS values, and humans can drink water with values of less than 2,000. Water with values above 2,600 should be avoided, while even livestock should not drink water having TDS values above 5,000.[7]

Plants and animals

The distribution and abundance of most plants and animals follows to a great degree the three major landscapes in the region: the broad zone of Kalahari sands, the omuramba valleys, and the eastern Tsumkwe area (see page 19). This is because most species are usually more abundant in one landscape than in others. The Kalahari sands are dominated by woodlands, which are tall and broad-leafed in the north where rainfall is highest. From there, the woodlands become progressively shorter and characterised more by shrubs and thorny species to the south. The omurumba valleys are more open, with expanses of grassland and scattered patches of trees and shrubs (many of which are acacia species) in the valley bottoms. The slopes of the valleys are often more covered with taller trees. The highest diversity of plant life is in eastern Tsumkwe area as a result of the variety of soils and topography, where different plant species grow on the calcrete soils, sands, pans, and the dolomites of the Aha Hills, for example.

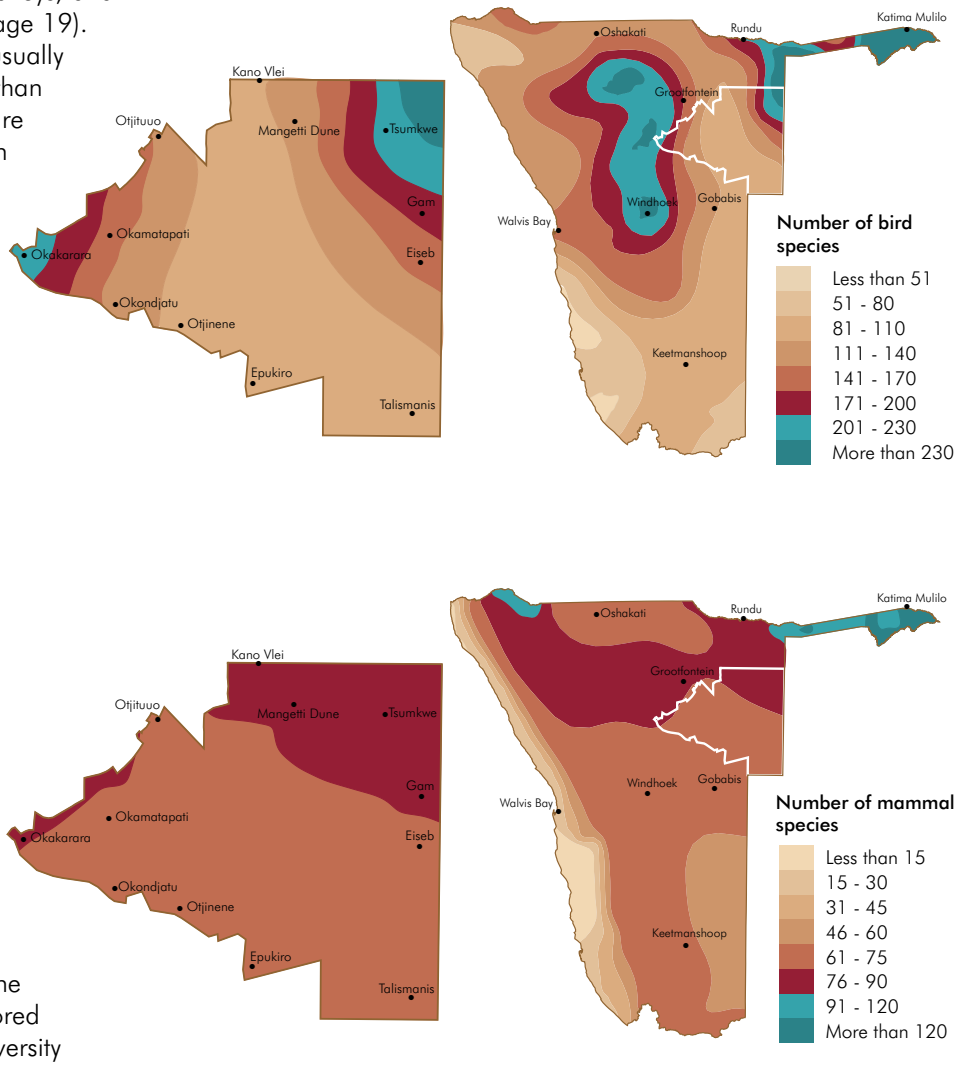


Figure 18. Measures of the diversity of birds and mammals.[2]

The high diversity of plants in the eastern Tsumkwe area is mirrored by similar patterns of greater diversity among birds and mammals ***(Figure 18)***. These maps show how levels of diversity compare with other areas in Namibia, in addition to an overall compilation of diversity based on numbers of plant, reptile, frog, bird, mammal and scorpion species and termite genera ***(Figure 19)***. The greater diversity of birds in the extreme west of the region is due to the presence of species associated with

the Waterberg. Substantial numbers of large mammals occur in the Tsumkwe area, the following being minimum population estimates in 2002 for a selection of species in the Nyae Nyae Conservancy: elephant (400-500), buffalo (60), eland (120), blue wildebeest (250), red hartebeest (400), gemsbok (850), ostrich (350), leopard (60) and hyaena (100-150 individuals). The abundance is due to the attractiveness of the area to many species and also the result of introductions of about 1,000 animals between 1999 and 2001.[8]

Only in the west of the region are some endemic species to be found, mainly also in association with the nearby Waterberg mountains. The overall presence of endemic species is low compared with other areas to the west in Namibia ***(Figure 20)***. This is because most species in the region are characteristic of habitats that are widely distributed in Botswana and other parts of the Kalahari Basin, rather than the more arid habitats in which most endemics are found to the west in Namibia.

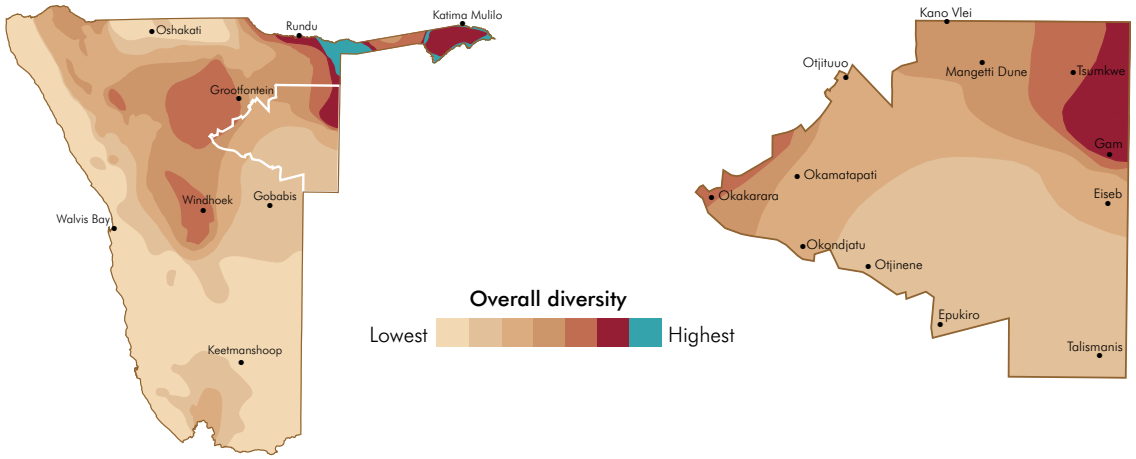


Figure 19. An overall compilation of diversity based on numbers of plant, reptile, frog, bird, mammal and scorpion species and termite genera.[2]

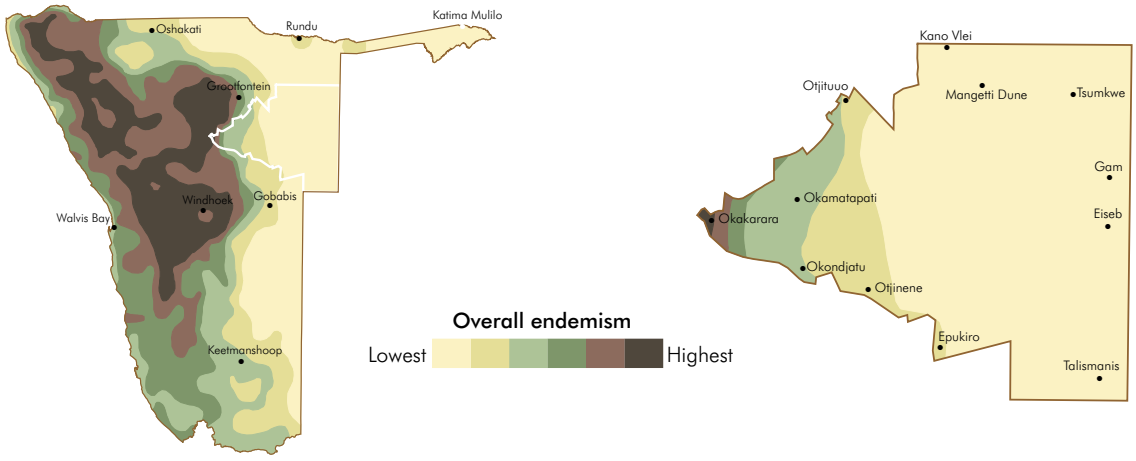


Figure 20. A composite measure of endemicity in Namibia based on numbers of endemic plants, reptiles, birds, mammals, scorpions and frogs.[2]

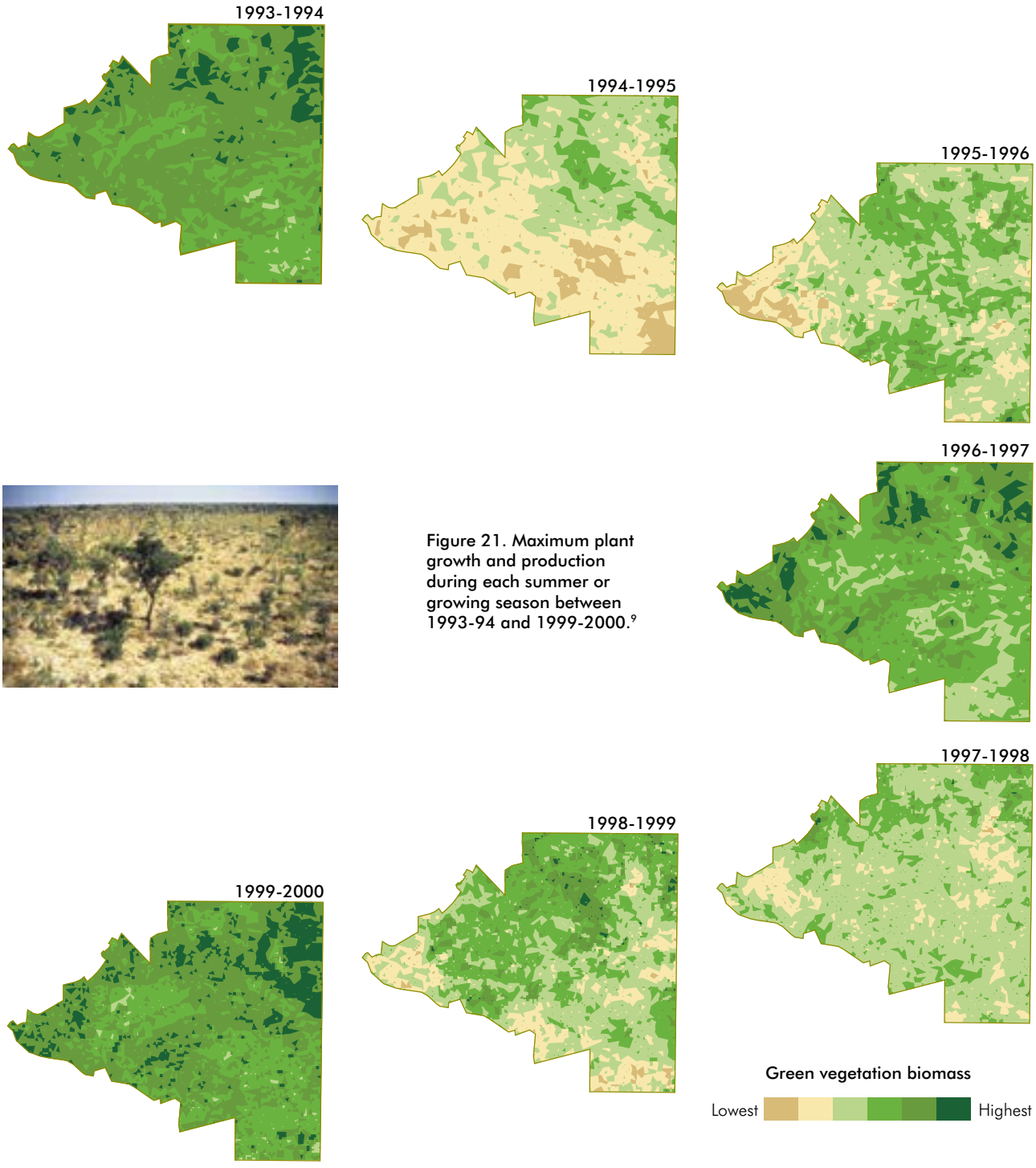


Figure 21. Maximum plant growth and production during each summer or growing season between 1993-94 and 1999-2000.[9]

Plant growth, which provides new grazing and browse for cattle and wildlife, varies greatly from year to year. Such variation is shown clearly in the series of maps of maximum plant growth for each of seven growing or summer seasons ***(Figure 21)***. Growth was relatively abundant during three seasons (1993-94, 1996-97 and 1999-2000), more average or mixed in three others, and very low in the 1994-95 season. Most of these year-to-year changes are the result of variation in the amounts and timing of rainfall.

The maps also show how plant growth can differ from place to place within in a season, even over short distances. However, the average maximum plant growth derived from these seven seasons indicates that the greatest amounts of growth are in the north ***(Figure 22)***. This is where rainfall is greatest and much of the vegetation is dominated by broad-leafed trees which produce good leaf cover in most years. Areas with the lowest plant production, on average, are in the block of Rietfontein farms where rainfall is low, but also where high stocking rates are so high that plant growth is limited (see page 36). The highest levels of variation in plant production from season to season are in the extreme west, between Okakarara, Okamatapati and Coblenz, and this is where the availability of grazing is probably most unpredictable.

An aerial view of large areas that have been fenced around a village, and the marked differences in vegetation cover on either side of the fences.

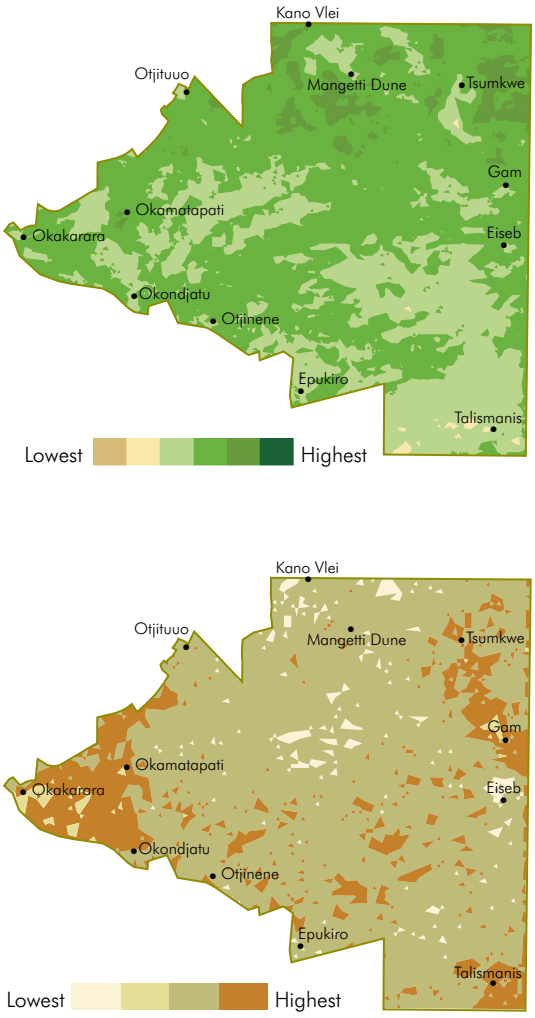
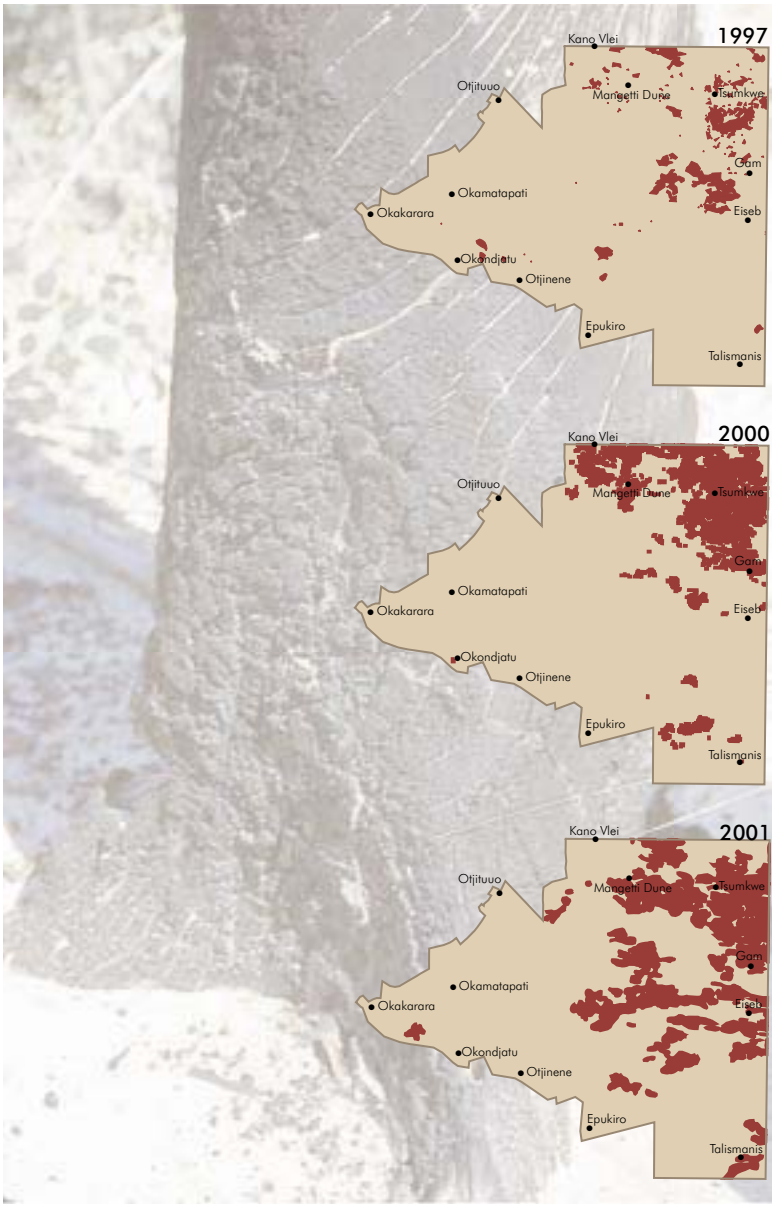


Figure 22. The map of average plant production (above) is an average of the seven seasons in Figure 21, while the map of variation is the co-efficient of variance over the seven seasons (below).[9]

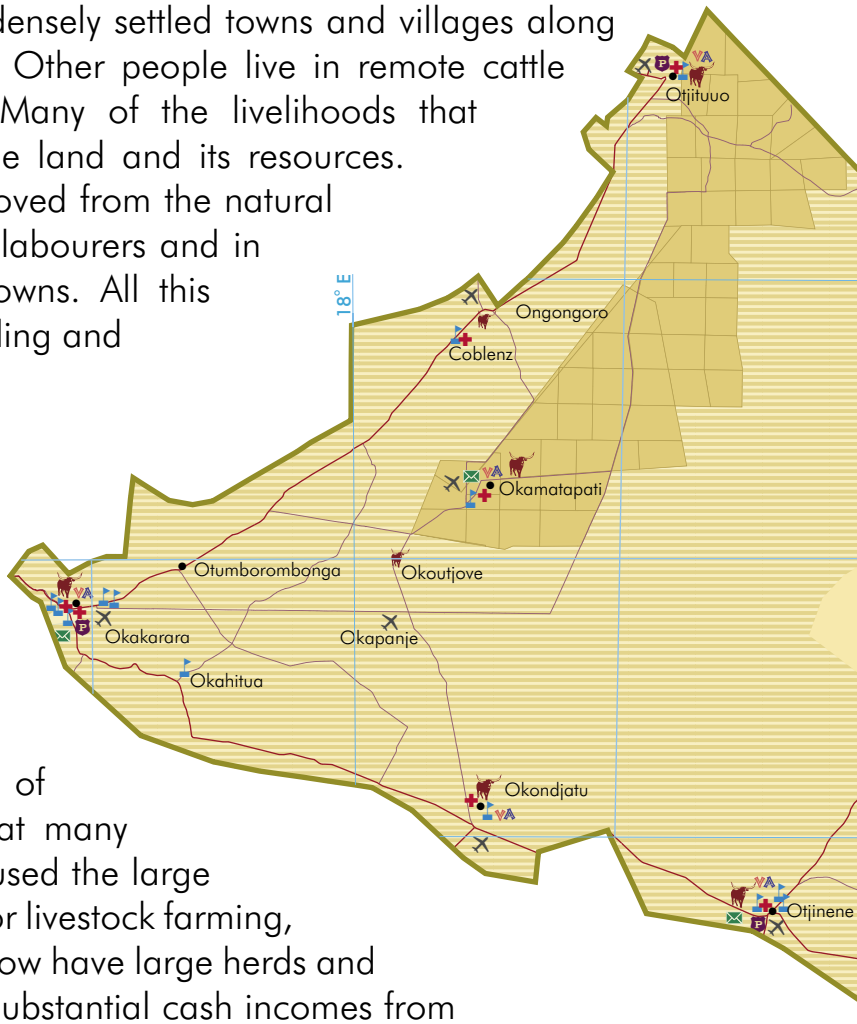
Large areas of the region burn each year, as shown in the maps of fire scars for three separate years ***(Figure 23)***. Most of the fires occur in the eastern Tsumkwe constituency where people start the great majority of fires, usually between June and October. There are few natural barriers or fire breaks to control the blazes, many of which become runaway bush fires that destroy hundreds of square kilometres of vegetation. The fires are a particular problem to broad-leafed woodlands in the region because many mature and valuable trees are killed by the burns. Moreover, repeated and frequent fires kill younger trees with the result that older trees that have been killed are not replaced. Some areas have therefore been badly deforested. Burning also causes the loss of grazing , and other pastures may be lost when invasive shrubs that withstand the effects of frequent burning cause areas to become bush encroached.

Figure 23. Areas that burnt during the 1997, 2000 and 2001.[10]

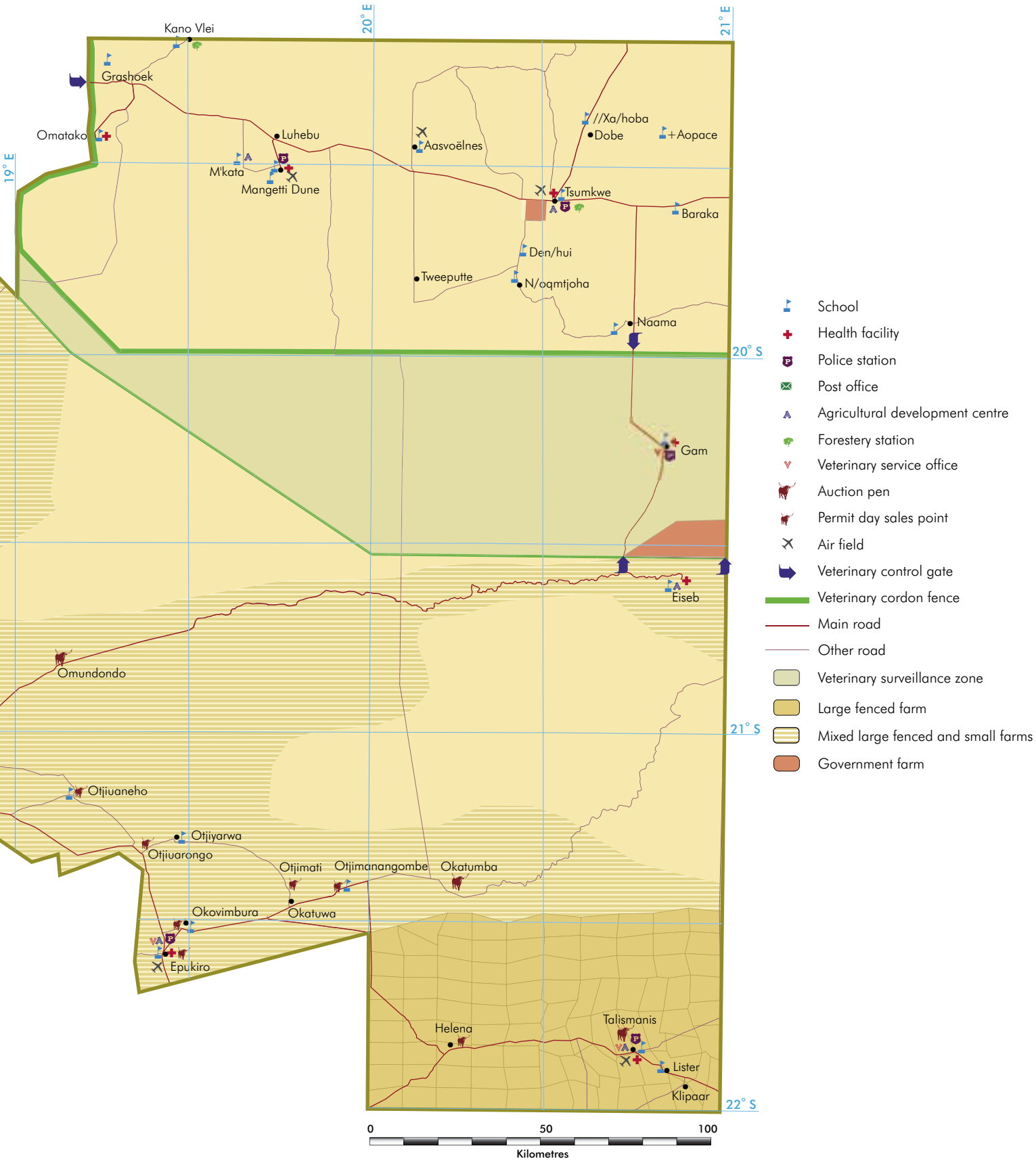


The world of people

Just over 50,000 people make their homes and living in these communal lands of eastern Namibia. The people live in many different places, but the majority are resident in the large number of densely settled towns and villages along the southern margins of the region. Other people live in remote cattle posts and other isolated settings. Many of the livelihoods that people pursue are tied closely to the land and its resources. But other occupations are more removed from the natural environment, for example as waged labourers and in government and business jobs in towns. All this means that the socio-economic standing and welfare of people varies a great deal.



One aspect of this variation is the gap between those who are wealthy and the large number of poor people, many of whom are probably the poorest of all Namibians. The separation has largely resulted from the adoption of different farming strategies, such that many of those who are now wealthy have used the large expanses of open land in the region for livestock farming, especially with cattle. These farmers now have large herds and farms, and they reap the benefits of substantial cash incomes from cattle sales. Their success as commercial farmers stands in contrast to the difficulties encountered by small-scale farmers and hunters-gatherers who rely on crop, meat and milk production and wild foods to give them all their domestic food requirements. This contrast is sharpened by the fact that all these different people live as close neighbours on the same communal land.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Epukiro
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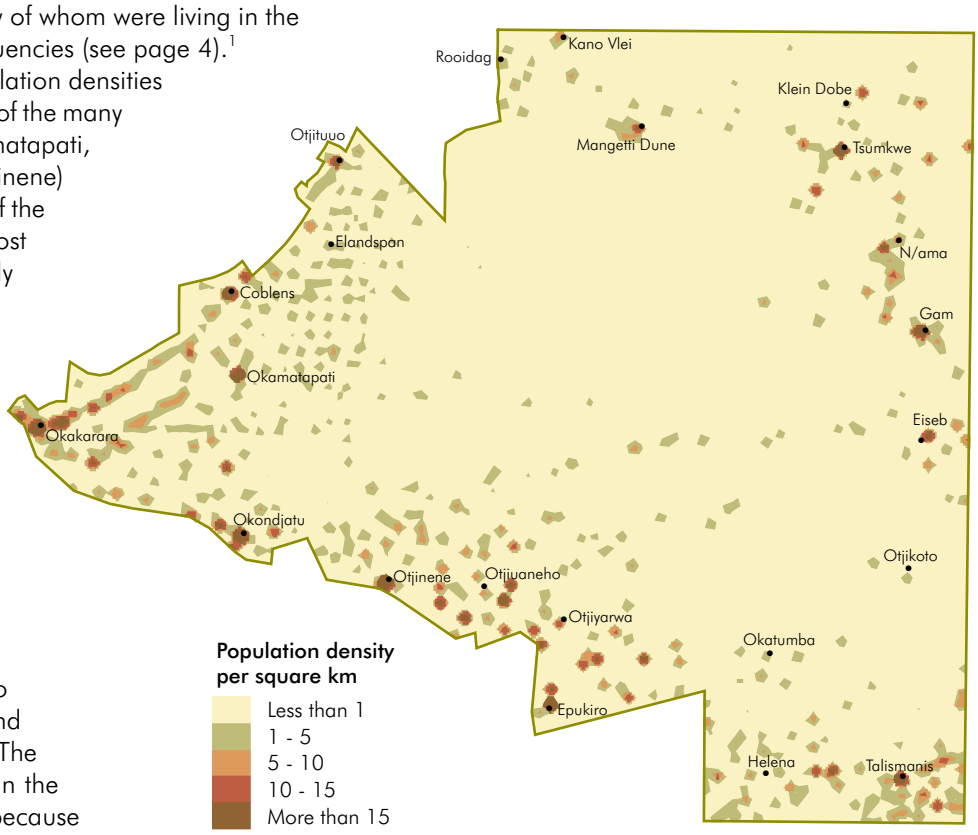
Kilometres
School
Health facility
Police station
Post office
Agricultural development centre
Forestery station
Veterinary service office
Auction pen
Permit day sales point
Air field
Veterinary control gate
Veterinary cordon fence
Main road
Other road
Veterinary surveillance zone
Large fenced farm
Mixed large fenced and small farms
Government farm

People

The national census held in 2001 recorded a total of 50,559 people in the region, the majority of whom were living in the Otjinene and Okakarara constituencies (see page 4).[1] It is also in these areas that population densities are highest ***(Figure 24)*** because of the many towns (such as Otjituuo, Okamatapati, Okondjatu, Okakarara and Otjinene) and villages. However, the map of the density of people shows that most (89%) of the region is completely uninhabited, these being areas with less than 1 person per square kilometre. About 10% of the area has between 1-10 people per square kilometre, and the remaining 1% consists of areas where the number of people exceeds 10 per square kilometre.

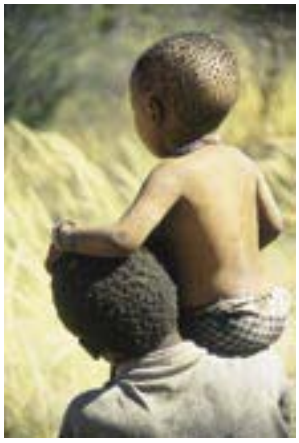
Figure 24. The density of people in 2000.[2]



The fact that the southern and western areas have greater numbers of people is due to fact that pumped underground water was first provided here. The first water points were provided in the southern and western areas because they were closest to Windhoek and other central towns. That proximity – together with the provision of water – laid the foundations for the whole pattern of settlement that we see today.

Figure 24 also clearly shows that many people live along the omuramba valleys, especially the Omatako. These valleys and many of the old pans in the south of the region provide soils which are better suited to cultivation than the surrounding sands. Many of the isolated settlements which are shown as having low densities are cattle posts or farmsteads which have been established by more wealthy cattle farmers.

As described on page 6, the region was previously divided into two homelands: Hereroland and Bushmanland, respectively for Herero and San people. One assumption that could be made from these regional groupings is that most Herero and San people live in the two areas.



Numbers of San and Herero people living in what was Bushmanland and Hereroland, and in other parts of Namibia in 1991.[11]

Area	San		Herero	
	Number	Percentage	Number	Percentage
Urban Bushmanland (Tsumkwe)	219	0.8%	21	0.0%
Rural Bushmanland	3,131	11.5%	14	0.0%
Urban Hereroland	190	0.7%	14,122	12.5%
Rural Hereroland	2,562	9.4%	17,939	15.9%
Other towns in Namibia	512	1.9%	37,413	33.1%
Other rural areas in Namibia	20,615	75.7%	43,406	38.4%
Total in Namibia	**27,229**	**100%**	**112,915**	**100%**

However, the table above shows quite the contrary. For a start, there were similar numbers of San people living in Bushmanland and Hereroland in 1991, and the majority of San people in fact live in other parts of Namibia. Secondly, Hereroland is home to less than 30% of all Otjiherero speakers, the majority of others being in towns elsewhere or in rural areas in Kunene and Erongo. A total of 46% of all Herero people were living in towns in 1991, compared with just 3% of all San people.

A hundred years ago, there were probably fewer than 1,000 people in the whole region. The first census in 1970 recorded a total of 17,284 people, growing then to 30,917 in 1981, 40,077 people in 1991 and 50,559 people in 2001 ***(Figure 25)***. A very high growth rate of 5.4% between 1970 and 1981 was at least partly due to the resettlement of people into the region, whereas the population grew at 2.6% per year between 1981 and 1991 and at 2.4% each year between 1991 and 2001. Within the region, growth rates have been highest in the Tsumkwe constituency, where a high proportion of people have been resettled over the past 30 years. Annual growth rates in Hereroland have also been much higher in the eastern areas of the Otjinene and Otjombinde constituencies (4.6% between 1991 and 2001) than in the west (0.6% from 1991 to 2001). This is perhaps because new farmers have better opportunities of establishing themselves in the more open areas of the east, compared with the western areas which are so densely populated with people and livestock (see page 36).

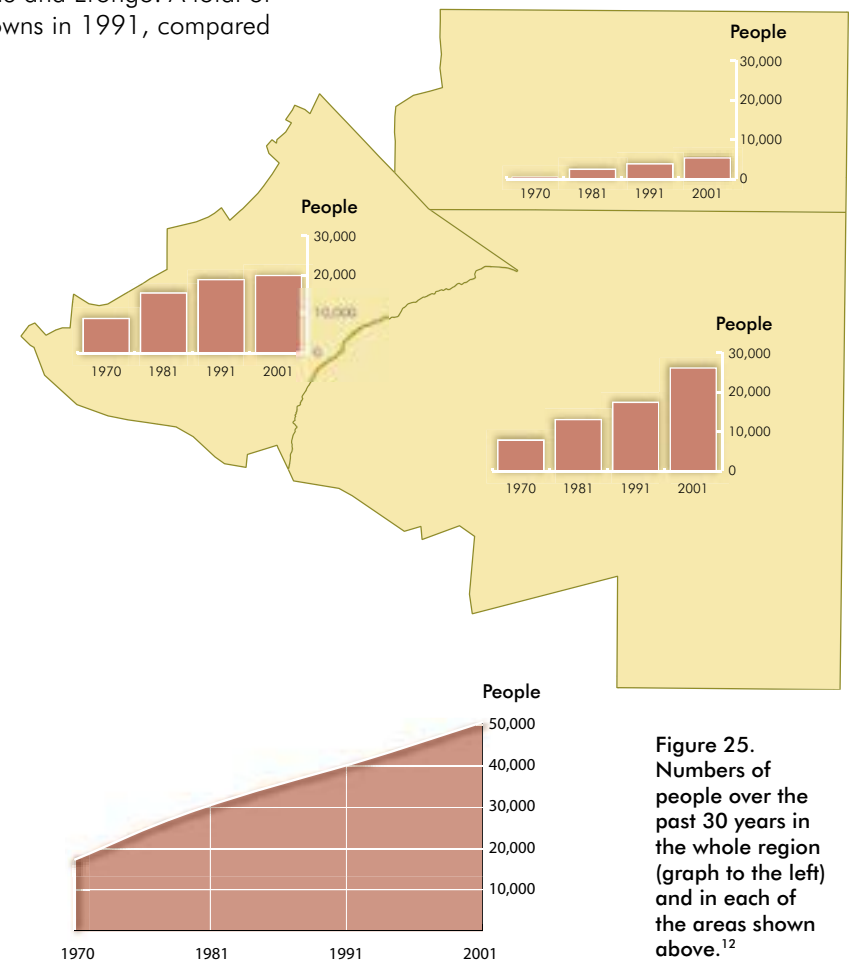
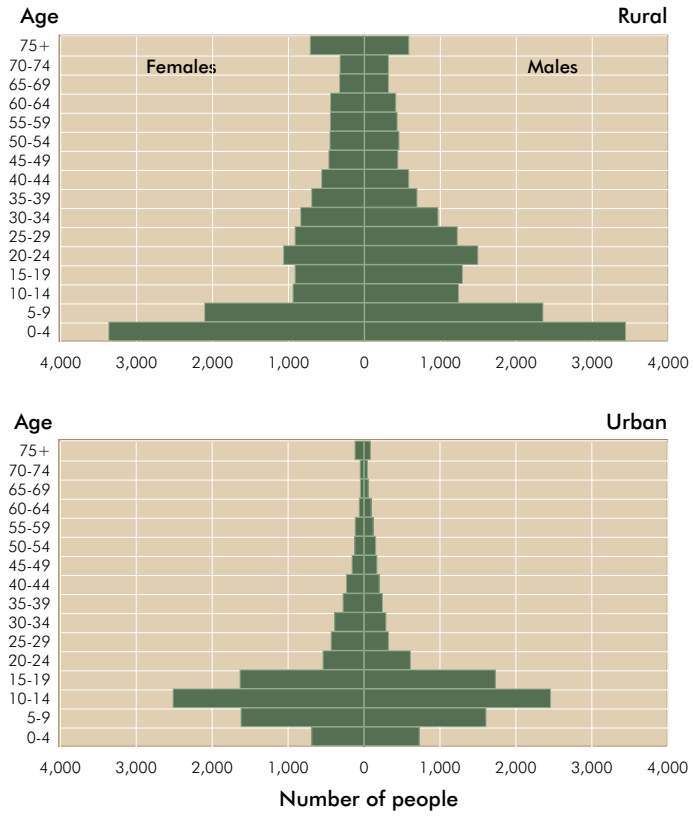


Figure 25. Numbers of people over the past 30 years in the whole region (graph to the left) and in each of the areas shown above.[12]

No settlements or villages were recognised as being towns in 1970, and the whole population was then regarded as living in rural areas. In 1991, by contrast, about 32% of all people in the region were recorded as living in the towns of Coblenz, Epukiro, Okakarara, Okamatapati, Otjinene and Otjituuo ***(Figure 26)***. These graphs also show the age structure of rural populations to be quite different from those in urban areas, which are dominated by young people of ages that almost certainly suggest that most of them were in town as school boarders. Another major difference is the greater proportion of adult (aged 25-50) women in towns. This relates to a greater proportion of men in rural areas, especially in the age group of 15 to 30 years, where there were 39% more males than females in 1991. Clearly, more young women than men move into towns, presumably in search of jobs and futures different from those offered in rural, communal homes. Another difference between urban and rural populations is the much higher proportion of elderly, retired people in rural areas. Overall, the region is characterised by a high population of young people, with 47% of all people being between the ages of 0 and 14 years in 1991. The percentage of 0 to 14 year-olds was also 47% in 1970.



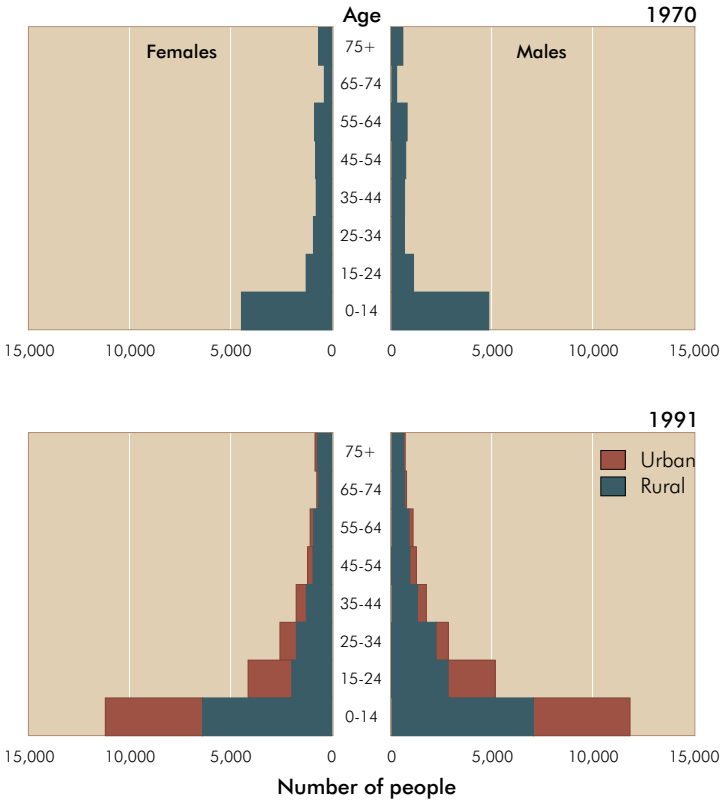
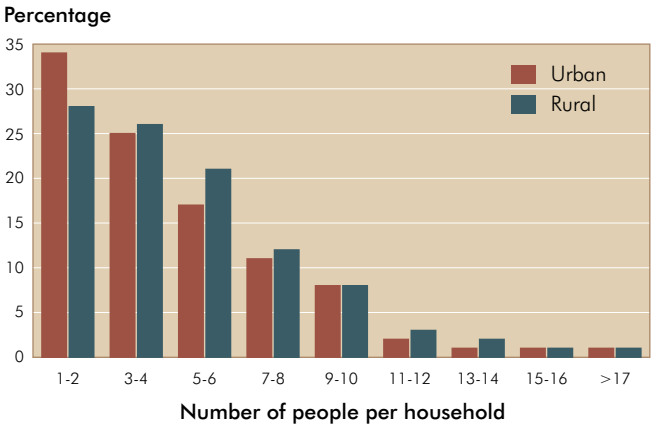


Figure 26. Age pyramids comparing numbers of females and males in different age groups in 1970 and 1991 (top two graphs) and in 1991 to compare urban and rural populations (graphs on the left). In 1970, age groups were reported in 15 and 10 year categories and numbers were for 1991 were grouped into the same categories to allow for comparison.[12]

The average size of each household was 6.1 people in 2001. This is rather higher than an average of 4.8 people recorded in 1991, the year on which the graph ***(Figure 27)*** is based that shows the majority of households to consist of between two and six people. In 1991, most homes in rural areas (4.9 people on average) were slightly larger than those in towns (4.5 people). Various surveys over the years indicate that about 60% of all homes are headed by men and 40% by women. It is likely that female-headed homes are smaller and poorer than those headed by men, but no clear information is available on this point. Quantitative information on household incomes in the region is also limited, but four features are clear. First, there is a great deal of variation in household wealth, with many poor homes contrasting with middle income ones and others that are very rich. The second feature is that most households have more than one income because different family members are often engaged in different economic activities.

Figure 27. Percentages of all households of different sizes in 1991.[11]



This leads on to a third characteristic: the diversity of incomes in each household. One person, for example, is paid a wage by a government job, another earns money from livestock sales or a small business, and an elderly pensioner receives a pension. Many households also receive remittances and material gifts from family members working elsewhere. All of these incomes contribute to a greater or lesser extent to the wealth and "health" of a household. One measure of the diversity of incomes is given in the following table. The high proportion of household heads reporting pensions as their main sources of incomes reflects the fact that many elderly and retired people are the head of the home.

The main source of income for the head of each household in 1994.[13]

Main source of income	Number and (%) of household heads
Farming	49 (36%)
Wages and salaries in cash	47 (35%)
Pension	32 (24%)
Business activities	3 (2%)
Cash remittances	5 (4%)

A fourth feature stems from the fact that most households are unable to cultivate or gather all their food requirements, simply because crop production is too difficult or unreliable (see page 35). This means that most households acquire their goods through exchanges, these days mostly conducted through cash transactions that allow people to earn money and buy most of their household needs. The cash exchanges have replaced barter trading that was characteristic of Herero societies long ago, and they are replacing the reciprocal exchanges or sharing that have been a feature of San society.

The great variation in wealth between households, and the number and diversity of incomes are particularly clear features of homes belonging to Herero people. Amongst San households, by contrast, overall poverty levels are much higher, there are fewer cash incomes and there is less variation from household to household. This is true for homes in what was Bushmanland and also for many of those in the previous Hereroland, where many San people live and work as poor labourers.

A final observation on household economies is that many homes are in transition, moving away from being directly dependant on natural resources to more diverse sources of income, and to incomes that make more indirect use of natural resources. This is best shown by the changing circumstances of many San households in the Nyae Nyae Conservancy (see page 46), where more and more people obtain incomes from craft production, tourism and fees for big game hunting. But it is also true for many Herero homes whose family members increasingly enter the job market and business sector. Similarly, a growing number of people earn large sums of money as commercial livestock farmers, their incomes now coming from the indirect use of large areas of grazing.

Farming

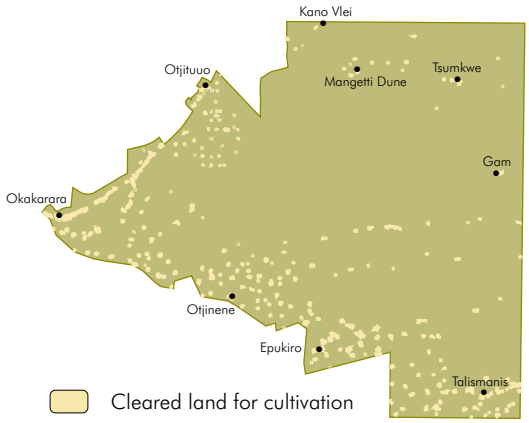
Three factors make agriculture very important to the region and its people. The first is that many more people are engaged in – and dependent upon farming – than any other livelihood. The second factor follows from the first: much more of the land is used for farming than any other purpose (see page 8). Thirdly, farming is the largest source of cash income for the region as a whole. The value of farming, however, really lies in livestock farming which is much more extensive and commonly practised than crop cultivation. Livestock are produced both for domestic consumption purposes and for commercial gain, whereas almost all crops are only grown for use as food at home. Much more farming occurs in the southern areas of what was Hereroland than further north in the previous Bushmanland. This is because many more people live in the southern areas and San people in Bushmanland have started farming only relatively recently. Herero people have been pastoralists for hundreds of years, by contrast.

As far as crop farming is concerned: it is difficult, risky and seldom productive! Little of the region is suited to crop growth because of the predominance of relatively infertile sandy soils. The sands also do not retain water well, and much of the limited rainfall rapidly drains away to below the reach of most plants' roots. The overall lack of rain, especially in showers that are sufficiently heavy and frequent to sustain crop growth, is another constraint on crop growth. Other problems are caused by pest damage and by a shortage of labour, especially during critical periods when fields must be ploughed, weeded and harvested. Finally, people in the region do not have a long tradition of growing crops, and many of the skills needed to produce crops in such a challenging environment have yet to be developed.

All crops in the region are rain-fed, and the great majority are grown in small fields close to rural homes. Areas cleared for cultivation are therefore to be found throughout the region (***Figure 28***). A relatively small proportion of households actually plant crops in any one year, as indicated in one survey that less than one-third of homes plant crops.[14] That percentage probably varies to some degree in relation to rainfall, more land being cleared and crops planted after a succession of good rainfall years, and fewer attempts being made to plant after several dry years of failed crops. In the southern areas of Hereroland, most fields are in soils that are somewhat clayey in omuramba valleys and on old pans. Maize is much the predominant crop, with only small areas sometimes being planted with vegetables.

Further north in the Tsumkwe constituency, a variety of development projects have introduced crops to San people over the past 30 years. The area cultivated by each household is generally very small, although some development projects have promoted the cultivation of larger communal gardens. Most of these gardens range between a quarter and half of a hectare in size. Mahangu is the main crop in this northern part of the region.

Figure 28. Areas cleared that have been cleared for cultivation, as mapped off aerial photographs and satellite images.[2]



Unlike the recent advent of crop production, livestock has a much longer history in the region, especially so if one traces its origins back to pastoral Herero farmers who probably first grazed their animals in central Namibia several hundred years of ago. Livestock farming and many of the commercial aspects that go with it also have their roots in Herero cattle farmers who traded cattle with Owambo and Damara people for centuries, bartering such good as mahangu, beads, copper, and iron tools. The opening up of the trade route with the Cape colony in South Africa around the mid 1800s intensified the trade of cattle by Herero people. More recently, the commercialization of livestock in the Herero reserves was accelerated by the introduction of the diary industry in Namibia in 1930s, which allowed Herero farmers to earn cash from the sale of cream.[15]

Livestock farming is dominated by cattle, sheep and goats, and large parts of the region are very densely stocked with these animals (***Figure 29***). This is particularly true in the western and southern areas, where cattle numbers exceed 10 animals per square kilometre (or 10 hectares per animal) in many places. Amongst the highest cattle stocking rates are near Talismanus. Similar overall distribution patterns hold for goats and sheep, although the density of goats is generally much higher than of sheep. ***Figure 29*** also provides a composite measure of livestock density, obtained by adding together the average unit weights for the three kinds of animals and dividing the total weight by the average weight (360 kilograms) of a large stock unit. The resulting map shows large areas to be very densely inhabited with livestock, and all areas with more than 10 large stock units per square kilometre are certain to be badly overgrazed as a result.

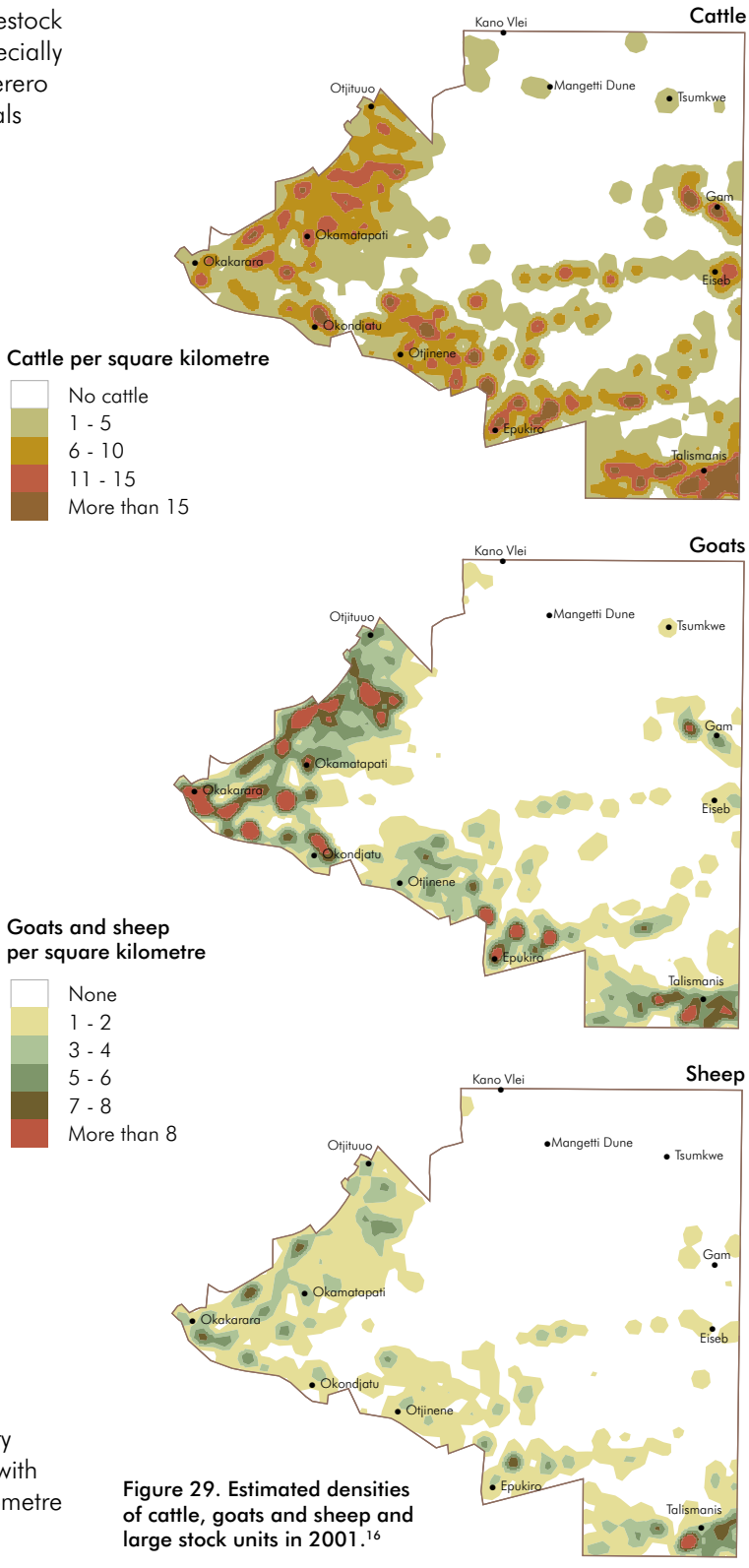
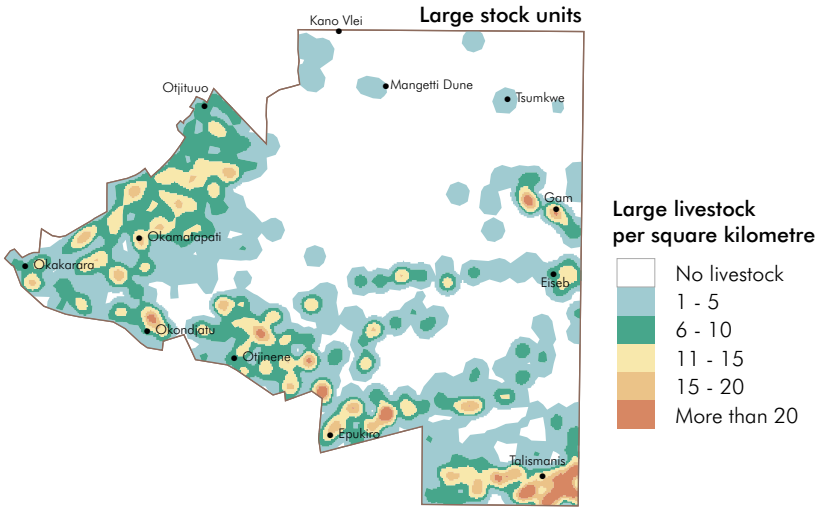


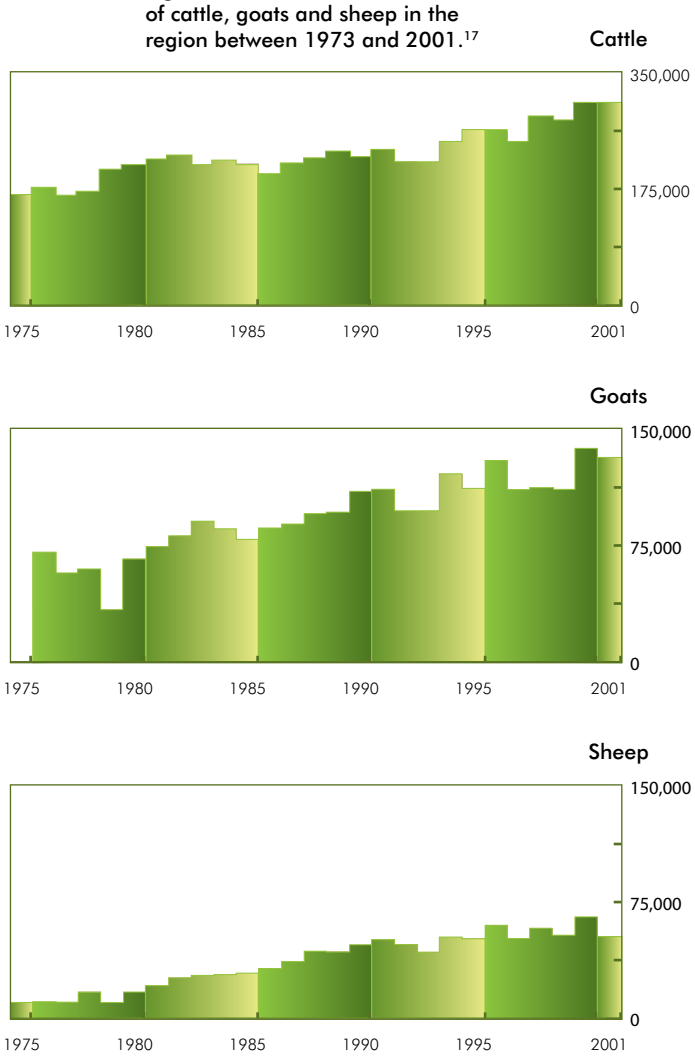
Figure 29. Estimated densities of cattle, goats and sheep and large stock units in 2001.[16]



Livestock numbers have grown significantly in recent decades (***Figure 30***). For example, the total number of cattle increased by about 3% each year from roughly 130,000 animals in 1973 to about 305,000 in 2001. Over the same period, numbers of goats increased by about 2% per year while the number of sheep increased by almost 6% each year. The total number of sheep (approximately 53,000) and goats (about 132,000) in 2001 was much lower than the number of cattle. Since cattle consume much more than goats and sheep, the impact of cattle on grazing and browse might be as much as ten times as that of small stock.

Figures to explore changes in cattle numbers in different parts of the region are only available for the last 10 years, but these indicate that there has been a much greater increase in eastern Hereroland than in other areas (***Figure 31***). This is probably due to a greater availability of open pastures in which farmers can establish new and larger herds in the east, since people (and livestock) are much more concentrated in the west. This conclusion is supported by information in ***Figure 32***, which shows that average herd sizes are much greater in the more open areas of western Hereroland than in areas where many people live. The biggest herds are in and around the large, fenced Okamatapati farms. Most farmers each own 150 and more cattle in these areas, whereas farmers living in villages along the southern and western borders generally have less than 50 cattle. Unfortunately, information to explore similar trends elsewhere in the region could not be collected.

Figure 30. Estimated numbers of cattle, goats and sheep in the region between 1973 and 2001.[17]



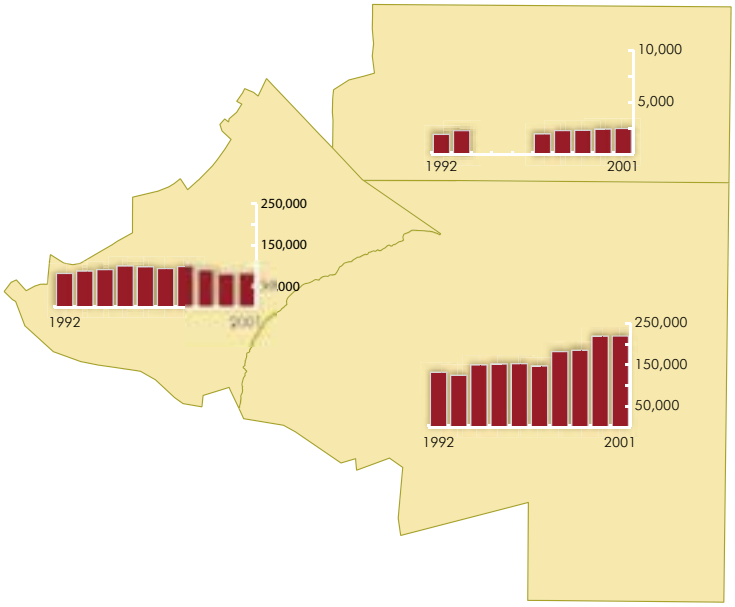


Figure 31. Estimated numbers of cattle in Bushmanland, Hereroland West and Hereroland East between 1992 and 2001.

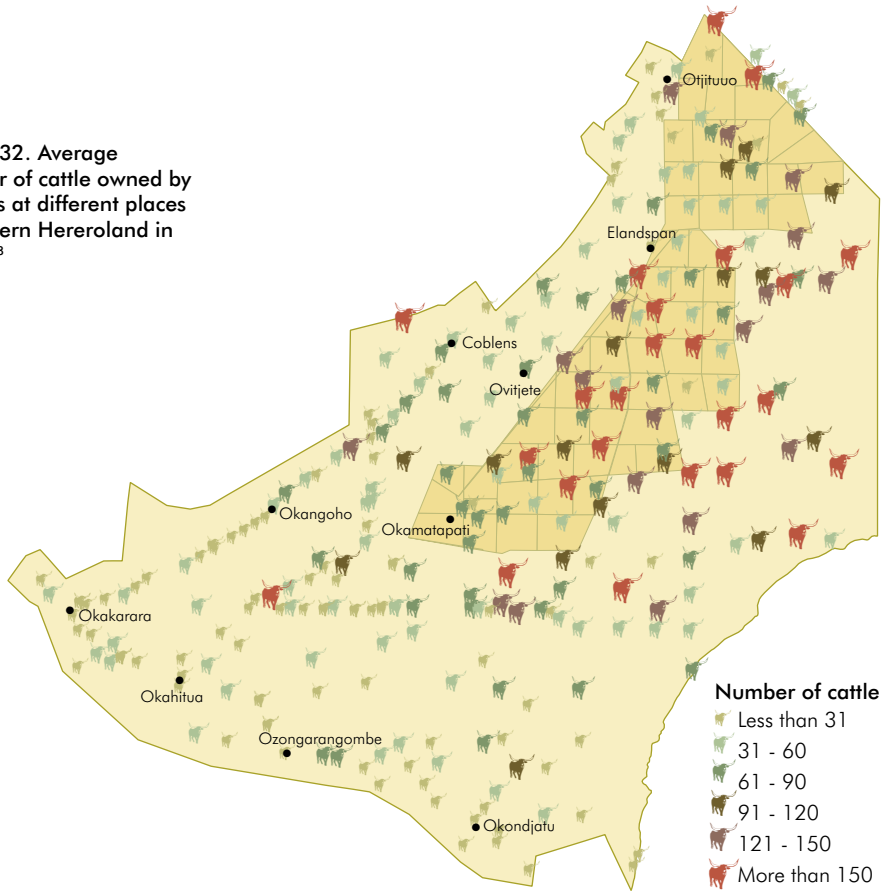


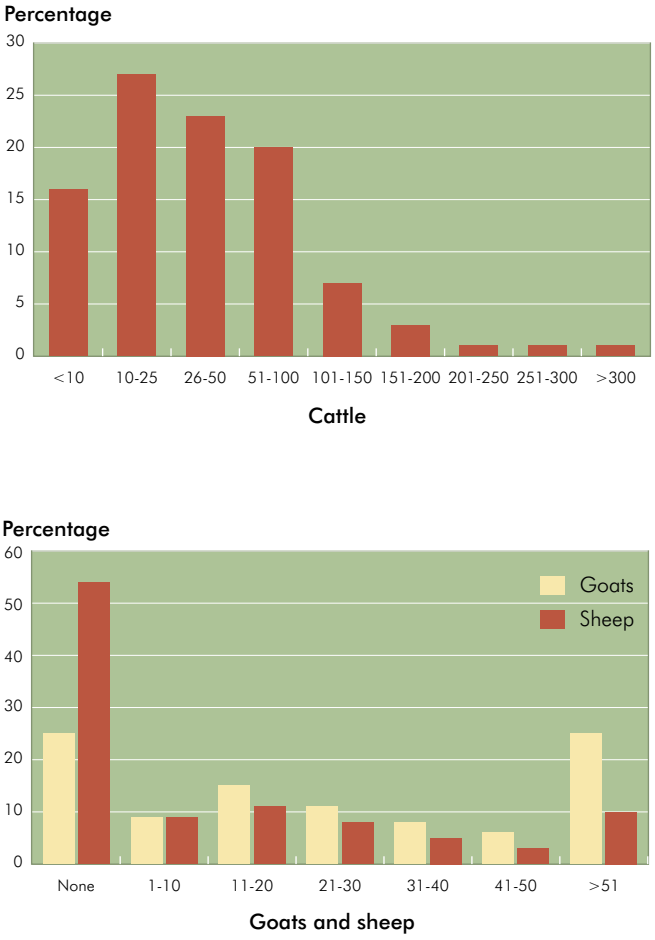
Figure 32. Average number of cattle owned by farmers at different places in western Hereroland in 2001.[18]

Patterns of ownership have evidently changed a good deal in recent years. Comparatively few households owned cattle 50 and more years ago, and very few farmers then owned large herds. For example, only 2% of all cattle farmers owned more than 50 head in 1933 and 1951[19] compared to about 35% of farmers having more than 50 cattle in 2001 (***Figure 33***). There are no clear figures available on the overall proportion of households now owning cattle. However, more than 90% of rural homes probably have cattle, with the majority of farmers having between 10 and 50 head of cattle. About 16% of farmers have less than 10 animals, and their animals jointly make up about 1% of all cattle in the region. By contrast, the 4% of farmers who each have more than 200 cattle together own about 24% of all cattle. In total, approximately 5,500 people own cattle in the region. About 800 of these farmers own more than 100 cattle and probably earn substantial incomes from their herds.[20]

Proportions of people keeping different numbers of sheep and goats differ very much from those for cattle owners. Thus, many farmers have neither kinds of small stock, especially in the case of sheep (***Figure 33***). Approximately 75% of farmers own fewer than 50 goats, while the remaining 25% of people who have larger herds own between them about 70% of all goats in the region. Farmers who have large herds of cattle also tend to own more goats and sheep than other farmers. For example, owners of more than 100 cattle also each have about 37 sheep and 68 goats on average, whereas those owning between 10 and 50 cattle only have average flocks of 8 sheep and 25 goats.

All of these figures clearly show that there is a very wide degree of variation in livestock ownership between different farmers. The many people with small numbers of animals use them mostly for domestic consumption, particularly for milk and meat, and they probably derive little cash income from livestock sales. Bigger, more wealthy farmers with large herds and flocks are evidently committed, serious farmers. Many of them are full-time farmers, living on or close to their farms and managing the day-to-day operations of their enterprises. Others are "weekend" farmers, commuting to their farms from homes and permanent jobs in Windhoek and elsewhere, and employing herders and family members to tend and manage their animals. Nevertheless, whether present or absent, all the farmers with large herds are as much commercial farmers as those who own freehold farms elsewhere in Namibia.

Figure 33. Percentages of farmers having different numbers of cattle, goats and sheep in 2001.[18]



The commercial nature of livestock farming is also evident from increasing off-take rates for cattle, with rates growing from 4.1% to 8.4% between 1940 and 1950, and to perhaps about 33% during the 1990s.[21] Compared with other communal areas in Namibia, the region has extremely well organised support systems and infrastructure for cattle farming and marketing. This is especially true of the many local farmers' associations and the network of auction pens and sales systems for cattle. The government has constructed large auction pens at various places (see map on pages 28 and 29). Some of these are now managed entirely by farmers' associations while other pens were built by these associations. So-called "permit day sales" are arranged by farmers' groups, who advertise the availability of a number of cattle to prospective buyers from outside the region. The buyers submit their price proposals, and the buyer with the highest price is then invited to the permit day sales point to buy and load the cattle.

Almost all commercial sales occur in the area south of the veterinary fence (see map on page 28 and 29). All livestock can be freely sold and moved from this southern area to abattoirs and other places anywhere in Namibia. Immediately to the north of this disease-free area is a surveillance zone in which animals must first be kept in quarantine for three weeks before being allowed south. The only quarantine farm for this purpose is just north of Eiseb.

The area to the north of the surveillance zone and veterinary fence is subject to strict control, and cattle are vaccinated against foot and mouth disease and lung sickness (CBPP) by the Directorate of Veterinary Services.

Much of this account of livestock farming has focussed on the Hereroland area because this is where the great majority of animals are kept. In Bushmanland, by contrast, there are relatively few animals. Small numbers of cattle, goats and isolated sheep are kept at San villages, while most of the remaining and larger numbers of animals belong to farmers that have moved into the area from Hereroland and Kavango.

Livestock suffer from several diseases, but the biggest overall cause of mortality is gifblaar (*Dichapetalum cymosum*). The plant is most abundant in areas where there is a transition of soils from deep sands to more clayey soils, especially on the slopes of dunes and omurambas. Most livestock deaths occur in the early summer months when the plant is almost the only species with green leaves. Of all cattle deaths reported by the Directorate of Veterinary Services over the past five years, about 37% in Hereroland East and 26% in Hereroland were due to gifblaar poisoning.

Other livestock health problems are caused mainly by botulism, anaplasmosis, pasteurellosis, and black quarter.

The consumption of gifblaar, especially in the early summer months, is the greatest cause of cattle deaths.

Public services

From the large map on page 28 and 29 showing most public services and infrastructure, it is clear that many areas are comparatively well developed. These developments have largely followed the settlement of people, and so schools, clinics, police stations, and post offices, for example, were only built where the presence of significant numbers of people was recognised. The greater provision of services in the southern and western margins of the region is thus due to the higher numbers of people living there. For similar reasons, there is a good deal of economic activity in several small towns in these areas. The lack of public services in other parts of the region, by contrast, is due mainly to the fact that few people live in these more remote areas.

The establishment of schools, clinics and other public facilities also followed the provision of another more fundamental public service: the supply of underground water. Boreholes and the diesel pumps and windmills that provided water have indeed been the major driving force determining land uses and where people live (see page 30). The close association between the supply of water and where people live is shown by the figures in the following table.[13] Approximately 97% of people live within a distance that takes less than 30 minutes to walk to water, which would be about 2 kilometres.

Distance to water	Percent of households
5 minutes or less	80%
6-15 minutes	10%
16-30 minutes	7%
31-60 minutes	1%
Over 60 minutes	1%

The settlements of Omatako, Mkata, Mangetti Dune, Aasvoëlnes, N//oqma and Luhebo were started by the South African Defence Force, which established bases at these places during the 1970s. Some 4,000 San people from southern Angola, Kavango and elsewhere were settled in these bases and much of the infrastructure in those settlements was first established during the 1970s. Approximately half of these people were moved to South Africa in 1989.

Almost all the needs of people and livestock for water are met by the pumping of water from underground reserves or aquifers (see page 20). There are approximately 600 water supply points or boreholes which were provided by the government (***Figure 34***). Wealthy farmers have installed other, private boreholes and pumps in recent years so that they could gain access to grazing for their cattle in remote areas. There are 12 bulk water supply points to major villages and towns. These are managed by Namwater, and most supply water pumped from high-yielding boreholes nearby.

Other water is pumped into the region through the extensive system of pipes running between Otjituuo, Coblenz, Okamatapati and Okakarara. The pipeline scheme was started in 1978 to open up pastures for livestock farming in these western areas. Water piped in from the north is pumped from boreholes at Berg Aukas, while water from the south comes from the Eastern National Water Carrier Canal to Okakarara, where it is first treated. Approximately 70% of the water in the Canal is pumped out of the Kombat mine, with the remaining 30% coming from Berg Aukas.

While the region as a whole has been short of water for centuries, there are now many areas that can be said to have too much water, at least so in relation to the carrying capacity of the surrounding environment. This is the case in places that are severely overgrazed because an abundance of borehole water has enabled farmers to keep more livestock than the plant life nearby can support. By contrast, pastures and woodlands have been less degraded in areas where water is less available to livestock.

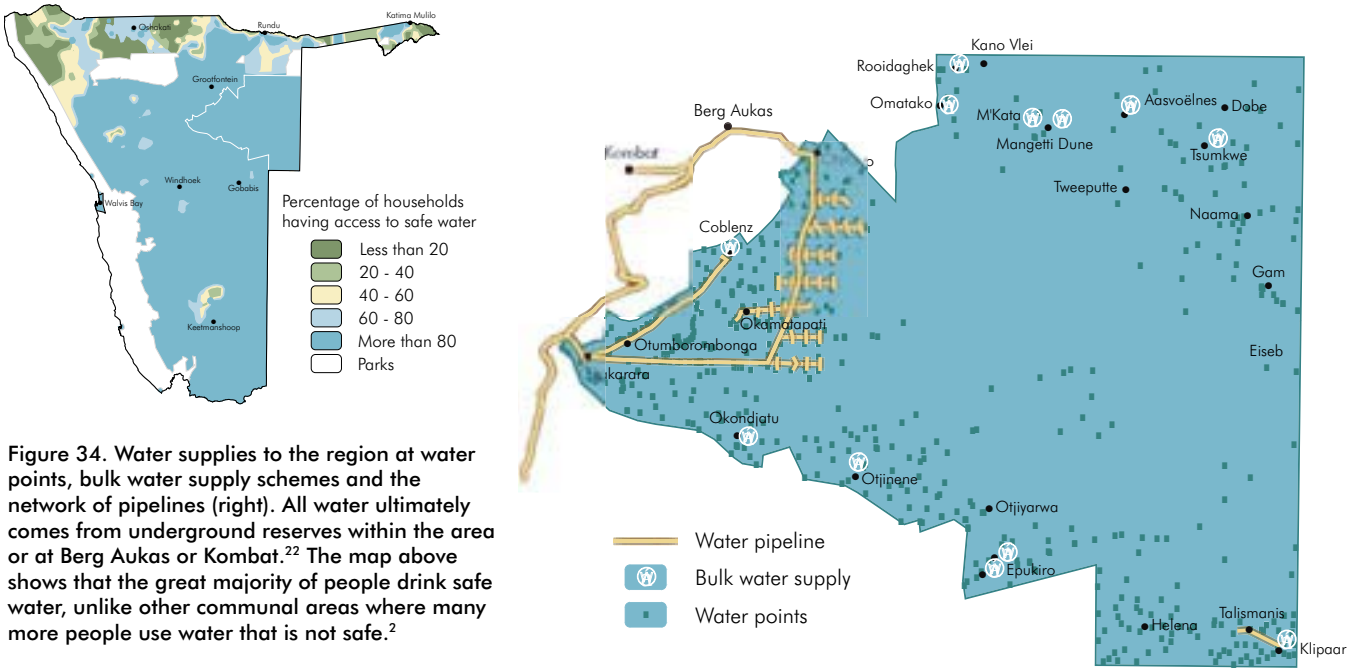


Figure 34. Water supplies to the region at water points, bulk water supply schemes and the network of pipelines (right). All water ultimately comes from underground reserves within the area or at Berg Aukas or Kombat.[22] The map above shows that the great majority of people drink safe water, unlike other communal areas where many more people use water that is not safe.[2]

Education

Formal schooling is offered at 36 schools of which 26 are primary schools that provide some or all of the seven primary grades. Five other combined schools teach primary grades and some junior secondary grades (Grades 8, 9 and 10). There are four secondary schools, but the senior secondary grades of 11 and 12 are only offered at one school. This senior secondary school is in Okakarara, which is also where the only vocational school in the region is located. Of the primary schools, there are six so-called village schools which were started over the past 10 years to provide schooling in the earliest grades for San children in the Tsumkwe area.

Total enrolments in the region have risen slowly at an annual, average growth rate of 1% from 11,491 pupils in 1992 to 12,619 in 2001. The great majority of pupils are in the primary grades (***Figure 35***). There are approximately equal numbers enrolled in each of the first nine grades, excluding Grade 8 in which there are high enrolments for some unexplained reason. The few pupils in Grades 11 and 12 are those at the only senior secondary school in Okakarara. Large numbers of learners probably board and attend schools offering secondary grades in places such as Grootfontein, Gobabis, Otjiwarongo and Windhoek.

In 1991, 69% of all 7-16 year-old children attended school. Attendance rates are unlikely to have increased to any extent since then, and access to schooling is clearly a problem in the region. This is because the figure of 69% is far below the national school attendance rate of 87% for this age group in 1991. In addition, less than half (about 44%) of all people live within 5 kilometres of schools (***Figure 36***). Another factor that limits school attendance is the fact that many San children do not go to school because their parents do not recognise the value of education.

Figure 35. Numbers of children enrolled in Grades 1 to 12 in the whole region during 2001.[23]

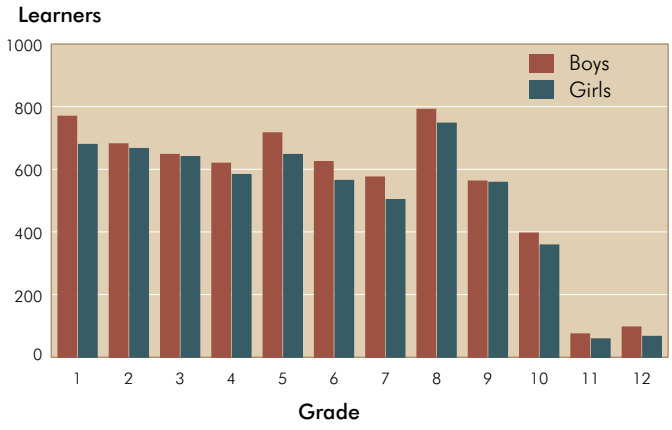
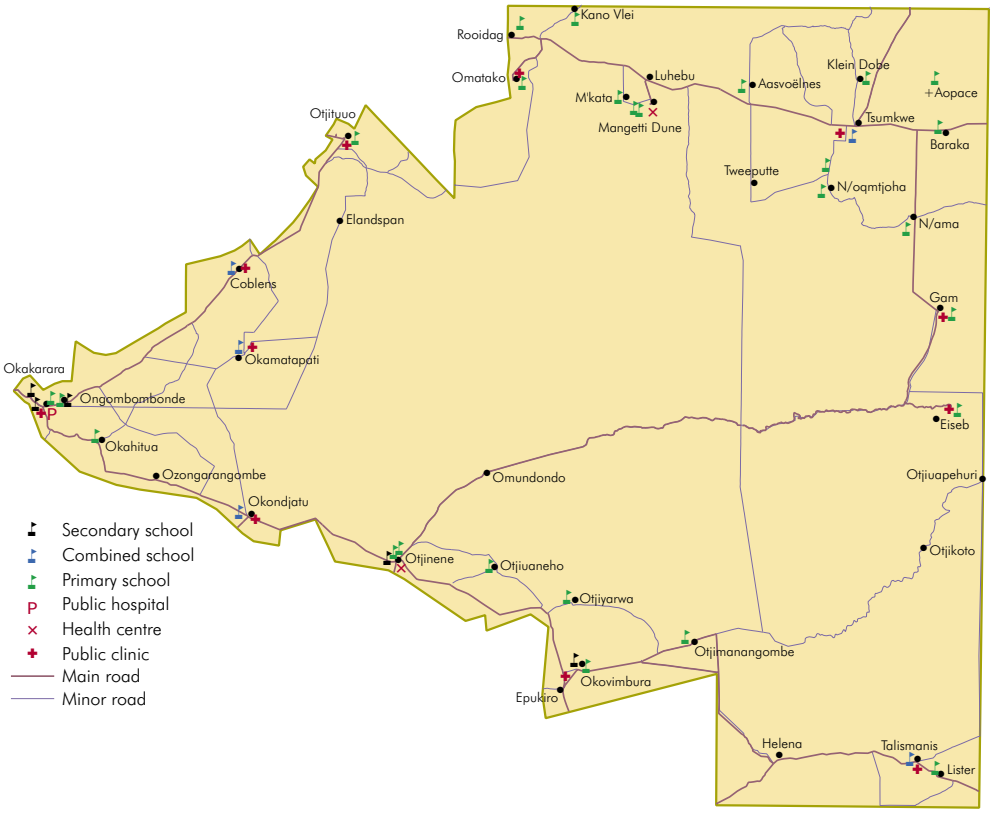
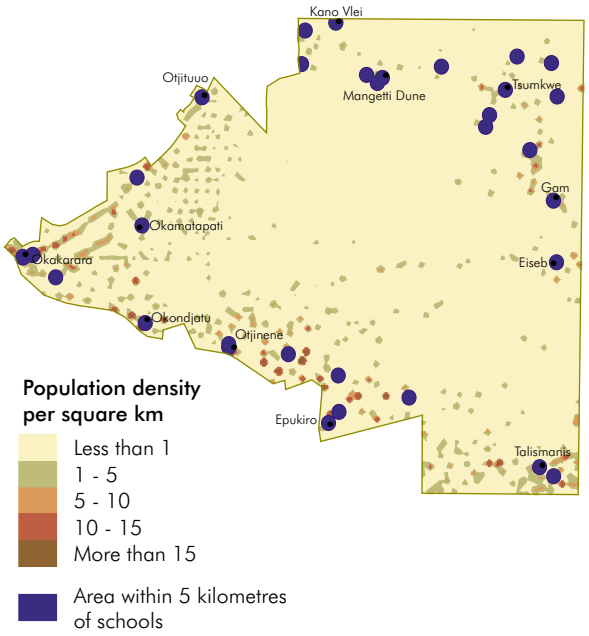
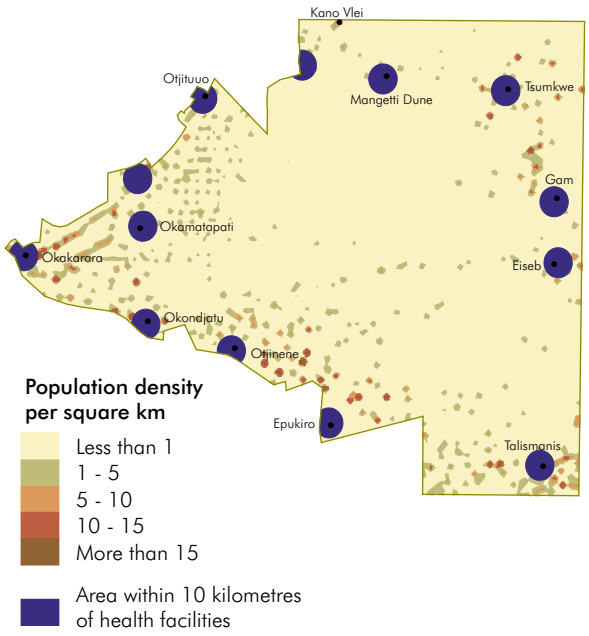


Figure 36. The distribution of different kinds of schools and health facilities in the region (top). In 2001, an estimated 44% of all people lived within areas of 10 kilometres around health facilities (bottom right), while about 45% of all people lived within 5 kilometres of schools (bottom left).[24] These two maps can help direct the siting of new clinics and schools because they show areas with relatively high densities of people that are far away from existing services.







Health

Public health services are provided at 11 clinics, two health centres (Mangetti Dune and Otjinene) and in one hospital at Okakarara. As is the case for schooling, a high proportion of people live far from these services. In fact, over half of all people live beyond a desirable catchment area of 10 kilometres around each facility (***see Figure 36***).

The most significant health problems in the region are caused by malaria, respiratory infections, teenage pregnancies, diarrhoea, alcoholism, sexually transmitted infections and HIV/AIDS, and tuberculosis. Information on HIV infection rates is not available, but approximately 18% of pregnant women were infected with the disease in Otjiwarongo in 2000, and this may be an indicative percentage of infection rates amongst all sexually active people. Tuberculosis is a particular health problem amongst San people for whom treatment is made difficult by the presence of drug-resistant strains of TB. Malaria infections occur most frequently in the northern areas as a result of higher rainfall and a greater abundance of standing water. Less than 10% of all people get malaria each year on average, but infection rates can be much higher in years with good rains. Malaria infections occur most frequently in February, March and April.

Almost all water supplied to people is safe or potable because it is pumped from under the ground (***see Figure 34***). Even water supplied from the Eastern National Water Carrier canal is first treated at Okakarara before being fed into the main pipeline system that serves the south-western areas. Problems caused by contaminated water probably only occur after heavy summer rains when some people may use water from local pans. However, these pans usually dry out quite rapidly.

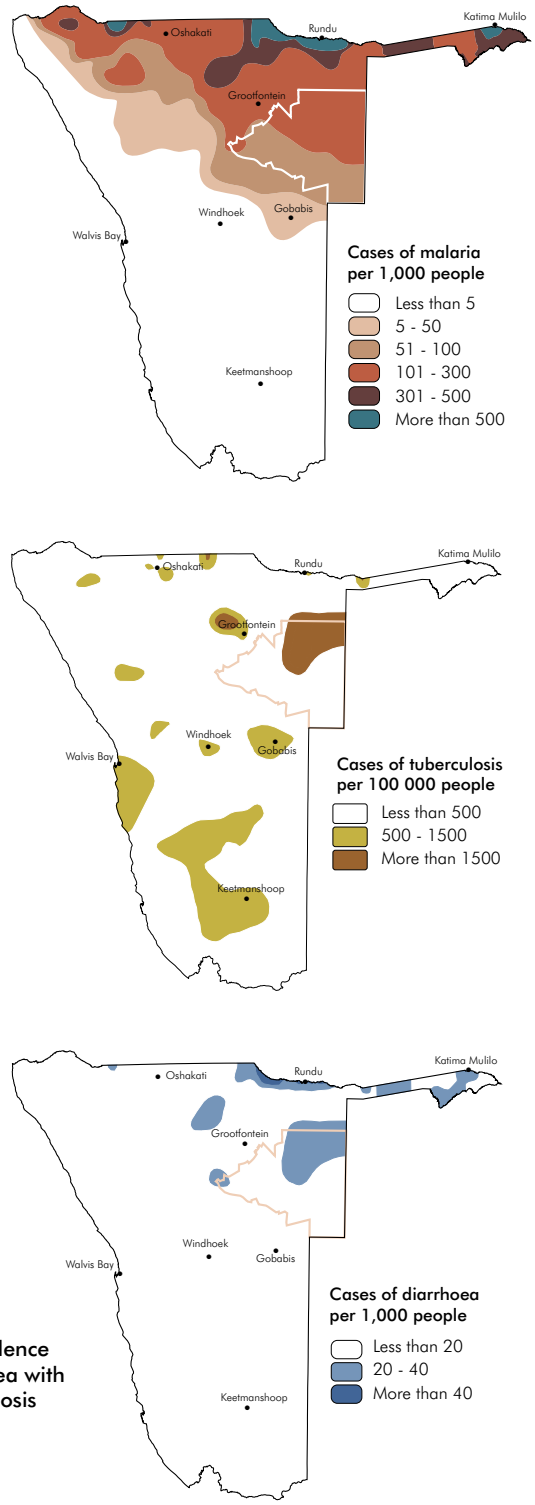


Figure 37. The incidence of malaria, diarrhoea with blood, and tuberculosis each year.[25]

What of the future?

Three key commodities - land, water and cattle - stand out as having much more value than any others in the region. The use (and abuse) of these commodities also has important consequences for people and the natural environment, and any future planning for the region should recognise the value of these three resources. For example, the distribution of people seen today was largely determined by the provision of pumped water, and almost all human activity in the region ultimately depends on the supply of underground water. Cattle farming dominates all other economic activity and much more land is used for ranching than any other purpose. Land has great value, especially so for cattle farmers, and large areas are no longer used communally or for the common good. There are also considerable conflicts over land between those who control large farms and those that have little access to land. Many San have effectively been dispossessed of access to land and the natural resources that were so important to these people.

The value of land, water and cattle has developed as a result of various events, and the communal areas of eastern Namibia have indeed had an interesting history. First, as a waterless expanse of savanna woodlands, they were occupied by San communities: hardy people whose nomadic, hunter-gathering lifestyle was the only viable way of living in this kind of environment. The harshness of the place also meant that the number of inhabitants was always small. And this is the way it was, perhaps so for thousands of years.

Then came a series of decisions by colonial governments to create homelands for Herero people in the region, and also to drill boreholes to provide permanent waters around which people could be settled. As age-old pastoralists, many Herero settlers turned the land to cattle farming, and most of the area was not suited to crop farming, anyway. As the years passed, some people became extremely successful cattle farmers, developing large herds which they grazed on extensive areas. That led to the formal allocation of large, fenced farms for some of the ranchers, while many other cattle farmers informally enclosed their own large farms.

Unlike many other parts of Namibia, the region has largely been left to its own devices. It has not benefited from economic growth driven by mining, tourism, or fishing, for example. Those people who could make good of the land as cattle farmers have done comparatively well, and wealth from cattle sales has helped to attract jobs and businesses to the region. Large parts of the region are now controlled or virtually owned by large-scale farmers, while remaining large

areas of truly communal and open land are generally remote. In any event, people cannot occupy these open areas because they lack water. Poorer folk – the San and many Herero people who did not became wealthy farmers or who could not find other sources of income – remain closeted in their villages, from where they eke out a living as hunter-gatherers and subsistence farmers.

A good deal of farming activity in the region is clearly of a commercial nature. In itself, this is not a problem, but what does raise difficulties is that these commercial activities foreclose access to resources that should be available for communal use. Government policy states that access to communal land should be open, especially for the poor in providing them with places to live since they cannot afford to buy their own land. A place to live is a commodity in its own right, but the commodities that are really important are the natural resources that the land provides. It is to these resources that free access is intended, and it is these resources that should be available to support the lives of poor people.

It is important that these contradictions in the use of land be resolved. Simply doing away with large-scale farming activities to open up access to resources for subsistence farmers would not do much good. Small-scale farming faces a variety of constraints, especially low soil fertility, rainfall and water supplies, and this is certainly not a place to be if the lives of subsistence farmers are to improve.

Given such conclusions, **what then of the future?** Before attempting to answer that question, three assumptions should be admitted. The first is that the nature and distribution of natural resources in the region predisposes it for extensive land uses. It is an environment in which you need big spaces to be successful, with significant investments that provide water, transport, access to markets and other services. Secondly, the possibility that much of this land may not be suited to communal use should be admitted. Even if resources for small-scale subsistence farming were abundant and freely available, there remains the difficulty of managing the resources for the common advantage of all. Thirdly, the entrenched presence of hundreds of large-scale, commercial farmers in the region should be recognised as a fact.

A first priority in our view is to encourage poorer people to move away from rural areas. It is simply very hard to imagine how rural people can ever make a decent living as subsistence farmers in an environment not suited to small-scale farming. Achieving such a shift away from rural land implies that people be encouraged to live in towns, and to acquire skills which allow them to develop economically in urban societies. This will not be easy, but there are many ways of supporting urban development. At least funds now spent on rural development would be used more wisely to increase skills, create jobs, and provide housing and other services in urban areas. Access to public services in the region would also be improved if more people lived in towns. After all, development in most countries is accompanied by urbanisation, and most people in developed parts of the world are concentrated in urban centres.

Second, land uses that make good and wise use of natural resources should be promoted. Since cattle ranching is firmly established as a viable land use, it seems sensible to develop mechanisms for large-scale farmers to take real ownership and responsibility for their land, managing it more responsibly and for the future. Stocking rates should be controlled and programmes to encourage rotational grazing should be promoted to ensure pastures are well managed.

Cattle farmers should also diversify their uses of the land, especially by building up numbers of wildlife that they can harvest. In this, they should follow the activities of many farmers on freehold farms who now earn good incomes by selling venison or hunting opportunities to trophy and other hunters. Initiatives now being pursued to develop conservancies elsewhere in the region should help to increase wildlife in the area, and give conservancy members new opportunities of making money from wildlife.

One successful conservancy has been established around Tsumkwe. Known as the Nyae Nyae Conservancy, the area now generates annual incomes of about N$1 million for approximately 2,000 San people who live in the area. Most of the income comes from the sale of hunting rights, but additional funds are earned by making and selling craft, and from fees levied for camping tourists. The conservancy covers an area of 907,000 hectares, and part of its success stems from

the very fact that it is such a large area. Another reason for its success is the relative abundance of several species of large wildlife in the conservancy. In fact, the area could hold much more wildlife, and income to the area could then be many times higher. In addition to increasing wildlife numbers, efforts should also made to manage this conservancy more strategically as a commercial venture in its own right.

Several other conservancies are being planned in the region (***Figure 38***), but the management of each will have to take into account the particular interests that residents have in farming and access to land. This will not be easy. For example, one reason that development of a conservancy in the western Tsumkwe constituency has been slow is that the area suffers from a host of competing land use and occupation interests. Many of the problems have been due to the recent arrival of immigrant farmers with large cattle herds into the area, with the result that San people are increasingly "squeezed" by these new farmers. In areas of former Hereroland, management systems now used by conservancies on freehold farms may be more appropriate because of the presence of so many large cattle ranches.

Finally, there is scope for tourism to be developed. Access to the region for tourists is difficult, but that will improve once a new, direct road between Gobabis and Grootfontein is opened. A map of accommodation for tourists in Namibia (***Figure 38***) shows that there is a remarkable lack of tourism facilities in the whole area. The map also demonstrates just how many guest lodges and other kinds of accommodation can be operated in relatively small areas of central Namibia. Creative and profitable ideas are now needed to attract visitors to enjoy the region's people and natural resources, and the wise use of those resources will be one of the challenges facing those who want greater benefits to come from the communal lands of eastern Namibia.

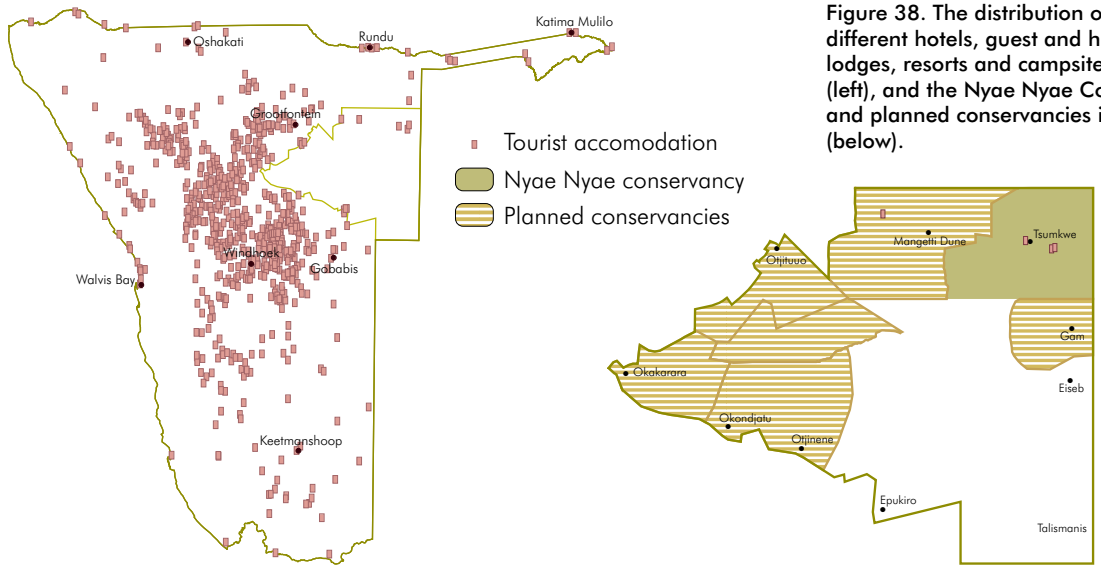


Figure 38. The distribution of about 900 different hotels, guest and hunting farms, lodges, resorts and campsites in Namibia (left), and the Nyae Nyae Conservancy and planned conservancies in the region (below).

Notes and sources

1. Numbers of people and households are based on the preliminary results of the 2001 Population and Housing Census. For the Tsumkwe constituency, the number of people is an adjusted estimate which excludes that part falling in the commercial farming area to the west of the communal area. We estimated that 910 people or 10.4% of the total number of people and households are in that communal area, and the 2001 Census figures were thus reduced pro rata by that percentage. The total area of the Tsumkwe constituency including the area of commercial farms is 28,440 square kilometres.
2. Adapted from material and sources in Mendelsohn, J.M., Jarvis, A.M., Roberts, C.S. & Robertson, T. 2002. *An Atlas of Namibia*. David Philip, Cape Town.
3. The land surveyor surveyed the farms that had already been fenced in 1988, and he was then instructed to continue marking out new farms to the south and east. He had two bulldozers, and the drivers were told to continue clearing lines due east, placing beacons every 7 kilometres. Farmers would follow these activities, immediately placing tyres on the beacons with their names to claim ownership of the new farms. The surveyor had been instructed to cover the whole of Hereroland in this way. However, a decision was made to stop this at about the time of independence (F.E. Mercker personal communication).
4. For a thorough discussion on the history or land enclosure and fencing in Hereroland, see Werner, W. 1997. *From communal pastures to enclosures: the development of land tenure in Herero reserves*. Namibian Economic Policy Research Unit, Windhoek.
5. From information kindly supplied by the Namibia Meteorological Services and from Namibia Resource Consultants. 1999. *Rainfall distribution in Namibia: Data analysis and mapping of spatial, temporal, and Southern Oscillation Index aspects*. Windhoek: Ministry of Agriculture, Water and Rural Development.
6. For more information see Christelis, G. & Struckmeier, W. (editors). 2001. *Groundwater in Namibia*. Ministry of Agriculture, Water and Rural Development and Ministry of Mines and Energy, Windhoek, and BIWAC. 1999. *Database for further decisions regarding the necessity and feasibility of future geophysical and hydrogeological investigations in the study areas Oshivelo, eastern Caprivi and eastern Tsumkwe-Otjinene (north-eastern Namibia)*. Department of Water Affairs, Windhoek.
7. Based on analyses of the Ministry of Agriculture, Water and Rural Development database on boreholes, and on data kindly supplied by Arnold Bittner and Katharina Dierkes.
8. Information supplied by the Chris Weaver and Greg Stuart-Hill of the LIFE Project, Windhoek.
9. From work done by Wynand du Plessis at the Etosha Ecological Research Unit, who extracted the maximum values reflecting green vegetation biomass for each square kilometre over a rainy season from NOAA (National Oceanic and Atmospheric Administration) satellite images. The images have a resolution of 1 x 1 km, and pixel values for biomass range from 0 to 255, which allow the values to be grouped into legend classes from low to high levels of production. The values over the seven seasons were averaged to produce a map of average biomass production, and the standard deviation of the values was used to calculate a co-efficient to show variation in plant growth. See also Du Plessis, W. 1999. *Linear regression relationships between NDVI, vegetation and rainfall in*

Etosha National Park, Namibia. Journal of arid environments, 42: 235-260.

10. The maps are based on the interpretation of NOAA satellite images by Simon Trigg and Johan le Roux, which then allowed burnt areas to be mapped.
11. Based on an analysis of the 1991 Population and Housing Census, conducted by the Central Statistics Office.
12. Based on population censuses in 1970, 1981, 1991 and 2001. Comparative figures from earlier censuses are not available because the census results were reported using different geographical zones. See Note 1 concerning estimates of people in Tsumkwe constituency in 2001.
13. Based on an analysis of the 1994 Income and Expenditure Survey, conducted by the Central Statistics Office.
14. Directorate of Extension and Engineering Services. 1994. *Socio-economic Survey: eastern communal areas*. Ministry of Agriculture, Water and Rural Development, Windhoek.
15. Werner, W. 1998. *No one will become rich: economy and society in the Herero Reserves in Namibia, 1915-1946*. Basel Namibia Studies Series No. 2, P. Schlettwein Publishing, Switzerland.
16. The maps of densities were compiled by this project. The number of animals recorded at each crushpen or stock inspection point was obtained from staff of the Directorate of Veterinary Services. The numbers were then linked to the location of these points and an estimate of density was made by "spreading" the numbers of animals over a radius of 10 kilometres around the points.
17. From the annual reports of the Directorate of Veterinary Services.
18. Derived from the stock census records kept by Animal Health Inspectors in western Hereroland and at Gam.
19. Werner, W. 1998. *No one will become rich: economy and society in the Herero Reserves in Namibia, 1915-1946*. Basel Namibia Studies Series No. 2, P. Schlettwein Publishing, Switzerland; and Werner, W. 1997. *From communal pastures to enclosures: the development of land tenure in Herero reserves*. Namibian Economic Policy Research Unit, Windhoek.
20. These figures are estimates extrapolated from the stock census records kept by Animal Health Inspectors in western Hereroland and Gam. These records covered 1,849 farmers who jointly owned about 101,000 cattle. This is one third of the estimated total number of cattle in the region, and so the total number of 1,849 and number of farmers with more than 100 cattle was simply multiplied by three.
21. Baird, J.H. 1995. *Verification of socio-economic data for SARDEP test areas in the southern and eastern communal areas*. Report for Ministry of Agriculture, Water and Rural Development and Deutsche Gesellschaft für Technische Zusammenarbeit, Windhoek.
22. Based on information supplied by Namwater and the Directorate of Rural Water Supply in the Department of Water Affairs.
23. Derived from Education Management Information System data of the Ministry of Basic Education, Sport and Culture.
24. These percentages were estimated by overlaying catchment areas with radii of 5 and 10 kilometres on the map of population density (see Figure 24).
25. Adapted from el Obeid, S., Mendelsohn, J.M., Lejars, M., Forster, N. & G. Brulé. *Health in Namibia: progress and challenges*. RAISON, Windhoek. 120 pp. The incidence of malaria and diarrhoea is the average number of outpatients with these diseases in relation to 1,000 people in the catchment area of each health facility, 1995-1999. The incidence of tuberculosis is amongst adults, and was recorded as the number of new outpatient cases per 100,000 people in each year, 1995-1999.

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