

The sandy scroll-bars around the confluence of the Cuito (top) and Okavango (below, left) Rivers remain as markers to show how the Cuito has shifted across this landscape. On a point of labels, Angolans call the Okavango the *Cubango* (also spelled *Kubango*) upstream of the confluence, while some Namibians prefer to call the whole river the *Kavango*.

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Okavango River: flow of a lifeline

For most people, the word Okavango brings the Delta to mind, a place given prominence by the public media and tourism, and renowned for its rich wildlife.



However, there is another part to the Okavango that should enjoy equal fame. This is the Okavango River's catchment, much of which consists of tens of thousands of square kilometres of the most pristine wilderness in an area once appropriately known in Angola as *terras do fim do mundo* – the land at the end of the earth. Moreover, the wealth of the Delta depends largely on the health of the catchment. The future of the Okavango Delta is thus rooted in the future of the Okavango River!

The whole Okavango River Basin is divided into three zones: the northern catchment from which water actively drains, the middle-reaches through which the Okavango River flows without

collecting significant runoff, and then the Delta (Figure 10). The northern area lies entirely in Angola and receives much higher rainfall than the middle zone, which is in southern Angola and Namibia. In addition to the differences in rainfall, there are also substantial changes in the use of land, demography and recent history across the whole Basin. All these aspects have direct or indirect bearings on the Delta.

The northern catchment spans an area of about 400 kilometres from east to west and 500 kilometres from north to south, and is divided into two sub-catchments. The western, or Cubango sub-catchment is relatively hilly and characterised

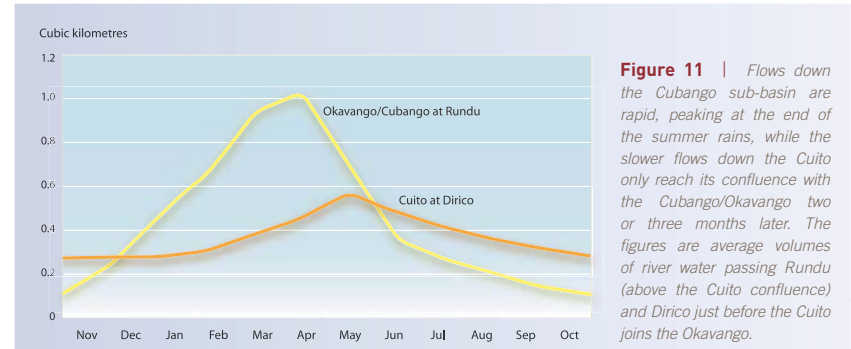
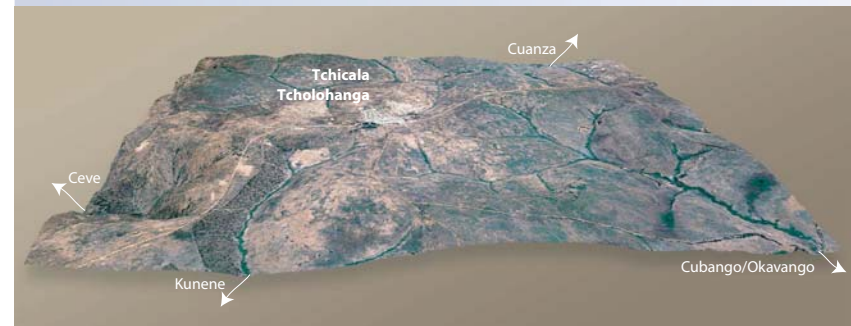


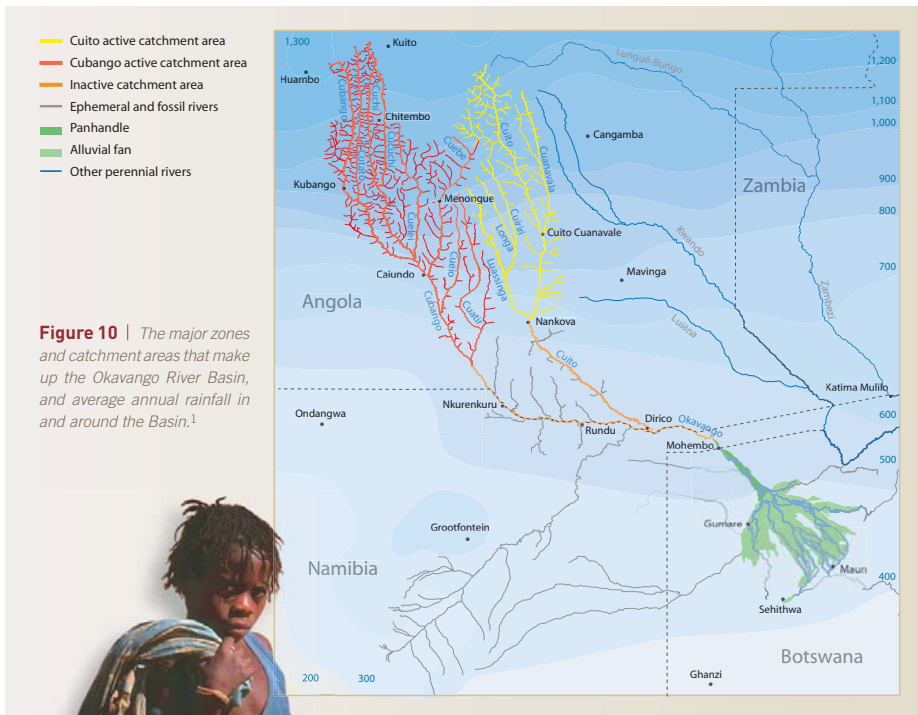
Figure 11 | Flows down the Cubango sub-basin are rapid, peaking at the end of the summer rains, while the slower flows down the Cuito only reach its confluence with the Cubango/Okavango two or three months later. The figures are average volumes of river water passing Rundu (above the Cuito confluence) and Dirico just before the Cuito joins the Okavango.



The Okavango River starts its journey to Delta just outside the small town of Tchicala Tcholohanga on the *plan alto* (highlands) of Huambo Province, Angola. Remarkably, the small hill where the town was built is also the source of three other major rivers. These, and the Okavango flow in quite separate directions: the Kunene River to the south-west and its eventual mouth in the Atlantic Ocean, the Ceve north-west to its mouth at Port Amboim on the Atlantic, the Okavango south-east to the Delta, and the Cutato (a major tributary of the Cuanza) north-east and then westwards to the Atlantic just south of Luanda. The river basins associated with the four tiny tributaries fanning out from small hill at Tchicala Tcholohanga thus cover hundreds of thousands of square kilometers of Angola, Namibia and Botswana.

by outcrops of granites, ferasol soils and Kalahari sands, while the eastern, Cuito sub-catchment consists almost entirely of Kalahari sands that blanket a flat landscape. Respectively, the two sub-catchments contribute about 55% and 45% of all the water that flows to the Delta, but their flow regimes are quite different (Figure 11).

Those flows coming off the western, higher areas are more rapid and aggressive, water running downstream soon after rain has fallen. Sharper increases in inflow to the Delta are therefore mainly of water coming from the Cubango and its major tributaries: the Cutato, Cuchi, Cacuchi, Cuebe and Cueio Rivers.





Images of Angola: Many rivers are flanked by wide grassy floodplains (*top left*), while their meanders are often so broad that the crystal-clear waters flow sideways as much as they do downstream (*bottom left*). Hundreds of kilometers of valley marshlands are dominated by papyrus which filters out nutrients, clays and sandy sediments (*top right*). Maize, cassava, bananas and various vegetables are grown in *onaka* fields along tiny tributaries (*2nd from top right*), while rivers provide the only water for most villagers to wash their clothes (*3rd from top right*). Remnants of the civil war, which ended in 2002, are scattered across the catchment (*bottom right*).



Images of Namibia: The well-wooded islands at Andara have not been cleared because they are the traditional burial grounds of Hambukushu chiefs (*top left*), but most riverine vegetation has been cleared for crops elsewhere (*middle left*). The Okavango flows along a narrow, steep-sided valley in some stretches, while elsewhere it meanders across broad floodplains (*bottom left*). Most tourist lodges (*top right*) are near Rundu or within 50 kilometres of Moembo. Goats and cattle are much more abundant than in the Angolan catchment (*middle right*). The Namibian government intends to expand the current 2,200 hectares of irrigation to a potential area of 15,600 hectares.²

By contrast, flows from the Cuito sub-catchment provide a more sustained input of water to the Delta, since much of the water entering the Cuito and its major tributaries – the Longa, Cuanavale and Luassinga Rivers – is slow seepage from the surrounding Kalahari sands. Moreover, the Cuito and its tributaries meander across broad valleys that have only the slightest gradient. For example, the Cuito River drops just 85 metres over a straight-line distance of about 270 kilometres from Cuito Cuanavale to Dirico. And the flow of water is further slowed as it percolates through the broad floodplains of grasses, reeds and sedges that line the main channels of these rivers.

River water in both sub-basins is generally crystal clear. Very few suspended particles and dissolved substances – including nutrients – are carried in the water. Much of the purity is due to the substrate of Kalahari sand, which consists mainly of grains of quartz. Little can be dissolved from the inert quartz and the sands have been leached by relatively abundant rain over millions of years. Very few clay particles are therefore available to be washed into the river water. The paucity of suspended clay in the flow off the catchment is fundamental in maintaining the permeability of the Delta's substrate and its fresh water (see page 55).⁴

But there is another, less obvious reason for the clear, nutrient-deficient waters. This is the effect of the same vegetation that slows the speed of water. Many of the nutrients and suspended clay particles that do get into the water are filtered out by the plants. The floodplains are especially broad in the Cuito sub-catchment, but lots of the valleys in the Cubango sub-catchment are likewise congested with dense beds of reeds, as shown in the photographs on page 30.

Rainfall averages over 1,300 millimetres per year in parts of the catchment furthest to the north-west. From there it steadily declines as the river moves southward, until it averages 450 millimetres in the lowest reaches of the Delta (Figure 10). Almost all the rain falls during the summer months between October and April, with the highest falls in December and January in most areas. However, in the most northerly areas, rain often falls in two peaks, one in November-December and the other in February-March. As a result, there are often two peak periods of flow into the Delta (see page 41).

Average rainfall in the middle reaches ranges between 500 and 600 millimetres per year. This zone also consists of Kalahari sand into which rain readily percolates and so there is almost no run-off, even after very heavy thunderstorms. The Okavango River thus functions as a conduit in the middle reaches, channeling water from its upstream Angolan sources to Botswana and the Delta.

The river is very much a lifeline for many people living along this channel in the middle reaches. It



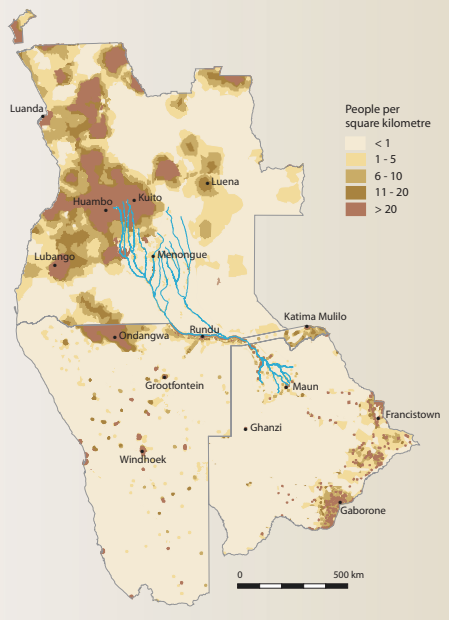
Dense, fairly tall *Brachystegia* or miombo woodlands cover gentle hills of red Kalahari sand in the upper catchment of the Cuito River and its major tributaries. Very few people live in this broad expanse of Angola.

waters their livestock and vegetable gardens and provides fish, reeds for houses and pastures for cattle. No other permanent surface water is available in the area, and so the value of the river for local residents is particularly high. This dependency on waters of the Okavango is quite different from conditions in the upper catchment where abundant rain means that people are less reliant on water from the thousands of tiny streams that feed the Okavango. Evaporation rates are also lowest in the upper catchment, and rain is therefore more effective in supplying the moisture needs of crops and pastures than downstream. Indeed, aridity further south is as much a consequence of very high rates of evaporation as it is of low rainfall. For example, evaporation per year in the middle reaches and around the Delta is about three to four times higher than average annual rainfall.

While most households in both the upper catchment and the middle reaches practise some kind of agriculture, a great many families do not depend on agriculture as a main source of income. Instead, additional incomes from wages, small businesses, pensions and remittances provide for most cash and food needs. The apparent paradox of rural, farming households relying on non-farming income is a consequence of two fundamental features throughout much of the Okavango River Basin.

The first is that conditions are poorly suited to agriculture: soils have low fertility; rainfall varies too much to produce good yields from such rain-fed crops as maize, cassava (manioc), sorghum and pearl millet; and pastures can not support large numbers of livestock.

Figure 12 | The density of people throughout the Basin and in Angola, Namibia and Botswana.³





Livestock diseases and crop pests also limit production, and so most families battle to harvest enough to meet their need for staples, let alone surpluses that might be sold to provide for their cash needs.⁵

Secondly, the scope for commercial production is limited by much of the Okavango River Basin being far from markets where occasional produce might be sold. Most people in all three countries are concentrated elsewhere in Angola, Namibia and Botswana, either in places better suited to farming or, increasingly, in towns and cities (Figure 12), and see page 71 in Chapter 7. For example, less than 3% of the total Angolan population is in the Basin, while equivalent proportions for Namibia and Botswana are also small, respectively 7% and 5%.

Nevertheless, the highest densities in the northern parts of the Basin are indeed a consequence of the relatively good farming conditions there, at least compared to areas further south. Densities elsewhere in the Basin are generally low and there are large areas where there are no, or just a handful of people. Menongue, Rundu and Maun are the only major urban areas in the whole Basin. Rundu and Maun each have populations of over 50,000, while Menongue probably has between 30,000 and 40,000 people. All other towns and villages are very small, most having between several hundred and a few thousand inhabitants.

The comparatively high population densities on the southern banks of the Okavango River in Namibia are a consequence of unusual circumstances. Perhaps more than half of this population was born in Angola or was born in Namibia of immigrants from Angola who moved south to escape the Angolan civil war, particularly during the 1980s and mid 1990s. Many Angolans were also attracted by the relatively better economic opportunities and social services in Namibia.

A consequence of the comparatively small proportions of the Angolan, Namibian and Botswana populations is that each government pays less attention to services and development in the Okavango Basin than elsewhere. The centres of government in each country – Luanda, Windhoek and Gaborone – are also all remote from the Basin and its needs. With the notable exception of tourism to the Delta (see page 81), enterprises and resources that generate significant revenue are also far from the Basin: for example, services in Luanda, offshore oil, and diamonds in the Lunda provinces in Angola; and coastal fish and diamonds in Namibia,



Most homes are clustered in villages or small towns in the Angolan headwaters (opposite page top) and downstream around the Delta (above), whereas households are generally spread as solitary homes along the river valley in the middle reaches (opposite page bottom).

services in Windhoek and Walvis Bay, and tourism in western Namibia. As for Botswana, services are concentrated in and around Gaborone, while exports of diamonds and beef are mainly from the central and southern regions.⁶

These factors – small populations, remoteness and other economic interests – mean that the Basin enjoys less interest than it should. For Angola, much of the catchment remains inaccessible as the *terras do fim do mundo*. Plans for hydroelectric and large-scale irrigation schemes have often been suggested, but none has materialized. There are no dams of any significance on any of the Okavango's tributaries in Angola.

There are also no dams in Namibia. Despite the Okavango's poor soils and isolation from markets, the Namibian government's main interest in the river is for irrigation. This use is often justified with the assumption that Okavango water can be used to create Namibia's breadbasket. Although there have been dozens of agricultural development projects in recent decades, farming remains unproductive and irrigation projects only function with substantial subsidies of public funds. There have also been plans to pipe Okavango water



Fires often burn over south-eastern Angola, as shown so clearly in the photograph on the cover. Tall savanna woodlands are being reduced to shrubland in many areas, both by frequent, intense fires and by uncontrolled logging.

to the central regions of the country and to use the water for hydropower, but these have not been implemented. In summary, the Namibia government mainly sees the river water as a passing resource to be harvested before it is lost at Moheumbo.⁷

Although some areas were proclaimed as hunting reserves by the Portuguese administration, no land within the Angolan catchment is now managed for environmental conservation. One small conservancy and the Bwabwata National Park, which includes a stretch of about 20 kilometres of the Okavango River, are the only conservation areas in Namibia. In Botswana, by contrast, most land in and around the Delta is under conservation management, either in the Moremi Game Reserve or as wildlife management areas (see page 79). Likewise, there is almost no tourism in Angola, significantly

more in Namibia, and then a substantial tourism industry in Botswana (see page 81).

Almost all land in the Basin is formally owned by the state, and except for national parks, government and private farms, formal urban areas and concessions areas, most land is settled and used as communal land. Access to this land is largely controlled by traditional authorities in Angola and Namibia where neither the state nor traditional authorities place effective limits on the use of commonage resources. In Botswana, access to land is controlled by land boards, and the use of commonage resources is controlled to some extent in designated wildlife management areas. Nevertheless, it is generally in everyone's interests to exploit commonages maximally throughout the Basin (see page 79). Wealthy residents who have lucrative off-farm incomes graze as many animals as they can manage, often



at the expense of poorer folk who subsist entirely on farming. A lack of control over commonages also leads to excessive clearing of virgin land (some of which is never used for cropping), run-away fires, and logging.

Recent history has treated residents of the Basin in the three countries quite differently. Angola recently emerged from a long period of strife that began with its war of independence from 1961 to 1975 which was then followed by a civil war from 1976 to 2002. And before those 41 years of turmoil, Angolans suffered from centuries of forced labour and slave trading. Namibia has had an easier, calmer past, although it too endured several decades of armed struggle for liberation from South African administration, which ended with independence in 1990. Botswana has had the most tranquil history, being the first to gain its independence in 1966 and having never had a war. Its government has been stable, and has enjoyed a reputation for service delivery and respect for human rights.

People in the upper catchment have thus endured the most violence, the highest levels of insecurity and the poorest public services. Moving downstream, history has been kinder in Namibia, and even gentler in Botswana. Together with these differences, the value of water increases downstream from Angola to Namibia and Botswana as the Okavango River enters environments that are progressively drier. Likewise, the value of tourism and wildlife also increases downstream because each of the three countries has done more to promote tourism than its upstream neighbour. The Okavango River is

most attractive as an oasis downstream, and nutrient resources that support wildlife are most plentiful in the Delta. The downstream Delta is the part of the Basin managed most effectively for conservation, but it is at the mercy of activities in the upstream Basin where incentives for environmental management have yet to develop. Creating incentives to manage the whole Basin wisely is one of the greatest challenges for people who value the Delta.

KEY POINTS

1. At the terminus of the Okavango River Basin, the Delta depends on the healthy flow of water from its catchment in Angola and the safe passage of water through Namibia. What is called the Okavango is therefore much more than the Delta.
2. About half of the Delta's inflow comes from the Cubango sub-catchment and the other half from the Cuito and its tributaries in Angola. Flows down the Cubango are quite rapid, whereas slower run-offs down the Cuito reach the Delta later.
3. Water flow is slowed and filtered by large expanses of reeds and floodplain grasslands that line the major tributaries and rivers in Angola.
4. Although rural households farm with crops and livestock, off-farm incomes from wages, business earnings, remittances and pensions usually provide for most of their livelihood needs.
5. Small proportions of all people in Angola, Namibia and Botswana live in the Okavango River Basin, and each country's greatest economic and political interests lie outside the Basin.
6. Although agricultural and hydro-power developments are often proposed in the Angolan catchment, much of it remains undeveloped and pristinine. Namibia often sees the Okavango's waters as a transient resource to be harvested before entering the Delta.
7. Waters of the Okavango gain increasing value as they flow downstream. History has treated residents of the Basin more kindly downstream, where the waters have greatest value for tourism and wildlife.