Cubango-Okavango River Basin Homogenous Units

Livelihoods vulnerability hotspot mapping

July 2018

FINAL

Acronyms

Acronym	Long Form
CBNRM	Community Based Natural Resource Management
CORB	Cubango Okavango River Basin
CRIDF	Climate Resilient Infrastructure Development Facility
CSIR	Council for Scientific and Industrial Research
EU	European Union
GCM	General Circulation Model
HWC	Human Wildlife Conflict
KAZA	Kavango-Zambezi
RCM	Regional Circulation Models
RCP	Representative Concentration Pathway
SADC	Southern African Development Community
TNC	The Nature Conservancy
UNDP	United Nations Development Programme
WASH	Water, Sanitation and Hygiene
WDA	Wildlife Dispersal Area

Contents

Preface

This report presents an *initial* draft of the homogenous unit narratives that will inform the development of more detailed hotspot narratives (and related proposed response/interventions) within each unit. The report has been developed using available literature and data, and through the interpretation of the overlayed metadata.

Through in-depth, in-country engagement with thematic experts, local organisations and key country stakeholders, this report will be refined to consider current and project district and ward level vulnerabilities.

1   Preamble to Discussion

The Cubango-Okavango River Basin (CORB) has been divided into 5 'homogenous units', largely based on spatial data layers that present similarity in characteristics of the layers in the selected units to enable more detailed hotspot analysis. The map below shows the subsequent area delineations. Discussions are provided associated with each homogenous unit, as an entry point into more detailed, iterative hotspot discussions per unit with wider stakeholder groups. Discussions in this report are done from far north-west, towards the south-east of the basin. Land cover based on recent satellite image data is provided as back-drop to the maps.

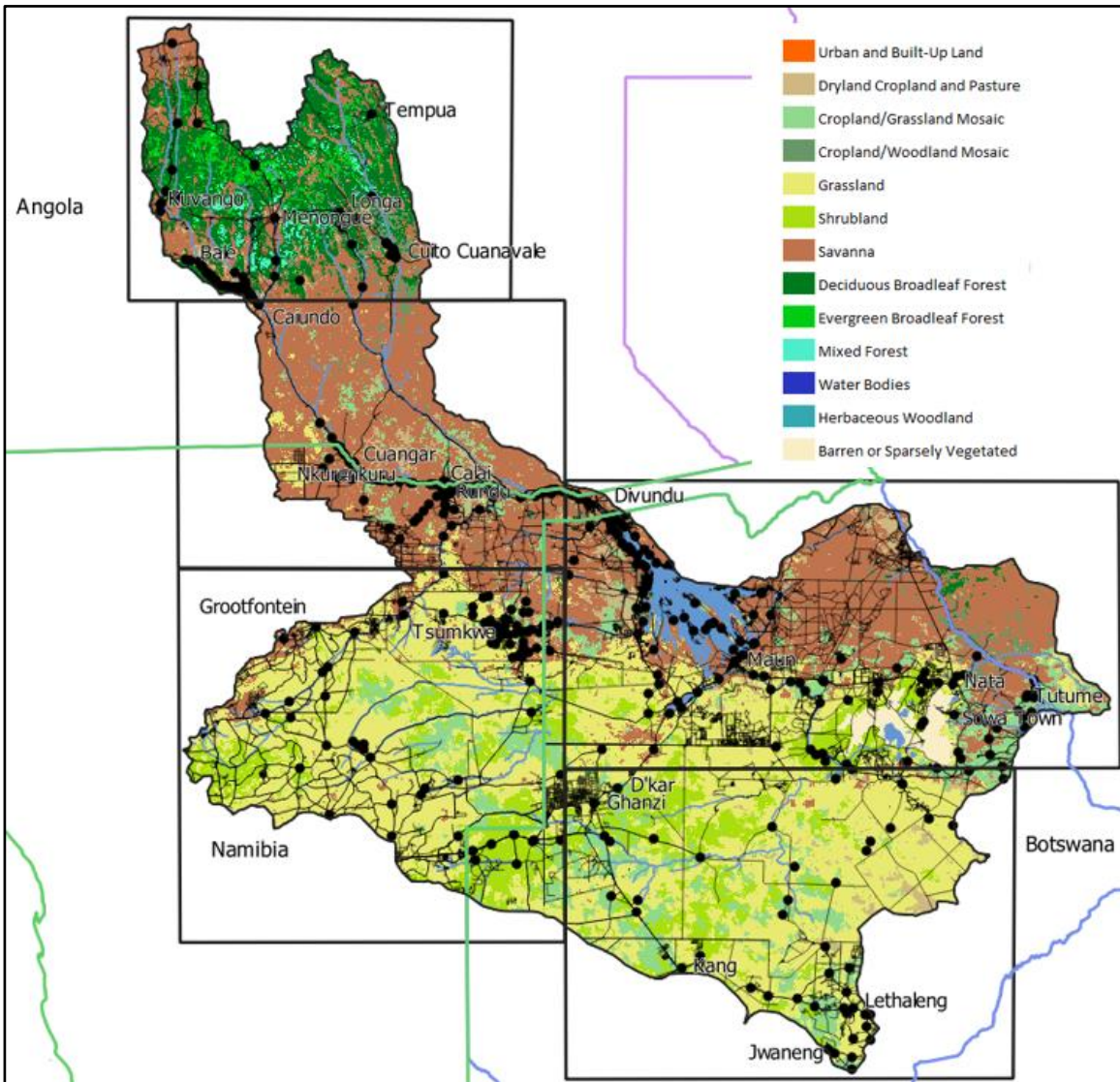**Figure 1 Area delineations for livelihood vulnerability hotspot analysis**

This approach reflects the findings from the Livelihoods Hotspot Mapping Stakeholder Inception Workshop on 13th April, held in Gaborone, Botswana, where distinct, differing hazards and vulnerabilities were identified in specific areas by Member State representatives: example of the Hazards identified are indicated, in Figure 2.
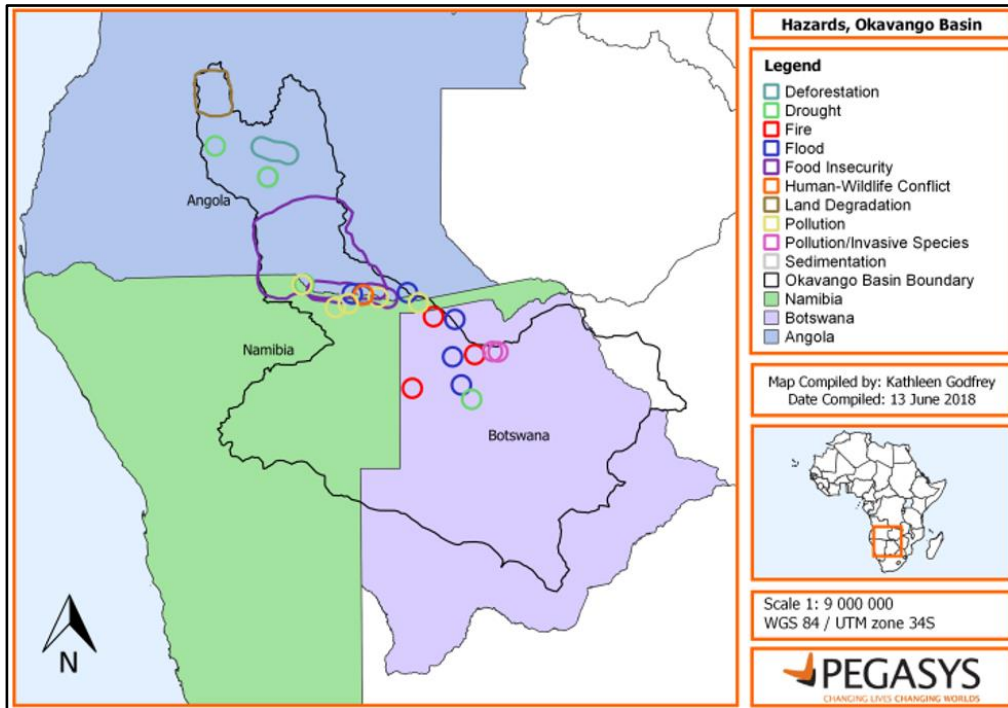
Figure 2 Hazards and vulnerabilities identified by Member States

The homogenous unit discussions include the best available and most rece............................ss the units. In some areas where data is not available, elements suc.................. , ..., and natural/topographical features as well as road infrastructure is considered to determine the potential for homogeneousness across the area, thus supporting extrapolation of unit characteristics in some instances. The same types of information are not necessarily available for all units – information is presented as best possible available and sourced via online published reports, books and academic papers, as the time of the narratives being compiled. The narratives are compiled based on readily available information, noting that field verification and stakeholder engagement to validate the details, situation or trends is still to be conducted. Data sources accessed to define the narratives are predominantly from 2014 to current (2018), from reputable sources such as census/statistics buros, national planning commissions of countries, the World Bank, UNICEF, UN, UNDP, SARUA and the like.

Figure 3 shows the opening page of the .pdf document[1] that is associated with these narratives – the full .pdf is submitted as an accompanying file on SharePoint.

Each narrative includes a brief 'recommendations' section on potential suitable technologies/interventions that key development partners could pursue, in line with their specific mandates[2]. It is important to note that these recommendations initial thoughts and are yet to be discussed with relevant partners. They will be refined and

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[1] Disclaimer: All spatial data used for analysis or maps created in this report, and all associated data is applied within the context of reasonable use. The data is used either under the principles of Creative Common License, or as free publicly available information. The author of this report does not take responsibility for any unreasonable misuse of the results

[2] In line with CRIDF's core mandate, and as identified in the poverty analysis in the OKACOM Engagement Plan (November 2017), the implementation of climate resilient water infrastructure is a key intervention to addressing health, education, living standards and infrastructure challenges. This narrative has to permeate any interventions that are decided on based on the homogenous zones discussions and livelihood vulnerability hotspot analyses.

elaborated on through further, in depth engagement with key partners, OKACOM structures and in-country experts.
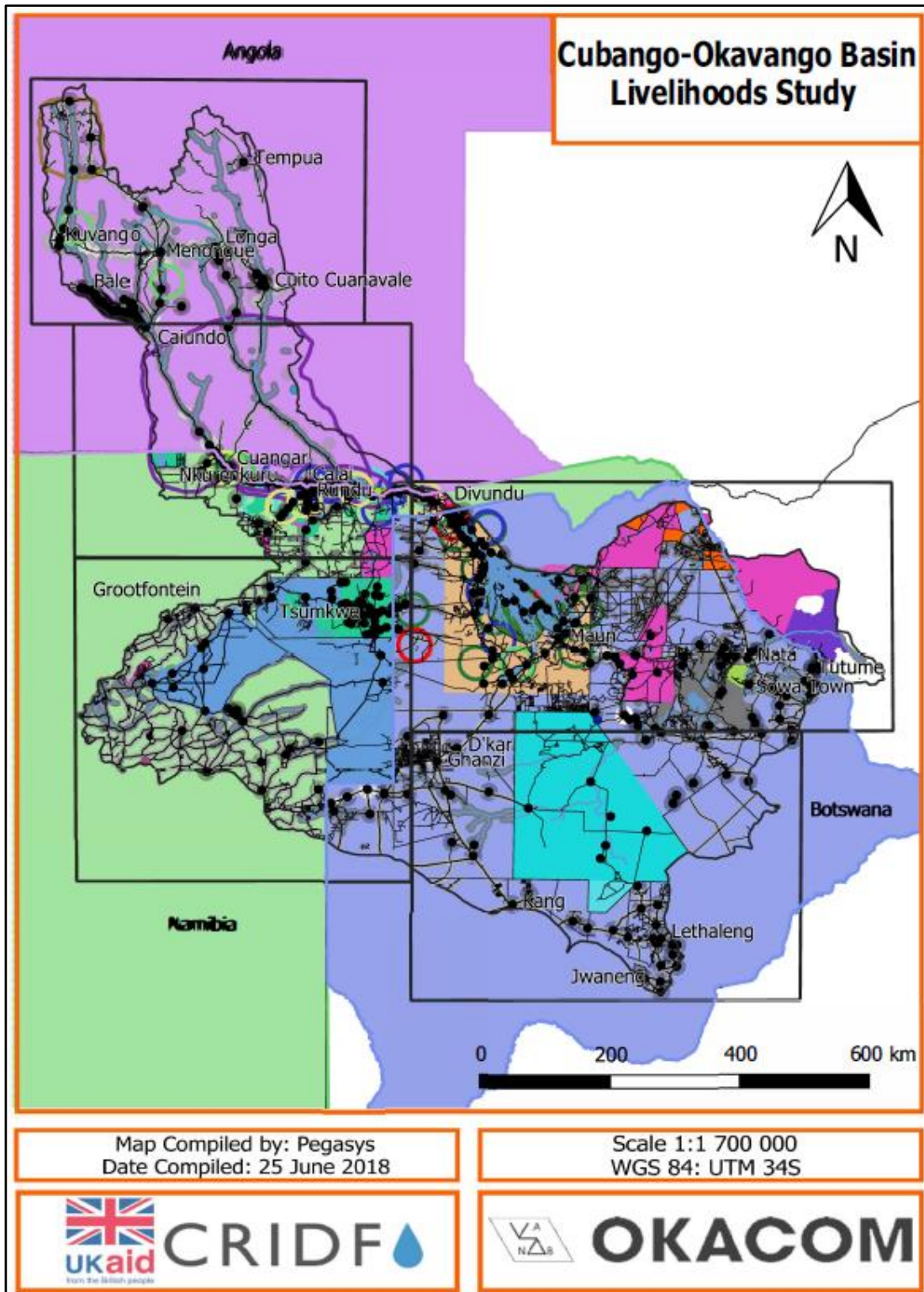
Figure 3 OKACOM livelihoods hotspot mapping .pdf opening page

The .pdf document allows users to put layers 'on' or 'off' depending on what features and data layers they are interested in viewing. It also enables layer selection for the homogenous units based on characteristics of the units that would support the narratives and unique hotspot identification within the units. In order to use the layered/"stacking" functionality, the navigation pane shown below can be used.

Figure 4 How to view layers to put them 'on' or 'off'

2 Climate model downscaling and climate impact assessment method

Climate models vary significantly depending on raw data inputs used as well as modelled future global temperature increases. The models can be used to generate climate futures according to various emission and climate forcing scenarios, with names such as 'A2', 'RCP4.5' and 'RCP8.5' where for example RCP8.5 being the 'extreme' or higher risk scenario. With over 55 potential models already having been developed, the choice of which to 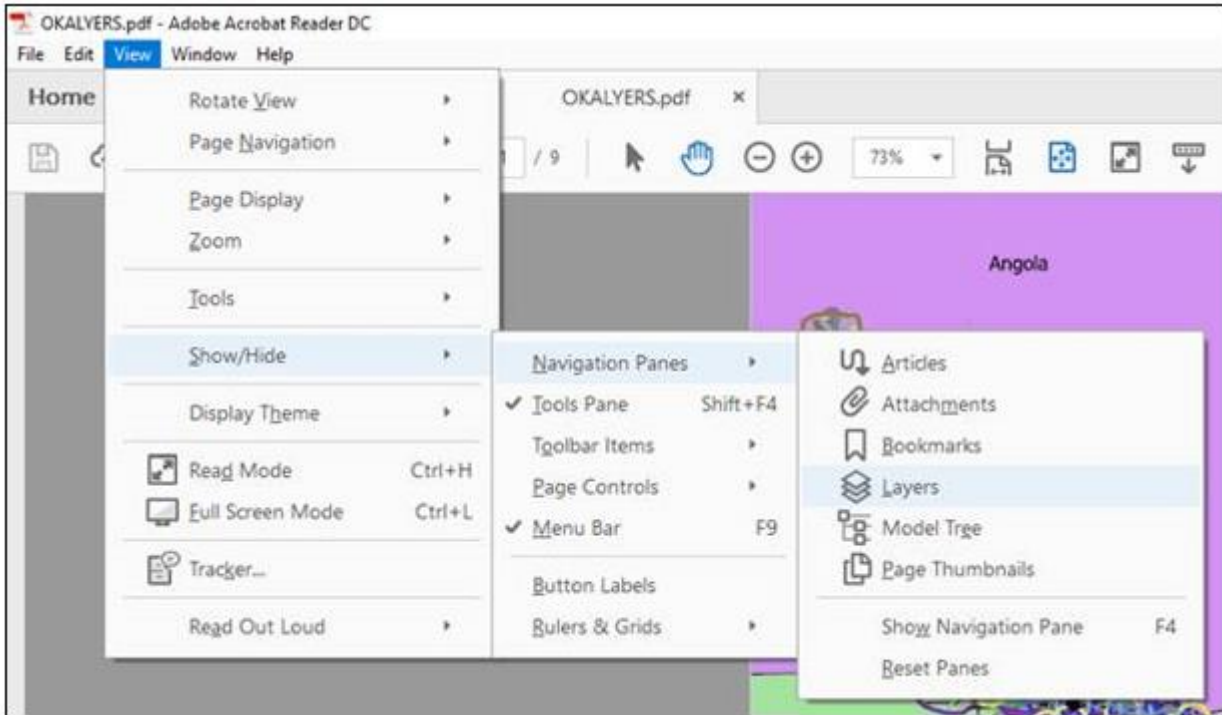use for particular areas worldwide comes down to selection by specialists in the field of climate modelling, based on their specific regional expertise. Between two and six models are usually selected and integrated to develop Regional Circulation Models (RCMs) to assess future climate change probability. Such an ensemble of high-resolution dynamically downscaled RCMs has been developed over a number of years and via significant specialist and super-computer input, by the Council for Scientific and Industrial Research (CSIR) (Engelbrecht *et al*, 2015).

Various trend analyses of the RCMs' outputs can be conducted from the outputs, inter alia concerning temperature changes, rainfall changes, fire risk and heat wave days (among others), relative to "reference" periods of actual weather observations. The analyses do not include evaluation of climate change-related impacts on flood specific variables. The closest elements to flood impacts would be consideration of relative changes in annual maximum daily rainfalls for the future periods. Variability at small scale and over short periods of time is also challenging to predict, and thus an increase in climate variability as well as increased intensity of climate and weather events (i.e. droughts, floods, etc) should be expected.

The CSIR model is arguably the biggest and most comprehensive climate change simulation experiment ever performed on the African continent (Engelbrecht, 2016 – personal communication). The spatial representation outputs from the CSIR model are therefore proposed to be applied to evaluate the impact of climate futures on the homogenous units in the CORB. The results present in some instances various percentiles (e.g. 10th, median and 90th). Since the percentiles are based on highly variable probabilities, it is suggested that the percentiles not be considered individually to determine the climate impacts (i.e. not 'different scenarios' to be considered), but rather that the range of variability be considered with the higher impact ranges applied as the situation to which interventions should respond. Above all, interventions should be considered regardless of which percentile the climate future probability is associated with.

The CSIR model simulated trends in annual-average near-surface temperatures (°C/century) over Africa for the period 1961–2010, calculated from CCAM downscalings of the following six CMIP3 GCMs integrated under the A2 SRES scenario:

- csiro;
- ukmo
- gfdl20
- gfdl21
- mpi
- miroc

Trends were calculated using the method of pairwise-slopes after interpolating the high-resolution model simulations to the 5° longitude × 5° latitude CRUTEM4v grid.

Model baseline climatologies for the period 1961–1990 (calculated at each grid point from the median of the six downscalings) are considered in the climate impact assessment for each homogenous unit. The climate impacts are considered in this document, within the boundaries of each of the selected 'homogenous units', by visually assessing the CSIR maps and reflecting on the climate impact that seem to be probable across the homogenous unit.

Therefore, the climate impact assessment include consideration of:

a) annual-average temperature (°C), annual-average maximum temperature (°C), and projected change in annual-average temperature (°C), for the time period 2071–2100 relative to 1961–1990;

b) annual-average number of heat-wave days (projected change in heat-wave days for the time period 2071–2100 relative to 1961–1990);

c) annual-average number of high fire-danger days;

d) annual- average rainfall totals (in mm) and projected change in annual-average rainfall for the time period 2071–2100 relative to 1961–1990; and

e) annual-average value of the Keetch–Byram drought index (this drought index being an international standard used to determine drought probability, with a value out of 10 – thus the closer to 10, the more critical the drought risk). The assessment includes where relevant the projected change in the seasonal cycle of the drought index over southern Africa and tropical Africa for the time period 2071–2100 relative to 1961–1990.

The analysis of observed trends in annual-average near-surface temperatures over the last five decades reveals drastic increases, particularly over certain parts of the CORB. The statistical relevance of the analysis over the Angola part of the basin is unfortunately less than over the Namibia and Botswana parts of the basin due to a lack of weather station measurements in the Angolan region. However, regardless of the statistical relevance, over some of the areas in the basin, temperatures have been rising at a much higher rate of temperature increase that what is globally observed.

The ensemble of high-resolution downscalings, obtained using a single regional climate model forced with the sea-surface temperatures and sea-ice fields of an ensemble of GCM simulations, is shown to realistically represent the relatively strong temperature increases observed in the basin. The amplitudes of warming are generally underestimated, however (*ibid*). Further warming is projected to occur during the 21st century, with plausible increases of 4–6 °C over the subtropics by the end of the century relative to present-day climate under the A2 (a low mitigation) scenario of the Special Report on Emission Scenarios. High impact climate events such as heat-wave days and high fire-danger days are consistently projected to increase drastically in their frequency of occurrence (*ibid*). General decreases in soil-moisture availability are projected due to enhanced levels of evaporation. The regional downscalings presented, and recent GCM projections indicate that annual-averaged temperatures may plausibly rise at about 1.5 times the global rate of temperature increase in the subtropics (i.e. the CORB included). These projected increases although drastic, may be conservative given the model underestimations of observed temperature trends (*ibid*). The relatively strong rate of warming, in combination with the associated increases in extreme temperature events, are key factors to consider when interpreting the interventions envisaged in terms of livelihood vulnerabilities. A focus on no-regret projects would be key to the success of livelihood vulnerability interventions.[3][4][5][6]

The region is acutely vulnerable to rainfall-related shocks with heavy dependence on agriculture (World Bank, 2017[7]). The poor are more exposed to weather extremes, they have less infrastructure to protect them from natural hazards, and their property is of lower quality, and thus is more likely to be damaged[8]. Therefore, climate resilient infrastructure will have a positive effect on the poor - especially women and girls - providing

3 https://reliefweb.int/map/angola/angola-drought-risk-4-nov-2013 (2013 study with spatial layers available: however poorer data)

4 https://theclimatedatafactory.com/search-results/?q=rundu (only for large cities or whole countries: not useful at basin/local scale)

5 http://www.bitri.co.bw/climate-change-division/ (academic? – projects: nothing usable yet)

6 Flood data seemingly available: http://globalfloodmap.org/Botswana however no downloadable info avail for mapping purposes

7 CRIDF report: **Poverty Diagnostic Report Okavango-Cubango River Basin**

8 Same as 11

better chances and access to health, education and to become more productive economically as time is saved, not spending enormous amounts of time travelling long distances to fetch water. The next chapters provide detailed analysis for each of the five homogenous units.

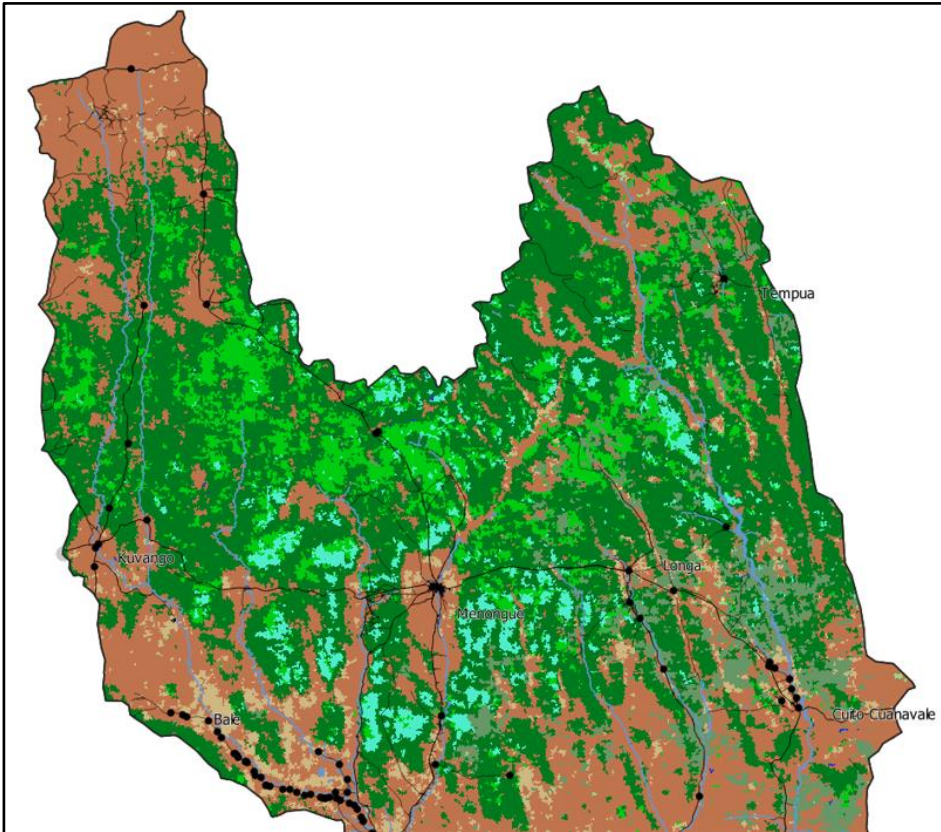# 3 Homogenous unit 1: Menongue - Far northern part of CORB

Figure 5 Map of Unit 1, showing land cover background (referring to land cover legend in Preamble, on page 1)

3.1 Socio-Economic

The area is predominantly populated by rural communities who reside either adjacent to the river or along roads. Populations are considered remote relative to the country's capital cities and main centres of economic activity and this is reflected in social development indicators in the basin that are lower than the national figures.

https://borgenproject.org/poverty-angola-causes-updates-statistics/Two-thirds[9] of people in Angola live with less than 2 dollars a day. 2016 Human Development index ranks Angola 149 out of 186 countries on the poverty scale since poverty permeates the entire nation. Poverty is greater in rural areas, which contain 38.5% of the population – with 94% of rural households categorized as poor.

Corruption is a major concern where channelling of available funds and economic benefits (forestry, mining, oil) existing in the region does not permeate to community-level.

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9 High level poverty details only for Angola – no regional/local scale https://borgenproject.org/poverty-angola-causes-updates-statistics/

3.2   Population

Angola has high infant mortality[10]. Many children do not have access to education, making future employment difficult. 34.6% people have unequal access to education, with 28.9% have an unequal income[11].

The rate of HIV/AIDS in Angola is lower than that of Botswana and Namibia and if this situation can be maintained, it could represent the start of a permanent demographic transition (OKACOM, 2011). As at 2012, already 68.2% of the population had knowledge and attitudes about HIV/AIDS in the Cuando Cubango province alone and at national level, HIV/AIDS prevalence among adults aged 15-49 was only 2.1%. However, OKACOM (2011) found that more than 40% people in the basin considered that access to health services was very poor, and besides AIDS, malaria was of greatest concern, with fairly high parasite levels present (4.9% malaria presence in the province). Access to sanitation in the Cuando-Cubango province was only 23.9% in 2012 (AfDB, 2017). Figures 6, 7 and 8 provide some key population and development indicators for Angola.
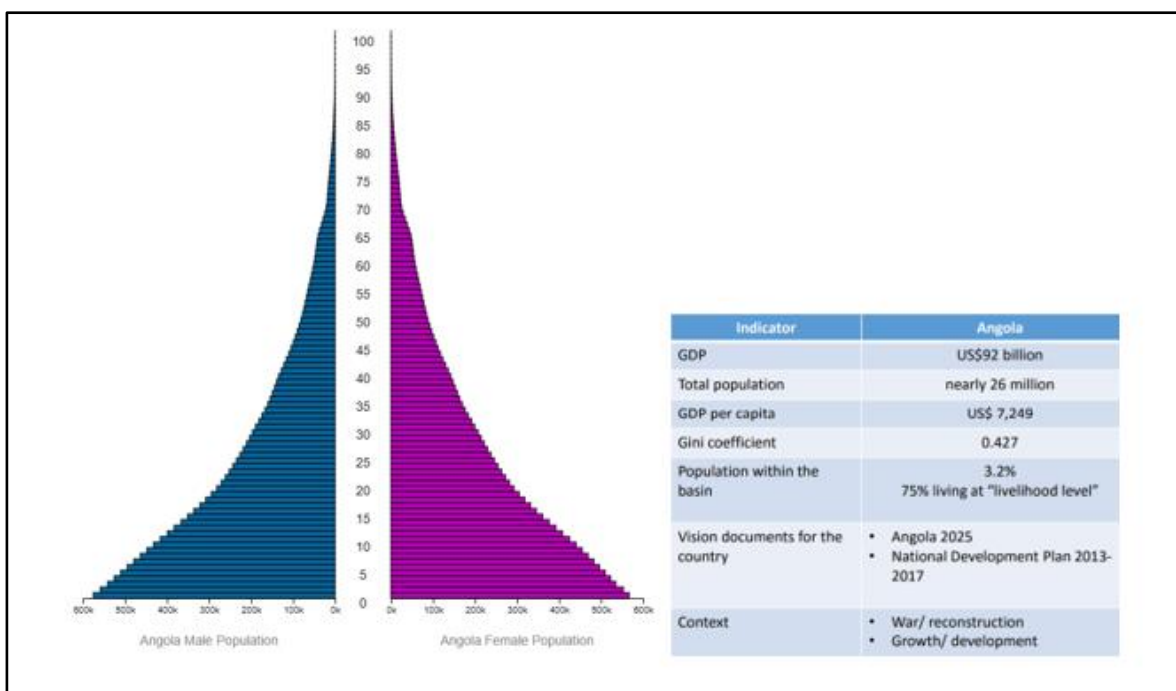

Indicator	Angola
GDP	US$92 billion
Total population	nearly 26 million
GDP per capita	US$ 7,249
Gini coefficient	0.427
Population within the basin	3.2% 75% living at "livelihood level"
Vision documents for the country	• Angola 2025 • National Development Plan 2013-2017
Context	• War/ reconstruction • Growth/ development

Figure 6 Angola's population pyramid and development indicators[1213]

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10 Virtually no 'local' stats are available – national stats were used

11 https://borgenproject.org/poverty-angola-causes-updates-statistics/

12 http://worldpopulationreview.com/countries/angola-population/

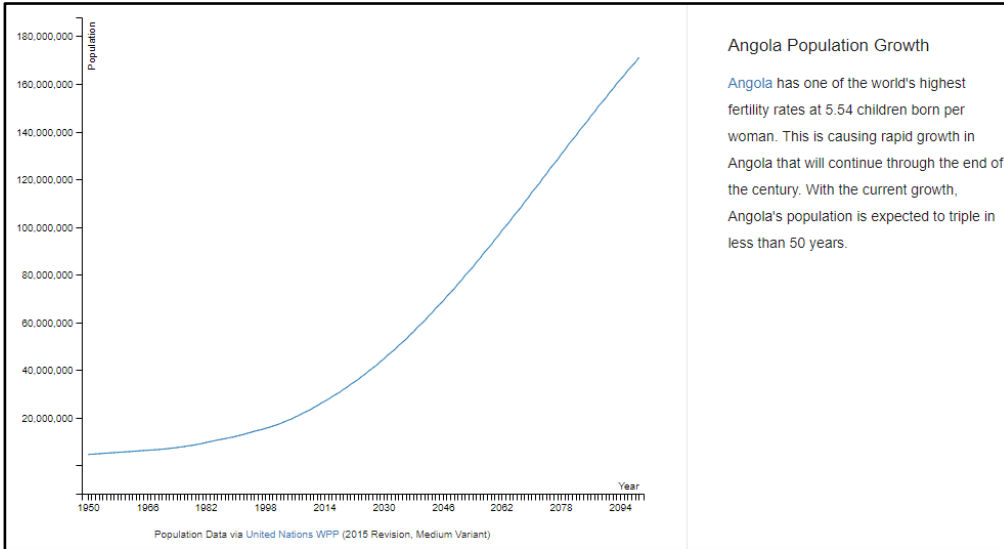13 https://www.unece.org/fileadmin/DAM/env/documents/2018/WAT/02Feb_06-07_BenefitsWS_Geneva/3.6_OKACOM_Chongica.pdf

Figure 7 Angola population growth

Figure 8 Angola population indicators

3.3   Infrastructure

Fewer than 4% of households have access to improved water supplies, far fewer than the 51% for the nation as a whole (OKACOM, 2011[14]). Only 24.7% of the Cuando-Cubango province had access to safe water in 2012[15]. The OKACOM (2011) survey revealed that over 54% of rural households in the basin relied on rivers as their water source, compared to 14% of urban households. In Menongue the capital of the Cuando-Cubango province, urban households use water holes or wells, rather than the river. As a result, a considerable amount of the population (38%) does not have access to safe water sources. Houses in the rural parts of the basin are predominantly made of wood, mud and grass, and the people are more dependent on wood and charcoal for fuel, and less likely to have access to electricity, than in the country as a whole.

There is relatively reasonable access to markets urban areas/services via road network, although large areas away from roads remain difficult to access. The presence of landmines across this unit is a challenge and risk. There is a very low electrification rate in rural areas of Angola, with only 6% of rural households having access to electricity (ibid) compounded by poor access to clean water and sanitation and high illiteracy rates (ibid). Access to electricity in the Angolan part of the basin (Cuando-Cubango) in 2012 was only 9.9% and child labour was 33.4% (AfDB, 2017).

With no running water or proper infrastructure for sanitation, disease runs rampant. Diarrheal diseases, cholera, measles and diphtheria are just a few such illnesses (ibid). Consequently, the mortality rate for children under five is around 17% (WHO, 2009). According to the World Health Organization, there were over 2,000 cholera outbreaks in 2009. Yet, there was only 1 doctor available for every 10,000 people. As a result, countless families lack access to vaccines or clinics to treat these diseases (ibid).

In recent years, there have been successful reconstruction programmes, including roads, airports, bridges, hospitals and schools. Although the Angolan government is beginning to make progress towards rebuilding, the answer for widespread poverty alleviation lies within the ruling party and channelling the revenue from the oil industry into the hands of Angolan's themselves (ibid). Notwithstanding these efforts, there are challenges of inadequate rural agricultural infrastructure (e.g. feeder roads, irrigation systems, and unreliable electricity supply), low use of yield enhancing inputs and technologies, lack of skills, limited access to credit, weak research and extension services for support to farmers and inefficient land management systems drive low agricultural productivity.

3.4   Environmental

The Cubango-Okavango Basin comprises approximately 700,000 square km but derives its principal flow from 120,000 square km of sub-humid and semi-arid rangeland in the Cuando Cubango Province of Angola. This is where this homogenous unit is primarily focussed.

Significant deforestation is prevalent in this unit[16], which severely impact the rest of the basin downstream. Deforestation also contribute to ecological losses, increased flood risk downstream, climate change (reduced carbon sequestration). Significant land degradation is of concern, in part related to forest loss but also related to land use practices. Erosion (and thus potential downstream siltation/sedimentation) risks are high, related to deforestation, land degradation and relatively steeper slopes.

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14 Cited in CRIDF poverty diagnostics report for OKACOM

15 http://angola.opendataforafrica.org/

16 Noting the World Bank's Resilient Livelihoods Enhancement Programme illustrated in an older map (although presented in Geneva in Feb 2018 - shows less deforestation than latest satellite image used for the mapping overlay (https://www.unece.org/fileadmin/DAM/env/documents/2018/WAT/02Feb_06-07_BenefitsWS_Geneva/3.6_OKACOM_Chongica.pdf).

There is already a fairly high fire risk in tree and brush-covered areas with the fire season mainly during winter time. Such runaway forest wildfires contribute to forest canopy loss. There are virtually no formal reserves/protected areas in this unit, therefore this is a critical gap in the basin's ecological regime and require addressing. Moreover, alien invasive species presence is unknown at this stage, and might increase fire severity.

3.5   Transboundary impacts

The unit has no direct boundary link yet still has a *significant* downstream impact on the rest of the basin. Consequently, whatever happens in this area will determine the future of CORB in totality.

3.6   Climate future

Rapidly rising surface temperatures (of between 2 and 3 °C) from the baseline can be expected, based to some extent on the prevalence of higher soil moisture due to tree cover/forest. With forest loss, temperatures may increase further. Annual maximum temperature expectations are around 26-30 °C. There is no significant fire danger index increase (i.e. in the annual number of high fire-danger days) – however, that is related to the forest/tree cover: if the tree cover (and subsequent near-surface moisture) reduce significantly, the fire risk may increase further. Not much change is expected in rainfall (between 800-1200mm in general) and heatwaves are expected to remain similar as current, however the hottest days/max temperatures that can be expected are to increase: around 4-6 °C maximum temperature increase can be expected. There is a fairly low drought index (compared to the other units in the basin) of between 6 and 7.5 (again based on forest land cover remaining in existence) (a value of 8 and above indicate more severe drought risk).

There does not seem to be significant change in seasonality or 'timing' of the seasons. "General drying (in terms of the index) is projected across the continent, even for areas (e.g. tropical Africa) where an increase in rainfall is plausible. This is due to the increases in temperature that are projected, which leads to drier soils (through enhanced evaporation) despite the rainfall increases." If this trend continues in current forest loss the future for this unit looks very bleak (Carvalho et al, 2016[17]) and UNDP[18].

Climate change is expected to have a major impact on the world's environment, economy and society, especially in African countries such as Angola due to the dependence of many vital sectors on climate variability (e.g. agriculture) and their low adaptive capacity (Carvalho et al, 2016). With the advances in the availability of climate model data sets provided by programs such as the CORDEX, Angola can benefit from studies on future climate change using high-spatial-resolution data, which have previously been absent for this region. The study on projected changes in temperature and precipitation over Angola during the 21st century was based on four regional climate models (RCMs). The spatial and temporal changes were analysed using a high- and medium-low radiative forcing scenario to consider the uncertainty in greenhouse gas emissions. Changes in the average annual precipitation, average annual temperature and a drought index are studied for short-, mid- and long-term projections (ibid). Compared to the reference period, relevant changes are projected in temperature and precipitation indices for the different models under both emission scenarios. These changes include an increase in both the maximum and minimum temperature of up to 4.9 °C by the end of the century and an intensification of droughts. The precipitation projections are highly variable – increasing and decreasing – across the region and dependent on the RCMs. Despite these differences, the precipitation generally decreases over time (approximately −2% by 2100), with the southern region experiencing a stronger decrease in precipitation (*ibid*). Further investigation is needed to minimize projections uncertain, as the annual

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[17] https://rmets.onlinelibrary.wiley.com/doi/abs/10.1002/joc.4925

[18] http://adaptation-undp.org/explore/middle-africa/angola

mean precipitation was overestimated by three of the RCMs (especially in the northern coastal units). Overall, these projected changes in climate can have important implications for the future of Angola, because they are expected to magnify existing problems, thus creating new risks for human and natural systems (*ibid*).

3.7   Understanding the vulnerabilities

There is a prevalence of compounding challenges in this unit – comprising poverty, ineffective/inappropriate land use management, low levels of land use planning from a governance perspective, and no control over deforestation/slash-and-burn regimes. There will be significant impacts if forest/tree loss occurs, which could swing vulnerability to drought, temperatures and increased fire risk *drastically* in this area, with subsequent *severe* negative impacts downstream. Lack of attention in this unit will spell *disaster* for the entire basin.

3.8   Potential suitable technologies/interventions

- CRIDF: Further investigation is required to determine livelihoods water infrastructure options to address the social (largely health related) vulnerabilities that persist in the unit. Reforestation interventions (linked to water infrastructure support) could also be considered, given that it is a key need for the entire basin related to this unit.
- UNDP: Creating awareness and education on reforestation might be a useful starting point given the impact of deforestation. Interventions might further consider fire mitigation to reduce runaway wildfires.
- EU: Considerations on land use/land degradation interventions is needed in order to reduce the impact of fires. This might require and include fire burn practice analysis aimed at changing behaviour. These interventions might also entail the implementation of firebreaks.
- TNC: Within the nature reserve establishment the key interventions might include fire break implementation and training of fire-monitors in order to improve response mechanisms when there is a firebreak.
- Other: Given the prevalence of land-mines in the unit, de-mining is required in order to support access to land and water in the unit. However, the presence of landmines is possibly protecting the area from further deforestation, hence, any de-mining should be accompanied by community sensitisation on the importance of reducing deforestation.

4 Homogenous unit 2: Cuangar/Calai/Rundu - Angola/Namibia border sharing
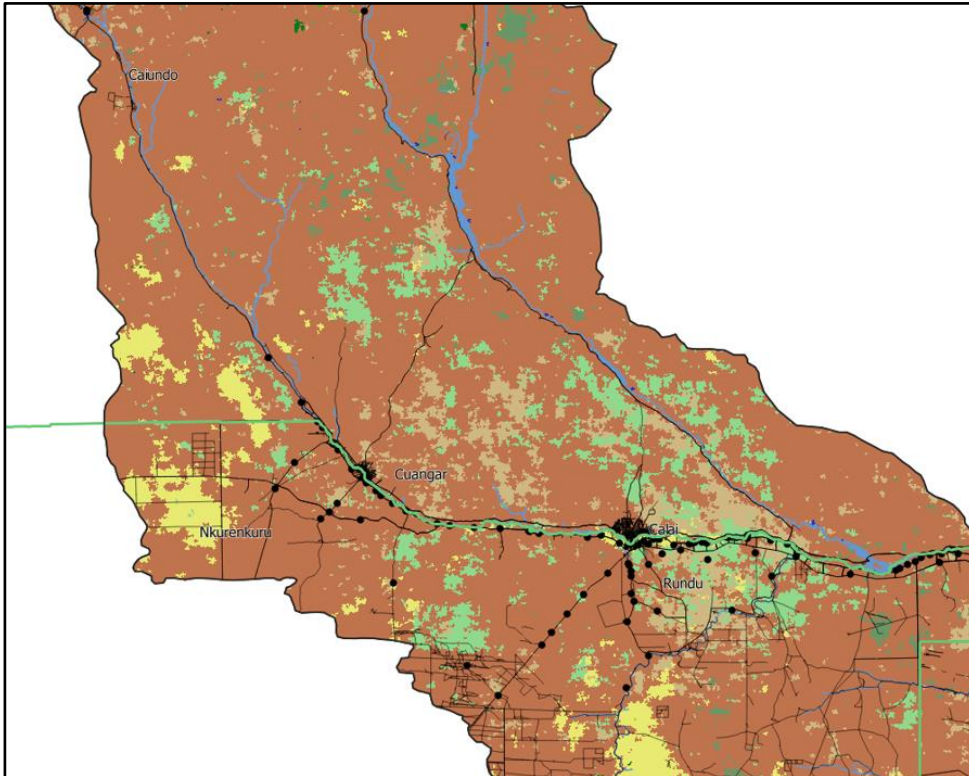
Figure 9 Map of Unit 2, showing land cover background

4.1 Socio-Economic

This unit is similar to the Angola narrative in unit 1 and also linked to the Namibian narrative presented in unit 3. The area comprises a largely very poor population, with significant food insecurity although relatively better services along main routes and rivers.

There is cross-border flexibility to the inhabitants of this area, especially along the border river area where there is virtually 'no border' and thus the design of interventions have to consider this borderless-ness. The Namibian side of the river reflects by far the highest headcount rate for poverty in the country (28-to 53% poverty rate[19]). Although no similar data exist for Angola, the same is expected due to the relatively flexible border.

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19 https://www.npc.gov.na/?wpfb_dl=225
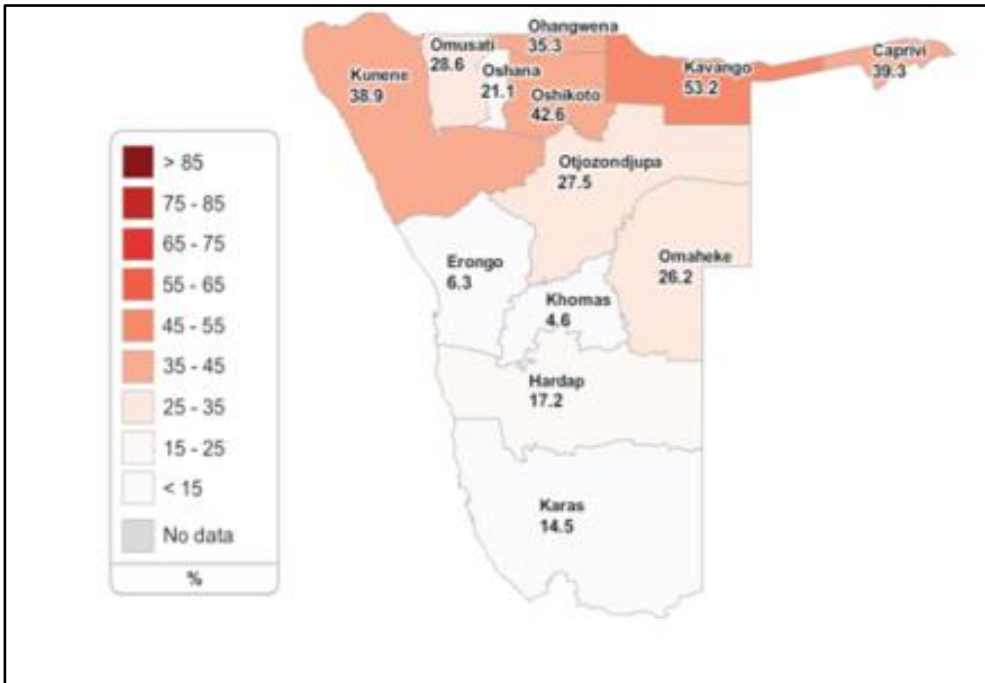
Figure 10 Namibia poverty headcount rate – upper bound poverty line (2011[20])

Since the best available descriptive information for the homogenous unit is for area south of the river (Angola-Namibia border), the situation is expected to be similar north of the river: With the exception of Rundu Urban and Rundu Rural West constituencies, in all the constituencies in Kavango region more than half of the population is poor. Although the literacy rate is high, at 79%, 18% of the population 6 years and above have never entered formal education while more than one third (35%) of those aged 15 years and above have not completed primary education. 61% of those aged 15 years and above are in the economically active category. However, only half are employed, resulting in 50% unemployment.

A 2012 UNDP Human Development Report indicates that Namibia has one of the highest inequalities in the World with a gini-co-efficient of 0.625. A comparison with other countries in the sub-region and beyond (Botswana 0.61, Angola (0.586) and South Africa (0.578) clearly shows that Namibia suffers from inequality more than her neighbours (UNDP 2012; UNCTAD, 2014). Poverty in Namibia continued to exhibit an urban-rural divide.

Unemployment is highest in Rundu Rural East, Kapako and Mashare constituencies (NPC, 2015:28) whilst subsistence farming is the main source of income, involving 43% households in the region. The only exception to this is Rundu Rural West and Rundu Urban constituencies where 39% and 55%, respectively, of the population cited salary and wages as the main source of income (ibid). Therefore, the agricultural sector is the main source of employment, accounting for 60% employment in the region. Unemployment is highest in Rundu Rural East, Kapako and Mashare constituencies (ibid). There is largely agro-pastoral reliance in Namibian side of the border[21].

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20 same as 28 above

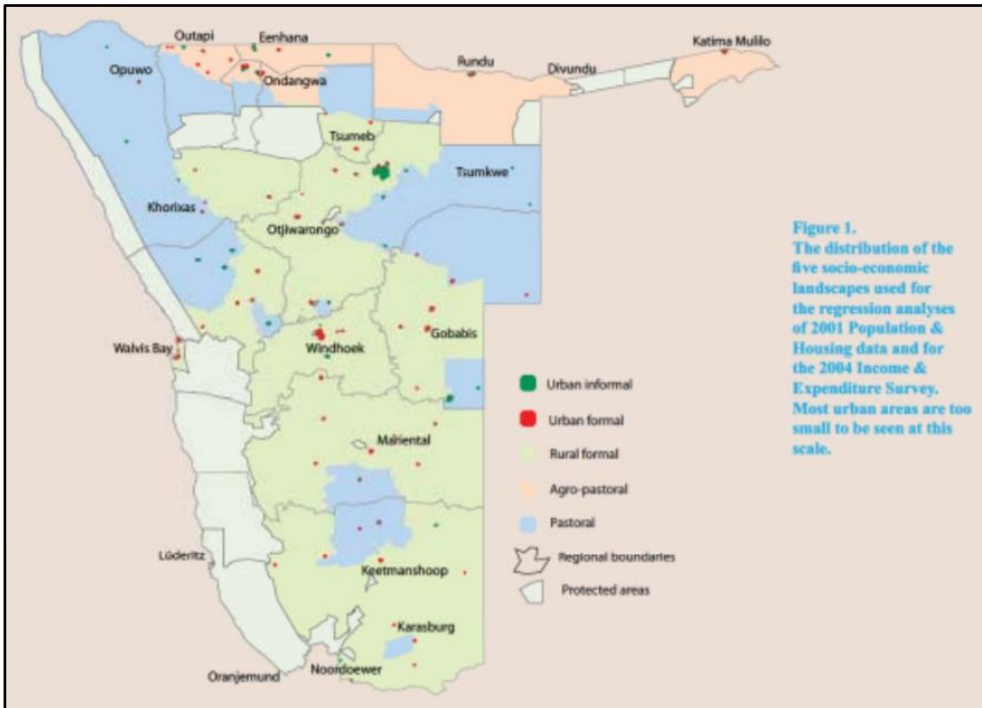21 http://www.un.org.na/home_htm_files/NPC-Summary%20Report.pdf

Figure 11 Distribution of socio-economic landscapes in Namibia[22]

4.2   Population

Details in Homogenous units 1 (for Angola) and 3 (for Namibia) are relevant to this unti, since it is a combination of the two countries. Kavango is the fourth most populous region in the country with a population of 223 352, accounting for 11% of the total national population[23]. An estimated 71% of the population lives in rural areas (NPC, 2015). Of the estimated 568 418 poor people in Namibia, 21% are found in the Kavango region, (ibid; see also[24]).

That 70% of the 20 most health deprived constituencies (most of which fall within the Kavango region) and having one third of their population being poor, is indicative of the problems that the poor face in gaining access to quality health services. This makes the Kavango region one of the most health deprived regions in Namibia.

4.3   Infrastructure

The northern and very southern area of unit has significantly poor accessibility. However, along the border, there is reasonable access to markets urban areas/services, even though roads may be in poor condition. In November 2015, CRIDF undertook a scoping mission to the Southern parts of Angola in the KAZA area known as the Kwando River WDA. It was found that there in urgent need from the government of Angola to intervene in this area socially and economically. Figures below show the condition of and access to services such as water and electricity. Moreover, local roads leading to the Kwando River WDA are in a bad state - it is virtually impossible to travel without 4x4 due to excessively sandy conditions. These conditions create logistical

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22 http://www.raison.com.na/Atlas%20of%20Poverty%20in%20Namibia%20HIGH%20RES.pdf

23 same as 29

24 http://www.raison.com.na/Atlas%20of%20Poverty%20in%20Namibia%20HIGH%20RES.pdf

difficulties and movement in and out of the area. This also limits the participation of local people to actively participate in any economic activity.

Figure 20.
The proportion of households in Caprivi and Kavango that did not have access to safe water in 2001.

Most of the homes that do not use treated or borehole water are located close to the Okavango and Zambezi Rivers, as well as to channels of the Zambezi that cross the eastern floodplains. Large numbers of people suffer from bilharzia because of their use of water from these rivers.

Away from the rivers, most rural homes use water from boreholes which is usually clean and safe to drink. Most people in both formal and informal areas of Rundu and Katima Mulilo have access to clean water.

Figure 3 Percentage of households having unsafe drinking water[25]

Figure 27.
The proportion of households in Caprivi and Kavango that used wood for cooking in 2001.
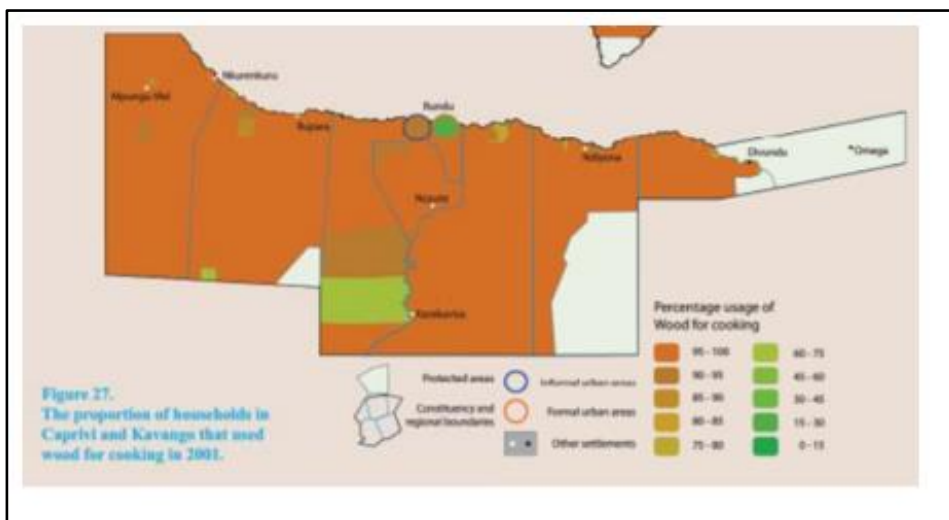
Figure 43 Proportion of households in Kaprivi and Kavango that used wood for cooking

Almost all rural households in these two regions rely on wood for cooking. The same is true for informal homes in Rundu and Kavango and it is only in formal housing areas that other fuels are used to a significant extent. Since there is no specific statistics data available for the northern part of the unit above the border, the same (or worse) situation is expected to be the case above the border.

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25 http://www.raison.com.na/Atlas%20of%20Poverty%20in%20Namibia%20HIGH%20RES.pdf
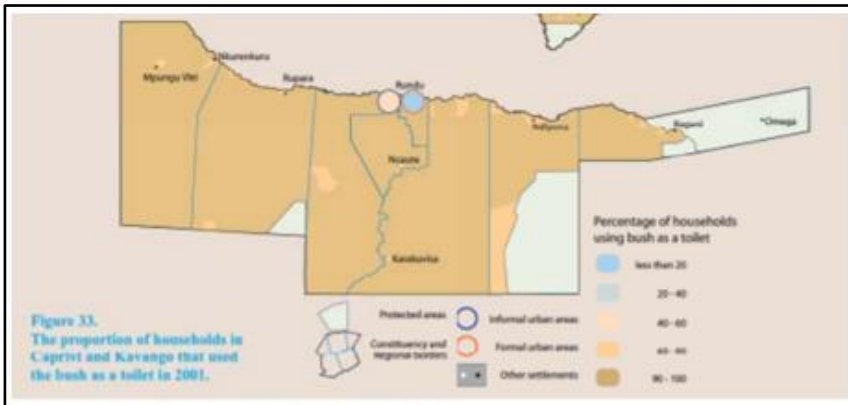
Figure 54 Proportion of households that used bush as toilets

Almost all households practice open defaecation (using the bush as a toilet).

4.4   Environmental

The unit is characterised by Savannah ecology with high wildfire rates towards the northern part of the unit (this correlate with AFIS online[26]).

There are virtually no formal reserves/protected areas in this unit, hence there is no protection of the Savannah biome. Deforestation and water pollution along the river is a concern. Along the river, there are Human Wildlife Conflicts (HWC), and there are flooding concerns towards the west of the unit.

4.5   Transboundary impacts

The unit has a direct transboundary link, therefore whatever is done on one side of the river must consider communities on the other side, to ensure sustainable impact.

4.6   Climate future

Significant average temperature increases are expected, between 4 and 6+ °C, to above 34 °C on average - especially around the central area along the river/border. This spells increased risk of fires in the same area along the river, as the temperature increases. The situation may impact fish resources and cause drying up of water supporting fish harvests, thus contributing to food insecurity or even complete loss of hydro-agriculture/fish farms. Heat wave increases can be expected especially towards the southern area in the unit. Rainfall is expected to be around 400-600mm per annum, and associated with high evaporation rates (due to temperature rise) especially if Savannah land cover is lost. This will have an impact on agricultural practices and asks for change in crop types that require less rainfall and a shorter growing season. The drought index is around 8.5 – 9 (out of 10): a very high indicator, although not the highest in the basin (noting unit 3 has the highest). This will have major implications on crop farming due to high future probability for inconsistency and ability to produce crops. It also impacts on herds, hence, needs to be taken into account land use management practices, policies and planning. This could be challenging given the longstanding cultural-behavioural practices.

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26 https://southernafrica.afis.co.za/

4.7   Understanding the vulnerabilities

Future food security due to drought impact is expected to be severe. On the other hand, there is already high reliance on non-agricultural/land-based food crops due to existing high risk of crop failure as a result of already lower rainfall, higher temperatures and heat waves in recent years. Peri-urban growth in this unit is also anticipated to contribute to significant socio-environmental challenges[27]: with rapidly growing populations residing near the river, and without adequate water supply facilities, water contamination and resultant waterborne diseases (including in downstream communities) is high.

There is a risk of political instability due to border-crossing and 'entering others' territory'. This is most prevalent with regards to accessing fish resources.

4.8   Potential suitable technologies/interventions

- There are some existing projects in Angola (north-east area along the border with Namibia[28]) with regard to flood management and mitigation.
- CRIDF: There is an opportunity for water resource management for sustainable use of the resources along both sides of the river. This comprises both peri-urban water supply schemes on both sides of the border, and irrigation interventions (with CRIDF already in the final design stages of the Mayana Community Irrigation scheme in northern Namibia).
- UNDP: There is potential for agricultural interventions especially dryland farming where crop adjustments should be suited to lower rainfall. Another option to consider is fish farming although it has challenges if water sources decline. The same applies for animal rearing/husbandry, where there is need, so that such farming adjust farming practices including reduction of herd sizes.
- EU: Interventions for landuse must take into account the future drier, hotter, low-rainfall drought outlook within the unit and design appropriate and sustainable uses.
- Other: The savannah land use is susceptible to fires so there is need to compile fire breaks especially in the northern part of the unit.

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[27] As identified in Inception Workshop on 13th April, but limited data available to corroborate this

[28] https://www.usaid.gov/results-data/success-stories/protecting-cunene-province-severe-climate-change

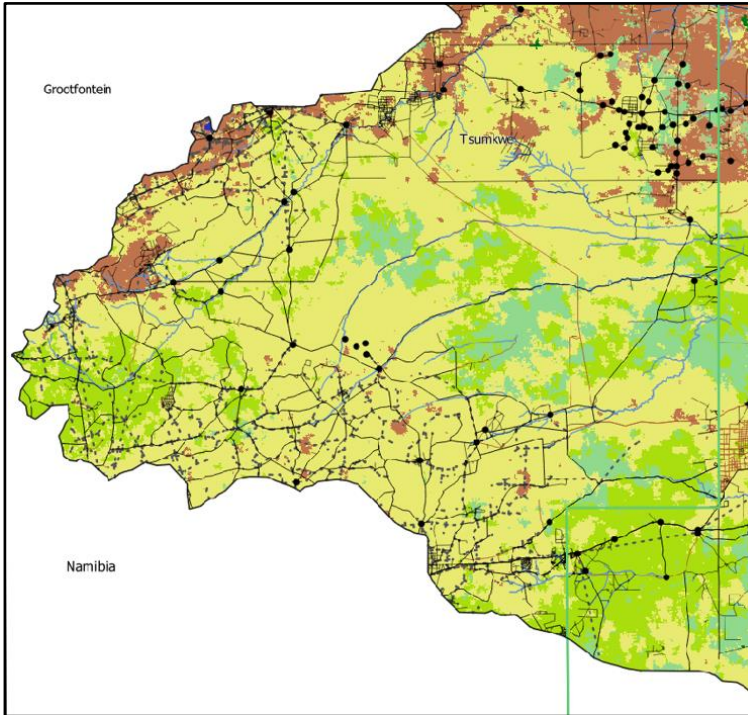# 5 Homogenous unit 3: Tsumkwe - 'Dry' Namibia/Botswana

Figure 65 Map of Unit 3, showing land cover background

5.1 Socio-Economic

The unit is fairly sparsely populated, and populations are generally very poor. Food security is a concern, but further clarity needs to be sought on the type and scale of predominant farming practices (e.g. subsistence farming, herd sizes and grazing patterns, etc.).

This unit includes largely the 'Otjozondjupa region' in Namibia: Although Otjozondjupa region is known for its potential for large scale commercial farms, the main source of income is salary and wages (60%), with agriculture, business and pensions jointly constituting the main source of income for 10% of the population. 72% of the population is economically active and of these, 37% are unemployed[29]. At 27.5% (39 573), the poverty headcount rate is slightly above the national average, while the rate of severe poverty is estimated at 14.9%. Poverty is highest in mostly rural constituencies characterised by subsistence farming (ibid). At the 2011-time point, Tsumkwe was the poorest constituency, with a poverty headcount rate of 65%, representing a marginal decrease of 1 percentage point from 2001, while the least poor constituency is Otjiwarongo with a poverty headcount rate of 17%. Tsumkwe constituency also has the lowest literacy rate, at 58%, with more than one third (36%) people aged 15 years and above having never attended school. The labour force is estimated at 69% of the population and more than half (52%) of this group is unemployed.

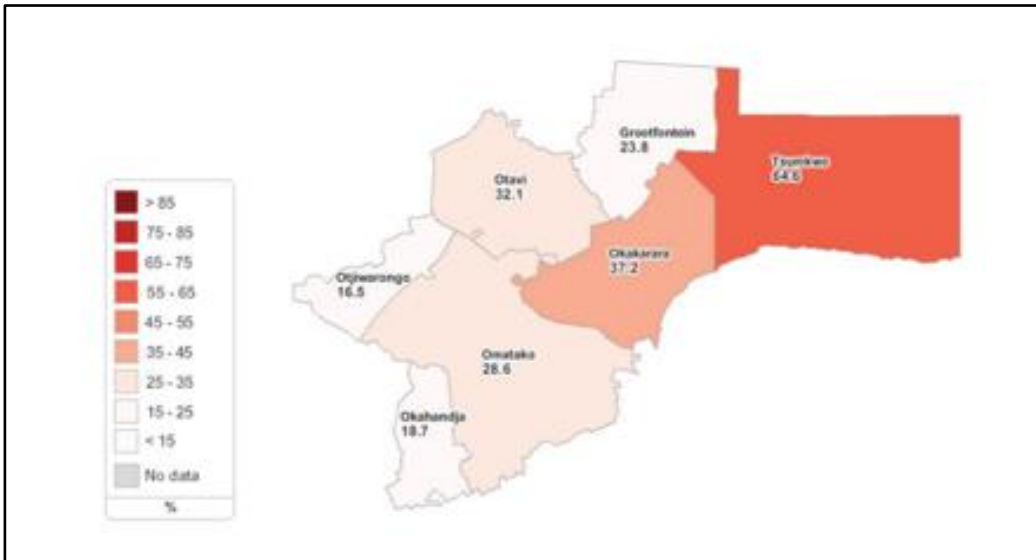29 https://www.npc.gov.na/?wpfb_dl=225

Figure 76 Otjozondjupa region poverty headcount rate 2011 (upper bound poverty line)[30]

Communities are largely pastoral reliant (herd-counts being an indication of 'wealth', with not much reliance on agricultural crops[31]). Land in the unit is largely held in communal tenure.
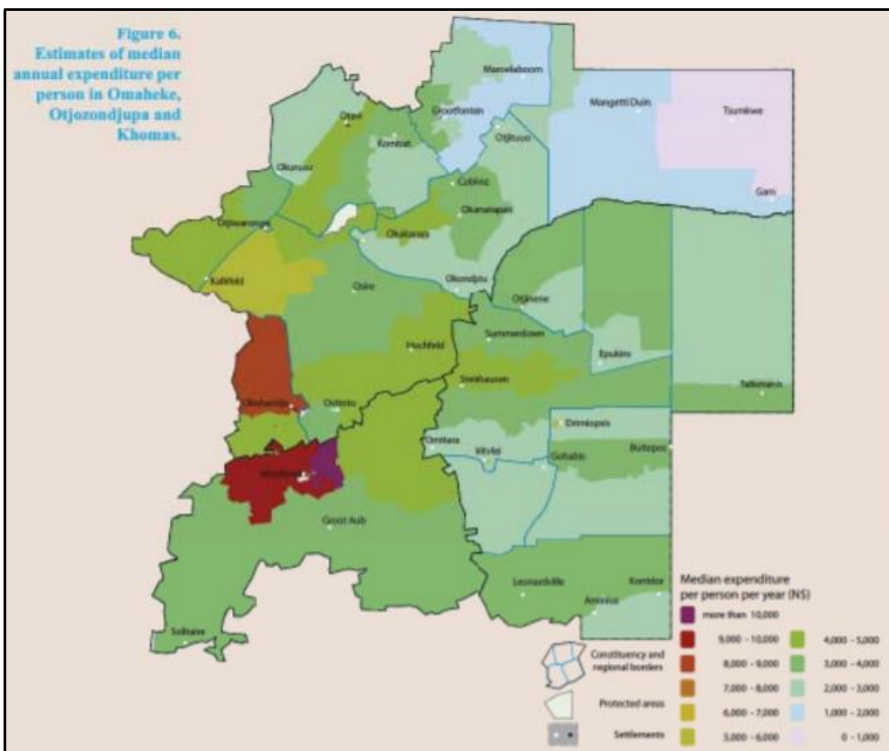

Figure 87 Estimates of median annual expenditure per person

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30 Same as 38

31

5.2   Population

Indicator	Namibia
GDP	US$10 billion
Total population	roughly 2.5 million
GDP per capita	U$ 10,754
Gini coefficient	0.613
Population within the basin	9.2% 60% living at "livelihood level"
Vision documents for the country	• Vision 2030 • National Development Plan • Harambee Prosperity
Context	• Sustained economic growth, increased income equality, employment creation

Figure 98 Population and development indicators

Between 2001 and 2011, in the Otjozondjupa region, the population grew at an average rate of 0.6% per annum. Over the past decade the region has experienced rapid urbanization, with 54% of the population currently living in urban areas, compared to 41% in 2001. This trend continues unabatedly. The region has a relatively young population, with an estimated 36% of the population being under 15 years of age. 95% households have access to safe drinking water and 56% use electricity for lighting[32].Literacy is high (83%) – despite Tsumkwe constituencies extremely low levels noted above. The most significant differences in levels of education are between rural and urban areas with few differences between informal and formal urban areas. Figures hereafter show the larger area around the unit - indicating the lower rate of schooling in the unit (top right side of the map) as compared to other areas.
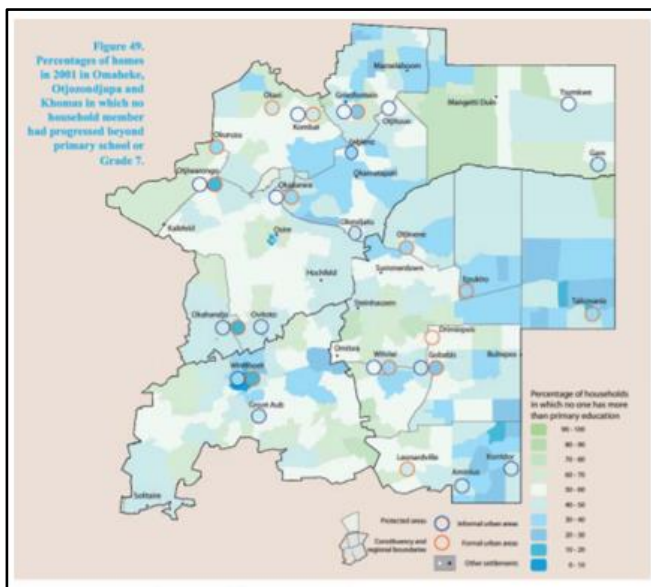
Figure 19 Percentages of households in which a member progressed beyond primary school[33]

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32 https://www.npc.gov.na/?wpfb_dl=225

33 http://www.raison.com.na/Atlas%20of%20Poverty%20in%20Namibia%20HIGH%20RES.pdf

5.3 Infrastructure narrative

Although there are no large cities or big towns, the unit is characterised by being fairly well connected with reasonable access to markets urban areas/services, in comparison to more other areas in units 1 and 2 of the basin especially.

The great majority of homes in the unit use safe water for drinking because it is pumped from boreholes. In addition, most larger towns have pipeline networks that distribute treated water.
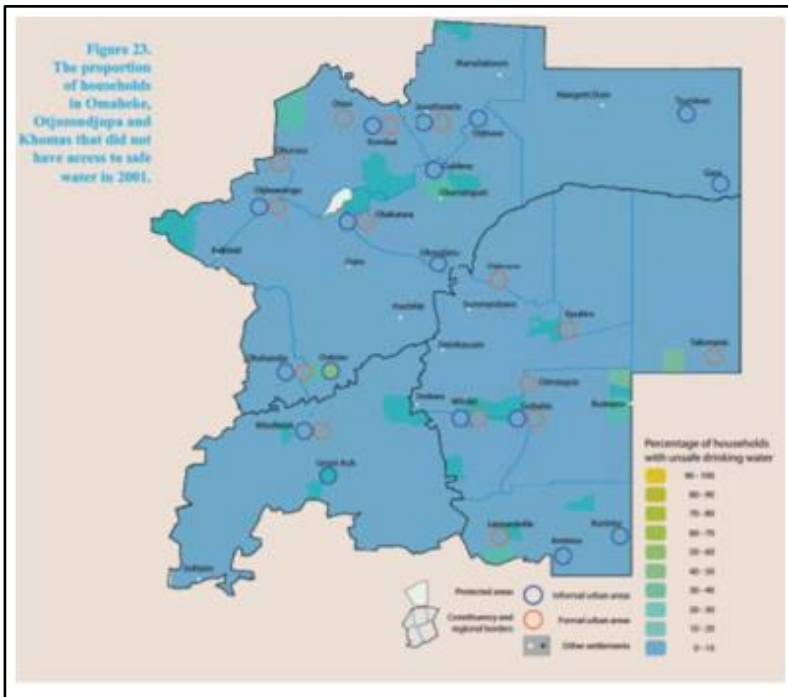
Figure 20 Proportion of households without access to safe water[34]

People who live in communal, informal urban areas use considerably more wood for fuel than those in formal housing due to poor electricity supply.

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34 http://www.raison.com.na/Atlas%20of%20Poverty%20in%20Namibia%20HIGH%20RES.pdf
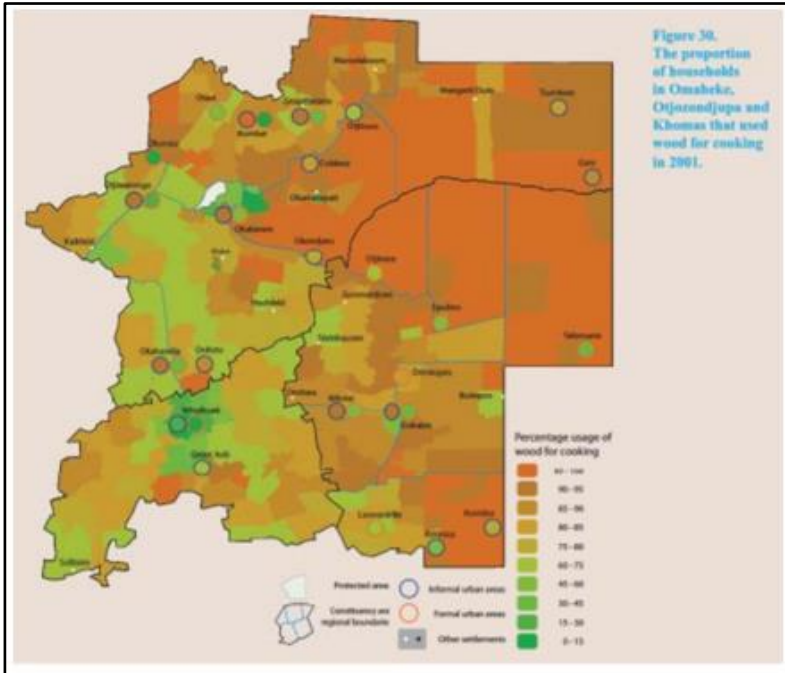
Figure 101 Proportion of households that use wood-fuel[35]

Problems related to poor sanitation are often more severe near densely populated informal settlements due to insufficient WASH infrastructue.
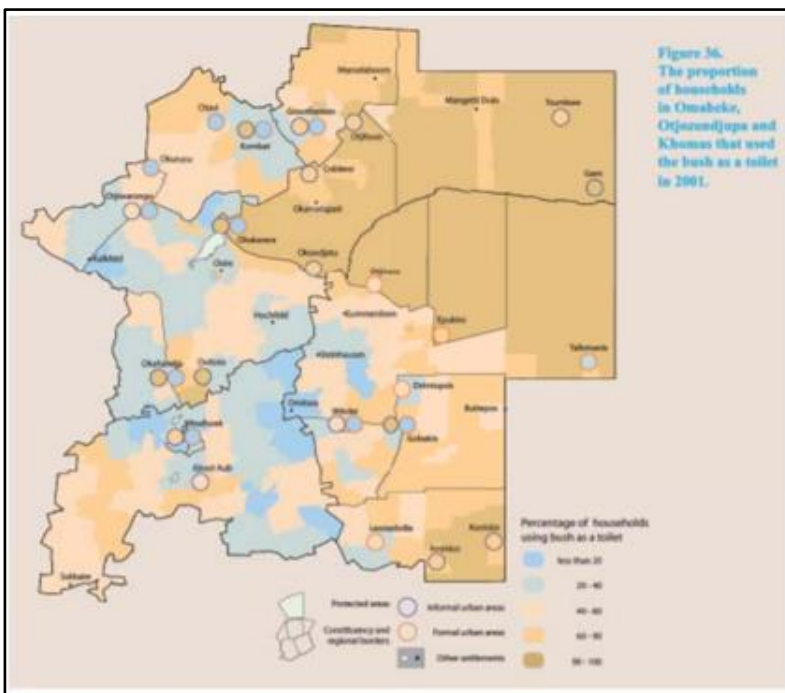
Figure 112 Proportion of households that used the bush as toilet

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35 same as in 43

5.4 Environmental

The dry shrubland, grassveld and desert-like areas are susceptible to high wildfire rates – similar to unit 2. The map below shows the vegetation biomass of Namibia as a whole, however it is clear that the very high biomass areas (in the green spectrum) relate largely to this unit. This biomass is highly sensitive to climate change noted hereafter (Section 5.5).
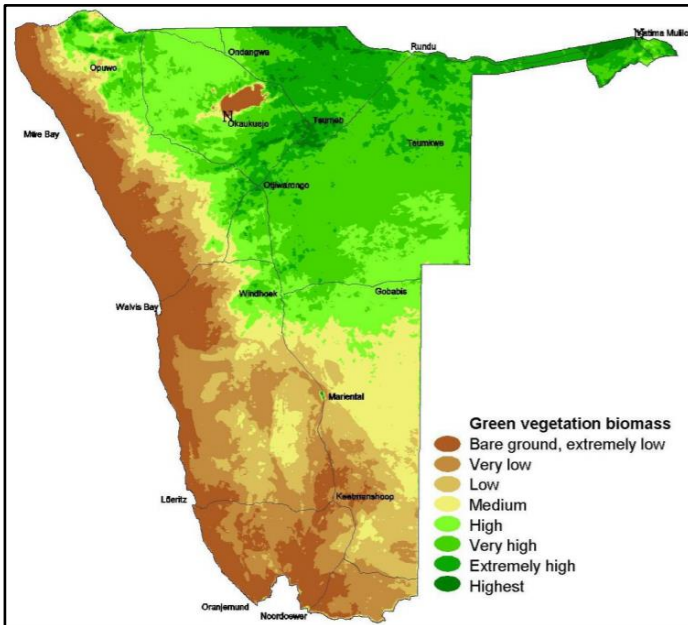
Figure 23 Map showing green vegetable biomass in Namibia - unit 3 being in the green area

Rainfall figures reflected below are expected to reduce drastically in future climate regimes[36].
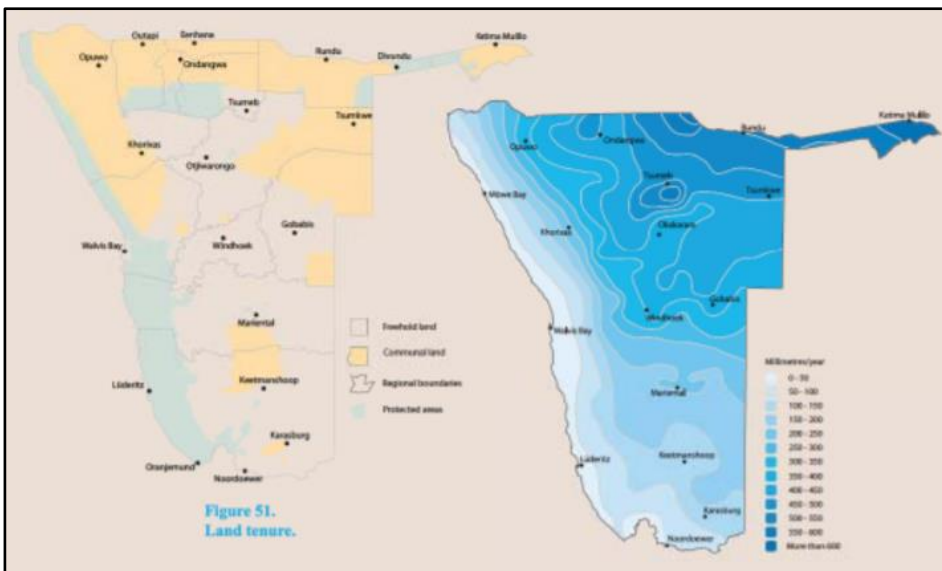
Figure 12 Land tenure and Rainfall patterns

36 http://www.adaptation-undp.org/sites/default/files/downloads/namibia_nationalclimatechangepolicyfornamib.pdf

Figure 135 Average rainfall and soil fertility[37]

There are reserves/protected areas in the unit, supporting some tourism-related economic activities. Future climate change may affect these areas, making it significantly drier – however, it is not expected to affect the tourism industry significantly, given much of this industry is dry-landscape based.

5.5 Transboundary impacts

Any intervention near the Namibia/Botswana border should consider implications on neighbouring border communities.

5.6 Climate future

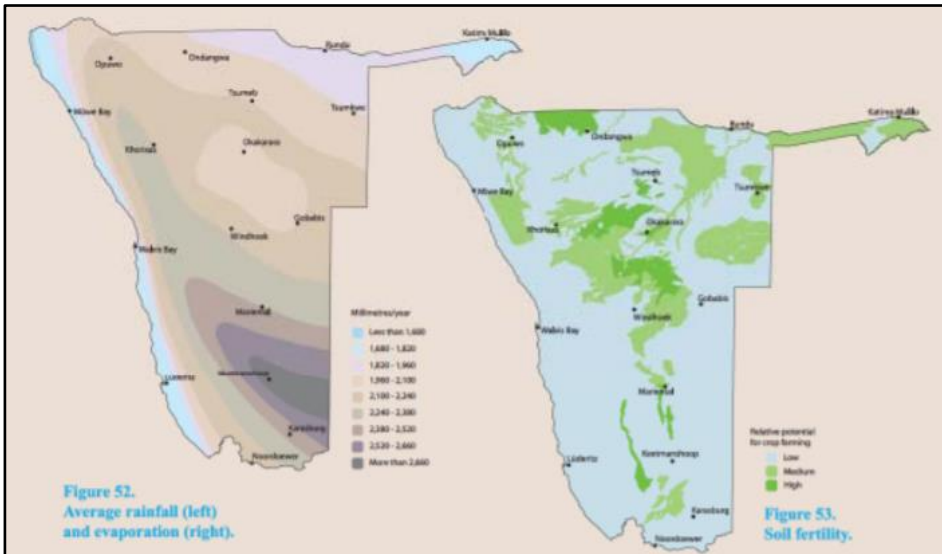Whilst the climate change projections might appear similar to unit 2 above, they are actually anticipated to be worse. The unit is expected to experience significant temperature increases above 34 °C across the unit. In some areas the temperatures will rise by approximately 6 °C higher than current, thereby increasing risk of fires substantially There is a major drought risk and resultant food insecurity with loss of crops/herds.

There is expected heat wave increase across the unit whilst there is also significant expected reduction in rainfall in some areas less than 100mm per annum (worse as one moves towards the south of the unit). This also has a net effect of high evaporation rates. This then has an impact on agricultural practices where there will be need for change to options that require almost zero rainfall (i.e. irrigation). The unit's drought index goes up to as high as 9+ (out of a possible 10) – the highest in the basin.

5.7 Understanding the vulnerabilities

Future food security and total desertification risk in this unit is a primary concern. Although population densities are lower, the challenges that they face makes them severely vulnerable to climate change.

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37 http://www.raison.com.na/Atlas%20of%20Poverty%20in%20Namibia%20HIGH%20RES.pdf

5.8   Potential suitable technologies/interventions

CRIDF: Key intervention entail water resource management for irrigation in the long-term which might require pipeline/borehole construction to augment and support crops. This might extend to support land cover interventions aimed at reducing bare soil which catapults desertification.
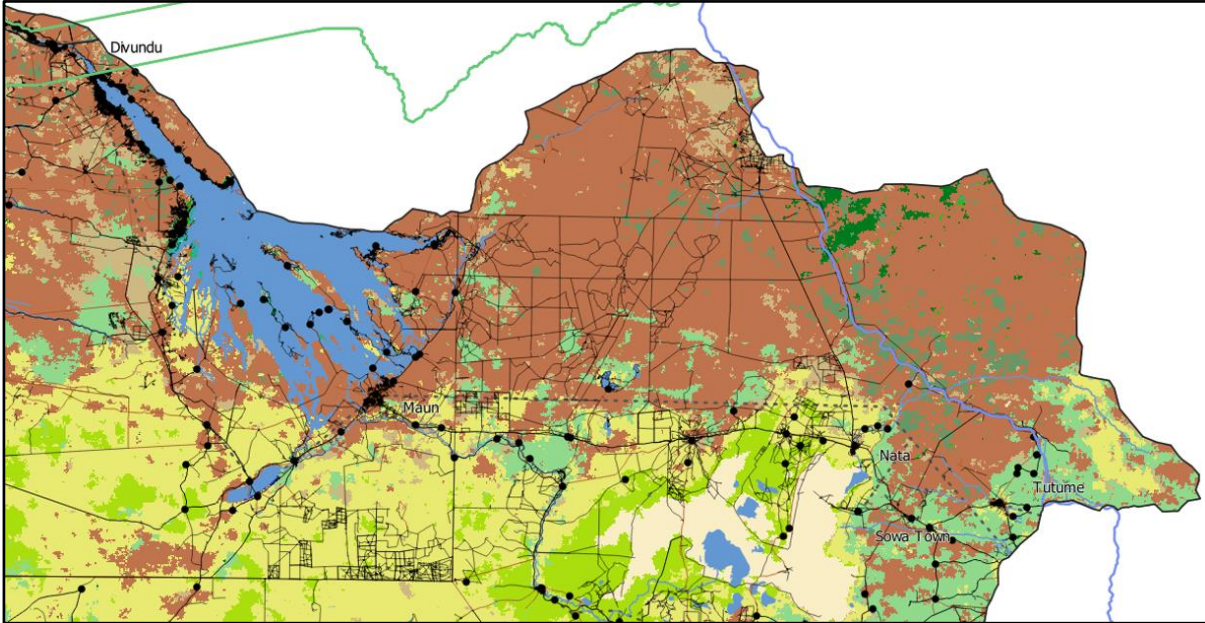
6 Homogenous unit 4: Maun - Delta and surrounds

Figure 146 Unit 5 Map, showing land cover background

6.1 Socio-Economic

The highest poverty pockets in Botswana are found in the more remote regions, which are almost entirely rural – this homogenous unit reflect that remoteness and the poverty details are applicable to this area. The greater portion (over 80%) of the Okavango-Cubango basin in Botswana falls within the North West region of the country – where this homogenous unit is situated. Hence, the statistics available cover this region on the parameters of interest for poverty diagnostics (health, education, standards of living). The unit consistently has the highest shares of poor and vulnerable in Botswana where 30.1% of the region's population was considered poor whilst 26.5% was deemed vulnerable (World Bank, 2015[38]). The poverty is only a little bit less severe than in units 1 and 2, for example (i.e. Angola part of the basin) – largely due to tourism activity – however, there are still notable challenges with local communities entering, and benefitting from, the highly profitable tourism value chains.

That is, whilst the area generates significant income as a lucrative and niche tourism hotspot, there are glaring disparities in terms of actual accrual of benefits to local communities[39]. Poverty and low income prevail. Reliance on tourism especially in the delta is seasonal and 'skewed'. Malaria is a major concern and very prevalent in the basin.

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[38] The World Bank (2015). *Botswana Poverty Assessment. (Note, statistics provided for Botswana were derived from the same key document); Government of Botswana (2015). National Education for All (EFA 2015) Review Report. Ministry of Education and Skills Development.*

[39] CRIDF **Poverty Diagnostic Report Okavango-Cubango River Basin**

The unit[40] boasts unique ecological features that constitute a vast natural resources base. These are however vulnerable to climate variability and the primary challenge is to achieve sustainable management of the renewable natural resources in a semi-arid environment amidst a rapidly growing human population. Other challenges include competing land-uses, poverty, inadequate coordination of natural resource-use regimes, and lately the HIV/AIDS epidemic. If left unmanaged, these can lead to a general decline in the natural resources base typified by low agricultural yields, reduced wildlife populations and distribution, reduced yields in fishing and veldt products, and consequently reduced opportunities and choices especially for rural communities.

Rural dwellers in the unit have traditionally relied on natural resources for their food, housing materials, medicines, household implements, energy and cultural activities, and in the past these practices have been relatively self-sustainable. Livestock farming and arable agriculture are the most common forms of land use in the unit. As resources scarcity increases, population sizes increase, and resource management regimes go beyond what the local capacity can maintain, people tend to harvest beyond even what they understand as sustainable levels, to meet their immediate needs. In turn the regeneration capacity of the resource (i.e. Delta) is compromised. Along with changes in flow and stream regimes from the upper part of the basin (i.e. unit 1 in particular), this unit faces a potentially dire future.

An increasing number of local communities are now utilizing wildlife as an additional land-use and economic activity. The last decade has seen an increase in public participation in management and use of natural resources, especially around the Delta. This has been facilitated mainly by Government's decision to devolve natural resources management and user rights to local communities in the form of Community Based Natural Resource Management (CBNRM). In addressing environmental concerns and increase people's choice in development, public education and awareness activities are being undertaken by environmental organisations within and outside Government. However, the processes have not resulted in much change to the situation in which communities in this unit are living, and their livelihood vulnerability remain largely the same as before the CBNRM process started.

There are strong regional and rural-urban dimensions in poverty in the unit. The large majority of the poor live towards the immediate south-west of the Delta and north of the Delta. Towns provide increased income opportunities and tourism ventures can enable local income support. However, the tourism industry remains largely a provider of salaries, as opposed to a multiplier of opportunities (i.e. 'salaries only' are the main livelihood support, whereas 'shareholding' in the industry remains limited). Acute levels of poverty are found in more remote areas, most prominently in the far North-West (Ngamiland) around the Okavango and Chobe and in the west and southwest (Kgalagadi) - the northern part of the Figure below.

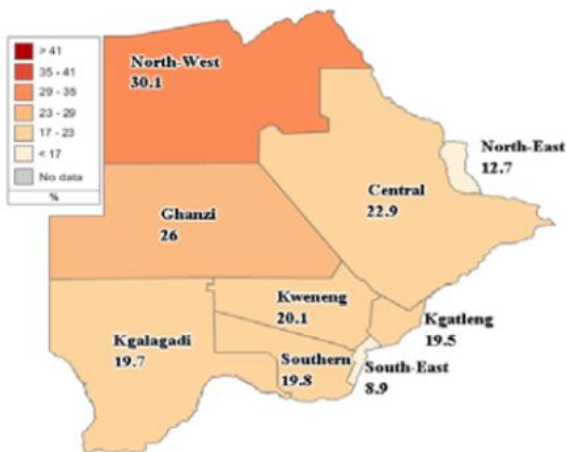40 limited regional level details area available, thus Botswana-wide info to be relied on: http://www.adaptation-undp.org/explore/southern-africa/botswana

Figure 27 Poverty rates in Botswana[41]

Larger households with more children have higher rates of poverty. Family structure is an important correlate of poverty; families with both parents have lower rates of poverty than single-parent families. Since Botswana has one of the world's highest HIV/AIDS rates, resulting in large numbers of deaths and AIDS orphans, there is a sizeable number of incomplete families, which are more likely to be poor (*ibid*). This unit is no different and although detailed statistics are not available, the assumption can be made that the unit has the highest HIV/AIDS rates in the basin, along with the highest poverty rates in the Botswana part of the basin.

Botswana's rapid poverty reduction can be attributed mainly to a combination of increasing agricultural incomes, including subsidies, and demographic changes. Unfortunately, the nationwide improvement have not reached as deep into this unit as one would have hoped. The remoteness of the unit as a whole, as well as the northern area of the unit being virtually 'cut off' from the rest of the homogenous unit (and the country as a whole), have resulted in the poverty reduction nationwide to not reflect here. Demographic changes associated with decreased dependency ratios contributed 24.3% to poverty reduction in Botswana – this figure is somewhat relevant in this unit since the change in demographics are reflected in this unit, as in the rest of the country, although to a lesser extent.

Notable disparities across income groups is present in key health indicators – and once again this unit is worse off than the rest of the country. Botswana's child malnutrition and mortality remain high, especially among the poor, and are not commensurate with national investments to improve child health and survival – again, this unit bearing the brunt of the 'non'-impact. This means that more than half of all deaths of children under age five in the unit are a result of preventable diseases, and malnutrition in children under age five remains a significant problem in the unit. Diarrheal diseases continue to be a challenge, especially since water and sanitation infrastructure in the unit remains underdeveloped, especially away from larger towns. The high HIV prevalence is also contributing to problems of under-nutrition in children and household food insecurity.

By international standards, overall poverty in Botswana has also fallen significantly, but extreme poverty around the Delta (i.e. this unit) remain high. Among the poorest group of the population, most of which live in this unit, the share of food expenditures declined, indicating some welfare improvement over the last two decades. However, the situation remains dire. Meanwhile, the share of food expenditures among the richest remained almost unchanged, suggesting stagnation in their welfare (and thus that of the country). Even though the poor areas (i.e. this unit) is trying to 'catch up' and the gap reducing, the deviation between the poorest and richest remain wide.

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41 file:///C:/Users/Maryna/Downloads/Botswana_Poverty_Assessment_2015.pdf and quoted by *World Bank, 2015*

6.2 Population

Indicator	Botswana
GDP	US$11 billion
Total population	just over 2 million
GDP per capita	US$ 15,845
Gini coefficient	0.605
Population within the basin	7.1% 54% living at "livelihood level"
Vision documents for the country	• Vision 2016 • National Development Plan
Context	• Sustained development, rapid economic growth, economic independence and social justice

Figure 15 Botswana population and development indicators[42]

Poverty in Botswana has a young face, with children less than 15 years of age representing 46.2% of the poor in 2009/10. Poverty by age follows a U-shaped pattern, with the young and old having highest % of poverty and those between the ages of 30 and 44 having the lowest poverty rates. Extreme poverty is also primarily a youth issue[43]. Due to the situation described in the socio-economic section for this homogenous unit, it is expected that these statistics are exaggerated in this unit, which is the poorest area in the country.

Based on 2010 UN data, Botswana's population has a relatively young age structure, with 34.1% below 15 years and less than 5% aged 65 and older. Although this is relatively reflected in unit 5, this trend is, however not the case in unit 4.

Fertility rates in this unit has not followed suit as the rest of the country, where population growth slowed in recent years. The young age structure will thus continue to grow into the future.

Although the dynamic of employment rates in the unit has been pro-poor in the past two decades, this unit has not seen the same positive trend.

6.3 Infrastructure

Although roads connect towns and villages fairly well, the condition of the roads in the unit are often poor. Transport in and across the Delta is challenging, thus reducing access to areas towards the north of the delta in particular.

Disparities reflected in infrastructure availability i.e. water provision and improved sanitation, as well as electricity, are most prevalent between the poor and non-poor, with the area around the delta being heavily affected and drawing Botswana's national averages in infrastructure connectivity down.

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42 https://www.unece.org/fileadmin/DAM/env/documents/2018/WAT/02Feb_06-07_BenefitsWS_Geneva/3.6_OKACOM_Chongica.pdf

43 file:///C:/Users/Maryna/Downloads/Botswana_Poverty_Assessment_2015.pdf

Disparity in access to electricity in the unit is significantly widespread and positively correlated with the low income across the unit. As example: Botswana's electricity connection rates are around 74% towards the south (Gaborone), however the poorest areas – which this unit is part of, only has around 19% access to electricity.

Sustainable access to improved water sources and sanitation remains uneven across income groups and affects socio-economic outcomes, such as health, worker productivity, income, and education. The share of the population with access to improved sanitation facilities rose impressively from 38.6% in 1990 to 64.3% in 2012. However, access to flush toilets remains significantly low among the poor. Use of flush toilets (both owned and communal) was a paltry 5.3% for the poorest 10%, compared with 64.6% for the richest 10%.

6.4 Environmental

Delta-specific challenges include human-wildlife-conflict where elephants and other predators pose a risk to human life. There are various protected areas in the unit. Several wildlife corridors exist[44], communities are also faced with the challenge of competing with wildlife for natural resources, putting their lives and livelihoods at risk. On the other hand, there are also incidences and risks of the intensification of poaching in and around the Okavango Delta.

The local communities' livelihoods are largely based on subsistence agriculture, which relies on rainfed or run-of-river water, yet, it is increasingly reckoned (as noted in the World Bank Report (2017)) that water shocks can have disastrous impacts (*ibid*,[45]) – meaning the populations are high vulnerable to climate shocks. Like in many areas across SADC, persistent/ unexpected droughts cause food crises, economically stifle farmers, and set off epidemics, while floods can wipe away lives and livelihoods, and destroy critical infrastructure[46]. There is also a risk of alien invasive species and deforestation in the unit.

6.5 Transboundary impacts

This unit is significantly affected by sub-catchment management regimes and land use changes upstream. The future of the delta relies on especially the practices and interventions in terms of re-forestation, halting of forest cover loss, and reduction of erosion in unit 1.

6.6 Climate future

The climate future of this unit is similar to unit 2, but lower fire danger index. However, there is a higher heat wave index, especially south of the delta - likely the highest heat wave probability in entire basin. Drought probability increases to as much as 9.5, despite there being a slightly improved rainfall outlook compared unit 2 (but still severe).

The region is expected to experience a temperature rise of up to 2 degrees Celsius and a decline in river flows of up to 13 % - resulting is a critical need to better inform and prepare citizens of the changing climate. Recognising this, the focus of the Botswana national adaptation and mitigation plan is the development and transfer of technology, finance and knowledge, and promote education and public awareness of climate issues – all issues that can improve the resilience of communities to the expected future climate[47].

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44 CRIDF report: **Poverty Diagnostic Report Okavango-Cubango River Basin**

45 Same as 49

46 Same as 49

47 http://www.bw.undp.org/content/botswana/en/home/ourwork/environmentandenergy/successstories/botswana-embarks-on-ambitious-plan-to-tackle-climate-change-.html

6.7   Understanding the vulnerabilities

The unit has high likelihood of HWC which is largely manifested in poverty-driven conflict escalation. This renders economic challenges in the area as high on the list, as livelihoods threats act as pull and push factors driving and exacerbating HWC and driving down ecological regeneration as well as potential future tourism incomes.
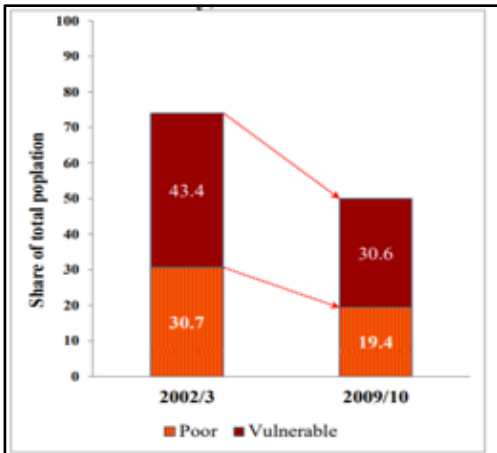

Figure 29 Botswana poverty and vulnerability, 2002/3 and 2009/10[48]

Large numbers of people in the unit are just marginally above the poverty line and at risk of falling back into poverty. Although vulnerability was reduced over the past two decades (Figure 29), at least half of the population remains either poor or vulnerable – and mainly reliant on agro-pastoral farming practices. The risk of falling back into poverty is significantly higher among rural households around the Delta where dependence on small scale and subsistence farming is greatest.
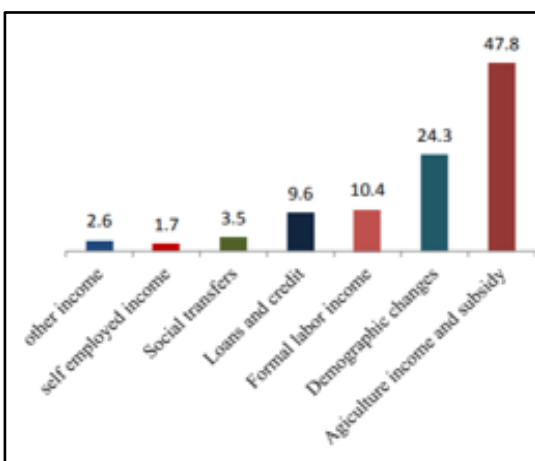

Figure 30 Contribution to poverty reduction in percentage points of poverty 2002/03 – 2009/10

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48 file:///C:/Users/Maryna/Downloads/Botswana_Poverty_Assessment_2015.pdf

Investments in human capital and efficient safety-net targeting are key areas that could speed up poverty reduction and reduce inequality in the unit. Eradicating poverty in the coming years will likely depend on raising worker productivity and participation in the labour market – and potentially increasing participation and ownership in tourism ventures and sectors that support tourism. Iimproving the quality of human capital and improving the efficiency of social protection programs also remains key. Micro simulations show that these factors can significantly accelerate the pace of poverty reduction and in this unit where poverty is great, such impacts should have a great effect. The combined effect of employment increases, improvements in education, and improved targeting of social protection programs could spearhead this change[49].

6.8   Potential suitable technologies/interventions

- CRIDF & UNDP: Building on CRIDF 1's KAZA+ Value Chain Analysis, and in line with the UNDP-GEF's programme aims around the Strategic Action Program[50], the Maun/Okavango Delta horticulture project seeks to formalise local famers' involvement in the thriving tourism value chain. The project targets both identified 'champion farmers' and community farming projects in the area – with a view to capacitating them to participate in both tourism and local food markets through the provision of infrastructure, agricultural inputs and capacity building support.   Using this intervention as a 'demonstration pilot', opportunities must be explored to scale-up/replicate this approach in other tourism clusters in the basin.
- Other:
    o   The interventions might entail capacity building and awareness creation on sustainable harvesting of natural resources for long-term benefits. This could be further improved by benefits from tourism from a flourishing and well-managed flora and fauna.
    o   In addition to horticultural activities, there is need to have a more integrated approach towards local ownership of tourism ventures and related services. This should include clear negotiations and agreements on the flow of economic benefits to local communities.
    o   Owing to the increases in temperatures and reduction in rainfall, the likelihood of heat waves increases thereby creating major impact on health. As such, there is a clear need for interventions that include health considerations.

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49 file:///C:/Users/Maryna/Downloads/Botswana_Poverty_Assessment_2015.pdf

50 specifically the Thematic Area 1 'Livelihoods and Social Economic Development'
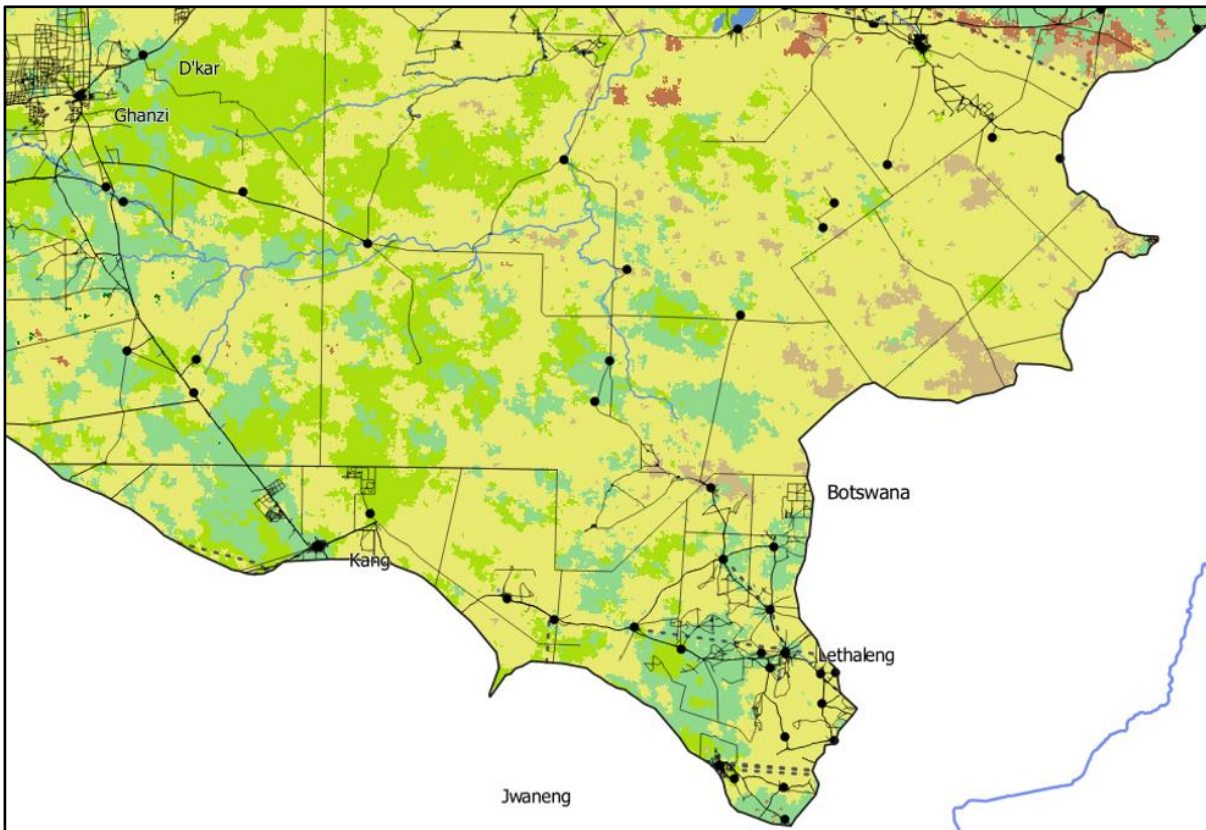
7 Homogenous unit 5: Ghanzi – Lethaleng

Figure 161 Unit 5 Map, showing land cover background

7.1 Socio-Economic

The same narrative as for unit 4 largely applies to this unit, noting however, that in this unit tourism plays a negligent role. Due to the similarities these are not all repeated here – only clear differences are highlighted, to reduce duplication of text. Pockets of very high poverty are also found in the South-East, particularly in Kweneng and parts of the Central district (which covers this unit). Unemployment figures are also similar as in unit 4 (Figure 32 hereafter). Although still high compared to the rest of Botswana, the poverty rates in this unit of the basin is slightly improved compared to that in unit 4.

Figure 3217 Botswana unemployment rates by regions 2009/10[51]

As visible in the figure hereafter, the Central district (where much of this unit is situated) falls in the 'middle' statistical reaches of the Gini coefficient in Botswana – somewhat better off than unit 4.
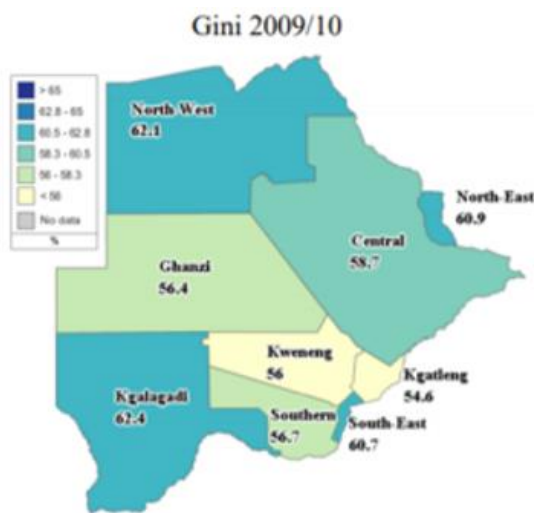

Figure 33 Regional poverty and inequality in Botswana 2009/10[52]

7.2   Population

A similar narrative as for unit 4 applies, except that there are smaller populations and lower population densities in unit 5 than in unit 4. Although poverty rates and access to health services are slightly improved than in unit 4, vulnerability and adaptive capacity levels remain a concern.

A growing working-age population and declining dependency ratios have played important roles in supporting poverty reduction in the unit over the past two decades. However, the unit remains in a delicate/fragile state where the balance towards a higher vulnerable state can swing negatively. Because of the unit's young age structure, however, the population dynamics in the area can be expected to change, as a result of high urbanisation trends.

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51 Same as 49

52 Same as 49

What drives the unit's relative improved outlook, is that the rural areas share of the Botswana population employment rose, in comparison to urban areas. The gains were concentrated more among the poor, and although the situation remains difficult, this unit received its share of this improvement. Agriculture remains a key job growth sector – with agriculture accounting for more than half the jobs in rural areas across Botswana. Given the inherent links between the agricultural sector and climate patterns, this indicates that communities in this unit are highly vulnerability to climate changes - especially drought, reduced rainfall, increased temperatures and seasonal variability.

7.3   Infrastructure

The unit is fairly well connected along road structures/near villages but there is low connectivity in unit interior, except in the large nature reserve area in the centre of the unit. Along road infrastructure and urban areas, water and sanitation is relatively better compared to rural areas.

The reduction achieved in monetary poverty is matched by overall gains in other measures such as asset ownership, access to electricity and sanitation, literacy and access to education.

The quality and access to electricity is better than average, but remain low compared to Botswana's National Development Plan (NDP) targets.

7.4   Environmental

With erratic and fewer surface water resources in this unit than what is available in unit 4, the area has higher susceptibility to drought and climate change impacts. Although there are less people living in this unit than elsewhere in the basin, there is higher livelihood vulnerability in terms of access to water. There are very low levels of bush, shrub and tree cover, thus any use of this resource for heat and fuel increases loss of biomass.

Although large protected areas exist within the unit, some challenges exist. These include deforestation - mainly experienced towards the centre of the unit and is a key concern because there are very low levels of electricity supply in the unit. This means that deforestation is likely to continue unless alternative options are available together with community sensitisation on the importance nature plays in reducing the effects that deforestation brings. The biggest concern is that such deforestation is happening in the protected area and therefore we can imply poaching is also taking place. This situation places pressure on potential future tourism income.

7.5   Transboundary impacts

There are no significant transboundary impacts in this unit.

7.6   Climate future

The same climate future is relevant as discussed in 4, however, maximum temperature highs are expected to be slightly lower - towards 32 °C. The rainfall probability is only slightly better than described in unit 4. Heat wave impact is expected to be less severe, however drought probability and variability in rainfall is expected to be more severe.

7.7   Understanding the vulnerabilities

The agro-pastoralism in the unit is expected to face a more difficult future where prediction of growing seasons may become more challenging and subsequently, food insecurity would become heightened. Along with this process, reliance on ever-dwindling numbers of wildlife and wood sources for cooking fuel points to eventual reduction of ecological capacity and natural resource base beyond regeneration capacity.

7.8   Potential suitable technologies/interventions

There are land use related issues which are driven by current practices. Interventions should focus on assessing existing livelihood practices and behaviours that require shifting through awareness creation and capacity building amongst community members. The other option is health considerations through awareness and early warning for heat waves and malaria. Such awareness can create agency amongst communities to reduce the net effect and impact of adverse weather such as heat waves and diseases such as malaria. Scope for specific intervention by CRIDF, UNDP and others is still to be informed by in-country engagements.