"wilderness is the original cathedral, the original temple, the original church of life in which they have been converted and healed and from which they have emerged transformed in a positive manner."

Sir Laurens van der Post in Ian Player

THE PLACE



2 THE PLACE

Within this section of the LORMP, the following is addressed:

- *Subsection 2.1* addresses the biophysical parameters which influence the initiatives to unlock the ecotourism potential of the river including, inter alia, geology and geomorphology, elevation, slope, river landscapes, riverine and riparian, as well as terrestrial ecology, climate, hydrology and water quality;
- *Subsection 2.2* discusses aspects related to the cultural environment within which the planning is taking place, and well as the need to protect and conserve elements of the endemic cultural heritage resources;
- *Subsection 2.3* provides insight into the business environment within which the planning is taking place, specifically illustrating aspects such as mining, agriculture, and the existing river based tourism operations and how they detract from, or contribute to high quality ecotourism development
- *Subsection2.4* discusses the tenure environment, addressing aspects such as landownership, restititution and utilization rights with the two countries;
- *Subsection 2.5* addresses the governance environment within which the planning has taken places, providing insight into aspects such as demographics, the legal framework form an international and country specific perspective, specifically focusing on aspects such as transfrontier conservation and water resource management and border demarcation, current institutional arrangements and structures between Namibia and South Africa, and the context of this river planning initiative within broader conservation and water management planning initiatives.

2.1 NATURAL ENVIRONMENT

Within this subsection the biophysical parameters that could influence the unlocking of the ecotourism potential of the LOR are discussed, including:

- Geology and geomorphology;
- Elevation;
- Slope;
- River landscapes;
- Riverine and riparian ecology;
- Terrestrial ecology;
- Climate - rainfall and temperature; and,
- Water – hydrology and water quality.

The discussions pertaining to these biophysical parameters are aimed at highlighting the specific influence that a specific parameter has on the ecotourism potential of the area.

Geology and geomorphology influence the environmental dynamics and landscape formation, such as active and non-active drainage areas, while elevation and slope determine landscape resilience, and have a direct influence on the biodiversity of an area. The river landscapes provide insight into the functioning of the river, while the riverine and riparian ecology ascertains the integrity of the aquatic and associated habitats.

The terrestrial ecology discusses aspects such as vegetation and the protection status of these plant communities. Rainfall and temperature, as a result of climatic influences, provide an indication of the ideal season during which activities can take place, while the discussion on water specifically addresses the hydrology and water quality issues, two aspects that directly affect tourism utilisation of the river.

2.1.1 Geology and Geomorphology

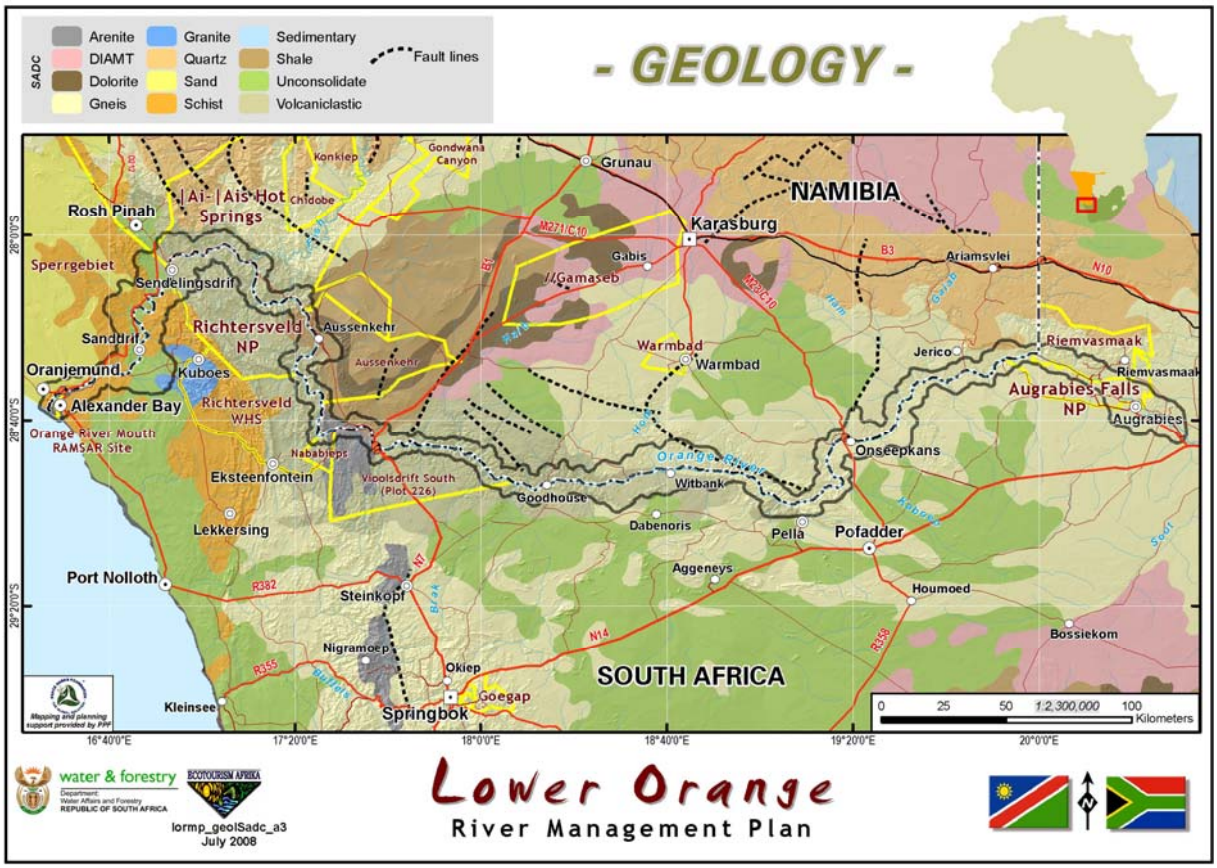
According to PWC, 2005d and PWC, 2005g, from Augrabies to Vioolsdrift/Noordoewer, the geology consists mainly of gneisses and schists, as well as granite and pegmatite. Downstream to Kotzeshoop, shale, limestone, arcose and phillites of the Nama System are found. West of Kotzeshoop, the LOR flows through the Richtersveld Igneous Complex. A variety of rocks, varying from the Swaziland System to the young tertiary river terrace-gravels are to be found in this area.

The LOR is generally deeply incised with narrow, poorly developed alluvial terrace deposits. The surrounding area consists mainly of exposed Namaqua Metamorphic Complex rocks, with some granites belonging to the Vioolsdrif and Haib groups. Very extensive quaternary outwash fans, with mainly dry, braided pattern drainage are an important feature of the terrain. (Refer Map 6.)

The LOR valley terrain consists of four major components:

- Gorge sections (< 1km wide) with steep rubble foot slopes and poorly developed silt terraces;
- Narrow valley sections (1- 1.5km wide) with wide silt terraces and minor tributary valleys;
- Broad valley sections (> 1.5km wide) with silt and gravel terraces and major tributary valleys; and,
- The coastal plain, characterized by steep sand dunes and a gradual river gradients.

Gorge-like sections of the river are generally difficult to access with silt terraces prone to undercutting or whole-scale removal during high floods (refer Figure 3). Narrow valley sections have relatively stable silt terraces relics, often showing some hummock dune development (refer Figure 4). Broad valley sections have well-preserved expanses of silt and gravel terraces, as well as extensive outwash fans from tributary streams (refer Figure 5). The coastal plain are characterized by steep dunes within the Sperrgebiet which terminate at the Orange River (refer Figure 6).



Map 6: Geology

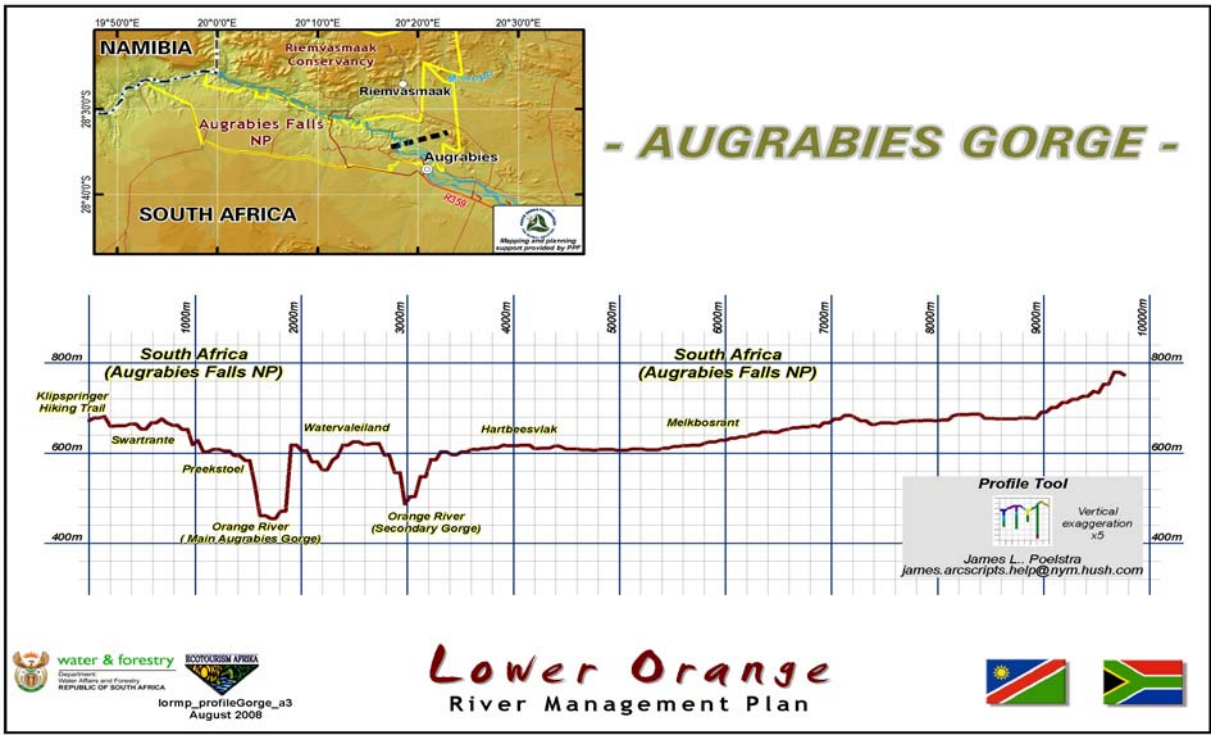


Figure 3: River Profiles – Augrabies Gorge

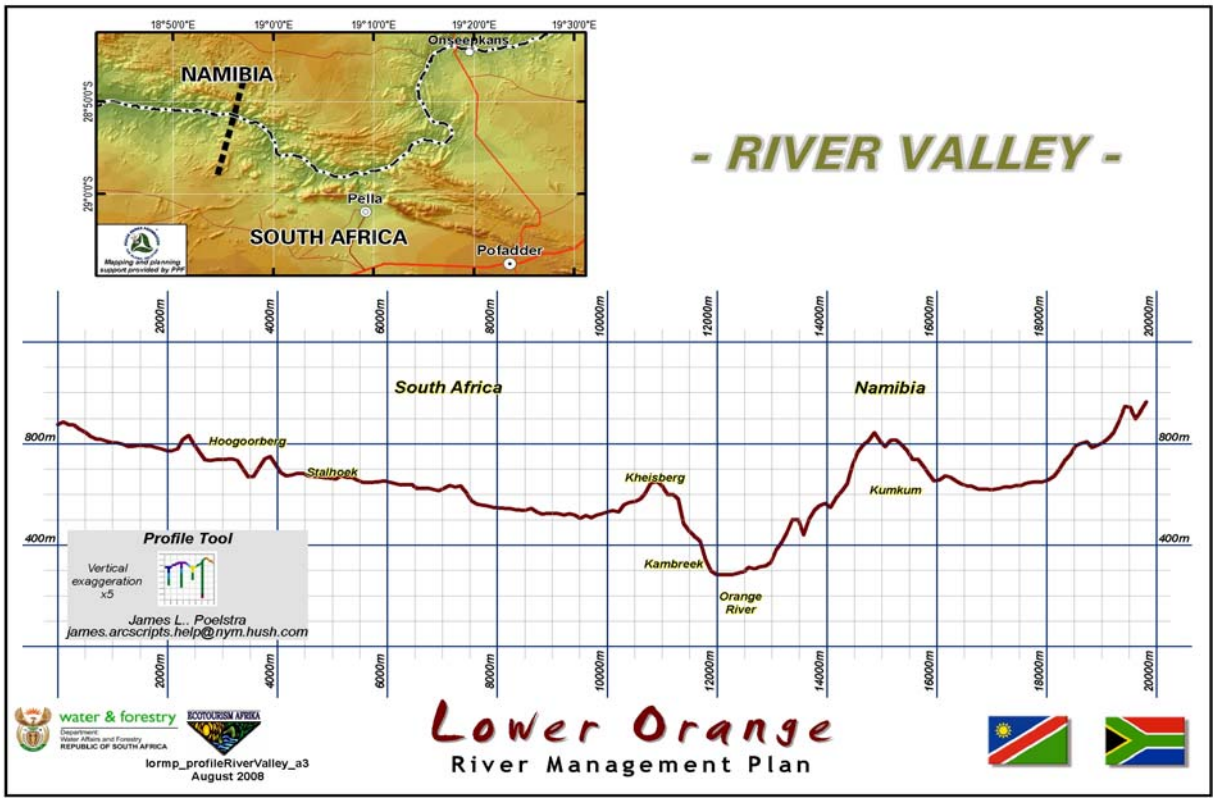


Figure 4: River Profiles – River Valley

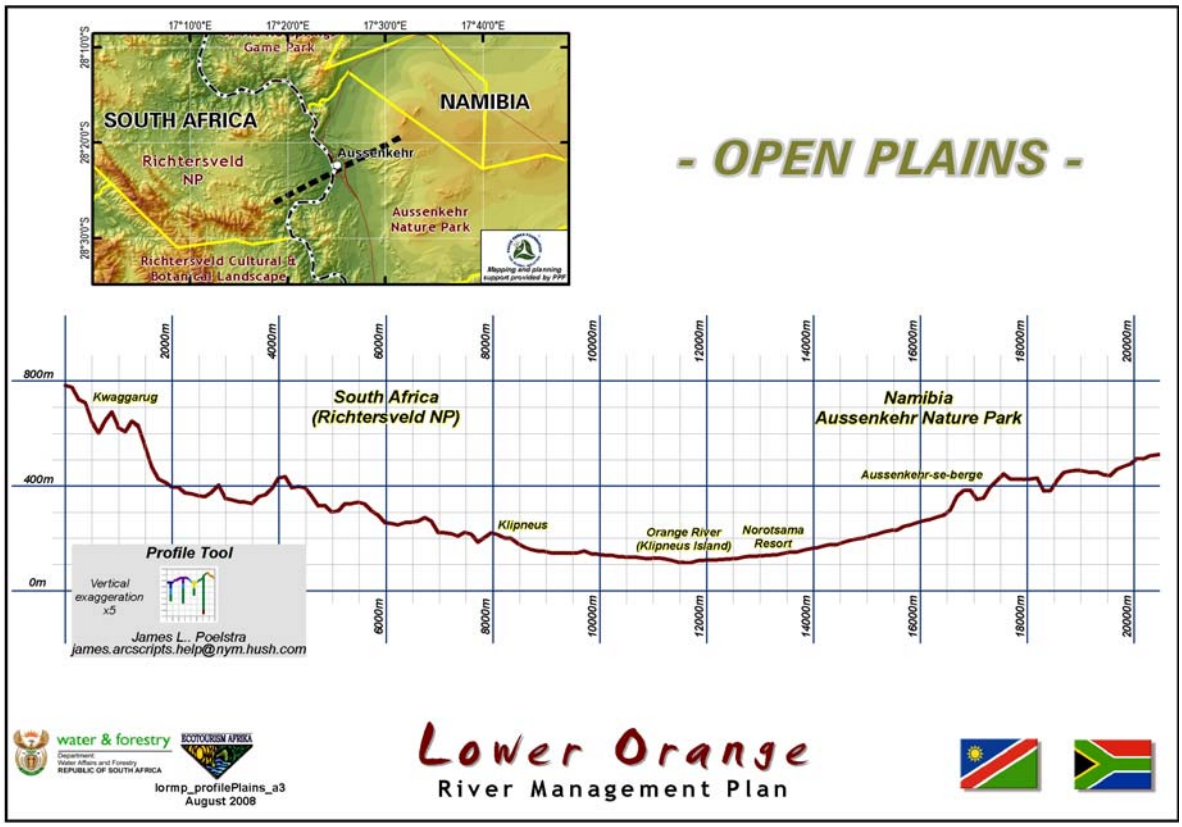


Figure 5: River Profiles – Open Plains

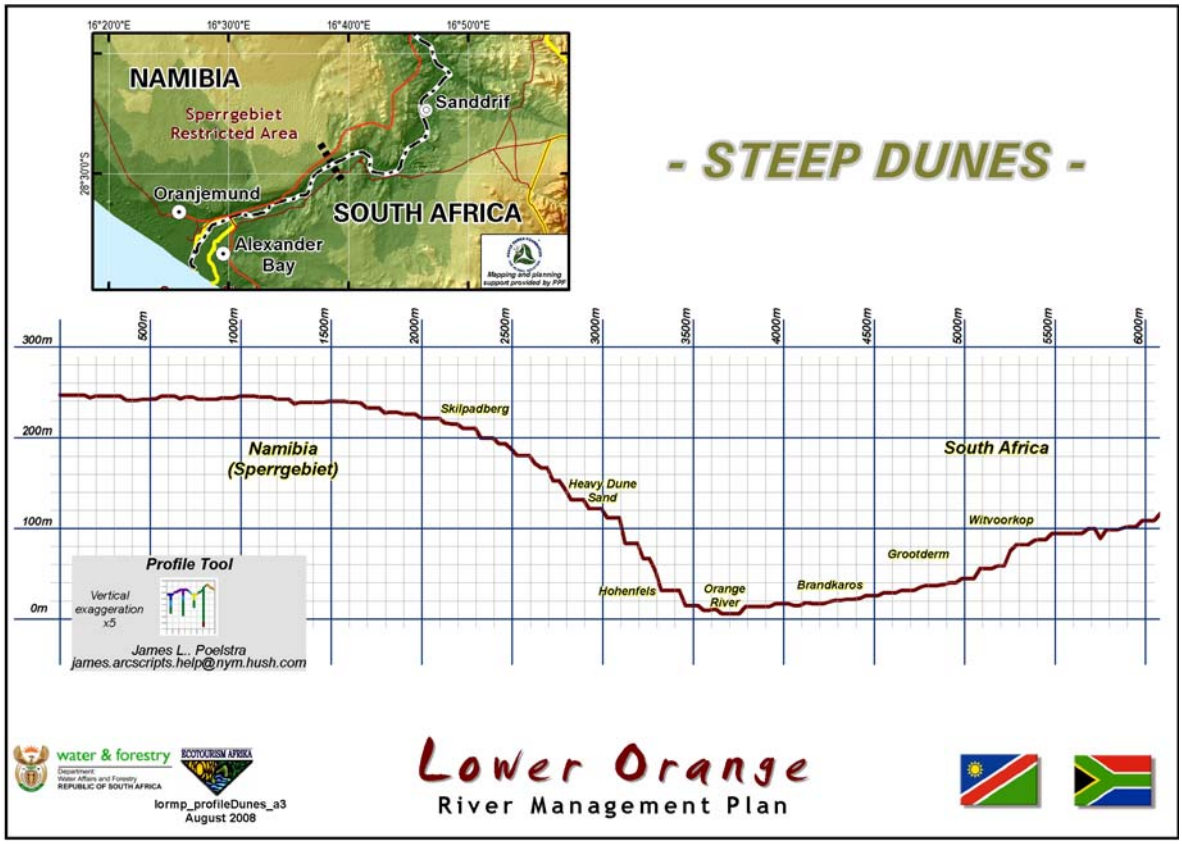


Figure 6: River Profiles – Steep Dunes

2.1.2 Elevation

Despite being perceived as a flat landscape, the LOR area is characterised by a deeply incised landscape with vast altitudinal variation, exceeding a 1000m in places, the highest areas being within the Hunsberg mountains just north of the Orange River within the ARTP. Large altitudinal variations also occur close to Pella, with smaller variation in the Augrabies Gorge, contributing significantly to the biodiversity of the region. (Refer Map 7.)

The western portion of the study area is additionally characterised by the relatively flat coastal plain stretching from the mouth of the river to the Hunsberge and mountains of the Richtersveld. Within a relatively short distance the altitude varies from sea level to almost 2km above sea level.

From the Augrabies Falls to the north-south orientated Mountains running parallel to the coast the Orange River effectively flows through a basin or depression, with higher, and flatter areas either side creating arcs away from the river (Refer Fig. 7).

2.1.3 Slope

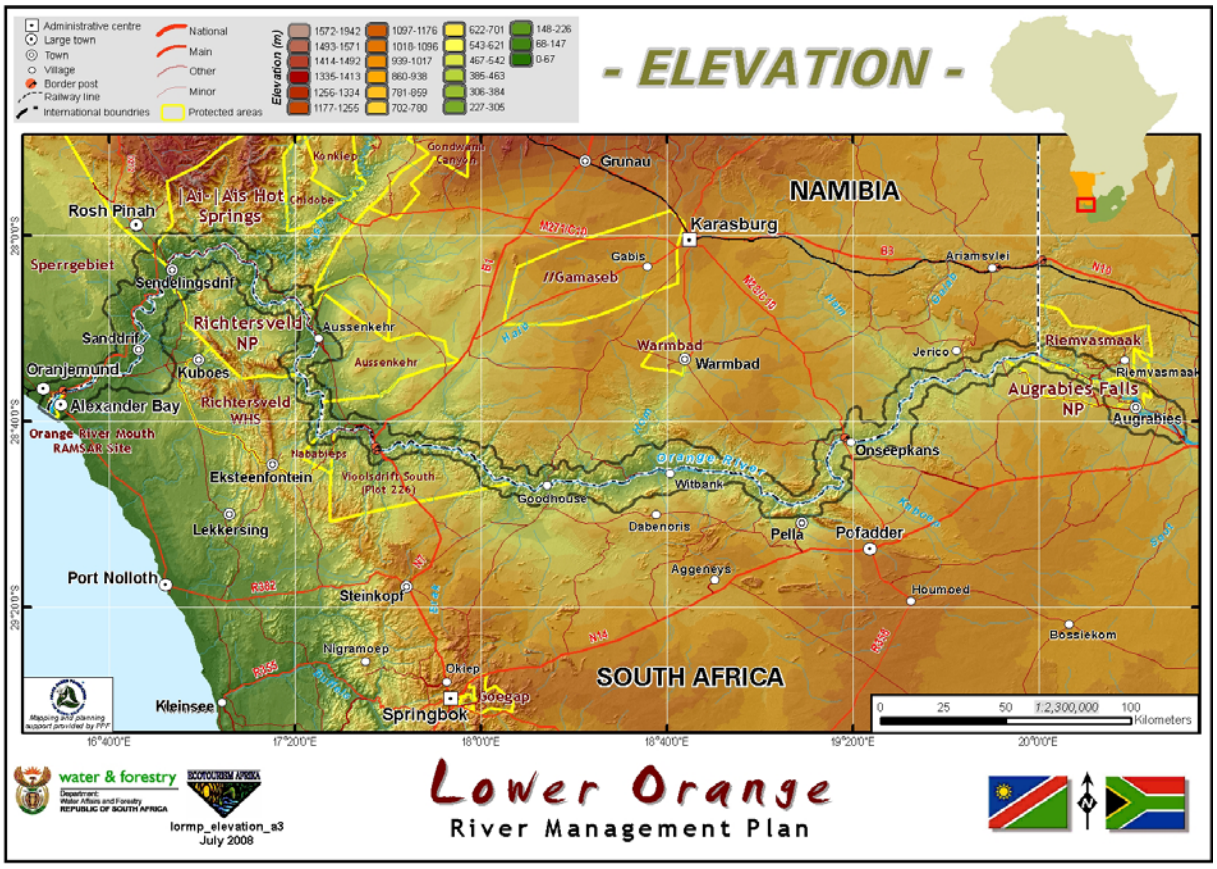
Five distinct steep slope areas occur along the river (refer Map 8):

- from the Augrabies Gorge along the table landscape stretching from Riemvasmaak to Ariamsvlei,
- Pella hills;
- from Goodhouse to Vioolsdrift;
- Nababeep to Aussenkehr; and,
- the ARTP.

These steep slopes negatively influence the accessibility of the area, yet locally, roads, such as at Blouputs and through the ARTP, access is relatively easy, despite the presence of steep slopes.

Besides difficulties associated with access, these steep slopes also affect run-off, with flash floods resulting from relatively low rainfall, yet exacerbated by the steepness of the terrain accelerating drainage. Due to the ruggedness of the terrain the trend is to place roads and camps on the relatively flat terrain offered by small streams and rivers draining the catchment. These, however, trend to wash away during flood events, emanating in losses to property and of lives, as well as critical access within inaccessible environments.

The escarpment edge and the identified steep areas along the river, contrast strongly with the flat terrain elsewhere in the study area, interspersed with smaller hills or inselbergs.



Map 7: Elevation

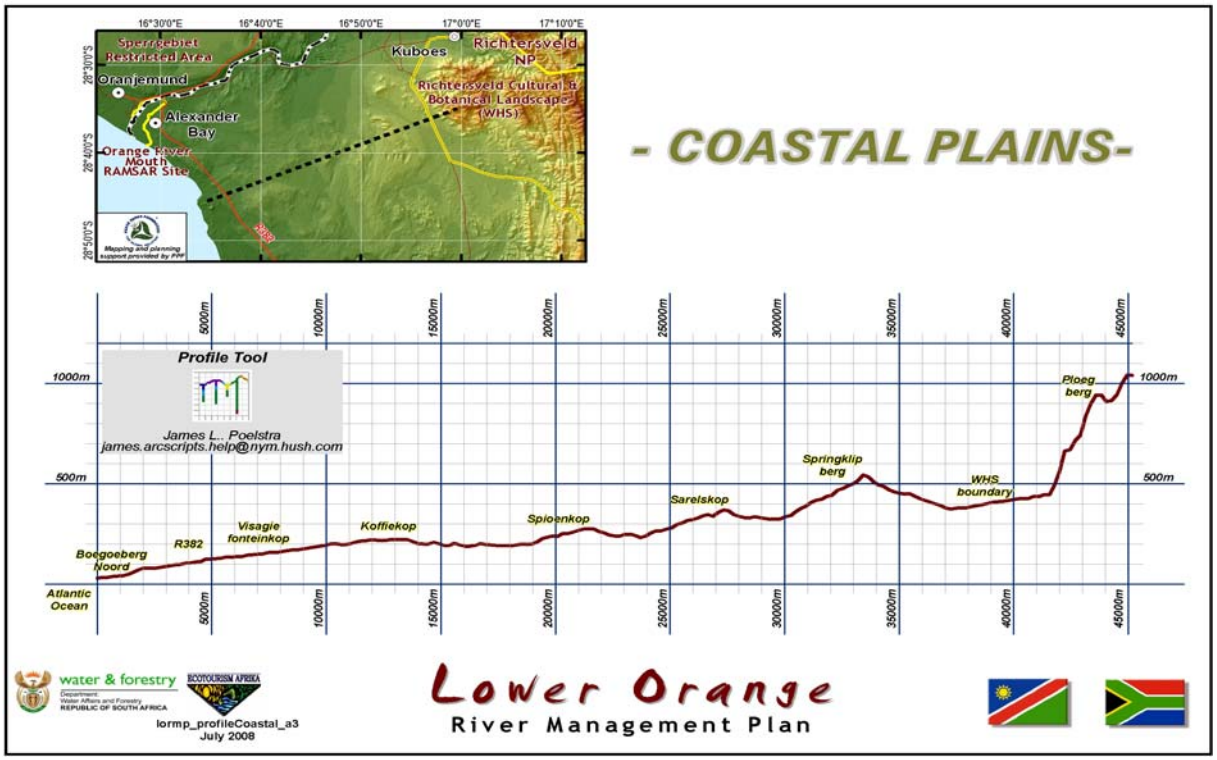
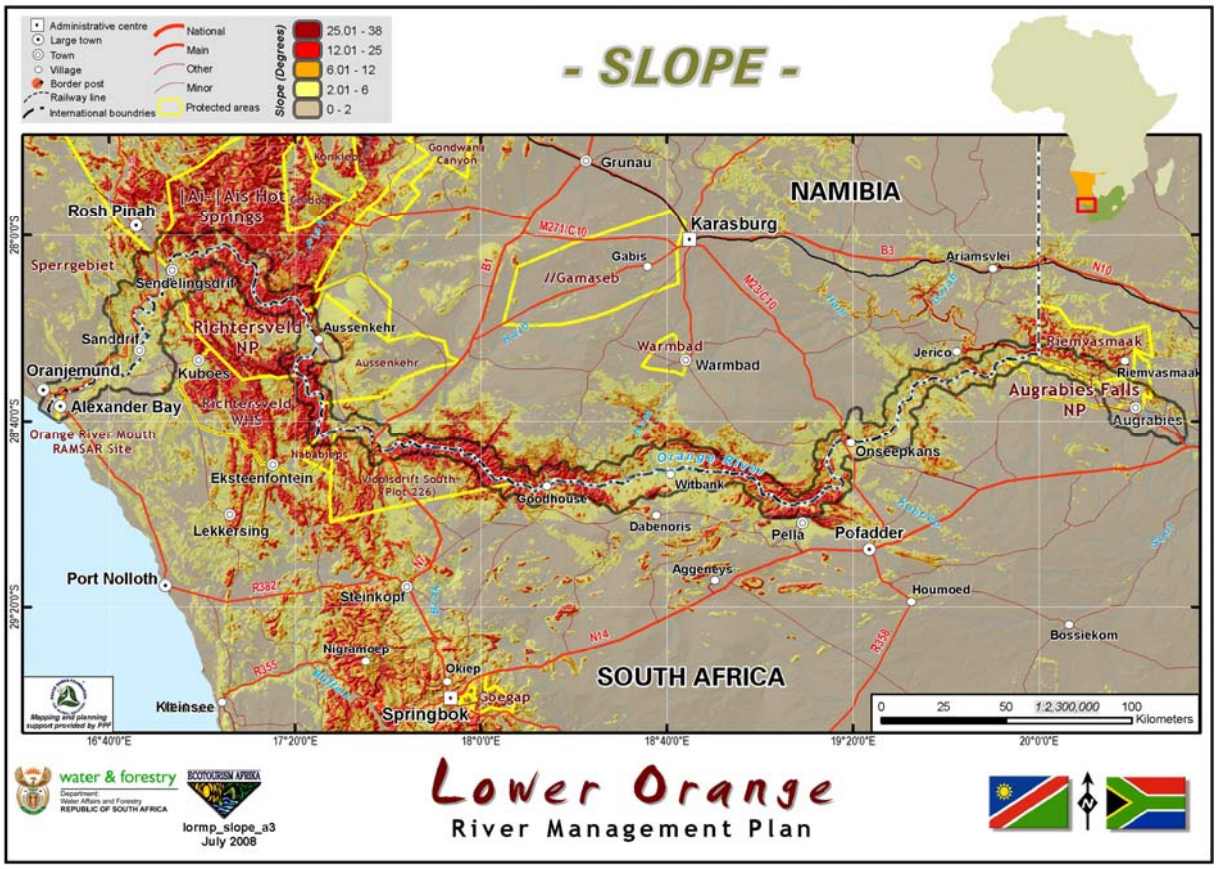


Figure 7: River Profiles – Coastal Plains


- SLOPE -
Administrative centre
Large town
Town
Village
Border post
Railway line
International boundries
National
Main
Other
Minor
Protected areas
Slope (Degrees)
25.01 - 38
12.01 - 25
6.01 - 12
2.01 - 6
0 - 2
NAMIBIA
SOUTH AFRICA
Rosh Pinah
Sperrgebiet
Sendelingsdrif
Sanddrif
Oranjemund
Alexander Bay
Orange River Mouth RAMSAR Site
Richtersveld NP
Kuboes
Aussenkehr
Grunau
Karasburg
Gabis
//Gamaseb
Warmbad
Ariamsvlei
Jericho
Riemvasmaak
Augrabies Falls NP
Augrabies
Onseepkans
Witbank
Goodhouse
Dabenoris
Pella
Pofadder
Aggeneys
Houmoed
Bossiekom
Ekseenfontein
Lekkersing
Port Nolloth
Steinkopf
Nigramoep
Okiep
Goegap
Springbok
Kleinsee
Nababiep
Widouwsdrift South (Plot 226)
0 25 50 1:2,300,000 100 Kilometers
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29°20'0"S
water & forestry
Department: Water Affairs and Forestry
REPUBLIC OF SOUTH AFRICA
ECOTOURISM AFRICA
lormp_slope_a3
July 2008
Lower Orange
River Management Plan

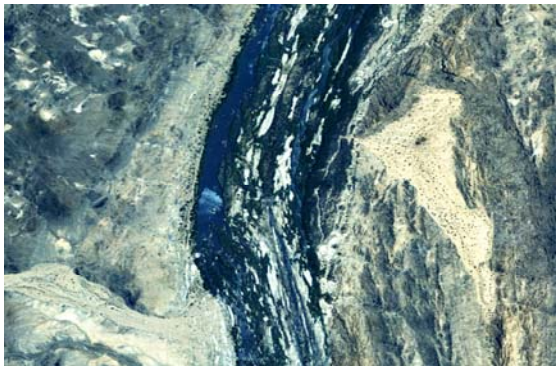
Map 8: Slope

2.1.4 River Landscapes

The geology, geomorphology and slope of the LOR directly influence the various river landscapes characteristic to the region resulting in the following six distinct river landscapes (refer Figure 8):

- ***Braided*** – characterised by an abundance of interwoven channels, creating islands of varying sizes;
- ***Braided rocky*** – where the river cuts across or along underlying bedrock resulting in the formation of rocky channels;
- ***Rocky*** – where the river has washed away all silt and exposes solid or loose rock and gravel, often associated with alluvial fans from quaternary catchments and streams;
- ***Pool and ripple*** – where rocky outcrops or sand banks are interspersed between pools creating small impoundments with rapids;
- ***Perennial pools*** – characteristic to the flat portions of the river lacking steep gradients; and,
- ***Perennial pools sandy*** – characteristic to the coastal plain where the gradient is flat and the effect of the Namib dunes pronounced, dominating the landscapes yet unable to curb the flow of the river.

Braided



Braided Rocky

Perennial Pool

Perennial Pool Sandy

Pool and Ripple

Rocky

Figure 8: Images of Representative River Landscapes

The extent of riparian vegetation, ranging from extensive and thick (mesic) through interspersed (nano) and sparse (xeric), to absent (absolute xeric) (Refer Figure 9), as well as the transformation types affecting the integrity of the riparian habitat, indicating whether the impacts are from settlements, mining or intensive agriculture are provided in an integrated river landscape series of maps (refer Maps 9-20) that illustrate the distinctive river landscapes along the 12 river sections as identified in this plan – summaries of the various landscapes and associated riparian vegetation are provided in Figures 10 and 11.

It is interesting to note the changes in the landscapes from the upper portions which are rocky and devoid of riparian vegetation, through the pools and ripples, and braided sections in the middle portion of the river, to the pools on the coastal plain. The braided rocky portions characteristic to the Oranjevalle section are quite unique along the entire LOR.

The extensive braided and braided rocky landscapes will influence the safe use of the river since these landscapes could result in groups being split and losing contact with each other. The use of concessionaires, river guides and registers could assist in overcoming this challenge, if combined with good mapping and river knowledge. The changing dynamics along the river as a result of floods and droughts will however influence the location of these channels.

The perennial pools as well as sandy pools does influence the product range since the slow water flow in these pools could make paddling difficult, especially if westerly breezes and winds are experienced. This however does not make these portions unusable within the field of ecotourism, yet would require the use of alternative vessels and river knowledge.

Mesic – extensive and thick

Nano – interspersed (left foreground)

Xeric – sparse (right foreground)

Absolute Xeric - absent

Figure 9: Images of Representative Riparian Vegetation

Map 9: River Landscape Section 1 (Augrabies)

Map 10: River Landscape Section 2 (Riemvasmaak)