



LANDSCAPE LEVEL ASSESSMENT OF BIODIVERSITY AND LANDUSE IN THE CENTRAL NAMIB, NAMIBIA



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The Central Namib

Namibia's Central Namib Desert comprises diverse habitats, from ephemeral river courses and coastal wetlands to expansive gravel plains, sand dunes and rocky outcrops. Together they support a remarkable biodiversity. High levels of endemism (unique species found nowhere else) characterise this ancient desert whilst dramatic climatic and topographic gradients foster a rich biological diversity.

The Central Namib is also a valued landscape for people. Subsistence and commercial farming contributes to local livelihoods on communal conservancies and in freehold areas, and the region is an important node for tourism. With tourism growing by 16% in recent years, the industry constitutes an increasingly significant contributor to Namibia's economy and an important sector for job creation.

The industry's potential for growth should not, however, be taken for granted and its continued development and sustainability depends on maintaining and protecting the natural capital – the assets and infrastructure – that are the basis for a travel and tourism-based economy.

The region is also rich in mineral deposits (notably uranium, gold, copper and iron ore) and supports a diverse mining industry including salt mines, dimension stone quarries, and several small-scale semi-precious stone mining operations.

Over recent years development pressure of on

this unique and fragile desert has intensified. In the mid-1990s a sharp rise in the uranium spot price led to increased commercial interest and exploration for this commodity within the Central Namib.

By 2007, when the Ministry of Mines and Energy (MME) issued a moratorium on uranium exploration, 36 exploration licenses had been granted in the Central Namib, both inside and outside of National Parks, in line with Namibian Policy which allows for mining in Protected Areas under certain conditions.

Whilst the uranium spot price has since dropped substantially, at least five mining licenses had been awarded by 2011, including a site bordering the Namib-Naukluft National Park – an area noted for its biodiversity richness and tourism value. A further two companies await the outcome of mining license applications.

With multiple competing landuses exerting increasing pressure on this desert landscape the persistence of biodiversity and ecological processes (e.g. water flow) that support many of the landuses of the Central Namib is under threat.

There has been a widespread call for more integrated landuse assessment and planning to ensure the *sustainable* development of the Central Namib for the benefit of all.



Landscape Level Assessment and Planning

“[It is] important to discuss how to reconcile development objectives of mineral exploitation and environmental protection for the country's long-term socioeconomic growth and stability. How do we continue our drive for economic development while at the same time ensuring that we conserve our biodiversity and our unspoilt landscapes? These are the elements of sustainable development. Carefully coordinated planning on how to make the best use of our resources is therefore necessary. Clearly, an integrated approach is required here, so that development of one resource will not jeopardize the potential of another.”

Minister Netumbo Nandi-Ndaitwah, Minister of Environment & Tourism

Practically every part of the Central Namib harbours valuable living natural resources and contributes towards national biodiversity and ecosystem service delivery. However, in a landscape of where many different landuses must coexist, it is important to identify and prioritise areas for conservation action that are of greatest significance and/or offer greatest opportunities or constraints for linking biodiversity and socio-economic development.

Assessing the optimal and most sustainable suite of landuse options over a landscape requires a sound, defensible understanding of the landscape in question. This includes the biodiversity and ecological processes (*see Box 2 for definition*) it supports and the ways in which people depend on, utilise and impact the landscape and the services it provides (e.g. fresh water, food, sites for recreation).

The inter-relationships between different landuses are also key. How might one landuse impact another? How do multiple developments in a landscape act together and

cumulatively impact on other valued landuses and the environment over time? And what mitigation actions (see Box 2) would be required to avoid, minimise, restore and, if necessary, offset those impacts?

Addressing these issues demands a landscape level approach to development and conservation planning.

Recognising the need for a landscape approach and building on recommendations from a Strategic Environmental Assessment for Namibia's Uranium Province, the Ministry of Environment and Tourism, through its GEF/UNDP supported Strengthening Protected Areas Network Programme, commissioned a Landscape Level Assessment (LLA) of key biodiversity vulnerability and landuse for the Central Namib in April 2011.

Fauna & Flora International led the assessment in collaboration with Anchor Environmental, EnviroMEND, Forest Trends, Gobabeb Training and Research Centre and University of Hamburg.

BOX 1. The mitigation hierarchy

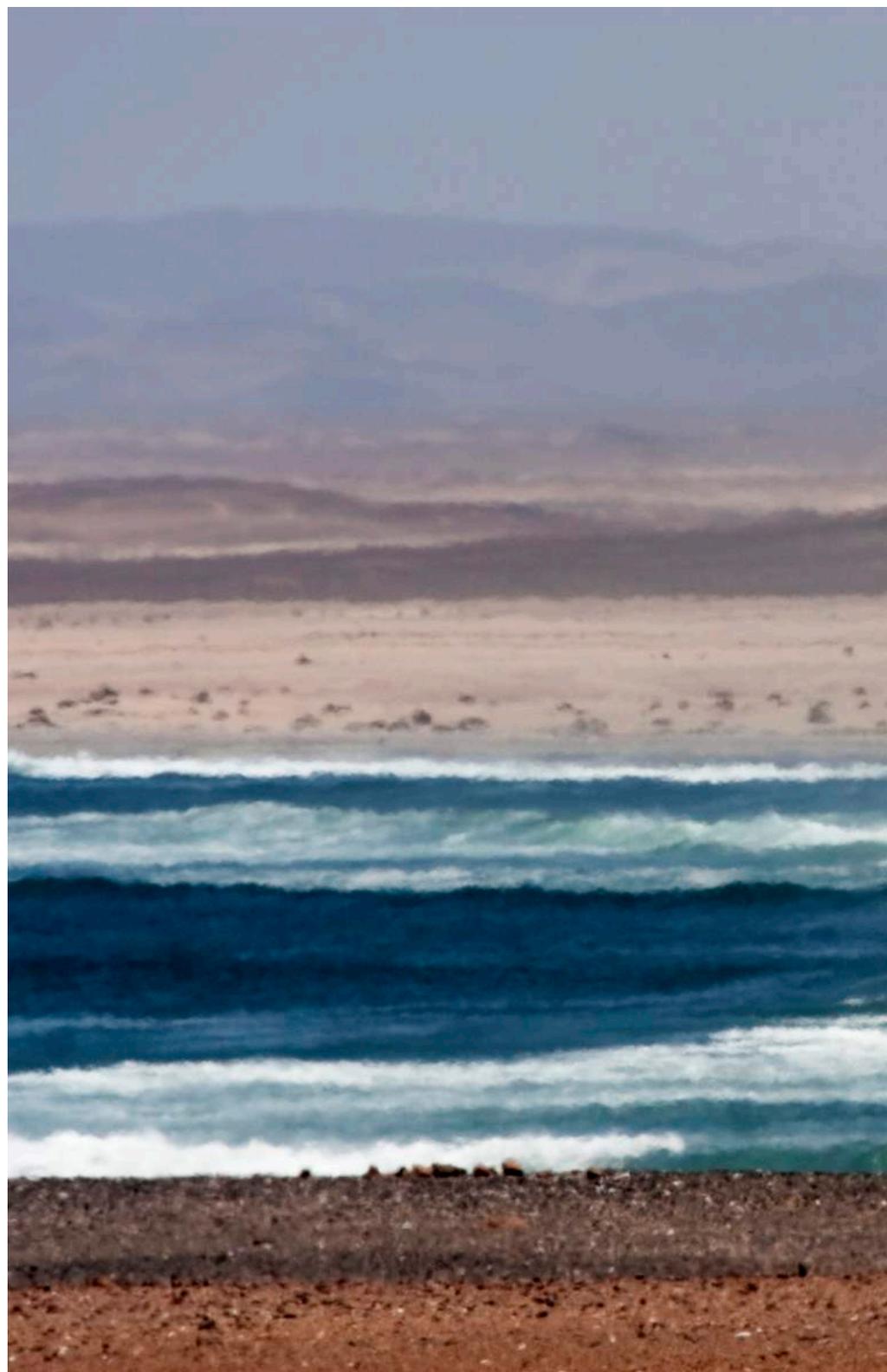
The *mitigation hierarchy* refers to a set of steps to reduce and alleviate residual environmental harm as much as possible, through avoidance, minimisation (or reduction), restoration and/or rehabilitation. Offsetting is the last step of the hierarchy when all other steps have been taken.

- **Avoidance:** measures taken to avoid creating impacts from the outset, such as careful spatial or temporal placement of elements of infrastructure, in order to completely avoid impacts on certain components of biodiversity.
- **Minimisation:** measures taken to reduce the duration, intensity and / or extent of impacts (including direct, indirect and cumulative impacts, as appropriate) that cannot be completely avoided, as far as is practically feasible.
- **Restoration/rehabilitation:** measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/ or minimised.
- **Offset:** measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimised and/or rehabilitated or restored, in order to achieve no net loss or a net gain of biodiversity. Offsets can take the form of positive management interventions such as restoration of degraded habitat, arrested degradation or averted risk, protecting areas where there is imminent or projected loss of biodiversity.

The first three steps aim to reduce to zero the residual impacts of a development project by appropriately adjusting and limiting, through various measures, the scope, duration, and/or intensity of adverse impacts during the project lifecycle (e.g. construction, operation phases etc). Offsets, in turn, are considered to address, where possible, any remaining residual impact due to the development project.

Business and Biodiversity Offsets Programme (BBOP). 2009. Business, Biodiversity Offsets and BBOP: An Overview. BBOP, Washington, D.C.

WBCSD (2012) Business Ecosystem Training (BT): Glossary of Terms and Acronyms. WBCSD Business Ecosystem Training.





Central Namib Landscape Assessment Approach

Spatial landscape level assessment and planning employs a systematic, evidence based approach to balance ecological, socio-cultural and economic activities within the landscape.

The landscape assessment for the Central Namib aimed to strengthen the information base for *biodiversity patterns, ecological processes* (see Box 2 for definitions) and socioeconomic values across the Central Namib so that more informed decisions about development, that take into account environmental, social *and* economic considerations, can be made.

The purpose of the assessment was therefore to:

- Capture key biodiversity patterns and ecological processes that characterise the Central Namib;
- Establish their current status and value for contributing towards conservation goals;
- Determine the socioeconomic values of natural assets across the landscape;
- Understand vulnerabilities of biodiversity and ecological processes to emerging threats.
- Assess potential implications of current and future developments (mainly mining) on biodiversity persistence and other landuses.

BOX 2: Biodiversity patterns and ecological processes

Biodiversity patterns – A pattern (spatial or temporal) that defines, regulates or explains an ecosystem or biodiversity feature:

- Ecological patterns: e.g. ecological zones as defined by climate and substrate and their distribution
- Community composition: e.g. lichen fields, species distributions, etc.
- Evolutionary patterns: e.g. endemism
- Seasonal patterns: e.g. ecological differences between dry and wet seasons, seasonal migrations

Ecological processes – The local, regional or global processes that facilitate, regulate and sustain the patterns and functions of ecosystems and the biodiversity within:

- Ecological processes: e.g. population and metapopulation dynamics – recruitment, migration, mortality; pollination; ecological succession; connectivity.
- Evolutionary processes: e.g. spatial and temporal processes specific to the Namib, which may influence speciation.
- Ecosystem processes: e.g. decomposition, nutrient cycling, sequestration, energy use, water recharge, water flow, etc.

The LLA compiled ecological and socioeconomic evidence, data and spatial layers for a defined, 4.77 million hectare area of the Central Namib. This information established a strong scientific foundation on the basis of which the relative importance of different parts of the landscape for biodiversity and for people was assessed.

A systematic spatial conservation planning assessment was conducted which involved translating information into spatial (map) layers (see Box 3, right). These were overlaid in a Geographic Information System (GIS) to determine the relationship between different features in the landscape, how they come together and how they contribute to conservation goals and targets.

Data were analysed and interpreted to determine:

- Effectiveness of formalised protected areas;
- Relative contribution of different areas to achieving conservation goals at least cost;
- Vulnerability of different ecosystems based on rarity and sensitivity to disturbance;
- Priority areas for biodiversity patterns and ecological processes;
- Economic value of tourism, natural resource harvesting and livestock grazing per hectare.

The assessment incorporated planning principles that promote the persistence of biodiversity and ecological processes under a changing climate.

BOX 3: Layers in the spatial assessment included:



Biodiversity pattern layers:

- > Vegetation types (top): the area is classified into 25 vegetation types which represent terrestrial biodiversity patterns (in different colours).
- > Aquatic features (middle): critical river networks, water points and associated vegetation, used to represent features for aquatic biodiversity (in blue)
- > Inselbergs (bottom): isolated rocky outcrops that are associated with high biodiversity, water capture and storage and potential refuge for fauna and flora (in orange).



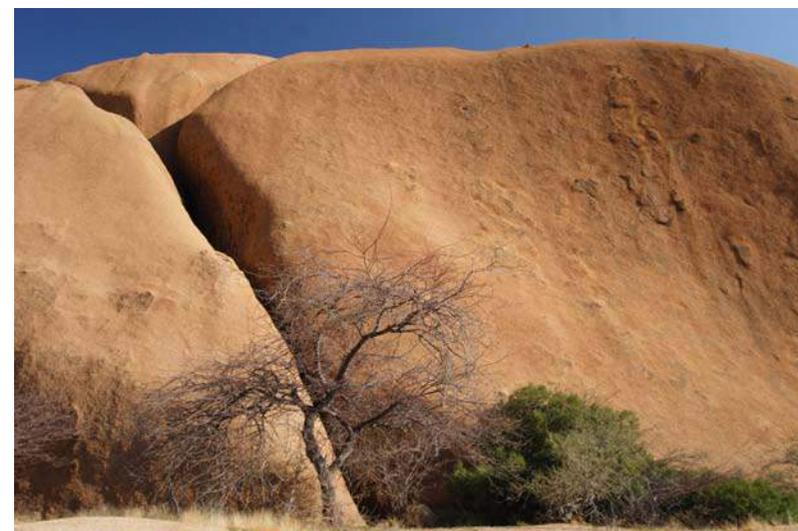
Ecological process layers:

- > Topographic variability: areas where a range of microclimates and habitat niches occur (black hatching)
- > River corridors: corridors within the study area are important for migration of many species, as ecological refugia and functional connectivity (in grey)
- > Vegetation diversity: areas of co-occurrence of four or more distinct vegetation types, representing ecological refugia and potential nodes of speciation (in orange hatching)



Current and future landuses:

- > Protected Areas : map formally and informally Protected Areas (coloured shading)
- > Current transformation: the current footprint from mining and infrastructure to identify where intact areas and transformed areas are (in red and grey)
- > Future development footprints (mining and associated infrastructure, urban expansion): predicted scenarios modelled and illustrated to help assess comparative advantages and disadvantages of proposed/potential land alteration over time (in red and grey)



Findings and Implications

Biodiversity and socioeconomic importance of the Central Namib

Over half the Central Namib ecosystems (represented by vegetation units) were found to be of moderate to high vulnerability (threat status), including many coastal ecosystems, such as the fragile lichen fields, parts of the coastal dune system and coastal wetlands, as well as riparian woodlands and the Brandberg.

- *Vulnerable ecosystems should be closely monitored and appropriate conservation action taken. Further detailed site-level assessments are recommended.*

Biodiversity Priority Areas (Fig. 1, left) that efficiently contribute towards conservation goals *and* are considered vulnerable (threatened) in the landscape were identified outside *and* within formal Protected Areas. Priority areas include the coastal strip, areas of high topographic variability, movement corridors (e.g. rivers and ridges) and climatic gradients between the coast and inland areas (e.g. Cape Cross to Messum Crater).

- *Biodiversity Priority Areas can be used to strengthen the conservation area network to ensure that it is comprehensive and adequate for meeting conservation goals.*

Outside of mining, multiple landuses contribute to local livelihoods and the economy:

- Rural households harvest a number of natural resources to an estimated value of N\$23,000 per household per annum.
- Livestock grazing directly adds value to communal areas (N\$7.43 per hectare) and on private ranches and freehold land (N\$26 per hectare).
- Tourism contributes N\$736 million per year (2010 value) with tourism value concentrated in the Swakopmund and Walvis Bay area, at tourism attractions and along road routes and river courses (Fig 2, top right).

- *Maps distributing these economic values across the landscape provide an important tool for comparing areas of environmental and socioeconomic significance in the landscape.*

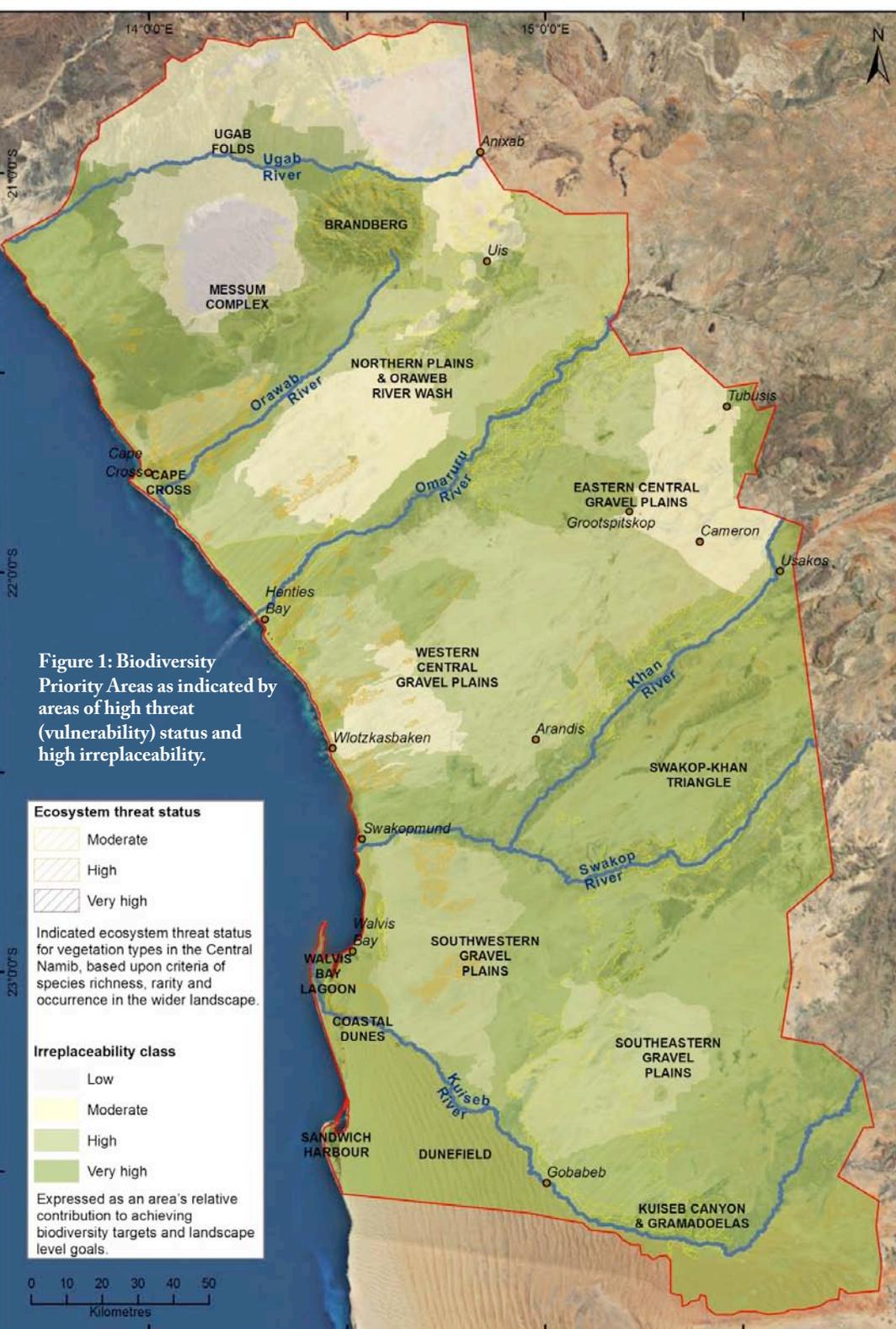


Figure 2: Spatial allocation of tourism value in N\$/ km²

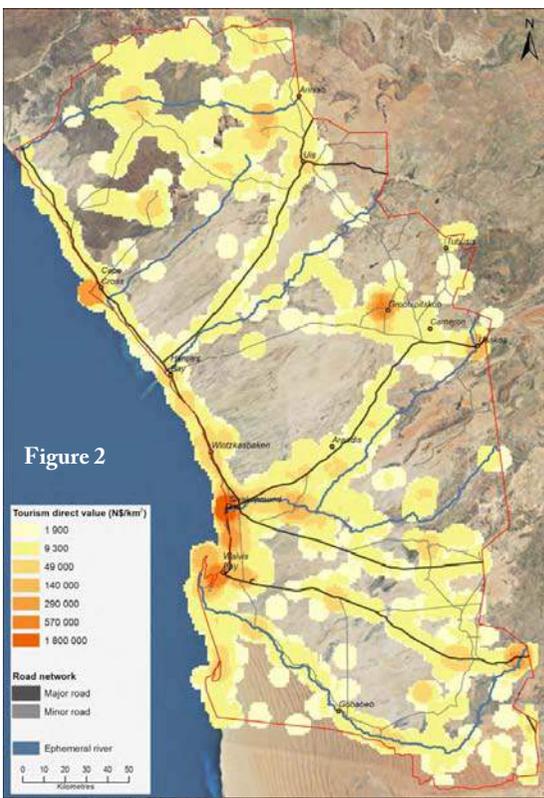
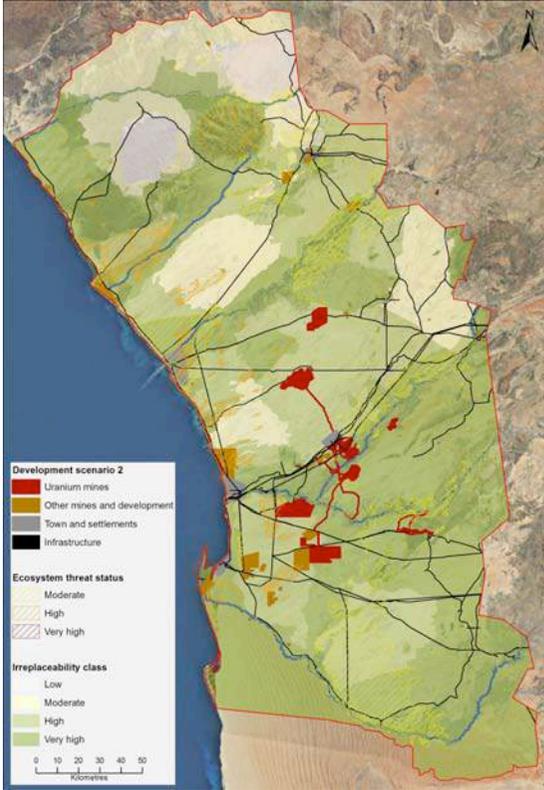


Figure 3: Impact of development scenarios on Biodiversity Priority Areas.



Representation of vegetation in Protected Areas

Formal Protected Areas cover 49% of the Central Namib and offer good representation of half the vegetation types found here. However, some vegetation types are underrepresented in Protected Areas. Furthermore, landuses incompatible with conservation (e.g. mining, infrastructure development) have already impacted vegetation types both outside *and* within Protected Areas.

- *It important to monitor impacts on underrepresented and vulnerable vegetation types. These findings can help guide targeted conservation and management action especially for vegetation unique to the area.*

Implications of development

Uranium mines currently occur in areas of the landscape that are important for achieving conservation goals and targets.

- *Collectively these mines have reduced options in the landscape for achieving conservation goals.*

Expanding and newly proposed developments are poised to intersect with biodiversity priority areas and areas of high tourism value (Fig. 3, bottom left).

- Lichen communities unique to the Central Namib and four other vegetation types are expected to be severely impacted by mining-related development.
- Poorly planned development of mineral resource extraction is expected to have a measurable impact on current tourism and future tourism opportunities.
- *To meet conservation goals and targets and balance the ecological, social and economic needs of the region integrated, sustainable landuse planning is needed.*



Decision Support Tool

The outputs of the landscape level assessment consist of a series of maps, technical reports (ecological, socioeconomic, spatial), a consolidated report and a database of spatial information. Together they demonstrate how the landscape fits together and how different elements interact.

The assessment represents a significant improvement on previously available data and information for biodiversity patterns and ecological processes in the Central Namib, providing all sectors with a spatial reference for ecological processes important for the delivery of key ecosystem services within the region (e.g. water resources).

In focusing on landscape level patterns and processes the Landscape Level Assessment has produced a new and powerful decision support tool (DST) which, in conjunction with other DSTs such as the Strategic Environmental Assessment for the Uranium Province (U-SEA) and the Namibia Coast Conservation and Management Project (NACOMA), can support decision-making for more sustainable, integrated development of the Central Namib, as illustrated in the schematic (right).

In the context of the Environmental Management Act, for example, the Landscape Level Assessment DST can be used to assist the application of best practice principles for the granting of exploration and mine licenses – avoiding impact to highly sensitive and/or irreplaceable areas for biodiversity and ecosystem services. The DST can also be used to help define the criteria against which Exclusive Prospecting License applications are reviewed (Fig. 4, left).

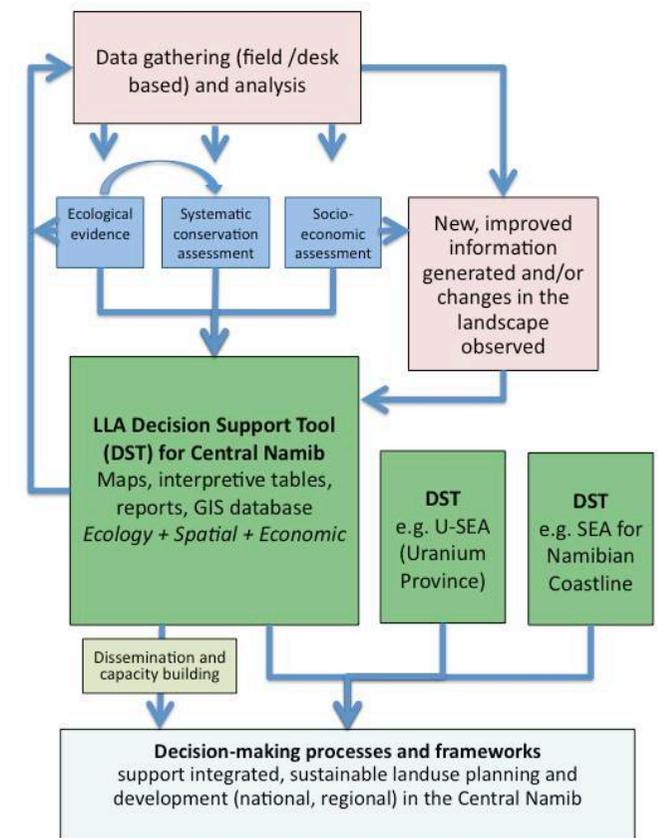


Figure 5: The Central Namib Landscape Level Assessment (LLA) should be used as part of broader decision making processes and frameworks and in conjunction with other DSTs to support sound decision-making for sustainable, integrated development.

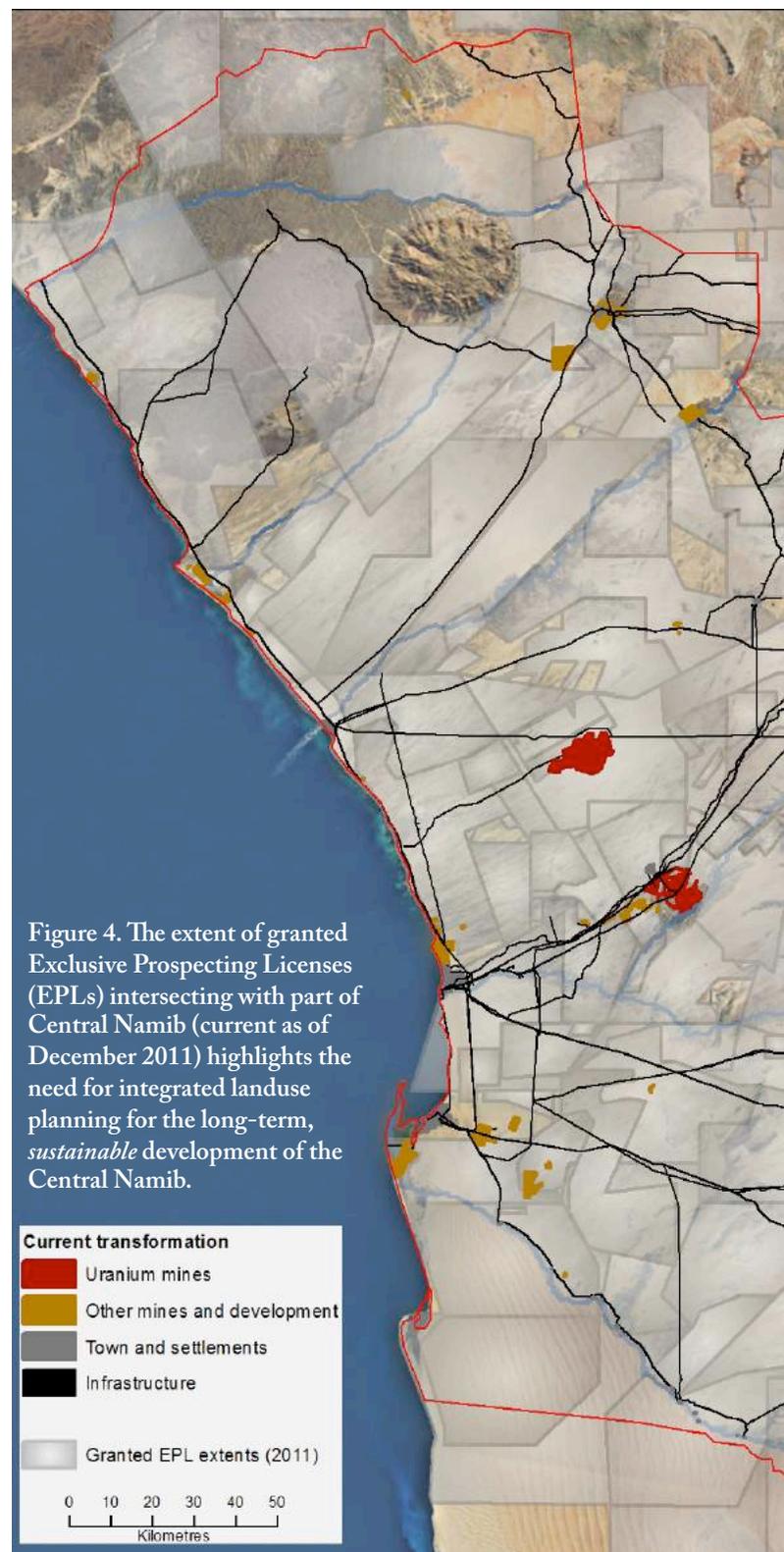


Figure 4. The extent of granted Exclusive Prospecting Licenses (EPLs) intersecting with part of Central Namib (current as of December 2011) highlights the need for integrated landuse planning for the long-term, *sustainable* development of the Central Namib.

Applying the Landscape Level Assessment

The outputs of the Central Namib Landscape Assessment form a decision support tool that can be used to:

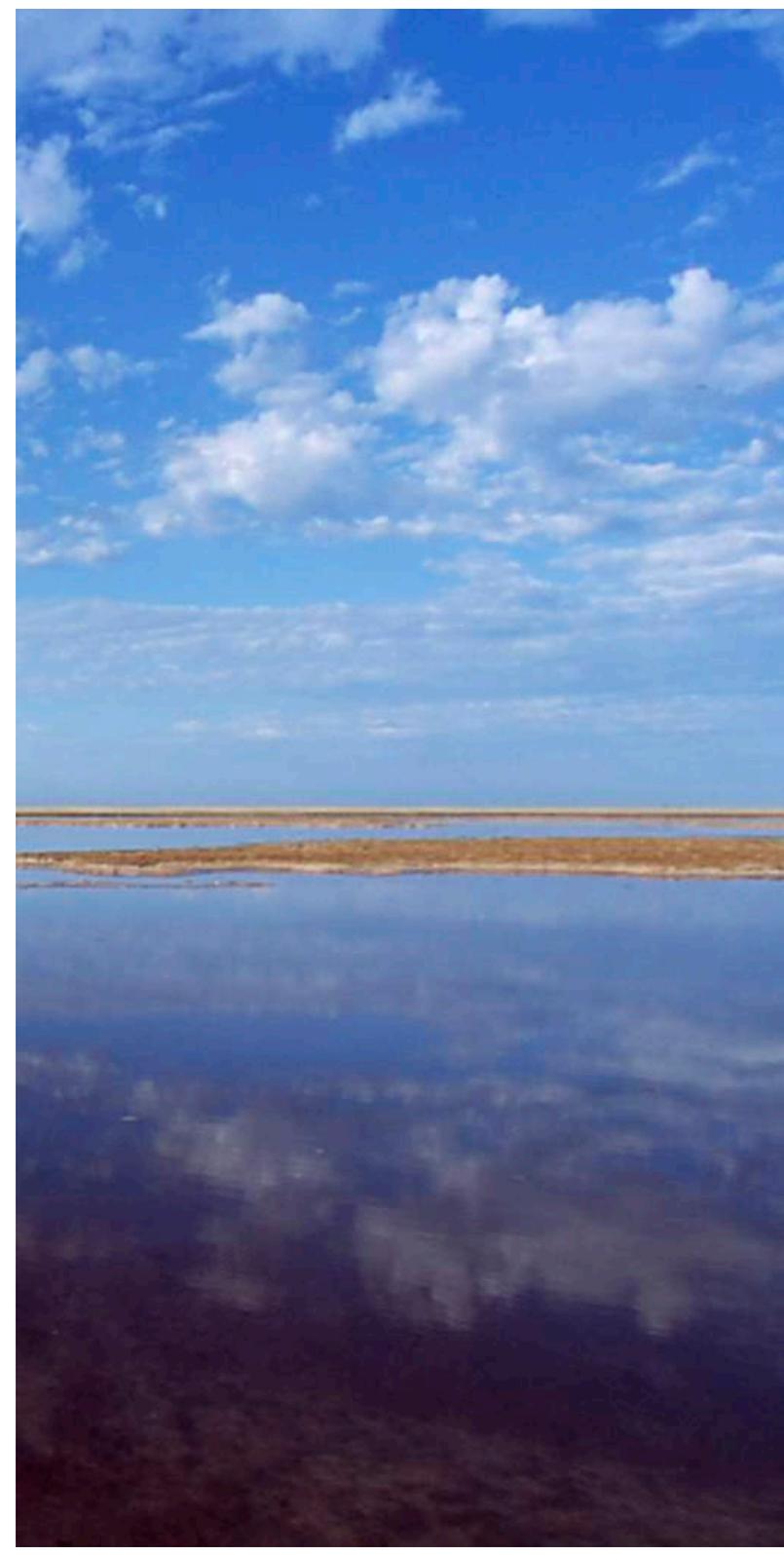
- inform policy development around integrated and sustainable landuse planning
- support implementation of the Environmental Management Act through EIA and ESIA applications and cumulative impact assessments.
- inform conservation planning and prioritisation to further strengthen the conservation areas network.
- help identify areas that should not be subject to exploration and development.
- guide where further, detailed site level assessment is needed
- inform consultation processes relating to any proposed new developments in the region
- raise awareness of the value of Central Namib landscape
- provide a landscape context than can help stakeholders assess and manage their impacts on biodiversity and ecosystem services.

- identify areas where mining and other development pressures coincide with high tourism values.
- support regional integrated landuse planning that takes account of environmental and socioeconomic values.
- provide the basis from which biodiversity offset planning can move forward.

The Landscape Level Assessment also constitutes a model that can be replicated in other regions of Namibia and provides a strong platform for the development of a national level risk assessment and support tool.

For the Landscape Level Assessment to remain effective and relevant as a decision support tool it must be utilised to its full potential and housed, actively managed and updated as additional, improved information become available and/or as changes occur in the landscape.

The integrity of a centralised database must be maintained and the sharing of new information and data encouraged to further develop the database for the region.





Credit: Pippa Howard / FFI

Acknowledgement

The Landscape Level Assessment of Key Biodiversity Vulnerability and Landuse for the Uranium Province of the Central Namib has received much support, input and feedback from a great many people, organisations and initiatives in Namibia and internationally. The Landscape Assessment team would like to thank all those that have so generously contributed their time, data, insight, ideas and expertise. Thank you.

