

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE UPGRADING OF INFRASTRUCTURE IN THE ETOSHA NATIONAL PARK

SOUTH ZONE

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EXECUTIVE SUMMARY

Introduction and Background

The Millennium Challenge Corporation (MCC) was established to assist in reducing poverty in developing countries. They achieve this by supporting sustainable, transformative economic growth to create and maintain sound policy environments. The Millennium Challenge Account-Namibia (MCA-N) is responsible for implementing such projects in Namibia. This particular project is to support the Ministry of Environment and Tourism (MET) improve infrastructure in the Etosha National Park (ENP). The aim is to improve the living conditions of employees in the ENP, thereby making it easier to attract and retain competent talent staff, manage the ENP more effectively and allow the ENP and Namibia to be more competitive in the regional ecotourism market.

Aurecon has been appointed by MCA-N as the independent environmental consultants to undertake the Environmental and Social Impact Assessment (ESIA) study required by the Ministry of Environment and Tourism: Department of Environmental Affairs and Development (MET:DEA). The process will investigate if there are any potential significant environmental and social negative impacts associated with construction activities of two staff villages and associated infrastructure and services. It will also provide an opportunity for the public and key role players to give input and participate in the process, as well as for specialist input on specific aspects. This report records the Site Selection process for development of housing and related infrastructure, whereby various development scenarios are considered from a variety of perspectives to ensure that a holistic and integrated approach is applied to site selection.

The ENP's protected area function is primarily to conserve biodiversity and its success as a tool for conservation will be based on how it protects the values that it contains. There is however, increasing pressure in terms of combining conservation with development for tourism. Disturbance is thus inevitable and management is generally oriented toward determining acceptable limits of change and limiting and managing human-induced changes meets these standards. Optimal development is defined in this case as that which adequately accommodates the development of infrastructure with the least impact on ecosystem functioning.

While this ESIA has been commissioned specifically to assess the impacts related to upgrading of MET infrastructure in the Park, this has been done in the context of a broader plan for development for the Park, to allow for a holistic approach for long-term sustainable planning. Thus the carry capacity of each site for development will be determined to inform planning for future expansion.

The site selection process for the optimal site for development is therefore undertaken with context of these principles. The site selection process only considered the centres where development should be considered in each zone. The detail of which infrastructure should be located where in the Park will be determined in the ESIA phase, based on the detailed baseline information and the assessment of impacts. The current assessment is focused on two areas of the ENP, namely the West and South Zones. This particular report covers the South Zone of the ENP, which includes the village of Okaukuejo and the Ombika Gate entrance.

The context of the Etosha National Park

The ENP was established in 1907 and has become the country's most popular tourist attraction. The 22,270 km² Park which includes the 4,590km² seasonally inundated Etosha Pan, is world famous for its wide variety of animal life, including 111 mammal species, 407 bird species, 116 reptile species and 18 amphibian species.

The vegetation in Etosha is mainly Mopane savanna, with a saline desert surrounding the pan area, ringed by a dwarf savannah fringe. The grass layer is comprised of a number of different grasses and the tree layer is composed of deciduous mopane bushes (*Colophospermum mopane*), which change into a mixed bushveld of mainly acacias (*Acacia* spp.). In addition, the park has a striking forest of moringa trees (*Moringa ovalifolia*). The park is bordered by a number of commercial farms to the south and east. Many of the farmers are now involved in wildlife farming, as well as stock farming, and

many have diversified their operations to include tourism. To the north lies the most densely populated area of Namibia. As a result, along the park's northern boundary human impact is evident as villages, livestock, and agriculture literally abut the park edge.

Current status of development in the South Zone

Okaukuejo is the only resort node in the south of Etosha and includes various types of tourist accommodation, camping, shops and restaurants for tourists. It also includes the research institute, administration buildings, staff quarters, staff clinic and shop, infrastructural as well as environmental services. In general the facilities are not in a good state and there is a clearly identified need for routine cleaning and care, as well as for regular professional maintenance work. The junior village and clinic area are located and constructed in such a manner that they are highly visible to visitors to the ENP and they detract from the wilderness qualities of some of the road accessing gateway views to the Okaukuejo camp. The engineering service area of the ENP is also very exposed to casual observers, which detracts from the nature reserve sense of place. It appears that the existing sewers are operating at maximum capacity (possibly even functioning above threshold capacity).

Ombika Gate, also known as the Anderson Gate, is the southernmost entry point into the park. The area has slight undulation and dense trees surrounding existing structures. Current development at Ombika Gate includes an entrance gate and visitor ablutions, a school, staff housing for gate staff and teachers, a playing field, a small maintenance workshop and service-related Infrastructure. The school structures on the small hill to the west of the gate are screened from view by trees and thus do not detract from the gateway effect of entrance into the game park for the tourists. The existing dilapidated residential structures to the east of the road immediately after entering the park do however detract from the visual experience of the park. The sewerage works, solid waste dump and electrical substitution and power lines to the east of the gate are screened by the existing development and are not immediately visible to the visitor. Sewage is collected by a variety of gravity systems into a sewer pump station, fitted with a temporary pump, and located east of the entrance road. Sewage is pumped to oxidation ponds, which appear to be in a reasonably good condition.

Development Scenarios for the ENP

There is currently development at both Okaukuejo and Ombika Gate. The distribution of development to each site must comply with MET long term strategic goals such as Strengthening the Protected Area Network (SPAN Project), as well as ensure that the directives, as set in the Etosha Management Plan (EMP) and other relevant documents pertaining to the management of the Park in terms of biophysical, cultural and social elements are met. The brief to the Aurecon team for the site selection element of the process was to determine the best development scenario for the above elements in terms of site location for each of the components listed above.

The infrastructure listed below has been identified as required for effective functioning of the South Zone at this stage. Some of the infrastructure already exists, although it may need upgrading, and therefore can be used, depending on where it is decided that development should be concentrated.

• 33 Senior houses	• 30 Junior houses
• Large Office for Administration	• Research Institute
• Workshop	• Services (Electricity, Solid Waste, Effluent Treatment, Water Treatment & Access)
• Fuel depot	• Vehicle Store
• Kindergarten/School	• Clinic
• Shop	• Sports fields
• Community Hall	• Recycle Yard

The development scenarios considered in the site selection process are summarized below. The preliminary identification of most of the sites by MET was based on previous studies undertaken to establish the condition of infrastructure in the ENP. The scenarios include building and renovating at Okaukuejo, and/or expanding housing and infrastructure at Ombika Gate. Two sites were considered at Ombika Gate, as well as the option of locating the village outside of the ENP altogether.

South Zone				
	<i>Ombika East</i>	<i>Okaukuejo</i>	<i>Ombika West</i>	<i>Outside Park</i>
Development Scenario 1	Build	Renovate & build		
Development Scenario 2		Renovate & build		
Development Scenario 3		Renovate & build	Build	
Development Scenario 4	Build	Renovate & build	Build	
Development Scenario 5		Renovate & build		Build

Existing information, stakeholder consultations and field visits were used to evaluate the various site options most suitable for the construction of ENP staff housing and management centres. Each of the development scenarios was considered in terms of the same set of criteria using the Multi-Criteria Decision-Making Model (MCDM), which is a discipline aimed at supporting decision makers who are faced with making numerous and conflicting evaluations. The process was undertaken to ensure that all scenarios were compared in an objective and defensible manner in order to determine the best possible option for development, as funded by the MCA-N.

The model used in this process was the Ideal Mode Analytical Hierarchy Process (AHP) Pairwise Comparison Model. The AHP method requires all specialists to develop a hierarchy which consists of the overarching goal, pre-selected alternatives and performance criteria. The options are then analysed by comparing them to one another (two at a time), whereby they consider whether an option is better or worse than the option it is being compared with. A rating scale is used to compare the alternatives where a low rating means a weak preference and a larger rating means a stronger preference. The specialists then rate the alternatives based on their judgment on which alternative is more important, supported by data obtained from fieldwork and existing documentation. The model prescribes numerical values which are processed and compared over the entire range of alternatives. Each option of the hierarchy is then assigned with a numerical weight. The weighting is calculated for each of the alternatives. The results obtained will indicate whether an alternative achieves the overarching goal.

Criteria for Site Selection

The site selection criteria were selected based on the broad definition of sustainability, which encompasses biophysical, social and economic considerations to ensure that the approach to optimal development in the South Zone of the ENP is holistic and integrated. A number of criteria were therefore identified to assist in determining optimal site selection.

The criteria indicated below were selected to ensure that all potential sites were considered and compared from a rational and balanced perspective. This allows for the optimal site to be selected upfront and so that resources for a detailed study can be focused on a preferred site.

Specialist input was obtained to draw up the criteria relevant to site selection, and approval of these was obtained from MET management and the MET/MCA-N Technical Management team. The criteria comprised a number of sub-criteria which inform the overall criterion. Only criteria that differentiate one site against another were included in the site selection criteria. Certain criterion will apply to all sites equally, such as issues relating to resident behaviour and maintenance of infrastructure, which are management issues that will apply to all sites equally regardless of location have been included. All relevant issues will however be addressed in the assessment phase.

The criteria were weighted to ensure that criteria considered as more important in terms of site selection were given more significance in the site selection process, as follows: Groundwater - 20%; Strategic - 20%; Social - 15%; Biotic - 15%; Operational - 10%; Technical - 10%; Visual - 10%. It is important to note that the same order of site preference was achieved with all criteria having the same weighting, although the degree of preference was slightly altered.

Criteria for Site Selection - MCDM	
Criteria	Sub-criteria
Biotic / Wildlife	Constraining biophysical features - sensitive/special habitats /species of concern
	Impact on ecosystem functioning
	Disturbance to wildlife (noise, changed movement patters)
	Land clearing of greenfield sites and roads (pristine vegetation)
	Spread of alien invasive plant and animal species
	Risk from/for veld fires - high fire risk vegetation
Groundwater	Potential aquifer pollution
	Water Availability
Operational / Tourism	Area available for expansion in future
	Storage of equipment for fencing and road maintenance
	Traffic on tourist roads - movement of staff and equipment
Technical / Financial	Additional/extended access roads required (distance, slope, substrate)
	Additional infrastructure for water provision/waste water & waste management
	Additional Road infrastructure required
	Requirements for building material - borrow pits and rehabilitation
Social	Control of social problems
	Impact on tourism facilities by workers (noise and crowding)
	Requirements for relocation and opportunity to improve living conditions
	Conflict with neighbouring landowners
	Access to services (schools, clinics etc)
	Risk of poaching and wood collection, as well as for social problems in the staff-tourist interface
Visual	Sense of place/visual impact
Strategic	Strategic Plans - relocate to periphery of park
	Time and budget required to achieve the development scenario
	Improvement in quality of infrastructure and improved quality of working conditions and resultant impact on tourism

Stakeholder inputs

An important consideration in the site selection process is the input from directly affected stakeholders. To ensure that such inputs were used to inform site selection, meetings were held with residents at Okaukuejo. A Background Information Document (English and Afrikaans) explaining the project was circulated to the immediately affected neighbours (Talení and Ongava Lodges, the Etosha Safari Camp, Oberland and Eldorado Farms and Wilderness Safaris as neighbouring landowners abutting the Park to the west and east of Ombika Gate). Consultation has also taken place with MET (Directorates of Parks and Wildlife Management, Environmental Affairs, Tourism and Scientific Services), Strengthening the Protected Areas Network Project (SPAN) and NWR. The ESIA was advertised in the Namibian newspaper. Public participation and stakeholder consultation will be undertaken on an ongoing basis throughout this process and the Site Selection and Baseline Reports will be presented to the public in meetings in August. .

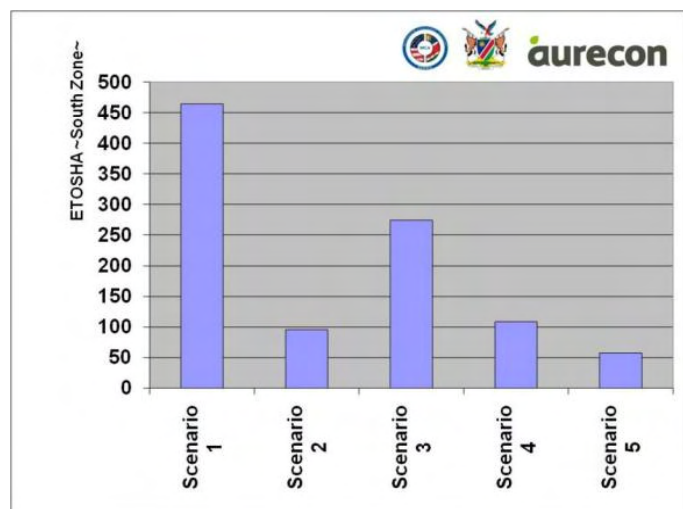
The residents in the South Zone are currently suffering due to lack of water and sanitation and support immediate interventions to improve living conditions. They understand the need to move out of the ENP if they are not working there, but they also feel that the Park is their home and they have nowhere to go. People seemed reluctant to move if such a move did not make a difference to their lives, but most would live elsewhere if good alternative housing was offered. The Hai//om don't want to be moved outside of the Park. Hai//om people feel they are being neglected and that their cultural heritage is in the ENP.

While some residents would prefer a site outside ENP or close to the border because of the freedom of movement afforded, others regard ENP as a safe environment with less access to shebeens and so on. The reaction to site selection was therefore mixed. There is deep concern that non-employees will not be catered for at a new site;

The neighbouring stakeholders support the initiative to upgrade infrastructure as they are concerned about the living conditions of the employees and about the impact that poor infrastructure is having on tourism in the ENP. The discussions indicate a concern for Hai//om and the stakeholders outside the ENP want the rights of the Hai//om to be met at a site within the Park. There is concern about the visual and noise impacts on neighbouring landowners and their tourism opportunities from a site at Ombika West.

Preferred Site

The preferred option in all scenarios with the exception of one of the criteria considered, namely Groundwater, is Scenario 1. This is the option of creating a new village at Ombika to the east of the existing gate for non-essential staff and moving most of the residents of Okaukuejo to this area, while upgrading the infrastructure at Okaukuejo for essential staff in this area.



This option is deemed to meet strategic, financial and technical considerations, while not impacting negatively on biotic, groundwater and visual aspects to an unacceptable level. It removes non-core staff from Okaukuejo, thereby meeting strategic goals for the Park and reducing risk of worker behaviour impacting on tourism.

From a social perspective, this site will also assist in managing the influx of people into the heart of the ENP, which is one of the major causes of the social problems experienced in the ENP. These social problems are impacting on management and tourism operations in the area. The fact that the site is in the Park allows for control of workers in the village, while restricting more densely populated areas to the periphery of the Park.

The vegetation at Ombika East is mixed low trees on calcrete, which is widespread in the Park. The site is removed from the spring in the area. It is located in a flat area, away from tourist routes and key neighbouring areas. An important consideration is that the Government of Namibia, through the Ministry of Lands and Resettlement, is currently acquiring farms to the east of the Ombika Gate for resettlement of the Hai//om San community members who are non-employees in the Park, and as such these farms will form a buffer area between the Park and neighbouring land owners. The site is close to existing services and the Gate, and it is screened by existing footprints (substation and waste site).

The substrate for development in the Ombika area is a mosaic of good and bad substrate, with both areas being a heterogenous mix calcrete and turf. Neither East nor West Ombika is uniformly optimal for building, because of the turf pans that get waterlogged in summer and become mud. Calcrete ridges are more suitable, but occur in scattered patches at both sites, while the intermediate substrate

varies in quality. In general, the Ombika West site is flatter and has more homogeneous substrate and represents an easier option. The Ombika East site is more uneven, more heterogeneous and will need more careful planning of infrastructure placement. From a substrate viewpoint, neither site is optimal, but both could be made to work and this aspect is therefore not considered a constraint to development. Whichever site is selected, final infrastructure placement will need to be adjusted to conform to small-scale substrate conditions on the ground. This aspect must however be carefully considered in the ESIA phase.

While a preference is shown for Scenario 3 in terms of Groundwater, Scenario 1 is the next favoured option, with none of the other alternatives being particularly viable. The presence of more Kalahari sand, calcrete and gravel in the vicinity of Ombika East means that it will be more vulnerable to pollution, especially in light of the presence of the waste site and the waste water treatment works close by. Groundwater will therefore require higher level of protection in this site and this aspect will need careful consideration in the ESIA phase. While water is available and less sensitive to pollution to the west of Ombika Gate, it is not preferred as the development site for a number of other reasons. Water availability is a potential issue for all sites in the Park and this aspect will be investigated thoroughly in the ESIA phase.

The vegetation at Ombika West is 'Etosha Turf Pans on KarstVeld', which is a restricted vegetation type. The current location of a viewing site at the Ombika Spring in the area is a limitation as wildlife at Ombika Spring may be disturbed and visually, development to west of Ombika Gate may interfere with visitor viewing of wildlife at Ombika Spring. There are plans to move the water hole to the north as wildlife activity in the area increases the potential for conflict with humans. However, this is not confirmed and currently, the siting of development close to the water hole is not desirable. Development may impact on neighbouring landowners, who run lodges and farms for tourism. The Ombika West site may have a significant negative visual impact on the northern area of the neighbouring farm in the area.

It is also not considered a good option to develop to the east and west of the Ombika Gate as this will increase both the ecological impacts by increasing the development footprint, while also costing more in terms of development of infrastructure to support the more expansive development footprint.

The option of upgrading and locating all infrastructure at Okaukuejo is not preferred as it is located close to the Okaukuejo Spring and development already hampers wildlife movement. Additional development for infrastructure in this area also restricts tourism expansion opportunities in the area in the future. Ground water is poor and one of the boreholes is already polluted, with limited capacity available. Visually, current infrastructure is already detracting from the tourist experience, while noise levels from the junior village impact on the tourist area. Conditions in the junior staff village are exacerbated by poorly maintained infrastructure together with the lack of functioning services. Whilst infrastructure in the senior village is in a better condition than the former, the living conditions in both villages are of low quality. The lack of management has also resulted in uncontrolled influx of non-employees into the area, further impacting negatively on the Okaukuejo area.

However, it is not considered desirable to move expensive infrastructure such as the existing research centre to Ombika, but to rather retain and upgrade both it and some of the maintenance centre in the camp to allow for maintenance operations related to the area to be handled from Okaukuejo. This will reduce unnecessary traffic on tourism roads.

The option of developing a site outside of the ENP for the South Zone was explored at a conceptual level and was found not to be a favoured option. The time frames involved in identifying and purchasing land outside of the ENP would mean that the money available from MCC may not be available as projects must be completed within 5-year time frames. The scope of purchasing and acquiring land outside the park will be larger and hence requires a much broader stakeholder engagement process with involvement from governmental and non-governmental levels and thus taking a longer time to resolve. It would also require additional funding for purchasing of land, which is not guaranteed and may also be better used in upgrading the ENP itself. The costs associated with establishing an entirely new township are likely to be higher than utilising available infrastructure as is possible within the ENP. Furthermore, the operation costs of transporting employees from outside the ENP to work will be higher and will increase traffic on the roads and the associated carbon footprint, which is an indirect impact often not considered. From a social perspective it will be even harder to implement management controls for employees for sites outside the ENP.

For these reasons, no specific site was looked for outside the ENP and this scenario was not considered at the detailed level that the other scenarios were.

The area indicated below, known as the development “envelope” will thus be assessed at Ombika East in the assessment phase by the specialists. This is in order to determine the significance of impacts related to development in this area, determine mitigation measures to reduce the severity of impact and to inform recommendations for planning, design, construction and operation. A carrying capacity for development will be determined.



Recommendations and Conclusions

It is recommended that Scenario 1, namely establishing a village at Ombika East be investigated in the EIA phase. This scenario will include relocating all non-essential staff to the new site, to be designed in such a manner that the functional township is created that provided good quality living conditions, supported by adequate provision of services. Certain functions should be maintained at Okaukuejo such as the Research Centre, which should be renovated.

The ESIA will be undertaken to ensure that the development proposals meet the goals of the MET in terms of managing the ENP; to ensure that the living and working conditions of employees in the ENP are upgraded; and to assist the ENP and Namibia to compete effectively in the regional ecotourism market by providing quality infrastructure.

In conclusion, an ESIA should be undertaken on Scenario 1 to investigate the significance of all impacts associated with the preferred site and make recommendations for the distribution of infrastructure between Okaukuejo and Ombika. It must further make recommendations for design of the village and infrastructure to avoid negative impacts and maximise positive ones. Recommendations for both the construction and operational phases must also be made to manage residual impacts to ensure that that the proposed development.

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List of Acronyms

AHP	Analytical Hierarchy Process
EIA	Environmental Impact Assessment
EMP	Etosha Management Plan
ENP	Etosha National Park
ESIA	Environmental and Social Impact Assessment
GRN	Government of Namibia
MCA-N	Millennium Challenge Account-Namibia
MCC	Millennium Challenge Corporation
MCDM	Multi-Criteria Decision-Making Model

MET	Ministry of Environment and Tourism
MET: DEA	Ministry of Environment and Tourism: Department of Environmental Affairs and Development
NWR	Namibian Wildlife Resorts
SPAN	Strengthening the Protected Areas Network

1. INTRODUCTION

1.1. RATIONALE FOR DEVELOPMENT

The Millennium Challenge Corporation (MCC) was established to assist in reducing poverty in developing countries. They achieve this by supporting sustainable, transformative economic growth to create and maintain sound policy environments. The Millennium Challenge Account-Namibia (MCA-N) is responsible for implementing such projects in Namibia. This particular project is to support the Ministry of Environment and Tourism (MET) improve infrastructure in the Etosha National Park (ENP). The aim is to improve the living conditions of employees in the ENP, thereby making it easier to attract and retain competent talent staff, manage the ENP more effectively and allow the ENP and Namibia to be more competitive in the regional ecotourism market.

Aurecon has been appointed by MCA-N as the independent environmental consultants to undertake the Environmental and Social Impact Assessment (ESIA) study required by the Ministry of Environment and Tourism: Department of Environmental Affairs and Development (MET:DEA). The process will investigate if there are any potential significant environmental and social negative impacts associated with construction activities of two staff villages and associated infrastructure and services. It will also provide an opportunity for the public and key role players to give input and participate in the process, as well as for specialist input on specific aspects.

The first stage of the ESIA in this case is the Site Selection process for development of housing and related infrastructure in both the West and South Zones of the ENP (**Error! Reference source not found.**), whereby the various development scenarios are considered from a variety of perspectives to ensure that a holistic and integrated approach is applied to site selection.

While the ESIA has been commissioned specifically to assess the impacts related to upgrading of MET infrastructure in the Park, this has been done in the context of a broader plan for development for the Park, to allow for a holistic approach for long-term sustainable planning.

1.2. RATIONALE FOR SITE SELECTION

When proposing development within a protected area, it is essential that the values of such a protected area are clearly understood so that any development proposal can be evaluated against the over-arching ideals and objectives. The significance of ENP, including its potential values, is fundamental to all the other assumptions about the site and decisions about the way it should be managed and used. While the ENP's protected area function is primarily to conserve biodiversity, there is increasing pressure and expectation that this protective function must be combined with development functions. With this in mind, the optimal development initiative will be the proposal which adequately accommodates the

development of infrastructure initiative with the least impact on ecosystem functioning. This is an important dimension of contemporary conservation because it requires a development model which acknowledges acceptable ‘trade-off’ between conservation and essential development.

Although disturbance is inevitable, management is generally oriented toward limiting and managing human-induced (exogenic) changes within the Park, as it is human-induced changes that are most disturbing in protected areas. Such human-induced changes may lead to conditions that visitors or managers feel are unacceptable or inappropriate. Management then concerns itself with determining what actions will be effective in influencing the amount, type and location of these changes in addition to determining how much change is acceptable.

Research has shown that relatively small amounts of recreational use lead to disproportionately large biophysical impacts (Cole & Stankey, 1997)¹. Thus, allowing any level of recreation in a protected area means that some level of impact will occur. The principal question to be asked is “how much impact is acceptable in this area?” Once this question has been addressed, managers must deal with the appropriateness of various techniques or actions to manage to this level of impact.

The success of protected areas as a tool for conservation is based around the assumption that they are managed to protect the values that they contain. Therefore, the commitment to setting aside land and providing services must be matched with similar commitments to resources for management. In other cases, even though management systems are in place, the pressures on protected areas are so great that their values continue to degrade. The recognition of the critical role that management must play to secure biodiversity within this protected area is potentially the most important factor in determining a successful project.

The site selection process for the optimal site for development within the South Zone is therefore undertaken with context of the principles discussed within this section. The site selection process only considered the centres where development should be considered in each zone. The detail of which infrastructure should be located where in the Park will be determined in the ESIA phase, based on the detailed baseline information and the assessment of impacts.

1.3. THE CONTEXT OF THE ETOSHA NATIONAL PARK

Namibia gets its name from the Namib Desert, which is named for the Nama word Namib, meaning open space and is hence known as the “land of open spaces”. This wilderness sense of place is enhanced by the very low population of Namibia, which is one of the lowest in the world with less than two people per km². Areas associated with manmade landscapes such as towns and infrastructure are limited, resulting in a unique resource of ‘untouched’

¹ Cole, D.N. and Stankey, G.H. (1997). Historical development of Limits of Acceptable Change: conceptual clarifications and possible extensions. In *Proceedings: Limits of Acceptable Change and Related Planning processes: Progress and Future Directions. General Technical Report*. US Department of Agriculture Forest Service

scenery. Namibia's vibrant tourism industry is nearly entirely based on the promotion of its natural assets.

Etosha National Park, first established in 1907, is Namibia's first national park. It has become the country's most popular tourist attraction, well-known for its exceptional wildlife viewing opportunities. The 22,270 km² Park which includes the 4,590km² seasonally inundated Etosha Pan, is world famous for its wide variety of animal life, including 111 mammal species, 407 bird species, 116 reptile species and 18 amphibian species. Etosha is a significant tourist attraction and is unique in terms of its importance to the Namibian tourist economy and international Etosha branding and resources. Etosha's landscape character is a vital part of the Namibian heritage as a "land of open spaces" as well as significant in terms of unique landscape predominantly associated with Etosha pan.

The vegetation in Etosha is mainly Mopane savanna, with a saline desert surrounding the pan area, ringed by a dwarf savannah fringe. The grass layer is comprised of a number of different grasses and the tree layer is composed of deciduous mopane bushes (*Colophospermum mopane*), which change into a mixed bushveld of mainly acacias (*Acacia* spp.). In addition, the park has a striking forest of moringa trees (*Moringa ovalifolia*). The park is bordered by a number of commercial farms to the south and east. Many of the farmers are now involved in wildlife farming, as well as stock farming, and many have diversified their operations to include tourism. To the north lies the most densely populated area of Namibia. As a result, along the park's northern boundary human impact is evident as villages, livestock, and agriculture literally abut the park edge.

1.4. CURRENT STATUS OF DEVELOPMENT IN THE SOUTH ZONE

The current assessment is focused on two areas of the ENP, namely the West and South Zones. This particular report covers the South Zone of the ENP, which includes the village of Okaukuejo (**Error! Reference source not found.**) and the Ombika Gate entrance (**Error! Reference source not found.**).

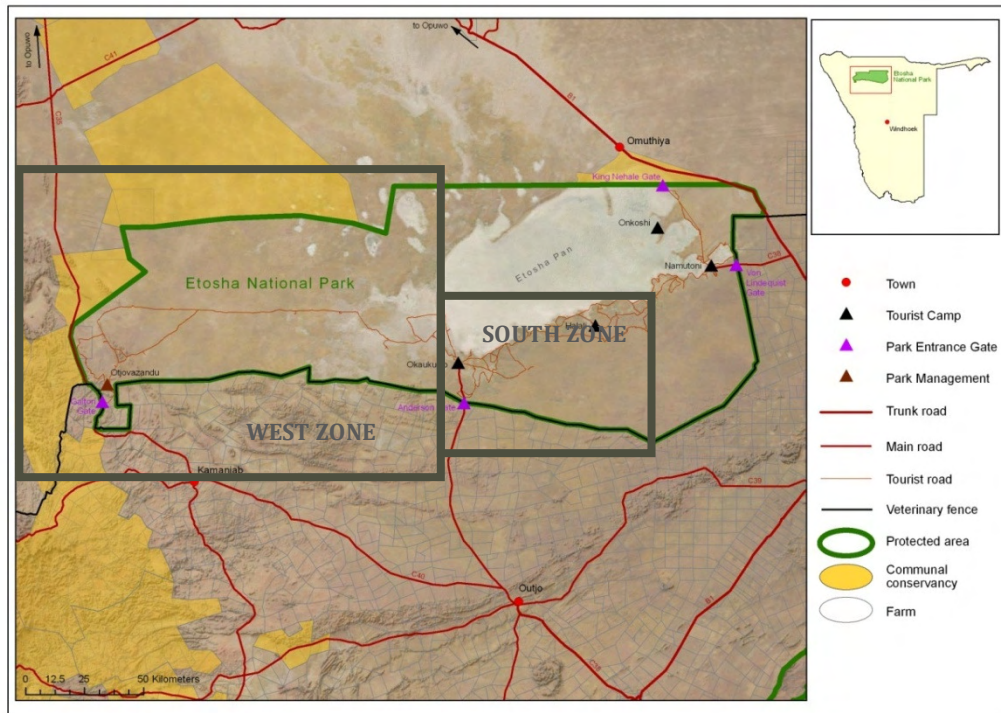


Figure 1: Locality of the Etosha National Park

i. Okaukuejo

This is the only resort node in the south of Etosha and includes various types of tourist accommodation, camping, shops and restaurants for tourists. It also includes administration buildings, staff quarters, staff clinic and shop, infrastructural as well as environmental services. Infrastructure related to the staff housing and management is dilapidated. The junior village and clinic area are located and constructed in such a manner that they are highly visible to visitors to the ENP and they detract from the wilderness qualities of some of the road accessing gateway views to the Okaukuejo camp. The engineering service area of the ENP is also very exposed to casual observers, which detracts from the nature reserve sense of place. Current infrastructure at Okaukuejo includes the following:

- Tourist infrastructure (accommodation, shops, information facilities);
- Research Institute
- Offices and administration centre
- Staff housing (senior and junior in two separate areas)
- Clinic, Shop and Kindergarten School
- Maintenance workshop

- Service-related Infrastructure (Waste Water and Water Treatment Plants, Power Lines)



Figure 2: Current Development at Okaukuejo



Figure 3. Colour plates from the Okaukuejo area from the Visual Baseline Report (VRMA, 2010)

ii. Ombika

Ombika Gate, also known as the Anderson Gate, is the southernmost entry point into the park. The area has slight undulation and dense trees surrounding existing structures. Current development at Ombika Gate includes the following:

- Entrance gate and visitor ablutions;
- School
- Staff housing for gate staff and teachers
- Playing field
- Maintenance workshop
- Service-related Infrastructure (Waste Water Treatment Plant, Electrical Substation, Power lines and Waste Treatment Plant)

The school structures on the small hill to the west of the gate are screened from view by trees and thus do not detract from the gateway effect of entrance into the game park for the tourists. The existing dilapidated residential structures to the east of the road immediately after entering the park do however detract from the visual experience of the park. The sewerage works, solid waste dump and electrical substitution and power lines to the east of the gate are screened by the existing development and are not immediately visible to the visitor.



Figure 4: Current Development at Ombika Gate



Figure 3:



Figure 4:



Figure 2:



Figure 1:

Figure 1: Locality Map

Figure 2: Views of school building

Figure 3: Radio mast on top of hill

Figure 4: Ombika Gate entrance

Figure 5: Colour Plates for the Ombika area from the visual baseline assessment for this study (VRMA 2010)

2. DEVELOPMENT SCENARIOS FOR THE ENP

The brief to the Aurecon team for the site selection element of the process was to determine the best development scenario for the above elements in terms of site location for each of the components listed above. There is currently development at both Okaukuejo and Ombika Gate. The distribution of development to each site must comply with MET long term strategic goals such as Strengthening the Protected Area Network (SPAN Project), as well as ensure that the directives, as set in the Etosha Management Plan (EMP) and other relevant documents pertaining to the management of the Park in terms of biophysical, cultural and social elements are met. The criteria considered for site selection are discussed in Section 3.2.

The infrastructure listed below has been identified as required for effective functioning of the South Zone at this stage. Some of the infrastructure already exists, although it may need upgrading, and therefore has the potential to be used depending on where it is decided that development should be concentrated.

- 33 Senior houses
- 30 Junior houses
- Large Office for Administration
- Research Institute
- Workshop
- Services (Electricity, Solid Waste, Effluent Treatment, Water Treatment & Access)
- Fuel depot
- Kindergarten/School
- Clinic
- Shop
- Sports fields
- Community Hall
- Recycle Yard
- Vehicle Store

It is critical that development within protected areas, which are sensitive for ecological or aesthetic reasons, or which may have unusual or unique cultural and historic elements, is soundly planned and executed to limit the likelihood of development initiatives which have a significant negative impact or which contradict the Etosha Parks governing policy, namely Etosha Management Plan (2007). It is essential that all development is efficient and effective to meet management objectives. The underlying principle guiding the development scenarios and site selection analysis must be development that contributes to the ongoing sustainability of the park without detracting from the natural values on which it is based.

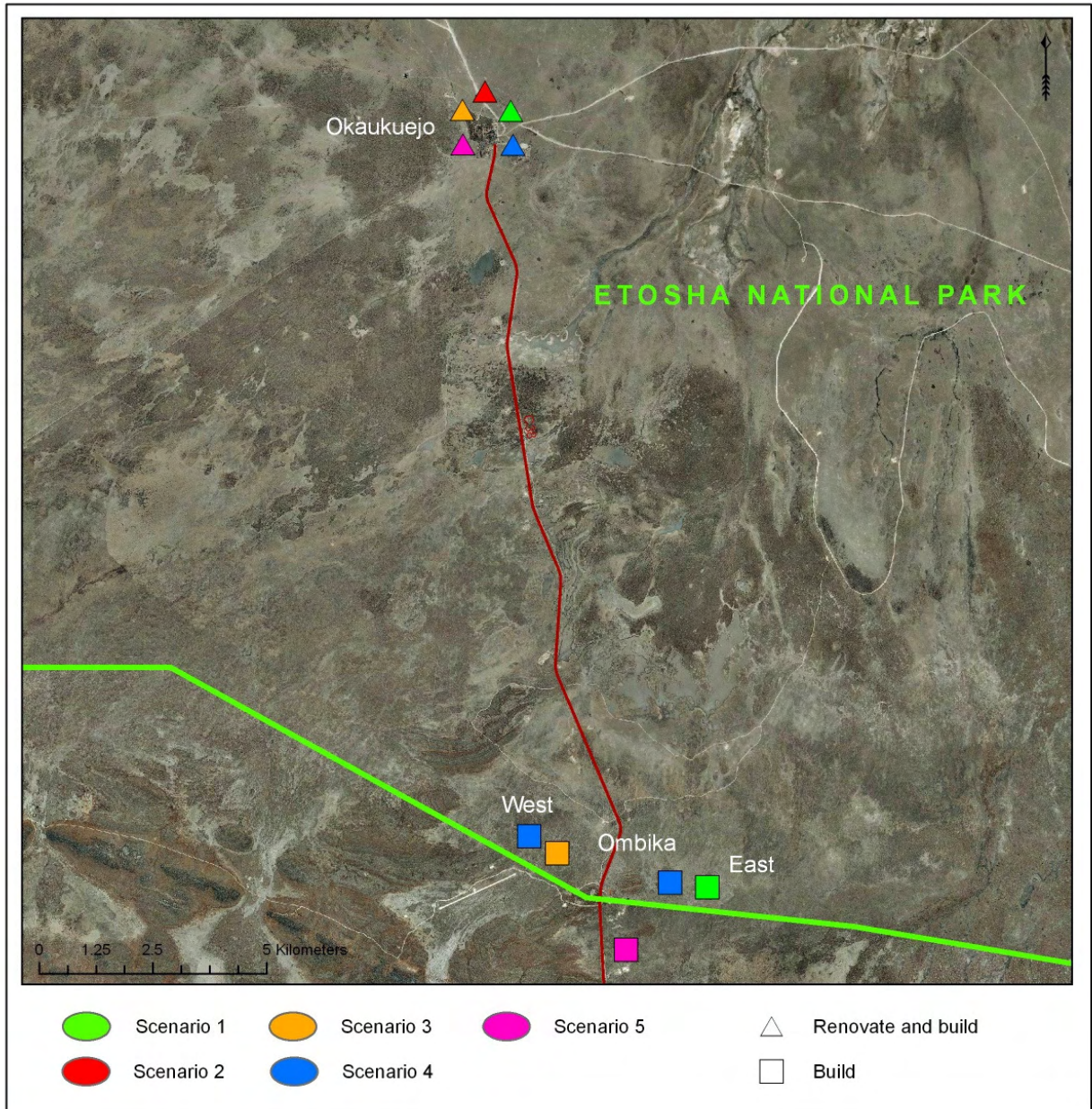
The development scenarios considered in the site selection process are summarized in Table 1, and **Error! Reference source not found.** below. The preliminary identification of most of the sites by MET was based on previous studies undertaken to establish the condition of infrastructure in the ENP. The scenarios include building and renovating at Okaukuejo, and/or expanding housing and infrastructure at Ombika Gate. Two sites were

considered at Ombika Gate, as well as the option of locating the village outside of the ENP altogether.

Table 1. Summary of Development Scenarios

South Zone				
	<i>Ombika East</i>	<i>Okaukuejo</i>	<i>Ombika West</i>	<i>Outside Park</i>
Development Scenario 1	Build	Renovate & build		
Development Scenario 2		Renovate & build		
Development Scenario 3		Renovate & build	Build	
Development Scenario 4	Build	Renovate & build	Build	
Development Scenario 5		Renovate & build		Build

Figure 6: Development Scenarios



Each of the development scenarios was considered in terms of the same set of criteria (Section 3.2) using the Multi-Criteria Decision-Making Model described in Section 3.1. The process was undertaken to ensure that all scenarios were compared in an objective and defensible manner in order to determine the best possible option for development, as funded by the MCA-N.

3. METHODOLOGY

3.1. MULTI-CRITERIA DECISION-MAKING MODEL (MCDM)

Existing information, stakeholder consultations, and field visits will be used to evaluate the various site options most suitable for the construction of ENP staff housing and management centres. MCA-N stipulated that an open, transparent and interactive process must be used to determine optimal site selection (i.e. the site and distribution of infrastructure that best meets a range of identified construction, operating and cost criteria), based on the major issues that will influence the viability and suitability of the proposed sites in the two proposed construction zones, in the Southern and Western sections of the Park.

The Multi-Criteria Decision-Making Model (MCDM) was used to assist in site selection. MCDM is a discipline aimed at supporting decision makers who are faced with making numerous and conflicting evaluations. It highlights conflicts and derives a way to reach a compromise in a transparent process. The process of MCDM prioritises options against a set of criteria. This process is well-suited to address complex technical strategic planning challenges. In MCDM, options could typically include project, technology and sequencing alternatives. Although several MCDM models are available internationally, not all are ideal for this specific category of application. The model used in this process will be the Ideal Mode Analytical Hierarchy Process (AHP) Pairwise Comparison Model. The simplified form, used since the 1700s, been refined over time. The recommended model is widely accepted as the most reliable of AHP Pairwise Comparison Models and has inspired the development of various other MCDM tools and software packages. It is recommended due to the ease of application in a spreadsheet format using simple matrix mathematics.

Advantages of this specific model in an application such as the selection of optimum scenarios for development include the following:

- It can tolerate a degree of inaccuracy due to rating or level of detail of base data, and as such allows for the application of this model early in the project life cycle, prior to detailed engineering designs being available;
- It allows for testing of the consistency of rating;
- It allows for a degree of difference of interpretation of rating scale by the various team members / specialists looking at the different aspects, as the results are normalised in the process by the model expressing the results as unit-less numerical values indicating relative preference only;
- Its ease of use and transparency;
- A sensitivity analysis can be done easily; and
- If required, it allows for the ranking of the criteria to determine the weighting that would apply to such in the calculation of the relative preference during the optimisation process.

The AHP method firstly requires that the specialists develop a hierarchy which consists of the overarching goal, pre-selected alternatives and performance criteria. The options are then analyzed by comparing them to one another (two at a time), whereby they consider

whether an option is better or worse than the option it is being compared with. A rating scale is used to compare the alternatives where a low rating means a weak preference and a larger rating means a stronger preference. The specific rating scale used throughout this application is summarised in the Table 2 below. The specialists then rate the alternatives based on their judgment on which alternative is more important as well as from data obtained from fieldwork and existing documentation.

Table 2. MCDM Rating Scale

RATING SCALE TABLE	
Rating	Description of Relative Rating
1	Equal
3	Weak preference
5	Essential or strong preference
7	Demonstrated preference
9	Absolute preference
2, 4, 6, 8	Intermediate values
Reciprocals of the above	If for criterion x, option A has a rating of one of the above when compared to option B (R_{XAB}), then option B has the reciprocal rating when compared to option A ($R_{XBA} = 1 / R_{XAB}$)

The model prescribes numerical values which are processed and compared over the entire range of alternatives. Each option of the hierarchy is then assigned with a numerical weight. The weighting is calculated for each of the alternatives. The results obtained will indicate whether an alternative achieves the overarching goal.

Various alternatives were proposed for the South Zone (Ombika/Okaukuejo) as described in Section 2 and assessed to inform site selection, according to the criteria outlines in Section 3.2 below.

3.2. CRITERIA FOR SITE SELECTION

The site selection criteria were selected based on the broad definition of sustainability, which encompasses the biophysical, social and economic criteria outlined below. This is to ensure that the approach to optimal development in the South Zone of the ENP is holistic and integrated. The criteria used in site selection in this process include:

- **Biophysical criteria.** This component refers to the need to select a development scenario that minimises the risk to ecosystem functioning and environmental integrity. Therefore, the biotic criterion prioritises the anticipated impacts on the fauna and flora, as well as the geohydrology of each site.
- **Technical Criteria.** This is related to the impact that a given development scenario will pose with regard to service provision and maintenance, development footprint, and logistical synergy with regard to continued Park management.
- **Economic criteria.** Financial accountability and stewardship is vital for both responsible and sustainable functioning of the Park, as well as for international based funding. Therefore, this component considers the extent to which each development proposal is achievable within the available budget (i.e. financially justified).

- **Social Criteria.** Protected area management does not only comprise the management and conservation of biodiversity, but that it has a social dimension, and therefore includes potential impacts for local residents, staff and tourists. As it is the social element that ultimately results in the disturbance of the biophysical aspects, this must be understood and managed.
- **Aesthetic and Cultural/Heritage criteria.** Visual and cultural/heritage factors are important elements when considering the sense of place within the proposed development sites, which affects the pride of local communities, tourism and economic potential.

A number of criteria were therefore identified to assist in determining optimal site selection i.e. the best site(s) for development, as well as distribution of infrastructure between all site(s) to ensure that the strategic goals of MET are met, without compromising the functioning and well-being of the biophysical and social environment. The criteria were selected based on the issues identified in the Terms of Reference for the study by MCA-N and from issues identified by the ESIA team in existing documentations and discussions with stakeholders. The various considerations identified were grouped in criteria, which were further broken down into sub-criteria, as determined by specialist input into this aspect.

The criteria indicated in These criteria summarised in Table 3 are discussed in greater detail below. Specialist input was obtained to draw up the criteria, which are deemed to have most relevance to the selection of sites within the ENP. Thereafter the criteria and results of the specialist input were presented to both MET management and the MET-MCA-N Technical Management team. After discussion and slight refinement, both the criteria and the findings were agreed to. The criteria are comprised of a number of sub-criteria which inform overall criterion.

While there are a number of criteria that need to be considered in the EIA phase when assessing the significance of impacts related to the proposed developments, the only criteria that are considered in site selection are those criteria that differentiate one site against another. Where the same criteria will apply to all sites equally, these have been disregarded as relevant to this aspect of the study, namely site selection. Where the same criteria will apply to all sites equally, these have been disregarded as relevant to this aspect of the study. This is especially relevant to issues relating to resident behaviour and maintenance of infrastructure, which are management issues that will apply to all sites equally, regardless of location.

Table 3 below were selected to ensure that all potential sites were considered from a rational and balanced perspective, allowing for effective comparison between the alternative sites. It is essential that the process for selection of a preferred site at this early stage is robust and defensible. This allows for the optimal site to be selected upfront and then resources for a detailed study can be focused on such a site, rather than doing equally detailed studies on a

variety of sites that may not meet certain essential criteria for functioning for one or more reasons.

These criteria summarised in Table 3 are discussed in greater detail below. Specialist input was obtained to draw up the criteria, which are deemed to have most relevance to the selection of sites within the ENP. Thereafter the criteria and results of the specialist input were presented to both MET management and the MET-MCA-N Technical Management team. After discussion and slight refinement, both the criteria and the findings were agreed to. The criteria are comprised of a number of sub-criteria which inform overall criterion.

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Table 3. Criteria for site selection

Criteria for Site Selection - MCDM	
Criteria	Sub-criteria
Biotic / Wildlife	Constraining biophysical features - sensitive/special habitats /species of concern
	Impact on ecosystem functioning
	Disturbance to wildlife (noise, changed movement patters)
	Land clearing of greenfield sites and roads (pristine vegetation)
	Spread of alien invasive plant and animal species
	Risk from/for veld fires - high fire risk vegetation
Groundwater	Potential aquifer pollution
	Water Availability
Operational / Tourism	Area available for expansion in future
	Storage of equipment for fencing and road maintenance
	Traffic on tourist roads - movement of staff and equipment
Technical / Financial	Additional/extended access roads required (distance, slope, substrate)
	Additional infrastructure for water provision/waste water & waste management
	Additional Road infrastructure required
	Requirements for building material - borrow pits and rehabilitation
Social	Control of social problems
	Impact on tourism facilities by workers (noise and crowding)
	Requirements for relocation and opportunity to improve living conditions
	Conflict with neighbouring landowners
	Access to services (schools. clinics etc)

	Risk of poaching and wood collection, as well as for social problems in the staff-tourist interface
Visual	Sense of place/visual impact
Strategic	Strategic Plans - relocate to periphery of park
	Time and budget required to achieve the development scenario
	Improvement in quality of infrastructure and improved quality of working conditions and resultant impact on tourism

The criteria were weighted to ensure that criteria considered as more important in terms of site selection were given more significance in the site selection process. The ranking is detailed below. However, it is important to note that the same order of site preference was achieved with all criteria having the same weighting, although the degree of preference was slightly altered. The original weighting of criteria was amended to reflect the concern from MET that the biotic considerations were not given enough weighting, considering the mandate of the Park.

—	Groundwater	20% (originally 25%)
—	Strategic	20% (originally 20%)
—	Social	15% (originally 25%)
—	Biotic	15% (originally 4%)
—	Operational	10% (originally 10%)
—	Technical	10% (originally 8%)
—	Visual	10% (originally 8%)

3.2.1 Biotic / Wildlife

This component refers to the need to select a development scenario that minimises the risk to ecosystem functioning and environmental integrity. The sub-criteria considered within this broader criterion include:

- *Constraining biophysical features / special habitats/ species of concern*

Infrastructure in a particular site is contra-indicated by the presence of special habitats or species of concern, especially where either/both are range-restricted. Preliminary baseline studies indicated that there were no species of concern that were exclusively restricted to any of the areas under consideration. The site selection process therefore focused on habitat preservation. The rocky hillsides tend to have relatively higher biodiversity than the surrounding open plains, by virtue of higher habitat heterogeneity. The hillsides were therefore considered to be more sensitive to disturbance. All natural water points were also considered to be sensitive. Besides the special and restricted aquatic habitat they provide, they are also an ecologically important resource for large game. Cave habitats were also considered to be highly sensitive. Both areas under consideration include dolomite areas, and Etosha is known to have caves and sinkholes (Marais & Irish 1997). In comparing alternative sites, not only the sites themselves, but also the likely orientation of linear infrastructure needed to service the sites (roads, pipelines and power lines) were considered.

- *Impact on ecosystem functioning*

Developments that interfere with large-scale ecosystem functioning will be unacceptable, especially in a National Park, where the land use is dependent upon the maintenance of those functions. Since the presence or absence of permanent water is one of the primary limiting factors for wildlife in the area, the potential impact of proposed developments on existing natural water points was considered. Assuming groundwater abstraction for new developments will take place at the nearest suitable location to the development, existing natural water points downstream of the development might be negatively impacted by excessive groundwater abstraction. Similarly, groundwater pollution emanating from the developments would impact downstream water points negatively. The siting of proposed developments relative to existing natural water points therefore informed the selection process.

- *Disturbance to wildlife (noise, changed movement patterns)*

As wildlife is part of Etosha's tourist appeal, development that disturb wildlife and reduces tourist exposure to wildlife will be unacceptable. Again, water points are the focus for wildlife. The potential interference of infrastructure development with wildlife access routes to water points was thus assessed. The location of existing barriers, such as boundary fences, relative to

proposed new developments and existing water points, and the likely effect of development on current access routes, were all taken into account.

- *Land clearing for a greenfield site (pristine vegetation)*

Even if a habitat does not fall in the 'special' category above, the clearing of pristine vegetation needs to be carefully considered, especially if it is going to be replaced with a less natural urbanised ecosystem. The area of affected vegetation in each scenario area was considered, relative to the abundance or otherwise of the particular vegetation type in the ENP. Vegetation types with smaller distribution ranges would be contra-indicators for development compared to more widespread types.

- *Spread of alien invasive plant and animal species*

Invasion by alien species tends to follow human settlement, and the probable effect of such invasions needs to be considered when planning infrastructure developments. In particular, the potential for a site to function as a reservoir from whence aliens may spread further was considered. The proximity of the infrastructure development to watercourses, roads and game trails, all of which may act as dispersal routes for aliens, was considered.

Plants were the primary alien species that were considered in terms of impact as a result of site selection, as domestic animals were considered to be subject to policies that are unaffected by changes in location of staff housing. Domestic animals are adequately covered by the Etosha Management Plan and associated Pets and Domestic Animals Policy. Accordingly, no pets should be present inside the park without a permit. The biggest threat from domestic animals is genetic contamination of African Wild Cat populations by unsterilised domestic cats, which would also have been addressed through the Management Plan. Since most pets do not survive without human assistance, their potential to disperse and establish populations that compete with indigenous fauna is limited and of lesser concern.

Alien plants are considered a higher risk as many such plants can become naturalised and spread beyond human habitation, survive without human assistance, and impact on indigenous vegetation. Particular high risk taxa like *Nicotiana glauca*, *Cactaceae* and *Prosopis* spp were noted in Table 5 of the biophysical specialist report. All of these species are already present in the Park, particularly in staff housing areas. New staff housing areas are at risk of becoming new dispersal reservoirs for alien plant species.

- *Risk from/for veld fires – high risk vegetation*

Increased human presence implies increased presence of open fires, whether for subsistence or recreational cooking, with attendant risk of veld fires. The location of proposed developments relative to sensitive habitats, but also relative to existing or potential firebreaks, like roads or boundary fences, was considered.

3.2.2 Groundwater

Groundwater is a critical criterion for site selection from two perspectives, namely availability for use in the development, as well as potential for pollution of the particular resource from development. Water availability in terms of quality and quantity is vital as lack of water will constrain in development. It is thus essential that the preferred site has a proven ability to provide suitable quality water over the long term to support both current and envisaged usage for future plans. Furthermore, lack of adequate management of waste and waste water has the potential to pollute underground water sources, thereby rendering the water unavailable to support the development in the future. Water sources that indicate a high sensitivity for pollution is therefore a constraint, although proper management of activities in such an area can mitigate the pollution potential.

3.2.3 Operational / Tourism

A number of factors influence how the Park operates and also how this impacts on tourism both now and in the future. As the future of the ENP is dependent on tourism, and the Park plays a significant role in the tourism sector of Namibia, the preferred site must contribute to effective functioning of the ENP and must preferably enhance, but in no way detract from tourism activities and potential in the ENP. Aspects considered in this criterion are outlined below.

- *Area available for expansion in future*

While development options must consider the immediate identified requirement for functioning from both the perspective of management of the conservation resource and from operation of the ENP for tourism, the long term plans for the area must also be considered. Needs for expansion of facilities for additional staff and for tourism-related infrastructure, together with the services required to support both is an essential consideration for planning of development. It is important that management infrastructure should not restrict the opportunities for tourism infrastructure in the future. Management infrastructure must thus be sited in such a way that it recognises where visitor facilities may potentially be located and accommodates current development in the long term planning context.

- *Storage of equipment for fencing and road maintenance*

Management of the ENP includes machinery used to maintain roads and fences, as well as tourism facilities, housing and service-related infrastructure. Heavy equipment is needed throughout the Park, and is currently deployed from a central area to where it is required for road and boundary fence maintenance and fire-breaks creation and management. There is therefore no requirement for location at a tourist camp and such centres can be relocated through the Park as required.

The maintenance division for the ENP currently operates from the maintenance station at Okaukuejo. There are more than 10 items of heavy

machinery (graders, trucks, loaders), a workshop and approximately 70 staff members based at Okaukuejo. Should the workshop be stationed at one point in the Southern Zone, the operators will have to drive heavy equipment over the main tourist road into the park. Fence maintenance teams need to be based close to the edge of the ENP. Should the workshop at Okaukuejo be upgraded as the only workshop, and workers be moved to Ombika, they will have to travel to work along the tourist roads. Alternatively this may mean upgrading the housing facilities at Okaukuejo, keeping a large workforce close to the tourist camp. This was considered in site selection, together with the option of decentralising this facility, with workshops at both Ombika and Okaukuejo and relevant teams and equipment located where they are needed most.

- *Traffic on tourist roads - movement of staff and equipment*

Currently, infrastructure for different purposes is located at the two centres, e.g. the tourism infrastructure, clinic, workshop and research institute at Okaukuejo and the entry gate, school and refuse dump at Ombika. Staff and their families therefore need to move between centres to access the various services and work centres, as well as to the nearest towns. This means additional movement of ENP residents on tourist roads. The option of locating such services close to the critical mass of residents is considered in this option, and will be explored further in the ESIA stage for the preferred site.

3.2.4 Technical / Financial

- *Additional/extended access roads required*

This aspect considers the technical requirements for each site and most specifically whether new or extended access roads will be required. This includes looking at the distance, slope and substrate of the area where the site and road will be located. For example, upgrading of Okaukuejo will require limited additional roads, while building of infrastructure at Ombika may require upgrading of existing roads. Substrate is also a consideration for building of houses.

- *Infrastructure for service provision*

Provision of services relates primarily to the supply and treatment of water, the supply of electricity and the collection and treatment of waste water (sewage) and of solid waste. As above, the option of development at Okaukuejo will entail upgrading of service-related infrastructure, while development of a new village at Ombika will require significantly more additional infrastructure in general. However, it must be borne in mind that all existing services in ENP are poorly maintained and will require considerable attention. Certain services, such as water provision, are operating close to capacity at present, limiting opportunities for expansion. It is therefore vital

that it is the cost aspect that is the critical component for this criterion as management of both upgraded and new services is essential required to ensure that there are no negative environmental and social impacts associated with service provision.

- *Requirements for building material - borrow pits and rehabilitation*

Additional building material may be required depending on where infrastructure and most specifically roads are located. This material is obtained from borrow pits which may be located inside the ENP. The environmental impacts associated with borrow pits can be significant and the need for additional material from borrow pits must be taken into consideration during site selection.

3.2.5 Social

The social impacts related to any development, and specifically development in protected areas can be significant. Many of the impacts, both positive and negative, are related to most development regardless of site. To a certain extent, some of the sub-components outlined below overlap with other criteria. The impact of workers on tourism facilities, for instance, is closely related to a site's visual impact, while the risk of poaching ties in with impact on wildlife (which is one of the sub-components of the biotic/ wildlife criterion). Nevertheless, there are sufficient grounds for retaining these components under the heading of social impacts, since in this context they refer specifically to the human dimension of these impacts – i.e. to manifestations of these impacts that are the direct result of people's actions (e.g. noise produced by exuberant or arguing workers), as opposed to impacts caused by changes in the physical environment (e.g. the erection of unattractive infrastructure). Another reason for maintaining this separation is the fact that the human aspect of an impact tends to require different mitigation measures to its physical aspect (e.g. the visual impact of buildings may be reduced through appropriate design and colours, while an attempt to change workers' interactional style would require a much more subtle and sustained intervention).

Some of the sub-components of the social criterion "work against one another," so that they involve inevitable trade-offs. A site that provides excellent access to services, for instance, inevitably places workers closer to neighbours and the temptations of larger settlements, thus impacting negatively on the control of social problems and increasing the risk of conflict with neighbouring landowners. It could therefore be argued that the ranking of development scenarios in terms of the social criterion requires its own "mini-MCDM" in which the various social sub-components are separated out, weighted in terms of their importance relative to one another, and then given separate rankings for the alternative development scenarios. This option was not pursued, however, since the priorities expressed by project stakeholders (including workers themselves) clearly placed greater weight on impacts arising from increased proximity between staff villages and existing settlements outside the Park (e.g. increased risk of social problems and conflict with neighbours) than on impacts associated with increased isolation (e.g. reduced ease of access to services). Instead of formally weighting the various sub-

components of the social criterion, the ranking of development scenarios on the social criterion therefore gave primary consideration to those sub-components known to be inter-correlated and consistent with stakeholder priorities – namely, the need to control social problems, to minimise impact on tourism and to avoid conflict with neighbouring landowners. The criteria discussed below were identified as being of a nature that they informed site selection.

- *Control of social problems*

Many of the current problems in the ENP are related to social problems. While control of social problems is primarily dependent on management actions, there are external influences that may exacerbate problems experienced, such as proximity to outside influences, ease with which people can enter the Park and so on. Furthermore, one must also consider how new infrastructure and new design of villages may impact on existing social problems. Currently there are a number of problems experienced, which include uncontrolled habitation, with employees (specifically in the villages where the junior staff are located) supporting unconfirmed numbers of extended family members in cramped and unsuitable conditions. This has resulted in significant pressure on existing services, such as water provision, waste water and waste management. Infrastructure has not been adequately maintained and the additional demands have exacerbated the already deteriorating condition of housing and infrastructure. There are family members of the ENP employees living in the ENP who are not employed and there are a number of shebeens being run illegally in the village. Abuse of alcohol and prostitution occurs and there is currently no effective management of such problems. There is also little control over movement into the ENP and the housing policy which restricts the numbers of people living in each house, as well as set the parameters for maintenance of housing is not implemented. Furthermore, there is an increase in the security risk closer to the fence and law enforcement requirements must be considered.

It is critical that site selection takes such factors into account and ensures that development is located and managed to minimise the opportunity for the current situation to continue.

- *Impact on tourism facilities by workers (noise and crowding)*

As mentioned previously, the ENP relies on tourism for its continued existence. The ENP is the major tourist destination in Namibia and its major attraction is the sense of wilderness that one anticipates experiencing in such an environment. The staff housing is located in close proximity to the tourism facilities. Uncontrolled noise, especially at night and over weekends, when many people are in their homes, can affect the tourism experience profoundly. Such issues were also considered as critical informants in the site selection process.

- *Requirements for relocation*

Should the staff village at Okaukuejo or part of it be housed somewhere in the future, there will be a requirement for residents to be relocated. Relocation of people is always a sensitive issue. In this particular case, the land is not owned by residents in the Park, but this aspect remains an emotive one. The presence of Hai//om in the ENP is a long standing and highly political issue, which makes site selection in this instance more complicated. The Hai//om people, whose ancestors have traditionally lived in the Park and supported themselves off the area were relocated for the establishment of the ENP in the early 1900's. They attach very strong emotional and spiritual connections to many areas within the Park boundaries. There are numerous sites in the Park that are important to the Hai//om. Basically every watering hole that was not artificially constructed in recent times housed a Hai//om settlement. These include Okaukuejo and Ombika. However, there does not appear to be a particular Hai//om connection with Galton Gate/Otjovasandu. That being said, all feedback received from Hai//om indicates that they experience their connection with the entire Park rather than just with some sites.

There is currently a land claim in place, which is being dealt with at top government level. However, the issue is not easily resolved and has been dragging on for a while. In the meanwhile, the Hai//om people feel that their concerns are not being addressed. Relocation to another area, even within the ENP is thus fraught and highly sensitive. This aspect was thus also considered as one of the informants for site selection.

- *Risk of poaching and wood collection and negative visitor/staff interactions*

Residents living in the ENP villages have been found to be poaching animals for food and collecting wood for fire. It is an important consideration for site selection that the preferred site for development does not increase opportunities for this to happen. This is an issue that must be controlled by management. However, certain sites may offer more opportunity for poaching and wood collection than others. Furthermore, certain employee and resident behaviour, such as alcohol abuse and prostitution may lead to negative impacts on and or interactions with tourists. Site selection must ensure that such opportunities are reduced wherever possible.

3.1.1. Visual

Sensitively located and aesthetically appropriate development in the ENP is essential for the maintenance of the sense of place in the Park. This sense of place is created largely by the open and untouched nature of the Park, where large tracts of open and undeveloped spaces predominate, supporting the wildlife that is strongly associated with the African visitor experience. The sense of place is thus a vital component of the Park and instrumental in

creating a resource that draws tourists to the area. The Management Plan for the Park also prescribes that any development undertaken must be located in such a manner that it is not visually intrusive for visitors so as not to detract from the tourism experience.

3.2.6 Strategic

- *Strategic Plans*

The management of ENP has taken a strategic decision to located non-essential staff and services to the periphery of the Park. This is to reduce pressure from development on core areas of the Park, for both biophysical and social reasons. The policy is also aimed at protecting the valuable tourism opportunities. The more development associated with areas within the Park, the less the open and untouched sense of place created. This criterion therefore considered which site fitted best with this policy,

- *Time frames involved in achieving the development*

Funding for upgrading of housing and infrastructure described in this study comes from the MCC. They have set up 5 year contracts with a number of developing countries. In Namibia, the MCA-N has identified a number of projects which can be developed to assist in reducing poverty levels by enhancing opportunities for development and employment. There is thus a requirement that projects get completed within specific time frames to ensure that the funding is secured as per the set agreements between all parties. Locating the new infrastructure within the Park boundaries is likely to ensure that the project is completed sooner and therefore funding is used effectively. Should the village be located outside the Park, time frames will be extended considerably, because of the need to purchase the land. This also affects the budget that is available for upgrading of the infrastructure.

- *Improvement in quality of infrastructure*

The aim of the project is to improve infrastructure in such a way that the quality of working and living conditions for those in the Park will be improved. Provision of adequate and well maintained housing and infrastructure will have less of an impact on the biophysical environment (e.g. poorly function waste water and waste facilities can impact significantly on water resources). It will also assist in improving the living conditions of those in the ENP. This may ensure that competent and talented staff are attracted to and stay in the Park for longer periods of service and that consistent and effective management of the ENP will lead to a reduction in uncontrolled social issues that are currently being experienced. The result of good quality infrastructure and strong management of the Park will ensure that the tourism resource of the Park is improved and protected.

4. STAKEHOLDER INPUTS

An important consideration in the site selection process is the input from directly affected stakeholders. To ensure that such inputs were used to inform site selection, a number of engagements were undertaken with both the residents and the neighbouring land owners. Meetings were held with residents at Okaukuejo to present the project and determine concerns from the residents of the area. A Background Information Document explaining the project was circulated to the immediately affected neighbours (neighbouring landowners abutting the Park to the west and east of Ombika Gate) and discussions were held with them regarding their concerns and opinions about site selection. These neighbours included Taleni and Ongava Lodges, the Etosha Safari Camp, Oberland and Eldorado Farms and Wilderness Safaris. Consultation has also taken place with MET (Directorates of Parks and Wildlife Management, Environmental Affairs, Tourism and Scientific Services), Strengthening the Protected Areas Network Project (SPAN) and NWR. The ESIA was advertised in the Namibian newspaper. Public participation and stakeholder consultation will be undertaken on an ongoing basis throughout this process and the Site Selection and Baseline Reports will be presented to the public in meetings in August. The Public Participation process followed will be presented in a separate Public Participation Report at a later stage in the process.

4.1. RESIDENTS OF THE ENP

The outcomes of discussions relevant to site selection are summarised below.

- There is a graveyard of 100 years behind the staff village to which people feel a connection;
- While some residents would prefer a site outside ENP because of the freedom of movement afforded, others regard ENP as safe environment with less access to shebeens and so on. The reaction to site selection was therefore mixed.
- The residents in general prefer the option of upgrading infrastructure at Okaukuejo. They like the sense of security and quiet and sense of place as well as the fact that it is close to work. There was also a perception that Ombika was not safe as it is so close to the Gate, while access at Okaukuejo is more regulated and therefore a safer option. The women especially liked living in ENP because they felt safe there.
- There is deep concern that non-employees will not be catered for at a new site;
- The residents are currently suffering due to lack of water and sanitation and support immediate interventions to improve living conditions.
- People understand the need to move out of the ENP if they are not working for there, but they also feel that is the Park is their home & they have nowhere to go.
- People seemed reluctant to move if such a move did not make difference to their lives, but most would live elsewhere if good alternative housing offered.
- The Hai//om don't want to be moved outside of Park. They want to go to area in the ENP not frequented by tourists and establish livelihoods from within the Park, such as making and selling curios.

- Hai//om people feel they are being neglected and that their cultural heritage is in the ENP. They feel they are overlooked for employment and there was some concern expressed that this process was a means to further exclude them from the Park.

4.2. NEIGHBOURING LANDOWNERS

The outcomes of discussions relevant to site selection are summarised below.

- There is deep concern for Hai//om and the stakeholders outside the ENP want the rights of the Hai//om to be met at a site within the Park;
- There is concern about the visual and noise impacts on neighbouring landowners and their tourism opportunities from a site at Ombika West;
- The neighbouring stakeholders support the initiative to upgrade infrastructure as they are concerned about the living conditions of the employees and about the impact that poor infrastructure is having on tourism in the ENP.

5. RESULTS OF MCDA

Using the methodology for site selection shown above, each criterion was evaluated separately and the overall integrated site preference is discussed in Section 5. The scoring for each criterion is presented in Appendix 1.

5.1. BIOPHYSICAL

5.1.1. Ombika East (Scenario 1):

A preference for Scenario 1 was shown in the Southern Zone, with none of the alternatives except Ombika West being particularly viable. The site to the east of Ombika Gate lacks most of the negative aspects of some of the other sites. The vegetation type found here is Mixed Low Trees on Calcrete, which is widespread elsewhere inside and outside the Etosha National Park. The site is located furthest from the Ombika Spring in the area and avoids further development on the Ombika Kopie, which is already heavily impacted. The exact site at Ombika East has not yet been defined but the general area is about 2.06 km on average from the Ombika Spring. It is also located across the rise extending northwest from Ombika Kopie and is not visible from the Spring.

Based on existing information, South-North groundwater movement is assumed. Due to the location of the site to the east of the Ombika Spring, both water abstraction and groundwater pollution is predicted to have a lesser impact on Ombika Spring than the alternative sites in the area. Furthermore, since it is not located on any routes between grazing areas and the spring, wildlife movements to and from Ombika Spring are unlikely to be affected by development to the east of the Galton Gate.

There are also several turf pans in the area which turn into temporary wetlands in the rainy season. Their continued ecological functioning in a developed area is less likely.

There is a low risk of spread of aliens from development at this site as there are no watercourses in the vicinity, and the site is offset from both wildlife trails and the main road. The fire risk is considered medium. The boundary fence is a major firebreak, and the main road to the west can act as a firebreak, but there are no pre-existing fire barriers to the north or east.

5.1.2. Okaukuejo (Scenario 2):

Okaukuejo is located in the vegetation type 'Etosha Steppe, Grasslands and Pan Edge', which is relatively widespread elsewhere in the Etosha National Park, but not found outside the park. While there were no special habitats to consider for this scenario, continued development at Okaukuejo may exacerbate existing environmental impacts. Okaukuejo Camp already disrupts wildlife movement patterns.

The area close to springs tends to experience trampling and overgrazing. This is most severe closer to the spring, decreasing with distance in all directions under normal conditions. In the case of Okaukuejo, because of the location of spring in relation to the camp, this pressure is concentrated into a smaller area, hence higher pressure per unit area. Game coming from the east of the camp walks a long way round to reach Okaukuejo Spring,

and grazing pressure on the west of Okaukuejo is correspondingly higher. If infrastructure development increases the footprint of Okaukuejo, these effects would be exacerbated.

Originally a natural spring, Okaukuejo Spring today needs to be artificially augmented with abstracted groundwater. Its upstream location from the main camp reduces the pollution risk. Okaukuejo's location on the road network and the volume of visitors make it more vulnerable to alien introductions. Again, additional developments would exacerbate this risk. The fire risk in this area is lower than in other sites, as the Karoo-type vegetation around Okaukuejo is less fire-prone (seasonally) than more woody vegetation. In addition the volume of game visiting the waterhole results in trampling and overgrazing, reducing the availability of combustible material.

Okaukuejo thus already impacts heavily on its environment, and additional developments are undesirable.

5.1.3. Ombika West (Scenario 3):

A portion of this site is located in the vegetation type 'Etosha Turf Pans on KarstVeld', which is range-restricted within the Etosha National Park, and not common outside it. Furthermore, a site at Ombika West would be close to the Ombika Spring, which is a sensitive habitat. The exact site at Ombika West has not yet been defined but the general area is about 1.38 km on average from the spring. This spring is currently augmented artificially. Water abstraction or groundwater pollution here may thus impact directly on the downstream Ombika Spring.

The close proximity of the site to Ombika Spring is furthermore likely to impact on wildlife movements to and from this important resource, which may also affect the tourist experience if infrastructure is visible from the spring parking lot. Ombika West slopes down towards Ombika Spring and is clearly visible from there. While the site is offset from the main road, its proximity to game trails and a water source could facilitate the spread of alien vegetation. Furthermore the presence of this spring close to the fence is increasing human-animal conflict with neighbouring landowners and the ENP management plans to move the water point further into the Park in the future. The current situation with respect to wildlife is therefore likely to change in future. However, the proximity to Ombika Spring in the current situation makes this an undesirable site from a biotic perspective.

There are also several turf pans near the foot of Ombika Koppie which turn into temporary wetlands in the rainy season. Their continued ecological functioning in a developed area is less likely. The access route to Ombika West is also likely to further impact on the already heavily impacted Ombika Koppie. The boundary fence is a major firebreak, and the main road to the east can act as a firebreak, but there are no pre-existing fire barriers to the north or west.

5.1.4. Ombika East and West (Scenario 4):

The construction of the village over the two sites will extend the footprint of the area with the associated negative impacts. It is desirable to concentrate the footprint to the greatest extent possible to reduce and consolidate the impacts into one area. The negative aspects

associated with both sites will be experienced over a larger area. The boundary fence would still act as a firebreak for this scenario, but the main road would lose that function, resulting in a slightly higher fire risk than for each of the sites individually.

5.1.5. Site outside the ENP (Scenario 5):

Depending on its location, an ex-park site (e.g. one opposite to the Ombika West site) could also impact on Ombika Spring through water abstraction or groundwater pollution. The major benefit of such a site is that wildlife movements in the park should be unaffected by developments outside the park. While no specific site is given, but in general there are no special vegetation types immediately outside Ombika Gate that are not widespread elsewhere. Fires outside the park should not affect the park as long as the boundary fence is maintained as a firebreak. Other criteria can only be evaluated for specific sites. Since no specific site outside the Park was investigated, this scenario was evaluated as a concept only. Its ranking as a second option should be seen more as a reflection of the high unsuitability of the remaining in-park sites, rather than any preference for an ex-park site.

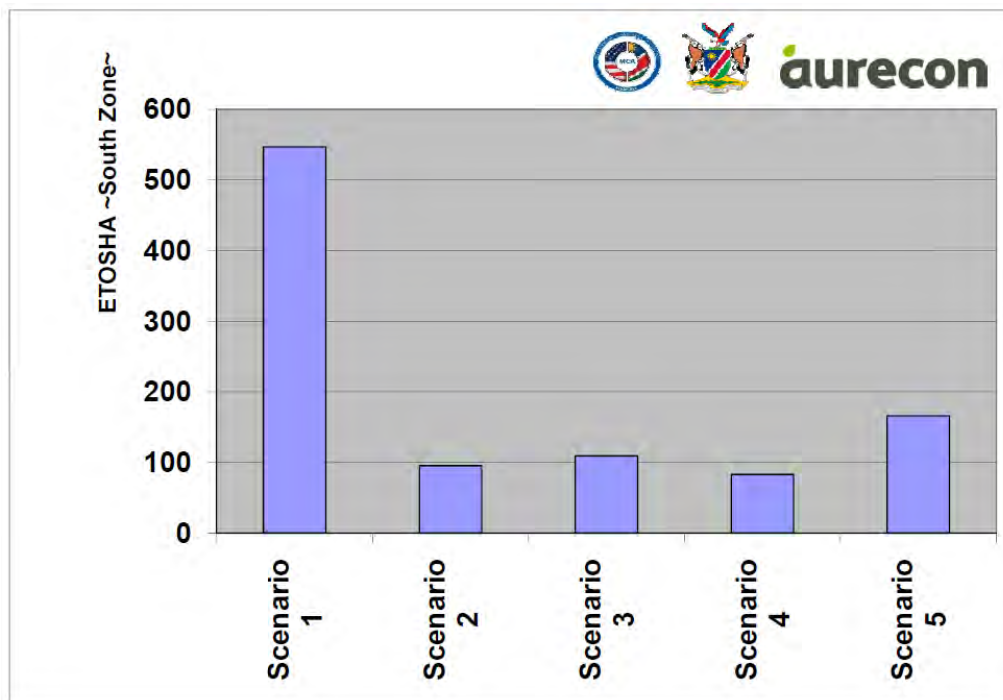


Figure 7: Results of the MCDM for the biotic criterion

5.2. GEOHYDROLOGICAL

5.2.1. Ombika East (Scenario 1):

The groundwater yield potential is classed as Moderate for the Ombika area and good quality groundwater is available close to Ombika East for development. Ombika is underlain by Tsumeb dolomite, limestone, shale and chert. However, the area to the east has more Kalahari sand, calcrete and gravel and the groundwater is thus more vulnerable to pollution and require a higher level of environmental protection if developed.

The substrate in the area is a mosaic of good and bad substrate, with areas of turf that get waterlogged in summer and becomes mud. This is a problem for building in that the foundations will require additional founding. However, this challenge can be dealt with by careful selection of areas for housing and placement in the calcrete areas. The existing waste site close to the proposed site in the east is already a threat to groundwater, so this site is not the preferred option for development. However, this area can be developed if stringent measures are put in place to protect groundwater resources and this Scenario is the second favoured site.

5.2.2. Okaukuejo (Scenario 2):

The groundwater yield potential is classed as Moderate for the Okaukuejo area. Okaukuejo is underlain by Kalahari sand, calcrete and gravel. The groundwater at Okaukuejo is presently of poor quality and some pollution of groundwater has already occurred. The current levels of development also have put pressure on the existing quantity of water, and current management procedures are not assisting in mitigating the negative impact on water resources. Furthermore, additional use of water for management purposes will reduce the availability for future tourism opportunities. This scenario is thus second least favoured of all options.

5.2.3. Ombika West (Scenario 3):

The site to the west of the Ombika Gate is preferred because good quality water is available close to the proposed site for development, and the potential for pollution of the water sources is least at this site. The substrate for development is also marginally better than that at Ombika East. For this reason this scenario is slightly preferred above Scenario 1 (development at Ombika East).

5.2.4. Ombika East and West (Scenario 4):

Development of infrastructure to both the east and west of the Ombika Gate will be more costly as water reticulation (and sewerage) and the associated management and problems will be greater for two sites than one. However, development at any or both of the sites at Ombika is preferred above all other scenarios.

5.2.5. Site outside the ENP (Scenario 5):

There is currently a supply of groundwater close to all sites within the ENP. Any development outside the ENP will require groundwater exploration. This will also entail installation of expensive new infrastructure from scratch.

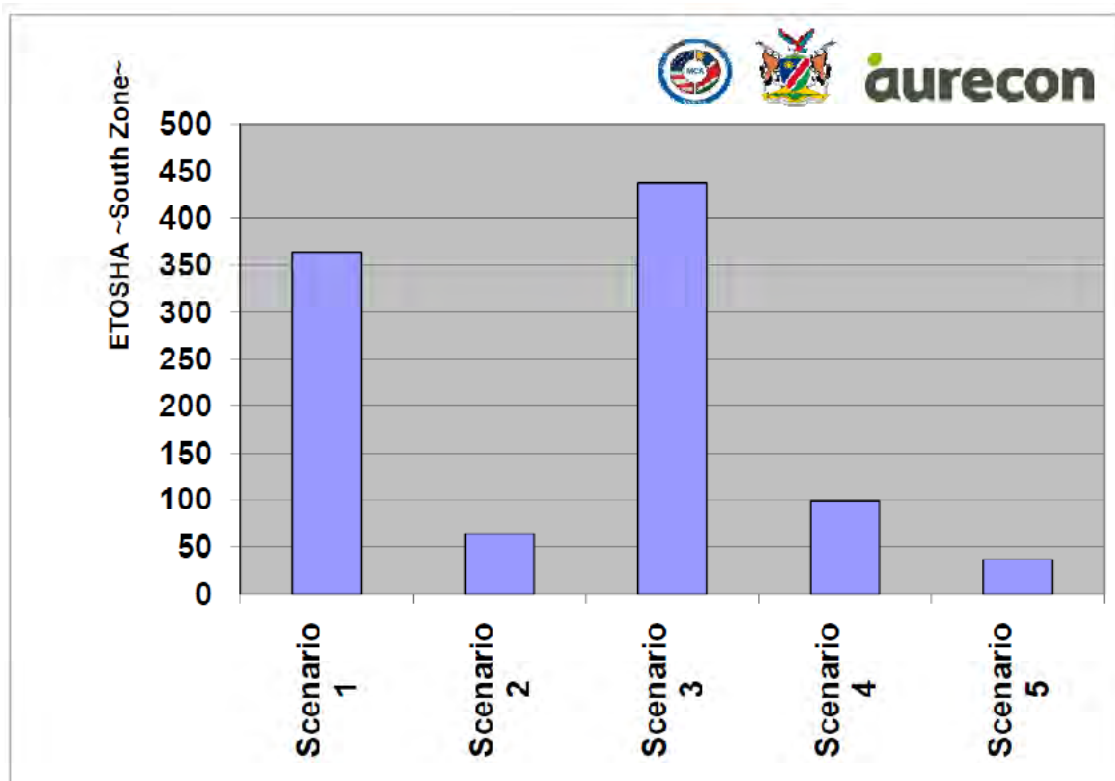


Figure 8: Results of the MCDM for the groundwater criterion

5.3. OPERATIONAL/TOURISM

5.3.1. Ombika East (Scenario 1):

From a Operational/Tourism perspective, any development at Ombika is a favoured option, as it removes a significant portion of the staff and resources from Okaukuejo (thus reducing the exogenous impacts in and around the camp) while still maintaining a reliable service to the tourism node by retaining a selection of senior staff within the existing infrastructure. This option maximizes the available infrastructure, reduces the disturbed footprint and reduces the resource demand. Ombika East offers the lowest ecological impact because the site abuts the southern perimeter fence, in a more common vegetation type while avoiding the risk of incurring resistance from the existing tourism establishment bordering the Park to the west of Ombika. The fact that MET is currently buying farms along the boundary of the Park to the south east of the Ombika Gate means that this area will act as a buffer between the Park itself and neighbouring landowners. Location of the new village to the east of the Gate in this context is preferred as it will decrease the opportunity for conflict between the Park and its neighbours.

5.3.2. Okaukuejo (Scenario 2):

Scenarios 2 (maintaining all infrastructures within Okaukuejo and upgrading) and 5 (placing staff facilities outside the Park) emerge as the least-preferred options. Scenario 2 is least favoured because the pressure on tourist experience and resources, imposed by increasing staff and non-tourist visitors will increase.

5.3.3. Ombika West (Scenario 3):

Scenario 3 emerges as the second-most preferred option, since it offers all the operational/tourism advantages of Scenario 1, with the exception that it poses a greater risk of giving rise to conflict with neighbouring landowners who already have an existing eco-tourism operation. The area to the east of Ombika Gate does not have existing tourism infrastructure or routes close to the fence. Furthermore, MET is in the process of acquiring farms for relocation of residents from the Park to the east of Ombika. This will therefore provide a buffer between the Park and neighbouring landowners in the future, should this be achieved.

5.3.4. Ombika East and West (Scenario 4):

Scenario 4 is the third-most preferred option because this option requires two greenfield sites, which is not ideal within a protected area. Ideally the development must be as contained as possible and the footprint as limited as possible.

5.3.5. Site outside the ENP (Scenario 5):

Scenario 5 could produce the least impact within the protected area. However, the land use approvals related to the negotiation, procurement and zoning of private land adjacent to the park would delay the project for an extended period of time. In addition, the ability to exert control over activities in staff villages would be reduced, thus increasing the risk of social problems.

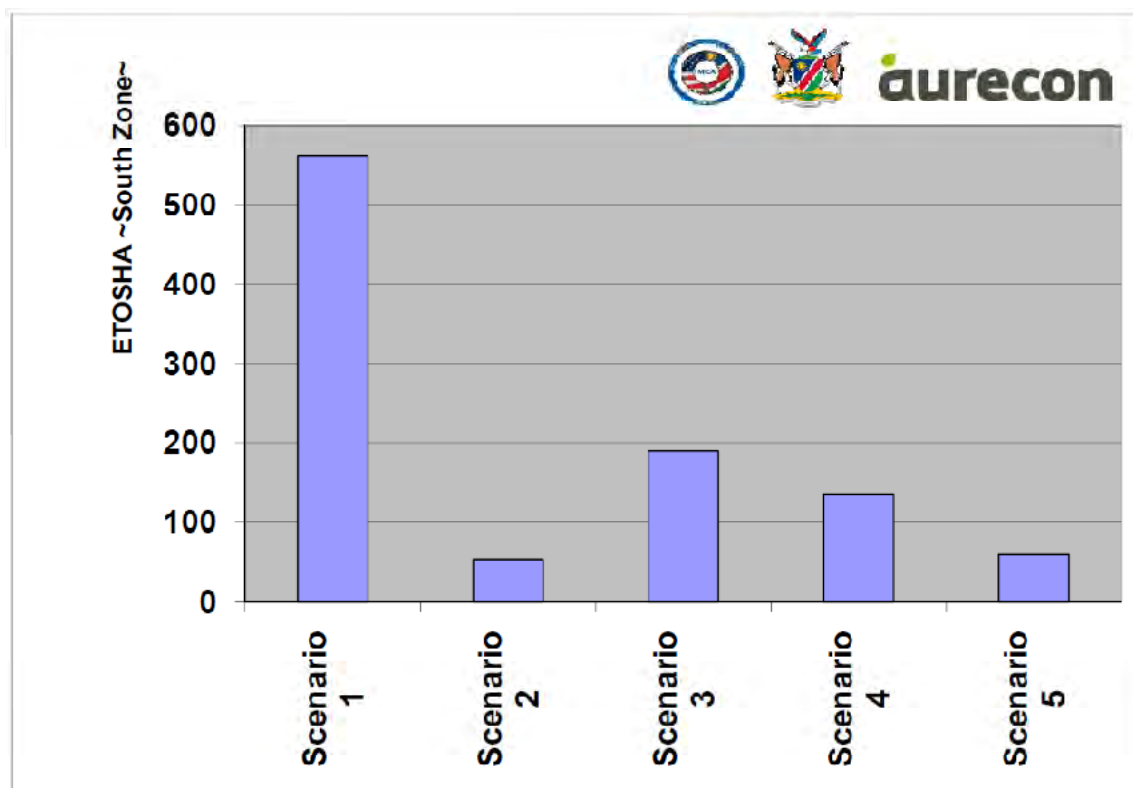


Figure 9: Results of the MCDM for the operational/tourism criterion

5.4. TECHNICAL/FINANCIAL

5.4.1. Ombika East (Scenario 1):

From a Technical/Financial perspective, Scenario 1 emerges as the most preferred option as Ombika East is the closest site to service connections. Existing access, water and electricity are all within a few hundred meters of the site and the slope of the landscape is flat, which further facilitates easier service installation.

From the viewpoint of suitability for buildings and foundations, three substrate types occur at both Ombika East and West. Calcrete ridges rise slightly above the surroundings, from < 1 m up to 2m in height. These are characterised by large embedded calcrete rocks, and often also the presence of *Commiphora africana*. This substrate is expected to be suitable for building. Turf pans are characterised by the absence of stones and a surface layer of fine powdery dust where disturbed, with darker soil at depth and dense grass where not yet grazed down, often the presence of *Combretum imberbe*, and (currently) dry mud, including embedded animal tracks and wallows in places. This substrate is expected to be totally unsuitable for building due to the fact that it become waterlogged in summer. Intermediate areas are characterised by medium-sized to small loose calcrete blocks scattered on the surface, occurring between the two other substrate types to form a mosaic-like gradient between them. Suitability for building is expected to vary with position in gradient. Current staff housing at Ombika (east of tar road) is built on this substrate.

The Ombika East site has a mix of all three substrates. Well-developed calcrete ridges (the surface manifestation of the north-eastward extension of Ombika Koppie subcrops) stretch across the northern part of the area, while similar ridges also occur along the boundary towards the southeast and east. Calcrete ridges at Ombika East are relatively higher (up to 2 m) and more uneven than at Ombika West. There is a large turf pan towards the northeast, confluent with the extensive bottomlands towards the north. The areas in between the calcrete ridges are filled with Intermediate type substrate, also with small turf pans in places. Turf pans make parts of the area unsuitable for building. Calcrete ridges are more suitable, but occur in scattered patches at both sites. The intermediate substrate varies in quality. The Ombika East site is uneven and heterogeneous and will need careful planning of infrastructure placement.

5.4.2. Okaukuejo (Scenario 2):

Scenarios 2 (maintaining all infrastructures within Okaukuejo and upgrading) and 5 (placing staff facilities outside the Park) emerge as the least-preferred options. Scenario 2 is least favoured because an upgrade of the staff facility would not relieve the camp from the pressure on the resources (water, electricity, waste etc.) but more than likely increase the pressure, and would not necessarily reduce the risk of undesirable social conditions taking root in the staff villages. The water at Okaukuejo is particularly corrosive, which impacts negatively on pipes and so on. Maintenance costs are higher because of this and for this reason additional infrastructure in the area which could be placed elsewhere is not preferred.

5.4.3. Ombika West (Scenario 3):

Scenario 3 emerges as the second-most preferred option, since it offers all the technical/financial advantages of Scenario 1, with the exception that the primary school is situated on the west side of Ombika Gate, and the ENP management do not want the new staff village within close proximity to the school. Furthermore, the western site is separated from the Ombika Gate by a rocky outcrop which would require greater costs with regard to service installation.

The Ombika West site is largely located on Intermediate substrate, with some very low (< 1 m) and narrow calcrete ridges running through it, orientated at approximate right angles to the boundary fence. Interspersed throughout this are small (30 - 100 m²) turf pans. Turf pans increase in frequency and size eastwards until they coalesce into the turf depression that extends northwards to Ombika Waterhole and beyond. Calcrete ridges correspondingly decrease eastwards. In general, the Ombika West site is flatter and has more homogeneous substrate and represents an easier option than Ombika East. From a substrate viewpoint, neither east nor west site is optimal, but both could be made to work.

5.4.4. Ombika East and West (Scenario 4):

Scenario 4 is the third-most preferred option because it requires two greenfield sites, thereby doubling the impact zone and increasing the financial requirements.

5.4.5. Site outside the ENP (Scenario 5):

Although Scenario 5 could produce similar technical results as Scenario 1, the financial implications related to procuring private land outside the park could be significant. Transport costs of transporting the workforce from outside the ENP will be costly to management and increase the carbon footprint of operation of activities related to the ENP. It will involve additional time related to transporting labour, decreasing efficiency of operations.

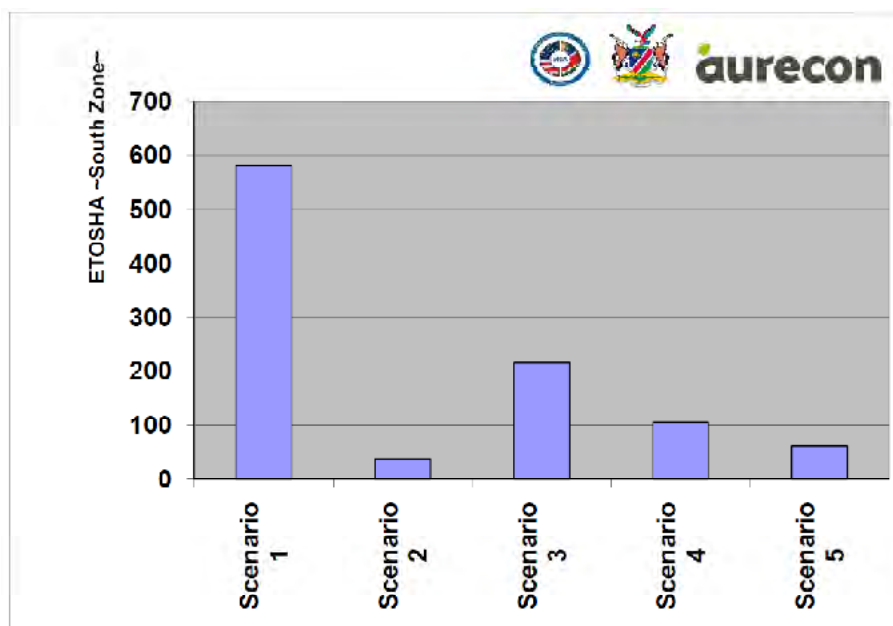


Figure 10: Results of the MCDM for the technical/financial criterion

5.5. SOCIAL

5.5.1. Ombika East (Scenario 1):

From a social perspective, Scenario 1 emerges as the most preferred option, as it removes some staff from Okaukuejo (thus reducing the probability of worker behaviour impacting negatively on the tourism experience at the camp) while avoiding the risk of incurring resistance from the existing tourism establishment bordering the Park to the west of Ombika.

5.5.2. Okaukuejo (Scenario 2):

Scenario 2 is the third-most preferred option because, although it avoids the risk of conflict with neighbours, it poses the danger of overcrowding and re-emergence of the undesirable social conditions currently prevalent at the Okaukuejo staff village.

5.5.3. Ombika East and West (Scenario 3):

Scenario 3 emerges as the second-most preferred option, since it offers all the social advantages of Scenario 1, with the exception that it poses a greater risk of giving rise to conflict with neighbouring landowners. The Ombika West site would place staff housing in close proximity of Ongava Game Farm and Lodge, which is situated at the southern border of the Park to the west of the gate. The management of Ongava has raised concerns about the possible relocation of Okaukuejo staff to Ombika, as this would place the staff village within close proximity of the tourist accommodation at Ongava. They are concerned an increased number of staff living at Ombika would give rise to an increase in poaching, illegal harvesting of natural resources and littering, and that noise from staff villages would disturb tourists' experience of the wild.

5.5.4. Ombika East and West and Site outside the ENP (Scenarios 4 & 5):

Scenarios 4 (splitting facilities between sites to the east and the west of Ombika) and 5 (placing staff facilities outside the Park) are the least-preferred options. In both cases, the ability to exert control over activities in staff villages would be reduced, thus increasing the risk of social problems.

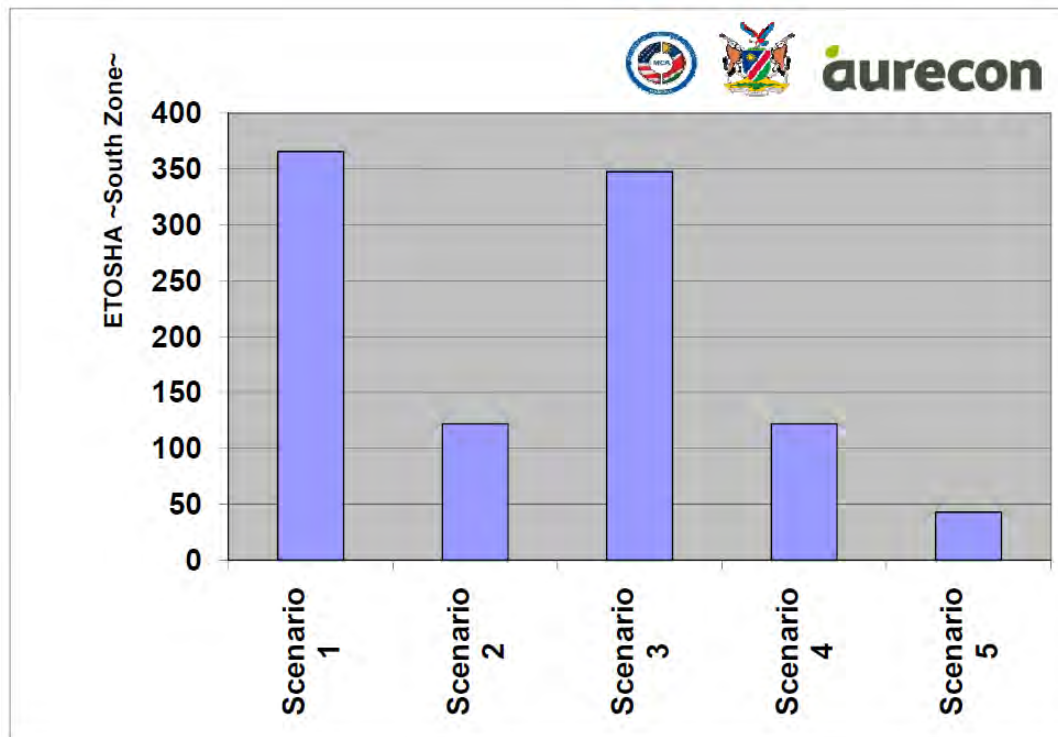


Figure 11: Results of the MCDM for the social criterion

5.6. VISUAL/AESTHETIC

5.6.1. Ombika East (Scenario 1):

Existing visual foot prints of the solid waste dump as well as the substation located to the east of Ombika Gate make this a good area for further development as in keeping with the objective of aligning development in areas which are already associated with higher levels of visual contrast. The site is screened from tourist roads and the possibilities for development in the area without undermining the surrounding landscape character are good, making this the preferred development scenario. Due to the current lack of tourist related-development close to the ENP boundary in neighbouring farms to the east of Ombika Gate and the programme for MET to buy this land for resettlement, this side is considered less visually sensitive than the area to the West.

5.6.2. Okaukuejo (Scenario 2):

Development opportunities within Okaukuejo staff areas are possible without detracting from the wilderness sense of place of the site or the surrounding areas. There is already a strong development footprint but any further development needs to be carefully implemented to ensure that visual intrusion is limited and there is no further impact to the parks visual resources. Removing non-essential infrastructure from this area will also assist in improving the visual landscape and reducing the existing visual impact. The existing landscape modifications are contained within a local visual context due to the surrounding vegetation which limits the zone of visual influence of the camp. This scenario emerges as the second best one.

5.6.3. Ombika West (Scenario 3):

This site is considered visually sensitive. It is currently more visually isolated from nodes of development in the Park. The landing strip on the adjacent conservancy is due south of the site and tourists flying in to the area will be exposed to views of development which would further detract from the overall visual appeal of the area. A further constraint for Ombika West development is that during winter when the trees lose their leaves, the possibility exists that tourists viewing the water hole will see the new dwellings behind the water hole which would detract from the viewing experience. However, this will change if the water hole is moved further into the Park.

5.6.4. Ombika East and West (Scenario 4):

This scenario is not favoured as it includes Scenario 3, for the reasons discussed above. Should the area to the east and west of the Gate be developed, there is potential that a linear visual effect of sprawling houses would be created as the development would be viewed on conjunction with Ombika Gate, the school and other infrastructure developments to the east of the gate.

5.6.5. Outside the ENP (Scenario 5):

There are many conservancies located outside the ENP and the opportunity exists for more to be established. Locating a village/township outside of the ENP may impact in this tourism opportunity in the future. However, as no specific site was selected, the visual implications of a specific site were not evaluated.

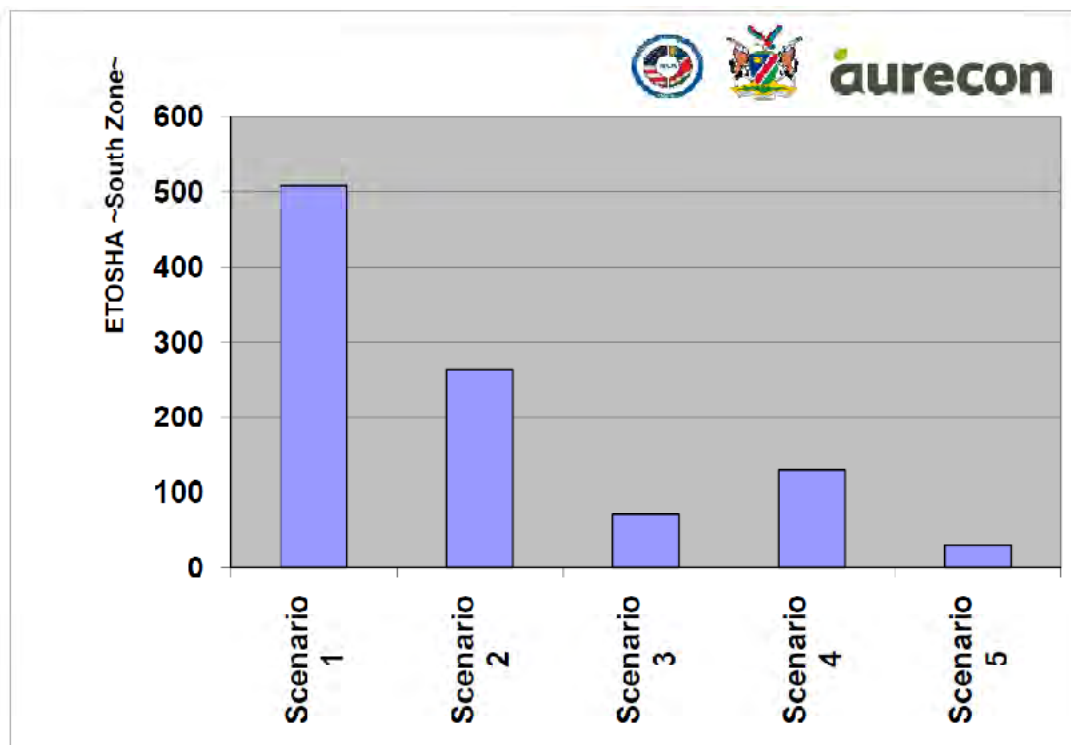


Figure 12. Results of the MCDM for the visual criterion

5.7. STRATEGIC

5.7.1. Ombika East (Scenario 1):

From a strategic perspective, Scenario 1 emerges as the most preferred option because this scenario achieves the strategic objective of significantly reducing the social and resource impact within the tourist priority nodes of the park. Scenario 1 also provides the opportunity to develop infrastructure with updated, more efficient materials and designs. The location of the school may however, result school children and staff crossing main tourist road on their way from staff village to school and having reason to hang around gate and road. This is a negative impact that will need to be managed.

5.7.2. Okaukuejo (Scenario 2):

Scenario 2 contradicts the strategic imperative by retaining the staff resource within the park, and in close proximity to the tourist node, without notable improvement to the status quo (the social elements would remain a concern).

5.7.3. Ombika West (Scenario 3):

Scenario 3 emerges as the second-most preferred option since it offers all the strategic advantages of Scenario 1, with the exception that the staff village would have to be placed further away from the existing infrastructure at Ombika Gate due to the required buffer zone around the school. Location of the village to the west of the hill means that there will not be a crossing of the main road to access the school and village.

5.7.4. Ombika East and West (Scenario 4):

Scenario 4 is the third-most preferred option because again, this option requires two greenfield sites, which is not ideal within a protected area. Ideally the development must be as contained as possible and the footprint as limited as possible.

5.7.5. Site outside the ENP (Scenario 5):

Scenarios 2 and 5 produce very similar results and emerge as the least preferred options with Scenario 5 being strategically poor because placing the staff village outside the park would reduce the ability to exert control over activities in staff villages, thus increasing the risk of social problems.

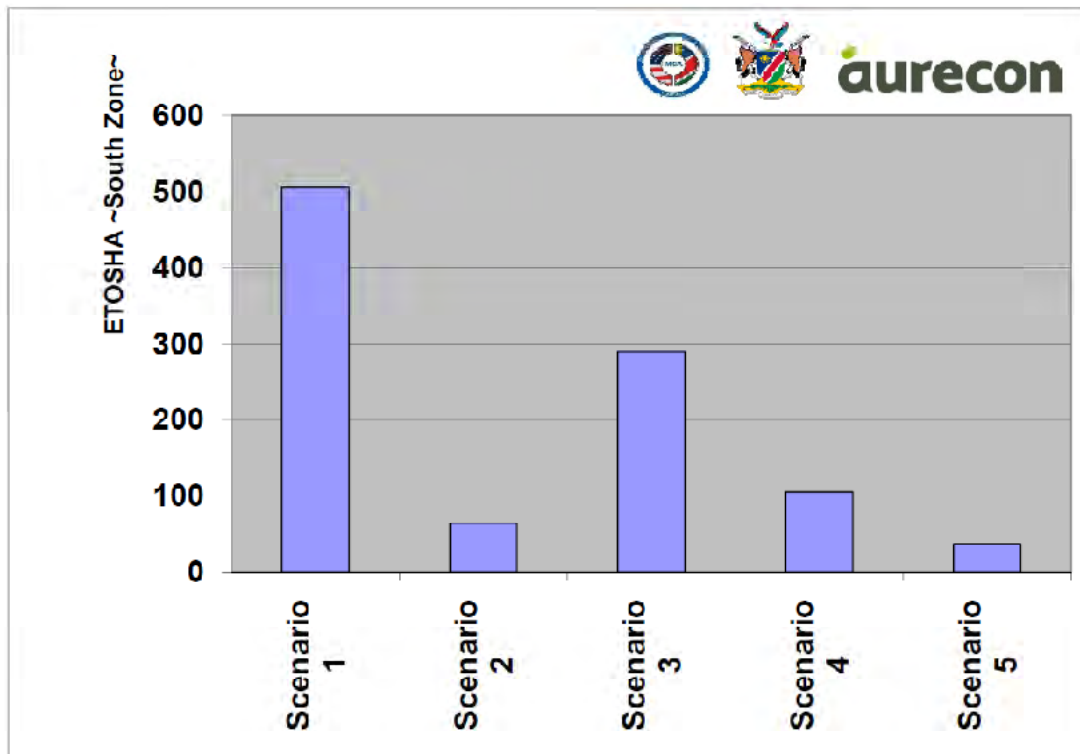


Figure 13. Results of the MCDM for the strategic criterion

6. PREFERRED SITE

The preferred option in all scenarios with the exception of one of the criteria considered, namely Groundwater, is Scenario 1. This is the option of creating a new village at Ombika to the east of the existing gate for non-essential staff and moving most of the residents of Okaukuejo to this area, while upgrading the infrastructure at Okaukuejo for essential staff in this area.

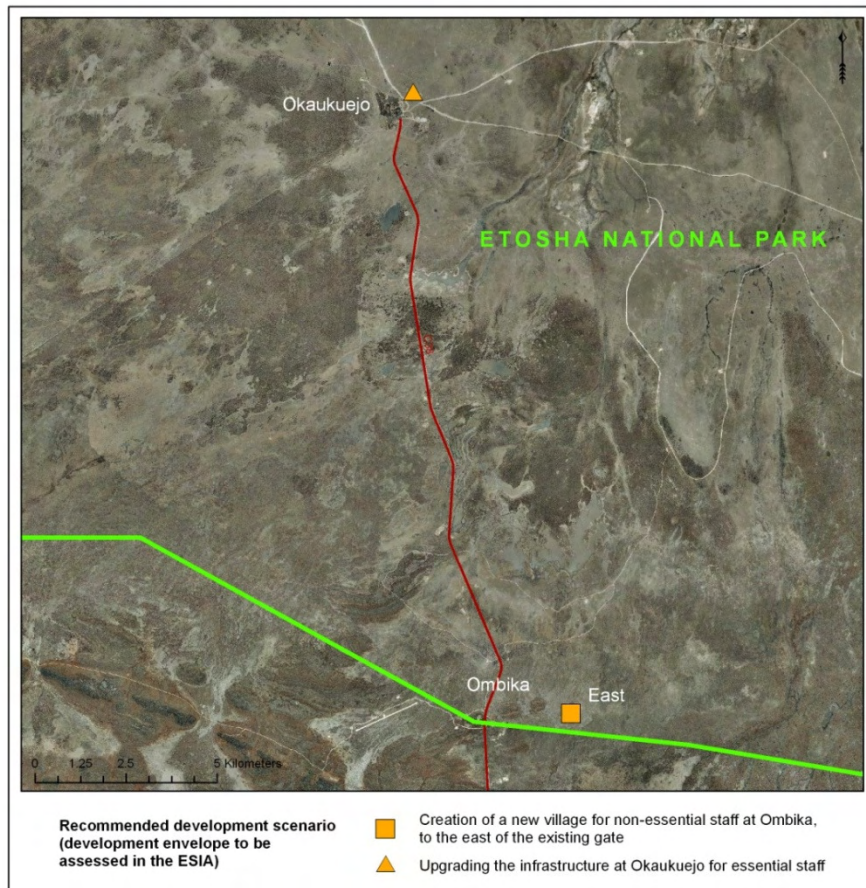


Figure 14. Map showing preferred options

This option is deemed to meet strategic, financial and technical considerations, while not impacting negatively on biotic, groundwater and visual aspects to an unacceptable level. It removes non-core staff from Okaukuejo, thereby meeting strategic goals for the Park and reducing risk of worker behaviour impacting on tourism.

From a social perspective, this site will also assist in managing the influx of people into the heart of the ENP, which is one of the major causes of the social problems experienced in the ENP. These social problems are impacting on management and tourism operations in the area. The fact that the site is in the Park allows for control of workers in village, while restricting more densely populated areas to the periphery of the Park.

The vegetation at Ombika East is mixed low trees on calcrete, which is widespread in the Park. The site is removed from the spring in the area. It is located in a flat area, away from tourist routes and key neighbouring areas. An important consideration is that the Government of Namibia (GRN) through the Ministry of Lands and Resettlement, is currently

acquiring farms to the east of the Ombika Gate for resettlement of the Hai//om San community members who are non-employees in the Park, and as such these farms will form a buffer area between the Park and neighbouring land owners. The site is close to existing services and the Gate and is screened by existing footprints (substation and waste site).

The substrate for development in the Ombika area is a mosaic of good and bad substrate, with both areas being a heterogeneous mix calcrete and turf. Neither East nor West Ombika is uniformly optimal for building, because of the turf pans that get waterlogged in summer and become mud. Calcrete ridges are more suitable, but occur in scattered patches at both sites, while the intermediate substrate varies in quality. In general, the Ombika West site is flatter and has more homogeneous substrate and represents an easier option. The Ombika East site is more uneven, more heterogeneous and will need more careful planning of infrastructure placement. From a substrate viewpoint, neither site is optimal, but both could be made to work and this aspect is therefore not considered a constraint to development. Whichever site is selected, final infrastructure placement will need to be adjusted to conform to small-scale substrate conditions on the ground. This could be put to positive use in creatively designing the proposed village to fit in with the surroundings. Final site selection has therefore been informed by all factors, not just substrate. This aspect must however be carefully considered in the ESIA phase.

While a preference is shown for Scenario 3 in terms of Groundwater, Scenario 1 is the next favoured option, with none of the other alternatives being particularly viable. The presence of more Kalahari sand, calcrete and gravel in the vicinity of Ombika East means that it will be more vulnerable to pollution, especially in light of the presence of the waste site and the waste water treatment works close by. Groundwater will therefore require higher level of protection in this site and this aspect will need careful consideration in the ESIA phase.

While water is available and less sensitive to pollution to the west of Ombika Gate, it is not preferred as the development site for a number of other reasons. Water availability is a potential issue for all sites in the Park and this aspect will be investigated thoroughly in the ESIA phase.

The vegetation at Ombika West is 'Etosha Turf Pans on KarstVeld', which is a restricted vegetation type. The current location of a viewing site at the Ombika Spring in the area is a limitation as wildlife at Ombika Spring may be disturbed and visually, development to west of Ombika Gate may interfere with visitor viewing of wildlife at Ombika Spring. There are plans to move the water hole to the north as wildlife activity in the area increases the potential for conflict with humans. However, this is not confirmed and currently, the siting of development close to the water hole is not desirable. Development may impact on neighbouring landowners, who run lodges and farms for tourism. The Ombika West site may have a significant negative visual impact on the northern area of the neighbouring farm in the area.

It is also not considered a good option to develop to the east and west of the Ombika Gate as this will increase both the ecological impacts by increasing the development footprint, while also costing more in terms of development of infrastructure to support the more expansive development footprint.

The option of upgrading all infrastructure at Okaukuejo is not preferred as it is located close to the Okaukuejo Spring and development already hampers wildlife movements. Additional development for infrastructure in this area also restricts tourism expansion opportunities in the area in the future. Ground water is poor and one of the boreholes is already polluted, with limited capacity available. Visually, current infrastructure is already detracting from the tourist experience, while noise levels from the junior village impact on the tourist area. Conditions in the junior staff village are exacerbated by poorly maintained infrastructure together with the lack of functioning services. Whilst infrastructure in the senior village is in a better condition than the former, the living conditions in both villages are of low quality. The lack of management has also resulted in uncontrolled influx of non-employees into the area, further impacting negatively on the Okaukuejo area.

However, it is not considered desirable to move expensive infrastructure such as the existing research centre to Ombika, but to rather retain and upgrade both it and some of the maintenance centre in the camp to allow for maintenance operations related to the area to be handled from Okaukuejo. This will reduce unnecessary traffic on tourism roads.

The option of developing a site outside of the ENP for the South Zone was explored at a conceptual level and was found not to be a favoured option. The time frames involved in identifying and purchasing land outside of the ENP would mean that the money available from MCC may not be available as projects must be completed within 5-year time frames. The scope of purchasing and acquiring land outside the park will be larger and hence requires a much broader stakeholder engagement process with involvement from governmental and non-governmental levels and thus taking a longer time to resolve. It would also require additional funding for purchasing of land, which is not guaranteed and may also be better used in upgrading the ENP itself. The costs associated with establishing an entirely new township are likely to be higher than utilising available infrastructure as is possible within the ENP. Furthermore, the operation costs of transporting employees from outside the ENP to work will be higher and will increase traffic on the roads and the associated carbon footprint, which is an indirect impact often not considered. From a social perspective it will be even harder to implement management controls for employees for sites outside the ENP.

For these reasons, no specific site looked for outside the ENP and this scenario was not considered at the detailed level that the other scenarios were.

The following area, known as the development “envelope” will thus be assessed at Ombika Gate in the assessment phase by the specialists (Figure 16). This is in order to determine the significance of impacts related to development in this area, determine mitigation measures to reduce the severity of impact and to inform recommendations for planning, design, construction and operation. A carrying capacity for development will be determined.

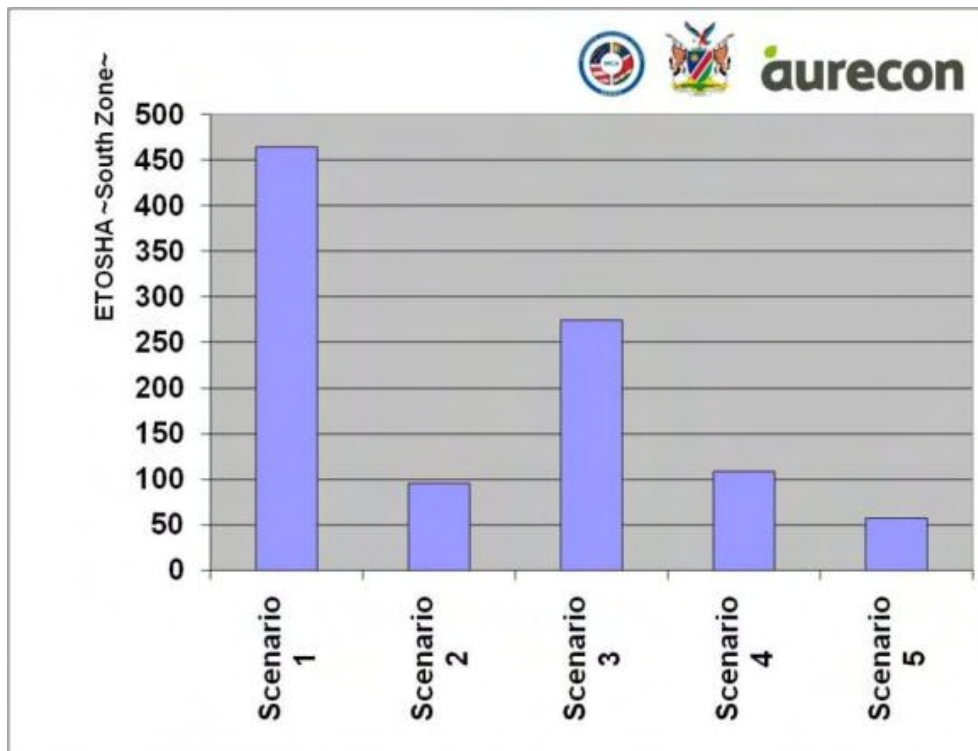


Figure 15. Preferred Site for Development



Figure 16: Development “envelope” to be assessed in the next phase of the ESIA.

7. RECOMMENDATIONS AND CONCLUSIONS

It is recommended that Scenario 1, namely establishing a village at Ombika East be investigated in the EIA phase. This scenario will include relocating all non-essential staff to the new site, to be designed in such a manner that the functional township is created that provided good quality living conditions, supported by adequate provision of services. Certain functions should be maintained at Okaukuejo such as the Research Centre, which should be renovated.

The EIA will be undertaken to ensure that the development proposals meet the goals of the MET in terms of managing the ENP; to ensure that the living and working conditions of employees in the ENP are upgraded; and to assist the ENP and Namibia to compete effectively in the regional ecotourism market by providing quality infrastructure.

In conclusion, an EIA should be undertaken on Scenario 1 to investigate the significance of all impacts associated with the preferred site and make recommendations for the distribution of infrastructure between Okaukuejo and Ombika. It must further make recommendations for design of the village and infrastructure to avoid negative impacts and maximise positive ones. Recommendations for both the construction and operational phases must also be made to manage residual impacts to ensure that the proposed development is environmentally and socially responsible.