SPATIAL CONSERVATION PLANNING FOR WIND FARM SITING IN LESOTHO

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Introduction

Several wind farms have been proposed for the Mountain Kingdom of Lesotho, the majority of which are located on ridgelines in the high lying parts of the country. The mountainous eastern part of the country abuts the Maloti Drakensberg along the border with South Africa – an area renowned for its biodiversity, cultural heritage and scenic splendour. Lesotho and the Drakensberg Escarpment are well known for their iconic but declining population of Bearded Vulture *Gypaetus barbatus* (Kruger 2014) and several colonies of Cape Vulture *Gyps coprotheres*.

One wind farm site was proposed for an area close to the edge of the northern Drakensberg Escarpment near Mont-aux-Sources. Environmental Resources Management (ERM) was appointed to undertake an EIA of the proposed windfarm. This paper examines the process followed to assess the site and the biodiversity sensitivities using a combination of data from vulture surveys, expert knowledge, and available spatial data from systematic conservation planning datasets compiled for the Maloti Drakensberg Transfrontier Project (MDTP). It demonstrates the unique advantage gained from access to available spatial biodiversity data in combination with expert knowledge of priority species to inform the development proposal and possible alternatives.

The Wind Farm Project

The wind farm site occupied 8000 ha, located on the road between Oxbow and Mokhotlong in Lesotho (Figure 1), with 100 turbines located on ridgelines spaced 300-500m apart, and designed to generate 150MW of energy. Generated electricity would be fed into the grid via a 132kV line to a substation 39km away, while internal overhead lines would connect the turbine areas. Various alternative sites had been previously screened from a technical, economic and environmental perspective, but no alternatives to the wind farm site were proposed for assessment in the EIA.

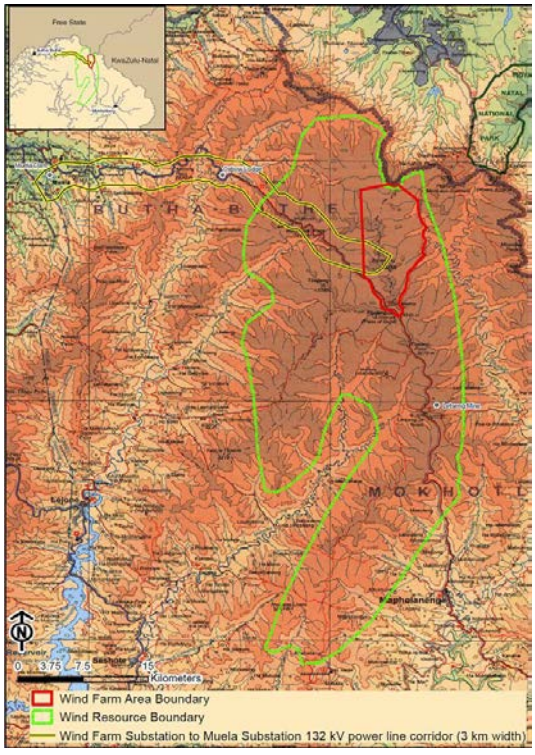

Figure 1. Location of Wind Farm Site in Lesotho

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Site Setting and Biodiversity Importance

The wind farm site was located at an altitude of 3200m in the highest alpine area on the top of the Drakensberg escarpment. The remote and desolate terrain is undulating and comprises ridgelines intersected by valleys with valley head fens - a unique wetland type located at high altitudes and considered critically endangered (SANBI 2013). They are threatened by livestock grazing, which causes erosion dongas leading to wetland drying and shrub encroachment. The steep escarpment edge with its vertical cliffs is located 2km from the proposed windfarm site. These cliffs run for most of the 1000km escarpment and are home to a number of cliff-nesting birds: Bearded Vulture *Gypaetus barbatus meridionalis*, Cape Vulture *Gyps coprotheres*, Black Eagle *Aquila verreauxii*, Black Stork *Ciconia nigra*. Of these the vultures are considered at highest risk of windfarm development.

Bearded Vulture

Bearded Vultures have two sub-species recognised on plumage characteristics: *G barbatus barbatus* occurs in Europe, the Himalayas and North Africa, while *G barbatus meridionalis* occurs in East and Southern Africa. Total global population is estimated at 2,000-10,000 individuals. In 2014, Bearded Vulture was uplisted on the IUCN red list from Least Concern to Near Threatened. However, the population in Lesotho / Drakensberg is evaluated as Endangered in the red list for South Africa and Lesotho. However, Kruger (2014) considers the true status as Critically Endangered, with an estimated 100-220 breeding pairs remaining. Their breeding range has declined by 27% (restricted to 28,127km^2) and breeding density by 20% (3.9 pairs per 1000km^2) in five decades and the population faces a high risk of extinction (Kruger 2014). They nest in pairs on high cliffs, generally above 1800m, and have one chick annually. Satellite-tracking has confirmed large home ranges of thousands of square kilometres, especially in non-breeding sub-adults which can fly 700km/day. They are threatened primarily by poisoning (feeding on poisoned carcasses), habitat degradation, and collision with powerlines. Reintroduction programmes have been attempted or are underway in Kenya and Spain, and feeding stations occur in several places globally.

Cape Vulture

The Cape Vulture (*Gyps coprotheres)* distribution is limited to southern Africa. It is listed as Vulnerable and has an estimated population size of less than 8,000 individuals. Cape Vultures live in colonies of less than ten to over a thousand birds on high steep cliffs. Many colonies are now inactive and the species is extinct in several locations. They are under threat for the same reasons as Bearded Vulture, and inappropriate tourism development with feeding stations provided in some areas to help maintain some colonies.

Vultures are particularly collision prone with wind turbines as they tend to use thermal uplift winds to ascend altitudinal gradients and stay airborne. In addition, vultures tend to forage while looking down and the top of the escarpment is often shrouded in cloud or mist with poor visibility.

Regional Context

The windfarm site lies within the Maloti Drakensberg Transfrontier Conservation and Development Area - the subject of a 5-year transboundary conservation initiative between South African and Lesotho called the Maloti Drakensberg Transfrontier Project (MDTP) with the aim of enhancing biodiversity conservation and sustainable land management. The MDTP area includes the UNESCO-listed Maloti Drakensberg Transboundary World Heritage Site, which runs the length of the escarpment, as well as the Royal Natal National Park which adjoins the windfarm site on the South African side and which includes the iconic Mont-aux-Sources amphitheatre. Recent inclusion of Sehlabathebe National Park in Lesotho as part of the Maloti Drakensberg Transboundary World Heritage Site requires Lesotho to evaluate impacts of wind power projects on vulture populations and the surrounding escarpment (IUCN 2013).

A comprehensive conservation planning study was undertaken for the Lesotho Highlands (MDTP 2007). The study included detailed mapping of wetlands, flora, degradation, rivers, fish, and priority bird species and integration of these spatial datasets to identify Lesotho's conservation priorities (Figure 2 and 3).

Results provided a valuable resource for evaluating the windfarm site sensitivities to highlight potential conflicts with conservation priority areas and sensitive features.

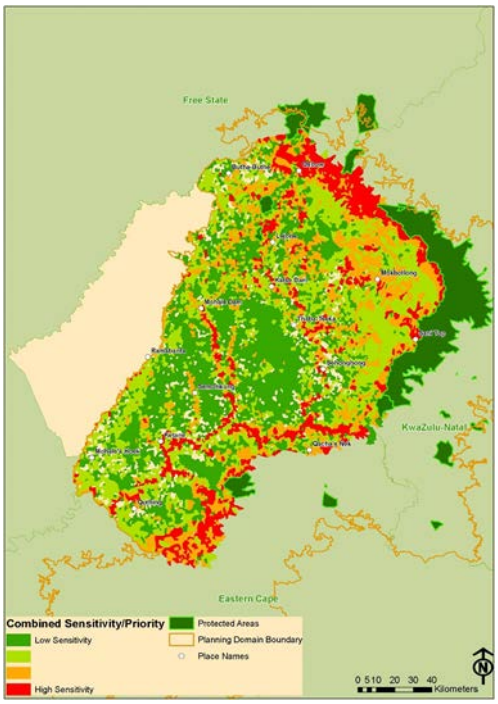

Figure 2. Windfarm Site Overlap with Oxbow – Senqu Priority Area and Bird Buffer Zones

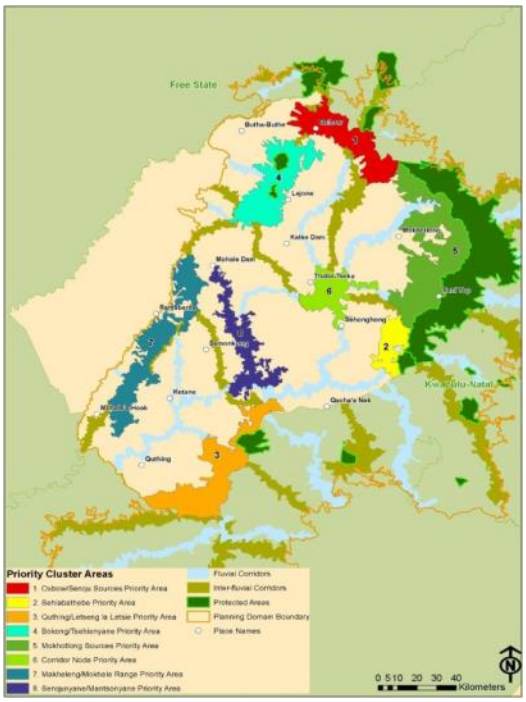

Figure 3. Conservation Priorities for the Lesotho Highlands (MDTP 2007).

Windfarm Assessment Process and Results

Activities undertaken involved the following steps:

1. The windfarm site was mapped and assessed in the context of the MDTP conservation planning outputs to identify particular biodiversity risks posed by the project. This highlighted the overlap of the windfarm site with the Oxbow-Senqu conservation priority area (Figure 3).

2. All data of nesting sites for collision-prone birds collected for the country since 1990 in the possession of the ornithologists on the team was mapped.

3. A helicopter survey was undertaken of the windfarm area (including the Drakensberg escarpment) to obtain new bird data and verify the status of previously recorded nest sites. In total, 3-4 recent or active Bearded Vulture nest sites were recorded within 10km of the proposed windfarm of which one was only 2km away. One active Cape Vulture colony (with six nests) was located only 6km from the nearest turbines, and many other colonies (including one with over 20 nests and one with over 100 nests) were found within a 30 km radius of the windfarm.

4. Buffer zones of different sizes were mapped around recorded nest sites based on bird collision risk as indicated in Table 1 and Figure 4.

The results showed a high level of overlapping bird buffer zones with the windfarm site (Figure 4).

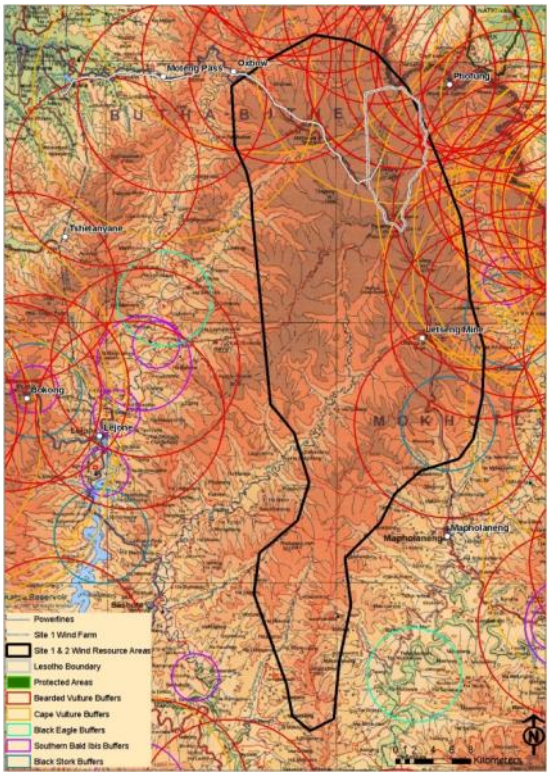

Figure 4. Windfarm Site Overlap with Oxbow – Senqu Priority Area and Bird Buffer Zones

Table 1. Applied Bird Buffer Zone Distances

Bird Species	Buffer Distance
Bearded Vulture (*Gypaetus barbatus*)	- 10km
Cape Vulture (*Gyps coprotheres*)	- 10km for colonies with <10 nests - 15km for colonies with 10-25 nests - 20km for colonies with >25 nests
Southern Bald Ibis (*Geronticus calvus*)	- 2.5km for colonies with <10 nests - 5km for >10 nests
Verraux¦s Eagle (*Aquila verreauxii*)	- 5km
Black Stork (*Ciconia nigra*)	- 5km

Note: more recent analysis of satellite tracking data suggests that adult Bearded and Cape Vultures tend to forage within 15km of nests (Rushworth & Kruger 2014), although Cape vulture may forage up to 40km from colonies.

5. Consultation with stakeholders from Ezemvelo KwaZulu Natal (KZN) Conservation Authority raised significant concern related to collision risks with birds and bats, and potential impacts on the status of the Maloti Drakensberg Transboundary World Heritage Site due to the proximity of the windfarm and risks to its wilderness experience by hikers / tourists.

Key Recommendations of the Study

Due to the high potential risks of the project on birds, particularly vultures, and on the wilderness character of the area adjoining the world heritage site, the study indicated the windfarm was a potential fatal flaw. It was recommended to the developers that the EIA consider an alternative site to the southwest of the proposed site where bird collision risk appeared to be lower. The windfarm project and EIA was subsequently terminated.

Follow Up Activities

Similar concerns have also been raised about another smaller windfarm project located further south near Letseng Mine. This windfarm has been authorised by the Ministry of Environment, Tourism and Culture (MINTEC) in Lesotho despite significant opposition from conservation stakeholders (Yeld 2013; BirdLife 2013). Birdlife South Africa have offered to assist MINTEC with providing guidance on windfarm development and have prepared a Memorandum of Agreement to work together to develop best practice guidelines and a strategic environmental assessment of renewable energy in Lesotho.

Subsequent research studies have modelled habitat and terrain use by Bearded Vultures in the Drakensberg region from 5 years of data for 21 satellite tracked birds (Rushworth & Kruger 2014; Kruger 2013). These studies have confirmed the proposed windfarms to be located in high bird risk areas (Reid *et al* 2015). Tracking data analysis showed vultures actively select ridgelines and upper slopes for foraging, and that Bearded Vultures spend 53% and Cape Vulture 62% of their flight within the blade sweep range of turbines (<100m height). Analysis of collision risks posed by

the two proposed windfarms suggests the vulture population in Lesotho is conservatively expected to decline at twice the present rate, reaching extinction in just over 100 years. This rate is expected to increase with expanding networks of powerlines and increased incidence of poisoning, The only viable and practical mitigation is to locate windfarms in areas of low vulture activity (Rushworth & Kruger 2014).

These studies provide additional support for highlighting the significant risks posed by windfarm sites in Lesotho and will hopefully lead to improved awareness and decision-making on windfarm development.

Conclusions

The windfarm scoping study benefitted immensely from:

i) access to robust spatial data from conservation planning studies;
ii) information from satellite-tracking studies;
iii) comprehensive mapped cliff-nesting bird data, and
iv) ornithologists with first-hand experience of bird surveys and nest site data in Lesotho collected over 20 years.

Availability of good conservation planning data facilitated early identification of project risks. The Oxbow windfarm development did not proceed further for financial reasons.

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