IMPACT ASSESSMENT CASE STUDIES FROM SOUTHERN AFRICA

Compiled by
Stephanie Dippenaar & Paul Lochner, (CSIR, South Africa)
Client: Genesis Eco-Energy

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EIA FOR THE KOUGA WIND ENERGY PROJECT, JEFFREYS BAY

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Aims of the Project

South Africa's Eastern Cape Province is reliant on electricity imports from other provinces yet houses significant industrial and rural development potential. Currently secondary agricultural processing companies, both small- and commercial-scale farmers, experience an intermittent and sometimes unreliable supply of electricity.

Given these challenges, and the favourable local wind climate, the objective of this wind energy project proposed by Genesis Eco-Energy (Pty) Ltd was to help stabilise energy supply to the Kouga area through the installation of a 15 MW wind farm that would be connected to the Eskom power grid. This project would assist the local economy in improving energy security, especially for emerging entrepreneurs in the area.

The project proponent, Genesis Eco-Energy, is a South African based renewable energy company that builds, owns and operates renewable energy projects.

The company has a strong focus on developing grid-connected wind energy projects.

Brief description of the development

The Kouga Wind Energy Project would have an electricity generation capacity of approximately 15 MW. The project was proposed to be located on the farm Sunnyside near Jeffreys Bay (Figure 1). The wind turbines would be connected to the local Eskom grid with a new line of not more than 500 m and most likely 22 kV capacity. The operational life of the facility was expected to be 25 years.

Wind turbines to be selected for this project could be between 500 kW and 2.5 Megawatts (MW) each. Machines of 1.8 to 2 MW would be used, depending on local wind conditions and market factors, and it was envisaged that one turbine size would be used for the entire wind farm. Therefore, the number of turbines required depended on the turbine size e.g. 30 machines if 500 kW turbines were used, and 8 if 2 MW turbines were used. The wind turbines would be mounted on towers with a maximum turbine hub height of about 75 m and blade length of 45 m (for the 2 MW turbines).

The wind regime was estimated to be able to produce an annual capacity factor of at least 30%. The kilowatt hours (kWh) production based on wind studies suggested a relatively equal power production distribution both daily (i.e. during day and night) and seasonally. The project was estimated to deliver at least 21 462 MWh per year.

Project phases and timeframes

The project was to be developed in 3 phases:

- Establish a wind monitoring mast of 40 m on site in order to gather information on local wind conditions. A second wind monitoring mast with a maximum height of approximately 50 m may also be erected.
- Lay the foundations for the turbines and establish the project infrastructure.
- Erect the wind turbines and establish links to the local power grid. A temporary access road to the site would be required. The construction phase was anticipated to take approximately three months.

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Brief description of the development

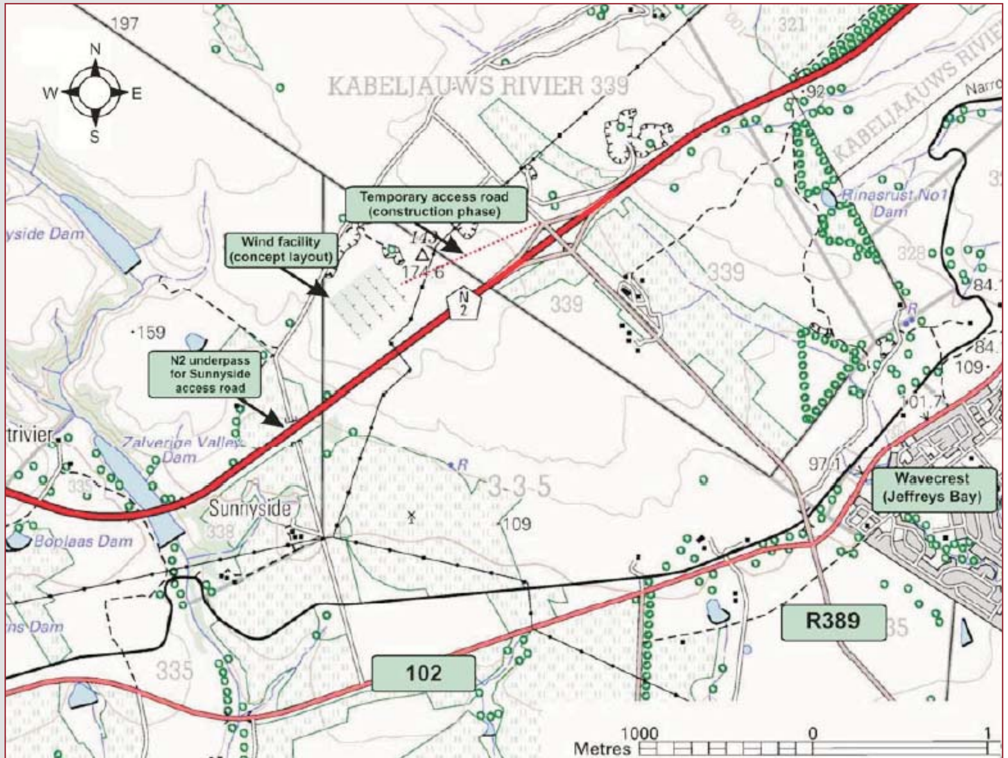

Figure 1. Location map for the Kouga Wind Energy Project.
(Note: the number and layout of turbines is conceptual)

Dimensions of project

The final choice of the size of turbine would be based on ease of erection, availability, suitability to the wind regime and flicker effects. Sources of new (i.e. manufacturer certified) wind turbines would be solicited. Turbines are typically spaced in rows of approximately 2.5 to 3.5 blade lengths apart. The turbine foundation would be an octagonal design of maximum 15 x 15 x 2.4 m depth, but possibly smaller, with the depth dependant on the soil condition. The tower diameter at the base was approximately 4 m and near the top 2.8 m. An example of the type of turbine envisaged for the Kouga project is shown in Figure 2.

The estimated extent of the wind farm was approximately 20 ha. However, agricultural practices would be able to continue amongst the wind turbines after construction as the physical footprint of the base of the turbine tower would only cover approximately 1% of this area.

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Environmental setting

Figure 2, Example of a wind turbine of the type envisaged for the Kouga project

Alternatives

No-go alternative

This alternative was included in the EIA as a benchmark against which to assess the impacts (positive and negative) of the proposal. The main economic consequence would be the ongoing unreliability and availability of electricity supply to the Kouga region, and associated impacts on local businesses.

Land use alternatives

The area consists of remnant fynbos habitat on sandstone, with very shallow soils. The site was zoned for agriculture and was mainly used for extensive cattle grazing, with carrying capacity of the land being approximately 6 ha per large animal unit. No other viable agricultural activities had been identified for the site. Given the rocky ground and shallow soils, the land was not suitable for crop farming. The vegetation on the site can be seen in Figure 3.

Activity and layout alternatives as part of the development

In the pre-feasibility stage of the project conducted during 2003 to 2005, a broad-brush screening was done of sites in the Southern and Eastern Cape that were potentially suitable for a combined wind energy and pumped storage scheme. This included consideration of sites in the area from Tsitsikamma to Kouga. Based on initial technical studies conducted by Afri-Coast Consulting Engineers on behalf of Genesis Eco-Energy, the Kouga area was selected as presenting the best opportunity for a successful project. Another wind farm site situated close to Humansdorp was considered, but ruled out due to its proximity to residential areas. The need for energy stability as well as the willingness of the owner of Sunnyside Farm to support the project made this an ideal site. Therefore no other sites were identified by the proponent for inclusion in the EIA.

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Alternatives

Technology alternatives as part of the development

The following technology alternatives were considered:

Combining a pumped storage scheme with a wind power scheme, to provide more continuous power input to the local grid. This option was explored by the project proponent in the pre-feasibility studies, which included site visits and specialist inputs by the CSIR's environmental team prior to the commencement of this EIA Unfortunately the pumped storage scheme was found to be prohibitively expensive and had to be dropped from the project proposal.

A range of scales of wind turbines, from 500 kW to 2.5 MW each, was considered.

Social considerations

Except for the construction period, the wind farm itself would not directly create jobs. Secondary job creation was expected due to greater energy stability. The current situation limited the economic growth potential in the Kouga area as some existing industries were considering moving elsewhere, and new industries were inhibited from developing because of the lack of an adequate and reliable electricity supply. The project objective was to alleviate these limitations and disincentives.

Related infrastructure

During the operational phase, the wind farm would be accessed from the Sunnyside farm road, which connects with the 102 road that runs parallel to the N2. A temporary 1 km long gravel access road, intersecting with the R389 road at the bridge over the N2, would need to be built for the construction phase (Figure 1).

The wind turbines would connect to the local Eskom grid with a new line of not more than 500 m to the existing municipal 66 kV powerline that passes the eastern edge of the site (Figure 3). The connection would most likely have 22 kV capacity. The developer would work with Eskom to finalise line capacities in the area.

Figure 3. Photo showing the existing Eskom power line passing the proposed site and the typical vegetation on site

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Environmental setting

Biophysical environment

Climate

The Kouga region features a bimodal rainfall pattern, where summer and winter rainfall regions come together, typical of the south-east coastal region of South Africa. During winter the prevailing wind is in a westerly to south-westerly direction and during summer the wind blows in a predominantly eastern direction. A high frequency of daily wind occurs in the area.

Landscape

The landscape is dominated by agricultural land and the expanding Jeffreys Bay township. Several power lines cross the property. The Mentorskraal Guest Farm is less than a kilometre away, located on the R389 road running from the N2 to Jeffreys Bay.

The site is situated approximately 8 km east from the coastline. Coastal towns adjacent to the site include Jeffreys Bay, Aston Bay and Paradise Beach. Humansdorp lies approximately 8 km west of the site.

Ecology

The conservation status of the vegetation ranges from Not Vulnerable (Humansdorp Grassy Fynbos) to Critically Endangered (Gamtoos Doringveld), with Kabeljous Renoster Thicket and Gamtoos Thicket regarded as Vulnerable. Faunal species that may occur in the study area were mostly assigned a conservation status of Least Concern, except Hewitt's Ghost Frog (Heleophryne hewitti), which is regarded as Critically Endangered. As the species is only known to occur in a limited number of catchments within the Elandsberg mountains, no individuals of this species were expected to be present at the proposed site.

The conservation status of five of the 12 species of bat was reported as Near Threatened, while the others were classified as Least Concern. Some of these species are aerial insectivores. There are no shelters for bats on or around the turbine site (e.g. caves or trees).

Bird species that were most likely to be impacted are raptors that use the favourable wind conditions on the ridge to forage. Relevant species are the rodent 'specialists' namely Rock Kestrel, Black-shouldered Kite, Common Buzzard, Jackal Buzzard and occasionally Lanner Falcon. Several terrestrial species favour the habitat (degraded Fynbos).

Heritage Resources

The site is further than five kilometres from the coast, and therefore shell middens are not expected this far inland. This was verified by a site visit as part of the EIA.

Socio-economic context

The Kouga Municipality has a population of approximately 63,000 people (1996 census as indicated in the Kouga Municipality revised IDP 2005/2006). Agriculture is one of the major contributors to the economy and employment in the area. Kouga has among the highest Formal Economy Performance scores, with positive factors including the positive trade balance, a fairly diversified economy, low financial grant dependence, and strong GDP and employment growth performance.

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Environmental setting

This is predominantly a rural area with a seasonal influx of visitors to the popular coastal tourist destinations such as Jeffreys Bay and Cape St Francis (Kouga Municipality Annual Report 2005-2006).

Planning context and surrounding land uses
The Kouga Municipal area had grown considerably over the previous 10 years and had become a major holiday destination. The tourism market was growing tremendously and would further benefit from the establishment of a game reserve near Jeffreys Bay. Jeffreys Bay itself was earmarked as a new business node of the Kouga region, with intensive industrial development and a R1,2 billion commercial and residential development being planned for a 600 ha site in the town.

EIA process followed

The key steps in the EIA process and associated timeframe are shown in Figure 4. Public Process Consultants conducted the public participation process. Key stakeholder meetings, as well as two public participation meetings, were conducted as necessary.

The heritage specialist team consulted with the Gamkwa Koisan Council, an NGO that strives to protect the heritage of the Gamkwa Koisan. The council members were all positive about the proposed development.

A further initiative prior to the start of the EIA was the establishment of a Steering Committee. This committee included the competent authority (Eastern Cape Department of Economic Development and Environmental Affairs (DEDEA), provincial representatives from the Department of Water Affairs and Forestry (DWAF, particularly when the pumped storage component was being investigated prior to the start of the EIA), the Kouga Municipality, land owners, Development Bank of South Africa (DBSA, a financing agent involved in the feasibility stage), Eskom (for input on the connection to the power grid), CSIR (environmental assessment practitioners) and the project proponent. The main purpose of the committee was to provide input to the EIA process and facilitate coordination among these lead stakeholders.

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TASKS		EIA SCHEDULE (MONTHS)															
		2008 Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2009 Jan	Feb	Mar	Apr	May	Jun
1	Notify authorities and submit EIA application	■															
2	Establish I&AP database, prepare BID and announce EIA		■														
3	I&AP registration & meetings with key stakeholders to source issues			■													
4	Prepare Draft Scoping Report (DSR) and Plan of Study for EIA (PSEIA)				■												
5	Public comments period (30 days) on DSR and stakeholder meetings					■	■	■									
6	Submit Final Scoping Report (FSR) and PSEIA to authorities for decision-making								■								
7	Inform I&APs of FSR submission								■								
8	Decision by authorities on FSR and PSEIA (30 days)								■	■							
9	Communicate authority decision to I&APs and process for next phase									■							
10	Specialist studies (including baseline fieldwork in 2007)						■	■	■	■							
11	Prepare Draft EIA Report and EMP								■	■	■						
12	Public review of Draft EIA Report and EMP										■	■					
13	Submit Final EIA Report and Draft EMP to authorities											■					
14	Decision by authorities (115 days)											■	■	■			
15	Communicate findings of decision to I&APs and opportunity to appeal														■		
16	Appeal process (45 days)															■	■
17	Communicate outcome of appeal process																■

Figure 4: EIA Schedule for the Kouga Wind Energy Project

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Main environmental impacts & issues

The key issues identified during the scoping process and assessed during the EIA were investigated in five specialist studies, namely:

- Impacts on ecology
- Impacts on birds
- Visual impacts
- Noise impacts
- Impacts on heritage.

Positive impacts

The wind turbines could be promoted as a model for renewable energy and a symbol of the effort of the local community and South Africa to join the developed world in implementing alternatives to energy sources that have high environmental risks, such as high CO_2 emissions from coal generated power or radioactive waste from nuclear power. The fact that the motion of the turbines was converting wind into energy could enhance the appeal of the view.

During construction and rehabilitation, there was an opportunity to remove two invasive alien plant species, *Acacia cyclops* and *Acacia mearnsii*.

The wind power in the area would result in more reliable energy and greater energy stability. This was expected to contribute to the economic growth potential, in the industrial as well as agricultural sectors, in the Kouga area.

Negative impacts

No fatal flaws or highly significant impacts were identified during the EIA process that would necessitate substantial redesign or termination of the project. Overall the predicted impact of the wind turbines was low to medium, with the visual impact being the most significant.

The proposed wind farm would have a significant impact on views over the landscape for people in the neighbourhood of the development site. Construction would involve a crane, causing very visible alteration to the landscape. This would be the most visually intrusive period due to the height of the apparatus but it would be of short duration. The wind turbines would result in additional noise emissions into the environment. During construction the main noise would be from diesel-powered equipment used for the clearing of the site and the preparation of foundations. The extent of this impact would be restricted to the immediate proximity of the construction site. During the operational phase, the noise emissions would be dominated by the aerodynamic noise caused by the interaction of the rotating blades with the flow of air. The extent to which this noise impact would be significant was approximately 1600 m from the centre of the wind energy facility.

The operation of the wind turbines could result in bird collisions with the turning blades, and the wind mast could also be a source of mortality in that birds might collide with the guy wires. The towers were legally required to have a red pulsating light on the top, but it was not envisaged that this would have a dramatic effect on birds.

No red flags were raised in terms of ecology as the site had a low conservation status, except for a limited area traversed by a drainage line or seep. Although there would be disturbance during construction, the actual footprint of the wind turbines was small (approximately 2 ha).

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Decision making process

The authority, DEDEA, was involved in a pre-application meeting and was represented on the Steering Committee. At the time of producing the final EIA report, the case officer, her immediate manager, the EIA practitioner and the proponent, conducted a site visit to Sunnyside farm.

Review inputs were obtained from authorities and local NGOs (such as the Wildlife and Environment Society of South Africa) as part of the consultation process for the EIA process. No independent external peer review process was used, as specialists had done other wind projects of a similar nature before, which included peer review, and were familiar with the issues surrounding the proposed project.

The Final EIA Report was submitted to the lead authorities in December 2008. The Environmental Authorisation was issued by DEDEA in March 2009. There were no appeals against the project.

Implementation of the EMP

As construction has not yet started on the project, it cannot be established whether the impacts predicted were correct or whether the EMP is effective.

Main elements of excellence in this EIA

Competent specialists with local knowledge of the area were of significant value in conducting the EIA. The bird specialist, for example, had done several wind EIA studies. Building on previous as well as local knowledge results in greater efficiency in predicting impacts and developing effective mitigation measures. The heritage specialists (for archaeology and palaeontology) were familiar with the local people and environment, and had good relationships with them, which supported the public participation process.

The public participation specialist (based in Port Elizabeth) had done several EIAs in the local area and already had a positive relationship with the community as well as most of the key stakeholders. The EIA could thus build on an existing stakeholder list. One-on-one meetings were held with key stakeholders, and consulting with them from the start of the EIA contributed to a general positive feeling from stakeholders regarding the project.

The EIA practitioners consulted closely with the local authority regarding implications for land-use planning.

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Lessons learnt

The project proponent should carefully consider the cost of the project design and planning before moving into the EIA domain. In this EIA, the consultants were going to commence a full EIA for the wind energy and the pumped storage scheme, but the pumped storage scheme was dropped due to cost implications just prior to commencing with the full EIA.

There is a need in South Africa for a better understanding of the local impact of wind turbines on bats. While there is good information (atlases and biodiversity indexes) available for birds and general biodiversity, bat occurrences and distribution patterns are poorly known. In areas where bats occur, or migrate, wind turbines could have a significant impact as the pressure waves from the turbines can burst the lungs of bats.

In order to avoid or manage negative cumulative impacts of numerous wind energy projects, there is a need for strategic level assessment to guide the location and planning for wind energy projects in regions with favourable wind climate.

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