

**Environmental Impact Assessment for the
proposed Banna Ba Pifhu Wind Energy Project
near Humansdorp, Eastern Cape:
Final Environmental Impact Assessment Report**

Chapter 3:

Description of the Affected Environment



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CHAPTER 3. AFFECTED ENVIRONMENT

This chapter provides an overview of the affected environment and local planning context (including surrounding land uses) for the proposed Banna Ba Pifhu Wind Energy Project. A broad understanding is given to the term 'environment', which includes the biophysical, socio-economic and heritage environment. This chapter, therefore, assists the reader in identifying potential impacts on the environment (positive or negative); and opportunities or constraints which the affected environment may present to the development.

3.1 SITE LOCALITY

The Banna Ba Pifhu Wind Energy Project is located on the Broadlands and Saragossa Farms in the Kouga Municipal Area, approximately 3.5 km south of the town of Humansdorp at an elevation of approximately 50 m to 90 m. It will be located on the following farms:

- Remainder of Farm 688
- Portion 2 and 15 of Farm 689
- Portion 1 of Farm 868.

The Banna Ba Pifhu wind energy project will have a total capacity of up to 30.6 MW. Current cattle farming activities would continue beneath and around the turbines.

3.2 BIOPHYSICAL ENVIRONMENT

3.2.1 *Climate*

Rainfall in the Kouga region is bimodal where both summer and winter rainfall occurs, a feature typical of the south-east coastal region of the country. The mean annual rainfall is approximately 400 mm. The weather is mild without extreme conditions with an average summer temperature of 24°C and a winter temperature of 17°C. During winter the prevailing wind is from a westerly to south westerly direction and during summer the wind is predominantly easterly. A high frequency of wind occurs daily in the area.

3.2.2 *Geology and Landscape*

The wind farm will be located on a relatively flat coastal plain. Foothills of Cape Fold Mountains rise towards the west and north of the wind farm site. Palaeo-dunes of up to 100m high can be seen south of the wind farm site near Thyspunt and Oyster Bay. The geology of the region is dominated by rocks of the Cape Supergroup which consist mainly of quartzite layers. These rocks tend to be erosion resistant, forming ridges and mountains, as well as rocky promontories

which jut out into the sea such as at Seal Point and Shark Shack Point near Cape St Francis. Palaeo-dunes of the Nanaga Formation and current dune fields are found along the coast.

The wind farm will be introduced into an agricultural landscape with dairy farming as the main land use type. Fynbos on the hills with thicket along deeper river valleys (and among palaeo-dunes) cover areas which are not cultivated. Humansdorp is the largest in-land settlement in the region and an important service centre for the agricultural community. The coastline contains numerous towns and resorts which cater for seasonal visitors and tourists, such as St Francis Bay, Cape St Francis and Oyster Bay.

There are various power line and road networks covering the area. A 66 kV power line crosses the site, linking to the Melkhoutbosch substation (Figure 3.1) located north of the N2-R330 interchange. The electricity generated at the Banna Ba Pifhu wind energy project is planned to feed into the 66 kV line and into the Melkhoutbosch substation.

The roads that may be affected will be the R330 between St Francis Bay and Humansdorp, the R102 between Humansdorp and Jeffrey's Bay and the N2. The R330 will be most affected since it passes very near the wind farm site.

3.2.3 Ecology, Biodiversity and Conservation Planning

Regional Planning - Mucina and Rutherford Vegetation of Southern Africa (2006)

The vegetation map of the study area is provided in Figure 3.2.

According to Mucina and Rutherford (2006), present vegetation consists of:

- **Humansdorp Shale Renosterveld**, which includes shrubby fynbos communities and low-lying seep and wetland/pan areas dominated by grasses and herbs with scattered thicket clumps, where not cultivated or transformed. Rocky outcrop communities also present on ridges with a mix of succulent and fynbos elements (**Endangered**).
- **Gamtoos Thicket** restricted to kloofs and valleys along drainage lines, of which the latter are dominated by trees (**Least Threatened**).

Regional Conservation Planning - Subtropical Thicket Ecosystem Planning

According to STEP vegetation classification, vegetation on site consists of:

- **Kromme Fynbos / Renosterveld Mosaic** - includes shrubby Renosterveld-Fynbos communities and low-lying seep and wetland/pan areas dominated by grasses and herbs with sporadic scattered thicket clumps, where not cultivated or transformed. Rocky outcrop communities also present on ridges with a mix of succulent and fynbos elements (**Vulnerable**).
- **Gamtoos Valley Thicket Mosaic** - restricted to kloofs and valleys along drainage lines, of which the latter are dominated by trees (**Vulnerable**).

Regional Conservation Planning - Garden Route Biodiversity Sector Plan

The present vegetation in within and directly adjacent to the site as per the Garden Route BSP, consists of:

Vegetation Variant	Conservation Status
Osbosch Thicket -Renosterveld	Vulnerable
Humansdorp Perennial Stream	Least Threatened
Soutvlei Inland Pans	Vulnerable
Kabeljous Valley Thicket	Vulnerable
Kromrivier Thicket Forest	Vulnerable
Tsitsikamma Perennial Stream	Critically Endangered

The Garden Route Biodiversity Sector Plan thus identifies the primary vegetation units that will be affected by the proposed wind farm as being **Osbosch Thicket-Renosterveld**, **Humansdorp Perennial Stream** and **Soutvlei Inland Pans**. These vegetation units have a low conservation status and the proposed development is thus unlikely to have any significant impact on conservation priorities. Furthermore, the majority of the site is in a transformed state, with remnant vegetation being in a degraded state. **Kabeljous Valley Thicket**, **Kromrivier Thicket Forest** and **Tsitsikamma River** and **Floodplain** although present in the vicinity, are mostly outside of the proposed development site and are unlikely to be affected.

This proposed land-use accommodates infrastructure installations serving both the urban and rural areas where such installations include nuclear power stations, **wind farms or other alternative energy technologies requiring large areas of undeveloped land**. The Garden Route BSP guidelines thus permit the use of areas for large-scale wind farms where they 'are associated with large areas of land left undeveloped thereby maintaining low transformation levels relative to the property size'; installations to be located on transformed, disturbed or low-value agricultural land, where possible' and 'avoidance of sensitive areas such as floodlines, river and wetland buffers and Special Habitats'.

3.2.4 Vegetation and habitat

Note: More information on the proposed impacts on ecology can be found in the ecology chapter (Chapter 5).

The current habitat is primarily dominated by transformed **agricultural pastures and lands** (both irrigated and fallow), with remnant pockets of **Osbosch Renosterveld - Thicket** on slopes and mostly degraded/transformed **Humansdorp Perennial Stream in low lying areas**. The majority of the land consists of cultivated fields, mainly producing fodder and grazing for livestock but may have been used historically for crop production.

Ecological barriers in the area consist of fences, gravel farm roads, culverts and power lines. Utility lines and roads are forming corridors for bird mediated seed dispersal as well as vehicle mediated dispersal, in the case of roads. Biotic interactions are concentrated around pollination, seed dispersal, herbivory and predation.

Dams, streams and drainage lines of natural or anthropogenic origin usually with typical associated aquatic and riparian flora in various states of ecological integrity and disturbance are present. Numerous small to medium sized farm dams are present on the site, which may have been associated with historical seasonal/ephemeral wetlands in the rainy season.

A few scattered alien plants are present as individuals or in small clumps, although these do not occur in abundance anywhere within the site.

A number of protected and endemic flora species are likely to occur in intact areas of natural vegetation, which will be identified in the Specialist study.

Terrestrial Faunal species that are expected to occur within the study area mostly have a conservation status of Least Concern to Vulnerable and No Endangered or Critically Endangered terrestrial fauna. The site does not host any butterflies of special concern and does not fall within an area of any Endangered or Critically Endangered reptiles as presented in Branch (1988). Vulnerable Blue Duiker (*Philantomba monticola*) and Endangered Oribi (*Ourebia ourebi*) have distributions that overlap with the locations of the wind farm, but due to the absence of preferred habitat, are not expected to occur on the proposed site. Hewitt's Ghost Frog (*Heleophryne hewitti*), which is regarded as Critically Endangered (Branch, 1988) is known to be present within a limited number of catchments within the Elandsberg mountains and no individuals of this species are expected to be present at the proposed site. It is however not ruled out that they might occur as the presence of the species in the area has not been determined.



Figure 3.1: Melkhoutbosch substation, near the N2-R330 interchange north of Humansdorp

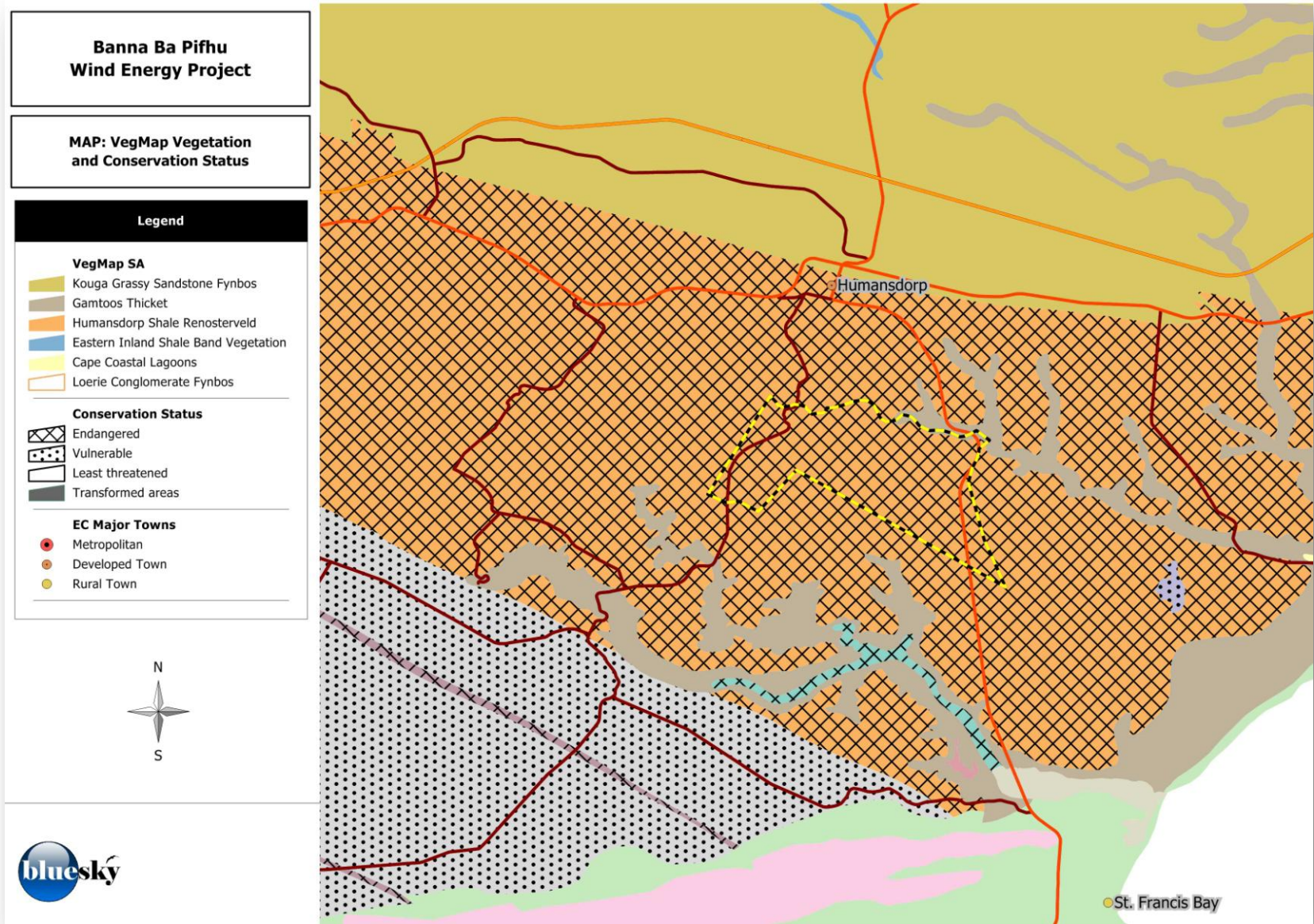


Figure 3.2: Vegetation map of the study area (including transformed land)

3.2.5 Birds

Note: More information on the proposed impacts on birds can be found in the birds chapter (Chapter 6).

The following bird habitat classes were defined within the survey area:

- Agriculture: The majority of the sites consist of agricultural land, and mostly comprises of pastures (for cattle grazing), both irrigated and dry-land, structurally resembling short grassland;
- Thicket: Very dense, in places impenetrable, shrub present in steep valleys along drainage lines. Small trees are also present;
- Wetlands: Includes both man-made dams and natural seasonal wetlands which, when dry, consist of short grassland virtually indistinguishable from the surrounding pastures. In the rainy season, depending on the amount of rainfall, some of the wetlands contain standing water for weeks up to several months ; and
- Scrub: Mostly natural renosterveld consisting of a mixture of grass and scattered shrubs.

Within the survey area approximately 7% of the bird habitat is classified as wetland, 15% as thicket, 13% as scrub and 65% as agriculture. These are estimates and may change depending on the rainfall pattern in any given year, but for purposes of the analyses, these ratios were assumed to be an accurate estimate to work with. A total of 16 priority species was identified during the survey period (see Table 3.1 and Figure 3.3 below).

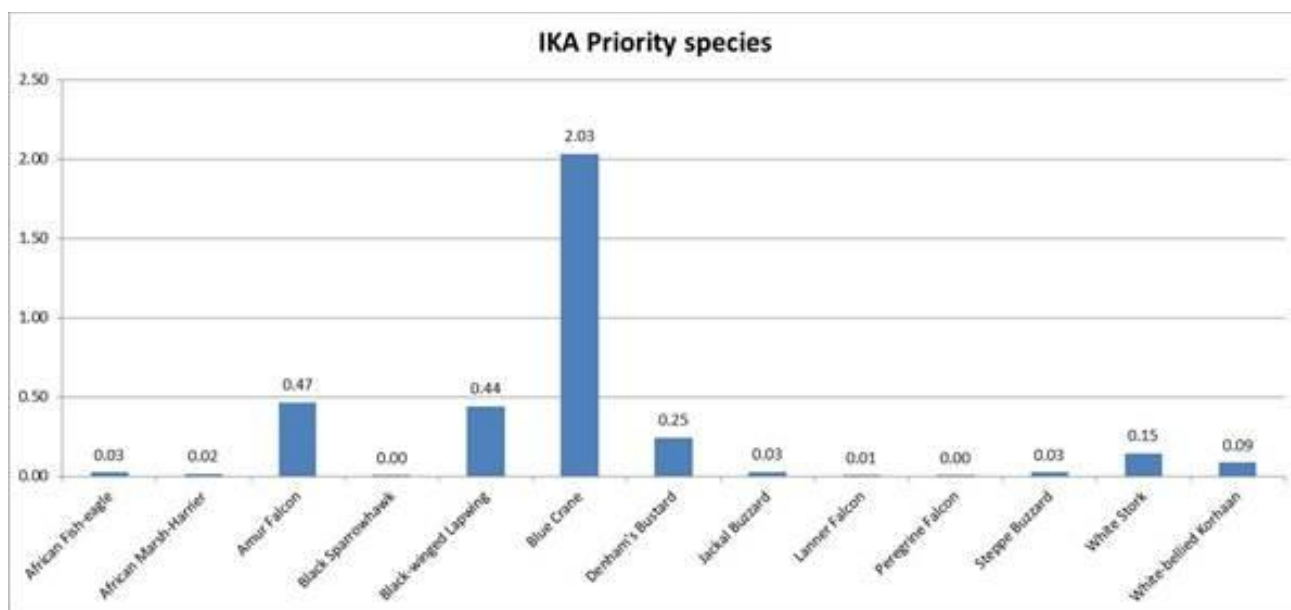


Figure 3.3: Index of kilometric abundance (IKA) for priority bird species recorded during transect surveys

Table 3.1: Priority species recorded to date at the Banna Ba Pifhu Wind Farm site

Common name	Scientific name
African Fish-Eagle	<i>Haliaeetus vocifer</i>
Peregrine Falcon	<i>Falco peregrinus</i>
Jackal Buzzard	<i>Buteo rufofuscus</i>
Blue Crane	<i>Anthropoides paradiseus</i>
Black Sparrowhawk	<i>Accipiter melanoleucus</i>
Denham's Bustard	<i>Neotis denhamii</i>
Steppe Buzzard	<i>Buteo vulpinus</i>
Lanner Falcon	<i>Falco biarmicus</i>
Black-winged Lapwing	<i>Vanellus melanopterus</i>
White-bellied Korhaan	<i>Eupodotis senegalensis</i>
Osprey	<i>Pandion haliaetus</i>
White Stork	<i>Ciconia ciconia</i>
African Harrier Hawk	<i>Polyboroides typus</i>
African Marsh-Harrier	<i>Circus ranivorus</i>
Amur Falcon	<i>Falco amurensis</i>
Secretarybird	<i>Sagittarius serpentarius</i>

The potential effects of a wind farm on birds are highly variable and depend on a wide range of factors including the specification of the development, the topography of the surrounding land, the habitats affected and the number and species of birds present. With so many variables involved, the impacts of each wind farm must be assessed individually. Each of these potential effects can interact, either increasing the overall impact on birds or, in some cases, reducing a particular impact (for example where habitat loss causes a reduction in birds using an area which might then reduce the risk of collision).

The principal areas of concern which will require investigation are listed below:

- Collision mortality on the wind turbines
- Displacement due to disturbance
- Habitat change and loss.

3.2.6 Bats

Note: More information on the proposed impacts on bats can be found in the bats chapter (Chapter 7).

Wind energy is emerging as a noticeable component of energy markets in a number of regions, with the USA, Spain and China being the biggest players (SAWEA, 2010). However, it has been estimated that between 33000 and 111000 bats may be killed annually by wind turbines in the Mid-Atlantic Highlands USA by 2020 (Kunz *et al.*, 2007). The cumulative impacts of such mortality on affected species of bats could have long-term population effects (Kunz *et al.*, 2007). Furthermore, in Europe, isotope analysis has revealed that wind farms don't only affect local bat

populations but may also cause fatalities of bats from geographically distant populations – up to and possibly beyond 1000 km away (Voigt *et al.*, 2012).

Although considerable progress has been made in recent years towards better understanding the problem, bat fatalities at wind turbines is still a major concern for this energy alternative. During a study by Arnett *et al.* (2009), 10 turbines monitored over a period of 3 months showed 124 bat fatalities in South-central Pennsylvania (USA). Cumulatively, turbines may have a catastrophic long term effect on bat populations if such a collision rate persists. It is, however, important to note, that the number of fatalities will vary greatly depending on the habitat and area where the wind farm is located, and the number can also be significantly decreased by effective mitigation measures.

Most documented impacts include:

- Direct collision;
- Barotrauma (mortality due to damage to bats' lungs caused by sudden change in air pressure close to the turning turbine blade; Baerwald *et al.*, 2008);
- Loss of foraging habitat (either due to wind farm construction or because bats avoid the wind farm area);
- Barrier effect of commuting and migrating routes; and
- Emission of ultrasound by wind turbines (probably limited).

At the Banna Ba Pifhu site, 4 of the 14 possible bat species that may occur at the site have been recorded during the long-term monitoring survey¹ thus far. These have been indicated in **Table 3.2** below.

¹ The 12 month pre-construction monitoring survey is being conducted according to the requirements of the South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments (Sowler & Stoffberg, 2012). It is important to note that the survey will only be completed in May 2013 and therefore, all findings in this report are preliminary.

Table 3.2: Bat species recorded at the Banna Ba Pifhu site.

FAMILY	SPECIES	COMMON NAME:	STATUS (int)	STATUS (SA)	HABITAT	METHOD OF CONFIRMATION
MINIOPTERIDAE	<i>Miniopterus natalensis</i>	Natal long-fingered bat	*NT	NT	Temperate or subtropical species; savannas and grasslands; cave-dependent.	Confirmed – calls only
MOLOSSIDAE	<i>Tadarida aegyptiaca</i>	Egyptian free-tailed bat	*LC	LC	Forages over desert, semi-arid scrub, savanna, grassland and agricultural land. Avoids forests.	Confirmed – calls only
VESPERTILIONIDAE	<i>Neoromicia capensis</i>	Cape serotine	LC	LC	Arid semi-desert to montane grassland, forests and savanna. Less abundant in low-lying hot savannas.	Confirmed – calls only
VESPERTILIONIDAE	<i>Eptesicus hottentotus</i>	Long-tailed serotine	LC	LC	Rocky outcrops, miombo woodland in gorges and granitic hills.	Confirmed – calls only

*NT-Near Threatened; LC-Least Concern

From the acoustic monitoring data collected thus far the following is evident:

- The Banna Ba Pifhu site is considered to have a relatively high bat activity index for the Southern Cape region. Compared to another site similarly located, the site is considered to be similar and slightly higher bat activity levels were recorded.
- *Miniopterus natalensis*, a Conservation Important species, has been confirmed to utilise the proposed Banna Ba Pifhu site.
- 91% of all bat activity occurs between 17:30 and 19:30 in the evening
- The Banna Ba Pifhu site is so far considered to be of Medium Risk to bats where operational mitigation measures will be required to ensure that bats utilising the site are not significantly impacted on.

3.2.7 Heritage

Note: More information on the heritage resources can be found in Chapter 11 (Archaeology) and Chapter 12 (Palaeontology).

Heritage includes palaeontology (e.g. fossils), archaeology and historical or cultural features that may exist on or near the site. The site is more than five kilometres from the coast, and therefore shell middens are not expected to be found this far inland (Binneman 1996, 2001, 2005). The site

might have had low cultural activity in the past, but it is unlikely that any archaeological or historical material would be located during development. Nonetheless, it must be recognised that there are several archaeological sites in the wider region that are of international significance and the developers should observe for any archeologically valuable features during the construction phase.

3.3 ECONOMICS

Note: More information on the impacts on the Economy of the area can be obtained in the Economics chapter (Chapter 10 of this report).

3.3.1 Demographics

The 2007 Community Survey estimated that the total population in Kouga has grown slightly since 2001 to 73 274 and decreased slightly in the Cacadu District to 363 485 (StatsSA, 2008). Estimates in the Kouga Integrated Plan (IDP) argue for a substantially higher population estimate of up to 86 000 people fuelled by a population growth rate of 2.4% per annum between 2000 to 2010 (Kouga Municipality, 2007).

The revised Kouga IDP (Kouga Local Municipality (KLM), 2010) points out that Jeffrey's Bay is now reputed to be one of the fastest growing towns in South Africa and the current trend suggests a high growth rate at 2.5% per annum for the Jeffrey's Bay and 2% for Humansdorp. It predicts that the population of the municipality will reach 90,000 within four years.

3.3.2 Employment

As with the rest of the country, unemployment is a major challenge in the area. The 2007 Community Survey indicates that unemployment in the Kouga Municipality has stayed at 27% for 2007 little changed from the 2001 estimate (StatsSA, 2008). For the individual towns in the municipal area, Table 3.3 shows that unemployment was highest in the smaller towns of Patensie (39.7%), Hankey (32.5%), Thornhill (32.5%) and Loerie (32.5%). Jeffrey's Bay, Humansdorp, St. Francis Bay and Cape St. Francis fared better at roughly 20% unemployment.

Table 3.3: Unemployment in the towns within the Kouga Municipality (2006)

SETTLEMENT TYPE	ELIGIBLE WORK FORCE (19 - 65 YRS)	PERMANENT RESIDENTS WITHOUT JOBS	%	SEASONAL FARM WORKERS	TEMPORARY DOMESTIC WORKERS	PERMANENT FARM WORKERS	PERMANENT INDUSTRY WORKERS	PROFESSIONAL WORKERS
CAPE ST. FRANCIS & ST. FRANCIS BAY	1523	305	20	N/A	Unknown	N/A	N/A	Unknown
HANKEY	6388	2078	32.5	430	860	2364	430	227
HUMANSDORP	13051	2662	20.4	82	862	2513	6315	615
JEFFREYS BAY	21870	4462	20.4	0	459	0	15230	1720
LOERIE	1320	429	32.5	Unknown	Unknown	Unknown	Unknown	Unknown
OYSTER BAY	553	114	20.6	N/A	43	N/A	352	44
PATENSIE	2092	830	39.7	221	83	258	1070	92
THORNHILL	1224	398	32.5	Unknown	Unknown	Unknown	Unknown	Unknown

Source: KLM (2010)

Figure 3.4 shows that the number of jobs in the Kouga Municipality increased by the greatest degree in the construction sector between 1996 and 2001 reflecting rapid development of the area. The agriculture, forestry and fisheries sector shed the greatest number of jobs during the same period in keeping with trends such as increased mechanisation. Notwithstanding this, for the Cacadu and Kouga Municipal area, the dominant sector in terms of employment provision in 2001 was agriculture, forestry and fishing providing 36% and 33% of all employment opportunities in these areas respectively. Other important sectors in the Kouga Municipality include wholesale and retail trade (15% of employment in 2001) and community/social/personal services (14% of employment in 2001). By comparison with the wider Kouga municipal area, Humansdorp and Jeffrey's Bay have particularly high portions of workers in the wholesale and retail trade, services as well as construction sectors reflecting their status as service centres with high growth. In Patensie, Hankey, Thornhill, Loerie and KwaNomzamo, by contrast, far higher levels of employment are associated with the agriculture, forestry and fishing reflecting a high concentration of lower skilled jobs among its residents.

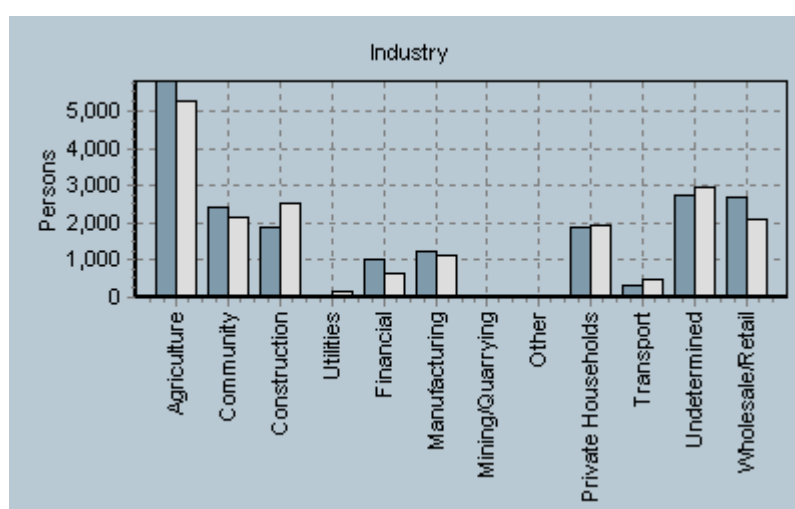


Figure 3.4: Jobs per sector for the Kouga Municipality (1996 – dark bars, 2001 – lighter bars)

Source: Demarcation Board using Census 2001 & 1996

3.3.3 Income levels

Household income levels in the study area are presented in Table 3.4 below. Approximately 44 % of households in the Cacadu District and 33 % in the Kouga municipal area had incomes below R9 600.00 per year in 2001. . KwaNomzamo had a similar income pattern to the District (46% of households with incomes below R9,600 per year) while Jeffrey's Bay and Humansdorp fared substantially better than the District and slightly better than the wider Kouga municipal area.

	Cacadu District	Kouga Municipality	Humansdorp	Jeffreys Bay	KwaNomzamo
No income	14%	11%	9%	10%	17%
R1 - R4 800	7%	5%	3%	3%	8%
R4 801 - R9 600	23%	17%	13%	13%	21%
R9 601 - R19 200	23%	24%	20%	17%	29%
R19 201 - R38 400	15%	19%	26%	17%	18%
R38 401 - R76 800	8%	12%	15%	18%	5%
R76 801 - R153 600	5%	8%	9%	14%	1%
R153 601 - R307 200	2%	3%	4%	6%	0%
R307 201 - R614 400	1%	1%	1%	1%	0%
R614 401 - R1 228 800	0%	0%	0%	1%	0%
R1 228 801 - R2 457 600	0%	0%	0%	0%	0%
R2 457 601 and more	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%

Table 3.4: Household incomes in the wider study area (2001)

Source: StatsSA, 2002

The 2007 Kouga IDP notes that the proportion of household living in poverty has increased by 6.4% in the past 10 years from 26.6% to 32.9%. The rate of increase in the Eastern Cape Province and Cacadu District ranges between 9% and 10% over the same period. Encouragingly the Human Development Index (HDI) for the Kouga area has improved in the past 10 years from 0.57 in 1996 to 0.62 in 2005 and remains better than the provincial and District HDI (KLM, 2007). The 2010 IDP review also notes the lower rates of poverty in Kouga than nationally, provincially or on a district level (see Figure 3.5). It further illustrates that since 2003 there has been a steady decline in poverty in Kouga (KLM, 2010).

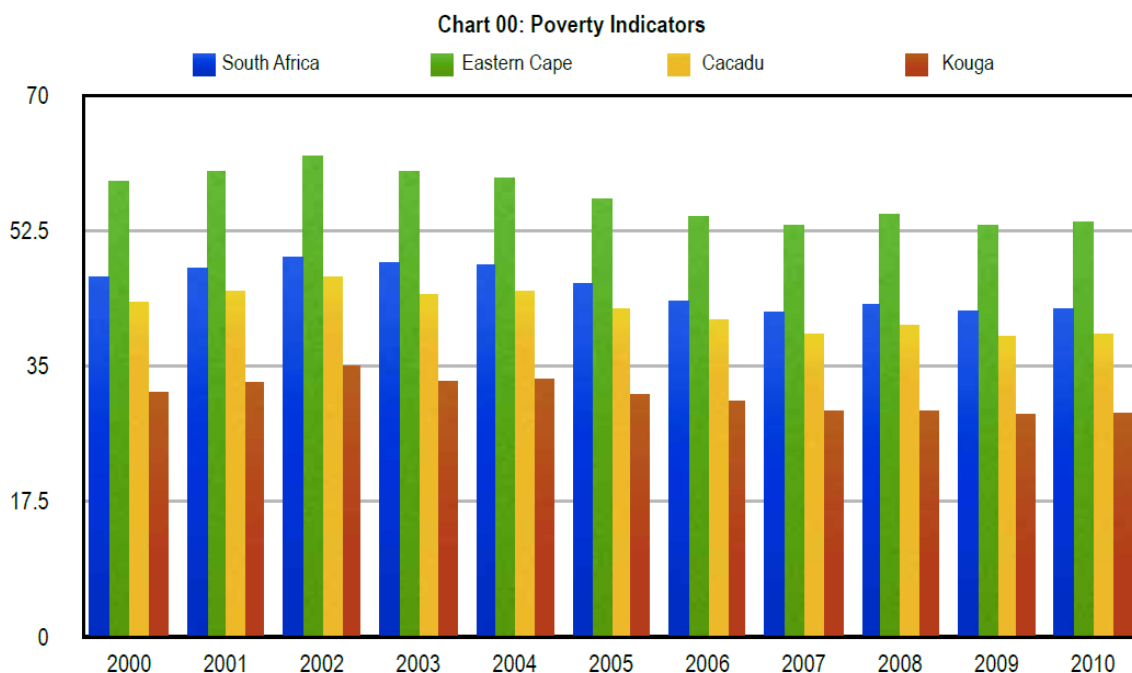


Figure 3.5: Poverty levels in the Kouga Municipality over time
Source: KLM (2010)

3.3.4 Economic growth and development

Economic development faces many challenges in the Kouga municipal area although its performance relative to other areas in the Cacadu District and Eastern Cape is encouraging. The Kouga IDP points out that municipal productivity is higher than the averages for the Cacadu District and province principally due to high growth in value creation relative to employment and labour remuneration. Growth in GDP and employment, from 1996 to 2004, and skills available to the local economy, are both higher than the provincial average. Kouga also has among the highest Formal Economy Performance scores in the province, with positive factors including the positive trade balance, a fairly diversified economy, low financial grant dependence, and strong GDP and employment growth performance. The Municipality fares well on Economic Absorption Capacity, considering high total disposable income, employment multiplier and informal sector capacity to generate economic opportunities relative to formal employment. The local economy claims a comparative advantage, for both employment and GDP contribution, in agriculture (centred on agriculture and hunting at 9.87% of GVA and 27.99% of employment) and construction (6.18% of GVA and 10.42% of employment). Kouga also claims GVA advantages in utilities (electricity supply and water), trade (centred on retail trade) and community services (dominated by public administration) (KLM, 2007).

3.3.5 Landscape character and sense of place

Note: More information on the proposed visual impacts can be found in the visual chapter (Chapter 8).

The landscape character and “sense of place” of the local area may be affected in the following ways by the proposed wind energy project:

- Potential visual intrusion on views from protected areas (particularly: Swan Island Nature Reserve (NR), Seekoei River NR and Noorsekloof Local NR which are relatively close to the wind farm site);
- Potential visual intrusion on views from Humansdorp and holiday resorts and residences on the Kromme River and in Paradise Beach;
- Potential visual intrusion on views from coastal areas where few man-made structures are currently visible (e.g. between Oyster Bay and Seal Point, and south of Paradise Beach);
- Cumulative visual and landscape impacts of various wind farms proposed for the region.

3.4 PLANNING CONTEXT AND SURROUNDING LAND USES

The economy of the Kouga Municipal area has grown considerably over the last 10 years and the area has become a major holiday destination. The tourism market is growing tremendously and will further benefit from the establishment of a game reserve near Jeffrey’s Bay. A Tourism Forum, where all the local tourism organisations are represented, was established to drive tourism in the Kouga region.

Agricultural production is on the increase and as the benefits of intensive land utilisation are becoming apparent its growth is constantly gaining momentum.

The site for the proposed Banna Ba Pifhu wind farm is presently zoned for agriculture and comprises irrigated pastures and grazing land.

Activities on the land surrounding the wind farm sites include:

- Stock farming
- Crop farming and
- Untransformed land (natural vegetation).

The area is not pristine and has been transformed by various human activities over the last two centuries. Nevertheless development should only proceed with due cognisance of environmental features.

3.5 REFERENCES

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