

DRAFT SCOPING REPORT

COMBINED ENVIRONMENTAL IMPACT ASSESSMENT FOR THE UMSINDE EMOYENI WIND ENERGY FACILITY PHASE 1 & 2 AND ASSOCIATED ELECTRICAL GRID CONNECTION PHASE 1 & 2 WESTERN CAPE & NORTHERN CAPE

Appendix 11.3: Methodology for Noise Impact Assessment



METHODOLOGY: ENVIRONMENTAL NOISE IMPACT ASSESSMENT

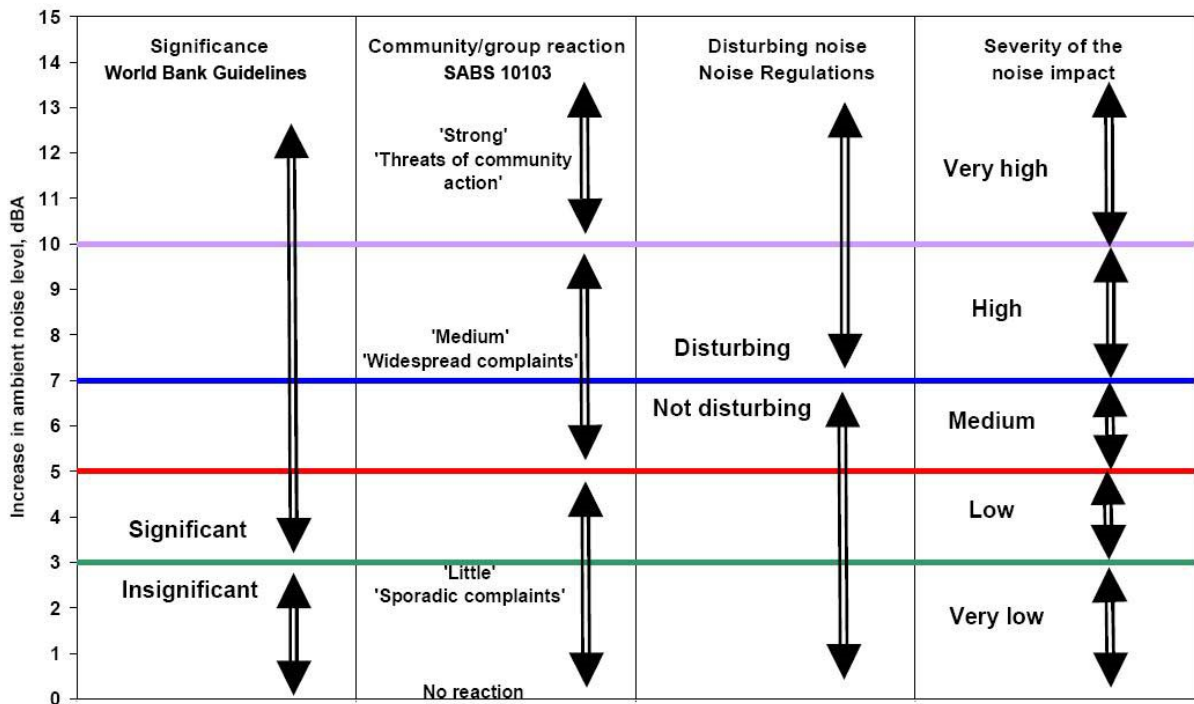
Noise criteria of concern

The criteria used in this report were drawn from the criteria for the description and assessment of environmental impacts from the EIA Regulations, published by the Department of Environmental Affairs and Tourism (April 1998) in terms of the NEMA, SANS 10103 as well as guidelines from the World Health Organization (WHO).

There are a number of criteria that are of concern for the assessment of noise impacts. These can be summarised in the following manner:

- *Increase in noise levels:* People or communities often react to an increase in the ambient noise level they are used to, which is caused by a new source of noise. With regards to the Noise Control Regulations, an increase of more than 7 dBA is considered a disturbing noise. See also Figure 1.
- *Zone Sound Levels:* Previously referred as the acceptable rating levels, it sets acceptable noise levels for various areas. See also Table 1.
- *Absolute or total noise levels:* Depending on their activities, people generally are tolerant to noise up to a certain absolute level, e.g. 65 dBA. However, anything above this level is considered unacceptable.

Figure 1: Criteria to assess the significance of impacts stemming from noise



In South Africa the document that addresses the issues concerning environmental noise is SANS 10103. See also Table 1. It provides the maximum average ambient noise levels, $L_{Req,d}$ and $L_{Req,n}$, during the day and night respectively to which different types of developments may be exposed. For rural areas the Zone Sound Levels (Rating Levels) are:

- Day (06:00 to 22:00) - $L_{Req,d} = 45$ dBA, and
- Night (22:00 to 06:00) - $L_{Req,n} = 35$ dBA.

However, the expected rating levels will be reviewed after the field work phase where onsite measurements will be collected.

SANS 10103 also provides a guideline for estimating community response to an increase in the general ambient noise level caused by an intruding noise. If Δ is the increase in noise level, the following criteria are of relevance:

- **$\Delta \leq 3$ dBA:** An increase of 3 dBA or less will not cause any response from a community. It should be noted that for a person with average hearing acuity an increase of less than 3 dBA in the general ambient noise level would not be noticeable.
- **$3 < \Delta \leq 5$ dBA:** An increase of between 3 dBA and 5 dBA will elicit 'little' community response with 'sporadic complaints'. People will just be able to notice a change in the sound character in the area.
- **$5 < \Delta \leq 15$ dBA:** An increase of between 5 dBA and 15 dBA will elicit a 'medium' community response with 'widespread complaints'. In addition, an increase of 10 dBA is subjectively perceived as a doubling in the loudness of a noise. For an increase of more than 15 dBA the community reaction will be 'strong' with 'threats of community action'.

In addition, it should be noted that the Noise Control Regulations defines disturbing noise to be any change in the ambient noise levels higher than 7 dBA than the background.

Table 1: Acceptable Zone Sound Levels for noise in districts (SANS 10103)

1	2	3	4	5	6	7
Type of district	Equivalent continuous rating level ($L_{Req,T}$) for noise dBA					
	Outdoors			Indoors, with open windows		
	Day/night $L_{R,dn}^a$	Daytime $L_{Req,d}^b$	Night-time $L_{Req,n}^b$	Day/night $L_{R,dn}^a$	Daytime $L_{Req,d}^b$	Night-time $L_{Req,n}^b$
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with one or more of the following: workshops; business premises; and main roads	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

Determining appropriate Zone Sound Levels

SANS 10103 unfortunately does not cater for instances when background noise levels change due to the impact of external forces. Locations close to the sea for instance always have a background noise level exceeding 35 dBA, and, in cases where the sea is rather turbulent, it can easily exceed 45 dBA. Similarly, noise induced by high winds again is not included.

Setting noise limits relative to the background noise level is relatively straightforward when the prevailing background noise level and source level are constant. However, wind turbines emit noise that is related to wind speed, and the environment within which they are heard will probably also be dependent upon the strength of the wind and the noise associated with its effects. It is therefore necessary to derive a background noise level that is indicative of the noise environment at the receiving property for different wind

speeds so that the turbine noise level at any particular wind speed can be compared with the background noise level in the same wind conditions.

Therefore, when assessing the overall noise levels emitted by a wind farm it is necessary to consider the full range of operating wind speeds of the wind turbines. This covers the wind speed range from around 3-5m/s (the turbine cut-in wind speed) up to a wind speed range of 25-35m/s measured at the hub height of a wind turbine. However, the Noise Working Group proposes that noise limits only be placed up to a wind speed of 12 m/s for the following reasons:

- Wind speeds are not often measured at wind speeds greater than 12m/s at 10m height.
- Reliable measurements of background noise levels and turbine noise will be difficult to make in high winds due to the effects of wind noise on the microphone and the fact that one could have to wait several months before such winds were experienced.
- Turbine manufacturers are unlikely to be able to provide information on sound power levels at such high wind speeds for similar reasons.
- If a wind farm meets noise limits at wind speeds lower than 12 m/s it is most unlikely to cause any greater loss of amenity at higher wind speeds. Whilst turbine noise levels will still be reasonably constant, even in sheltered areas the background is likely to contain much banging and rattling due to the force of the wind.

Available data indicates that noises from a Wind Turbine is drowned by other noises (wind howling around building, rustling of leaves in trees, rattling noises, etc) above a wind speed of 8 – 10 m/s, even if the wind blows in the direction of the receiver.

A typical background noise vs. wind speed regression curve is illustrated in **Error! Reference source not found.** It should be noted that curves for daytime (6:00 – 22:00) and night time (22:00 – 6:00) would be different, but as wind speeds increase, the wind induced noise levels approach each other (wind speeds exceeding 15 m/s).

The curve was developed by plotting all measurement data (as collected by the author during periods when the wind was blowing) and fitting a curve through the points. The measurement points were selected to be away from structures (buildings, trees, etc.) that could significantly impact the ambient sound levels during high winds. This is because ambient sound levels are generally significantly higher closer to dwellings or other structures than at points further away from such structures (during times when a wind is blowing). In addition data collected when other noise sources were present (traffic, industrial noises) were not included.

Once ambient sound levels are collected it will be evaluated as illustrated in **Error! Reference source not found.**, the zone sound levels as stipulated in SANS 10103 as well as International Guidelines (such as the IFC noise limits).

Figure 1: Ambient sound measurements and noise criteria curve considering wind speeds

