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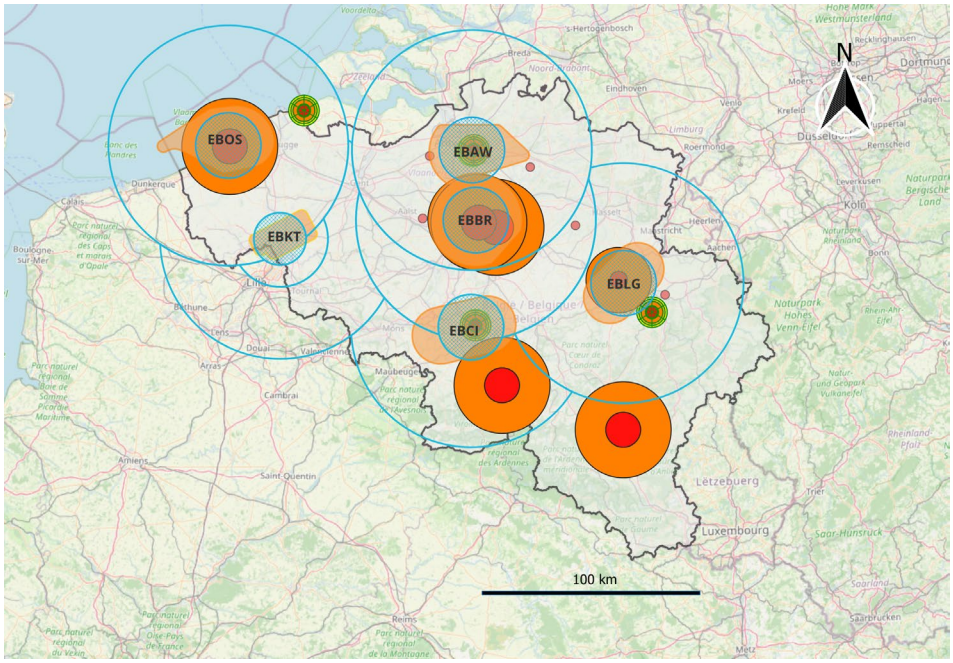
Think before printing

WIND TURBINE CONSULTATION MAP



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skeyes / Tervuursesteenweg 303 / B-1820 Steenokkerzeel / T +32 2 206 21 11
zetel - siège / De Meeûssquare 35 / B-1000 Brussel - Bruxelles
RPR - RPM - Brussels 0206.048.091 / BTW - TVA BE 0206.048.091

1. Introduction

The Wind Turbine Consultation Map is a vector-based map showing the criteria applied by skeyes for wind turbines. It provides wind turbine developers with a geospatial overview of the possibilities for their project(s) in relation to the location of technical installations, operations and flight procedures that fall under skeyes' responsibility.

The Wind Turbine Consultation Map has been drawn up for wind turbines with a maximum tip height of 300 m. For larger turbines, as well as for wind farms comprising 10 or more turbines (including those already built and/or permitted) or in the case of a cluster with a potential cumulative effect depending on the location in relation to the installations and procedures, an ad hoc assessment will always be required.

The map shows, for each zone, what type of study is required and where wind turbines cannot be permitted for safety reasons. The reference criteria are shown on the map using colour (outlined, hatched and shaded zones). Criteria relating to installations and procedures may overlap. In any case, skeyes will analyse all criteria individually.

The reference criteria used by skeyes are based on existing European and ICAO regulations, studies commissioned by skeyes, international studies in which skeyes collaborated (including those commissioned by Eurocontrol), international guidelines, information exchanged in various forums in which skeyes actively participates (ICAO, Eurocontrol, etc.), the experience of other air navigation service providers (ANSPs) and skeyes' own experience.

For all requests for opinion regarding the construction of buildings, wind turbines, permanent or temporary structures or installations at a location that may pose a risk to aviation, please contact the Urban Planning Department at skeyes (urba@skeyes.be). Applications for temporary permits or preliminary opinion may be submitted by individuals and businesses. Applications for official permits can be submitted via a public authority, the Belgian Civil Aviation Authority (BCAA), or via the Environment and Spatial Planning Desk ('Omgevingsloket Vlaanderen').

ICAO codes for airports:
EBAW - Antwerp Flanders International Airport
EBBR - Brussels Airport
EBCI - Brussels South Charleroi Airport
EBKT - Kortrijk-Wevelgem International Airport
EBLG - Liege Airport
EBOS - Ostend–Bruges Flanders International Airport

Abbreviations:

AGL	Above Ground Level
ANSP	Air Navigation Service Provider
ARP	Aerodrome Reference Point
ATCO	Air Traffic Control Officer
ATS	Air Traffic Service
CNS	Communication, Navigation and Surveillance
CTR	ConTrol Zone
DGLV	*Directoraat Generaal LuchtVaart* (Belgian Civil Aviation Authority)
DGTA	*Direction Générale Transport Aérien* (Belgian Civil Aviation Authority)
DME	Distance Measuring Equipment
DVOR	Doppler Very high frequency Omnidirectional Range
ICAO	International Civil Aviation Organisation
NDB	Non-Directional Beacon
NM	Nautical Miles
PANS-OPS	Procedures for Air Navigation Services – Aircraft OPerationS
RDF	Radio Direction Finder
TAW	*Tweede Algemene Waterpassing* (Second General Levelling Survey)
TMZ	Transponder Mandatory Zone

Important:

- There is no exact formula regarding height, number and location that can be used to predict whether, and how many, wind turbines can be permitted in the vicinity of a radar without this having an (unacceptable) impact on aviation;
- When assessing the potential impact of a wind turbine, the blades are always taken into account. If the blades penetrate a specific zone (orange, red, shaded, etc.), the entire wind turbine is analysed on the basis of the penetrated zone;
- Each application is assessed taking into account wind turbines that have already been granted planning permission and constructed, as well as applications for which a positive preliminary opinion has been issued, in order to calculate the potential cumulative impact of a cluster of turbines;

- if, despite a negative opinion from skeyes, a decision is taken to construct wind turbines, skeyes cannot be held responsible for any consequences. skeyes reserves the right to have the turbines modified or removed in the event of interference. This is to ensure that air traffic safety can continue to be guaranteed.

Although skeyes has made reasonable efforts to categorise content correctly, define keywords, and add captions and titles, skeyes does not guarantee the accuracy of such information or any metadata provided with the content. skeyes accepts no responsibility whatsoever for the use of this information or metadata.

2. Reference criteria

PANS-OPS reference criteria layer

The purpose of the PANS-OPS assessment is to ensure vertical and horizontal protection when flying by instruments under normal conditions. PANS-OPS provides criteria for the design of procedures for approaching, holding and departing from instrument flights. PANS-OPS provisions also cover en-route procedures where maintaining clearance from obstacles is relevant. A PANS-OPS assessment verifies the impact of a design on all relevant (including planned) procedures under standard conditions.

The criteria are defined by PANS-OPS, ICAO Doc 8168 and Commission Regulation (EU) No 139/2014, and adapted to the local geographical context by skeyes and the certified airports.

The layer (see Figure 1) comprises, for each airport under skeyes' control, and EBKT:

- an inner circle (hatched blue zone) of 15 km (12 km for EBKT) from the ARP (Aerodrome Reference Point). Within this area, there is always an impact on operations. To this end, a more detailed study will be carried out by skeyes;

- an outer circle (blue contour line) of 55 km from the ARP (Aerodrome Reference Point). Within this area, skeyes will carry out an assessment if the highest point of the wind turbine (as stated in the TAW) exceeds the ceiling indicated on the map.

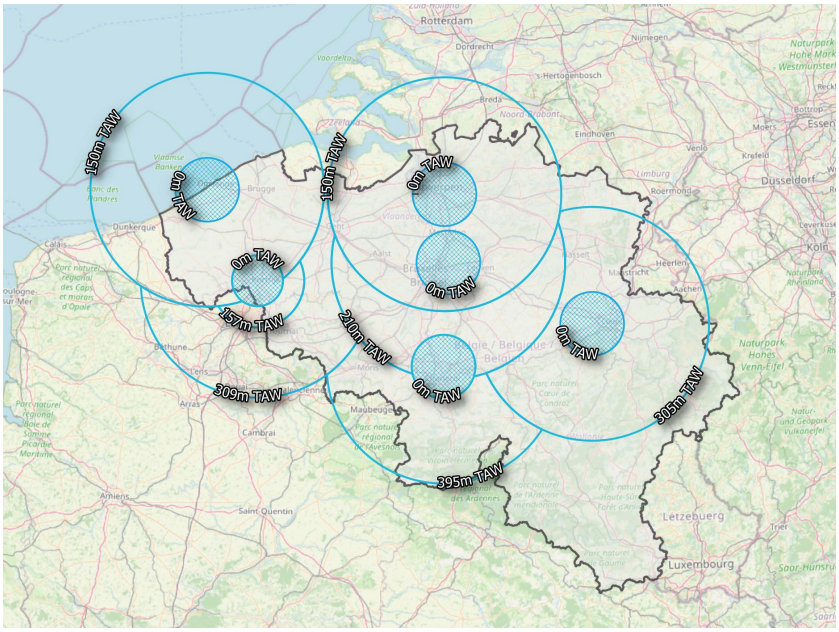

Figure 1: PANS-OPS criteria symbols

ATS reference criteria layer

The operational impact on flight procedures or surveillance coverage must be assessed by ATS.

The layer for the ATS criteria (see Figure 2) comprises the CTR/TMZ areas with a buffer of 1.5 NM (orange zone with orange and yellow contour lines respectively). Within this zone, there is always an impact on the facilities used by skeyes and/or the operations carried out. To this end, a study will be carried out by skeyes.

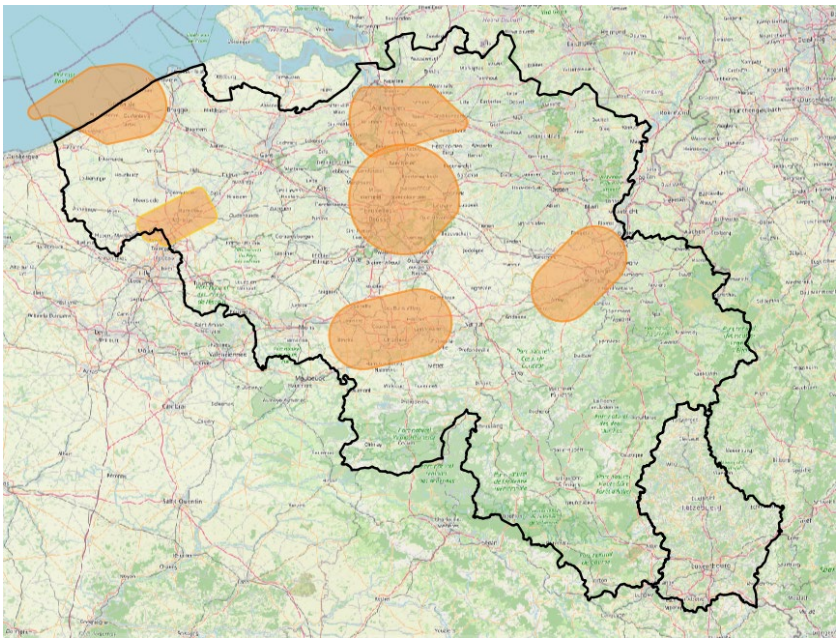

Figure 2: ATS criteria symbols

CNS reference criteria layer

Radar

Structures can affect the propagation of radio frequency waves emitted by communication, navigation and surveillance (CNS) equipment. This, in turn, can impact the performance of the equipment used to provide safe air traffic services. Specifically for radar surveillance systems, they can cause noise or interference due to the reflection of radio waves, which in turn reduces the radar's ability to detect aircraft. Furthermore, wind turbines, mainly due to their rotating blades, can generate false reports on the ATCO radar display.

The reference criteria used by skeyes for radar assessments are based on existing ICAO regulations, studies commissioned by skeyes, Eurocontrol guidelines, the experience of other air navigation service providers (ANSPs) and skeyes' own experience.

The rules apply only to conventional turbines (3 blades, horizontal axis) with a minimum height of 30 m AGL and a maximum height of 300 m AGL. All other turbines, as well as wind farms comprising more than 10 turbines (including turbines that have already been built and/or permitted), are subject to an ad hoc study.

For each primary and/or secondary radar, the layer comprises:

Protection criteria for radars (wind turbines) (Figure 3)

The protection zones around the (primary and/or secondary) radars consist of an inner circle (no-go zone) and an outer circle (zone requiring further investigation). The size of these zones depends on the tip height of the wind turbines, with the exception of the radar site at Liege Airport (EBLG).

- Inner circle (no-go zone – dark orange/red zone with a contour line)

Wind turbines are not permitted within this zone. The radius of the inner circle varies depending on the maximum tip height (AGL) of the wind turbine:

Tip height < 150 m: 4 km no-go radius

Tip height < 210 m: 5 km no-go radius

Tip height < 230 m: 6 km no-go radius

Tip height < 270 m: 7 km no-go radius

Tip height ≤ 300 m: 8 km no-go radius

Within this zone, the impact on radar installations and operations is unacceptable.

In exceptional cases, skeyes is prepared to analyse the impact on primary and secondary radar for wind turbines with a maximum tip height of 70 m AGL within the 4 km no-go zone.

- Outer circle (orange zone with a contour line)

Outside the inner circle but within the outer circle, there is a potential impact on skeyes' facilities and/or operations. A DEA (Detailed Engineering Assessment) is mandatory in this zone.

The radius of the outer circle also depends on the tip height:

Tip height ≤ 210 m: outer circle up to 16 km

Tip height > 210 m and ≤ 300 m: outer circle up to 22 km

The DEA must be carried out by a specialist external party with the necessary expertise and simulation tools. The applicant must agree in advance with skeyes on the content and the criteria that this study must meet.

Protection criteria for radars at Liege Airport (EBLG)

Deviating protection criteria apply to the radar installations at Liege Airport, regardless of the tip height of the wind turbines.

- Inner circle (no-go zone – dark orange/red zone with a contour line)

Wind turbines are not permitted within this zone: 4 km no-go radius.

Within this zone, the impact on radar installations and operations is unacceptable.

In exceptional cases, skeyes is prepared to analyse the impact on primary and secondary radar for wind turbines with a maximum tip height of 70 m AGL within this zone.

- Outer circle (orange zone with a contour line)

Outside the inner circle but within the outer circle, a DEA is mandatory: outer circle up to 15 km.

The DEA must be carried out by a specialist external party. The applicant must agree in advance with skeyes on the content and criteria of the study.

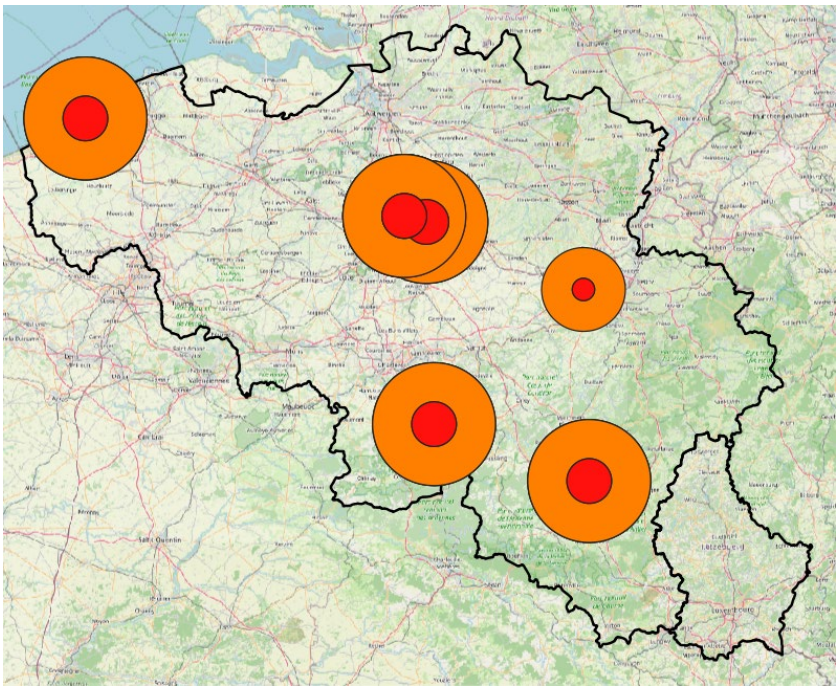

Figure 3: radar criteria symbols

NDB (non-directional beacon)

The criteria are based on ICAO EUR DOC 015, Third Edition, 2015.

This layer (Figure 4) shows a circle with a radius of 1 km (red zones with a purple contour line) for the NDB ONW, near EBAW. No wind turbines are permitted within this area.

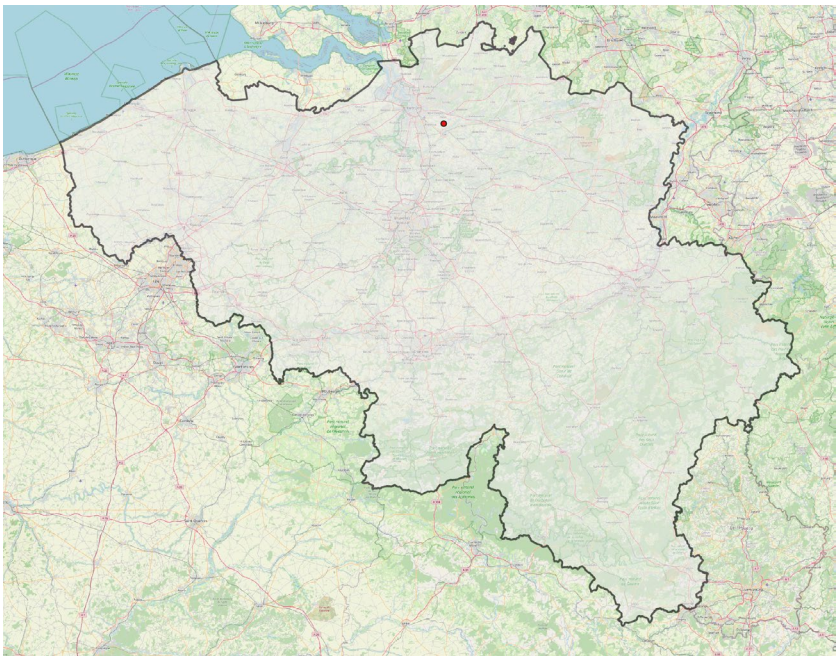

Figure 4: NDB criteria symbols

DVOR / RDF

The protection criteria for DVOR installations have been updated and now apply only to a limited number of sites, namely Antwerp, Brussels, Costa, Gosly and Sprimont.

The following sites, which have an RDF installation, are also protected using the same methodology: RDF EBAW, RDF EBAW_NB, RDF EBCI, RDF EBLG, RDF EBOS, RDF EBSH, RDF1 EBBR and RDF2 EBBR.

To protect navigation aids, skeyes applies the guidelines set out in ICAO EUR DOC 015, Third edition (Nov. 2015), and the findings of a study conducted by NAVCOM CONSULT.

The resulting protection criteria ensure that all equipment continues to operate within the specifications set out in ICAO Annex 10.

For all navigation aids, the layer comprises:

- a circle between the 0-3 km radius of the navigation aids (zone A, red with a green contour line). No wind turbines are permitted within this area;
- a circle between the 3-7 km radius of the navigation aids (zones B-C-D, orange with a green contour line). Within this area, the number of wind turbines per 60° rotating sector is limited, with an increment of 1°, in accordance with the following rules:
    - in the 3–5 km zone (zone B), a maximum of 14 wind turbines are permitted per 60° sector. They may also be located in zones C and D;
    - in the 5–6 km zone (zone C) and where there are no wind turbines in zone B, a maximum of 16 wind turbines are permitted per 60° sector. These wind turbines may also be located in zone D;
    - in the 6–7 km zone (zone D) and where there are no wind turbines in zones B and C, a maximum of 18 wind turbines are permitted per 60° sector.

Both existing and planned wind turbines will be taken into account when determining the specific number. Please note that preliminary opinions for wind turbines are valid for a limited period (2 years).

The layer shows the starting position of the dial, which is rotated in 1° increments to calculate the maximum number of wind turbines.

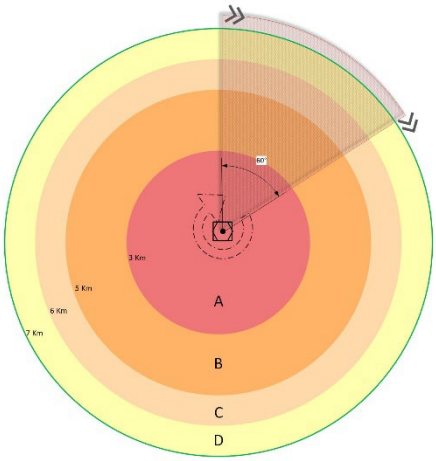

Figure 5: rotating dial

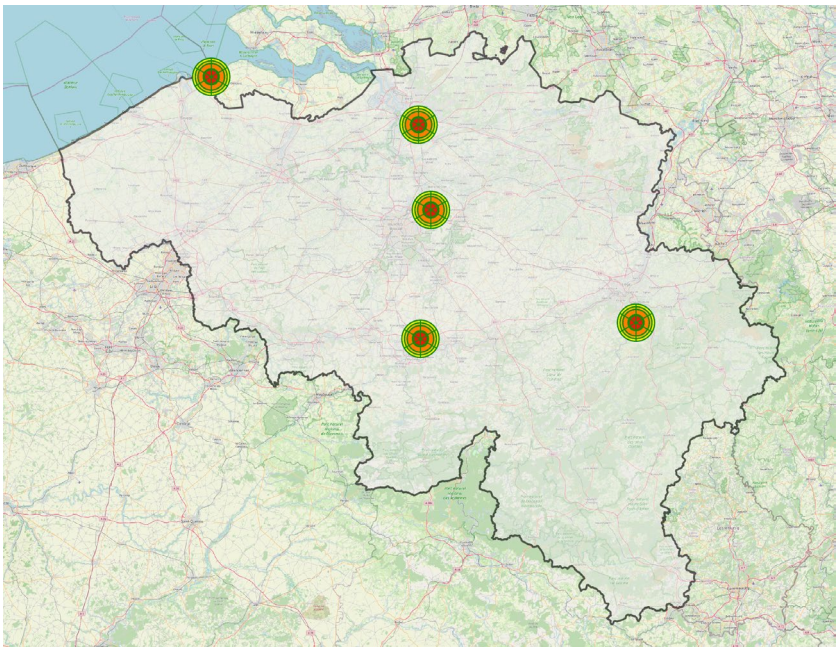

Figure 6: DVOR criteria symbols

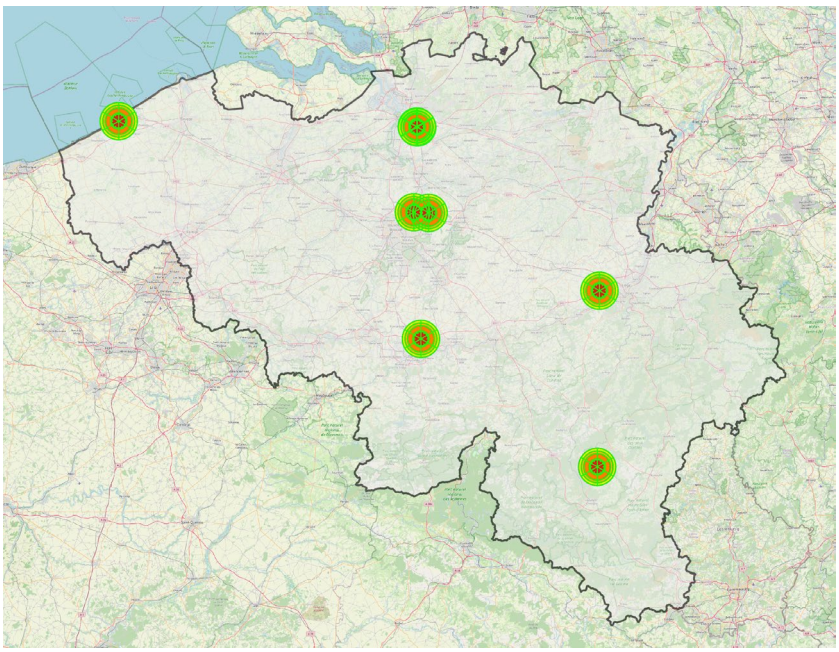

Figure 7: RDF criteria symbols

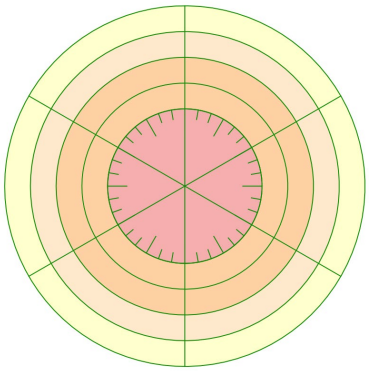

Figure 8: zoom on DVOR/RFD criteria symbols

DME

Protection criteria for DME installations

A no-go zone with a 2 km radius applies around DME installations, within which wind turbines are not permitted. Outside this zone, no specific height restrictions apply, unless they result from PANS-OPS surfaces.

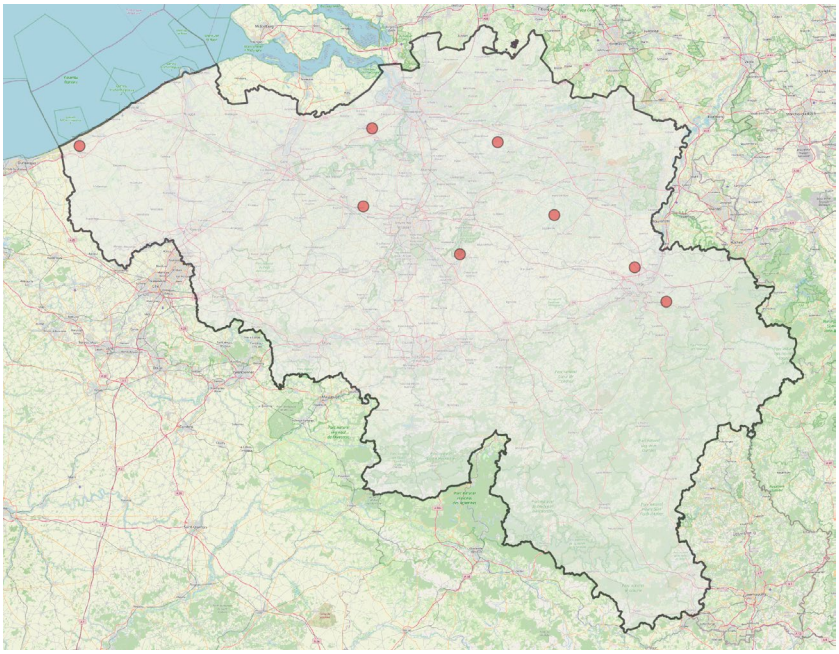

Figure 9: DME criteria symbols

METEO reference criteria layer

skeyes has one weather radar located at Brussels Airport.

The layer for this weather radar contains an:

- inner circle (red zone with a pink contour line) within a radius of 0–10 km from the radar where wind turbines are not permitted;

- outer circle (orange zone with a pink contour line) within a 10–20 km radius from the radar, where an initial impact assessment is being carried out by skeyes. An external study may be required if the initial impact assessment does not provide a definitive conclusion. The applicant must consult with skeyes regarding the content and the criteria that the proposed study must meet.

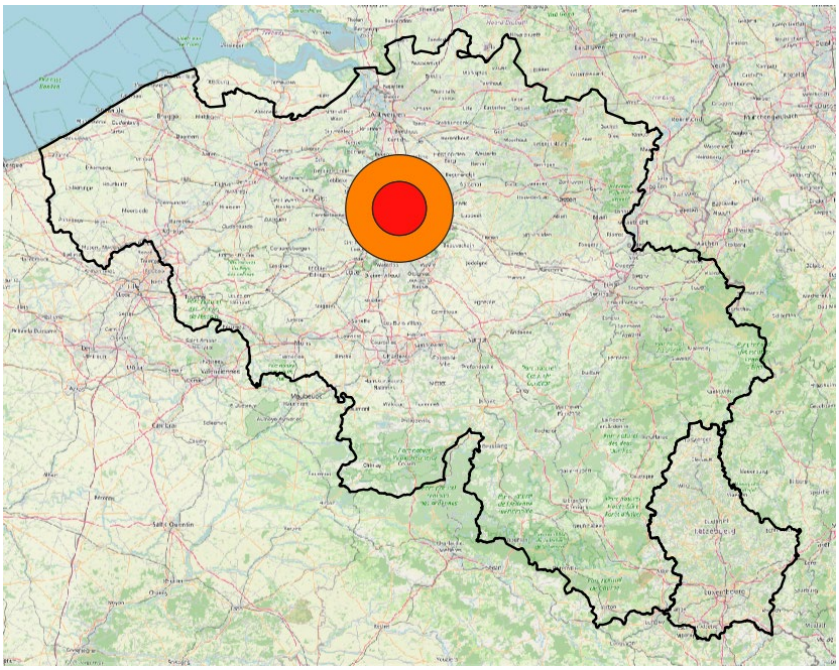

Figure 10: meteo criteria symbols

3. GIS data

Vector data

The vector data is in GeoPackage (.gpkg) format. This is an open, standardised, platform-independent, portable, self-describing and compact format for geospatial information.

Vector and attribute data can be imported and used via the appropriate connector in your GIS software.

The geopackage file contains the following information:

- vector layer criteria (polygons/lines)
- attribute tables
- an OSM Web Map Service (Tile)
- layer legend with the specific symbolism of the criteria
- a QGIS project

Projection system

The required projection system is: EPSG 31370 (Belge 1972 / Belgian Lambert 72).