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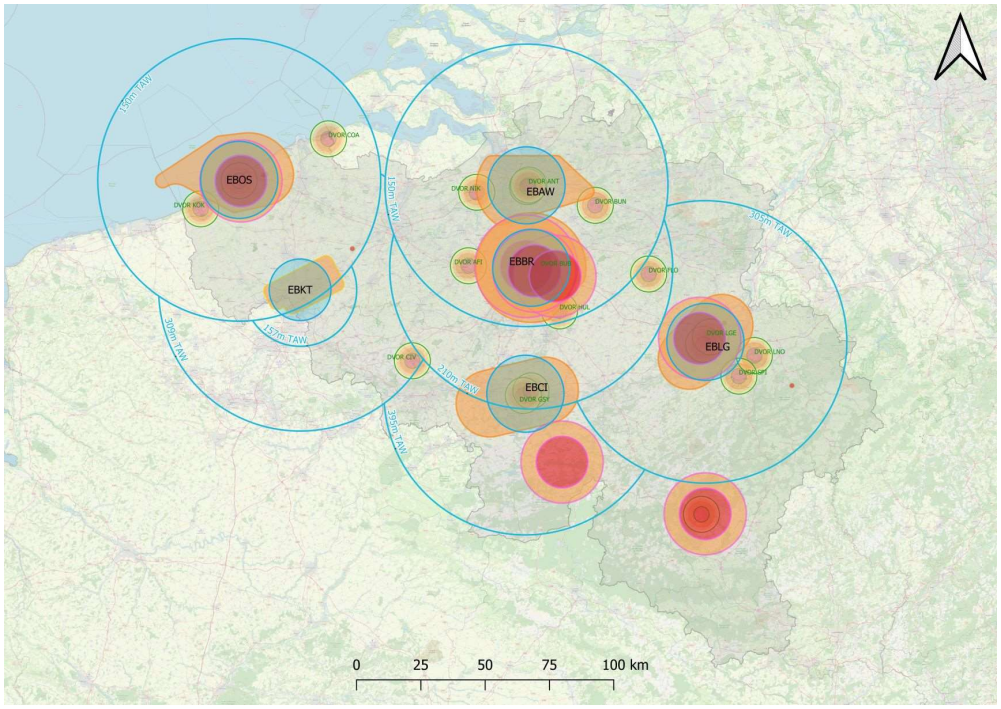
Think before printing

WIND TURBINE CONSULTATION MAP



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1. Introduction

The Wind Turbine Consultation Map is a consultation map of the raster and vector type containing the criteria skeyes uses for wind turbines. It offers wind turbine developers an insight into the possibilities of their project(s) with regard to the location of technical installations, operations and flight procedures under the responsibility of skeyes.

The Wind Turbine Consultation Map is designed for wind turbines with a maximum tip height of 210 m. For larger turbines, as well as for wind farms exceeding 10 turbines (including turbines that have already been built and/or licensed), an ad hoc assessment will always be necessary.

The map shows per zone which type of study is necessary and where wind turbines cannot be admitted for safety reasons. The reference criteria are shown on the map in colour (contoured, hatched and coloured zones). Criteria of installations and procedures may overlap. skeyes will in any case analyse all criteria individually.

The reference criteria that skeyes uses are based on existing European and ICAO regulations, studies commissioned by skeyes, international studies that skeyes participated in (carried out, inter alia, on behalf of Eurocontrol), international guidelines, exchange of information in different fora in which skeyes actively participates (ICAO, Eurocontrol, etc.), experience of other air navigation service providers (ANSPs) and skeyes' own experience.

For all requests for opinions for establishing buildings, wind turbines, permanent or temporary constructions or installations at a location that may present a risk to aviation, you can address the skeyes Urbanism service. Requests can be submitted by private individuals and companies for temporary permits or preliminary opinions and for official permits via a public service, the Directorate-General for Air Transport (DGLV/DGTA) or via the Omgevingsloket Vlaanderen.

Airport ICAO code:

EBAW Antwerp Flanders International Airport
EBBR Brussels Airport
EBCI Brussels South Charleroi Airport
EBKT Kortrijk-Wevelgem International Airport
EBLG Liège 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
DGTA	Direction Générale Transport Aérien
DME	Distance Measuring Equipment
DNG	Deuxième nivellement général
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
TMZ	Transponder Mandatory Zone

Important:

- There is no specific formula regarding height, number and location on the basis of which it can be predicted whether and how many turbines can be allowed in the vicinity of a radar without them having an (inadmissible) impact on aviation.
- The blades are always taken into account when evaluating the possible impact of the wind turbine. If the blades enters a certain zone (orange, red, hatched,...), the entire wind turbine is analysed on the basis of the entered zone.
- Each request shall be examined taking into account the already licensed and built wind turbines, as well as requests for which a positive preliminary opinion has been given, in order to calculate the possible cumulative effect of a cluster of turbines.
- If the decision to build wind turbines is taken against the negative opinion of skeyes, the latter cannot be held responsible for any consequences. skeyes reserves the right to have the turbines adjusted or removed in the event of nuisance. This in order to be able to continue to guarantee the safety of air traffic.

While skeyes has made reasonable efforts to properly categorize, define keywords, add caption and title, skeyes does not warrant the accuracy of any such information, or any metadata provided with the content. skeyes bears no responsibility whatsoever for the use of this information.

2. Reference criteria

PANS-OPS reference criteria layer

The objective of the PANS-OPS assessment is to guarantee vertical and horizontal protection when flying on instruments under normal conditions. PANS-OPS provides criteria for the design of instrument approach, holding and departure procedures. PANS-OPS provisions also cover en-route procedures to safeguard obstacle clearance. A PANS-OPS assessment verifies the impact of a construction on all relevant (incl. planned) procedures under standard conditions.

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

The layer incudes for each aerodrome controlled by skeyes 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 extensive study shall be conducted by skeyes.

- Outer circle (blue contour line) of 55 km from the ARP (Aerodrome Reference Point). Within this area skeyes shall conduct an assessment if the wind turbine's highest point (referenced in TAW/DNG) exceeds the ceiling indicated on the map.

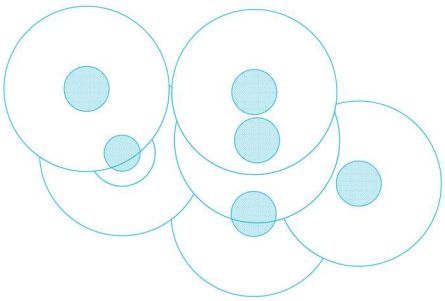

Figure 1: PANS-OPS criteria symbols

ATS reference criteria layer

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

The layer for the ATS criteria includes the CTR/TMZ areas with a 1.5 NM buffer (orange zone with respectively orange and yellow contours). Within this area there is always an impact on the installations used and/or operations carried out by skeyes. To this end, a study shall be conducted by skeyes.

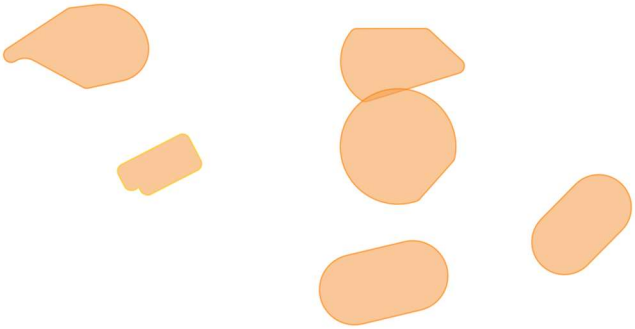

Figure 2: ATS criteria symbols

CNS reference criteria layer

Radar

Constructions can affect the propagation of radio frequency waves transmitted by Communication, Navigation and Surveillance (CNS) equipment. This can affect the performance of the equipment used to provide safe air traffic services. Specifically, for radar surveillance systems they can cause clutter or interference, due to reflection of the radio waves, which reduces the ability of the radar to detect aircrafts. In addition, primarily due to the rotating blades, wind turbines can cause the generation of false reports on the ATCO radar display.

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

The rules are only valid for classical turbines (3 blades, horizontal axis) of at least 30 m AGL and with a maximum height up to 210 m AGL. All other turbines as well as wind farms exceeding 10 turbines (including turbines that have already been built and/or licensed) are subject to an ad-hoc study.

The layer incudes for each primary and/or secondary radar an:

- Inner circle (red zone with pink contours) between 0-10 km radius of the (primary and/or secondary) radar. Within this area no wind turbines are allowed. As an exception skeyes is willing to analyse the impact on the primary and secondary

radar for all wind turbines (regardless of their height) with a maximum tip height of 70 m AGL in this zone.

- Outer circle (orange zone with pink contours) between a 10-16 km radius of the (primary and/or secondary) radar. Within this area there is always an impact on the installations used and/or operations carried out by skeyes. To this end, a detailed engineering assessment will be required (to be performed by an external party who has the required expertise and tools to perform a simulation). The applicant must consult with skeyes as to the content and criteria to be met by the study presented.

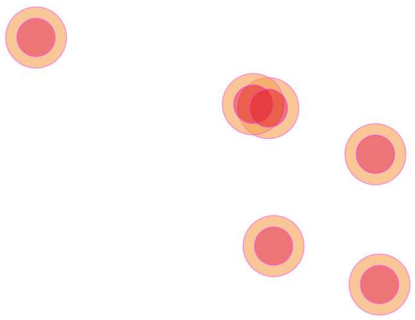

Figure 3: CNS criteria symbols

NDB

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

This layer includes for every NDB a circle of 1 km radius (red zones with purple contours). Within this area no wind turbines are allowed.

Figure 4: NDB criteria symbols

DVOR / RDF

For the protection of navigational aids, skeyes applies the guidance material of ICAO EUR DOC 015 3rd edition (Nov. 2015) and the results of a study performed by NAVCOM CONSULT.

The protection criteria resulting from this work guarantee that all equipment remains functioning within the specifications described by ICAO annex 10.

The layer includes for all navigational aids a:

- Circle between a 0 - 3 km radius of the navigational aids (zone A, red with green contours). Within this area no wind turbines are allowed.
- Circle between a 3 - 7 km radius of the navigational aids (zones B-C-D, orange with green contours). Within this area the number of wind turbines is limited per 60° rotating sector with an increment of 1° according the following rules:
    - in the 3 – 5 km zone (zone B) a maximum of 14 wind turbines is allowed per 60° sector. They may also be located in zones C and D.
    - in the 5 – 6 km zone (zone C) and when there are no wind turbines in zone B, a maximum of 16 wind turbines is allowed per 60° sector. These wind turbines can also be located in zone D.
    - in the 6 – 7 km zone (zone D) and when there are no wind turbines in zone B and C, a maximum of 18 wind turbines is allowed per 60° sector.

Both executed and planned wind turbines will be taken into account to determine the specific amount. Please note that preliminary advices for wind turbines are restricted in time (2 years).

Note that at present the DVOR and DME installations are collocated. Consequently, the DME's are protected de facto by the DVOR criteria. So no separate criteria for DME's are considered.

The layer shows the starting position of the dial that is rotated with a 1° increment for the calculation of the maximum number of authorized wind turbines.

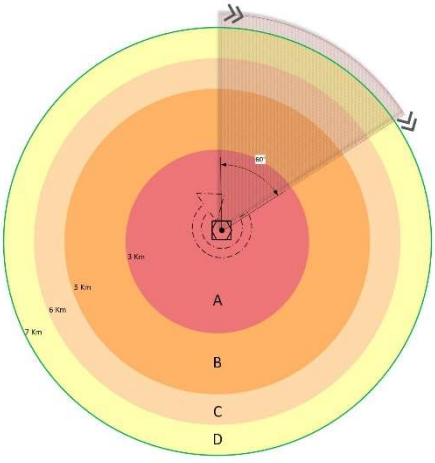

Figure 5 : turning dial

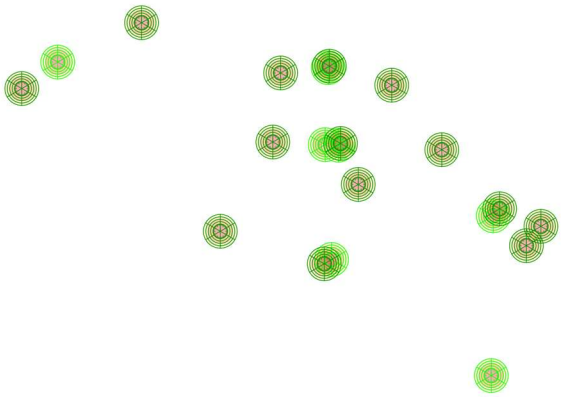

Figure 6: DVOR/RDF criteria symbols

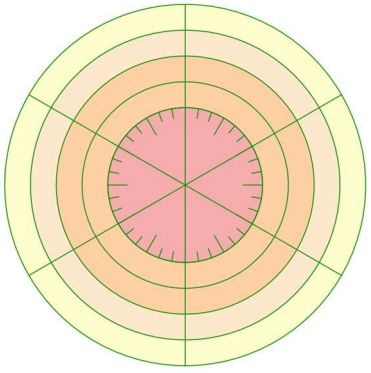

Figure 7: DVOR/RDF criteria symbols

METEO reference criteria layer

skeyes has 1 meteo radar which is located at Bussels Airport.

The layer for this meteo radar includes an:

- Inner circle (red zone with pink contours) between a 0-10 km radius of the radar where no wind turbines are allowed.

- Outer circle (orange zone with pink contours) between 10-20 km radius of the radar where a first impact study is performed by skeyes. An external study can be required if the first impact study is inconclusive. The applicant must consult with skeyes as to the content and criteria to be met by the study presented.

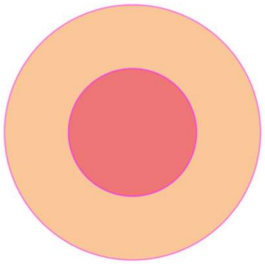

Figure 8: meteo criteria symbols

3. GIS Data

Raster data

The raster data is in “bmp”, “jpeg” and “tiff” formats. Each of these formats is accompanied by its “world file” in order to be georeferenced in GIS software.

Vector data

Vector data is in GeoPackage (.gpk) format. It is an open, standardized, platform independent, portable, self-describing and compact format of geospatial information.

The reading and use of vector and attribute data is carried out via the appropriate connector of your GIS software

The geopakage file contains the following information:

- Criteria vector layers (polygons / lines)
- Attribute tables
- An OSM Web Map Service (Tile)
- The specific symbologies of the criteria
- A QGis project
- Metadata

Projection system

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