Noise Contours around Brussels Airport for the year 2020

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1 Introduction

The Government imposes an obligation on Brussels Airport Company to annually calculate noise contours in order to perform an assessment of the noise impact caused by departing and landing aircraft on the area surrounding the airport. The calculations are imposed on Brussels Airport pursuant to Flemish environmental legislation (VLAREM) which was amended in 2005[1] in accordance with the European guideline on the assessment and control of environmental noise, and the environmental permit[2] of Brussels Airport Company. In 2019, the 'Airports' section in VLAREM was adjusted[3]. This change has had no impact on this report (see 1.2).

These noise contours are calculated according to a strictly-defined methodology (see 1.2) and reflect evolutions in the number of movements and fleet changes, as well as the actual use of runways and flight paths. Weather conditions and other events affect this actual use. To check their accuracy of the calculations, the noise contours are compared with the sound measurements at a number of locations around the airport.

Between 1996 and 2014, these contours were calculated by the Acoustics and Thermal Physics Laboratory of the Belgian university KU Leuven. This assignment has been carried out by the WAVES research group of the Ghent University (UGent) since 2015. The calculations are commissioned by the airport operator, which is currently Brussels Airport Company.

1.1 Disclaimer

This assignment is performed by recognised sound experts working at the Ghent University with the explicit order to submit a report in compliance with the legal obligations imposed on Brussels Airport Company pertaining to the applicable legislation. The recognised sound experts at the Ghent University are responsible for the conformity of this result, but are not responsible for the quality and comprehensiveness of the raw data provided to them. The following limitations apply with regard to the use of this report:

- This report contains no information, judgment or opinion about the applicable (environmental) legislation at federal or regional level, and is not suitable to be used for this purpose.

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[1] Belgian Official Gazette, Decision by the Flemish Government on the evaluation and control of environmental noise, amending the decision of the Flemish Government of 1 June 1995 on the general and sector-specific rules on environmental health, 31 August 2005.

[2] AMV/0068637/1014B AMV/0095393/1002B; Decision by the Flemish Minister of Public Works, Energy, Environment and Nature, containing the judgment relating to the appeals lodged against the Decision with reference D/PMVC/04A06/00637 of 8 July 2004 by the Provincial Executive of the Provincial Council of Flemish Brabant, on granting of the environmental licence for a period expiring on 8 July 2024 to NV Brussels International Airport Company In Chapter 5.57. International Airport Company (B.I.A.C.), Vooruitgangsstraat 80 box 2, 1030 Brussels, to continue operating and to alter (by adding to it) an airport located at Brussels National Airport in 1930 Zaventem, 1820 Steenokkerzeel, 1830 Machelen and 3070 Kortenberg, 30 December 2004

[3] Chapter 5.57. AIRPORTS, Section 5.57.1.2. General provisions § 3. The noise contours are calculated using a calculation model that is compatible with the methodology, as stated in ECAC Doc. 29, 3rd edition (2005) or a later edition

- This report may not be interpreted as an opinion or action plan to minimise exposure, sleep disruption or nuisance among the public.

1.2 Compulsory calculations

In accordance with the VLAREM environmental legislation, the operator of an airport categorised as class 1[4] must have the following noise contours calculated annually:

- L_{den} noise contours of 55, 60, 65, 70 and 75 dB(A) to show noise impact over 24 hours, and to determine the number of people who are potentially seriously inconvenienced;
- L_{day} noise contours of 55, 60, 65, 70 and 75 dB(A) to show noise impact during the day from 07:00 to 19:00;
- $L_{evening}$ noise contours of 50, 55, 60, 65, 70 and 75 dB(A) to show noise impact during the evening from 19:00 to 23:00;
- L_{night} noise contours of 45, 50, 55, 60, 65 and 70 dB(A) to show noise impact at night from 23:00 to 07:00;

In addition to the VLAREM obligations, the environmental permit of Brussels Airport Company imposes extra noise contour calculations for:

- L_{night} and L_{den} noise contours, such as are required by the present VLAREM obligation;
- Frequency contours for 70 dB(A) and 60 dB(A); as in preceding years, Brussels Airport Company asked UGent to calculate the following frequency contours:
    - Frequency contours for 70 dB(A) during the daytime period (07:00 to 23:00) with frequencies 5x, 10x, 20x, 50x and 100x
    - Frequency contours for 70 dB(A) at night (07:00 to 23:00) with frequencies 1x, 5x, 10x, 20x and 50x
    - Frequency contours for 60 dB(A) during the daytime period (07:00 to 23:00) with frequencies 50x, 100x, 150x, and 200x
    - Frequency contours for 60 dB(A) at night (23:00 to 07:00) with frequencies 10x, 15x, 20x, and 30x

The calculation of the noise contours must be carried out in accordance with the 'Integrated Noise Model' (INM) of the American Federal Aviation Administration (FAA), version 6.0c. This software meets the conditions stated in Vlarem (ECAC Doc. 29, 3rd edition (2005) or a later edition).

The number of people who are potentially seriously inconvenienced within the various L_{den} contour zones must be determined on the basis of the dose-response relationship laid down in VLAREM.

The noise zones must be shown on a 1/25 000 scale map.

[4] Class 1 airports: airports that meet the definition of the Chicago Convention of 1944 on the establishing of the International Civil Aviation Organisation, and having a take-off and arrival runway of at least 800 metres;

1.3 History of noise contours

The annual calculation of noise contours started in 1996. Until VLAREM was amended to comply with the European guideline on environmental noise in 2005, the following division of the operational day was used (day: 06:00 – 23:00; night: 23:00 – 06:00). Since VLAREM was adjusted in accordance with the guideline, the noise contours reports are calculated officially according to the breakdown of the day in the guideline (day: 07:00 – 19:00; evening: 19:00 – 23:00; night: 23:00 – 07:00). Since 2015, the annual calculation is no longer carried out by the Acoustics and Thermal Physics Laboratory of KU Leuven, but by the WAVES research group at the Ghent University. During this transition of implementing institution, it was verified that the calculation models and assumptions would not lead to discontinuities in the results.

1.4 INM: Integrated Noise Model

Since 2011 the INM 7 model (sub-version INM 7.0b) has been used for the calculation of the noise contours. Model version 6.0c was used for the officially-reported noise contours every year from 2000 to 2010. Because the model used and the related aircraft database have an impact on the calculation of the noise contours, the noise contours for the year 2000 and from 2006 to 2010 were recalculated using version 7.0b[5]. In this way, it is possible to assess the evolution of the noise contours since 2000 without being affected by the calculation model used.

1.5 Population data

Since the noise contours of 2017, the most recent population data available is used to determine the number of residents living inside the contour zones and the number of people who are potentially seriously inconvenienced. In the reports prior to 2017, population information was used in accordance with the 10-year population census to determine the population by statistical sector (most recent population as of 1/1/2011). Annually adjusted population figures at the level of the statistical sectors are now available through the open data section of the Office for Statistics and Economic Information (also known as the National Institute for Statistics). The most recent dataset available is used to calculate the exposure figures in this report (that is, the population as of 01 January 2020). In this way, the evolution of the population up to the level of the statistical sectors is taken into account. This year, the population growth for the last year is taken into account in accordance with the method.

In noise contour reports prior to and including 2016, the exposed population was determined on the basis of a homogeneous distribution of the number of residents over the surface area of the statistical sector. From 2017, the calculation method was further refined, which improves the geographical distribution within the statistical sector. Based on the address files in the Brussels-Capital Region and Flanders, the number of persons is calculated for each address location.

[5] With regard to the frequency contours of 60 and 70 dB(A), only the year 2010 was calculated with version 7.0b of the INM calculation model.

The information on the number of housing units is different in the Brussels-Capital Region and Flanders. In Flanders the number of housing units for each address is known, whereas in the Brussels-Capital Region this information is not available. In Flanders, this makes the exposure more sensitive to apartment buildings within a statistical sector. Not all address points are dwellings. In Flanders the addresses are categorised and, based on this information, the specific addresses of companies are removed. The population in a statistical sector is divided equally between the number of dwellings for the Flemish territory and the number of address points for the Brussels-Capital Region.

1.6 Source data

For the calculation of the noise contours, and in order to be able to compare the results against those of the noise monitoring network, Brussels Airport Company has made source data available. A comprehensive summary of these source data carrying references to the corresponding files has been included in Appendix 4.6.

1.7 INM Study results

Brussels Airport Company was also provided with the following files in digital format, as appendices to the report:

- UGENT_EBBR20_INM_studie.zip (the INM study used)
- UGENT_EBBR20_geluidscontouren.zip (the calculated contours in shape format)
- UGENT_EBBR20_opp_inw.zip (the number of residents and the surface area, as calculated within the noise contours)

2 Definitions

2.1 Explanation of a few frequently-used terms

2.1.1 Noise contours

As a result of flight traffic, noise impact is either observed or calculated for every point around the airport. Due to a difference in distance from the noise source, these values may vary sharply from one point to another. Noise contours are isolines or lines of equal noise impact. These lines connect together points where equal noise impact is observed or calculated.

The noise contours with the highest values are those situated closest to the noise source. Farther away from the noise source, the value of the noise contours is lower.

2.1.2 Frequency contours

The acoustic impact of overflight by an aircraft can be characterised at every point around the airport by, for example, the maximum noise level observed during overflight. This maximum noise level can be determined, for example, as the maximum of the equivalent sound pressure levels over 1 second ($L_{Aeq,1s,max}$)[6] during this overflight.

The number of times that the maximum sound pressure level exceeds a particular value can be calculated for the passage of all aircraft overflights during a year. The number of times on average that this value is exceeded each day is the excess frequency. Frequency contours connect locations where this number is equal.

2.1.3 Noise zones

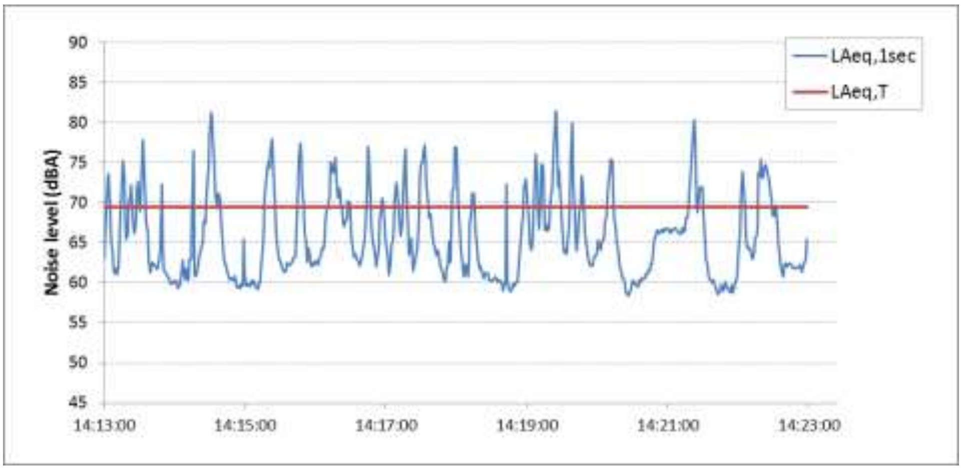
A noise zone is the zone delimited by two successive noise contours. The noise zone 60-65 dB(A) is, for example, the zone delimited by the noise contours of 60 and 65 dB(A).

2.1.4 The A-weighted equivalent sound pressure level $L_{Aeq,T}$

The noise caused by overflying aircraft is not a constant noise, but has the characteristic of rising sharply to a maximum level and thereafter declining sharply again. Noise impact at a specific place resulting from fluctuating sounds over a period is represented by the A-weighted equivalent sound pressure level $L_{Aeq,T}$ (see Figure 1).

[6] The INM calculation programme calculates the quantity $L_{Amax,slow}$. However, the values for this quantity are similar to those for the quantity $L_{Aeq,1s,max}$.

Figure 1: Graph of the A-weighted equivalent sound pressure level ($L_{Aeq,T}$) for a period T=10 minutes, together with the instantaneous ($L_{Aeq,1sec}$) from which this is derived.



The A-weighted equivalent sound pressure level $L_{Aeq,T}$, over a period T, is the sound pressure level of the constant sound containing the same acoustic energy in that same period as the fluctuating sound. The unit for an A-weighted equivalent sound pressure level is the dB(A).

The designation A-weighted (index A) means that an A-filter is used to determine the sound pressure levels. This filter reflects the pitch sensitivity of the human ear. Sounds at frequencies to which the ear is sensitive are weighted more than sounds at frequencies to which our hearing is less sensitive. Internationally, A-weighting is accepted as the standard measurement for determining noise impact around airports. This A-weighting is also applied in the VLAREM legislation on airports.

Three types of $L_{Aeq,T}$ contours are calculated in this report:

- L_{day}: the equivalent sound pressure level for the daytime period, defined as the period between 07:00 and 19:00
- $L_{evening}$: the equivalent sound pressure level for the evening period, defined as the period between 19:00 and 23:00
- L_{night}: the equivalent sound pressure level for the night period, defined as the period between 23:00 and 07:00

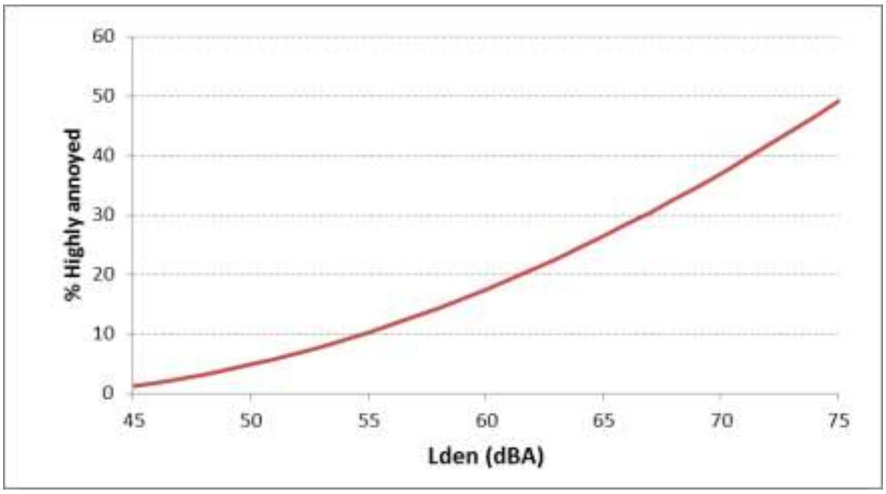
2.1.5 L_{den}

The European directive on the control and assessment of environmental noise (transposed in VLAREM 2), recommends using the L_{den} parameter to determine the exposure to noise over a longer period. The L_{den} (Level Day-Evening-Night) is the A-weighted equivalent sound pressure level over 24 hours, with a (penalty) correction of 5 dB(A) applied for noise during the evening period (equivalent to an increase of the number of evening flights by a factor of 3.16), and 10 dB(A) during the night (equivalent to an increase of the number of night flights by a factor of 10). For the calculation of the L_{den} noise contours, the day is divided as per section 57 of VLAREM 2, with the evening period from 19:00 to 23:00 and the night period from 23:00 to 07:00. L_{den} is the weighted energetic sum of these three periods with a weighting according to the number of hours for each period (12 hours for the day, 4 hours for the evening, and 8 hours for the night).

2.2 Link between annoyance and noise impact

An exposure relationship is imposed by VLAREM 2 to determine the number of people who are potentially seriously inconvenienced within the L_{den} noise contour of 55 dB(A). This equation shows the percentage of the population that is potentially seriously inconvenienced by the noise impact expressed in L_{den} (Figure 2). % of seriously inconvenienced persons = $-9,199*10-5(L_{den}-42)^3+3,932*10-2(L_{den}-42)^2+0,2939(L_{den}-42)$

Figure 2: Percentage of people who are potentially seriously inconvenienced due to L_{den} for aircraft noise.



(Source: VLAREM – environmental legislation based on Miedema 2000)

The aforementioned equation was established from a synthesis/analysis of various noise annoyance studies at various European and American airports carried out by Miedema[7], and was adopted by the WG2 Dose/Effect of the European Commission[8]. Note that L_{den} only determines around 30% of the variation in reported severe inconvenience[9].

Future developments

In October 2018, a WHO report appeared in which new exposure-effect relationships were proposed. The target value for observed health effects was lowered to 45 dB L_{den} and 40 dB L_{night}[10]. In a recent expansion to the Environmental Noise Directive (END-Directive 2002/49/EC)[11] exposure-effect relationships adapted by WHO were adopted in the END. Alternative exposure-effect relationships can be used as long as they are based on high-quality and statistically significant studies. The authorities

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[7] Miedema H.M.E., Oudshoorn C.G.M., Elements for a position paper on relationships between transportation noise and annoyance, TNO Report PG/VGZ/00.052, July 2000.

[8] European Commission, WG2 – Dose/Effect, Position paper on dose response relationships between transportation noise and annoyance, 20 February 2002

[9] van Kempen EEMM et al. Selection and evaluation of exposure-effect relationships for health impact assessment in the field of noise and health, RIVM Report No. 630400001/2005. Bilthoven: RIVM; 2005.

[10] WHO Europe, Environmental Noise Guidelines for the European Region (2018), ISBN 978 92 890 5356 3http://www.euro.who.int/en/publications/abstracts/environmental-noise-guidelines-for-the-european-region-2018,

[11] COMMISSION DIRECTIVE (EU) 2020/367 of 4 March 2020 amending annex III to directive 2002/49/EG of the European Parliament and the Council concerning the method of determining the damaging effects of ambient noise.

involved should implement these adjustments no later than 31 December 2021. The impact of this change on this reporting -within the context of the regulations in Vlarem II Chapter 5.57 Airports and the environmental permit of BAC - is not yet known.

2.3 Methodology

Noise contours are calculated using the ‘Integrated Noise Model 7.0b’ (INM 7.0b) of the United States Federal Aviation Administration (FAA). This model and the methodology used comply with the methodology prescribed in the VLAREM legislation (Chapter 5.57 Airports).

The procedure for calculating noise contours consists of three phases:

- Collection of information concerning the flight movements, the routes flown, aircraft characteristics and meteorological data.
- Execution of the calculations.
- Processing of the contours using a Geographic Information System (GIS).

2.4 Data input

INM calculates noise contours around the airport based on an average day/evening/night input file. An average day does not mean a selected, typical day on which the airport is used normally. It is based on the data for a complete year, where an average twenty-four hour period is determined by bringing all flight movements in that year into the calculation, and then dividing it by the number of days in that year.

Aircraft follow certain routes which are essentially determined by the runway used and the SID flown (Standard Instrument Departure) for take-offs, or by the runway used and the STAR (‘Standard Arrival Route’) for arrivals. The existing SIDs and STARs are shown in the AIP (‘Aeronautical Information Publication’). This official documentation specifies the procedures to be followed for the flight movements at a specific airport.

Information about aircraft movements

The following data is required to specify aircraft movements:

- Aircraft type
- Time
- Nature of the movement (departure/arrival)
- Destination or origin
- Runway used
- SID followed

The flight information is provided by Brussels Airport Company as an export of the flight movements from the central database (CDB). All the necessary information is stored in this database. The quality of the data is very good.

A matching INM aircraft type is linked to every aircraft type based data such as on type, engines, registration. In most cases, the aircraft types are present in INM, or in the standardised list with valid alternatives. For a small fraction of aircraft that cannot be directly identified in INM, an equivalent is sought based on other data, for example, the number and type of engines and the MTOW (maximum take-off weight).

Helicopters are not included specifically in the calculations, but they are added proportionally to the flight movement type (landing/take-off) and the time of day. Helicopter flights represent about 2.3% of movements. A SID is not available for some aircraft departures (usually domestic flights with smaller aircraft). These flights are also added proportionally to the flight data (about 0.9%).

2.4.1 Radar data

A number of SIDs are given per runway in the Aeronautical Information Publication (AIP). These departure descriptions are not geographical stipulations, but are laid down as procedures. They must be followed when a certain height or geographical location is reached. Reaching this height and/or geographical location depends on the aircraft type, weight (and indirectly on the destination), as well as weather conditions. This may result in a very large geographical distribution of the actual flight paths for the same SID. This creates bundles of movements that use the same or similar SIDs.

Taking into account each individual radar track results in an enormously long calculation time. A method is therefore available in INM to take this distribution into account. This manual method (one action per bundle) has been automated since 2015, without making use of the internal method in INM.

The SIDs that fall inside the zone of the sound contours are grouped together for the take-off movements in a number of larger bundles, and a static division is used for those bundles based on the actual routes flown. This statistical method is an improvement compared to the built-in methodology of INM, which uses a symmetrical distribution around the average route of the actual routes flown, whereas the distribution of the paths in bundles is generally asymmetrical. For a number of frequently-used SIDS, the calculations are refined by a further subdivision based on aircraft type.

Grouping by approach path is not possible for arrivals using the information in the CDB. For this reason, the bundles for arrivals are divided on the basis of geographical data. Approaches for runways 25R and 25L are from the south-east, north or north-west, or in line with the runway from longer distances. No distinctions are made by aircraft type for approaches because the approach path is not influenced by this factor.

2.4.2 Meteorological data

For the calculation of the contours for 2020, the actual average meteorological conditions are used. The weather data are available via Brussels Airport Company every thirty minutes. The wind direction, wind speed and temperatures are linked to the individual flight movements. The headwind is calculated for each individual flight movement and for the runway used. In this way, an annual averaged meteorological condition, which is weighted for the number of flights under each meteorological condition, is obtained.

The wind speed is provided in accordance with the calculation method and converted to knots (kn). The meteorological parameters for 2020 are:

- Average headwind (annual average across all runways, take-off and landing): 5.9kn.
- Average temperature: 11.3°C.
- Average headwind per runway:
    - 25R 6.2kn.
    - 25L 6.8kn.
    - 07R 3.6kn.
    - 07L 5.4kn.
    - 19: 5.1 kn
    - 01: 3.5 kn.

2.4.3 Take-off profile

The weight of the aircraft influences the take-off profile at departure. Given that this actual weight is not available in the CDB, a method proposed by INM is used to factor in this effect (the INM 'stage' parameter). It is assumed that the greater the distance from Brussels Airport to the destination, the more this aircraft will operate at its maximum take-off weight. This is justified, among others, by the fact that the kerosene constitutes an important part of the total weight of an aircraft. This complies with the methodology of the preceding annual reports.

The coordinates of all airports can be found on the website ‘http://openflights.org/data.html’. This list is used to calculate the distance to Brussels Airport from any airport.

2.5 Execution of the contour calculations

2.5.1 Match between measurements (NMS) and calculations (INM)

INM enables calculations at specific locations around the airport. To check the assumptions concerning the input data and the accuracy of the INM, the calculated noise impact is compared with sound measurements taken at 30 locations.

The comparison with measurements provides a validation of the calculations. Note that the noise calculations as well as the noise measurements imply specific uncertainties. The noise calculations group, flight movements for example, without taking the actual height of an aircraft flying overhead into account (this is determined by the assigned INM standard departure profile, not by the actual radar data). The measuring stations are unmanned because they are monitored continuously throughout the year. Local deviations caused by local noise events or background noise, for example, may affect the measured levels. Although these are removed as far as possible from the measurements (for example, through an automatic link between noise events and aircraft, based on the radar data), such contributions to the measured levels cannot be completely excluded.

Reliability of the calculation method can however be achieved when there is sufficient matching between the annual averages of the measured noise events and the annual average forecast based on the average day, across a sufficient number of measuring stations.

2.5.2 Technical data

The calculations are carried out with INM 7.0b with a 'refinement 11' and 'tolerance 0.5' within a grid which is 8 nmi westwards, 16 nmi eastwards and 8 nmi[12] northwards and southward in relation to the airport reference measuring point. The altitude of the airport reference measuring point in relation to sea level is 184 ft.

2.5.3 Calculation of frequency contours

The noise contours are calculated directly in INM. Frequency contours show the number of times a certain value is exceeded; these contours cannot be provided directly by INM.

INM is able to calculate the maximum noise pressure on a regular grid per aircraft movement. This information is input into a GIS to calculate frequency contours with standard functionality.

[12] 1 nmi (nautical mile) = 1.852 km (kilometre)

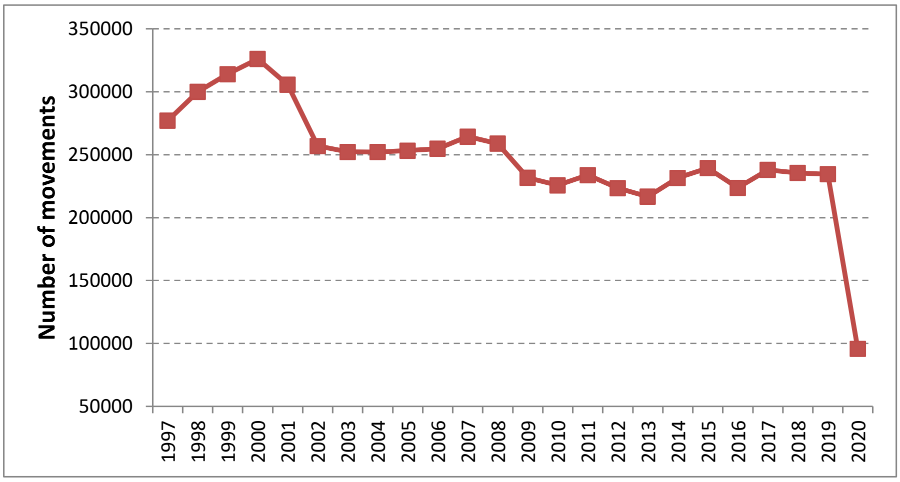
3 Results

3.1 Background information about interpreting the results

3.1.1 Number of flight movements

One of the most important factors in the calculation of the annual noise contours around an airport is the number of movements which occurred during the past year. Following the decline of the number of movements between 2011 and 2013, there was an increase of 6.9% in 2014 and a further increase of 3.4% in 2015. In 2016 the number of aircraft movements fell to 223,688 (-6.5%). This is largely a result of a temporary closure following the attacks on the airport on 22 March 2016. In 2017, the number of movements increased by 6.3% to 237,888. In 2018, the number of movements increased by 1.0% to 235,459. In 2019 there was once again a slight decline of 0.4% and the total number of movements was 234,460. In 2020, the picture was entirely defined by the impact of the global pandemic and the consequences for international travel. The number of flight movements fell by 59.1% to 95,811.

Figure 3: Evolution of flight traffic (all movements) at Brussels Airport.



The number of night-time movements (23:00-06:00) rose by 35.8 % from 17,347 in 2019 to 11,131 in 2020 (4,632 of which were take-offs). This includes helicopter movements and flight movements exempt from slot coordination, such as government and military flights.

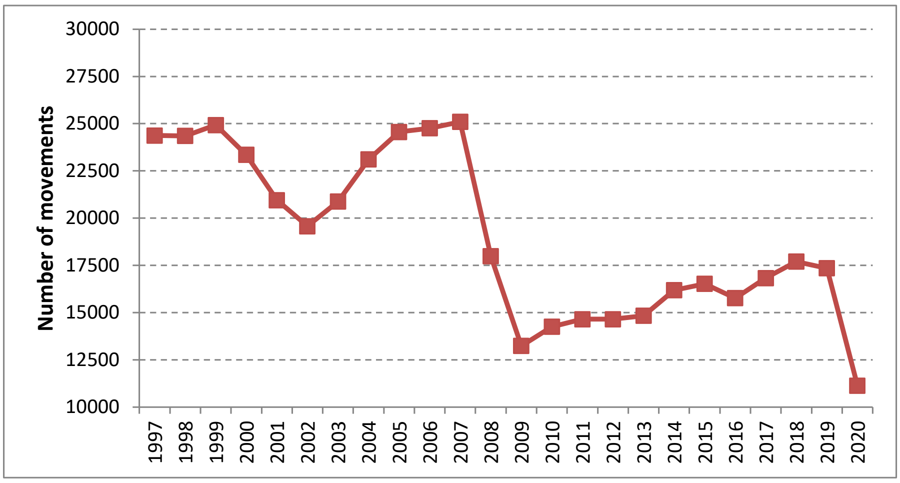
In 2020, the number of assigned night slots[13] for aircraft movements remained at 10,970 (15,780 in 2019), including 4,480 for departures (4,581 in 2019), within the limitations imposed on the slot coordinator of Brussels Airport, who since 2009 has been authorised to distribute a maximum of

[13] night slot: permission given by the coordinator of the Brussels National Airport, pursuant to Regulation (EEC) No. 95/93 of the Council of 18 January 1993 concerning common rules for the allocation of slots at community airports, to use the entire infrastructure required for the exploitation of an air service at the Brussels National Airport on a specified date and at a specified landing and take-off time during the night, as assigned by the coordinator;

16,000 night slots, of which a maximum of 5,000 may be allocated to departures (MD 21/01/2009, official amendment to the environmental permit).

The number of movements during the operational day period (06:00 to 23:00) dropped by 61.0% from 217,113 in 2019 to 84,680 in 2020.

Figure 4: Evolution of flight traffic during the night (23:00-06:00) at Brussels Airport.



As a result of changes to the Vlarem legislation in 2005, noise contours are no longer measured based on a daily breakdown that coincides with the operating schedule at Brussels Airport, but rather, the day is split up into a daytime period (07:00 - 19:00), an evening period (19:00 - 23:00) and a night-time period (23:00 - 07:00). The number of movements in 2020, the data for 2019 and the trend are shown in Table 1. The numbers for the night period are further broken down into operational nights (23:00 - 06:00) and the morning period (06:00 - 07:00).

Table 1: Number of movements (incl. helicopter movements) in 2020 and the change in comparison to 2019 (VLAREM division of the day).

	2019			2020			Relative change versus 2019		
period	landings	departures	total	landings	departures	total	landings	departures	total
day (07:00 - 19:00)	74,788	78,564	153,352	30,160	32,041	62,201	-59.7%	-59.2%	-59.4%
evening (19:00 - 23:00)	27,756	25,976	53,732	9,861	8,932	18,793	-64.5%	-65.6%	-65.0%
night (23:00 - 07:00)	14,689	12,687	27,376	7,891	6,926	14,817	-46.3%	-45.4%	-45.9%
00:00 - 24:00	117,233	117,227	234,460	47,912	47,899	95,811	-59.1%	-59.1%	-59.1%
06:00 - 23:00	105,205	111,908	217,113	41,413	43,267	84,680	-60.6%	-61.3%	-61.0%
23:00 - 06:00	12,028	5,319	17,347	6,499	4,632	11,131	-46.0%	-12.9%	-35.8%
06:00 - 07:00	2,661	7,368	10,029	1,392	2,294	3,686	-47.7%	-68.9%	-63.2%

The general increase of 59.1% in the annual number of flight movements between 2020 and 2019 is evenly distributed throughout the day (-59.4%), evening (-65.0%) and night (-45.9%). The decrease in movements is greater during the day and the evening. Between 06:00 and 07:00 the decrease in movements was 63.2%.

3.1.2 Other important evolutions

In addition to the number of flight movements, there are a number of other parameters that also determine the size and the position of the noise contours, such as the runway and the route used, flight procedures and the deployed fleet. The most important changes are summarised below.

3.1.2.1 COVID-19 pandemic: impact per month

Movements declined drastically due to the COVID-19 pandemic. The lockdown and restrictions on travel started in mid-March 2020. To frame this impact, the relative number of movements per month is plotted for the day, evening and night compared to 2019 in Table 2. This illustrates the changes in the number of movements throughout the year in the different phases of the pandemic. The impact is greatest for the day and evening in April to June with decreases below 10% of the normal situation. There is a slight recovery in the summer months to almost 40% after which the number of movements drops again due to the second wave at the end of the year.

The picture for the night differs greatly from this pattern due to the continued operation of cargo flights during the night. There was a drop to 35% from April to June, after which the number of movements fluctuated between 45% and 54% between April and November and rising to 63% in December. This strong variation in movements throughout the year will not be directly visible in the noise maps, as the noise maps calculate an annual average exposure. The evaluation method is not susceptible to these strong variations throughout the year.

Table 2: Relative evolution of the number of movements per month in the year 2020 compared to 2019

Period	Jan	Feb	Mrt	Apr	Mei	Jun	Jul	Aug	Sep	Okt	Nov	Dec	Total
day (07:00 - 19:00)	98%	106%	59%	9%	12%	19%	37%	40%	33%	34%	27%	35%	41%
evening (19:00 - 23:00)	97%	105%	57%	7%	7%	12%	28%	33%	26%	24%	24%	27%	35%
night (23:00 - 07:00)	98%	115%	78%	36%	34%	34%	45%	45%	48%	52%	54%	63%	54%
total	98%	107%	60%	12%	14%	19%	36%	39%	33%	33%	29%	36%	41%

3.1.2.2 Fleet changes during the operational night

The evolution of the most frequently used aircraft types during the operational night (23:00-06:00) in 2020 is available in Table 3 for heavy aircraft (MTOW > 136 tonnes, ‘heavies’) and in Table 4 for lighter aircraft (MTOW <136 tonnes).

The COVID-19 pandemic has had a relatively low impact on cargo transport and consequently on the aircraft used during the operational night. The most commonly used aircraft is the B752 (28.2% of all movements in 2020), followed by the B734 (21.0%), and the A306 (8.8%). Five aircraft types make up between 2.9% and 5.9 % (A332, A320, A333, B763 and the B738) of all movements. These eight types are responsible for 88.9% of the night flights. In terms of departures, the B752 is also the most frequently used aircraft overall (34.1%), followed by the B734 (24.2%), and the A306 (21.9%).

The number of movements in 2020 using heavy aircraft amounted to 3,857, a decrease of 16.6% compared with 2019, when this number was 4,627. There was a decrease of 8.1% compared with 2019 for departing heavy aircraft.

Table 3: Evolution of the number of flight movements per aircraft type during the operational night period (23:00-06:00) for the (MTOW > 136 tonnes) aircraft types.

	Landings				Departures			
MTOW > 136 ton	2019	2020	Evolution	Evolution (%)	2019	2020	Evolution	Evolution (%)
A306	978	1012	155	+16%	922	1012	90	+10%
A332	729	395	-334	-46%	344	266	-78	-23%
A333	1042	366	-676	-65%	33	15	-18	-55%
B763	35	269	234	+669%	127	60	-67	-53%
B77L	14	17	3	+21%	149	163	14	+9%
B744	6	29	23	+383%	4	18	14	+350%
B789	23	32	9	+39%	47	7	-40	-85%
B788	83	33	-50	-60%	64	6	-58	-91%
B77W	1	4	3	+300%	3	5	2	+67%
A359	2	5	3	+150%	0	3	3	
B762	1	2	1	+100%	1	2	1	+100%
A310	3	0	-3	-100%	4	3	-1	-25%
B748	0	2	2		0	1	1	
A343	3	3	0	+0%	1	0	-1	-100%
A400	1	1	0	+0%	0	1	1	
MD11	0	2	2		0	0	0	
B78X	0	1	1		0	0	0	
C5M	0	1	1		0	0	0	
A346	1	0	-1	-100%	0	0	0	
B74S	1	0	-1	-100%	0	0	0	
C17	4	0	-4	-100%	0	0	0	
K35R	1	0	-1	-100%	0	0	0	

Table 4: Evolution of the number of flight movements per aircraft type during the operational night period (23:00-06:00) for the most common, light (MTOW <136 tonnes) aircraft types.

	Landings				Departures			
MTOW < 136 ton	2018	2019	Evolution	Evolution (%)	2018	2019	Evolution	Evolution (%)
B752	1426	1555	129	+9%	1398	1579	181	+13%
B734	1324	1215	-109	-8%	1030	1119	89	+9%
A320	2817	565	-2252	-80%	191	18	-173	-91%
B738	1029	219	-810	-79%	489	106	-383	-78%
EXPL	121	119	-2	-2%	77	85	8	+10%
A319	1265	165	-1100	-87%	80	5	-75	-94%
B737	317	71	-246	-78%	7	1	-6	-86%
B733	47	35	-12	-26%	44	32	-12	-27%
ATP	1	17	16	+1600%	0	18	18	
E190	210	25	-185	-88%	28	4	-24	-86%
C130	13	25	12	+92%	1	1	0	+0%
C56X	27	17	-10	-37%	7	7	0	+0%
A20N	45	16	-29	-64%	8	3	-5	-63%
CL60	1	9	8	+800%	4	8	4	+100%
LJ45	7	9	2	+29%	4	6	2	+50%
C510	12	7	-5	-42%	5	6	1	+20%
A321	52	10	-42	-81%	96	3	-93	-97%
C425	8	6	-2	-25%	8	6	-2	-25%
GLEX	3	9	6	+200%	3	1	-2	-67%
GLF5	9	4	-5	-56%	7	5	-2	-29%
C25B	3	5	2	+67%	1	4	3	+300%
C25A	12	7	-5	-42%	4	2	-2	-50%
FA7X	7	7	0	+0%	8	2	-6	-75%
CRJ9	102	8	-94	-92%	17	1	-16	-94%
C560	2	3	1	+50%	2	5	3	+150%
C525	6	6	0	+0%	5	2	-3	-60%
F2TH	13	6	-7	-54%	4	2	-2	-50%
FA50	0	6	6		3	1	-2	-67%
E145	7	3	-4	-57%	4	3	-1	-25%
C680	7	2	-5	-71%	3	3	0	+0%
E545	2	2	0	0%	0	3	3	
F900	9	3	-6	-67%	8	2	-6	-75%
FA8X	7	4	-3	-43%	0	1	1	
A21N	14	2	-12	-86%	10	2	-8	-80%
H25B	0	2	2		0	2	2	
P180	1	2	1	100%	5	2	-3	-60%
C750	3	3	0	0%	0	1	1	
E135	8	3	-5	-63%	3	1	-2	-67%
C25C	2	4	2	100%	0	0	0	
GLF4	5	4	-1	-20%	6	0	-6	-100%

3.1.2.3 Runway and route usage

Preferential runway usage

The preferential runway usage, published in the AIP (Skeyes), shows which runway should preferably be used, depending on the time that the movement occurs, and in some cases on the destination and the MTOW of the aircraft. This scheme did not change during the year 2020 (see Table 5).

If the preferential runway configuration cannot be used (for example due to meteorological conditions or maintenance on one of the runways), Skeyes will then choose the most suitable alternative configuration, taking account of factors including the weather conditions, runway equipment and traffic demand. In this respect, conditions are tied to the preferential runway usage arrangements, including wind limits expressed as the maximum crosswind and maximum tailwind at which each runway can be used. If these limits are exceeded, air traffic control must switch to an alternative configuration. Under preferential runway usage conditions, the maximum tailwind is 7 kt and the maximum crosswind is 20 kt. In the event of alternative runway usage, the maximum speeds are also 20 kt for crosswind but only 3 kt for tailwind.

Table 5: Preferential runway usage since 19/09/2013 (local time) (source: AIP)

		Day		Night
		06:00 to 15:59	16:00 to 22:59	23:00 to 05:59
Mon, 06:00 – Tues 05:59	Departure	25R		25R/19(1)
	Landing	25L/25R		25R/25L(2)
Tues, 06:00 – Wedn 05:59	Departure	25R		25R/19(1)
	Landing	25L/25R		25R/25L(2)
Wed, 06:00 – Thurs 05:59	Departure	25R		25R/19(1)
	Landing	25L/25R		25R/25L(2)
Thurs, 06:00 – Fri 05:59	Departure	25R		25R/19(1)
	Landing	25L/25R		25R/25L(2)
Fri, 06:00 – Sat 05:59	Departure	25R		25R(3)
	Landing	25L/25R		25R
Sat, 06:00 – Sun 05:59	Departure	25R	25R/19(1)	25L(4)
	Landing	25L/25R	25R/25L(2)	25L
Sun, 06:00 – Mon 05:59	Departure	25R/19(1)	25R	19(4)
	Landing	25R/25L(2)	25L/25R	19

(1) Runway 25R for traffic via ELSIK, NIK, HELEN, DENUT, KOK and CIV / Runway 19 for traffic via LNO, SPI, SOPOK, PITES and ROUSY (aircraft with MTOW between 80 and 200 tonnes can use runway 25R or 19, aircraft with MTOW > 200 tonnes must use runway 25R, regardless of their destination).

(2) Runway 25L only if air traffic control considers this necessary.

(3) Between 01:00 and 06:00, no slots may be allocated for departures.

(4) Between 00:00 and 06:00, no slots may be allocated for departures.

Runway use as a result of the pandemic and the renovation work for runway 25R

Two additional events affected runway availability. During the lockdown, the principle of "Single Runway Use" was implemented as a measure, in other words all operations were grouped on one runway. Runway 25L-07R was therefore fully closed from 18 March, 2020 to 8 July, 2020. This means that at any given time during this period, one of the runways 01, 19, 25R or 25L was in use for both take-offs and landings.

A thorough renovation of runway 25R-07L was carried out with the runway being completely closed from 13 July at 6:00 to 23 August at 6:00. These works also had a preparatory phase that started on Wednesday 8 July and ended on Monday 13 July at 5:00, each time from 15:30 to 7:30. During these days/hours in the preparatory phase, landing on runways 25R and 19 was not possible, while the available landing distance on runways 07L and 01 was shortened. Take-off from runways 07L and 01 was not possible, while the available take-off distance from runways 25R and 19 was shortened.

Runway use as a result of meteorological conditions

Weather conditions in 2020 caused slightly fewer operations to be carried out using the 'non-preferential runway use' than in 2019.

A complete overview of runways used in 2020 and the evolution in runway usage in comparison with 2019 can be found in appendix 4.1. These changes to the routes flown are included in the calculations.

3.2 Comparison of measurements and calculations

The INM software enables a number of acoustic parameters to be calculated at a specified location around the airport. The extent to which the calculated values correspond to the values registered and processed by the measuring system can be evaluated by performing these calculations at the Noise Monitoring System (NMS) measuring station locations. Different data sources are used in the NMS system and are correlated with each other: noise measurements, CDB, radar tracks and weather. Measurements and calculations are compared for the parameters $L_{Aeq,24h}$, L_{night} and L_{den}.

The calculated values are compared with the values of the correlated measured events. Only the acoustic parameters of an event are recorded by the monitoring network. To select the events by aircraft, an automatic link is made in the NMS to the flight and radar data; these are the so-called correlated events.

The system of correlation is imperfect and it is possible for events to be incorrectly attributed to overflying traffic and vice versa. To minimise the contribution of such incorrect classifications, a trigger level is set with a minimum duration time: an event is expected only when the trigger level of 10 s is exceeded. The event ends when the trigger level is not achieved during 5 s. The trigger levels are set for each measuring station and depend on the local noise in the area. These trigger levels were evaluated in the beginning of 2015 and adjusted for several measuring stations. At that time, the maximum duration of an event was increased from 75 s (for 2014) to 125 s. As in previous years, this criterion was retained for 2020. In events of even longer duration, the chance of this being caused by an airplane is quite small. Note that beyond the conditions relating to the event duration and trigger level, a correlation with a registered aircraft movement is also necessary based on its radar track results.

In the table below, a comparison is made between the values simulated in the INM at the different measuring station locations and the values measured/calculated on the basis of the correlated events for the chosen parameters. Aside from data from the measuring stations of Brussels Airport Company, results from the Environment, Nature and Energy Department (LNE) measuring stations (with codes

NMT 40-2 and higher) are also recorded. The measurement data from these measuring stations are input and linked to flight data in the NMS of the airport.

For measuring stations of the BIM in the Brussels-Capital Region, the abovementioned procedure is not possible because the measurement data is not supplied to BAC (until 2009, the measurement data from the BIM for two measuring stations - Haren and Evere - had in fact been made available to BAC). An overview of the locations of all measuring stations can be found in Appendix 4.2.

The measuring stations NMT01-2, NMT03-3, NMT15-3 and NMT23-1 are situated on the airport site and/or in the immediate vicinity of the runway system and the airport facilities. The flight-correlated noise events comprise contributions from ground noise as well as overflights. The link to specific flight movements is not always equally reliable for these measuring stations. For these reasons, the measured values at these measuring stations are less relevant for assessing noise emission from overflying aircraft, and while they are reported, they are not considered in the assessment of the accuracy of the simulations.

The fraction of time that the measuring system is active (so-called 'uptime') is very high for the majority of the measuring stations. Only at 1 measuring station, namely Koningslo (NMT40-2, 79.38%), is this value lower than 95%. If this measurement station is not taken into account, the average uptime is 98.82%.

The simulations are always performed for a full year. For the measuring point at Koningslo, the measurements must therefore be extrapolated in view of the lower uptime fraction. It is also assumed that during the periods lacking measurements, there was the same proportion of exposure to aircraft noise as during the periods in which the measuring station was active. For most measuring stations, this correction is virtually negligible.

The comparison between calculations and measurements based on the $L_{Aeq,24h}$ shows that the discrepancy between the calculated values and the measured values across all measuring stations, except NMT48-3 (Bertem), is smaller than 2 dB(A) (after also excluding the measuring points NMT01-2, NMT03-3, NMT15-3 and NMT23-1 mentioned in the previous paragraph). The Bertem measuring station has few overflights and thus has the lowest registered noise levels (<35 dB(A) $L_{Aeq,24h}$). The resulting margin for error is large and that is reflected in the comparison between the measurements and the calculations. At 12 measuring stations, the deviation is limited to up to 0.5 dB(A). At 10 measuring stations, the measurements are higher than the calculations, at 17 measuring stations the measurements are lower than the calculations (in each case with the abovementioned exclusions). The global discrepancy between simulations and measurements is 0.9 dB(A) (“root-mean-square error” or RMSE), if Bertem (as well as NMT01-2, NMT03-3, NMT15-3 and NMT23-1) is excluded from this evaluation.

Globally, similar limited deviations between measurements and simulations are obtained for L_{night} (1.0 dB (A) RMSE, excluding measuring points NMT01-2, NMT03-3, NMT15-3, NMT23-1). The highest deviations (excluding NMT01-2, NMT03-3, NMT15-3 and NMT23-1) are found at the Wezenbeek-Oppem and Strombeek-Bever measuring locations; the predicted level appears here to be more than 2 dB(A) lower than the measurements. At all the other measuring stations, the deviations were lower than 2 dB(A), and at 11 measuring stations lower than 0.5 dB(A).

For the noise indicator L_{den} the RMSE is 0.9 dB(A) (excluding NMT01-2, NMT03-3, NMT15-3, NMT23-1). At all the other measuring stations, the deviations were within 2 dB(A). Twelve measuring stations had a deviation of maximum 0.5 dB(A). At 13 measuring stations the calculations result in an underestimation of the measured levels, at 14 measuring stations they lead to an overestimation (excluding NMT01-2, NMT03-3, NMT15-3, and NMT23-1). The overestimation and underestimation thus balance each other out almost perfectly; the average deviation, over all measurement points (excluding NMT01-2, NMT03-3, NMT15-3, and NMT23-1) is only 0.1 dB(A).

Table 6: Match between calculations and measurements for noise indicator $L_{Aeq,24h}$ (in dB(A)). The grey rows in the table indicate comparisons between measurements and calculations which are difficult to perform (see text).

Location code	location name	measurements (dB(A))	calculations (dB(A))	difference (dB(A))
NMT01-2	STEENOKKERZEEL	57.6	63.7	-6.1
NMT02-2	KORTENBERG	62.1	62.7	-0.6
NMT03-3	HUMELGEM-Airside	56.9	57.4	-0.5
NMT04-1	NOSSEGEM	59.8	59.7	0.1
NMT06-1	EVERE	46.1	45.6	0.5
NMT07-2	STERREBEEK	48.9	48.6	0.3
NMT08-1	KAMPENHOUT	53.0	53.0	0.0
NMT09-2	PERK	48.6	49.8	-1.2
NMT10-1	NEDER-OVER-HEEMBEEK	51.5	51.6	-0.1
NMT11-2	SINT-PIETERS-WOLUWE	47.7	47.4	0.3
NMT12-1	DUISBURG	44.1	44.2	-0.1
NMT13-2	GRIMBERGEN	42.3	43.0	-0.7
NMT14-1	WEMMEL	44.6	44.8	-0.2
NMT15-3	ZAVENTEM	48.4	52.8	-4.4
NMT16-2	VELTEM	50.8	51.2	-0.4
NMT19-3	VILVOORDE	49.0	50.2	-1.2
NMT20-2	MACHELEN	50.3	52.0	-1.7
NMT21-1	STROMBEEK-BEVER	49.1	47.6	1.5
NMT23-1	STEENOKKERZEEL	63.0	65.5	-2.5
NMT24-1	KRAAINEM	49.4	48.7	0.7
NMT26-2	LAKEN	43.2	43.6	-0.4
NMT40-2* +	KONINGSLO	48.4	49.5	-1.1
NMT41-1*	GRIMBERGEN	44.7	45.6	-0.9
NMT42-2*	DIEGEM	59.7	60.5	-0.8
NMT43-2*	ERPS-KWERPS	50.3	51.3	-1.0
NMT44-2*	TERVUREN	45.4	45.6	-0.2
NMT45-1*	MEISE	41.5	42.8	-1.3
NMT46-2*	WEZEMBEEK-OPPEM	50.5	50.2	0.3
NMT47-3*	ZAVENTEM	49.7	48.5	1.2
NMT48-3*	BERTEM	31.7	34.8	-3.1
NMT70-1*	ROTSELAAR	45.3	43.7	1.6

*noise data Environment Department off-line correlated by the NMS+Measuring station with an uptime smaller than 90%

Table 7: Match between calculations and measurements for noise indicator L_{night} (in dB(A)). The grey rows in the table indicate comparisons between measurements and calculations which are difficult to perform (see text).

Location code	location name	measurements (dB(A))	calculations (dB(A))	difference (dB(A))
NMT01-2	STEENOKKERZEEL	55.7	65.5	-9.8
NMT02-2	KORTENBERG	58.5	58.8	-0.3
NMT03-3	HUMELGEM-Airside	53.5	53.6	-0.1
NMT04-1	NOSSEGEM	58.9	57.9	1.0
NMT06-1	EVERE	38.3	37.4	0.9
NMT07-2	STERREBEEK	49.9	48.5	1.4
NMT08-1	KAMPENHOUT	52.1	52.2	-0.1
NMT09-2	PERK	46.3	46.5	-0.2
NMT10-1	NEDER-OVER-HEEMBEEK	49.5	48.1	1.4
NMT11-2	SINT-PIETERS-WOLUWE	44.9	44.3	0.6
NMT12-1	DUISBURG	42.9	42.1	0.8
NMT13-2	GRIMBERGEN	37.9	37.9	0.0
NMT14-1	WEMMEL	41.1	41.3	-0.2
NMT15-3	ZAVENTEM	48.4	50.0	-1.6
NMT16-2	VELTEM	47.6	47.5	0.1
NMT19-3	VILVOORDE	47.3	46.9	0.4
NMT20-2	MACHELEN	48.3	48.7	-0.4
NMT21-1	STROMBEEK-BEVER	47.1	45.1	2.0
NMT23-1	STEENOKKERZEEL	62.5	65.0	-2.5
NMT24-1	KRAAINEM	45.3	44.9	0.4
NMT26-2	LAKEN	39.0	40.1	-1.1
NMT40-2* +	KONINGSLO	47.1	46.6	0.5
NMT41-1*	GRIMBERGEN	42.8	42.4	0.4
NMT42-2*	DIEGEM	56.5	55.1	1.4
NMT43-2*	ERPS-KWERPS	46.2	47.2	-1.0
NMT44-2*	TERVUREN	45.8	44.7	1.1
NMT45-1*	MEISE	37.3	38.6	-1.3
NMT46-2*	WEZEMBEEK-OPPEM	47.5	47.1	0.4
NMT47-3*	ZAVENTEM	50.3	48.0	2.3
NMT48-3*	BERTEM	31.5	32.4	-0.9
NMT70-1*	ROTSELAAR	41.4	39.8	1.6

*noise data Environment Department off-line correlated by the NMS+Measuring station with an uptime smaller than 90%

Table 8: Match between calculations and measurements for noise indicator L_{den} (in dB(A)). The grey rows in the table indicate comparisons between measurements and calculations which are difficult to perform (see text).

Location code	location name	measurements (dB(A))	calculations (dB(A))	difference (dB(A))
NMT01-2	STEENOKKERZEEL	62.9	71.4	-8.5
NMT02-2	KORTENBERG	66.5	66.9	-0.4
NMT03-3	HUMELGEM-Airside	61.4	61.7	-0.3
NMT04-1	NOSSEGEM	65.7	65.1	0.6
NMT06-1	EVERE	49.1	48.6	0.5
NMT07-2	STERREBEEK	55.9	54.8	1.1
NMT08-1	KAMPENHOUT	58.8	58.9	-0.1
NMT09-2	PERK	53.7	54.5	-0.8
NMT10-1	NEDER-OVER-HEEMBEEK	56.8	56.4	0.4
NMT11-2	SINT-PIETERS-WOLUWE	52.6	52.1	0.5
NMT12-1	DUISBURG	49.6	49.3	0.3
NMT13-2	GRIMBERGEN	46.7	47.2	-0.5
NMT14-1	WEMMEL	49.4	49.5	-0.1
NMT15-3	ZAVENTEM	54.8	57.7	-2.9
NMT16-2	VELTEM	55.4	55.5	-0.1
NMT19-3	VILVOORDE	54.4	55.0	-0.6
NMT20-2	MACHELEN	55.4	56.5	-1.1
NMT21-1	STROMBEEK-BEVER	54.4	52.6	1.8
NMT23-1	STEENOKKERZEEL	69.1	71.6	-2.5
NMT24-1	KRAAINEM	53.6	53.0	0.6
NMT26-2	LAKEN	47.6	48.2	-0.6
NMT40-2* +	KONINGSLO	54.2	54.1	0.1
NMT41-1*	GRIMBERGEN	50.1	50.4	-0.3
NMT42-2*	DIEGEM	64.2	64.4	-0.2
NMT43-2*	ERPS-KWERPS	54.4	55.4	-1.0
NMT44-2*	TERVUREN	52.0	51.3	0.7
NMT45-1*	MEISE	46.1	47.2	-1.1
NMT46-2*	WEZEMBEEK-OPPEM	55.3	54.9	0.4
NMT47-3*	ZAVENTEM	56.5	54.5	2.0
NMT48-3*	BERTEM	38.0	39.9	-1.9
NMT70-1*	ROTSELAAR	49.5	48.0	1.5

*noise data Environment Department off-line correlated by the NMS+Measuring station with an uptime smaller than 90%

3.3 Noise contours

The results of the noise contour calculations for the parameters described above (L_{day}, $L_{evening}$, L_{night}, L_{den}, freq.70 and freq.60) are presented in this section.
The surface area and the number of residents is calculated for each noise contour. The evaluation of the number of exposed residents has been performed since 2017, and will be carried out according to a more refined method (see 1.5). On the basis of the L_{den} contours, the number of potentially seriously inconvenienced persons is calculated according to the method described in chapter 2.2. More information is available in the appendices: per municipality in appendix 4.3, the evolution of the contours over multiple years in appendix 4.5. Appendix 4.4 contains the maps.

3.3.1 L_{day} contours

The L_{day} contours represent the A-weighted equivalent sound pressure level for the period 07:00 to 19:00 and are reported from 55 dB(A) to 75 dB(A) in steps of 5 dB(A). The evolution of the contours for 2019 and 2020 is shown in Figure 5.

The evaluation period for the L_{day} contours falls entirely within the operational daytime period (06:00 to 23:00) as specified at Brussels Airport. This means that the 'Departure 25R – Landing 25L/25R' runway usage is to be preferred at all times, except at the weekend on Saturdays after 16:00 and on Sundays before 16:00, when departures are to be distributed over 25R and 19. When this preferential runway usage cannot be applied due to weather conditions (often with an easterly wind), then the combination of departures from 07R/07L and landings on 01 or 07L/07R is generally applied.

There are a number of relevant findings. In the first place, there was a strong reduction in the number of landings during the day (-58.7%) as well as the number of departures (-59.2%) as a result of the COVID19 pandemic. Runway use was also affected by this. This is mainly apparent in the relative number of arrivals on runway 25R (37.1% in 2020 compared to 28.0% in 2019) and runway 25L (38.4% in 2020 compared to 55.2% in 2019), a relative shift to landings on runway 25R. The renovation of runway 25R/07R also has an impact on runway use, but due to the strong reduction in the number of movements, this impact is less than could be expected with a normal number of movements. The stronger decrease in the number of movements on runway 25L compared to 25R is also caused by the imbalance in the decrease of freight and passenger traffic. Cargo flights are usually handled on runway 25R so that the number of movements on runway 25L also saw a relative decrease due to this effect, on top of the effect of the single runway use and despite the temporary closure of runway 25R during the renovation works.

The renovation is also evident in the relative number of departures from runway 19 (12.5% in 2020 and 2.4% in 2019) and runway 01 (4.0% in 2020 and 0.2% in 2019). The latter was also partly a result of the use of a single runway during the first lockdown period. Due to the renovation works, there were also relatively more landings on runway 19 (13.1% in 2020 and 2.5% in 2019) and on runway 01 (8.3% in 2020 and 6.2% in 2019). On runway 01 and runway 19, the total number of departures even increased compared to 2019: from 167 to 1,270 on runway 01 and from 1,906 to 4,000 on runway 19. The number of landings on runway 19 increased from 1,836 to 3,940 but decreased on runway 01 from 4,670 to 2,513.

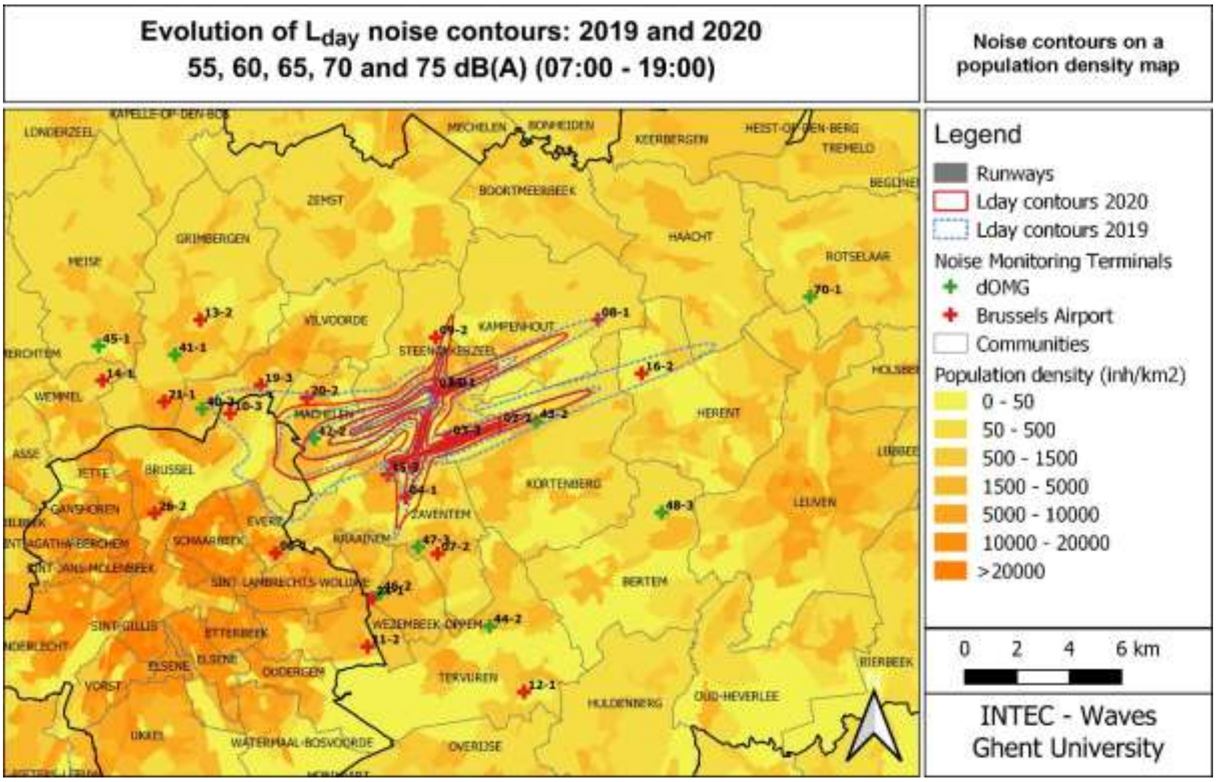
To the west of Brussels Airport, the contour shrank as a result of a decrease in the number of departures from runway 25R (from 65,342 to 24,185). Both the lobe for the turn to the left and the turn to the right shrank strongly (over four dB). The share of the flights from runway 25R on routes with a turn to the left decreased slightly from 37.4% to 34.2% and shifted to straight ahead routes (6.4% to 6.1%). Due to the decrease in the number of arrivals at 07L, the contribution of landings shrank even more than that of departures, causing the bulge on the contour to disappear. In line with track 25R, the contour shrank 5 dB.

The contours were strongly reduced to the east of Brussels Airport, but there is a large difference between runway 25R about -3 dB and on runway 25L, about -6 dB, a consequence of the greater decrease in the number of landings on runway 25L. The number of departures on runway 07R also dropped sharply (from 10,006 to 1,290), so that the contour also shrank sharply in width.

To the south of Brussels Airport, the landing contour shrank due to the decrease in the number of arrival on runway 01 (from 4,670 to 2,513) but the contour widened as a result of the increase in the number of departures on runway 19 (from 1,906 to 4,000).

There was also a significant change to the north of Brussels Airport. The number of departures on runway 01 rose sharply (from 167 to 1,270) while the landings on runway 19 rose sharply as well (from 1,836 to 3,940). The contour increased by approximately 5 dB and became wider due to the higher number of departures. This is mainly an effect of the renovation of runway 25R.

Figure 5: L_{day} noise contours around Brussels Airport in 2019 (dotted blue) and 2020 (solid red).



The total surface area inside the L_{day} contour of 55 dB(A) declined in 2020 by about 47.5% compared to 2019 (from 4,851 to 2,547 ha). The number of residents inside the L_{den} contour of the 55 dB(A) noise contour dropped by 46.3% (from 34,489 to 18,507).

3.3.2 $L_{evening}$ contours

The $L_{evening}$ contours represent the A-weighted equivalent sound pressure level for the period 19:00 to 23:00 and are reported from 50 dB(A) to 75 dB(A) in steps of 5 dB(A). The evolution of the contours for 2019 and 2020 is shown in Figure 6. Due to a lower level being reported in comparison with L_{day}, there is a visually magnifying effect. By correcting 5 dB(A), the 50 dB(A) contour becomes as important for the calculation of L_{den} as the 55 dB(A) L_{day} contour. The evaluation period for the $L_{evening}$ contours falls entirely within the operational daytime period (06:00 to 23:00), as specified at Brussels Airport.
There are a number of relevant findings, which are similar to those of the day. In the first place, there was a strong reduction in the number of landings during the evening (-65.5%) as well as the number of departures (-65.6%) as a result of the COVID19 pandemic. Runway use was also affected by this. This is mainly apparent in the relative number of arrivals on runway 25R (38.9% in 2020 compared to 28.2% in 2019) and runway 25L (40.0% in 2020 compared to 55.2% in 2019), a relative shift to landings on runway 25R. The renovation of runway 25R/07R also has an impact on runway use, but due to the strong reduction in the number of movements, this impact is less than could be expected with a normal number of movements. The stronger decrease in the number of movements on runway 25L compared to 25R is also caused by the imbalance in the decrease of freight and passenger traffic. Cargo flights are usually handled on runway 25R so that the number of movements on runway 25L also saw a relative decrease due to this effect, on top of the effect of the single runway use and despite the temporary closure of runway 25R during the renovation works.

The renovation is also evident in the relative number of departures from runway 19 (7.8% in 2020 and 2.1% in 2019) and runway 01 (5.0% in 2020 and 0.2% in 2019). The latter was also partly a result of the use of a single runway during the first lockdown period. Due to the renovation works, there were also relatively more landings on runway 19 (8.8% in 2020 and 2.1% in 2019). On runway 01, there was a smaller impact on landings (10.5% in 2020 and 9.3% in 2019). On runway 01, the total number of departures even increased compared to 2019: from 46 to 449. The number of departures on runway 19 increased slightly from 535 to 697. The number of landings on runway 19 increased slightly from 581 to 866 but decreased on runway 01 from 2,576 to 1,032.

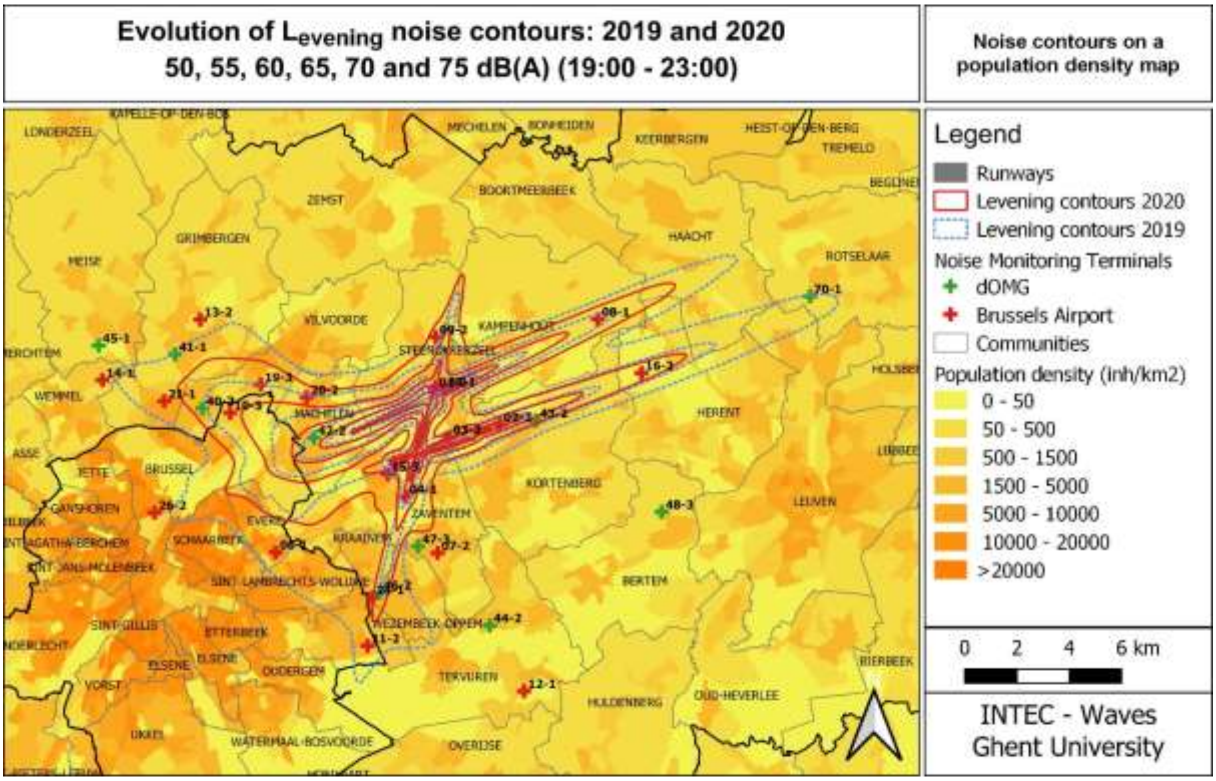
To the west of Brussels Airport, the contour shrank as a result of a decrease in the number of departures from runway 25R (from 21,799 to 7,142). In the three directions (turn to the left, turn to the right, straight ahead) the contours shrank sharply by about four dB each time. The share of the flights from runway 25R on routes with a turn to the left (41.1% to 38.4%), and to the right (38.2% to 35.9%) deceased somewhat as a result of which the share for the straight ahead routes increased from 4.7% to 5.7%. Due to the decrease in the number of arrivals at 07L (from 812 to 116) and 07R (from 636 to 65), the contribution of landings shrank even more than the contribution of departures.

The contours were strongly reduced to the east of Brussels Airport, but there is a large difference between runway 25R about -3 dB and on runway 25L, about -6 dB, a consequence of the greater decrease in the number of landings on runway 25L. The number of departures on runway 07R also dropped sharply (from 2,702 to 332), so that the contour also shrank sharply in width.

To the south of Brussels Airport, the landing contour shrank due to the decrease in the number of arrival on runway 01 (from 2,576 to 1,032) but the contour widened as a result of the increase in the number of departures on runway 19 (from 535 to 697).

There was also a significant change to the north of Brussels Airport. The number of departures on runway 01 rose sharply (from 46 to 449) while the landings on runway 19 also increased (from 581 to 866). The contour increased by approximately 2 dB and became wider due to the higher number of departures. This is a combined effect of the renovation of runway 25R and the use of a single runway during the first lockdown period.

Figure 6: $L_{evening}$ noise contours around Brussels Airport for 2019 (dotted blue) and 2020 (solid red).



The total surface area inside the $L_{evening}$ contour of 50 dB(A) dropped in 2020 by about 48.3% compared with 2019 (from 14,038 ha to 7,252 ha). The number of residents inside the $L_{evening}$ contour of 50 dB(A) dropped by 70.2% (from 255,558 to 76,262). The relative decline in population is larger than it is in surface area, considering the sharp reduction of the $L_{evening}$ contour is partly in the more densely-populated zones.

3.3.3 L_{night} contours

The L_{night} contours represent the A-weighted equivalent sound pressure level for the period 23:00 to 07:00 and are reported from 45 dB(A) to 70 dB(A) in steps of 5 dB(A). The evolution of the contours from 2019 to 2020 is shown in Figure 7. Due to an additional contour being reported, a magnifying effect between the day and the evening is created. The 45 dB(A) L_{night} contour is larger than the 55 dB(A) contour for daytime and is now, due to the correction of 10 dB(A) for the calculation of L_{den}, just as significant as the L_{day} contour of 55 dB(A) and the $L_{evening}$ contour of 50 dB(A).

The evaluation period for the L_{night} contours does not coincide with the operational night period (23:00 to 06:00) and also consists of the flights during the operational daytime period between 06:00 and 07:00. The noise contours are a combination of the runway and route usage during the operational night and during the operational day.

There are a number of relevant findings for the night, which are similar to those of the day. In the first place, there was a strong reduction in the number of landings (-46.3%) as well as the number of departures (-45.4%) as a result of the COVID19 pandemic. Runway use was also affected by this. This is especially evident in the relative number of arrivals on runway 25R (55.7% in 2020 and 45.2% in 2019) and runway 25L (20.7% in 2020 and 39.7% in 2019), a relative shift to landings on runway 25R. The renovation of runway 25R/07R also has an impact on runway use, but due to the strong reduction in the number of movements, this impact is less than could be expected with a normal number of movements. The greater decrease in the number of movements on runway 25L compared to 25R is also caused by the imbalance in the decrease of freight and passenger traffic and this effect is even greater during the night than during the day and evening. Cargo flights are usually handled on runway 25R so that the number of movements on runway 25L also saw a relative decrease due to this effect, on top of the effect of the single runway use and despite the temporary closure of runway 25R during the renovation works.

The renovation is also evident in the relative number of departures from runway 19 (7.8% in 2020 and 2.1% in 2019) and runway 01 (5.0% in 2020 and 0.2% in 2019). The latter was also partly a result of the use of a single runway during the first lockdown period. Due to the renovation works, there were also relatively more landings on runway 19 (8.8% in 2020 and 2.1% in 2019). The share of landings on runway 01 was rather stable (10.5% in 2020 and 9.3% in 2019). On runway 01, the total number of departures even increased compared to 2019: from 46 to 449. The number of departures on runway 19 increased slightly from 535 to 697. The number of landings on runway 19 increased slightly from 581 to 866 but decreased on runway 01 from 2,576 to 1,032.

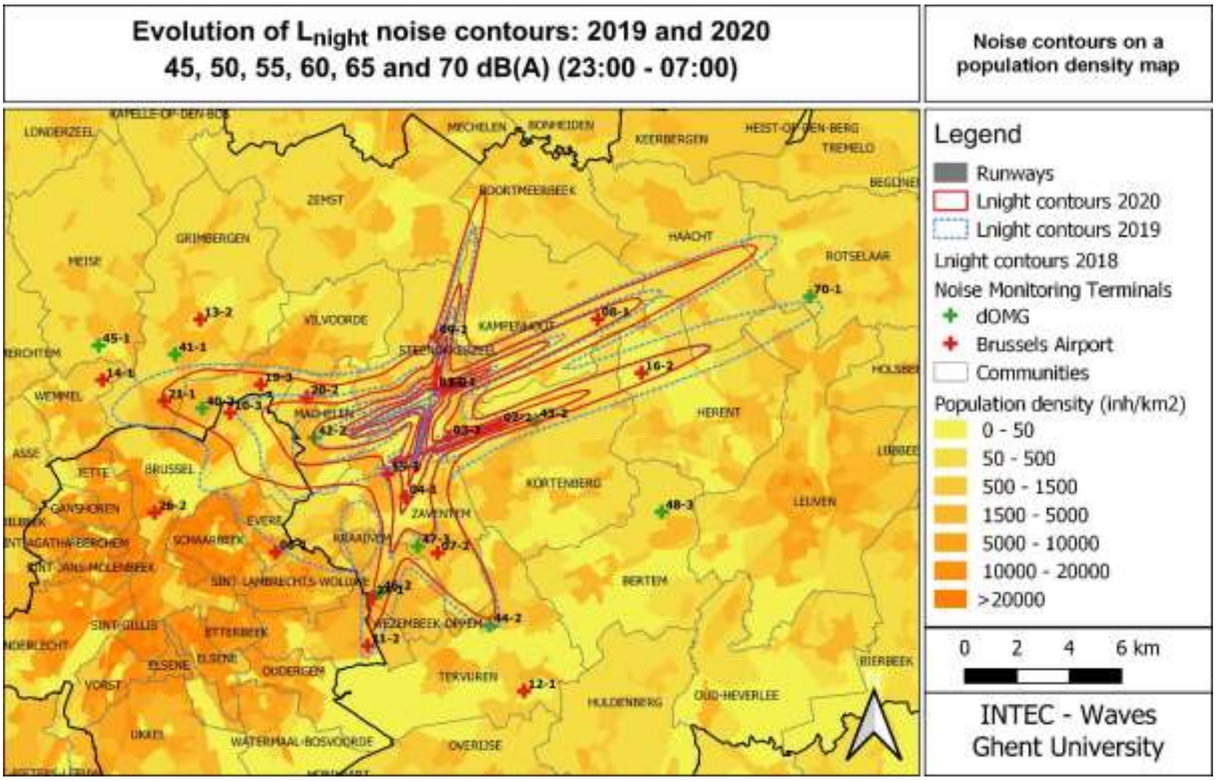
To the west of Brussels Airport, the contour shrank as a result of a decrease in the number of departures from runway 25R (from 9,553 to 4,296). Both the lobe for the turn to the left and the turn to the right shrank strongly. There is a striking difference between the turn to the right and the turn to the left. The share of flights from runway 25R on routes with a turn to the left decreased sharply from 26.6% to 8.7%. This is not a shift in routes, but an effect of the imbalance in the change of freight and passenger traffic caused by the pandemic. The flights with a turn to the left are mainly passenger flights departing between 06:00 and 07:00 which have been significantly reduced. Night time freight transports are less affected by the pandemic and the contribution of the route straight ahead and with a turn to the right are impacted less by the pandemic. Due to the sharp drop in the number of arrivals at 07R (from 300 to 4), the contour in this zone shrank even further, with a combined effect of approximately 6 dB observed in line with runway 07R.

The contours were strongly reduced to the east of Brussels Airport, but there is a very large difference between runway 25R with a drop of approximately 1 dB and runway 25L with a reduction of almost exactly 5 dB, so that the contours of 2020 coincide with the lower contour of 2019. The number of departures on runway 07R also dropped sharply (from 494 to 39), so that the contour also shrank sharply in width.

To the south of Brussels Airport, the landing contour shrank through the decrease in the number of arrivals on runway 01 (from 939 to 720). The lobe for departures on runway 19 is stable. The deviating position of the lobe is an effect of the sharp decline of the departures from runway 25R with a turn to the left.

There was also a significant change to the north of Brussels Airport. The number of departures on runway 01 rose sharply (from 0 to 363) while the landings on runway 19 also increased slightly (from 967 to 1,120). The contour increased by approximately 2 dB and became wider due to departures. This is a combined effect of the renovation of runway 25R and the use of a single runway during the first lockdown period.

Figure 7: L_{night} noise contours around Brussels Airport in 2019 (dotted blue) and 2020 (solid red).

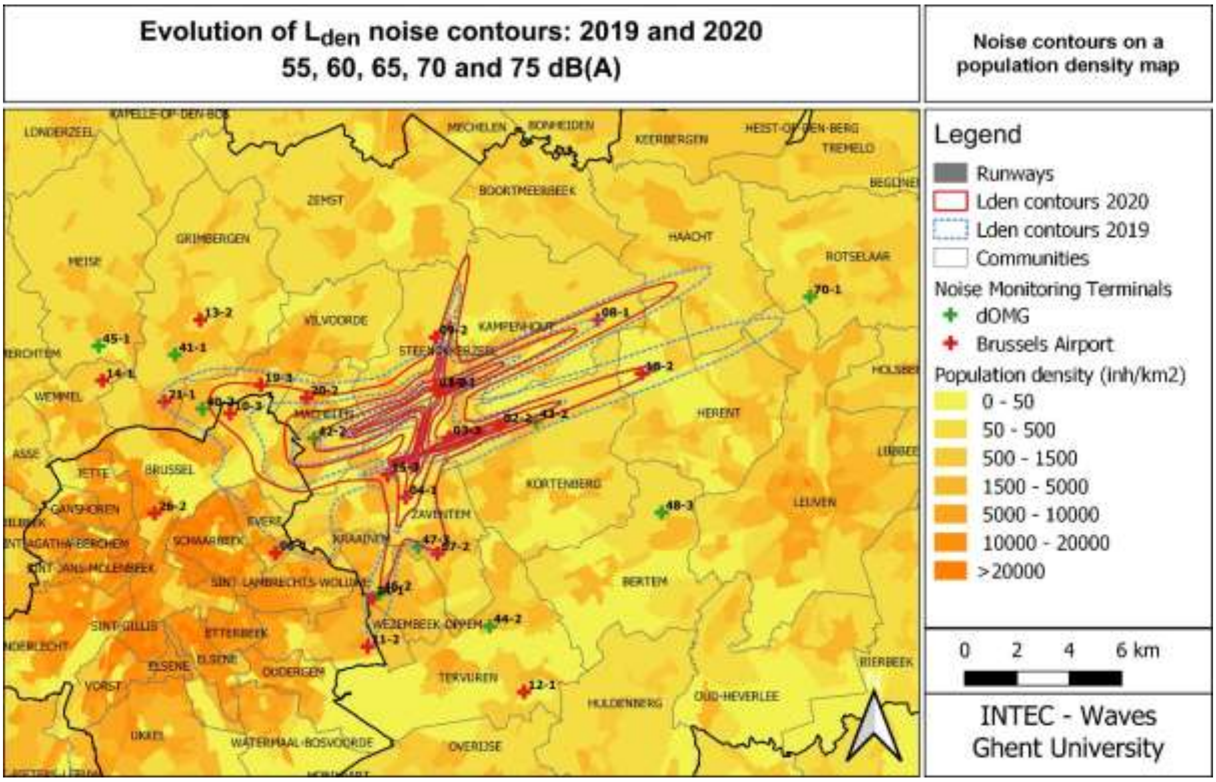


The total surface area within the L_{night} contour of 45 dB(A) dropped in 2020 by 33.4% compared with 2019 (from 13,044 ha to 8,691 ha). The number of residents inside the L_{night} contour of 45 dB(A) dropped by 50.2% (from 163,718 to 81,566). The decrease in contours within a number of more densely populated areas means that the decrease in the total number of inhabitants is greater than the decrease in surface area.

3.3.4 L_{den} contours

The quantity of the L_{den} unit is a combination of L_{day}, $L_{evening}$ and L_{night}. The evening flight movements are penalised with 5 dB(A) and the night flight movements with 10 dB(A). In Figure 8 you can see the evolution of the L_{den} contours for 2019 and 2020. The L_{den} contours are reported from 55 dB(A) to 75 dB(A) in steps of 5 dB(A).

Figure 8: L_{den} noise contours around Brussels Airport in 2019 (dotted blue) and 2020 (solid red).



The changed form is a weighted combination of all effects which are outlined in detail in the discussion of L_{day}, $L_{evening}$ and L_{night} contours. The findings for the different periods to the west of the airport are confirmed. The strong contraction of the lobe for the departures from runway 25R with a turn to the left during the night determines the L_{den} contour. All other changes are the same for the day, evening and night, which is reflected in the L_{den} contour.

The total surface area inside the L_{den} noise contour of 55 dB(A) dropped in 2020 by 39.1% compared with 2019 (from 9,115 ha to 5,549 ha). The number of residents inside the L_{den} contour of 55 dB(A) dropped by 53.4% (from 97,624 to 45,508).

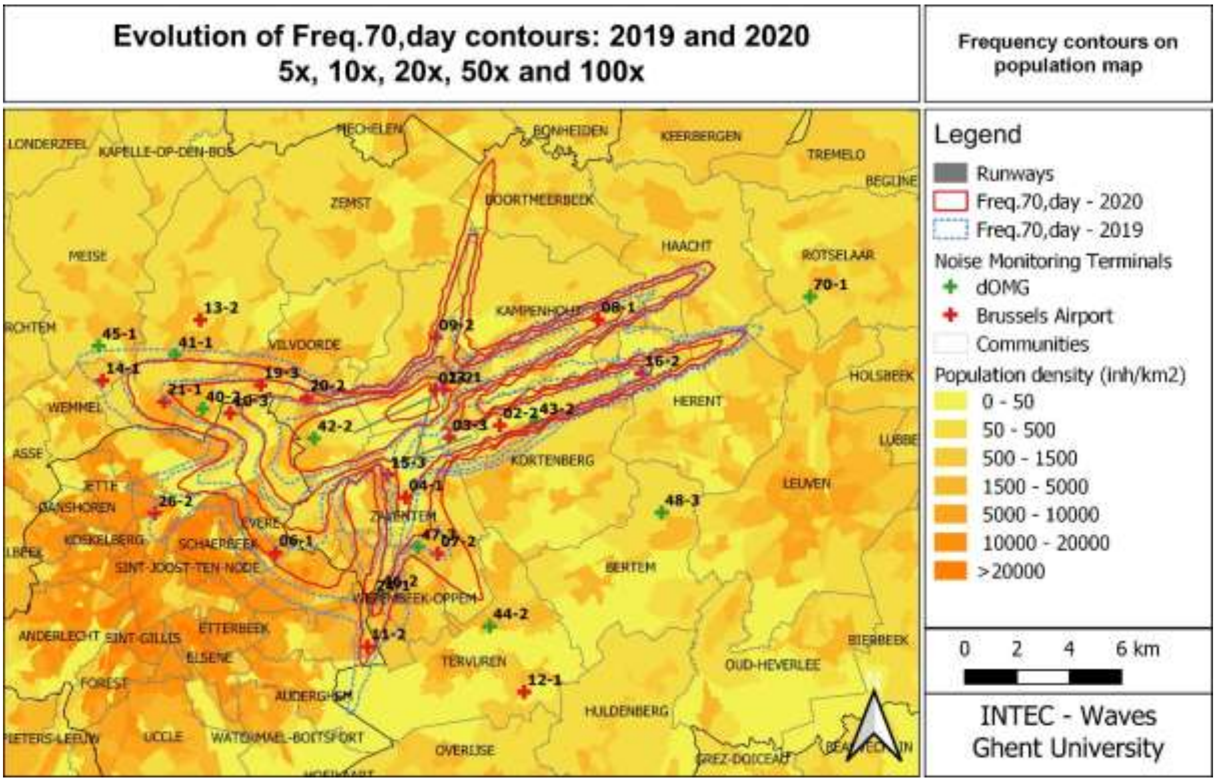
3.3.5 Freq.70,day contours (day 07:00 - 23:00)

The Freq.70,day contours are calculated for an evaluation period consisting of both the L_{day} and $L_{evening}$ evaluation periods. The evolution of the Freq.70,day contours reflects the general decrease in traffic, changes in the runway usage and the changes in the use of routes (see Figure 9).
The contours here also shrank in line with the decrease in the number of departures. The evaluation in number of events is a linear scale presented with non-linear contour intervals, in contrast to the logarithmic scale for noise exposure expressed in equivalent sound level. In this exceptional scenario with the sharp decrease in the number of flight movements due to the pandemic, the difference in these evaluation methods becomes clearly visible.

The contour for the departures of runway 25R shrank by at least a factor of two, and even more so for the straight ahead route due to the effect of the reduced number of landings on runways 07L and 07R. The landing contour for runway 01 is getting smaller. The drop in the number of departures from runway 07L and 07R is visible in the narrowing of the associated contours. The outer landing contours for runways 25R and 25L are relatively less affected and this mainly means that the number of loud events is less linked to the total number of flight movements but rather to the presence of flights. The lobe for departures from runway 19 increased in line with the increase in the number of departures on this runway and a similar effect can be observed for the landings on runway 01.

The total surface area inside the contour of '5x above 70 dB(A)' rose in 2020 by only 19.0 % compared with 2019 (from 13,621 ha to 11,036 ha). The number of residents inside the Freq.70,day contour of 5 events decreased by 42.8% (from 284,427 to 159,753). Here, too, the contours shrank mainly in densely populated areas.

Figure 9: Freq.70,day contours around Brussels Airport in 2019 (dotted blue) and 2020 (solid red).



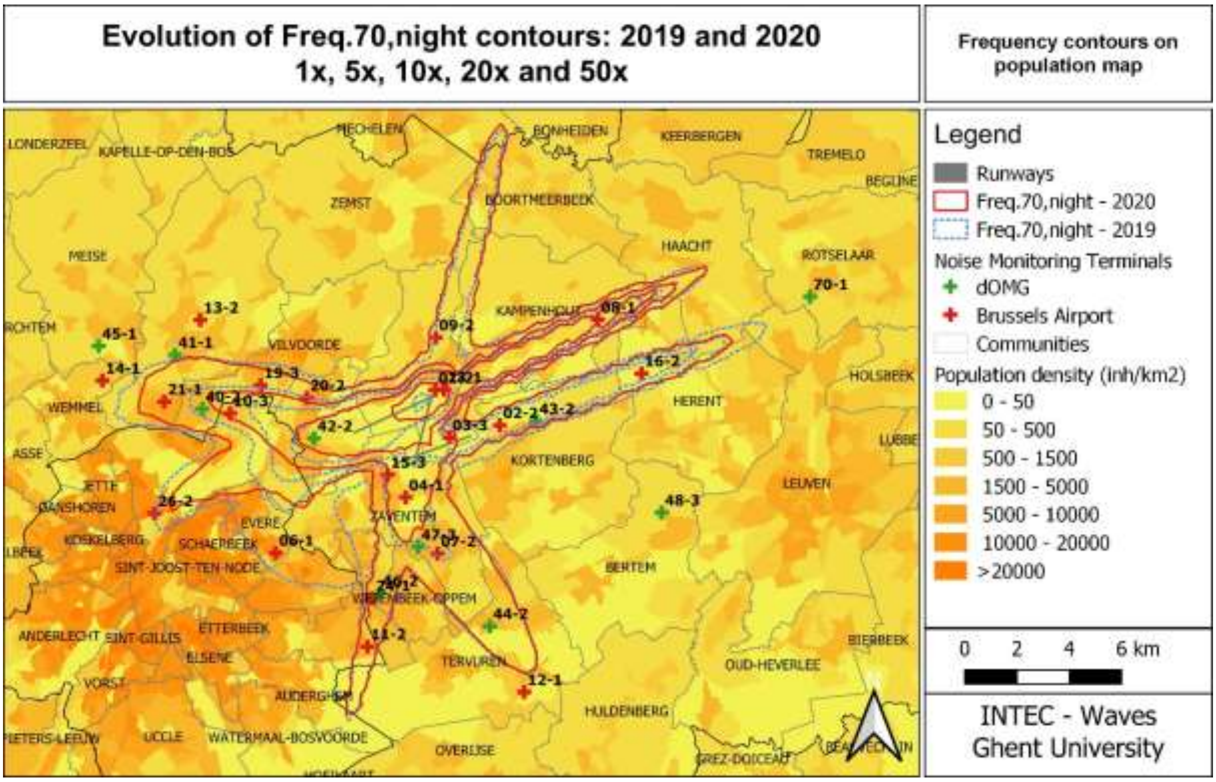
3.3.6 Freq.70,night contours (night 23:00-07:00)

The Freq.70,night contours are calculated for the same evaluation period as the L_{night}. The evolution of the Freq.70,night contours reflects the general decrease in traffic and the changes in the runway and route usage that were discussed for L_{night}. The choice of contour values for Freq,70, night are more sensitive to changes in flight movements in 2020.

The outer contour, for one event above 70 dBA, barely changes for the landings on runway 19, runway 25R, 01 and for the take-offs on runway 19. There is a contraction proportional to the reduction in the number of movements for departures from runway 25R with a turn to the right and straight ahead and for landings on 25L. For the landings on runway 25L, the higher contours were completely eliminated, given the average of less than 5 events per night in 2020. The most important change occurs at the departures from runway 25R with a turn to the left where all contours shrank by at least a factor of 5 (the 1x contour for 2020 corresponds to the 5x contour of 2019). The 50x contour did not occur in 2020.

The total surface area inside the 1x above the 70 dB(A) contour during the night declined in 2020 by 18.6% compared to 2019 (from 13,489 to 10,976 ha). The number of residences inside this contour dropped by 49.4% (from 225,698 to 114,295).

Figure 10: Freq.70,night contours around Brussels Airport in 2019 (dotted blue) and 2020 (solid red).

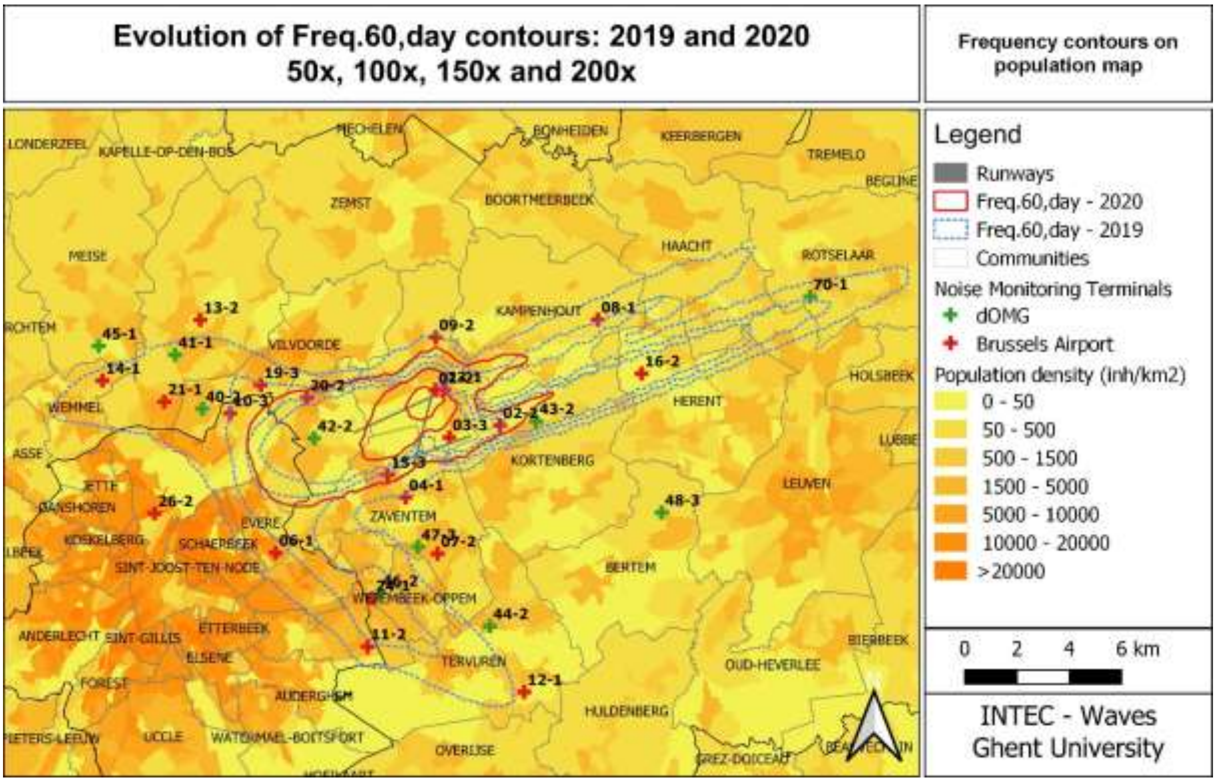


3.3.7 Freq.60,day contours (day 07:00-23:00)

The Freq.60,day contours are calculated for an evaluation period consisting of both the L_{day} and $L_{evening}$ evaluation periods. The evolution of the Freq.60,day contours reflects the changes in traffic density and runway and route usage and the changes that have been discussed These contours shrank by a factor of three (the 50x contour for 2020 coincided with the 150x contour for 2019). The impact on this parameter is uniform across all movements, take-offs and landings and for all runways. The 200x contour did not occur in 2020.

The total surface area inside the Freq.60,day-contour of 50x above 60 dB(A) dropped very sharply in 2020 by 76.8% compared with 2019 (from 16,467 ha to 3,824). The number of residents inside the Freq.60,day contour of 50 times above the 60 dB(A) also dropped sharply by 87.4% (from 290,915 to 36,790).

Figure 11: Freq.60,day contours around Brussels Airport in 2019 (dotted blue) and 2020 (solid red).

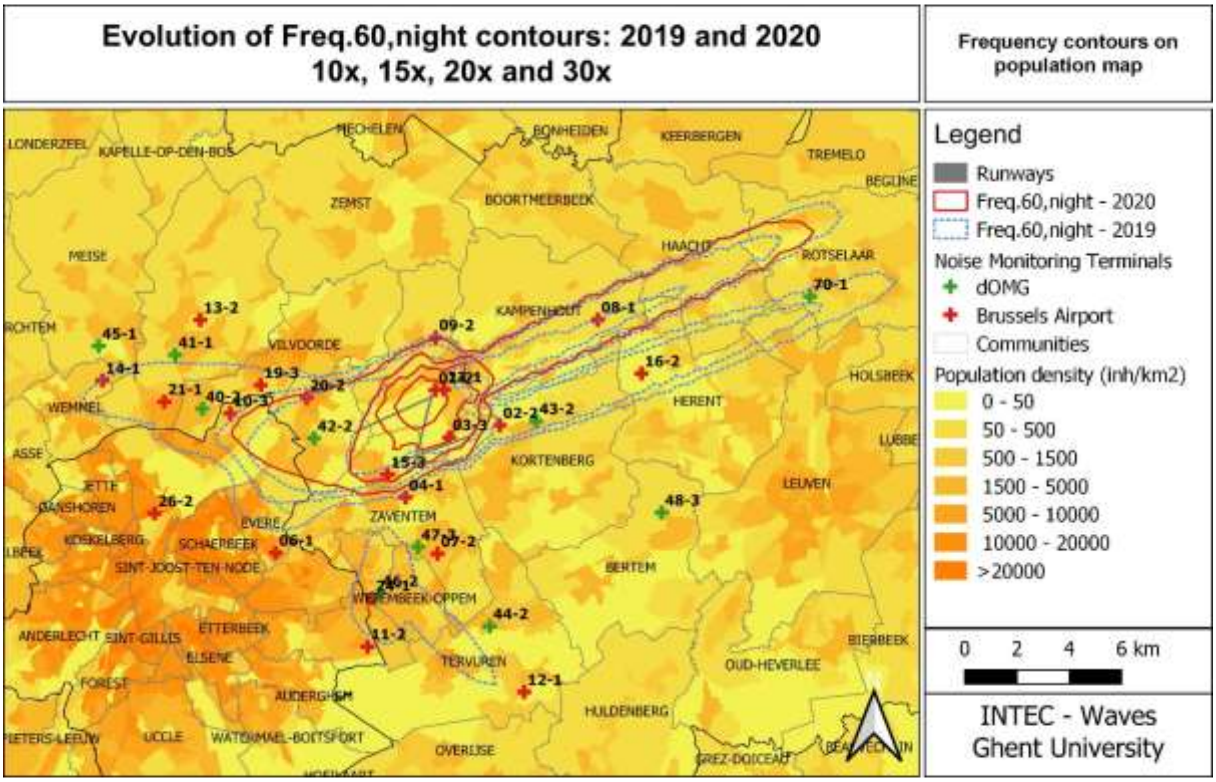


3.3.8 Freq.60,night - contours (night 23:00-07:00)

The Freq.60,night contours are calculated for the same evaluation period as the L_{night}. The evolution of the Freq.60,night contours reflects the changes in traffic density and runway and route usage. There was also a major impact on this evaluation. This parameter and the choices of the contours describe the impact of the changes in runway and route use very well. The outer landing contour for runway 25R remains almost identical, but the higher contours no longer occur. The contour for the departures from runway 25R with a turn to the right shrank by a factor of less than two (10x for 2020 was between the 15x and 20x contour for 2019), the contour for the route straight ahead and the turn to the left almost fully disappeared. The contours for landings on runway 25L fully disappeared as well. The contour that arises at the intersection of the landings on runway 01 and the left turn for the departures of runway 25R fully disappeared as well.

The total surface area inside the Freq.60,night contour with 10x above 60 dB(A) dropped in 2020 by 56.4% compared with 2019 (from 13,352 ha to 5,827 ha). The number of residents inside the Freq.60,night contour of 10x above 60 dB(A) decreased by 72.0% (from 163,518 to 45.803).

Figure 12:Freq.60,night contours around Brussels Airport for 2019 (dotted blue) and 2020 (solid red).



3.4 Number of people who are potentially seriously inconvenienced

The number of people who potentially seriously inconvenienced is determined on the basis of the calculated L_{den} and the exposure-effect relationship for serious inconvenience, as stipulated in VLAREM 2 (see 2.2). Number of people who are potentially seriously inconvenienced is also reported per municipality. The most recent population numbers available (01 January 2020) are used in this report.

Table 9 shows the results for the number of potentially seriously inconvenienced persons. The results are also shown graphically in Figure 13.

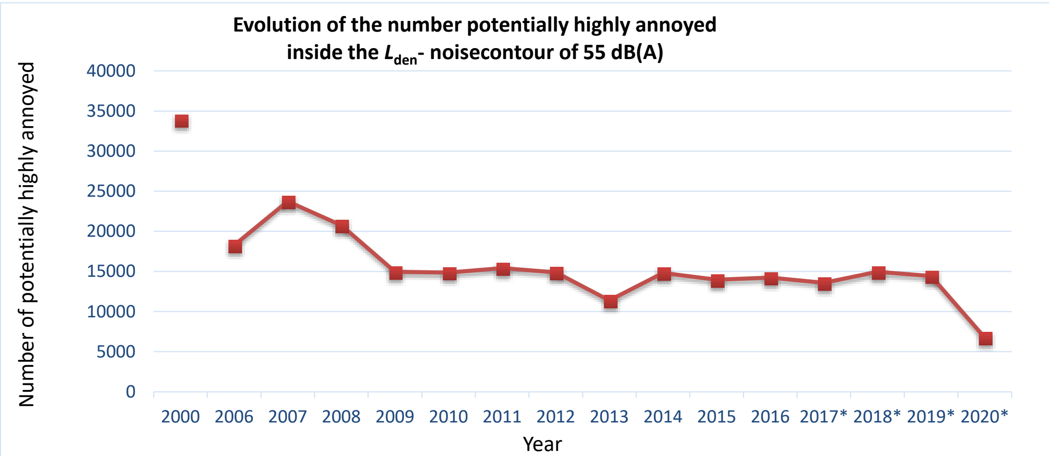
The total number of potentially seriously inconvenienced persons in 2020 within the contour of 55 dB(A) is 6,756, a decrease of 53.1% in comparison to 2019. The results are based on the same methodology for the allocation of the population (based on address points) and show a real change in exposure, including the increase in the population density.

Many municipalities fall outside the L_{den} 55 dB contour in 2020, in particular: Evere, Grimbergen, Leuven, Sint Lambrechts-Woluwe and Sint-Pieters-Woluwe. In 2019, a total of 2,586 potentially seriously inconvenienced people were reported here. Zemst enters the list of municipalities exposed due to the landing contour on runway 19 with 2 potentially seriously inconvenienced people and is also the only municipality with an increase. This is a direct result of the renovation of runway 25R. Other municipalities saw a sharp decrease: Brussels (-939), Haacht (-49), Herent (-133), Kampenhout (-110), Kortenberg (-394), Kraainem (-371), Machelen (-838), Steenokkerzeel (-157). Vilvoorde (-990), Wezenbeek-Oppen (-215) and Zaventem (-882). The most exposed municipalities in absolute numbers are Machelen, Zaventem, Steenokkerzeel and Brussels, in total 6,122 potentially seriously inconvenienced or 90.6% of the total number.

Table 9: Evolution of the number of people who are potentially seriously inconvenienced inside the L_{den} 55 dB(A) noise contour.

Year	2000	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
INM version	7.0b	7.0b	7.0b	7.0b	7.0b	7.0b	7.0b	7.0b	7.0b	7.0b	7.0b	7.0b	7.0b	7.0b	7.0b	7.0b
Method	opp	opp	opp	opp	opp	opp	opp	opp	opp	opp	opp	opp	adres	adres	adres	adres
Population data	1jan'00	1jan'03	1jan'06	1jan'07	1jan'07	1jan'08	1jan'08	1jan'10	1jan'10	1jan'10	1jan'11	1jan'11	1jan'16	1jan'17	1jan'19	1jan'20
Brussel	2,441	1,254	1,691	1,447	1,131	1,115	1,061	1,080	928	1,780	1,739	1,789	1,803	1,889	1,898	959
Evere	3,648	2,987	3,566	3,325	2,903	2,738	2,599	2,306	1,142	2,975	1,443	1,850	1,505	1,875	1,754	0
Grimbergen	3,111	479	1,305	638	202	132	193	120	0	175	428	517	449	440	485	0
Haacht	96	103	119	58	36	31	37	37	24	50	115	70	78	66	51	2
Herent	186	88	140	162	119	115	123	134	107	152	111	161	133	136	136	3
Huldenberg	112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kampenhout	529	747	727	582	453	483	461	399	430	469	648	566	457	563	439	329
Kortenberg	664	548	621	604	512	526	497	422	603	443	366	438	431	521	495	101
Kraainem	1,453	934	1,373	1,277	673	669	667	500	589	111	368	379	388	524	393	22
Leuven	70		9	22	2	1	3	5	0	11	0	0	13	18	22	0
Machelen	3,433	2,411	2,724	2,635	2,439	2,392	2,470	2,573	2,278	2,505	2,598	2,649	3,015	2,995	3,032	2,194
Meise	506	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Overijse	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rotselaar	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schaarbeek	2,026	995	1,937	1,440	603	1,153	1,652	1,703	76	1,647	354	956	6	165	0	0
Sint-L.-Woluwe	1,515	382	1,218	994	489	290	196	150	0	0	0	1	142	44	241	0
Sint-P.-Woluwe	642	411	798	607	396	477	270	82	390	0	79	102	90	338	85	0
Steenokkerzeel	1,769	1,530	1,584	1,471	1,327	1,351	1,360	1,409	1,455	1,439	1,675	1,525	1,506	1,595	1,545	1,388
Tervuren	1,550	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vilvoorde	2,622	1,158	1,483	1,177	894	812	868	851	302	1,012	1,120	1,136	1,146	1,103	1,129	139
Wemmel	142	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wezembeek-O.	1,818	739	878	670	359	425	408	399	457	172	282	252	268	360	250	35
Zaventem	5,478	3,490	3,558	3,628	2,411	2,152	2,544	2,716	2,618	1,884	2,638	1,835	2,144	2,315	2,464	1,582
Zemst	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Eindtotaal	**33,889**	**18,257**	**23,732**	**20,737**	**14,950**	**14,861**	**15,409**	**14,886**	**11,399**	**14,825**	**13,965**	**14,226**	**13,575**	**14,948**	**14,420**	**6,756**

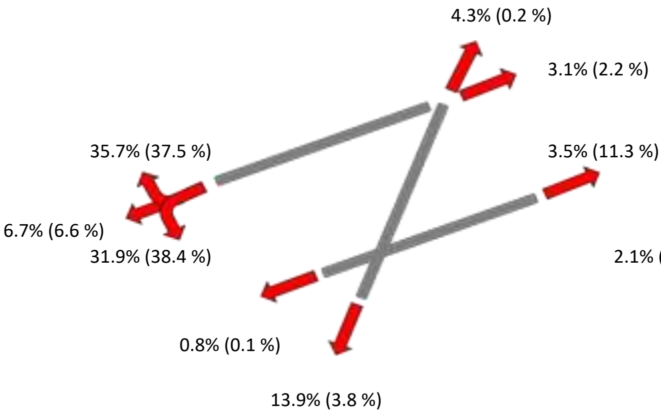
Figure 13: Evolution of the number of people who are potentially seriously inconvenienced inside the L_{den} 55 dB(A) noise contour. From 2017, the new methodology (use of the address points, including annual population evolution) is accented with *.

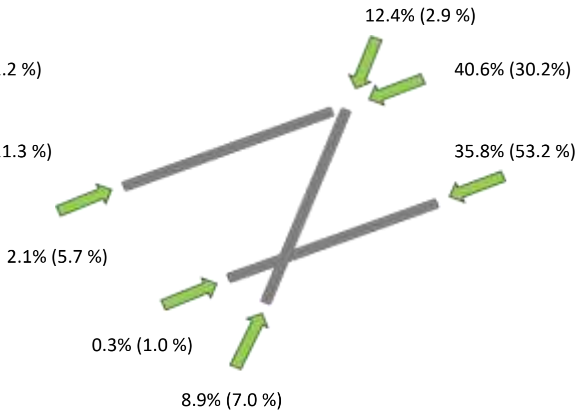


4 Appendices

4.1 Runway and route usage

Table 10: Overview of the number of departures and arrivals annually and per runway, including changes in comparison to the previous year (all flights, day, evening and night). The figures between brackets are the data for 2019.

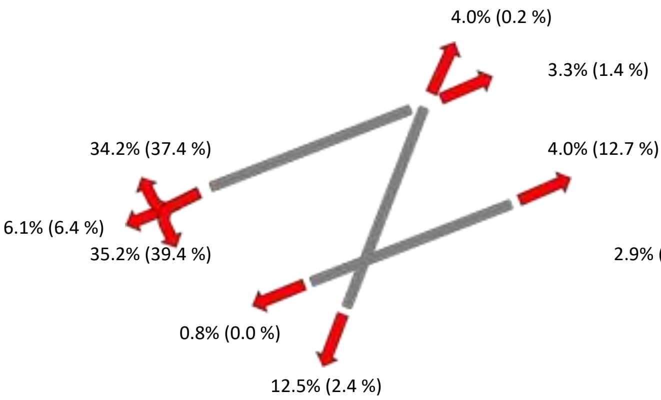


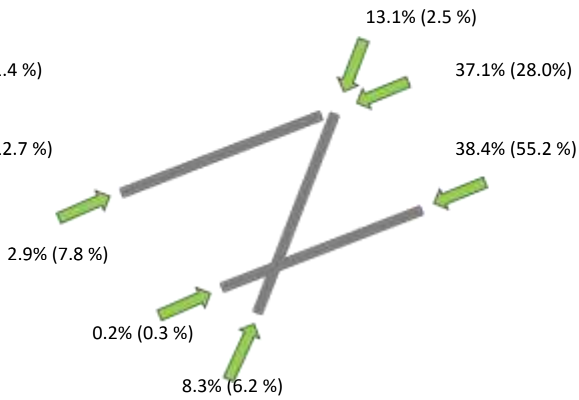


All flights (day. evening. night)				
Departures				
	Number		Percentage	
Runway	2019	2020	2019	2020
01	213	2,082	0.2%	4.3%
07L	2,546	1,502	2.2%	3.1%
07R	13,202	1,661	11.3%	3.5%
19	4,451	6,665	3.8%	13.9%
25L	121	367	0.1%	0.8%
25R	96,694	35,623	82.5%	74.4%

All flights (day. evening. night)				
Landings				
	Number		Percentage	
Runway	2019	2020	2019	2020
01	8,185	4,265	7.0%	8.9%
07L	6,640	993	5.7%	2.1%
07R	1,176	135	1.0%	0.3%
19	3,384	5,926	2.9%	12.4%
25L	62,399	17,162	53.2%	35.8%
25R	35,449	19,430	30.2%	40.6%

Table 11: Overview of the number of departures and arrivals annually and per runway, including changes in comparison to the previous year: day. The figures between brackets are the data for 2019.

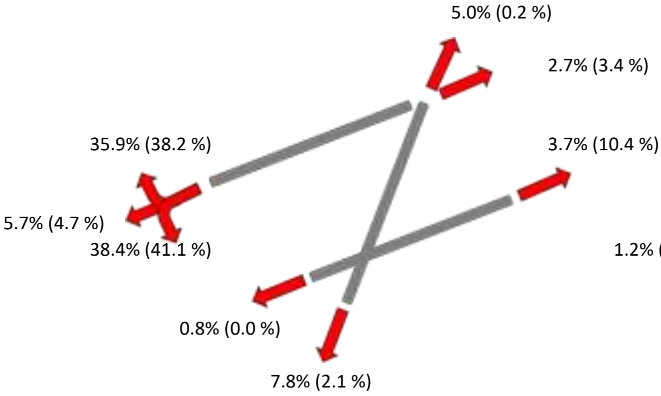


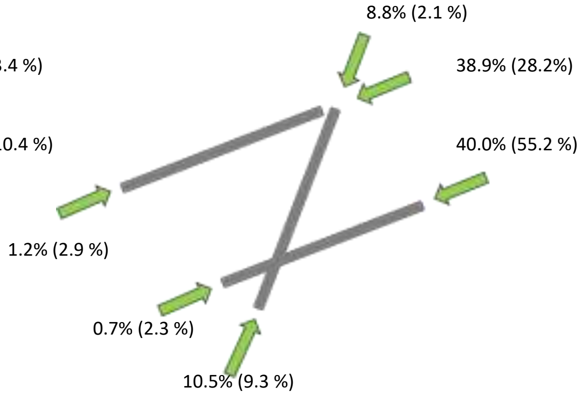


Flights day				
Departures				
	Number		Percentage	
Runway	2019	2020	2019	2020
01	167	1,270	0.2%	4.0%
07L	1,126	1,051	1.4%	3.3%
07R	10,006	1,290	12.7%	4.0%
19	1,906	4,000	2.4%	12.5%
25L	17	246	0.0%	0.8%
25R	65,342	24,185	83.2%	75.5%

Flights day				
Landings				
	Number		Percentage	
Runway	2019	2020	2019	2020
01	4,670	2,513	6.2%	8.3%
07L	5,809	862	7.8%	2.9%
07R	240	66	0.3%	0.2%
19	1,836	3,940	2.5%	13.1%
25L	41,258	11,584	55.2%	38.4%
25R	20,975	11,195	28.0%	37.1%

Table 12: Overview of the number of departures and arrivals annually and per runway, including changes in comparison to the previous year: evening. The figures between brackets are the data for 2019.

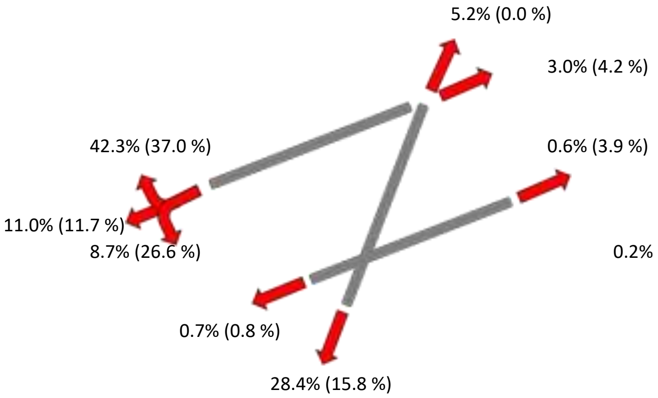


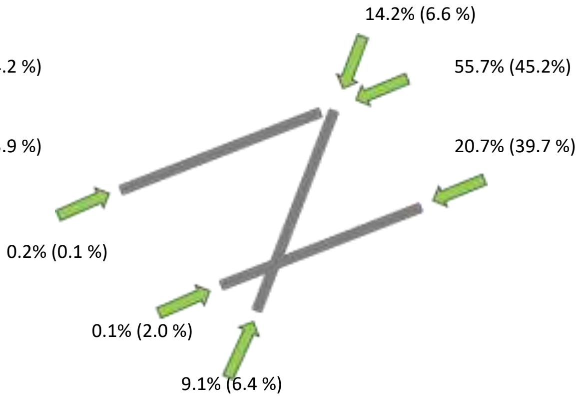


Flights evening				
Departures				
	Number		Percentage	
Runway	2019	2020	2019	2020
01	46	449	0.2%	5.0%
07L	891	240	3.4%	2.7%
07R	2,702	332	10.4%	3.7%
19	535	697	2.1%	7.8%
25L	3	72	0.0%	0.8%
25R	21,799	7,142	83.9%	80.0%

Flights evening				
Landings				
	Number		Percentage	
Runway	2019	2020	2019	2020
01	2,576	1,032	9.3%	10.5%
07L	812	116	2.9%	1.2%
07R	636	65	2.3%	0.7%
19	581	866	2.1%	8.8%
25L	15,315	3,945	55.2%	40.0%
25R	7,836	3,837	28.2%	38.9%

Table 13: Overview of the number of departures and arrivals annually and per runway, including changes in comparison to the previous year: night. The figures between brackets are the data for 2018.





Flights night				
Departures				
	Number		Percentage	
Runway	2019	2020	2019	2020
01	0	363	0.0%	5.2%
07L	529	211	4.2%	3.0%
07R	494	39	3.9%	0.6%
19	2,010	1,968	15.8%	28.4%
25L	101	49	0.8%	0.7%
25R	9,553	4,296	75.3%	62.0%

Flights night				
Landings				
	Number		Percentage	
Runway	2019	2020	2019	2020
01	939	720	6.4%	9.1%
07L	19	15	0.1%	0.2%
07R	300	4	2.0%	0.1%
19	967	1,120	6.6%	14.2%
25L	5,826	1,633	39.7%	20.7%
25R	6,638	4,398	45.2%	55.7%

4.2 Location of the measuring stations

Figure 14: Location of the measuring stations.

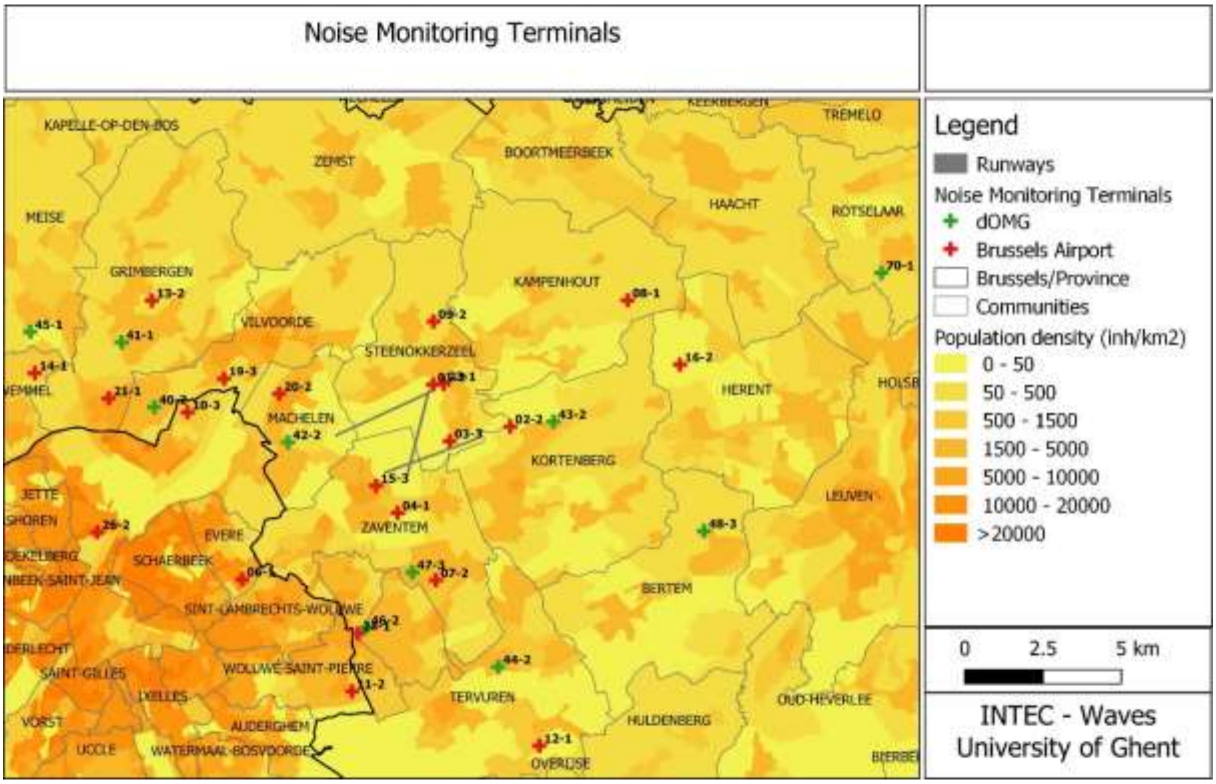


Table 14: Overview of the measuring points.

Code	Name
NMT01-2	STEENOKKERZEEL
NMT02-2	KORTENBERG
NMT03-3	HUMELGEM-Airside
NMT04-1	NOSSEGEM
NMT06-1	EVERE
NMT07-2	STERREBEEK
NMT08-1	KAMPENHOUT
NMT09-2	PERK
NMT10-3	NEDER-OVER-HEEMBEEK
NMT11-2	SINT-PIETERS-WOLUWE
NMT12-1	DUISBURG
NMT13-2	GRIMBERGEN
NMT14-1	WEMMEL
NMT15-3	ZAVENTEM
NMT16-2	VELTEM

Code	Name
NMT19-3/4	VILVOORDE
NMT20-2/3+	MACHELEN
NMT21-1	STROMBEEK-BEVER
NMT23-1	STEENOKKERZEEL
NMT24-1	KRAAINEM
NMT26-2	BRUSSEL
NMT40-2*	KONINGSLO
NMT41-1*	GRIMBERGEN
NMT42-2*	DIEGEM
NMT43-2*	ERPS-KWERPS
NMT44-2*	TERVUREN
NMT45-1*	MEISE
NMT46-2*	WEZEMBEEK-OPPEM
NMT47-3*	ZAVENTEM
NMT48-3*	BERTEM
NMT70-1*	ROTSELAAR

4.3 Results of contour calculations for 2020

4.3.1 Surface area per contour zone and per municipality

Table 15: Surface area per L_{day} contour zone and municipality – 2020.

Area (ha)	L_{day} contour zone in dB(A) (day 07:00-19:00)					
Municipality	**55-60**	**60-65**	**65-70**	**70-75**	**>75**	**Total**
Brussel	158	1	-	-	-	159
Kampenhout	156	16	-	-	-	171
Kortenberg	152	30	2	-	-	185
Machelen	362	227	79	20	-	687
Steenokkerzeel	400	243	135	133	0	910
Zaventem	294	86	32	23	-	434
Totaal	**1,521**	**602**	**247**	**176**	**0**	**2,547**

Table 16: Surface area per $L_{evening}$ contour zone and municipality – 2020.

Area (ha)	$L_{evening}$ contour zone in dB(A) (evening 19:00-23:00)						
Municipality	**50-55**	**55-60**	**60-65**	**65-70**	**70-75**	**>75**	**Total**
Brussel	549	374	19	-	-	-	942
Evere	162	-	-	-	-	-	162
Grimbergen	160	-	-	-	-	-	160
Haacht	58	-	-	-	-	-	58
Herent	169	-	-	-	-	-	169
Kampenhout	635	166	17	-	-	-	818
Kortenberg	347	134	26	1	-	-	509
Kraainem	87	-	-	-	-	-	87
Machelen	267	362	240	116	-	-	985
Steenokkerzeel	636	403	244	267	0	-	1,550
Vilvoorde	503	15	-	-	-	-	517
Wezembeek-Oppem	67	-	-	-	-	-	67
Zaventem	800	297	75	57	-	-	1,228
Total	**4,440**	**1,751**	**621**	**441**	**0**	**-**	**7,252**

Table 17: Surface area per L_{night} contour zone and municipality – 2020.

Area (ha)	L_{night} contour zone in dB(A) (night 23:00-07:00)						
Municipality	**45-50**	**50-55**	**55-60**	**60-65**	**65-70**	**>70**	**Total**
Boortmeerbeek	52	-	-	-	-	-	52
Brussel	653	112	-	-	-	-	765
Evere	0	-	-	-	-	-	0
Grimbergen	150	-	-	-	-	-	150
Haacht	425	0	-	-	-	-	425
Herent	278	-	-	-	-	-	278
Kampenhout	745	416	103	7	-	-	1,272
Kortenberg	325	138	26	2	-	-	491
Kraainem	111	3	-	-	-	-	114
Machelen	349	414	181	44	12	-	1,000
Rotselaar	10	-	-	-	-	-	10
Steenokkerzeel	548	432	289	205	155	0	1,630
Tervuren	32	-	-	-	-	-	32
Vilvoorde	475	12	-	-	-	-	487
Wezembeek-Oppem	144	1	-	-	-	-	144
Zaventem	1,067	487	157	50	25	-	1,785
Zemst	56	-	-	-	-	-	56
Total	**5,418**	**2,016**	**756**	**308**	**193**	**0**	**8,691**

Table 18: Surface area per L_{den} contour zone and municipality – 2020.

Area (ha)	L_{den} contour zone in dB(A)					
Municipality	**55-60**	**60-65**	**65-70**	**70-75**	**>75**	**Total**
Brussel	597	58	-	-	-	655
Haacht	62	-	-	-	-	62
Herent	68	-	-	-	-	68
Kampenhout	581	178	24	-	-	783
Kortenberg	285	79	13	-	-	377
Kraainem	39	-	-	-	-	39
Machelen	373	341	149	36	10	908
Steenokkerzeel	562	350	231	143	106	1,392
Vilvoorde	196	-	-	-	-	196
Wezembeek-Oppem	24	-	-	-	-	24
Zaventem	653	263	77	29	18	1,041
Zemst	3	-	-	-	-	3
Total	**3,445**	**1,270**	**494**	**208**	**133**	**5,549**

Table 19: Surface area per Freq.70,day contour zone and municipality – 2020.

Area (ha)	**Freq.70,day contour zone (07:00-23:00)**					
Municipality	**5-10**	**10-20**	**20-50**	**50-100**	**>100**	**Total**
Boortmeerbeek	149	-	-	-	-	149
Brussel	292	344	449	32	-	1,118
Evere	333	104	-	-	-	437
Grimbergen	550	27	-	-	-	577
Haacht	173	151	-	-	-	324
Herent	134	177	71	-	-	382
Kampenhout	406	444	435	-	-	1,285
Kortenberg	119	149	436	-	-	704
Kraainem	218	72	-	-	-	290
Machelen	71	126	291	517	-	1,005
Meise	2	-	-	-	-	2
Schaarbeek	9	-	-	-	-	9
Sint-Lambrechts-Woluwe	246	-	-	-	-	246
Sint-Pieters-Woluwe	93	-	-	-	-	93
Steenokkerzeel	246	360	519	330	156	1,612
Vilvoorde	211	341	29	-	-	581
Wemmel	1	-	-	-	-	1
Wezembeek-Oppem	92	59	-	-	-	151
Zaventem	936	615	370	78	-	1,999
Zemst	55	20	-	-	-	75
Total	**4,334**	**2,988**	**2,600**	**958**	**156**	**11,036**

Table 20: Surface area per Freq.70,night contour zone and municipality – 2020.

Area (ha)	**Freq.70,night contour zone (23:00-07:00)**				
Municipality	**1-5**	**5-10**	**10-20**	**>20**	**Total**
Boortmeerbeek	275	-	-	-	275
Brussel	807	326	-	-	1,133
Evere	70	-	-	-	70
Grimbergen	469	-	-	-	469
Haacht	172	43	14	-	230
Herent	363	9	0	-	372
Kampenhout	626	290	422	-	1,339
Kortenberg	627	-	-	-	627
Kraainem	215	-	-	-	215
Machelen	270	341	363	-	974
Mechelen	50	-	-	-	50
Oudergem	2	-	-	-	2
Schaarbeek	15	-	-	-	15
Sint-Pieters-Woluwe	126	-	-	-	126
Steenokkerzeel	656	291	446	204	1,597
Tervuren	658	-	-	-	658
Vilvoorde	457	100	-	-	557
Wezembeek-Oppem	263	-	-	-	263
Zaventem	1,173	590	140	-	1,903
Zemst	102	-	-	-	102
Total	**7,397**	**1,990**	**1,385**	**204**	**10,976**

Table 21: Surface area per Freq.60,day contour zone and municipality – 2020.

Area (ha)	Freq.60,day contour zone (day 07:00-23:00)				
Municipality	**50-100**	**100-150**	**150-200**	**>200**	**Total**
Brussel	547	-	-	-	547
Evere	0	-	-	-	0
Kampenhout	133	-	-	-	133
Kortenberg	170	-	-	-	170
Machelen	970	22	-	-	992
Steenokkerzeel	844	441	117	-	1,403
Vilvoorde	21	-	-	-	21
Zaventem	386	172	-	-	558
Total	**3,072**	**635**	**117**	**-**	**3,824**

Table 22: Surface area per Freq.60,night contour zone and municipality – 2020.

Area (ha)	Freq.60,night contour zone (23:00-07:00)				
Municipality	**10-15**	**15-20**	**20-30**	**>30**	**Total**
Brussel	405	-	-	-	405
Haacht	641	-	-	-	641
Herent	102	-	-	-	102
Kampenhout	1,160	53	4	-	1,217
Kortenberg	40	-	-	-	40
Machelen	861	62	-	-	923
Rotselaar	282	-	-	-	282
Steenokkerzeel	408	416	494	265	1,583
Vilvoorde	17	-	-	-	17
Zaventem	197	351	69	2	619
Total	**4,111**	**882**	**567**	**267**	**5,827**

4.3.2 Number of residents per contour zone and per municipality

Table 23: Number of residents per L_{day} contour zone and municipality – 2020.

Number of Inhabitants	L_{day} contour zone in dB(A) (day 07:00-19:00)					
Municipality	**55-60**	**60-65**	**65-70**	**70-75**	**>75**	**Total**
Brussel	3,693	41	-	-	-	3,734
Kampenhout	325	138	-	-	-	462
Kortenberg	177	-	-	-	-	177
Machelen	5,741	3,393	10	-	-	9,144
Steenokkerzeel	2,744	618	111	-	-	3,473
Zaventem	1,515	1	-	-	-	1,515
Total	**14,195**	**4,191**	**122**	**-**	**-**	**18,507**

Table 24: Number of residents per $L_{evening}$ contour zone and municipality – 2020.

Number of Inhabitants	$L_{evening}$ contour zone in dB(A) (evening 19:00-23:00)						
Municipality	**50-55**	**55-60**	**60-65**	**65-70**	**70-75**	**>75**	**Total**
Brussel	5,936	5,056	104	-	-	-	11,096
Evere	8,428	-	-	-	-	-	8,428
Grimbergen	2,664	-	-	-	-	-	2,664
Haacht	16	-	-	-	-	-	16
Herent	239	-	-	-	-	-	239
Kampenhout	2,125	380	138	-	-	-	2,642
Kortenberg	1,339	136	-	-	-	-	1,475
Kraainem	1,201	-	-	-	-	-	1,201
Machelen	4,473	4,233	4,230	183	-	-	13,118
Steenokkerzeel	5,558	2,984	621	78	-	-	9,241
Vilvoorde	9,980	82	-	-	-	-	10,062
Wezembeek-Oppem	1,447	-	-	-	-	-	1,447
Zaventem	11,235	3,397	1	-	-	-	14,633
Total	**54,642**	**16,266**	**5,093**	**261**	**-**	**-**	**76,262**

Table 25: Number of residents per L_{night} contour zone and municipality – 2020.

Number of Inhabitants	L_{night} contour zone in dB(A) (night 23:00-07:00)						
Municipality	**45-50**	**50-55**	**55-60**	**60-65**	**65-70**	**>70**	**Total**
Boortmeerbeek	301	-	-	-	-	-	301
Brussel	7,750	1,467	-	-	-	-	9,217
Grimbergen	4,175	-	-	-	-	-	4,175
Haacht	1,239	2	-	-	-	-	1,241
Herent	615	-	-	-	-	-	615
Kampenhout	2,757	1,007	207	75	-	-	4,047
Kortenberg	1,305	127	-	-	-	-	1,432
Kraainem	1,866	-	-	-	-	-	1,866
Machelen	5,019	8,241	588	2	-	-	13,850
Steenokkerzeel	4,015	3,905	1,387	312	57	-	9,676
Tervuren	459	-	-	-	-	-	459
Vilvoorde	9,222	80	-	-	-	-	9,302
Wezembeek-Oppem	2,395	-	-	-	-	-	2,395
Zaventem	19,314	3,544	34	0	-	-	22,893
Zemst	100	-	-	-	-	-	100
Total	**60,530**	**18,372**	**2,217**	**390**	**57**	**-**	**81,566**

Table 26: Number of residents per L_{den} contour zone and municipality – 2020.

Number of Inhabitants	L_{den} **contour zone in dB(A)**					
Municipality	**55-60**	**60-65**	**65-70**	**70-75**	**>75**	**Total**
Brussel	6,397	519	-	-	-	6,917
Haacht	16	-	-	-	-	16
Herent	29	-	-	-	-	29
Kampenhout	1,739	377	148	-	-	2,263
Kortenberg	795	38	-	-	-	833
Kraainem	208	-	-	-	-	208
Machelen	5,669	6,135	645	-	-	12,449
Steenokkerzeel	5,402	2,386	567	110	-	8,465
Vilvoorde	1,317	-	-	-	-	1,317
Wezembeek-Oppem	337	-	-	-	-	337
Zaventem	12,310	346	1	-	-	12,657
Zemst	17	-	-	-	-	17
Total	**34,236**	**9,801**	**1,361**	**110**	**-**	**45,508**

Table 27: Number of residents per Freq.70,day contour zone and municipality – 2020.

Number of Inhabitants	**Freq.70,day contour zone (07:00-23:00)**					
Municipality	**5-10**	**10-20**	**20-50**	**50-100**	**>100**	**Total**
Boortmeerbeek	1,128	-	-	-	-	1,128
Brussel	4,068	2,416	5,155	294	-	11,933
Evere	28,428	4,596	-	-	-	33,024
Grimbergen	13,506	725	-	-	-	14,231
Haacht	563	75	-	-	-	638
Herent	231	527	37	-	-	794
Kampenhout	1,104	1,333	1,195	-	-	3,631
Kortenberg	742	928	1,334	-	-	3,003
Kraainem	6,133	1,051	-	-	-	7,183
Machelen	1,311	2,427	4,173	5,697	-	13,608
Meise	21	-	-	-	-	21
Schaarbeek	196	-	-	-	-	196
Sint-Lambrechts-Woluwe	14,655	-	-	-	-	14,655
Sint-Pieters-Woluwe	3,662	-	-	-	-	3,662
Steenokkerzeel	1,233	2,906	3,247	1,613	-	8,999
Vilvoorde	5,495	6,588	143	-	-	12,226
Wezembeek-Oppem	1,977	1,316	-	-	-	3,293
Zaventem	18,294	6,115	2,364	646	-	27,418
Zemst	52	55	-	-	-	107
Total	**102,799**	**31,056**	**17,647**	**8,250**	**-**	**159,753**

Table 28: Number of residents per Freq.70,night contour zone and municipality – 2020.

Number of Inhabitants	Freq.70,night contour zone (23:00-07:00)				
Municipality	1-5	5-10	10-20	>20	Total
Boortmeerbeek	2,502	-	-	-	2,502
Brussel	9,984	2,947	-	-	12,930
Evere	1,850	-	-	-	1,850
Grimbergen	13,723	-	-	-	13,723
Haacht	149	16	2	-	167
Herent	789	-	-	-	789
Kampenhout	1,862	996	1,116	-	3,974
Kortenberg	2,486	-	-	-	2,486
Kraainem	4,490	-	-	-	4,490
Machelen	4,337	6,585	2,602	-	13,523
Mechelen	280	-	-	-	280
Schaarbeek	1,266	-	-	-	1,266
Sint-Pieters-Woluwe	3,708	-	-	-	3,708
Steenokkerzeel	3,981	2,347	2,382	496	9,206
Tervuren	4,394	-	-	-	4,394
Vilvoorde	11,572	182	-	-	11,754
Wezembeek-Oppem	5,189	-	-	-	5,189
Zaventem	16,928	4,829	141	-	21,899
Zemst	164	-	-	-	164
Total	**89,653**	**17,902**	**6,243**	**496**	**114,295**

Table 29: Number of residents per Freq.60,day contour zone and municipality – 2020.

Number of Inhabitants	Freq.60,day contour zone (07:00-23:00)				
Municipality	50-100	100-150	150-200	>200	Total
Brussel	5,948	-	-	-	5,948
Evere	9	-	-	-	9
Kampenhout	594	-	-	-	594
Kortenberg	152	-	-	-	152
Machelen	13,366	-	-	-	13,366
Steenokkerzeel	5,482	2,849	-	-	8,331
Vilvoorde	82	-	-	-	82
Zaventem	6,968	1,341	-	-	8,309
Total	**32,599**	**4,191**	**-**	**-**	**36,790**

Table 30: Number of residents per Freq.60,night contour zone and municipality – 2020.

Number of Inhabitants	Freq.60,night contour zone (23:00-07:00)				
Municipality	10-15	15-20	20-30	>30	Total
Brussel	5,103	-	-	-	5,103
Haacht	2,113	-	-	-	2,113
Herent	196	-	-	-	196
Kampenhout	4,034	501	-	-	4,535
Kortenberg	24	-	-	-	24
Machelen	12,733	2	-	-	12,735
Rotselaar	767	-	-	-	767
Steenokkerzeel	2,132	2,527	4,365	539	9,562
Vilvoorde	82	-	-	-	82
Zaventem	3,150	7,535	-	-	10,685
Total	**30,334**	**10,565**	**4,365**	**539**	**45,803**

4.3.3 Number of persons who are potentially highly inconvenienced per contour zone and per municipality.

Table 31: Number of residents potentially highly inconvenienced contour zone and municipality – 2020.

Number of Inhabitants	**L_{den} contour zone in dB(A)**					
Municipality	**55-60**	**60-65**	**65-70**	**70-75**	**>75**	**Total**
Brussel	864	94	-	-	-	959
Haacht	2	-	-	-	-	2
Herent	3	-	-	-	-	3
Kampenhout	214	73	43	-	-	329
Kortenberg	94	7	-	-	-	101
Kraainem	22	-	-	-	-	22
Machelen	751	1,270	174	-	-	2,194
Steenokkerzeel	693	485	167	43	-	1,388
Vilvoorde	139	-	-	-	-	139
Wezembeek-Oppem	35	-	-	-	-	35
Zaventem	1,519	62	0	-	-	1,582
Zemst	2	-	-	-	-	2
Total	**4,338**	**1,991**	**383**	**43**	**-**	**6,756**

4.4 Noise contour maps: evolution 2019-2020

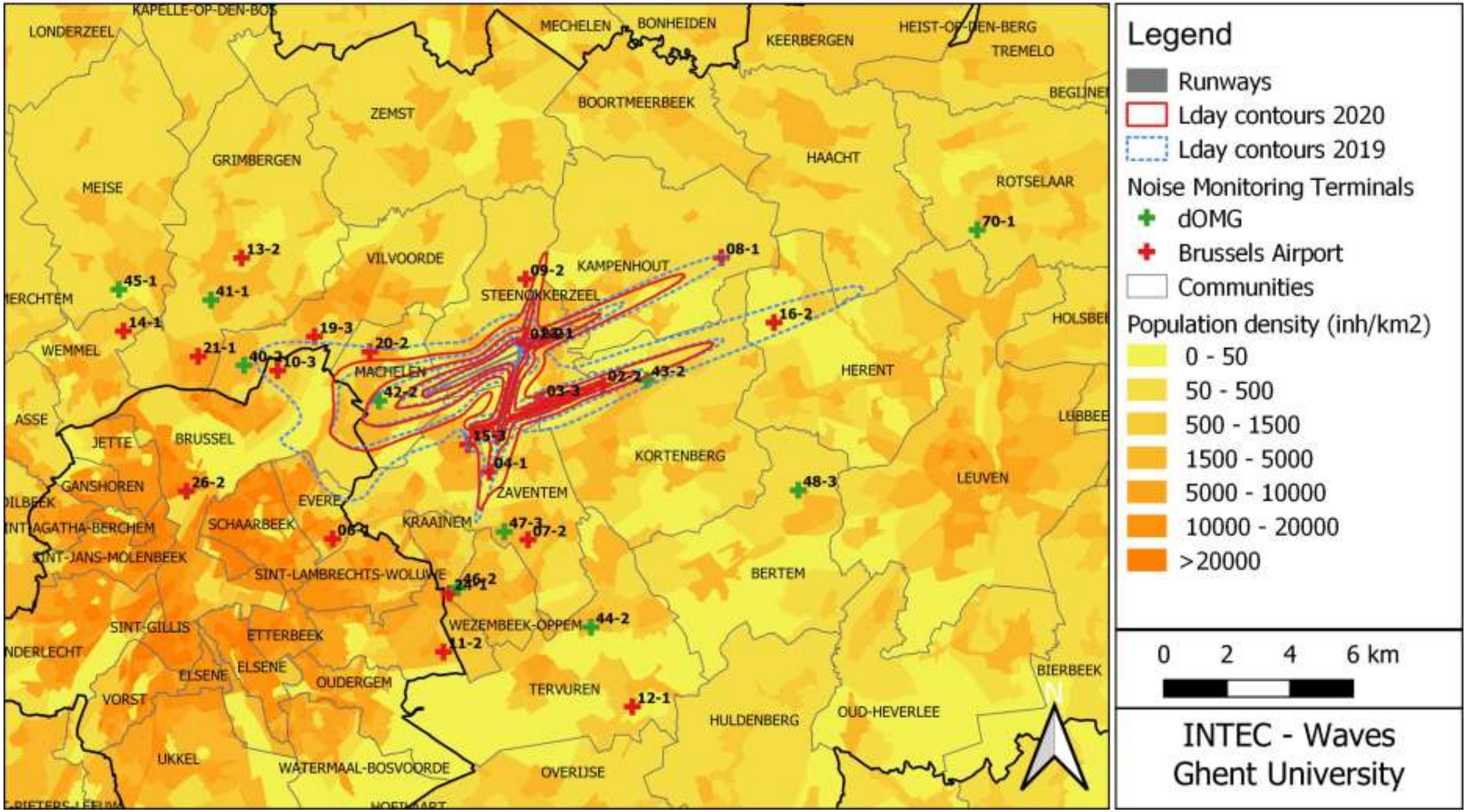
This appendix includes noise maps in A4 format.

- L_{day} noise contours for 2019 and 2020, background population map – 2020
- $L_{evening}$ noise contours for 2019 and 2020, background population map – 2020
- L_{night} noise contours for 2019 and 2020, background population map – 2020
- L_{den} noise contours for 2019 and 2020, background population map – 2020
- Freq.70,day noise contours for 2019 and 2020, background population map – 2020
- Freq.70,night noise contours for 2019 and 2020, background population map – 2020
- Freq.60,day noise contours for 2019 and 2020, background population map – 2020
- Freq.60,night noise contours for 2019 and 2020, background population map – 2020

- L_{day} noise contours for 2019 and 2020, background NGI topographical map
- $L_{evening}$ noise contours for 2019 and 2020, background NGI topographical map
- L_{night} noise contours for 2019 and 2020, background NGI topographical map
- L_{den} noise contours for 2019 and 2020, background NGI topographical map
- Freq.70,day noise contours for 2019 and 2020, background NGI topographical map
- Freq.70,night noise contours for 2019 and 2020, background NGI topographical map
- Freq.60,day noise contours for 2019 and 2020, background NGI topographical map
- Freq.60,night noise contours for 2019 and 2020, background NGI topographical map

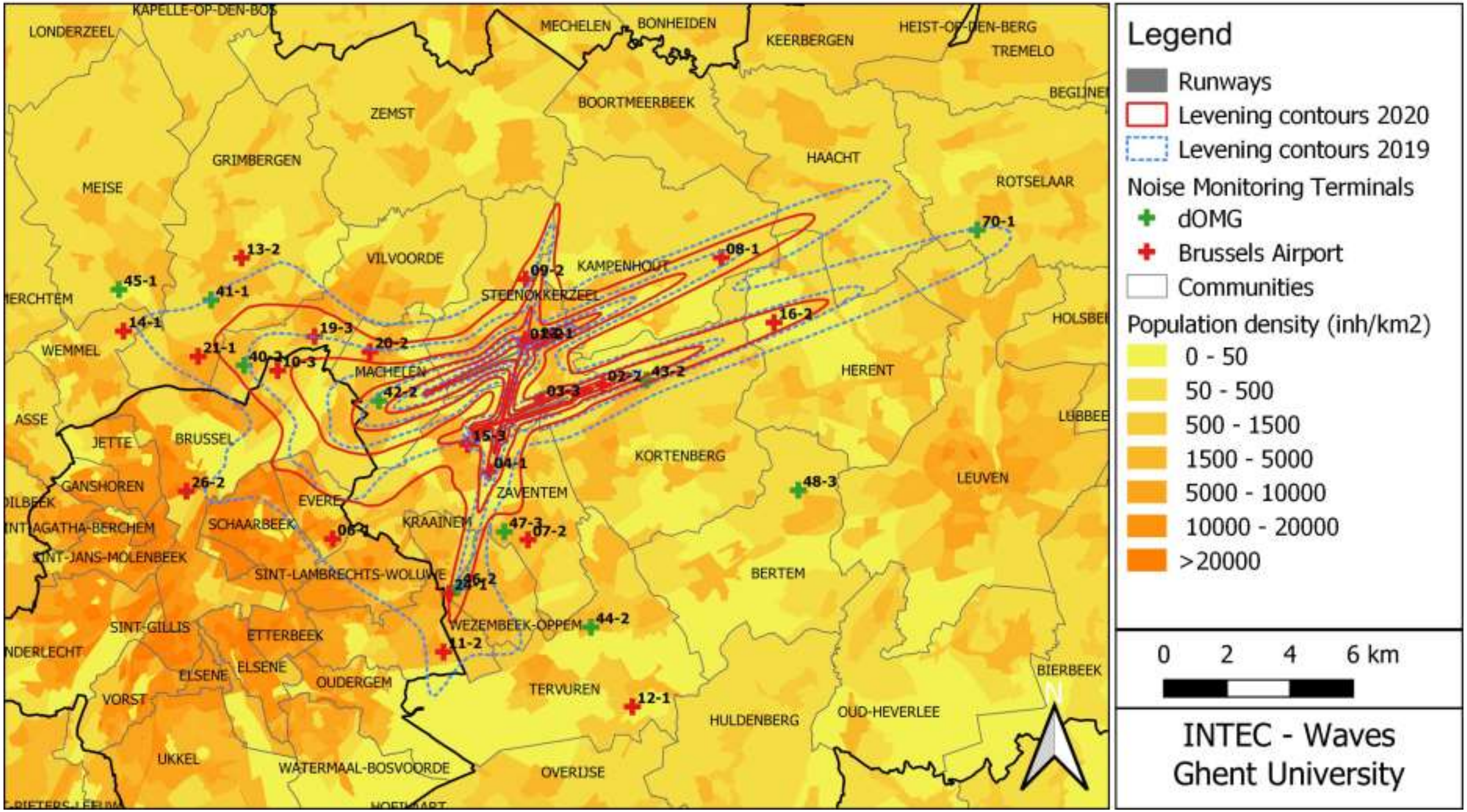
Evolution of L_{day} noise contours: 2019 and 2020
55, 60, 65, 70 and 75 dB(A) (07:00 - 19:00)

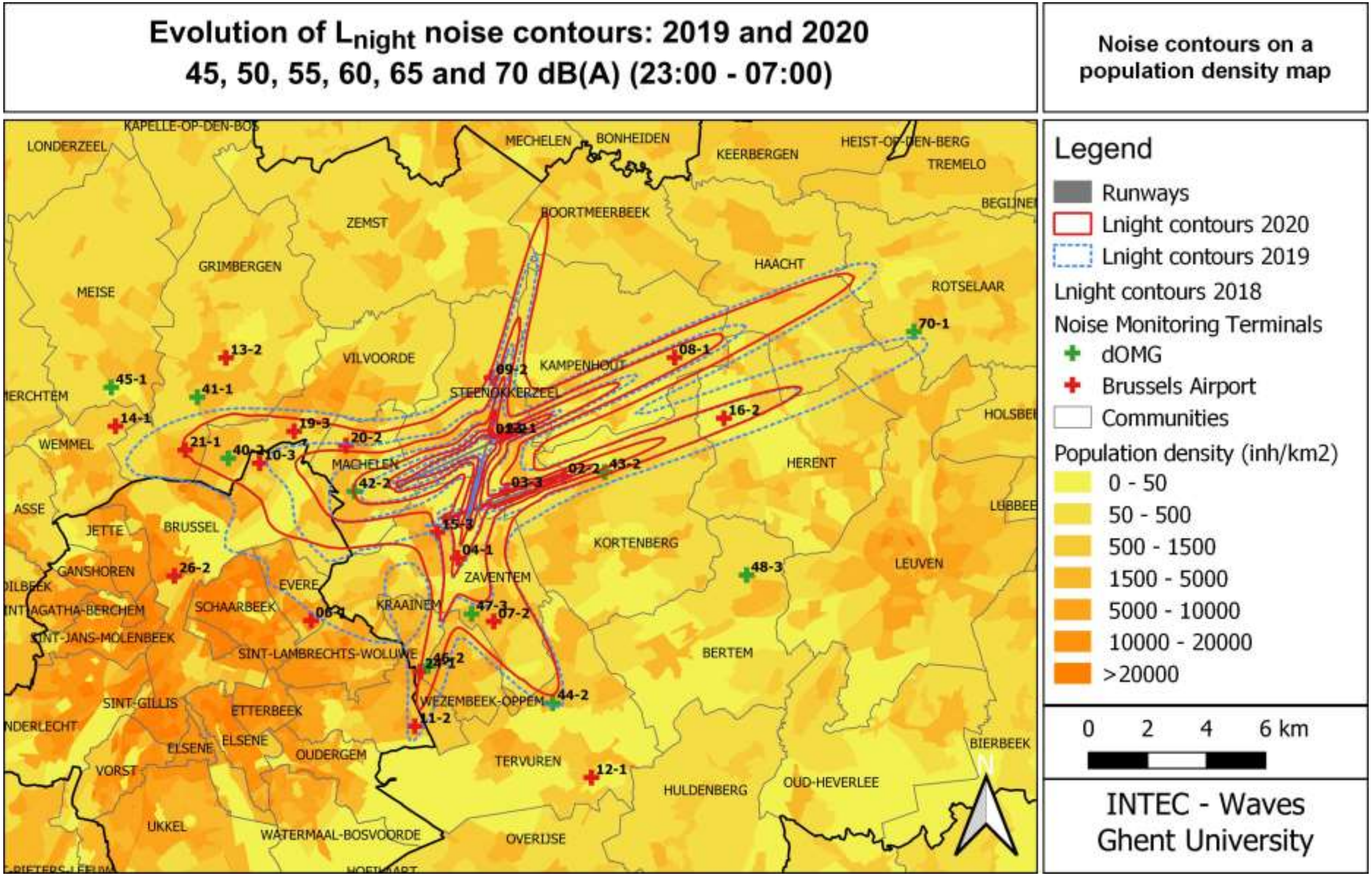
Noise contours on a population density map



Evolution of $L_{evening}$ noise contours: 2019 and 2020
50, 55, 60, 65, 70 and 75 dB(A) (19:00 - 23:00)

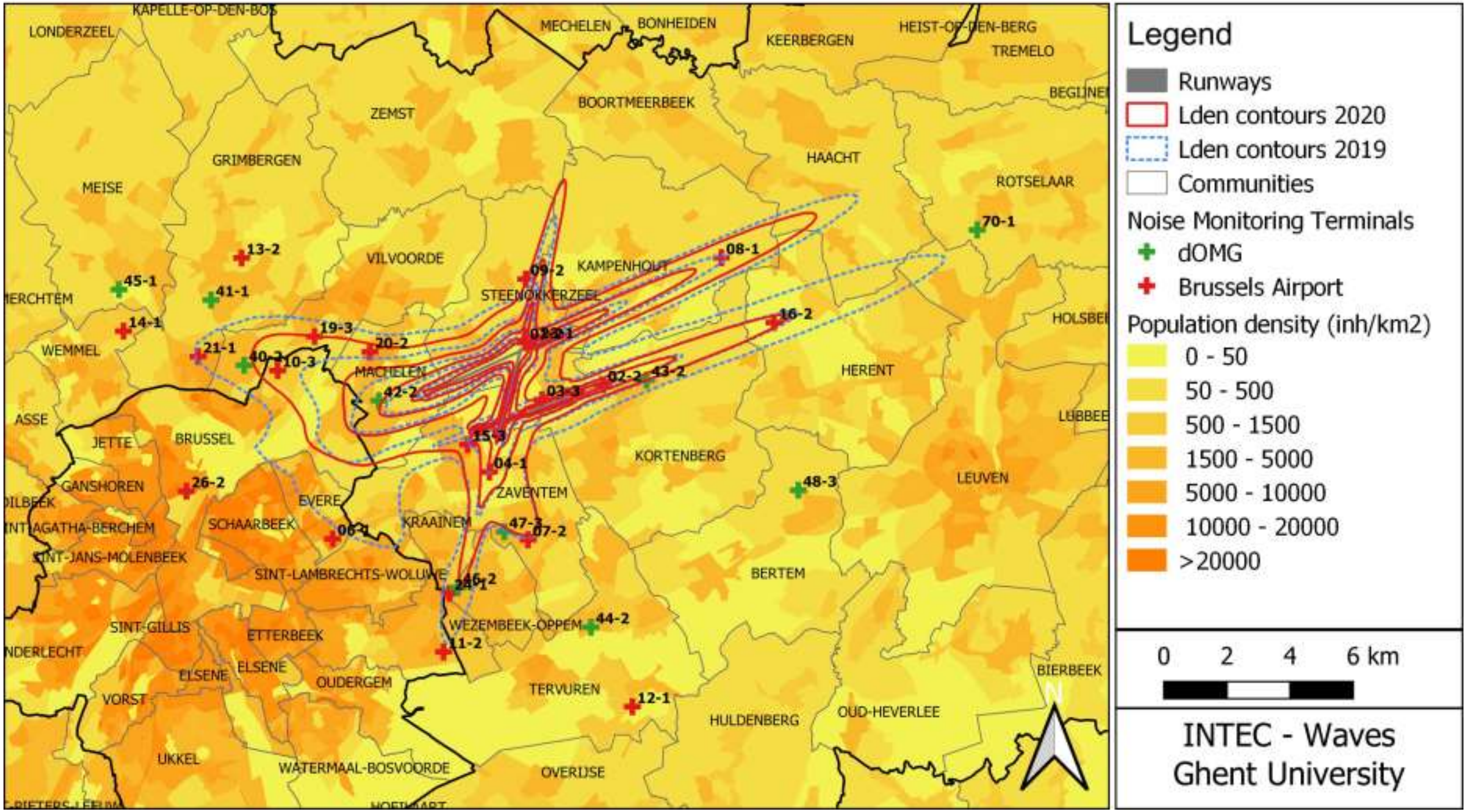
Noise contours on a population density map

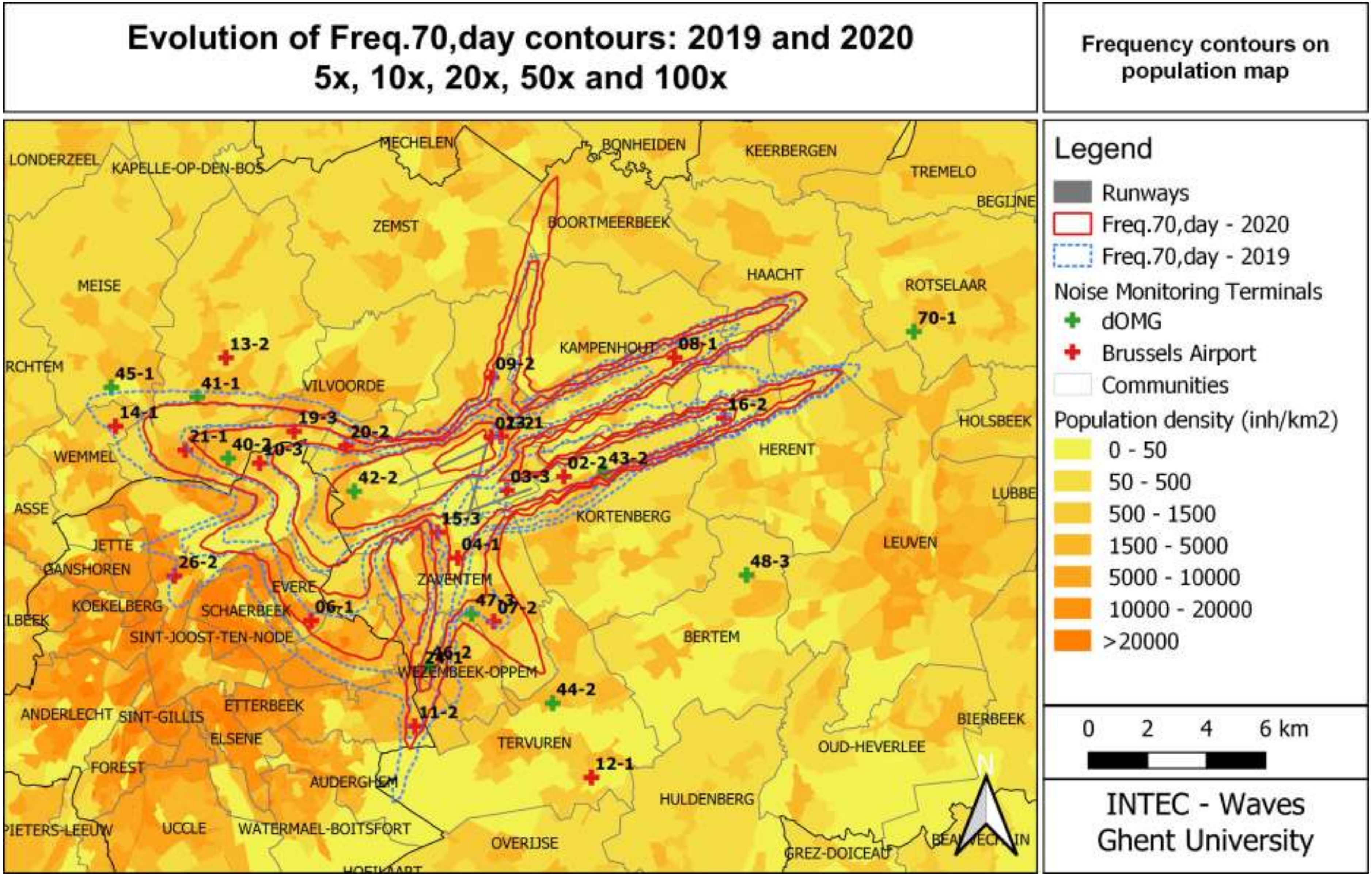



Evolution of Lnight noise contours: 2019 and 2020
45, 50, 55, 60, 65 and 70 dB(A) (23:00 - 07:00)
Noise contours on a population density map
Legend
Runways
Lnight contours 2020
Lnight contours 2019
Lnight contours 2018
Noise Monitoring Terminals
dOMG
Brussels Airport
Communities
Population density (inh/km2)
0 - 50
50 - 500
500 - 1500
1500 - 5000
5000 - 10000
10000 - 20000
>20000
0 2 4 6 km
INTEC - Waves
Ghent University
KAPELLE-OP-DEN-BOS
LONDERZEEL
MECHELEN
BONHEIDEN
KEERBERGEN
TREMELO
ZEMST
BOORTMEERBEEK
GRIMBERGEN
HAACHT
ROTSELAAR
MEISE
VILVOORDE
KAMPENHOUT
STEENOKKERZEEL
WEMMEL
MACHELEN
HERENT
ASSE
JETTE
BRUSSEL
KORTENBERG
LEUVEN
GANSHOREN
EVERE
ZAVENTEM
SCHAARBEEK
KRAAINEM
SINT-JANS-MOLENBEEK
SINT-LAMBRECHTS-WOLUWE
BERTEM
SINT-GILLIS
ETTERBEEK
WEZEMBEEK-OPPEM
ELSENE
OUDERGEM
TERVUREN
BIERBEEK
VORST
HULDENBERG
OUD-HEVERLEE
UKKEL
WATERMAAL-BOSVOORDE
OVERIJSE
13-2
45-1
41-1
14-1
19-3
20-2
21-1
40-2
10-3
42-2
09-2
08-1
16-2
02-2
43-2
03-3
15-3
04-1
70-1
48-3
26-2
06-1
47-3
07-2
44-2
11-2
12-1
N

Evolution of L_{den} noise contours: 2019 and 2020
55, 60, 65, 70 and 75 dB(A)

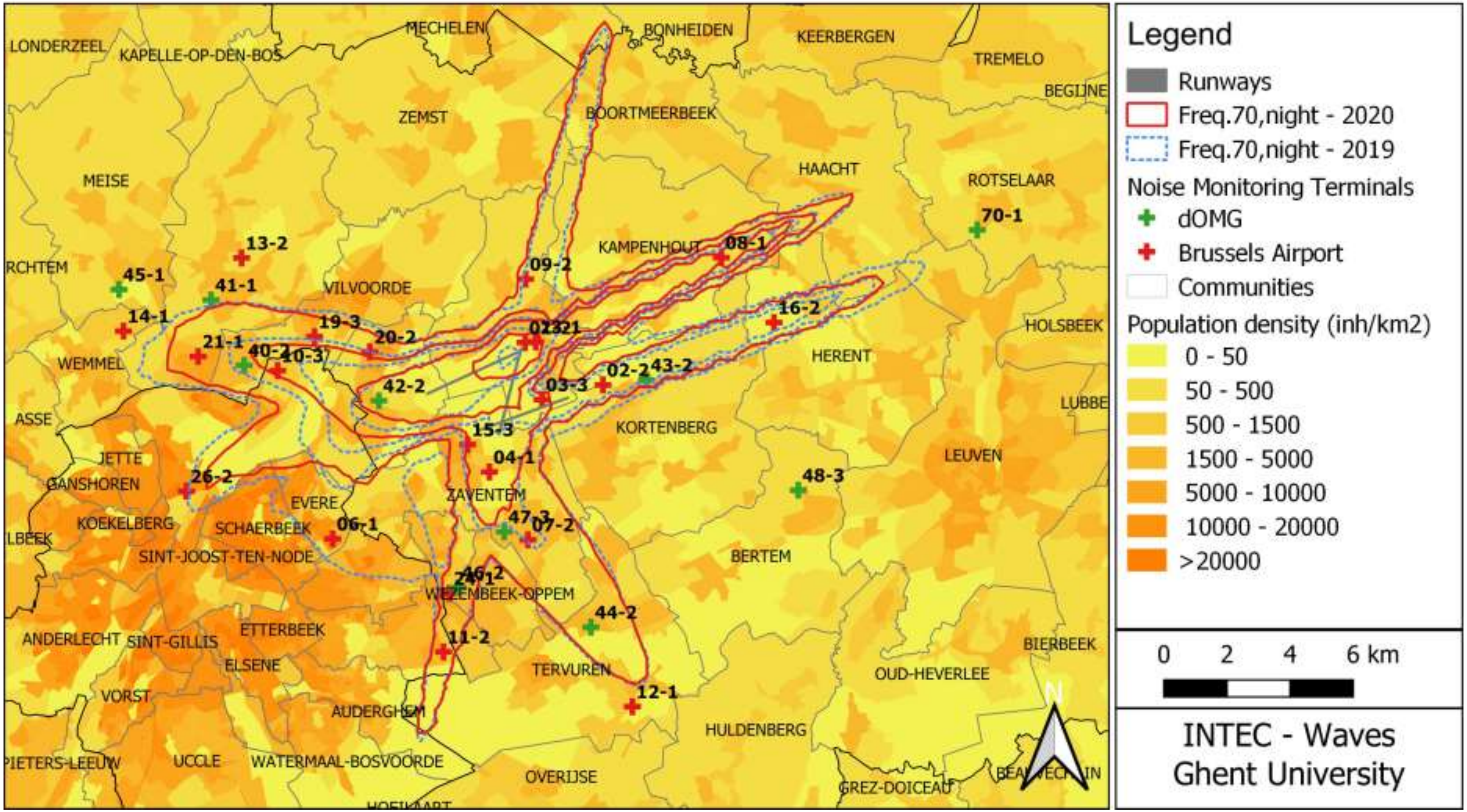
Noise contours on a population density map

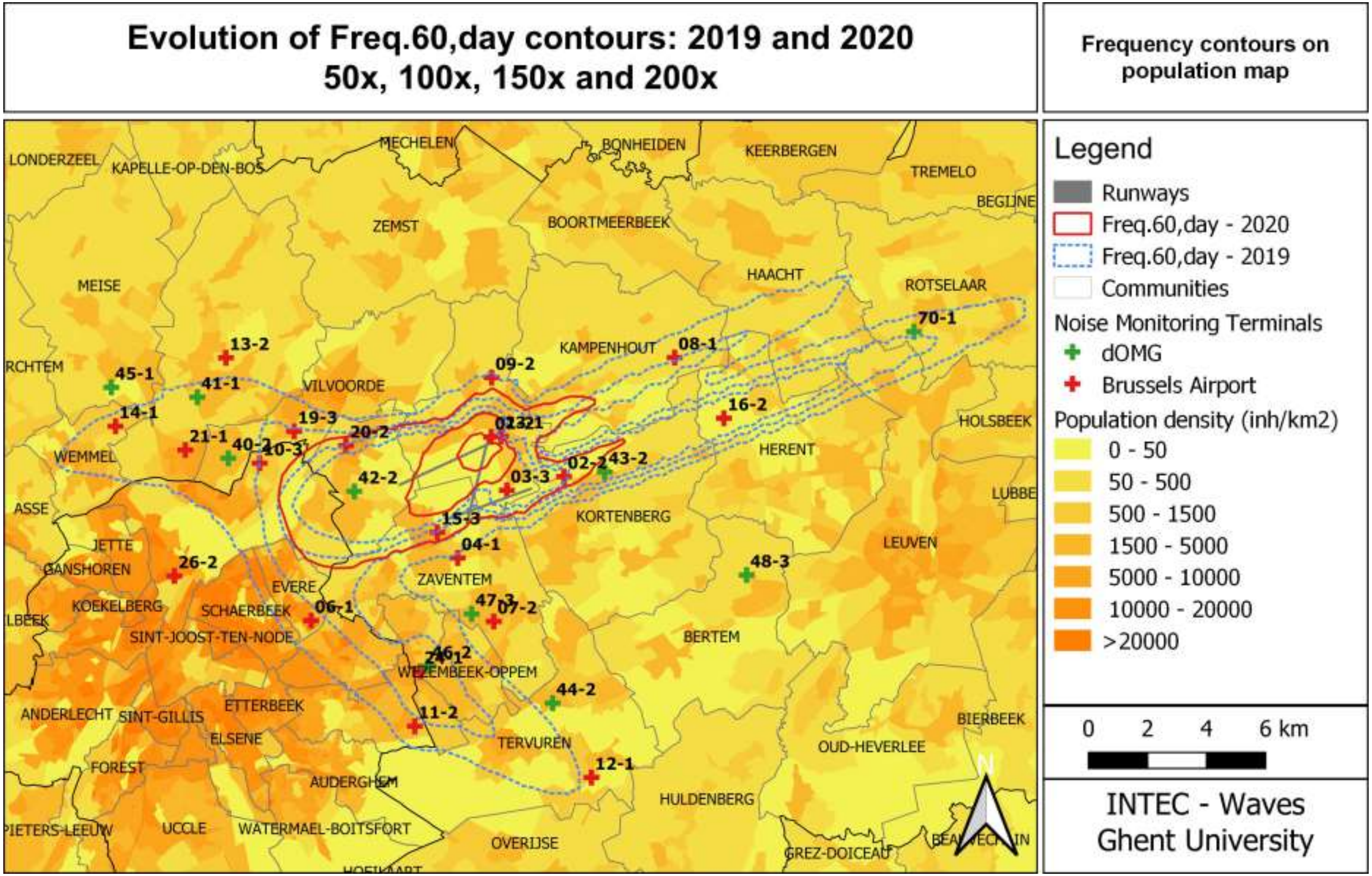



Evolution of Freq.70,day contours: 2019 and 2020
5x, 10x, 20x, 50x and 100x
Frequency contours on population map
Legend
Runways
Freq.70,day - 2020
Freq.70,day - 2019
Noise Monitoring Terminals
dOMG
Brussels Airport
Communities
Population density (inh/km2)
0 - 50
50 - 500
500 - 1500
1500 - 5000
5000 - 10000
10000 - 20000
>20000
0 2 4 6 km
INTEC - Waves
Ghent University
LONDERZEEL
KAPELLE-OP-DEN-BOS
MECHELEN
BONHEIDEN
KEERBERGEN
TREMELO
ZEMST
BOORTMEERBEEK
MEISE
HAACHT
ROTSELAAR
KAMPENHOUT
VILVOORDE
HOLSBEEK
WEMMEL
HERENT
ASSE
KORTENBERG
JETTE
GANSHOREN
LEUVEN
ZAVENTEM
EVERE
KOEKELBERG
SCHAERBEEK
SINT-JOOST-TEN-NODE
BERTEM
WEZEMBEEK-OPPEM
ANDERLECHT
SINT-GILLIS
ETTERBEEK
ELSENE
TERVUREN
OUD-HEVERLEE
BIERBEEK
FOREST
AUDERGHEM
HULDENBERG
UCCLE
WATERMAEL-BOITSFORT
OVERIJSE
GREZ-DOICEAU
13-2
45-1
41-1
14-1
21-1
40-2
40-3
19-3
20-2
42-2
09-2
08-1
70-1
16-2
02-2
43-2
03-3
15-3
04-1
26-2
06-1
47-3
07-2
48-3
44-2
11-2
12-1

Evolution of Freq.70,night contours: 2019 and 2020
1x, 5x, 10x, 20x and 50x

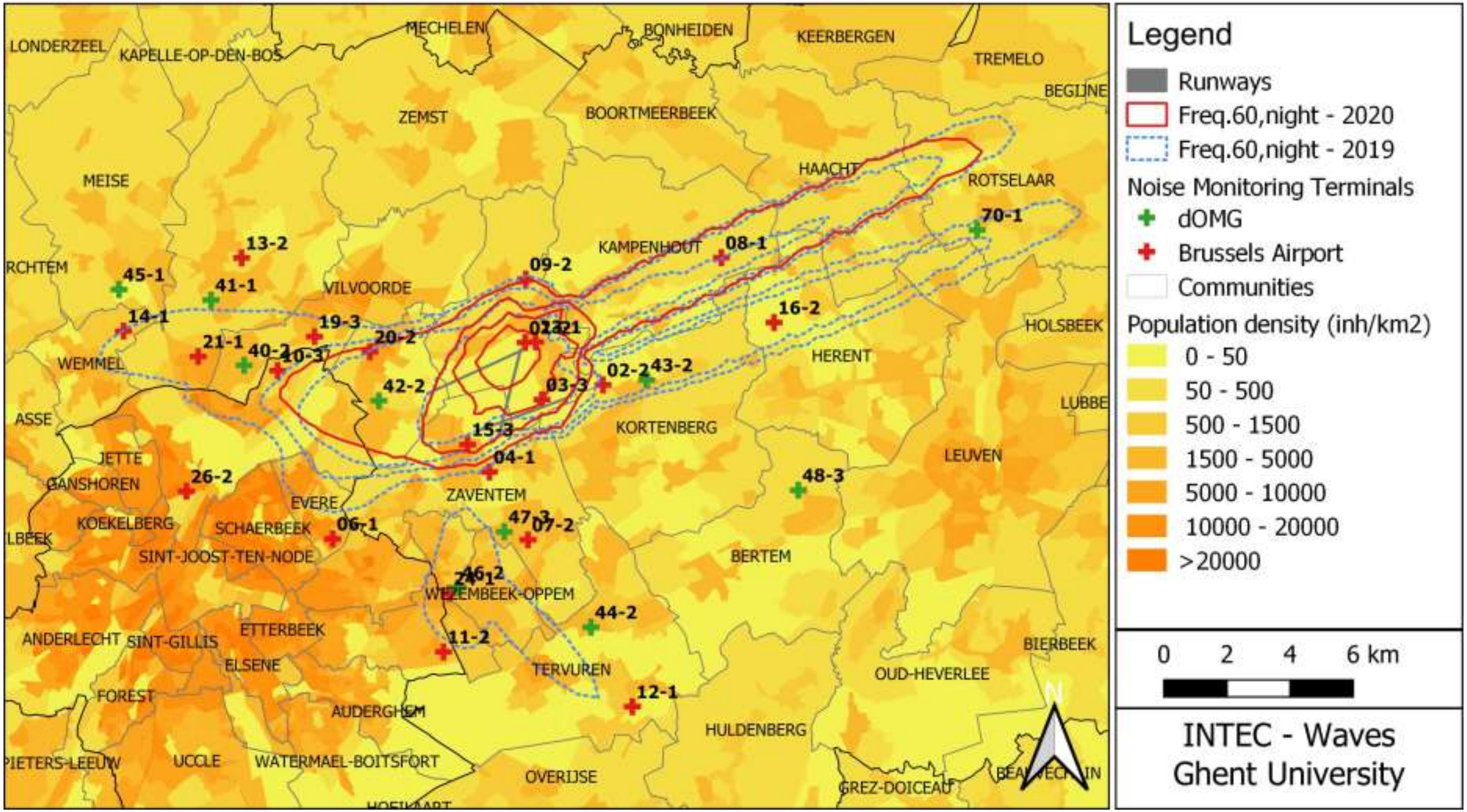
Frequency contours on population map

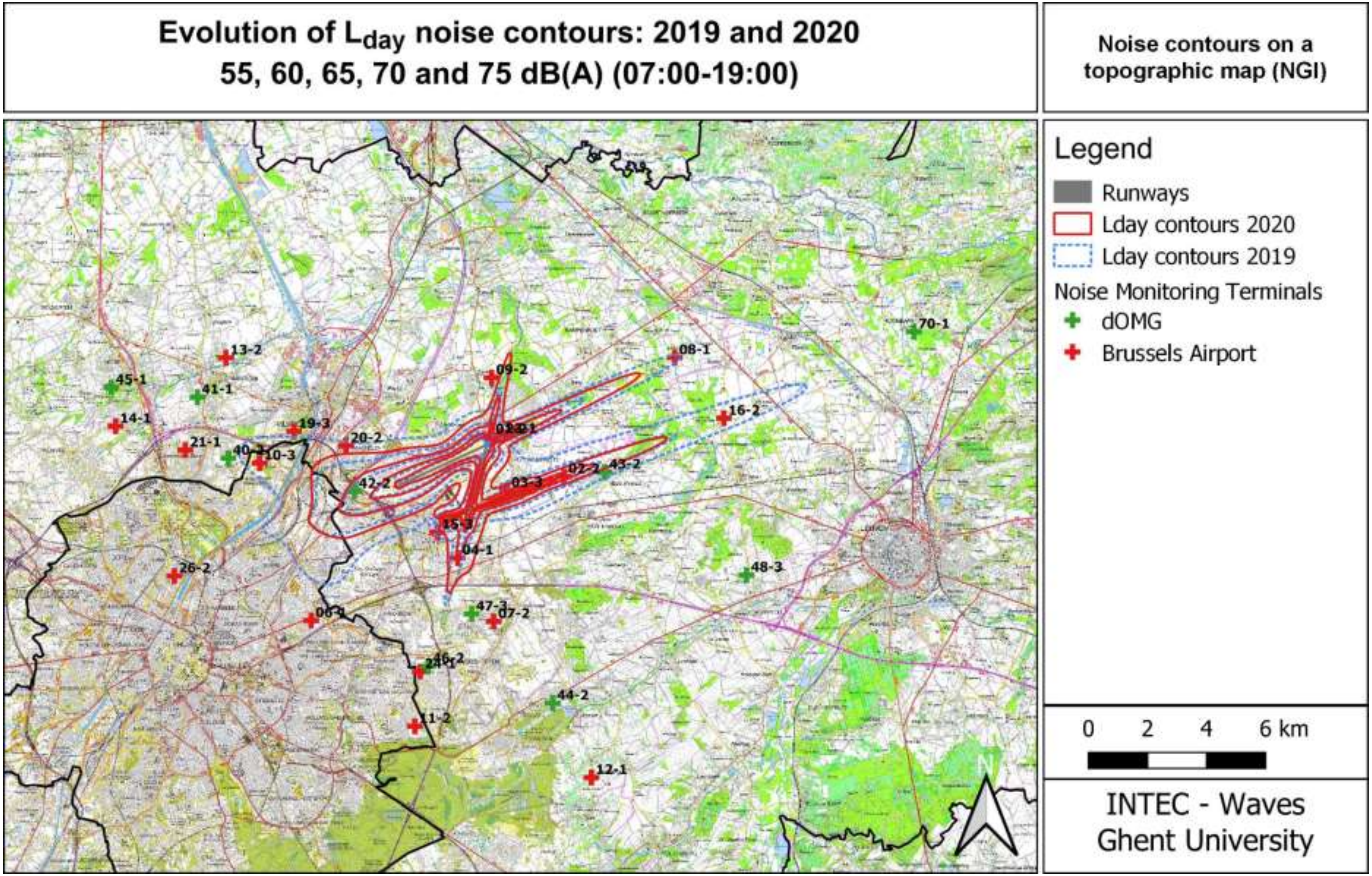



Evolution of Freq.60,day contours: 2019 and 2020
50x, 100x, 150x and 200x
Frequency contours on population map
Legend
Runways
Freq.60,day - 2020
Freq.60,day - 2019
Communities
Noise Monitoring Terminals
dOMG
Brussels Airport
Population density (inh/km2)
0 - 50
50 - 500
500 - 1500
1500 - 5000
5000 - 10000
10000 - 20000
>20000
0 2 4 6 km
INTEC - Waves
Ghent University
LONDERZEEL
KAPELLE-OP-DEN-BOS
MECHELEN
BONHEIDEN
KEERBERGEN
TREMELO
BEGIJNE
ZEMST
BOORTMEERBEEK
MEISE
HAACHT
ROTSELAAR
KAMPENHOUT
VILVOORDE
HOLSBEEK
WEMMEL
HERENT
ASSE
KORTENBERG
LUBBE
LEUVEN
JETTE
GANSHOREN
EVERE
ZAVENTEM
KOEKELBERG
SCHAERBEEK
SINT-JOOST-TEN-NODE
BERTEM
WEZEMBEEK-OPPEM
ANDERLECHT
SINT-GILLIS
ETTERBEEK
ELSENE
TERVUREN
BIERBEEK
OUD-HEVERLEE
FOREST
AUDERGHEM
HULDENBERG
UCCLE
WATERMAEL-BOITSFORT
OVERIJSE
GREZ-DOICEAU
13-2
45-1
41-1
14-1
21-1
40-2
40-3
19-3
20-2
09-2
08-1
70-1
16-2
42-2
03-3
02-2
43-2
15-3
04-1
48-3
26-2
06-1
47-3
07-2
24-1
46-2
44-2
11-2
12-1

Evolution of Freq.60,night contours: 2019 and 2020
10x, 15x, 20x and 30x

Frequency contours on population map

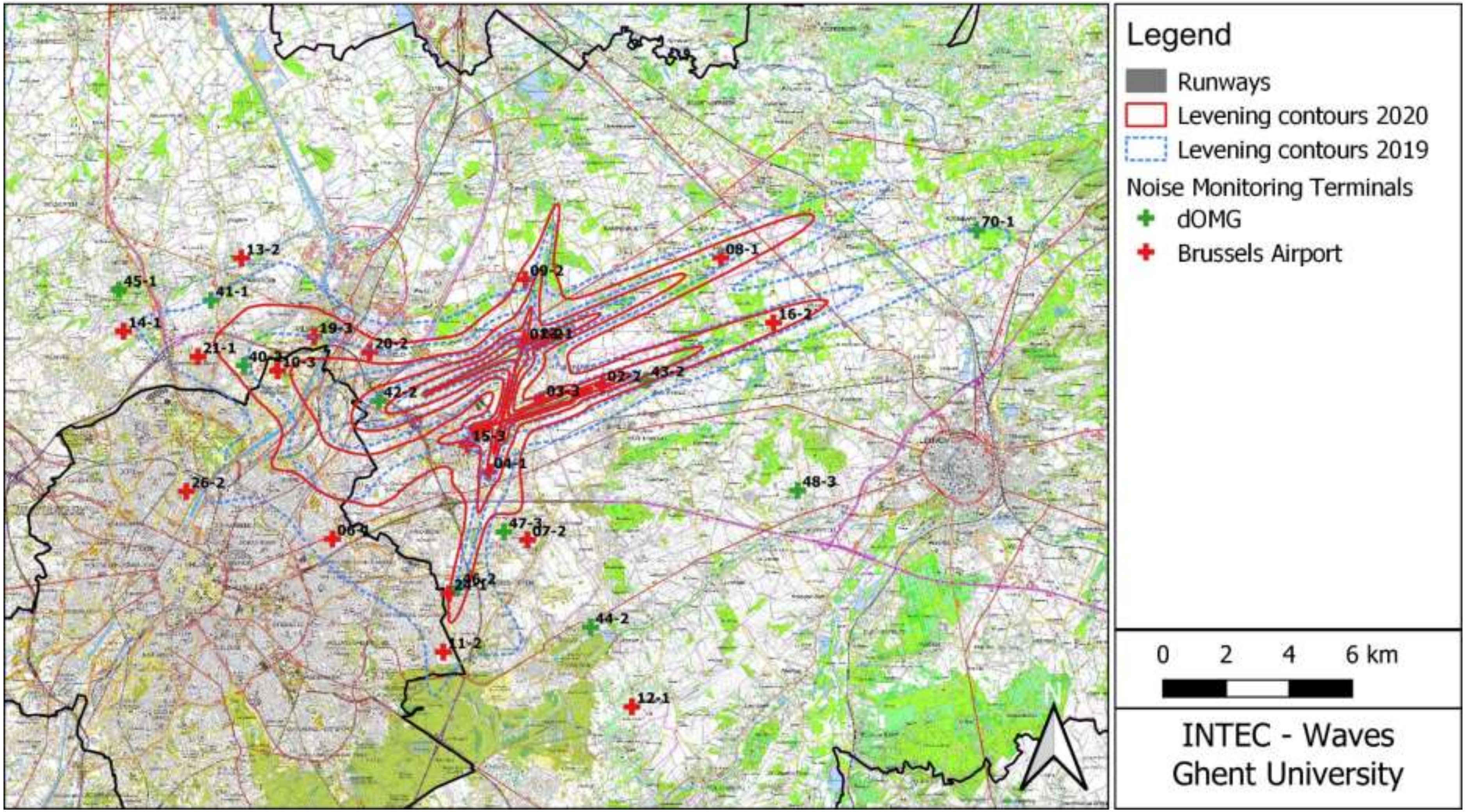




Evolution of Lday noise contours: 2019 and 2020
55, 60, 65, 70 and 75 dB(A) (07:00-19:00)
Noise contours on a topographic map (NGI)
Legend
Runways
Lday contours 2020
Lday contours 2019
Noise Monitoring Terminals
dOMG
Brussels Airport
0 2 4 6 km
INTEC - Waves
Ghent University
13-2
45-1
41-1
14-1
19-3
21-1
20-2
10-3
42-2
09-2
08-1
16-2
70-1
03-3
02-2
43-2
15-3
04-1
26-2
48-3
47-3
07-2
44-2
11-2
12-1

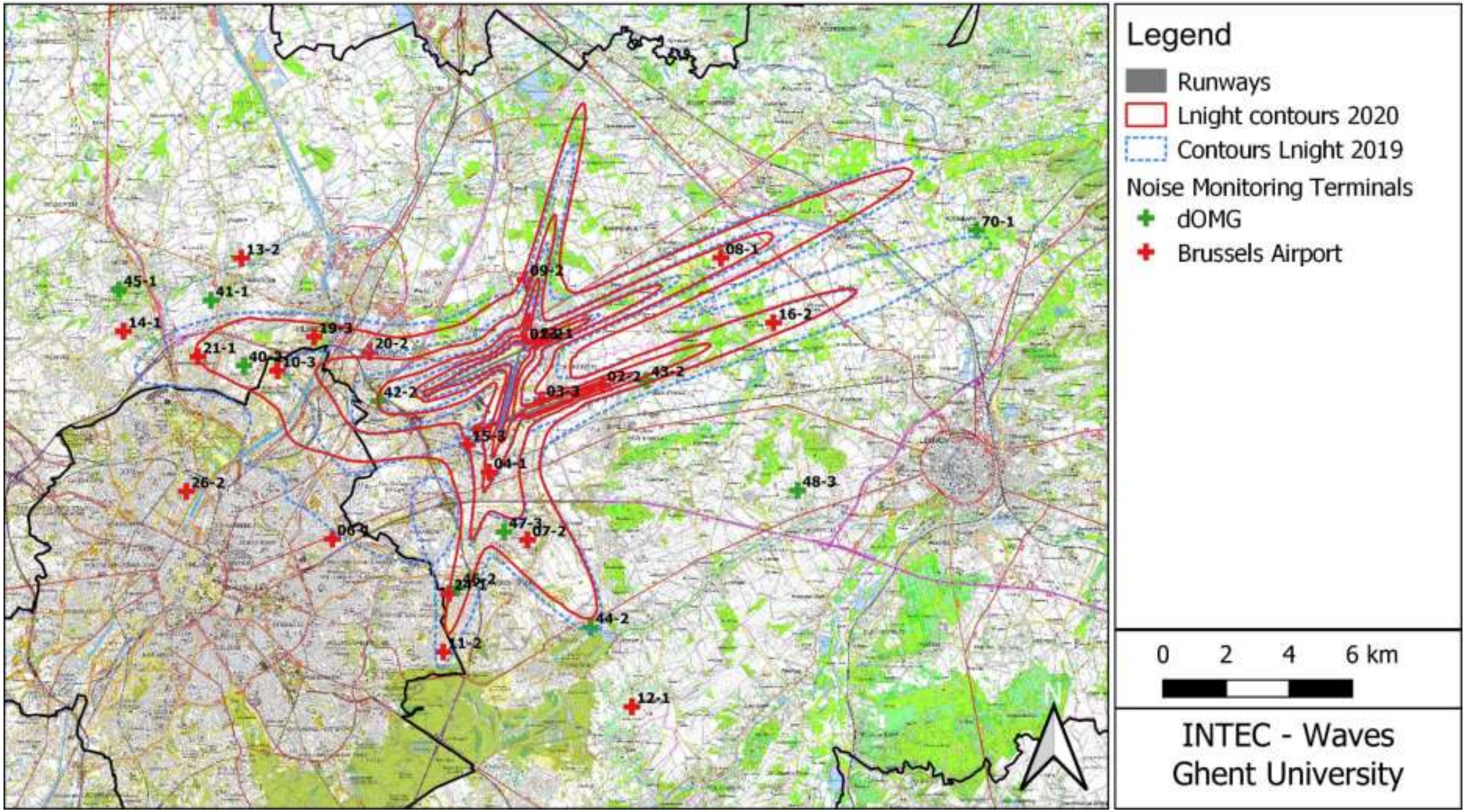
Evolution of $L_{evening}$ noise contours: 2019 and 2020
50, 55, 60, 65, 70 and 75 dB(A) (19:00-23:00)

Noise contours on a topographic map (NGI)



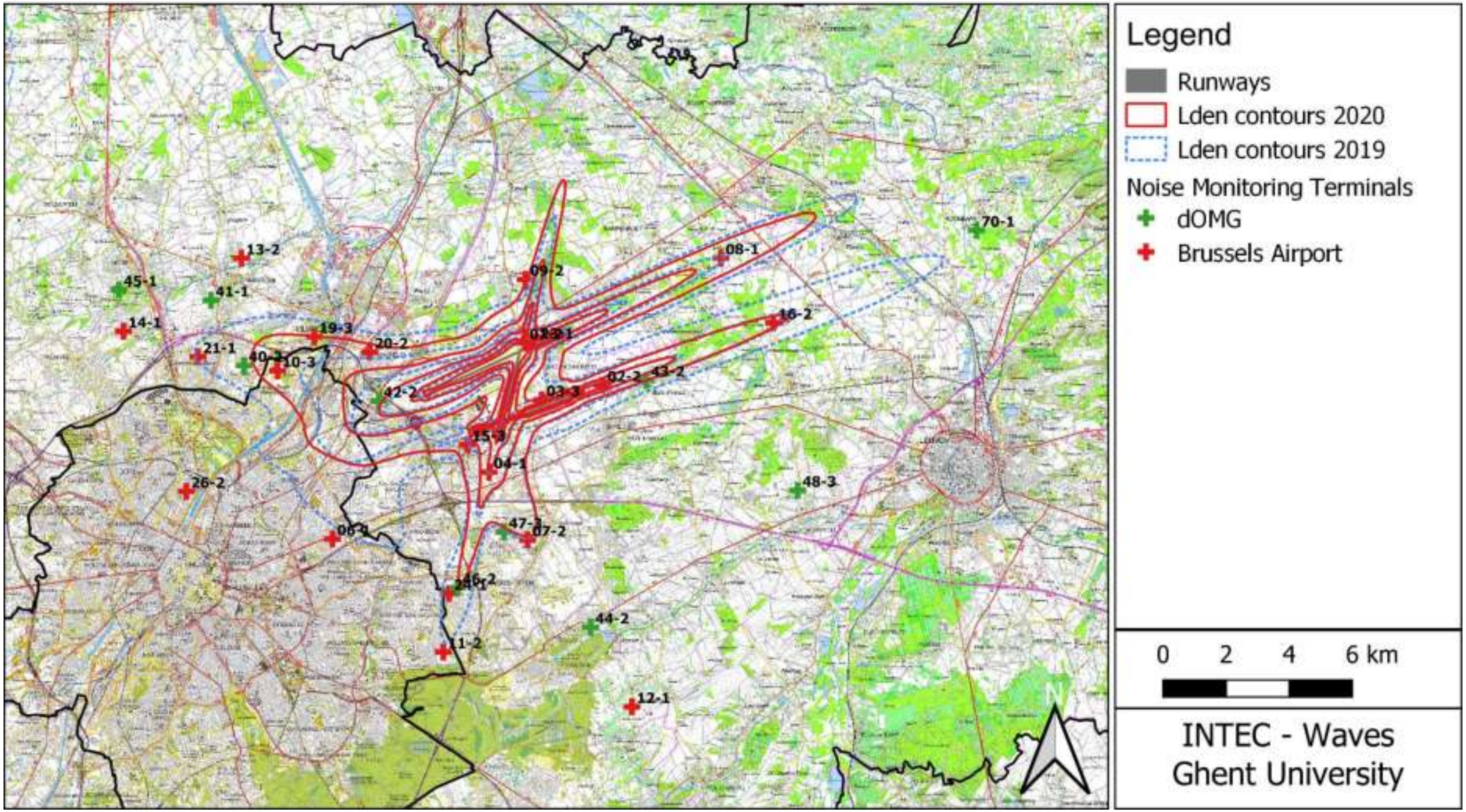
Evolution of L_{night} noise contours: 2019 and 2020
45, 50, 55, 60, 65 and 70 dB(A) (23:00-07:00)

Noise contours on a topographic map (NGI)



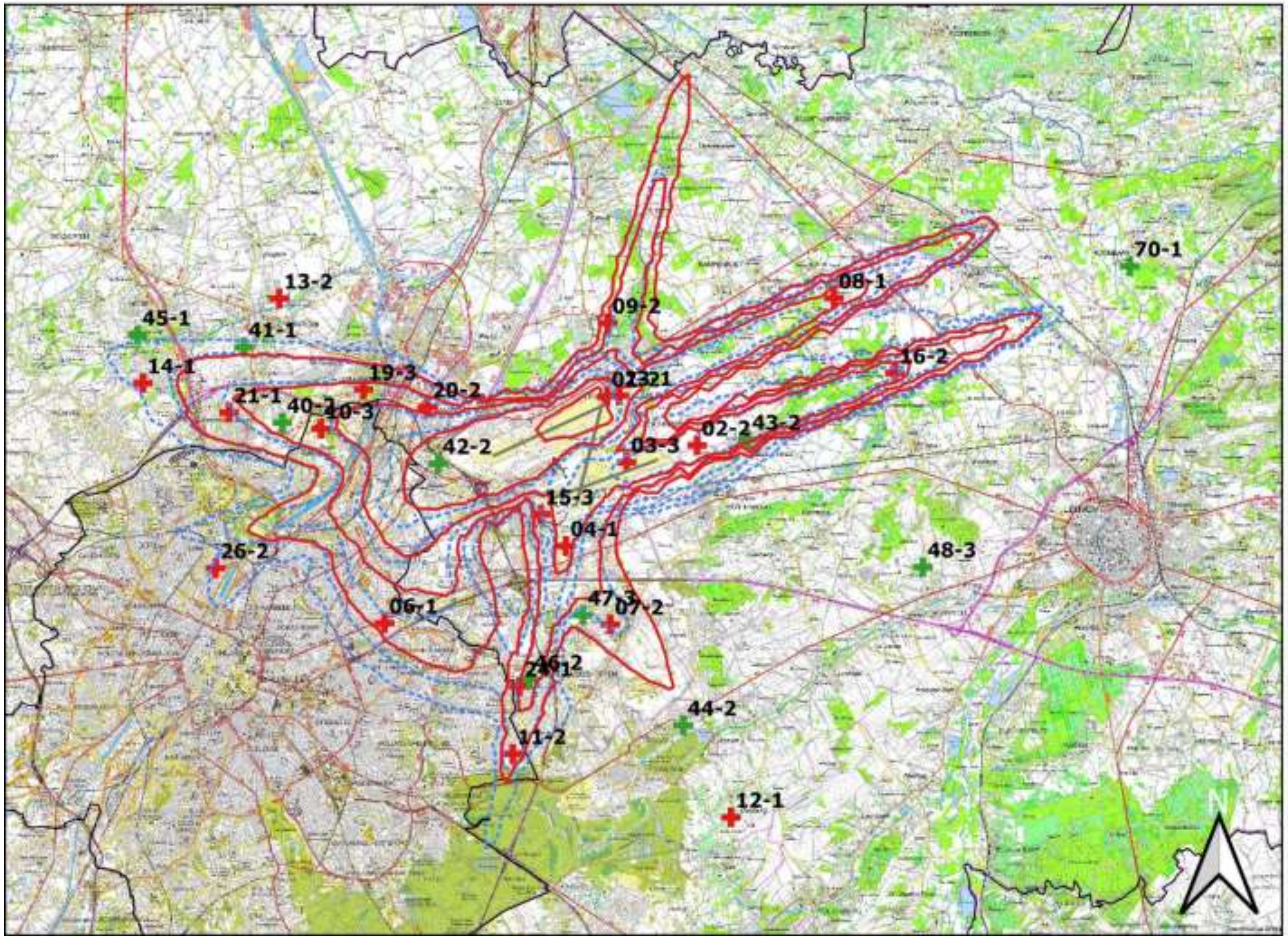
Evolution of L_{den} noise contours: 2019 and 2020
55, 60, 65, 70 and 75 dB(A)

Noise contours on a topographic map (NGI)



Evolution of Freq.70,day contours: 2019 and 2020
5x, 10x, 20x, 50x and 100x

Frequency contours on topographique map (NGI)



Legend

Runways

Freq.70,day - 2020

Freq.70,day - 2019

Noise Monitoring Terminals

dOMG

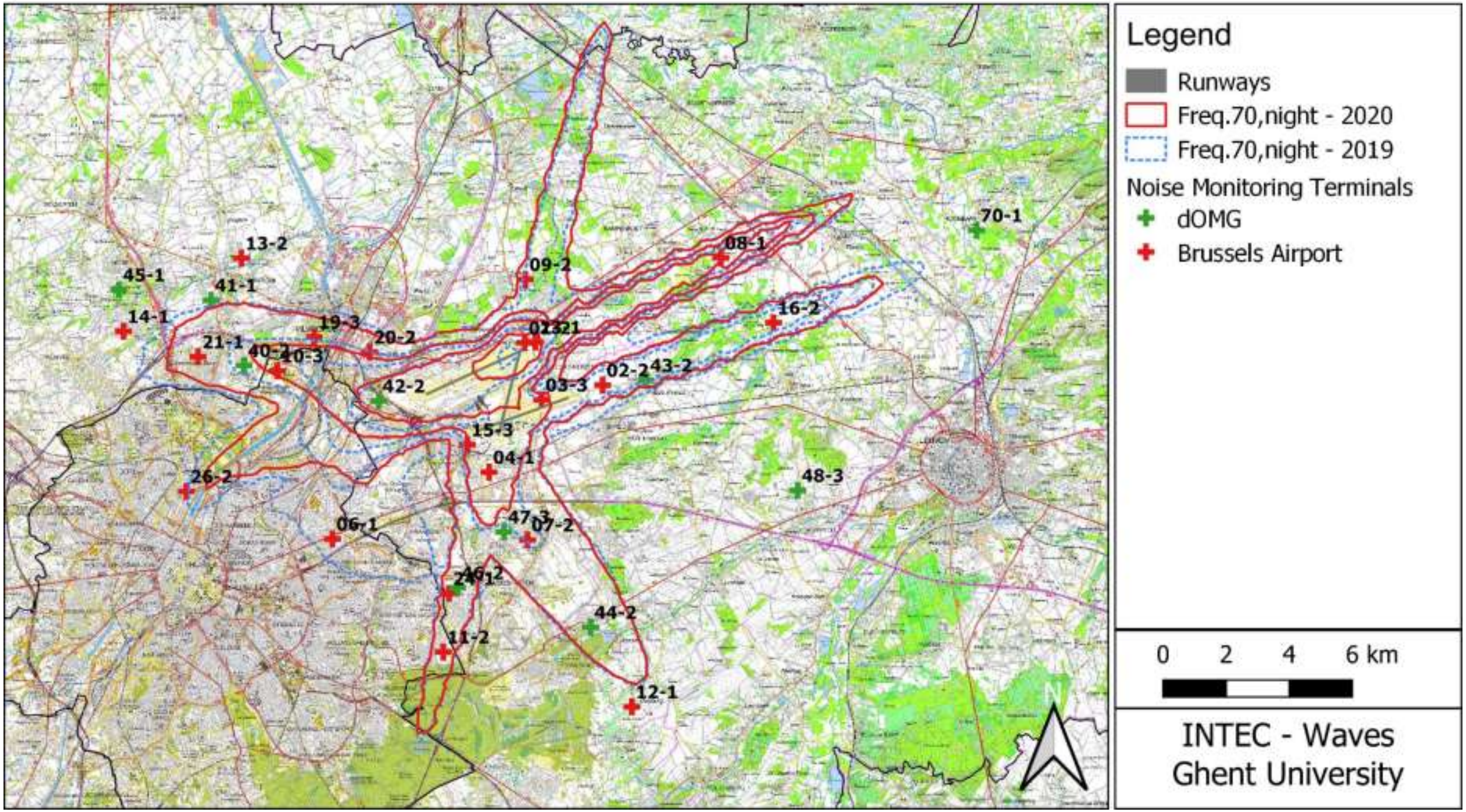
Brussels Airport

0 2 4 6 km

INTEC - Waves
Ghent University

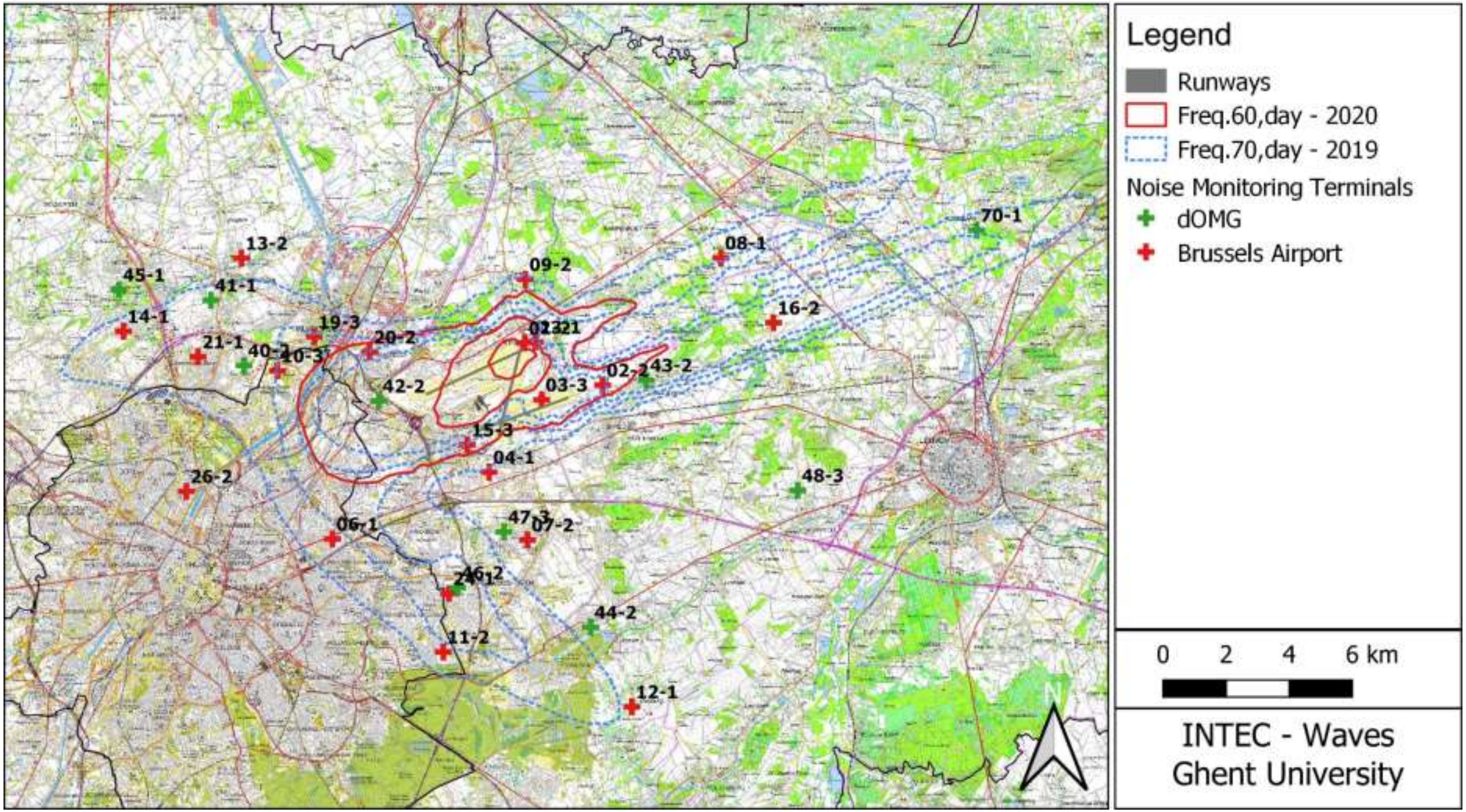
Evolution of Freq.70,night contours: 2019 and 2020
1x, 5x, 10x, 20x and 50x

Frequency contours on topographique map (NGI)



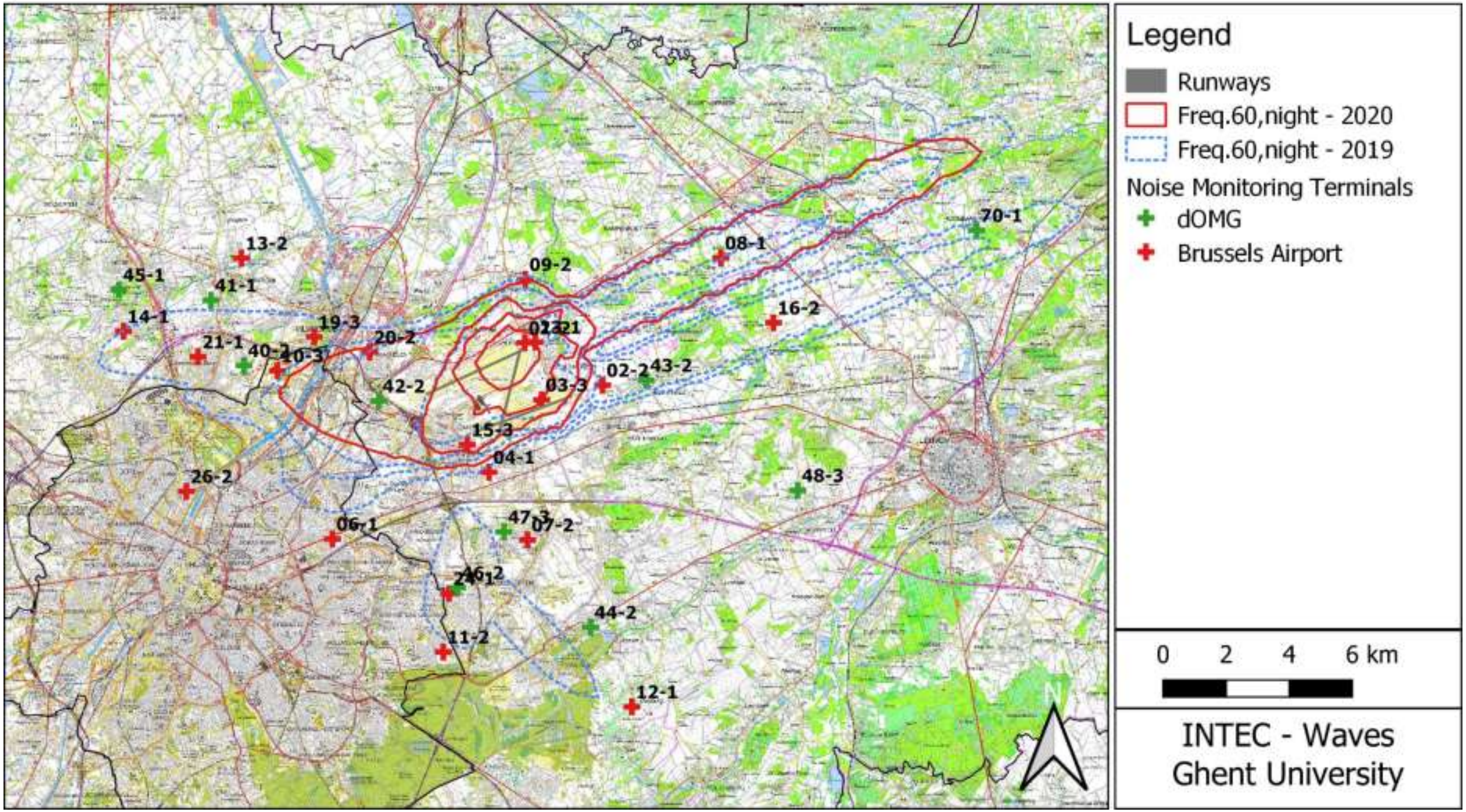
Evolution of Freq.60,day contours: 2019 and 2020
50x, 100x, 150x and 200x

Frequency contours on topographique map (NGI)



Evolution of Freq.60,night contours: 2019 and 2020
10x, 15x, 20x and 30

Frequency contours on topographique map (NGI)



4.5 Evolution of the surface area and the number of residents

4.5.1 Evolution of the surface area per contour zone: L_{day}, $L_{evening}$, L_{night}, Freq.70,day, Freq.70,night, Freq.60,day and Freq.60,day.

Table 32: Evolution of the surface area inside the L_{day} contours (2000, 2006-2020).

Area (ha)	L_{day} contour zone in dB(A) (day 07.00-19.00)*					
Year	**55-60**	**60-65**	**65-70**	**70-75**	**>75**	**Totaal**
2000	5,919	2,113	827	383	242	**9,485**
2001						
2002						
2003						
2004						
2005						
2006	3,787	1,379	545	213	150	**6,073**
2007	3,978	1,431	575	227	153	**6,364**
2008	4,072	1,492	596	232	161	**6,553**
2009	3,461	1,300	523	206	133	**5,622**
2010	3,334	1,261	514	196	126	**5,431**
2011	3,330	1,241	509	199	127	**5,406**
2012	2,978	1,121	466	189	117	**4,871**
2013	2,779	1,106	455	176	121	**4,637**
2014	2,924	1,120	474	187	116	**4,821**
2015	3,143	1,180	489	230	93	**5,135**
2016	2,886	1,087	545	123	82	**4,723**
2017	2,990	1,109	471	216	90	**4,876**
2018	3,037	1,150	486	227	87	**4,987**
2019	2,963	1,105	554	138	91	**4,851**
2020	1,521	602	247	176	0	**2,547**

* Calculated with INM 7.0b

Figure 15: Evolution of the surface area inside the L_{day} contours (2000, 2006-2020).

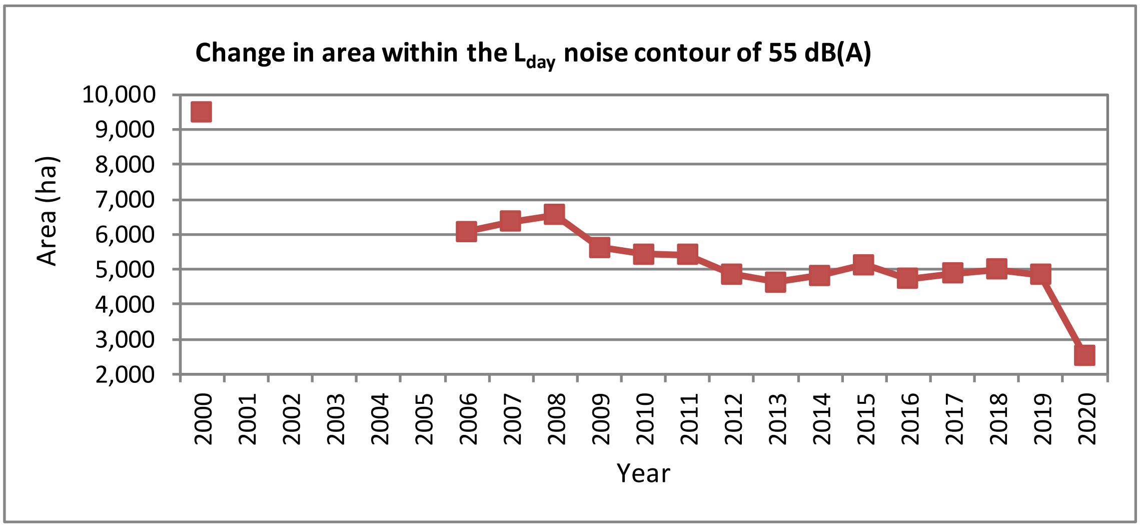


Table 33: Evolution of the surface area inside the $L_{evening}$ contours (2000, 2006-2020).

Area (ha)	$L_{evening}$ contour zone in dB(A) (evening 19.00-23.00)*						
Year	50-55	55-60	60-65	65-70	70-75	>75	Total
2000	11,266	5,265	1,889	741	346	216	**19,723**
2001							
2002							
2003							
2004							
2005							
2006	8,483	3,000	1,106	449	178	113	**13,329**
2007	9,106	3,369	1,223	506	200	124	**14,528**
2008	10,052	3,730	1,354	548	218	135	**16,037**
2009	8,313	3,126	1,146	463	178	109	**13,336**
2010	7,821	3,073	1,124	452	171	106	**12,747**
2011	7,711	3,004	1,106	446	175	105	**12,547**
2012	7,608	2,881	1,046	427	171	103	**12,237**
2013	6,998	2,668	994	401	161	104	**11,222**
2014	7,421	3,087	1,106	445	175	50	**12,283**
2015	8,244	3,051	1,108	450	205	89	**13,147**
2016	8,402	3,188	1,137	536	135	91	**13,488**
2017	8,556	3,172	1,108	457	205	92	**13,590**
2018	9,134	3,445	1,207	489	225	99	**14,599**
2019	8,836	3,283	1,138	542	142	97	**14,038**
2020	4,440	1,751	621	441	0	0	**7,252**

* Calculated with INM 7.0b

Figure 16: Evolution of the surface area inside the $L_{evening}$ contours (2000, 2006-2020).

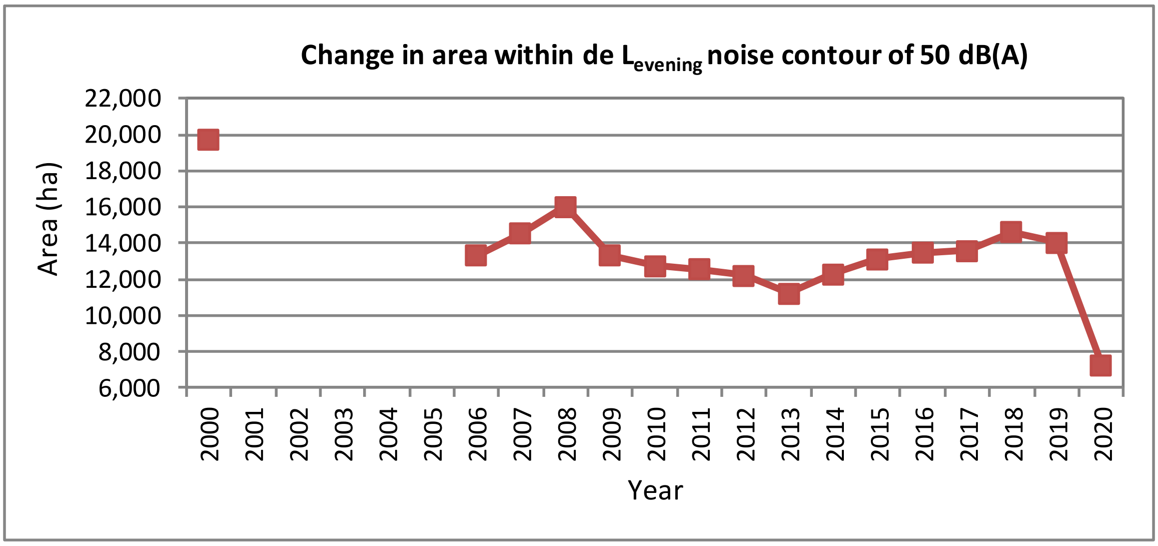


Table 34: : Evolution of the surface area inside the L_{night} contours (2000, 2006-2020).

Area (ha)	L_{night} contour zone in dB(A) (night 23.00-07.00)						
Year	45-50	50-55	55-60	60-65	65-70	>70	Total
2000	13,927	6,145	2,366	1,090	492	290	**24,310**
2001							
2002							
2003							
2004							
2005							
2006	10,135	3,571	1,450	554	211	153	**16,075**
2007	10,872	3,936	1,597	625	236	165	**17,430**
2008	9,375	3,232	1,260	495	189	123	**14,673**
2009	7,638	2,613	1,014	397	155	96	**11,913**
2010	7,562	2,633	999	390	154	96	**11,835**
2011	8,184	2,803	1,066	413	164	106	**12,736**
2012	8,525	2,827	1,074	419	168	105	**13,118**
2013	7,817	2,857	1,525	172	130	0	**12,501**
2014	7,800	2,921	1,120	448	179	115	**12,583**
2015	8,451	3,019	1,172	460	194	117	**13,413**
2016	7,969	2,930	1,111	441	188	109	**12,748**
2017	7,995	2,929	1,112	427	186	104	**12,754**
2018	8,495	3,084	1,148	442	178	128	**13,476**
2019	8,172	3,016	1,124	437	190	105	**13,044**
2020	5,418	2,016	756	308	193	0	**8,691**

* Calculated with INM 7.0b

Figure 17: Evolution of the surface area inside the L_{night} contours (2000, 2006-2020).

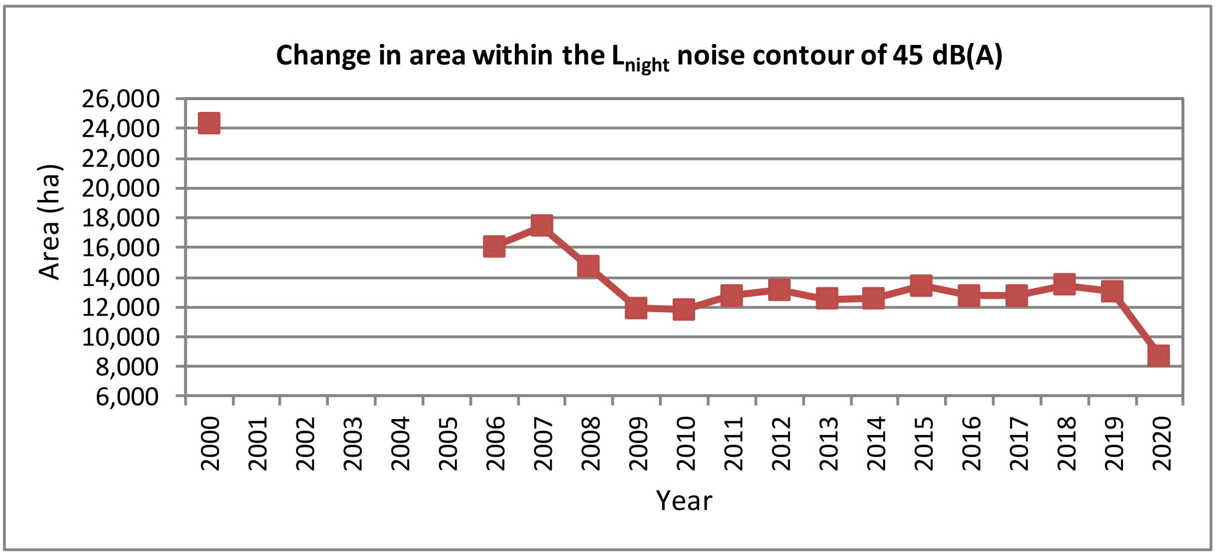


Table 35: : Evolution of the surface area inside the L_{den} contours (2000, 2006-2020).

Area (ha)	L_{den} contour zone in dB(A) (d. 07-19, ev. 19-23, n. 23-07)*					
Year	**55-60**	**60-65**	**65-70**	**70-75**	**>75**	**Total**
2000	10,664	4,063	1,626	745	497	**17,594**
2001						
2002						
2003						
2004						
2005						
2006	6,963	2,448	957	373	251	**10,992**
2007	7,632	2,640	1,036	416	271	**11,996**
2008	7,118	2,483	953	379	246	**11,178**
2009	5,771	2,077	797	316	203	**9,163**
2010	5,576	2,052	782	308	199	**8,917**
2011	5,767	2,076	800	316	208	**9,167**
2012	5,623	1,998	771	308	205	**8,905**
2013	5,152	1,981	767	299	216	**8,415**
2014	5,429	2,066	800	325	136	**8,756**
2015	5,695	2,159	825	332	224	**9,236**
2016	5,554	2,085	797	326	213	**8,974**
2017	5,579	2,088	795	325	213	**9,000**
2018	5,957	2,186	832	336	228	**9,540**
2019	5,646	2,115	802	331	220	**9,115**
2020	3,445	1,270	494	208	133	**5,549**

* Calculated with INM 7.0b

Figure 18: Evolution of the surface area inside the L_{den} contours (2000, 2006-2020).

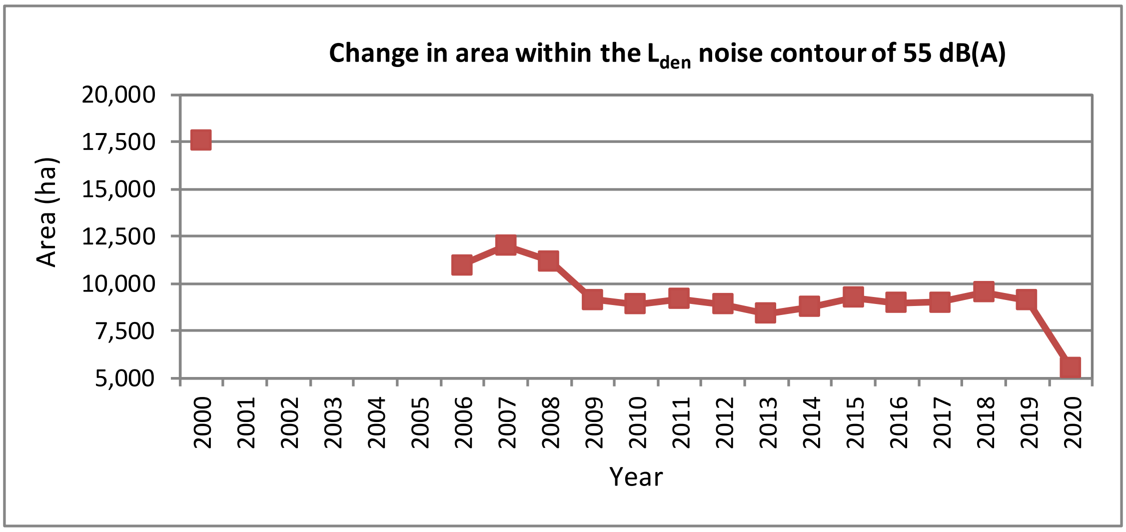


Table 36: Evolution of the surface area inside the Freq.70,day contours (2000, 2006-2020).

Area (ha)	Freq.70,day contour zone (day 07.00-23.00)*					
Year	5-10	10-20	20-50	50-100	>100	Total
2006						
2007						
2008						
2009						
2010	5,171	3,164	4,119	2,097	1,877	**16,428**
2011	4,933	2,989	4,216	1,934	1,854	**15,926**
2012	5,155	3,662	3,797	1,578	1,684	**15,877**
2013	4,660	3,915	3,154	1,879	1,503	**15,557**
2014	4,809	3,745	3,465	1,631	1,722	**15,372**
2015	6,650	4,431	3,442	1,903	1,887	**18,314**
2016	3,331	3,407	3,372	1,715	1,666	**13,491**
2017	3,556	3,415	3,375	1,625	1,750	**13,722**
2018	3,851	3,553	3,286	1,811	1,773	**14,276**
2019	3,489	3,432	3,249	1,607	1,844	**13,621**
2020	4,334	2,988	2,600	958	156	**11,036**

* Calculated with INM 7.0b

Figure 19: Evolution of the surface area inside the Freq.70,day contours (2000, 2006-2020).

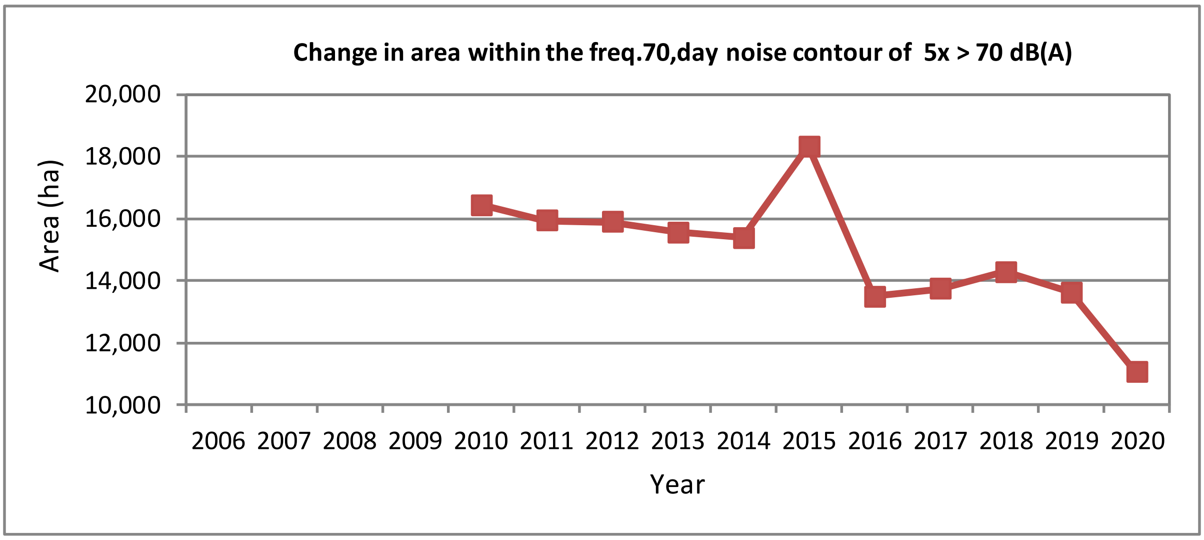


Table 37: Evolution of the surface area inside the Freq.70,night contours (2000, 2006-2020).

Area (ha)	Freq.70,night contour zone (night 23.00-07.00)*					
Year	**1-5**	**5-10**	**10-20**	**20-50**	**>50**	**Total**
2006						
2007						
2008						
2009						
2010	9,535	2,679	1,948	748	0	**14,910**
2011	9,557	2,662	2,095	801	0	**15,115**
2012	9,226	2,846	2,005	861	0	**14,938**
2013	9,083	2,821	2,223	723	0	**14,944**
2014	8,169	2,586	2,030	1,001	27	**13,813**
2015	7,949	2,928	1,876	1,133	0	**13,885**
2016	8,104	2,439	2,149	998	0	**13,690**
2017	7,813	2,512	2,142	959	0	**13,427**
2018	8,207	2,508	2,362	957	0	**14,034**
2019	7,834	2,345	2,299	1,012	0	**13,489**
2020	7,397	1,990	1,385	204	0	**10,976**

* Calculated with INM 7.0b

Figure 20: Evolution of the surface area inside the Freq.70,night contours (2000, 2006-2020).

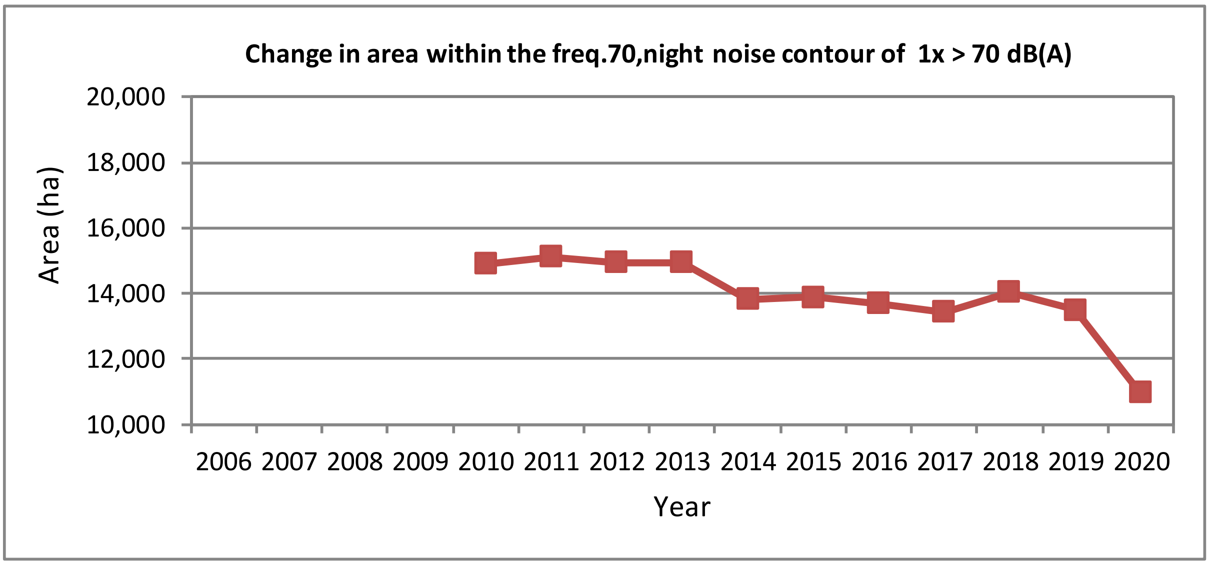


Table 38: Evolution of the surface area inside the Freq.60,day contours (2000, 2006-2020).

Area (ha)	Freq.60,day contour zone (day 07.00-23.00)*				
Year	**50-100**	**100-150**	**150-200**	**>200**	**Total**
2006					
2007					
2008					
2009					
2010	9,288	3,313	1,681	2,409	**16,692**
2011	9,112	3,405	1,476	2,579	**16,572**
2012	9,007	2,691	1,754	1,885	**15,337**
2013	8,005	1,958	2,053	972	**13,632**
2014	9,329	2,112	1,865	2,050	**15,357**
2015	9,211	3,511	1,633	1,848	**16,203**
2016	9,256	2,670	1,918	1,916	**15,760**
2017	8,315	3,795	1,795	2,223	**16,129**
2018	9,359	3,235	1,876	2,159	**16,629**
2019	8,816	3,495	1,916	2,239	**16,467**
2020	3,072	635	117	0	**3,824**

* Calculated with INM 7.0b

Figure 21: Evolution of the surface area inside the Freq.60,day contours (2000, 2006-2018).

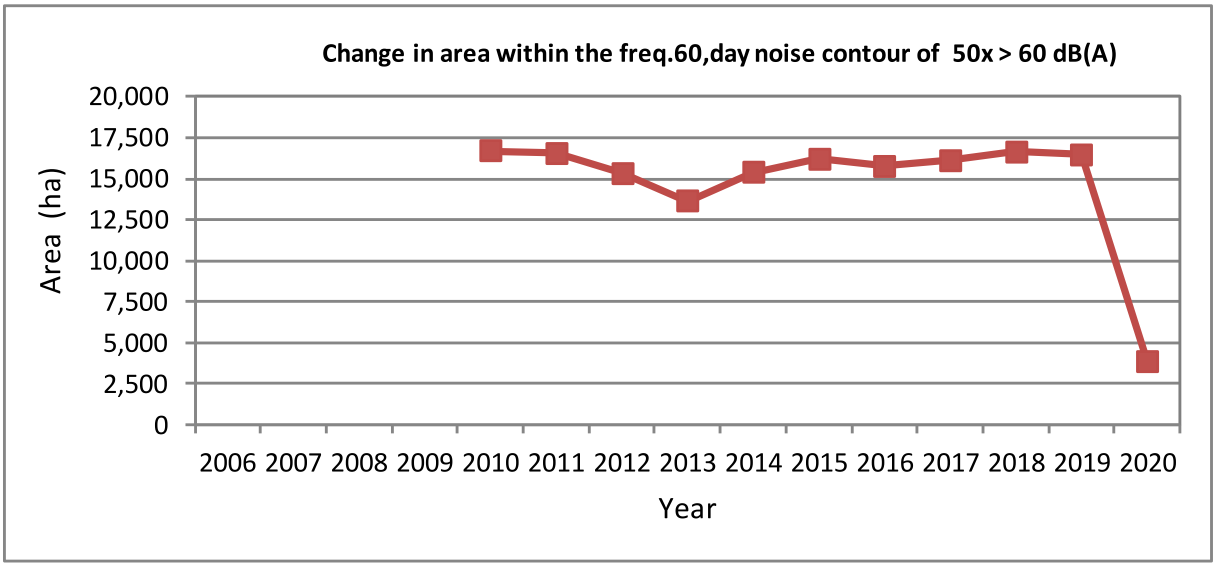
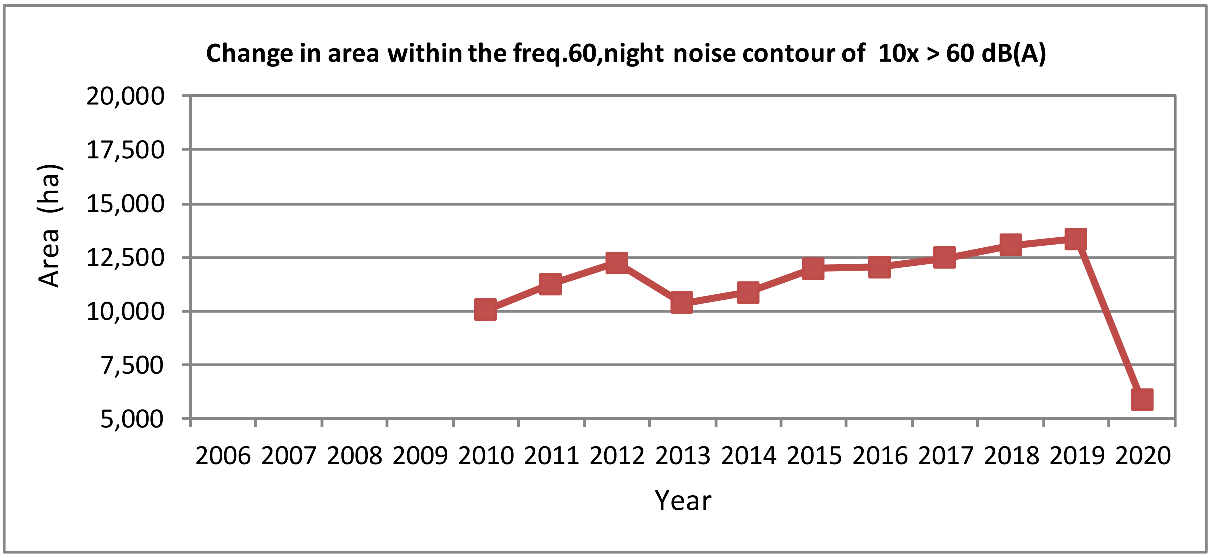


Table 39: Evolution of the surface area inside the Freq.60,night contours (2000, 2006-2020).

Area (ha)	Freq.60,night contour zone in dB(A)*				
Year	10-15	15-20	20-30	>30	Total
2006					
2007					
2008					
2009					
2010	5,577	1,797	1,930	725	**10,030**
2011	6,436	1,972	1,930	905	**11,242**
2012	7,522	1,778	1,932	1,004	**12,236**
2013	5,083	2,367	1,888	1,031	**10,369**
2014	4,807	2,542	1,845	1,670	**10,864**
2015	5,819	1,786	3,064	1,295	**11,964**
2016	5,142	3,635	2,053	1,222	**12,052**
2017	5,612	3,310	2,349	1,183	**12,454**
2018	5,580	3,434	2,746	1,301	**13,061**
2019	5,802	3,774	2,480	1,296	**13,352**
2020	4,111	882	567	267	**5,827**

* Calculated with INM 7.0b

Figure 22: Evolution of the surface area inside the Freq.60,night contours (2000, 2006-2018).



4.5.2 Evolution of the number of residents per contour zone: L_{day}, $L_{evening}$, L_{night}, Freq.70,day, Freq.70,night, Freq.60,day and Freq.60,night.

Table 40: Evolution of the number of residents inside the L_{day} contours (2000, 2006-2020).

Number of inhabitants		L_{day} contour zone in dB(A) (day 07.00-19.00)*					
Year	**Population data**	**55-60**	**60-65**	**65-70**	**70-75**	**>75**	**Total**
2000	01jan00	106,519	13,715	5,660	1,134	20	**127,048**
2001							
2002							
2003							
2004							
2005							
2006	01jan03	39,478	9,241	2,714	74	3	**51,511**
2007	01jan06	47,260	9,966	3,168	102	3	**60,499**
2008	01jan07	44,013	10,239	3,217	101	4	**57,575**
2009	01jan07	32,144	8,724	2,815	58	3	**43,745**
2010	01jan08	30,673	8,216	2,393	35	7	**41,323**
2011	01jan08	28,828	8,486	2,460	46	7	**39,828**
2012	01jan10	23,963	8,277	2,110	22	2	**34,375**
2013	01jan10	22,737	7,482	1,318	7	2	**31,546**
2014	01jan11	22,998	8,649	2,249	22	2	**33,920**
2015	01jan11	23,662	8,945	2,350	99	0	**35,056**
2016	01jan11	20,554	8,380	2,094	28	0	**31,057**
2017**	01jan16	21,950	9,003	3,108	0	0	**34,062**
2018**	01jan17	23,289	8,993	2,798	3	0	**35,083**
2019**	01jan19	21,875	9,342	3,270	3	0	**34,489**
2020**	01jan20	14,195	4,191	122	0	0	**18,507**

* Calculated with INM 7.0b, , ** evaluation by address

Figure 23: Evolution of the number of residents inside the L_{day} contours (2000, 2006-2020).

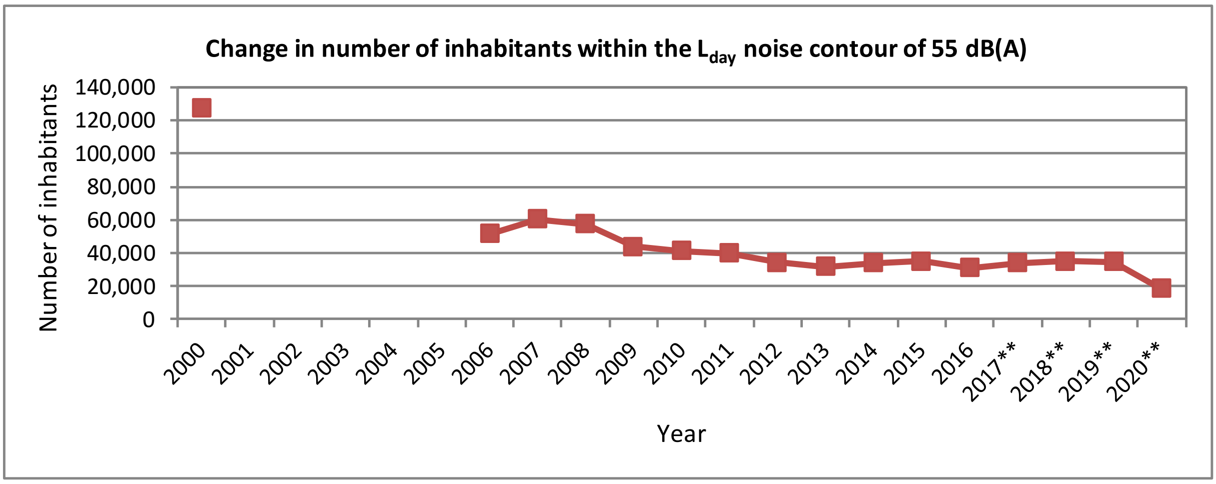


Table 41: Evolution of the number of residents inside the $L_{evening}$ contours (2000, 2006-2020).

Number of inhabitants		$L_{evening}$ contour zone in dB(A) (evening 19.00-23.00)*						
Year	Population data	50-55	55-60	60-65	65-70	70-75	>75	Total
2000	01jan00	209,265	86,637	13,246	4,990	602	9	**314,750**
2001								
2002								
2003								
2004								
2005								
2006	01jan03	185,699	24,488	7,138	2,030	28	3	**219,386**
2007	01jan06	214,616	35,445	8,217	2,583	38	2	**260,901**
2008	01jan07	249,024	43,589	9,514	2,969	52	3	**305,152**
2009	01jan07	198,351	29,774	7,448	2,186	32	2	**237,793**
2010	01jan08	198,934	37,729	7,127	2,057	25	5	**245,878**
2011	01jan08	198,540	41,951	7,110	2,077	32	5	**249,716**
2012	01jan10	213,799	46,427	7,309	2,072	27	1	**269,635**
2013	01jan10	148,866	25,888	6,432	1,054	7	1	**182,247**
2014	01jan11	187,698	23,913	9,632	2,052	29	0	**223,324**
2015	01jan11	168,549	22,593	8,790	2,424	88	0	**202,444**
2016	01jan11	204,319	29,643	9,140	2,796	52	0	**245,949**
2017**	01jan16	206,220	26,880	9,055	3,173	5	0	**245,334**
2018**	01jan17	226,101	34,113	10,033	3,538	57	0	**273,841**
2019**	01jan19	213,243	28,965	9,814	3,531	5	0	**255,558**
2020**	01jan20	54,642	16,266	5,093	261	0	0	**76,262**

* Calculated with INM 7.0b, ** evaluation by address

Figure 24: Evolution of the number of residents inside the $L_{evening}$ contours (2000, 2006-2020).

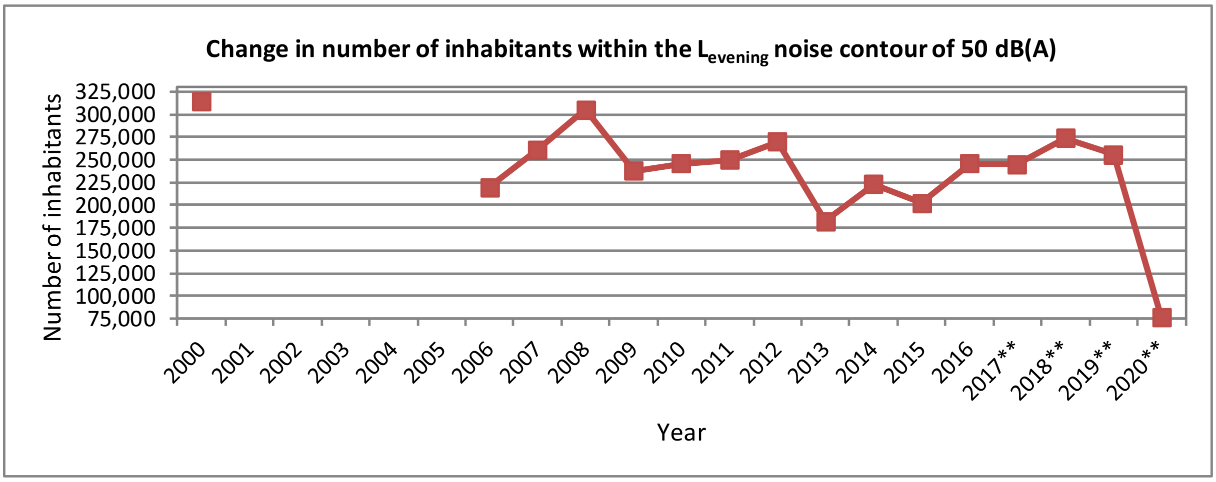


Table 42: Evolution of the number of residents inside the L_{night} contours (2000, 2006-2020).

Number of inhabitants		L_{night} contour zone in dB(A) (night 23.00-07.00)						
Year	**Population data**	**45-50**	**50-55**	**55-60**	**60-65**	**65-70**	**>70**	**Total**
2000	01jan00	139,440	57,165	18,384	8,394	1,325	72	**224,779**
2001								
2002								
2003								
2004								
2005								
2006	01jan03	167,033	28,985	8,836	1,167	174	8	**206,202**
2007	01jan06	199,302	32,473	11,607	2,185	181	26	**245,772**
2008	01jan07	151,736	26,450	7,985	1,017	133	3	**187,323**
2009	01jan07	122,871	19,528	6,303	622	92	2	**149,418**
2010	01jan08	129,820	19,986	6,077	571	89	5	**156,548**
2011	01jan08	129,969	22,490	6,414	622	94	5	**159,594**
2012	01jan10	124,012	24,015	6,963	585	78	2	**155,655**
2013	01jan10	91,140	28,407	7,152	51	3	0	**126,754**
2014	01jan11	163,270	24,221	7,889	869	110	3	**196,362**
2015	01jan11	125,407	26,956	8,239	762	159	2	**161,524**
2016	01jan11	128,939	23,476	7,954	715	131	0	**161,216**
2017**	01jan16	106,964	27,127	7,484	469	66	0	**142,110**
2018**	01jan17	122,588	29,355	7,601	501	64	0	**160,109**
2019**	01jan19	127,079	27,978	8,065	529	66	0	**163,718**
2020**	01jan20	60,530	18,372	2,217	390	57	0	**81,566**

* Calculated with INM 7.0b, ** evaluation by address

Figure 25: Evolution of the number of residents inside the L_{night} contours (2000, 2006-2020).

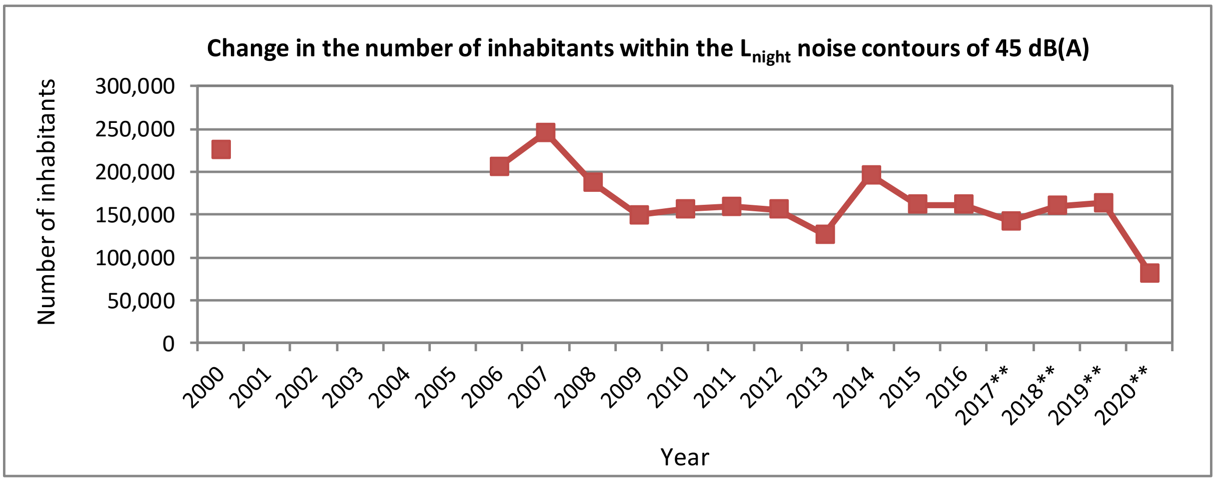


Table 43: Evolution of the number of residents inside the L_{den} contours (2000, 2006-2020).

Number of inhabitants		L_{den} contour zone in dB(A) (d. 07-19, ev. 19-23, n. 23-07)*					
Year	Population data	55-60	60-65	65-70	70-75	>75	Total
2000	01jan00	166,767	36,797	14,091	3,952	264	**221,871**
2001							
2002							
2003							
2004							
2005							
2006	01jan03	107,514	18,697	5,365	560	63	**132,198**
2007	01jan06	147,349	19,498	6,565	946	82	**174,442**
2008	01jan07	125,927	19,319	5,938	717	24	**151,925**
2009	01jan07	87,766	15,105	4,921	404	9	**108,205**
2010	01jan08	87,083	15,619	4,506	337	11	**107,556**
2011	01jan08	90,988	15,941	4,664	362	13	**111,969**
2012	01jan10	86,519	16,220	4,617	319	6	**107,680**
2013	01jan10	56,516	16,517	3,994	197	5	**77,229**
2014	01jan10	84,747	16,525	5,076	368	9	**106,725**
2015	01jan11	72,628	17,721	5,244	428	55	**96,075**
2016	01jan11	77,229	16,694	5,284	450	23	**99,680**
2017**	01jan16	70,139	17,645	5,264	257	0	**93,305**
2018**	01jan17	77,812	19,476	5,413	413	0	**103,114**
2019**	01jan19	72,561	19,231	5,448	383	0	**97,624**
2020**	01jan20	34,236	9,801	1,361	110	0	**45,508**

* Calculated with INM 7.0b, ** evaluation by address

Figure 26: Evolution of the number of residents inside the L_{den} contours (2000, 2006-2020).

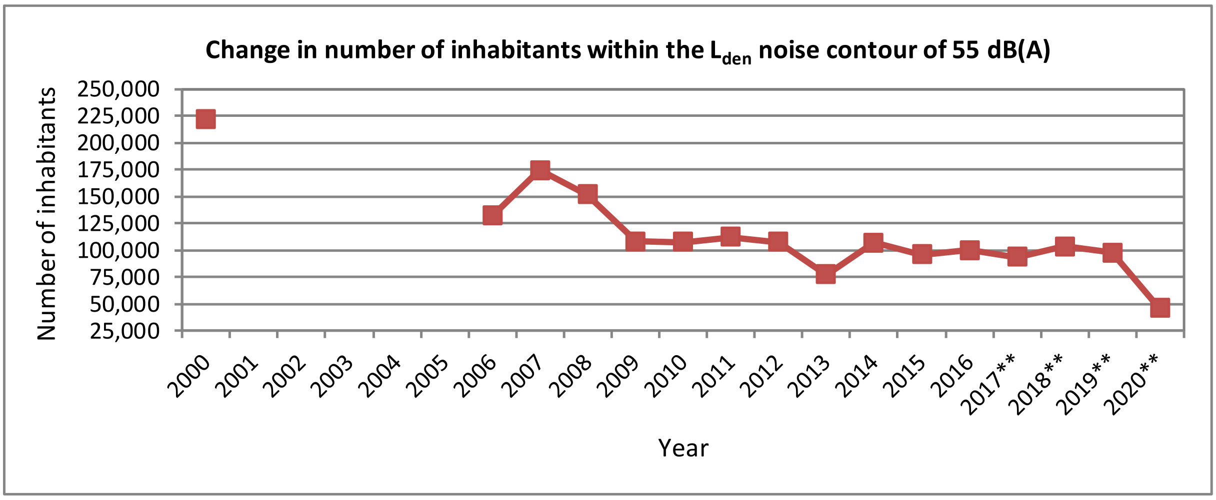


Table 44: Evolution of the number of residents inside the Freq.70,day contours (2000, 2006-2020).

Number of inhabitants		Freq.70,day contour zone (day 07.00-23.00)*					
Year	**Population data**	**5-10**	**10-20**	**20-50**	**50-100**	**>100**	**Total**
2006							
2007							
2008							
2009							
2010	01jan08	133,468	77,606	82,703	15,348	9,874	**318,999**
2011	01jan08	133,014	80,395	78,893	11,783	10,018	**314,103**
2012	01jan10	128,971	95,435	58,279	10,112	9,339	**302,136**
2013	01jan10	94,888	84,745	33,045	14,225	6,554	**239,376**
2014	01jan11	226,319	139,618	47,774	10,655	10,379	**434,746**
2015	01jan11	163,105	104,564	43,843	11,547	11,204	**334,264**
2016	01jan11	95,084	86,813	40,288	10,509	10,541	**243,235**
2017**	01jan16	111,019	92,035	40,125	10,365	12,694	**266,238**
2018**	01jan17	122,115	94,126	42,456	22,569	1,024	**282,289**
2019**	01jan19	108,714	110,676	42,207	21,742	1,088	**284,427**
2020**	01jan20	102,799	31,056	17,647	8,250	0	**159,753**

* Calculated with INM 7.0b, ** evaluation by address

Figure 27: Evolution of the number of residents inside the Freq.70,day contours (2000, 2006-2020).

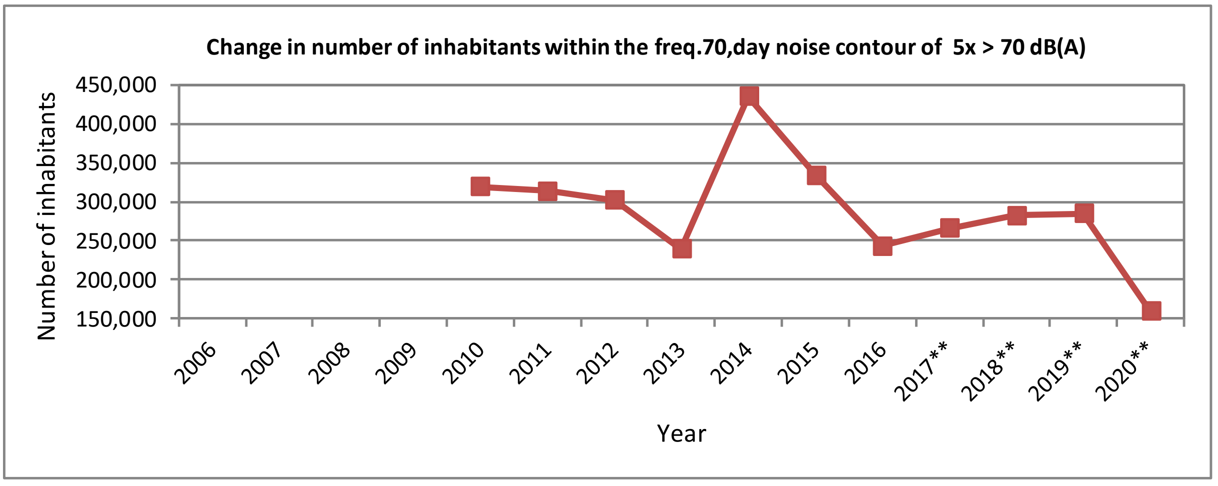


Table 45: Evolution of the number of residents inside the Freq.70,night contours (2000, 2006-2020).

Number of inhabitants		Freq.70,night contour zone (night 23.00-07.00)*					
Year	**Population data**	**1-5**	**5-10**	**10-20**	**20-50**	**>50**	**Total**
2006							
2007							
2008							
2009							
2010	01jan08	239,529	23,583	12,968	2,597	0	**278,677**
2011	01jan08	232,090	22,587	13,071	3,261	0	**271,010**
2012	01jan10	195,400	21,774	12,858	4,078	0	**234,110**
2013	01jan10	158,701	22,985	15,876	1,774	0	**199,913**
2014	01jan11	240,106	19,794	13,018	6,333	0	**279,251**
2015	01jan11	167,925	22,934	13,681	6,400	0	**210,939**
2016	01jan11	183,776	18,616	14,079	6,151	0	**222,622**
2017**	01jan16	155,257	19,411	14,408	5,854	0	**194,930**
2018**	01jan17	172,835	21,478	14,948	6,020	0	**215,281**
2019**	01jan19	184,024	20,072	15,028	6,574	0	**225,698**
2020**	01jan20	89,653	17,902	6,243	496	0	**114,295**

* Calculated with INM 7.0b, ** evaluation by address

Figure 28: Evolution of the number of residents inside the Freq.70,night contours (2000, 2006-2020).

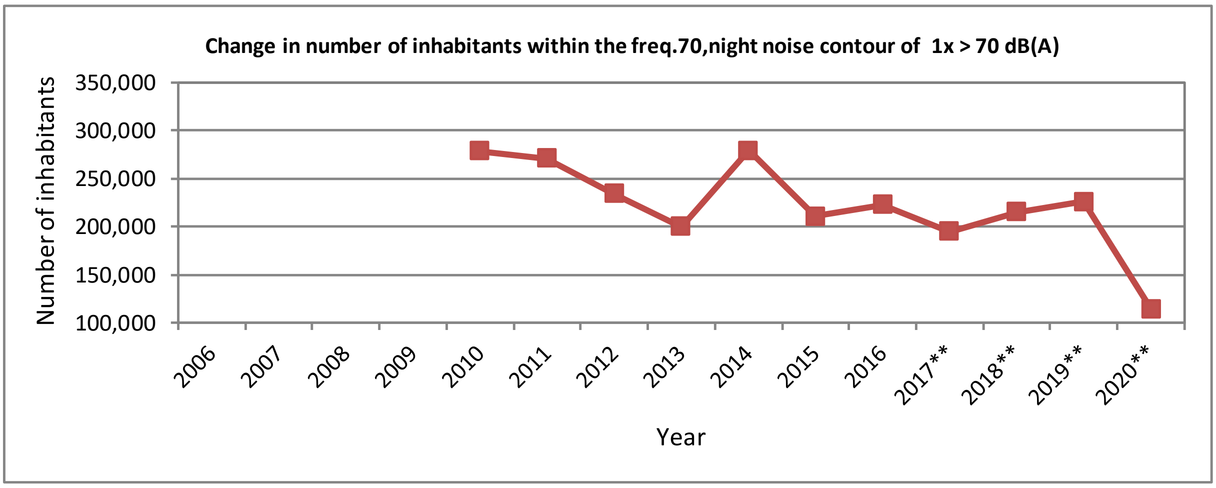


Table 46: Evolution of the number of residents inside the Freq.60,day contours (2000, 2006-2020).

Number of inhabitants		Freq.60,day contour zone (day 07.00-23.00)*				
Year	**Population data**	**50-100**	**100-150**	**150-200**	**>200**	**Total**
2006						
2007						
2008						
2009						
2010	01jan08	154,110	49,587	14,723	15,834	**234,253**
2011	01jan08	152,727	50,646	8,604	18,816	**230,793**
2012	01jan10	158,634	35,632	10,547	15,498	**220,312**
2013	01jan10	123,956	12,877	18,257	3,603	**174,921**
2014	01jan11	273,603	22,036	10,282	17,121	**323,042**
2015	01jan11	191,263	23,810	12,105	16,596	**243,774**
2016	01jan11	179,841	31,127	10,476	17,495	**238,939**
2017**	01jan16	174,069	62,701	9,661	22,736	**269,167**
2018**	01jan17	221,416	18,985	11,353	21,484	**273,238**
2019**	01jan19	200,841	55,497	10,932	23,645	**290,915**
2020**	01jan20	32,599	4,191	0	0	**36,790**

* Calculated with INM 7.0b, ** evaluation by address

Figure 29: Evolution of the number of residents inside the Freq.60,day contours (2000, 2006-2020).

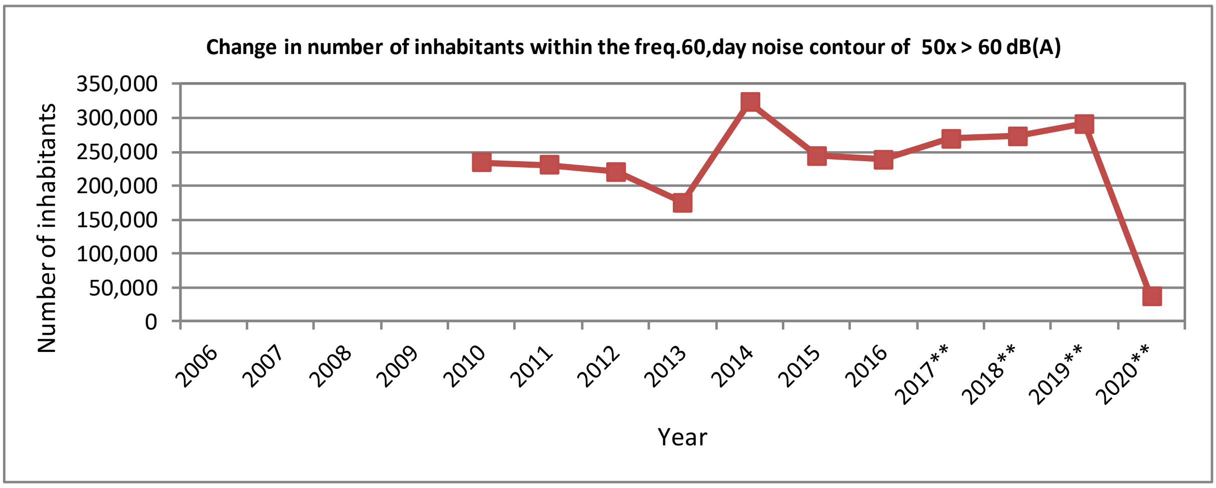
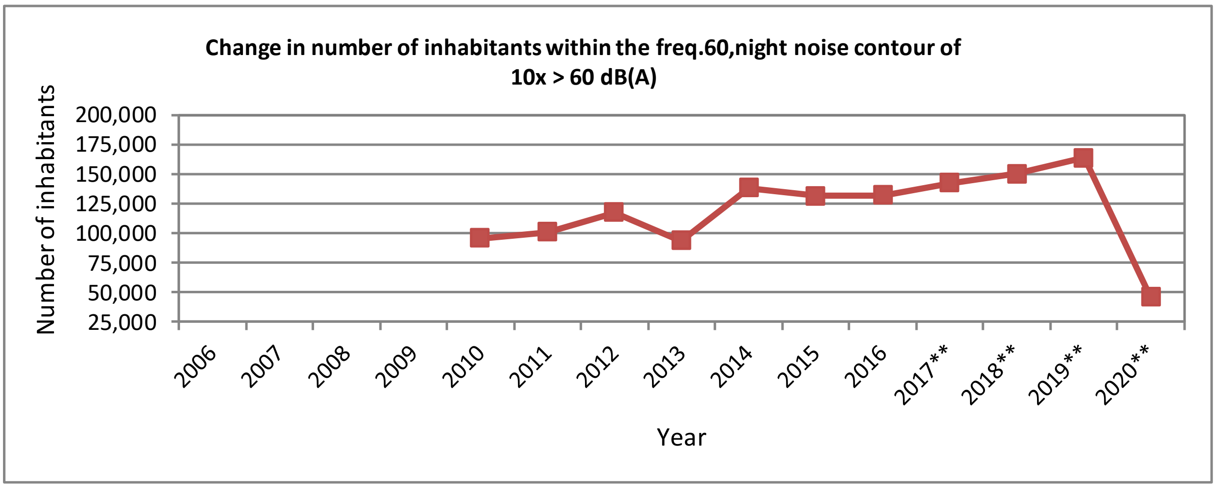


Table 47: Evolution of the number of residents inside the Freq.60,night contours (2000, 2006-2020).

Number of inhabitants		Freq.60,night contour zone in dB(A)*				
Year	Population data	10-15	15-20	20-30	>30	Total
2006						
2007						
2008						
2009						
2010	01jan08	62,090	9,411	21,231	3,262	**95,994**
2011	01jan08	65,246	9,522	20,695	5,450	**100,913**
2012	01jan10	80,911	8,723	20,642	7,009	**117,284**
2013	01jan10	52,151	14,679	20,269	6,340	**93,438**
2014	01jan11	79,725	27,741	18,637	12,317	**138,420**
2015	01jan11	84,429	12,453	24,502	10,351	**131,736**
2016	01jan11	81,235	20,356	21,869	8,779	**132,238**
2017**	01jan16	93,532	15,687	23,488	9,538	**142,245**
2018**	01jan17	98,609	16,849	24,728	10,016	**150,202**
2019**	01jan19	110,835	17,770	24,096	10,817	**163,518**
2020**	01jan20	30,334	10,565	4,365	539	**45,803**

* Calculated with INM 7.0b, ** evaluation by address

Figure 30: Evolution of the number of residents inside the Freq.60,night contours (2000, 2006-2020).



4.6 Documentation provided files

Radar data for the year 2020 (source: BAC-TANOS)

2020-JAN-JUN_flights.csv	07/01/2021	22,751 kB
2020-JAN-JUN_ops.csv	07/01/2021	632,343 kB
2020-JUL-DEC_flights.csv	07/01/2021	17,607 kB
2020-JUL-DEC_ops.csv	07/01/2021	496,676 kB

Flight data for the year 2020 (source: BAC-CDB)

cdb_2020_01_12.txt	04/01/2021	26,353 kB

Weather data for the year 2020 (source: BAC-TANOS)

2020_meteo.xlsx	07/01/2020	3,329 kB

Noise events for the year 2020 (source: BAC-TANOS / dOMG)

2020-01_03_events TANOS_BAC.xlsx	11/02/2021	68,382kB
2020-04_06_events TANOS_BAC.xlsx	11/02/2021	16,665 kB
2020-07_09_events TANOS_BAC.xlsx	11/02/2021	34,711 kB
2020-10_12_events TANOS_BAC.xlsx	11/02/2021	34,171 kB
2020-01_06_events TANOS_VO.xlsx	11/02/2021	28,380 kB
2020-07_12_events TANOS_VO.xlsx	11/02/2021	22,628 kB

1 h reports noise measuring network for the year 2020 (BAC-TANOS / dOMG)

uur-rapporten_2020-0106 TANOS.xlsx	11/02/2021	20,034 kB
uur-rapporten_2020-0712 TANOS.xlsx	11/02/2021	20,299 kB
status_LNE_2020_all.xls	11/02/2021	2,031 kB