



Health-Economic Impact of the aircraft noise from Brussels Airport

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Study commissioned by Bond Beter Leefmilieu

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Introduction

This short study was commissioned by Bond Beter Leefmilieu with the request to apply the same methodology that was used by Bruit-Parif study¹. The authors (ENVISA) urge caution when interpreting the results of this work, and offer no comment on the validity or otherwise of the numbers calculated or the conclusions that may be deducted.

However, the results obtained here are broadly inline with those obtained in the Bruit-Parif study.

Comparison of the health-economic cost between the Bruit-Parif study for the Ile-de-France region and the Envisa study (with the Bruit-Parif method) for Brussels

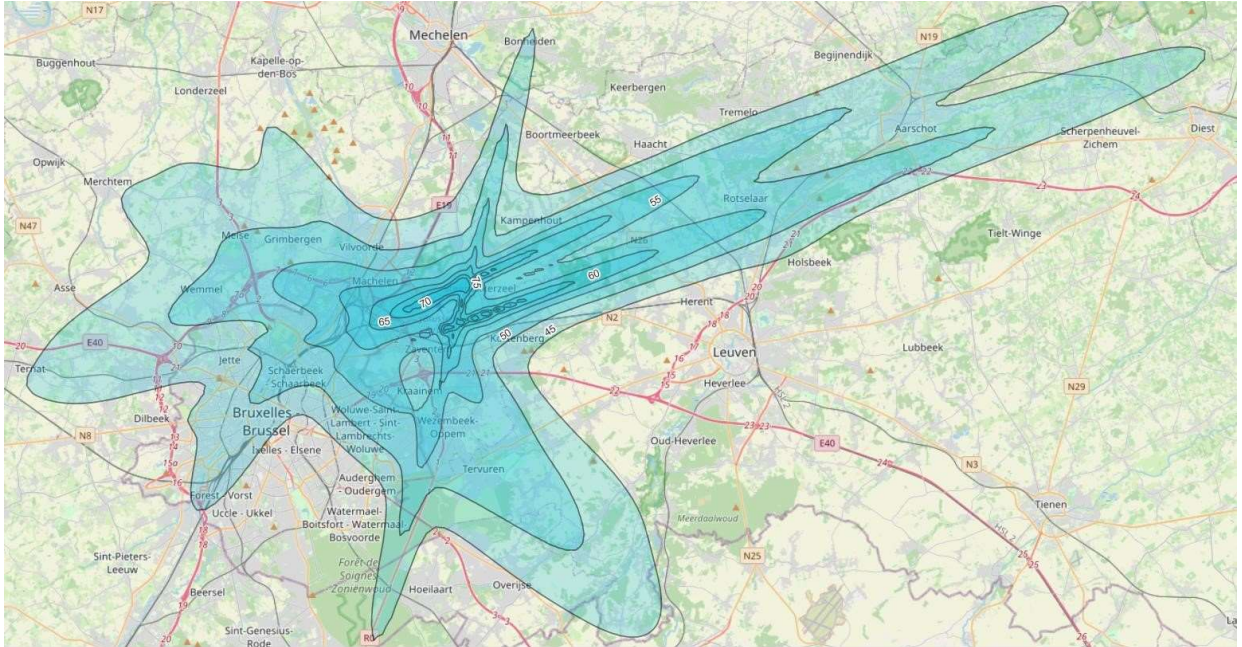
	Bruit-Parif - Ile-de-France			Envisa - Brussels		
	People	DALYs	Cost €bn/yr	People	DALYs	Cost €bn/yr
Annoyance	210,000	4,200	0.553	220,000	4,830	0.578
Sleep disturbance	188,000	13,000	1.738	109,000	7,630	1.007
Cardiovascular	78,800	9,300	1.222	53,000	6,800	0.9

¹ [2021-11-30 - Rapport - Coût social du bruit en Ile-de-France.pdf \(bruitparif.fr\)](#)

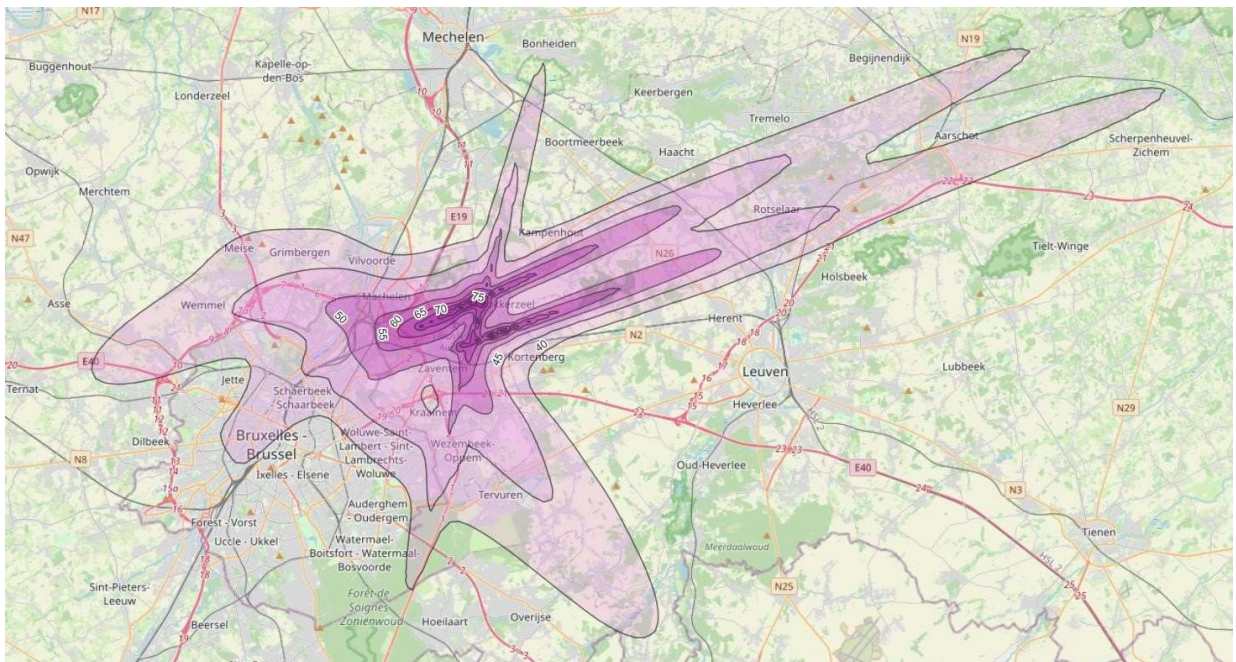
Noise contours

The noise contours for Lden 50 dB, 45 dB and Lnight 40 dB representing **2019** have been generated using AEDT. They are shown below with the other contours obtained in the Envisa Chapter 3 Noise Study for Brussels-National¹.

Lden



Lnight



¹ <https://mobilit.belgium.be/fr/publications/rapport-envisa-chapitre-3>

Noise Annoyance

After having computed the population within the **Lden** contours, the percentage of the population Highly Annoyed (HA) within each noise band has been calculated using the dose-effect relationship from the WHO^{2,3}:

$$AR_{HA,air} = \frac{(-50.9693 + 1.0168 * L_{den} + 0.0072 * L_{den}^2)}{100}$$

The number of people highly annoyed was then calculated for every noise band by multiplying the population inside the band with the AR (Absolute Risk, i.e. the percentage), and summed.

$$N_{x,y} = \sum_j [n_j * AR_{j,x,y}]$$

Giving a total number of **HA** equal to **220,000 people**.

This number was then converted to **DALYs** (Disability Adjusted Life Years) with a Disability Weight of **0.02** (defined by the WHO, 2018), giving **4,380 DALYs**.

Finally, this value can be converted to Euros with the value of a healthy life-year, equal to 132,000 €, as derived from the work of the Quinet Commission⁵.

This gives a health-economic cost of **578,500,000 €/year**.

Sleep Disturbance

Using the **Lnight** contours, the percentage of the population Highly disturbed during sleep (**HSD**, High Sleep Disturbance) within each noise band has been calculated using the dose-effect relationship from the WHO^{4,2}:

$$AR_{HSD,air} = \frac{(16.7885 - 0.9293 * L_{night} + 0.0198 * L_{night}^2)}{100}$$

The number of people highly disturbed was then calculated for every noise band by multiplying the population inside the band with the percentage, and summed.

$$N_{x,y} = \sum_j [n_j * AR_{j,x,y}]$$

Giving a total number of **HSD** equal to **109,000 people**.

This number was then converted to **DALYs** (Disability Adjusted Life Years) with a Disability Weight of **0.07** (defined by the WHO, 2018), giving **7,630 DALYs**.

² WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Annoyance

³ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020L0367&qid=1651314716842&from=EN>

⁵ Commissariat général à la stratégie et à la prospective, 2013. Évaluation socioéconomique des investissements publics.

⁴ WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Effects on Sleep.

Finally, this value can be converted to Euros with the value of a healthy life-year, equal to 132,000 €, as derived from the work of the Quinet Commission.

This gives a health-economic cost of **1,007,000,000 €/year**.

Cardiovascular Diseases

Using the **proportion** of the population within the **Lden** contours, the **Relative Risk (RR) of IHD (Ischemic Heart Disease)** was calculated for each noise band, with the following formula from the WHO:

$$RR = \exp(\ln(1,09)/10 \times (L_{den} - 45)) \text{ si } L_{den} \geq 45 \text{ dB, and } RR = 1 \text{ si } L_{den} < 45 \text{ dB}$$

It corresponds to an increase of the relative risk equal to 9% per an increase of 10 dB(A), normalized.

Then the **Absolute Risk (RR)** and the **Over-Risk** were calculated, with an incidence rate equal to 3.7%⁵. This gives a total number of people subject to an **increased risk of IHD** equal to **2,000 people**.

About cerebrovascular accidents, for aircraft noise, the results published in the framework of the DEBATS⁸ programme (France) do not show any association between exposure to aircraft noise and stroke mortality.

The **Relative Risk of Hypertension among men**⁶ was calculated with the formula:

$$RR = \exp(\ln(1,48)/10 \times (L_{den} - 45)) \text{ si } L_{den} \geq 45 \text{ dB, and } RR = 1 \text{ si } L_{den} < 45 \text{ dB}$$

It corresponds to an increase of the relative risk equal to 48% per an increase of 10 dB(A)^{7,8}, normalized.

⁵ Prévalences et statut fonctionnel des cardiopathies ischémiques et de l'insuffisance cardiaque dans la population adulte en France : apports des enquêtes déclaratives « Handicap-Santé » (santepubliquefrance.fr)⁸ Evrard AS, Lefèvre M, Baudin C, Nassur AM, Bouaoun L, Bruitparif, Carlier MC, Champelovier P, GiorgisAllemand L, Kourieh A, Lambert J, Léger D, Laumon B. Bruit des avions et santé des riverains d'aéroport. L'étude nationale Debats. Résultats à l'inclusion. Université Gustave Eiffel (2020). doi: 10.25578/M3JK-R022

⁶ The national DEBATS programme indicates an increased relative risk of hypertension in relation to airborne noise exposure only in men. noise, only in men. The association found in women was not found to be statistically significant

⁷ Evrard AS, Lefèvre M, Champelovier P, Lambert J, Laumon B. Does aircraft noise exposure increase the risk of hypertension in the population living near airports in France? Occupational and Environmental Medicine 2017;74(2):123-129.

⁸ Lefèvre M, Champelovier P, Lambert J, Laumon B, Evrard AS. Niveau tensionnel moyen et risque d'hypertension chez les riverains des aéroports en France. Bulletin Épidémiologique Hebdomadaire 2018;18: 364-372.

The **Absolute Risk (RR)** and the **Over-Risk** were calculated, with an incidence rate of 36.5%⁹ of hypertension among men (in France) was used to calculate the total number of men affected.

This gives a number of men subject to an **increased risk of hypertension** equal to **51,000 people**.

The potential cases of both IHD and Hypertension were then converted to **DALYs** (Disability Adjusted Life Years) using a **Disability Weight of 0.405 for IHD** (WHO, 2018), and **0.117 for hypertension** (WHO, 2018), giving a total number of **6,800 DALYs**.

Finally, after converting to euros, this gives a health-economic cost of **almost 900,000,000 €/year**.

⁹ [L'hypertension artérielle en France : prévalence, traitement et contrôle en 2015 et évolutions depuis 2006 \(santepubliquefrance.fr\)](https://www.santepubliquefrance.fr)