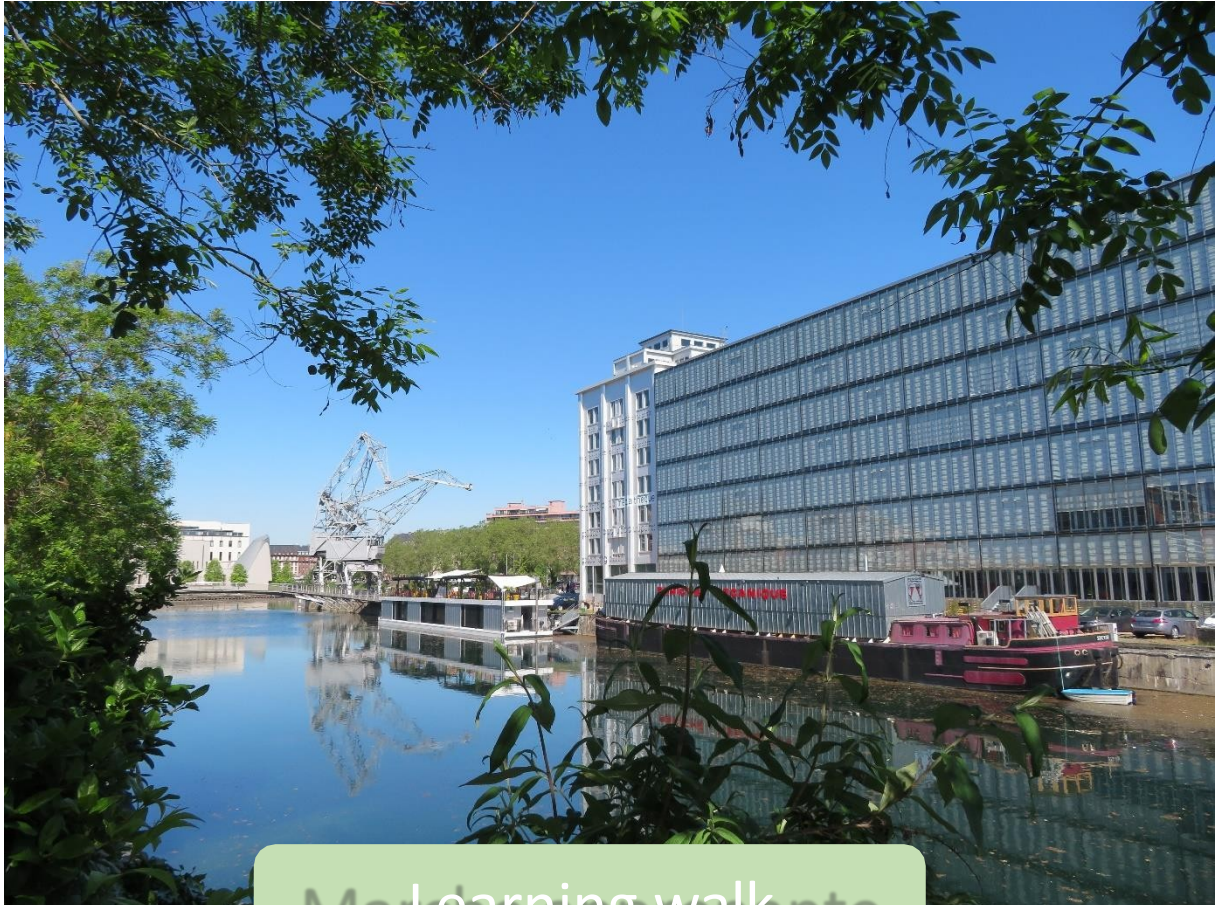


## TRAINING COURSE: "HEALTH-PROMOTING URBAN PLANNING"

September 2024



Area: Danube and Malraux neighbourhoods in Strasbourg

### Contributors:

Pascale Rouillard-Neau, Head of Environmental Health and Hygiene, City and Eurometropolis of Strasbourg

Raphaël Wurm, Environmental Research Officer, City and Eurometropolis of Strasbourg

Emmanuelle Drab-Sommesous, Director of Support and Development, ATMO Grand Est

Katharina Brockstedt, Coordinator of the Envirobat Grand Est Resource Centre

## PREAMBLE

The training course "Health-promoting urban planning", which took place on 9 and 10 September 2024, is jointly organised by the Eurométropole de Strasbourg and the École des Hautes Études en Santé Publique (EHESP).

This project is part of the Local Health Contract and the PACTE "Planning and Building for Ecological Transition" programme of the Eurométropole de Strasbourg.

The partners associated with this training programme are ATMO Grand Est, CEREMA Grand Est and Envirobat Grand Est.

This document outlines the stages of the learning process in environmental health that took place in the Malraux/Danube neighbourhood.

Indeed, development and urban planning choices play a key role in the quality of life and well-being of residents, and must therefore be adapted to environmental issues in order to ensure health as much as possible.

This learning journey, the third session for the local authority, aims to identify the links and challenges between urban planning and health through the places observed during the walk and knowledge of the area.

For several environmental determinants such as exposure to noise, air pollution, active mobility, etc., this document highlights some elements from the literature on health impacts and links the subject to the reality of neighbourhood development at various stations.

The learning walk is an opportunity to explore the Danube Eco-neighbourhood from a health perspective.

The Danube ZAC (joint development zone) was created in 2008. From the outset, the project was part of a desire to build the city on top of the city. From 1925 to 1971, the ZAC site was home to a former gas production plant. In 1999, GDF began the initial clean-up of the site. The clean-up was then continued by SERS, the ZAC developer.

The objectives of the project were as follows:

- Promote new forms of mobility: neighbourhood served by public transport, traffic calming measures, facilities for bicycle use, etc.
- Developing community living: a co-designed neighbourhood (48 co-design workshops, educational visits, SERS project barge, etc.), shared public spaces, a nursing home, a student residence, etc.
- Promoting biodiversity: local species, zero pesticides, reduced maintenance to encourage biodiversity, etc.
- A neighbourhood that promotes residents' health: improved soil quality, air quality measures, a meeting area that brings peace to the heart of the neighbourhood, binding specifications for the layout of housing and bedrooms, etc.
- An energy-efficient neighbourhood: urban designs that promote natural sunlight, limited car use, ELITHIS positive energy tower, etc.
- No rainwater discharge into the network: rainwater is infiltrated via swales for road water, green roofs and devices to control the outflow, which is then returned to the swales.

In total, 7 hectares have been developed, providing 650 housing units (50% subsidised housing – including 10% social home ownership, 10% self-promotion, 40% private developers), an 84-bed nursing home, 20,000 m<sup>2</sup> of net floor area for offices, shops and services, and 6,000 m<sup>2</sup> of net floor area for public facilities.



*Learning walk circuit*

No. 1	In front of INET – Rue Edmond Michelet
	Introduction

This section briefly discusses the impact of environmental exposure on health, the recent concept of the exposome taken into account by public health legislation, and the social cost of air pollution and noise.

## ■ The importance of taking environmental exposures into account

### WHO 2006: Nearly a quarter of all diseases are caused by environmental exposure

16 JUNE 2006 | GENEVA - **Up to 24% of diseases worldwide are caused by preventable environmental exposures.** Indeed, global health statistics released by the WHO for 2024 highlight the fact that outdoor and indoor air pollution caused **6.7 million deaths in 2019**, of which 4.2 million were attributable to outdoor air pollution and 3.2 million to indoor air pollution. And in 2019, **99% of the world's population lived in environments where air pollution levels exceeded the limits set by the WHO** (the WHO recommends an annual concentration of fine particles of around 5 µg/m<sup>3</sup> to protect public health).

Well-targeted interventions can prevent most of these environmental risks, as shown in a report published today by the World Health Organisation (WHO). The report also estimates that more than 33% of diseases affecting children under the age of five are caused by environmental exposures. Preventing environmental risks could save the lives of nearly four million children a year, especially in developing countries.

The report, entitled *Preventing Disease Through Healthy Environments: Towards an Assessment of the Burden of Environmental Illness*, is the most comprehensive and systematic study ever undertaken on how preventable environmental risks contribute to a range of diseases and injuries.

**WHO report July 2019: Environmental and health inequalities in Europe** In all countries of the WHO European Region, there are inequalities in environmental exposure and environmental injuries, which contribute to health inequities.

According to this report, **environmental risk factors account for at least 15% of mortality in the Region** – approximately 1.4 million deaths per year, most of which are preventable.

The report shows that disadvantaged population subgroups can have exposure levels to environmental risk factors that are five times higher than those of privileged subgroups.

Inequalities in environmental exposure exist within countries themselves. In France, more than three out of four children breathe polluted air, according to a report by Réseau Action Climat and UNICEF France<sup>1</sup>. However, children are not a homogeneous and uniform group. **Certain factors, such as poverty, are particularly debilitating.** Poor populations find it more difficult to escape unfavourable living conditions due to a lack of sufficient resources, and are therefore more **likely to experience multiple disadvantages**.

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<sup>1</sup> Climate Action Network France & UNICEF France. (October 2021). *Social injustice in the air. Child poverty and air pollution*. [https://reseauactionclimat.org/wp-content/uploads/2021/10/injusticesocialesdanslair\\_rapport\\_final\\_webpages.pdf](https://reseauactionclimat.org/wp-content/uploads/2021/10/injusticesocialesdanslair_rapport_final_webpages.pdf)

**harmful exposures** (poor indoor air quality, higher exposure to noise, heat, etc.). Most studies also show that socio-economically disadvantaged areas **have fewer green spaces, parks, playgrounds and leisure areas, or other resources that could offset less favourable living conditions.**

**This combination of harmful exposures has a direct impact on children's vulnerability and can lead to various diseases.** A French study has shown that in Paris, although all neighbourhoods are exposed to air pollution, the poorest residents are three times more likely to die from a pollution episode than the wealthiest residents.

According to the WHO, two-thirds of deaths attributed to environmental risk factors are due to non-communicable diseases such as heart disease, stroke and cancer.

## ■ The concept of the exposome

With the new concept of the exposome, the Touraine public health law recognises environmental health as a public health issue in its own right for the first time. **The exposome defines the impact of an individual's physical, biological and social environment from conception to the end of life.** In other words, studying exposome data is no easy task and remains highly complex due to its multifactorial nature.

### Article L2111-1 of the CSP - Amended by Law No. 2016-41 of 26 January 2016 on the modernisation of our health system - Art. 1

*The State, local authorities and social security organisations shall participate, under the conditions set out in this book, in the protection and promotion of maternal and child health, which includes in particular:*

*...//....*

*5° Preventive and informational measures concerning health risks linked to environmental factors, based on the concept of the exposome.*

### Article L1411-1 of the CSP \_ Amended by Law No. 2019-774 of 24 July 2019 - Art. 7

*The Nation defines its health policy in order to guarantee the right to health protection for all.*

*Health policy is the responsibility of the State. It aims to promote living conditions conducive to good health, improve the health of the population, reduce social and regional inequalities and ensure equality between women and men, as well as to guarantee the best possible health security and effective access to prevention and care for the population.*

*Health policy includes:*

*1° Monitoring and observing the health status of the population and identifying its main determinants, particularly those related to education and living and working conditions. The identification of these determinants is based on **the concept of the exposome, understood as the integration over a lifetime of all exposures that may influence human health;***

*2° Promoting health in all areas of life, particularly in educational establishments and in the workplace, and reducing health risks related to*

diet, environmental factors and living conditions that may affect it;

- **Exposure:** **impacts health** **impacts on intergenerational health** **and transgenerational**

Article "**The exposome paradigm: definition, context and perspective**" by Bernard Jégou (Inserm U 1085)

"According to WHO projections, these heterogeneous chronic diseases will lead to more than 40 million deaths worldwide each year. There is no doubt that the economic impact of these long-term diseases will be considerable. Thanks to advances in knowledge about epigenetics<sup>3</sup> and microbiota<sup>4</sup>, the question now is whether chronic diseases are "*non-communicable*", as they are very often described, or, on the contrary, transmissible.

However, **epigenetics, which encompasses all processes regulating gene expression, both during development and in response to environmental signals, is capable of transferring intergenerational and transgenerational inheritance** in terms of evolution, general biology and disease. For example, the winter famine that struck the Netherlands during the Nazi occupation in 1944-1945 led to studies being carried out on various cohorts. These revealed that adults whose parents (both men and women) suffered during this period had a higher incidence of short stature, obesity, microalbuminuria, metabolic and cardiovascular diseases, schizophrenia, and increased mortality. Recent studies also indicate that epigenetic alterations persist 60 years later in adults born to couples who suffered through this terrible famine.

[https://www.medecinesciences.org/en/articles/medsci/full\\_html/2020/10/msc200322/msc200322.html](https://www.medecinesciences.org/en/articles/medsci/full_html/2020/10/msc200322/msc200322.html)

***In point 1, we observe...***

- Alignment of trees conducive to cool spots;
- Presence of grass on the tram track surface, which helps reduce tram noise (noise absorption)



No. 2	Transit along Avenue du Rhin
	<i>Air pollution and indoor air quality Noise from transport infrastructure</i>

This second station focuses on air pollution and noise from transport infrastructure.

### ■ Outdoor air pollution

Avenue du Rhin is a very busy road, with up to 45,000 vehicles per day. The **main** chemical and physical **pollutants** emitted by road traffic are:

- 47% of **NO<sub>x</sub>** emissions come from road traffic (EMS - 2020) = *a gas that irritates the bronchial tubes*.  
**NO<sub>2</sub>** is an indicator of air pollution linked to road traffic.
- Road traffic contributes to approximately 20% of direct emissions of **PM<sub>10</sub>** and **PM<sub>2.5</sub>** (EMS - 2020).  
Particles emitted by combustion engine vehicles are the most toxic due to their size and composition. The surface of these PM particles contains metals and carcinogenic PAHs, which are responsible for cardiovascular and respiratory diseases.
- **Benzene**, a member of the VOC family, is mainly emitted by vehicles in the form of unburned HC produced in the exhaust and through evaporation (fuel tank, carburettor, etc.) = *respiratory irritation + carcinogenic effects*.

#### Influencing factors <sup>2</sup> :

- Number of vehicles: *higher concentrations during peak periods*.
- Type of vehicle: *heavy goods vehicles emit more NO<sub>x</sub> and PM than private vehicles, as do diesel engines compared to petrol engines, and two-wheeled vehicles emit high levels of VOCs, etc.*
- Traffic speed: *NO<sub>x</sub> and PM emissions are high at very low speeds or high speeds, while benzene emissions are highest at low speeds*.
- Road topography: *road width, height of surrounding buildings & dispersion of air pollution*.
- Weather conditions: *role in general (regional) and local dispersion near a road*.

Pollution is highest on roads, then gradually decreases with distance. The impact of a road on air quality can extend up to 200 m away (**NO<sub>2</sub>**), a distance that varies depending on the pollutants.

European law sets limit values for the presence of certain pollutants in the air, which are not yet being met across the whole of France, justifying the various penalties imposed on the country. The main emissions are related to **NO<sub>x</sub>** and **PM**.

#### Diffuse pollution:

Air pollution from motor vehicle traffic affects the respiratory health of urban populations in the very short term. In Europe, a simple annual increase of 5  $\mu\text{g}/\text{m}^3$  in fine particles is accompanied by a 13% increase in the risk of heart attack and a 19% increase in the risk of stroke.

The assessment of health risks related to air pollution produced by roads (INSERM – 2011, updated in 2015) confirms the impact on the health of the population living near a busy road (> 10,000 vehicles/day).

Living less than 75 metres from a high-traffic road increases cardiovascular mortality by 38% and the risk of ischaemic stroke by 22%, and ultimately increases the risk of dementia, diabetes and lung cancer.

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<sup>2</sup>[AIRPARIF News No. 39 - December 2012 - Pollution near traffic](#)

The prevalence of certain diseases linked to air pollution from road traffic is on the rise:

- ⇒ new cases of asthma in children (approximately 15 to 30%),
- ⇒ chronic respiratory and cardiovascular diseases in adults aged 65 and over,
- ⇒ increased risk (30%) of myeloblastic leukaemia in children.

Given the high stakes in terms of air quality, an **assessment of the impact of developments** (construction projects or road infrastructure developments) **on air quality and health** must be carried out at various stages of the project's progress.

A methodological guide on the "air and health" aspect of road impact studies has been developed by Cerema (2005, updated in 2019) and presents a list of useful tools and resources available.

#### **Channelled pollution:**

A distinction must be made between emissions from facilities classified for environmental protection (ICPE) and other industrial or tertiary emissions.

- For all **ICPE channelled emissions** (mandatory treatment):  
The INERIS Guide (2021): "*Assessment of the state of the environment and health risks – an integrated approach to the management of chemical emissions by ICPEs*" describes the assessment process (in four stages) for the prevention and management of health risks from ICPEs subject to authorisation.
  - ➔ Definition of a study area (based on the radius of the public inquiry notice), assessment of emissions, issues and exposure routes,
  - assessment of the state of the environment (dispersion modelling) and prospective assessment of health risks.
- For **non-ICPE discharge** facilities: application of the Departmental Health Regulations (RSD), a technical regulatory document applicable by the mayor. According to Article 63.1 of the RSD-67: "*Fresh air intakes and openings must, in principle, be located at least 8 metres from any potential source of pollution, in particular vehicles, smoke duct outlets, extracted air outlets, or with arrangements such as that a return of air polluted ne is not possible. Stricter provisions may be decided by the competent authority when there is a large amount of polluted air in the vicinity (e.g. extraction of air used for ventilation in a vehicle fleet or a large public building). Air extracted from premises must be discharged at least 8 metres from any window or fresh air intake, unless arrangements such as a polluted air return system are not possible. Air extracted from premises with specific pollution must also be discharged without recycling.*

#### **Airparif study, 2012**

Although air quality is improving overall and despite compliance with RSD provisions, concentrations of pollutants from road traffic (NO<sub>x</sub>, PM and benzene) may exceed limit values in the immediate vicinity of certain sensitive public buildings (schools, nurseries, hospitals, nursing homes).

#### **Changes in air quality in the Eurométropole de Strasbourg and along the Avenue du Rhin:**

Overall, in terms of regulatory values, air quality is improving year on year. However, if we take as a reference the recommended values defined by the WHO, which constitute health thresholds, the following is observed for 2021:

Population exposed to exceedances of WHO recommended thresholds:

- NO<sub>2</sub> (annual average): 486,500 inhabitants (i.e. 100% of the population)

- PM10 (annual average): 381,900 inhabitants (78% of the population)
- PM2.5 (annual average): 486,500 inhabitants (i.e. 100% of the population)

However, Avenue du Rhin remains a black spot.

## ■ Social cost of air pollution

**July 2015: social cost of air pollution in France: €101 billion**

On Wednesday 15 July, the Senate inquiry committee, chaired by Jean-François Husson, Senator (Les Républicains) for Meurthe-et-Moselle, published its estimate of the overall financial cost of poor air quality. This unprecedented assessment takes into account not only the health damage caused by pollution, but also its impact on buildings, ecosystems and agriculture.

Air pollutants not only increase the risk of lung cancer, but are also suspected of being a risk factor for breast cancer. This is revealed in a review of the international literature conducted by researchers from Inserm, CNRS and the University of Grenoble Alpes.

According to available data, approximately 1,700 cases of breast cancer each year in France can be attributed to exposure to air pollutants. The associated economic cost, combining tangible costs (those related to treatment) and intangible costs (those related to deaths, loss of quality of life and patient suffering) is in the order of £500 million to £800 million per year.

ANSES conducted an exploratory study on the socio-economic cost of indoor air quality:

- ⇒ **Social cost of indoor air quality: €19 billion in France**
- ⇒ **Social cost of outdoor air quality: €101 billion in France In addition:**
  - **48,000 premature deaths per year** (according to a study by Santé publique France), representing 9% of mortality in France and a loss of life expectancy at age 30 that could exceed two years
  - **30% of the population suffering from respiratory allergies** (RNSA)

## ■ Social cost of noise

**Social cost of noise in France: €147 billion, well above the 2016 estimate (€57 billion per year):** study commissioned by the National Noise Council and ADEME (July 2021)

**Transport noise** accounts for the majority of this social cost (68.4%), or €106.4 billion per year, mainly **road noise**, which accounts for 51.8% of the total cost, followed by air noise (9.4%) and rail noise (7.2%).

**Neighbourhood noise** accounts for 16.9% of the social cost, or €26.3 billion per year, including noise emitted by individuals (11.4%), construction site noise (3.4%) and noise generated in the environment by professional activities (2.1%).

Neighbourhood noise is one of the noises most strongly felt by French people, as shown by the survey "Les Français et les nuisances sonores" (The French and noise pollution) published in September 2014 by Ifop. Respondents cited neighbourhood noise as the most annoying noise pollution in their homes, on a par with transport noise.

The discomfort, sleep disturbances and other health impacts (cardiovascular disease) caused by neighbourhood noise are estimated to cost French society around €11.5 billion each year.

***In point 2, we observe...***

- A road infrastructure with heavy traffic,
- The presence of balconies facing this road, which are exposed to air pollution and noise pollution,
- The presence of fresh air intakes on the façades facing road traffic.



No. 3	Solange Fernex School and ATMO Grand Est measuring station – Rue de l'Elbe
	Modelling of air and noise exposure

The purpose of this third station is to address the importance of improving knowledge of exposure to outdoor pollution and noise in a development and construction project.

▪ **The ATMO Grand Est measuring station**

As a reminder, ATMO Grand Est is the association approved for monitoring air quality in the Grand Est region, with a remit to provide transparent information on air quality and issue alerts in the event of pollution episodes.

As part of this monitoring, measuring stations have been set up across the region.

The *Strasbourg-Danube* station, located on Rue Emmanuel Levinas in the new eco-neighbourhood, is one of the EMS's urban background measurement sites. It has been in operation since 2019, taking over from the historic *Strasbourg-Est (Neudorf)* station, and monitors concentrations in the new neighbourhood. The main pollutants measured at the station are  $\text{NO}_2$  and different particle sizes:  $\text{PM}_{10}$ ,  $\text{PM}_{2.5}$ , and ultrafine particles ( $\text{PM}_{0.1}$ ).



Regulatory height: 4 to 8 metres

#### Pollution levels at the Strasbourg-Danube station (observation in 2023):

- For  $\text{NO}_2$  (road traffic indicator): in 2023, the average annual concentrations measured at the Strasbourg-Danube station are  $20 \mu\text{g}/\text{m}^3$ .
- For  $\text{PM}_{10}$  (multiple sources: domestic heating in winter, agriculture in spring and road traffic): annual concentrations are  $15 \mu\text{g}/\text{m}^3$

#### In relation to regulatory values:

- On 24 April 2024, the European Parliament adopted new rules to revise air quality standards for 12 regulated pollutants. These standards must be to be met by<sup>1</sup>January 2030. The new directive sets stricter concentration limits than those set by Directive 2008/50/EC, which are currently in force, for several pollutants, including fine particulate matter ( $\text{PM}_{2.5}$ ,  $\text{PM}_{10}$ ),  $\text{NO}_2$  and  $\text{SO}_2$ . For the two pollutants with the greatest impact on human health,  $\text{PM}_{2.5}$  and  $\text{NO}_2$ , the annual limit values must be reduced by more than half, from  $25 \mu\text{g}/\text{m}^3$  to  $10 \mu\text{g}/\text{m}^3$  and from  $40 \mu\text{g}/\text{m}^3$  to  $20 \mu\text{g}/\text{m}^3$  respectively.

Polluant	Périodicité	Type de norme	Norme en vigueur	Norme révisée adoptée pour 2030	Dépassements autorisés	Valeurs guides de l'OMS (2021)
$\text{PM}_{2.5}$	Annuelle	Valeur limite	$25 \mu\text{g}/\text{m}^3$	$10 \mu\text{g}/\text{m}^3$	-	$5 \mu\text{g}/\text{m}^3$
	24h	Valeur limite	<i>pas de norme</i>	$25 \mu\text{g}/\text{m}^3$	18 fois/an	$15 \mu\text{g}/\text{m}^3$
$\text{PM}_{10}$	Annuelle	Valeur limite	$40 \mu\text{g}/\text{m}^3$	$20 \mu\text{g}/\text{m}^3$	-	$15 \mu\text{g}/\text{m}^3$
	24h	Valeur limite	$50 \mu\text{g}/\text{m}^3$	$45 \mu\text{g}/\text{m}^3$	18 fois/an	$45 \mu\text{g}/\text{m}^3$
$\text{O}_3$	Moy. jour. max. sur 8h	Valeur cible	$120 \mu\text{g}/\text{m}^3$	$120 \mu\text{g}/\text{m}^3$	18 j/an (moy. sur 3 ans)	$100 \mu\text{g}/\text{m}^3$
	Moy. jour. max. sur 8h	Objectif à long terme	$120 \mu\text{g}/\text{m}^3$	$100 \mu\text{g}/\text{m}^3$ **	3 j/an	-
$\text{NO}_2$	Annuelle	Valeur limite	$40 \mu\text{g}/\text{m}^3$	$20 \mu\text{g}/\text{m}^3$	-	$10 \mu\text{g}/\text{m}^3$
	24h	Valeur limite	<i>pas de norme</i>	$50 \mu\text{g}/\text{m}^3$	18 fois/an	$25 \mu\text{g}/\text{m}^3$
	1h	Valeur limite	$200 \mu\text{g}/\text{m}^3$	$200 \mu\text{g}/\text{m}^3$	3 fois/an	-
$\text{SO}_2$	Annuelle	Valeur limite	<i>pas de norme</i>	$20 \mu\text{g}/\text{m}^3$	-	-
	24h	Valeur limite	$125 \mu\text{g}/\text{m}^3$	$50 \mu\text{g}/\text{m}^3$	18 fois/an	$40 \mu\text{g}/\text{m}^3$
	1h	Valeur limite	$350 \mu\text{g}/\text{m}^3$	$350 \mu\text{g}/\text{m}^3$	3 fois/an	-
$\text{CO}$	24h	Valeur limite	<i>pas de norme</i>	$4 \mu\text{g}/\text{m}^3$	18 fois/an	$4 \mu\text{g}/\text{m}^3$
	Moy. jour. max. sur 8h	Valeur limite	$10 \mu\text{g}/\text{m}^3$	$10 \mu\text{g}/\text{m}^3$	-	-
Benzène	Annuelle	Valeur limite	$5 \mu\text{g}/\text{m}^3$	$3,4 \mu\text{g}/\text{m}^3$	-	-
Plomb	Annuelle	Valeur limite	$0,5 \mu\text{g}/\text{m}^3$ *	$0,5 \mu\text{g}/\text{m}^3$	-	-
Arsenic	Annuelle	Valeur limite	$6 \text{ ng}/\text{m}^3$ *	$6 \text{ ng}/\text{m}^3$	-	-
Cadmium	Annuelle	Valeur limite	$5 \text{ ng}/\text{m}^3$ *	$5 \text{ ng}/\text{m}^3$	-	-
Nickel	Annuelle	Valeur limite	$20 \text{ ng}/\text{m}^3$ *	$20 \text{ ng}/\text{m}^3$	-	-
BaP	Annuelle	Valeur limite	$1 \text{ ng}/\text{m}^3$ *	$1 \text{ ng}/\text{m}^3$	-	-

The new air quality standards for the protection of human health set by the new directive revising Directive 2008/50/EC and comparison with the WHO guideline values (2021)

- The "Danube" station complies with the annual limit values and air quality objectives of French regulations and the new regulations.  
European limits for  $\text{NO}_2$ ,  $\text{PM}_{10}$  and  $\text{PM}_{2.5}$ .

- However, the WHO guidelines (September 2021) are exceeded for two of the three pollutants measured (PM<sub>2.5</sub> and NO<sub>2</sub>).

## ▪ The establishment of the Solange Fernex school

When designing the "Danube" eco-neighbourhood project, the environmental risk associated with air quality was addressed from two perspectives:

- the impact of the neighbourhood on the immediate environment;
- indoor air quality in the context of energy consumption control.

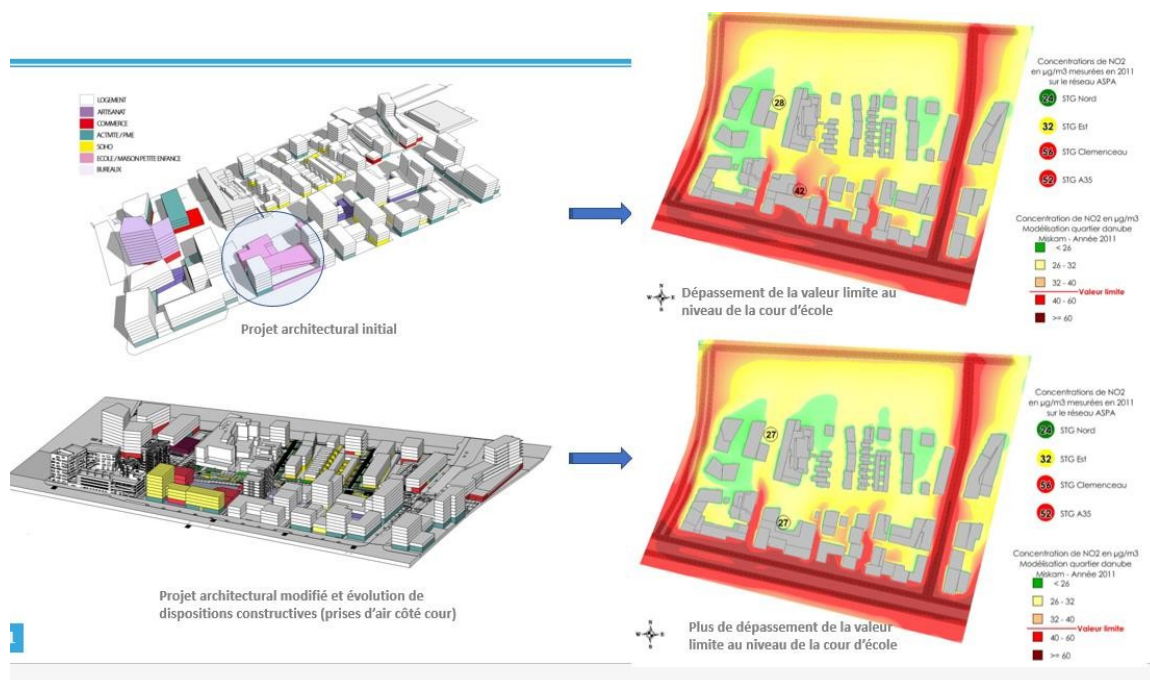
The *Strategic Air Map* produced by ATMO GE for the Strasbourg metropolitan area identified areas where limit values were exceeded (or at risk of being exceeded), prompting a review of the exposure of the neighbourhood's population (and the future school) to air pollution. A series of measurements was then taken prior to the construction of the neighbourhood, demonstrating the significant impact of Avenue du Rhin on air quality in the area.

With regard to the future school, ATMO GE carried out air quality modelling prior to the construction of the eco-neighbourhood to help choose its location and orientation according to different architectural options for the buildings (room orientations, etc.).

This very detailed modelling highlighted a risk of exceeding the annual NO<sub>2</sub> limit value in the school playground. The final design was therefore modified by adding a floor to act as a physical barrier to air pollution from traffic on Avenue du Rhin (the façade facing Avenue du Rhin acts as a screen against the dispersion of pollutants). Air pollution is blocked at street level, thus protecting the school playground at the rear of the building. The building's air intakes have also been placed in these less polluted areas in order to limit the impact on indoor air quality.

**The aim of this new configuration is to keep concentration levels below regulatory values at the rear of the building where the playground is located.**

The latest measurement campaigns confirm a significant difference in concentrations between the front of the school (on the Avenue du Rhin side), where the limit value may be exceeded, and the school playground (at the rear of the building), where concentrations comply with regulatory values.



The work carried out represents compensatory measures: an unfavourable initial situation is partially offset by adjustments, but the situation is still not ideal. Pollution is "displaced"; pollutants that should have ended up in the playground remain in the street, increasing their concentrations there.<sup>3</sup>

#### Recommendations:

- ⇒ **Give priority to favourable areas for locating establishments catering to sensitive populations.** Compensatory measures or adaptations can reduce exposure, but concentrations remain higher than in a favourable area. Consideration should be given to the use of areas highly exposed to air pollution in order to limit exposure.
- ⇒ **Modelling and adaptation studies** remain useful for buildings constructed in areas highly exposed to air pollutants.

### ■ Indoor air quality (IAQ)

#### Monitoring indoor air quality in nurseries and schools:

Monitoring indoor air quality in nurseries and schools, in accordance with regulations in force since<sup>1</sup>January 2023, is based on the following principles:

- on the one hand, **the mandatory annual assessment of the establishment's ventilation systems;**
- on the other hand, **a self-assessment aimed at identifying and reducing sources of indoor air pollution** must be carried out every four years. This self-assessment must be followed by the implementation of an improvement action plan;

<sup>3</sup> Other avenues: Reduce traffic on Avenue du Rhin (particularly heavy goods vehicles). Install a screen between Avenue du Rhin and the heart of the neighbourhood at the perpendicular streets (i.e. Rue Levinas) to reduce the flow of polluted air from Avenue du Rhin.

- Finally, during key stages of construction, such as renovation work, **comprehensive or partial air quality measurement campaigns** must be carried out by accredited bodies.

This monitoring is reinforced for sensitive public buildings located within a radius of:

- 3 km of a pollutant-emitting facility (dry cleaning facility);
- 3 km from chemical and para-chemical industries, collective heating plant, wood...
- 200 m from a busy car park with over 1,000 spaces;
- 100 m from a bus station;

⇒ **Practical guide** *"For better air quality in places that welcome children"*  
(INERIS - Ministry for Ecological and Solidarity Transition, 2017).

Outdoor air pollution is a commonly discussed topic, but pollution levels are often higher inside buildings. Air intakes draw in ambient outdoor air with the various pollutants present. Added to this are all the pollutants from indoor sources: emissions from materials, activities (cooking, smoking), chemicals (cleaning, etc.). Indoor air pollutants are less diluted/dispersed than outdoors, so their concentration is higher and can even be dangerous.

In 2019, ANSES expertise also confirmed the **transfer of outdoor pollutants into** homes => the preservation of indoor air quality is enshrined in Article L111-9 of the French Building and Housing Code.

Indoor air quality problems can be linked to poor construction practices, particularly if drying times are not respected. Moisture can facilitate the growth of mould, which then emits biological pollutants into the air.

Other malfunctions can be observed, even in new buildings, related to:

- incorrect sizing of the ventilation system: insufficient flow rates can lead to condensation;
- noise pollution (excessive airflow resulting from poor positioning of the unit, coming from outside via the air intakes on the façade);
- discomfort caused by poorly located air inlets;
- water damage caused by accidental accumulation of condensation in ducts.

There are several solutions for limiting exposure to indoor air pollutants:

- **Limit sources** (choose low-emission materials, prohibit certain activities in unsuitable rooms, etc.)
- **Renew the air** through appropriate ventilation to reduce the concentration of pollutants inside rooms.

#### **Solutions to be implemented...**

- **Modelling sensitive buildings and their equipment**  
e.g. (courtyards, balconies) to reduce exposure to air pollution,
- Orientation of fresh air intakes away from atmospheric pollution.
- Before delivery to users, acceptance testing and verification of ventilation system performance (achievement of flow rates, functional vents, balancing) against objectives.

- Training of users in the use of equipment (frequency of filter replacement, etc.).

## ▪ Noise pollution

In terms of noise, exposure on Avenue du Rhin is significant.
















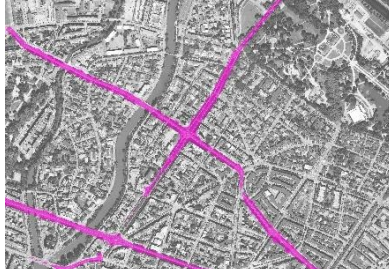


According to European Directive No. 2002/49/EC of 25 June 2002, urban areas with more than 100,000 inhabitants are required to produce strategic noise maps for the environment relating to transport infrastructure (air, rail and road) and facilities classified for environmental protection.

In support of these maps, the local authority must draw up an Environmental Noise Prevention Plan (PPBE):

- **Strategic noise maps show the exposure of people and areas to noise pollution** from transport infrastructure and industrial activity.
- **The PPBE defines the actions to be taken to reduce exposure to environmental noise and preserve quiet areas.**
- Strategic noise maps and PPBEs are updated every five years.

## Type A, B, C and D maps

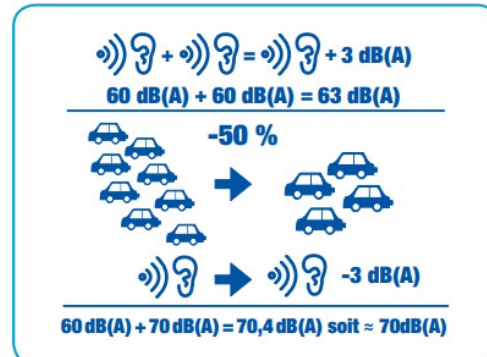
- ⇒ See noise maps: <https://www.strasbourg.eu/cartes-de-bruit>
- ⇒ See the PPBE for the Eurométropole de Strasbourg: <https://www.strasbourg.eu/plan-prevention-du-bruit-dans-environnement>

	<div>Palette de couleur NF-S31-130</div> <div><div></div><div>&lt; 50 dB(A)</div></div> <div><div></div><div>&gt; 50 à 55 dB(A)</div></div> <div><div></div><div>&gt; 55 à 60 dB(A)</div></div> <div><div></div><div>&gt; 60 à 65 dB(A)</div></div> <div><div></div><div>&gt; 65 à 70 dB(A)</div></div> <div><div></div><div>&gt; 70 à 75 dB(A)</div></div> <div><div></div><div>&gt; 75 dB(A)</div></div>	<p><b>Type A map</b> locating areas exposed to noise, to assistance of isophone curves isophones in <b>Lden (Level day, evening, night)</b> in steps of 5, from 50 dB(A) to above to 75 dB(A)</p>
		<p><b>Type A map</b> locating areas exposed to noise, to using of isophonic isophonic in <b>Ln (Level night)</b> in increments of 5, from 50 dB(A) to higher to 75 dB(A)</p>
	<div></div> <div>Affected area</div>	<p><b>Type B map</b> locating areas affected by noise as designated by the prefectural decree on the noise classification of land transport infrastructure.</p>
	<div></div> <div>Exceedance zone</div>	<p><b>Type C map</b> showing areas likely to contain buildings whose Lden (Level day, evening, night) exceeds the regulatory threshold value.</p>
	<div></div> <div>Exceedance zone</div>	<p><b>Type C map</b> showing areas likely to contain buildings whose Ln (Level night) exceeds the regulatory threshold limit.</p>
	<div>See map legend type A</div>	<p><b>maps from types D</b> represent changes in noise levels or predictable (infrastructure project infrastructure project) and are visually similar to maps A.</p>

For Avenue du Rhin, it appears that according to Map A, the noise level is high: between 70 and 75 dB(A) at the front of buildings, and even exceeding 75 dB(A).

Map C indicates that the section of Avenue du Rhin exceeds the limit values (regulatory 68 dB(A) for  $L_{den}$ ) for road noise. Older buildings (built before 1978) are clearly noise black spots. While the acoustic performance of the façades of recent buildings is good, the balconies and terraces overlooking the road have a highly degraded, noisy environment.

As a reminder, here are a few acoustic benchmarks:



During the first lockdown in 2020, noise measurements and modelling on Avenue du Rhin showed exposure levels falling by between 2 and 7 dB(A).

The results show that lockdown had a significant impact on noise levels, particularly at night, with a reduction of nearly 7 dB(A) during certain night-time periods. During the day (excluding the evening), the reduction was a maximum of 2 dB(A). From 8 p.m. onwards, the differences became more significant (4 to 6 dB(A)).

Traffic was reduced by nearly 45% overall, with the greatest impact during peak hours: the morning rush hour saw a decrease of nearly 68% and the evening rush hour saw a decrease of more than 50%.

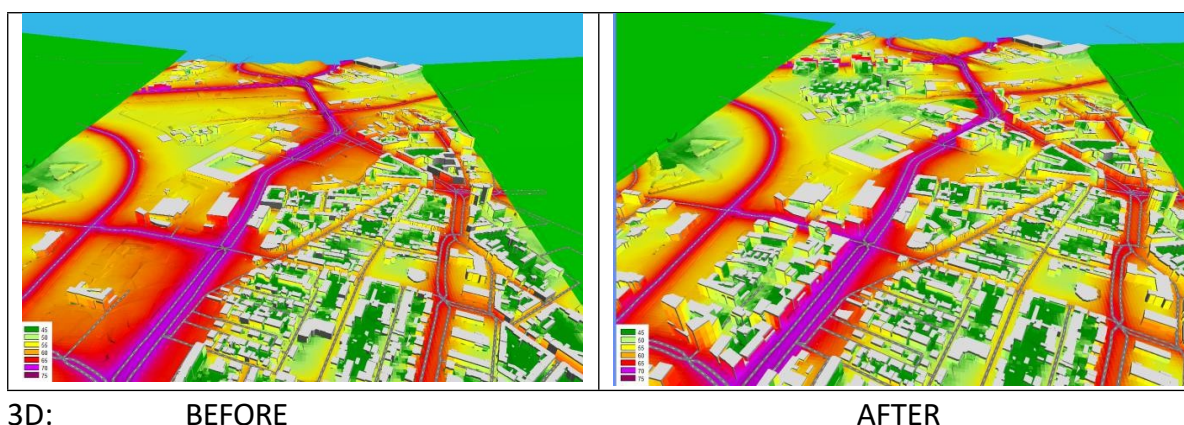
**In the context of an urban development or urban renewal project, noise maps and environmental noise prevention plans are the first tools for understanding the soundscape.**

**The guide Noise, Climate, Air, Energy for Effective Planning published by ADEME (2019) offers numerous ideas for addressing urban planning and development operations while ensuring that climate, air, energy and noise actions are aligned.**

**As with air, 3D modelling of noise exposure is one such solution.**

In order to refine noise exposure, the impact of noise in the context of a development project (macro approach) or even a building construction project (more micro approach), it can be very useful, even essential, to carry out 3D noise modelling to determine the best development scenarios and select the most suitable architectural forms. Combining this modelling approach with air modelling will yield co-benefits.

Modelling maps:



### Solutions to be implemented...

- Modelling areas to be developed and sensitive buildings and their facilities, e.g. (courtyards, balconies) to reduce noise exposure.
- Drawing on the co-benefits and antagonisms of air and noise modelling to influence planning choices and architectural forms.
- Combine thermal and acoustic insulation: as a reminder, insulating a building does not improve its acoustic performance. It can even make it worse. On the other hand, soundproofing a building can improve its thermal performance.

No. 4	Heart of the Danube eco-neighbourhood
	<i>Social cohesion</i>

### Promoting social cohesion

**According to the ISadOrA guide, key 8 focuses on public spaces that promote social cohesion in relation to health issues:**

**Urban planning, and more specifically the planning of public spaces, has an influence on social cohesion<sup>4</sup> insofar as it promotes or hinders contact and opportunities for individuals to meet** (Croucher et al., 2012; Mazumdar et al., 2017; Renalds et al., 2010). The perception of the neighbourhood, particularly the sense of safety it generates, plays an important role and also contributes to social cohesion (Liska et al., 1988; Skogan and Maxfield, 1981). This perception is influenced by factors as diverse as population density, traffic intensity and safety, aesthetics, the presence of vegetation, and functional diversity (Leslie and Cerin, 2008).

According to the second section of the guide to public spaces published by the FNAU, "Public space is a physical space that is shared, can be developed, and serves as a support for social ties and various activities." For Fred Kent, president and founding member of the Project for Public Spaces office, "a

<sup>4</sup> "Social cohesion reflects a group's ability to live together, through shared norms and values, relationships based on trust and solidarity, the formation of social networks, a sense of belonging to the same community, and a strong attachment to their place of residence. (Carpiano, 2006; Forrest and Kearns, 2001)" (A. Roué-Le Gall, et al., ISADORA Guide, 2020)

A truly high-quality public space is one that people want to visit regularly and where they can forge links with other people.

As places for social interaction, travel, waiting, relaxation and entertainment, public spaces and the way they are designed have a key impact on our physical and mental health and social well-being. Thinking ahead about health issues in the planning and design of public spaces is essential from a prevention perspective. It is a question of playing on atmospheres, aesthetics and feelings of safety, and creating places for living and interacting that take mental and social wellbeing into account. The quality of a space will depend on its ability to diversify atmospheres (shade, presence of nature, etc.), to create comfortable places and varied and pleasant atmospheres throughout the day and throughout the year.

According to the FNAU guide, the points to be addressed in order to promote a space that emphasises quality spaces are as follows:

- Minimise nuisances observed on the site (noise, visual pollution, odour nuisances and air pollution).
- Limit noise pollution associated with surfaces (choice of materials) and, more generally, work on the site's sound environment.
- Highlight the presence of nature (water, plants, open ground),
- Provide sheltered areas (from wind, rain, sun, etc.),
- Promote better clarity of the space.

However, it is important to note that "uses such as social relations, while they can be encouraged and perhaps even more easily constrained by a certain urban form, cannot be conditioned".

**In point 4, we observe...**

- Spaces for use by residents

No. 5	Passage de la Gosseline
	Polluted sites and soils Liminal species (rodents)

The Danube sector provides an opportunity to discuss the **management of contaminated sites and soils**, and rodents.

▪ **Management of contaminated sites**

Soil quality, and more broadly subsoil quality including groundwater and soil gases, is an important issue in urban planning and environmental health. Current or past activities at a site can degrade the quality of these environments and create sources of pollution. Then, through transfer and vector phenomena (inhalation, ingestion, permeation, direct contact, etc.), this pollution impacts targets: residents, employees, etc.

This is the principle of the conceptual framework defined in the national methodology for managing polluted sites and soils developed in 2007 and updated in April 2017 (see Note of 19 April 2017 on polluted sites and soils - Update of the 2007 methodological texts on the management of polluted sites and soils). This methodology is based on the principle of controlling pollution and its impact in order to

enable a reduction in emissions of substances responsible for chronic exposure of populations and continuous improvement in the quality of the environment.

Based on the conceptual model, it is possible to act on the three components (sources, vectors or targets) to manage this issue. Priority is given to management measures at source. Where it is not possible to eliminate the sources, it is necessary to ensure that the site is compatible with its current and/or future use and its environment in terms of health.

**Multiple management measures are possible to make the site compatible with its use and environment.** For example:

- soil, soil gas and groundwater decontamination operations (off-site, on-site or in-situ techniques),
- construction measures (relocation of the building on the site, crawl space, forced ventilation of premises to ensure indoor air renewal, protection of drinking water supply networks, soil cover, etc.)
- restrictions on use (prohibition of vegetable crops or fruit trees in open ground, prohibition of certain uses such as sensitive establishments).

All these management measures are studied in a Management Plan, which assesses the costs and benefits and calculates health exposure levels according to different development scenarios. This is an iterative process and requires additional studies and work during the development of the project.



In the area under study, the Danube district (which has been awarded the eco-district label) underwent **extensive decontamination due to the existence of a gasworks until 1974.**

After the plant ceased operations (1999 to 2001), the former operator undertook initial decontamination work to make the site suitable for industrial use.

In relation to the current development, new studies and work have been carried out by local authorities and private project developers

*View of the old gasworks in 1959*

to ensure that residual pollution is compatible with current uses (tertiary, residential and even sensitive, with the Solange Fernex school complex).

In concrete terms, the management measures mentioned above have been implemented in this eco-neighbourhood, for example:

- ⇒ It is possible to see the raised beds for gardening activities.
- ⇒ The school complex is built on a crawl space
- ⇒ Control structures for decontamination work are in place

For the future, the recording and traceability of these operations are essential. To this end, the regulatory tools for ensuring that the issue of polluted sites and soils is taken into account in urban planning are the PLUi (local urban planning initiative), easements and restrictions on use that can be put in place on plots of land, or the historical databases available (BASIAS, BASOL, SIS soil information sector) or to be built (Urban Historical Inventory – the Eurométropole de Strasbourg has been working on this inventory since 2018/completion in 2025).

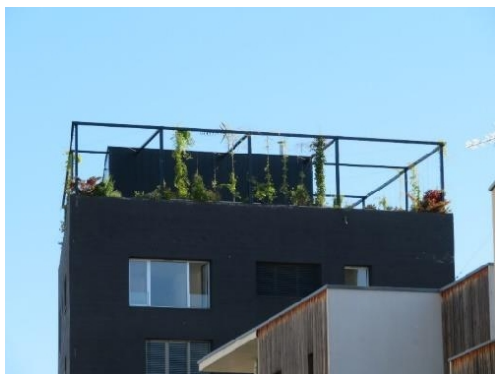
At the first level of planning permission, the planning certificate (CU), the planning authorities must inform applicants of the existence of a polluted or potentially polluted site or soil. At a higher level (building and development permits), and in cases where the site is classified as SIS or where the ICPE site is subject to a change of use, applicants, who are informed at the time of purchase of the land, must submit a certificate (ATTES). The ATTES, issued by a certified consulting firm specialising in polluted sites and soil, certifies that the development (green spaces, etc.) or construction project takes into account the issue of soil/subsoil pollution.

### ■ Liminal species

At this level, we can see a chicken coop. Symbolising the return of nature to the city, more and more residents are adopting chicken coops. However, this is not without its consequences. The food given to the chickens is likely to attract rats and other rodents. To prevent them from accessing the chicken coops, measures can be taken during construction. "When installing the fence around the enclosure, also install a fine mesh fence (6 mm maximum) 80 cm above the ground, and put in place underground protection with a horizontal return of at least 50 cm or a concrete foundation at least 20 cm deep. This will generally prevent rodents from entering the chicken coop. Use rodent-proof feeders and install water troughs inside the henhouse rather than in the enclosure."<sup>5</sup>

#### *In point 5, we observe...*

- Above-ground containers to enable gardening activities,
- Raised terraces for gardening activities in response to soil pollution, which has since been treated,
- A chicken coop that is likely to attract rodents



<sup>5</sup> Eurométropole de Strasbourg. (July 2024). Poulailier en ville. Guide des bonnes pratiques. Available at: <https://www.strasbourg.eu/poulaillers>

No. 6	Dusuzeau Basin
	Active mobility Living environment

At station No. 5, we propose to address the quality of the living environment, the facilities and services that contribute to the living environment and promote active mobility.

### ■ Active mobility

**Active mobility** refers to travel undertaken without any energy input other than human energy and through the sole physical effort of the person travelling. This includes travel on foot, by scooter, by bicycle, in a non-motorised wheelchair, etc.

**Physical activity** is defined by the WHO as "any bodily movement produced by muscles that requires energy expenditure above resting levels". **Adults** are recommended **to engage in 30 minutes of dynamic physical activity per day (60 minutes for children)** (World Health Organisation, n.d.; Warburton et al., 2006).

Duclos, M. (2021). **Epidemiology and effects of physical activity and sedentary behaviour on morbidity and mortality in the general population.** Revue du Rhumatisme Monographies. <https://doi.org/10.1016/j.monrhu.2020.11.008>

**"Five million deaths per year worldwide could be prevented if physical activity (PA) recommendations were followed.** The attributable risk of mortality linked to physical inactivity is 6% and the preventable fraction is 15%. Studies have demonstrated with a high level of scientific evidence **that regular physical activity and sport can prevent and treat most chronic non-communicable diseases: cardiovascular disease, type 2 diabetes, colon cancer, breast cancer and endometrial cancer.** Physical activity also contributes to the prevention of the main risk factors for these diseases. In France, regardless of age group, PA is considered insufficient according to WHO recommendations, and sedentary time reaches 12 hours per day. Children are the most affected by this combination

"inactivity and sedentary lifestyle". To change this behaviour, which combines insufficient physical activity and a sedentary lifestyle from an early age, changes must be made to all aspects of PA and sedentary lifestyle (school, studies, professional life, leisure activities), from an early age, throughout life and into old age. (Author's presentation)

**According to the ISadOrA guide, key 6 on active mobility and people with reduced mobility (PRM) in relation to health issues:**

**"Promoting active mobility** and taking into account accessibility for people with reduced mobility has a positive impact on health in two ways: on the one hand, **it encourages physical activity, and on the other, it has a favourable effect on individuals' social environment.**

**The health benefits of physical activity are now widely recognised** (INSERM, 2008). Physical activity has been shown to improve cardiovascular health, mental health, neurocognitive development, quality of life and general well-being. It prevents obesity,

cancer, high blood pressure and potentially type 2 diabetes, as well as falls in older people (Kavanagh et al., 2005; Lee and Buchner, 2008; World Health Organisation, 2016). **Conversely, physical inactivity has been identified as the fourth leading risk factor for mortality worldwide** (British Medical Association, 2012), due in particular to urban lifestyles (World Health Organisation, 2016). The potential risks associated with physical activity (asthma, mortality, traffic accidents, higher exposure to air pollution) are largely offset by the benefits (Kavanagh et al., 2005; Mueller et al., 2015; Praznocy, 2012).

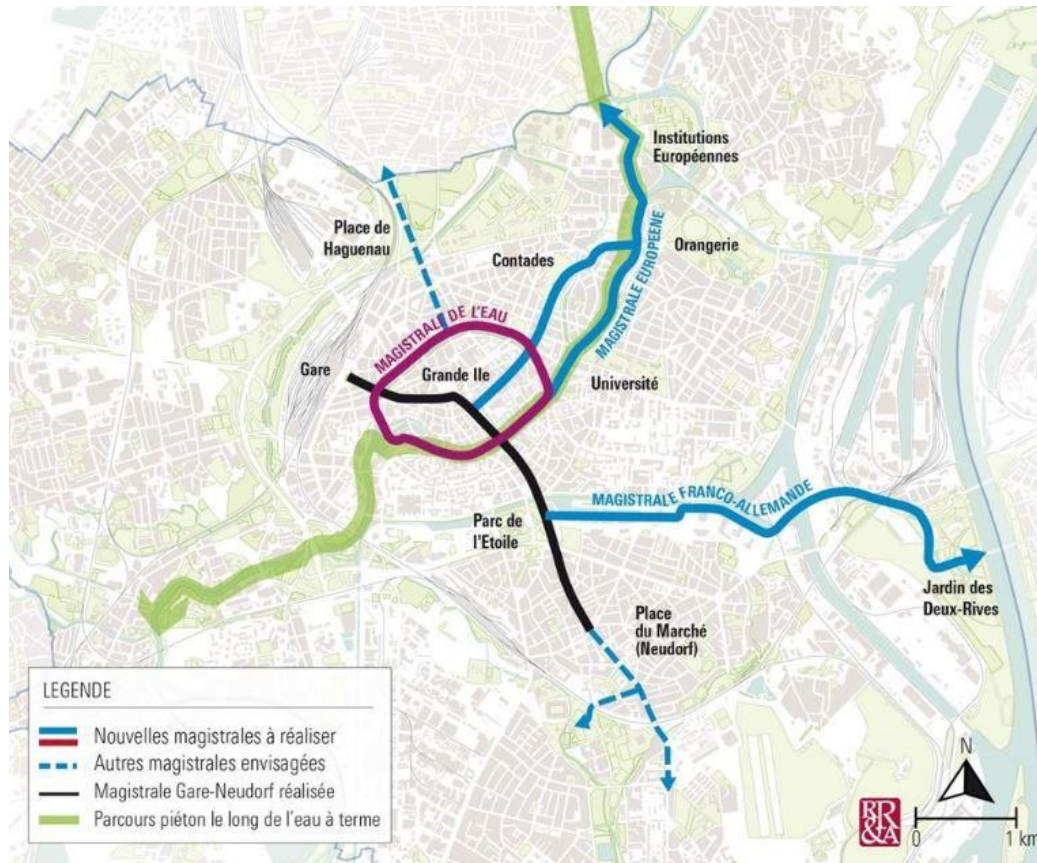
**Walking and cycling are active modes of transport that enable people to achieve the daily level of physical activity recommended by the WHO** (Audrey et al., 2014; Donaire-Gonzalez et al., 2015; Wanner et al., 2012). Regularly cycling and/or walking to work significantly reduces all-cause mortality, cardiovascular mortality (from myocardial infarction and stroke) and cancer mortality, compared to people who only use public transport or cars (Dinu et al., 2019; Celis-Morales et al., 2017; Andersen et al., 2017). These beneficial effects are observed regardless of gender, age, socioeconomic status, physical activity at work, leisure-time physical activity, time spent sitting per day, diet, BMI and co-morbidities. Finally, active travel, either alone or in combination with public transport, promotes the integration and reinforcement of physical activity into daily routines.

**In addition, several studies attest to the link between walkability and social cohesion, although the level of evidence remains low** (Mazumdar et al., 2017). **Residential neighbourhoods designed to be walkable are thought to enhance feelings of safety and are positively associated with social capital** (Foster et al., 2010; Wood et al., 2008).

**The feeling of having access to services** (employment, schools, transport, shops, restaurants, banks, libraries, community centres, playgrounds) **is associated with a higher level of participation in the neighbourhood** (Richard et al., 2009), with some of these places providing opportunities to organise social events (Boessen et al., 2017)."

It should also be noted that there are additional benefits. Promoting active mobility also helps to foster healthy environments and reduce nuisances that are also likely to have an impact on people's health (air or noise pollution).

The promotion of active mobility also depends on the urban environment and the "practicability" of public spaces. It is therefore essential to pay particular attention to mobility conditions (road layout, signage, pedestrian accessibility, condition and width of pavements, cycle facilities and dedicated lanes). From micro-development to pedestrian plans, there are several tools available to promote active modes of transport, particularly walking. For example, the Eurométropole de Strasbourg has launched the concept of "pedestrian boulevards". These boulevards are "the structural axes of the pedestrian master plan, directly linking the neighbourhood's central areas and thus improving urban clarity. [...] [It] differs from traditional pedestrian development in the generous space it provides for pedestrians. The emphasis is on pedestrian comfort, which can be achieved by providing regular rest areas and ensuring that the main route is clearly visible. Additional efforts are made to eliminate major barriers and improve crossings. This axis is therefore designed according to the expected number of pedestrians, so as not to exceed a pedestrian density of 0.7 per square metre. In addition, the route of the main thoroughfares is also carefully studied, particularly in relation to the transport hubs to be served. The aim is to favour quiet, peaceful locations away from major roads, while still serving these main hubs.



The route of the pedestrian thoroughfares in Strasbourg to be created as part of the 2021-2030 Pedestrian Plan

For find find more: the file "Walk in city" by CEREMA (<https://www.cerema.fr/fr/actualites/dossier-marche-ville>)

## ■ Services offered

**According to the ISadOrA guide, key 7 on accessibility to employment, shops and services related to health issues:**

"Although it is not solely responsible for the health status of populations, the health determinant 'access to healthcare and social services' is recognised as a major health determinant (Lalonde, 1974; Dahlgren and Whitehead, 1991; MSSS Québec, 2010). ISadOrA {3} Regarding the influence of commercial supply on eating habits, several studies show that the availability of healthy, diverse, high-quality and affordable food products is associated with healthy eating (Morland et al., 2006; Larson et al., 2009; Loper, 2007). Conversely, even if no correlation can be established between the presence of fast food restaurants and obesity, it has been established that eating at this type of restaurant is associated with higher consumption of fatty and sugary foods, sugary drinks and large portions (Powell et al., 2007; Glanz et al., 2004).

### ***In point 6, we observe...***

- Quiet, safe alleyways to encourage soft mobility and children's play
- Easy access to bicycle garages,

- Services (shops, schools, reception centres for people with disabilities, etc.)
- Proximity to the cycle path, etc.



No. 7	Parvis des Black Swan – Malraux Peninsula
	<i>Tiger mosquito</i>

### ▪ Tiger mosquito

The problem of tiger mosquitoes, which have been present in the Eurométropole de Strasbourg since 2015, is an emerging issue that a number of local stakeholders are involved in combating and preventing. These mosquitoes, which are spreading rapidly throughout the region, are carriers of zoonoses and a source of nuisance.



### ▪ A vector of arboviruses

The tiger mosquito can be a vector for arboviruses such as dengue, Zika and chikungunya if and only if it is infected. It is not a natural carrier of these diseases. It becomes infected

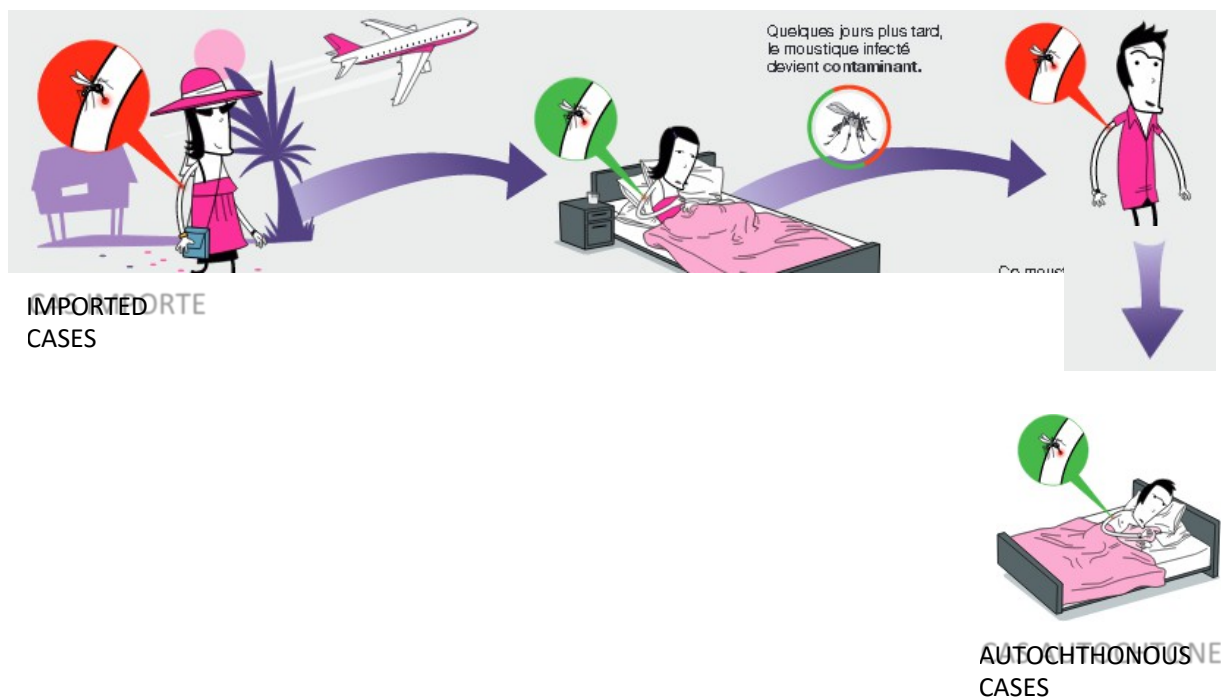
by biting a sick person returning from a trip to a country where these diseases are present (imported case). Viral for several days, the mosquito then becomes capable of transmitting the disease in the immediate vicinity by biting healthy people (autochthonous case).

Although these diseases mainly occur in tropical areas, the occurrence of indigenous cases (contracted without travel) in mainland France represents a very real risk. The fear of the national authorities is that these arboviruses will spread more widely in France.

In this context, a new governance system was put in place by **Decree No. 2019-258 of 29 March 2019** on the prevention of vector-borne diseases, most of whose provisions came into force on 1 January 2020. This decree:

- Entrusts the ARS with entomological surveillance and intervention missions around new mosquito settlements and suspected cases to prevent vector-borne disease epidemics, as well as other prevention and information measures. The ARS will directly implement the necessary LAV measures or entrust them to existing operators while providing funding.
- Bases the management of vector-borne disease epidemics on the Orsec system (emergency response programme), in particular to facilitate the mobilisation of all stakeholders by the Prefects.
- Redefines ANSES's remit by entrusting it with the coordination of expertise on vectors.
- Mayors are responsible for preventing the establishment and spread of insect vectors; this responsibility is now enshrined in the regulatory section of the Public Health Code. They must ensure that users are informed and aware of the issue.
- For information, the CEA carries out mosquito control operations for comfort purposes (larvicide treatment only) in strategic areas severely infested by the common mosquito (e.g. Ried du Bas-Rhin).

#### Mode of transmission:



- **Nuisances and health issues**

**The tiger mosquito is particularly well adapted to global warming.** In addition to requiring only small amounts of water to lay its eggs, it thrives in temperatures between 30 and 35°C.

At the national level, indigenous cases and arbovirus epidemics are on the rise in Mediterranean regions.

In 2022, the heatwave summer led to numerous **indigenous** cases of arbovirus diseases in France: 65 cases of dengue fever spread across nine transmission clusters.

Four **imported** cases of dengue fever have also been reported in the Bas-Rhin region, including two in Strasbourg. One of the cases required a large-scale mosquito control operation to be carried out in two busy areas of the city.

In addition to its impact on health, the tiger mosquito *Aedes albopictus* also causes real nuisance with its repeated bites throughout the day, with peak activity at sunrise and sunset. This prevents people from using outdoor areas (gardens, terraces, playgrounds, etc.), which are sought-after havens of coolness in summer, including in schools. In addition, its blood meals are said to be interrupted, so it will bite the same host or different hosts several times to feed.

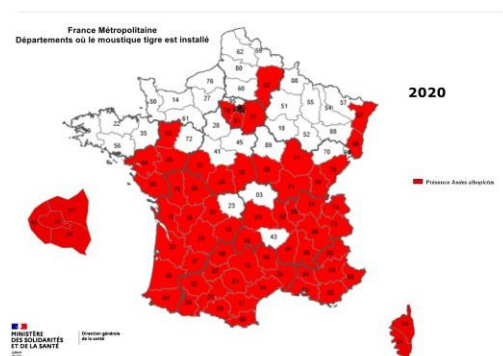
As well as being a public health issue, it is also an economic issue, impacting the tourism and hospitality sectors. Please note: the national plan to combat the tiger mosquito does not allow for preventive insecticide treatments to eliminate nuisances. Careful measures must be taken to eliminate all sources of standing water (see below).

As global warming is accelerating the proliferation of the tiger mosquito, we must be proactive. The effects are already visible in the expansion of its range, the lengthening of its period of presence and the shortening of its development cycle, increasing the risk of arbovirus outbreaks in our territory.

- **Expansion across the territory**

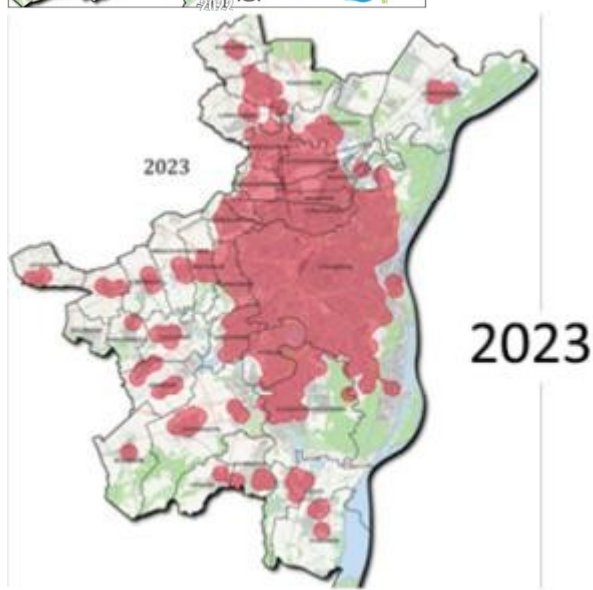
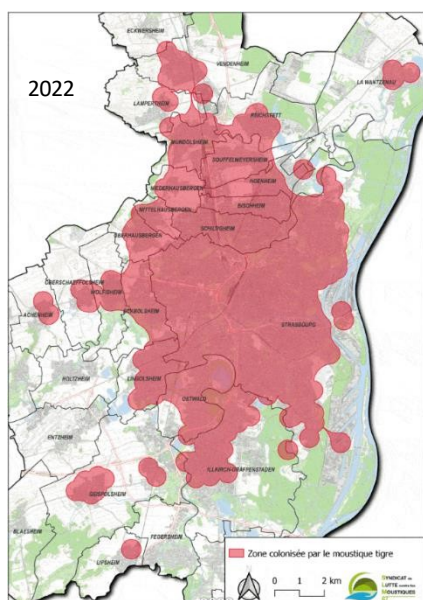
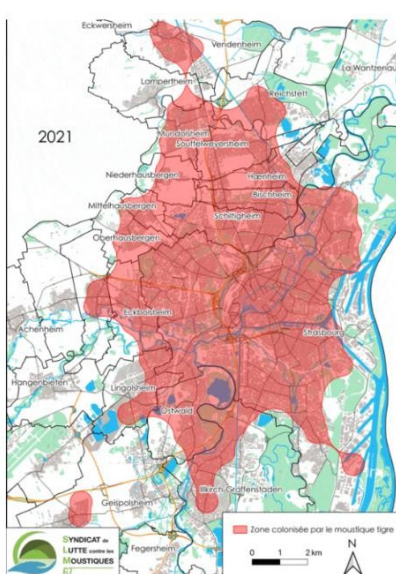
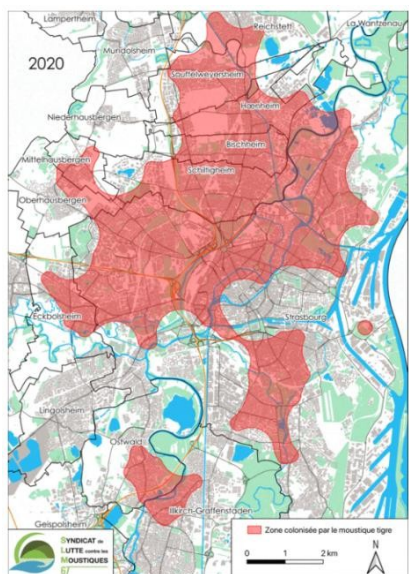
The tiger mosquito has been present in Menton since 2004:

- ⇒ 30 departments colonised in 2015
- ⇒ 67 departments colonised in 2021



Expansion of the tiger mosquito's presence in the Eurometropolis of Strasbourg:





To date, all 33 municipalities have been colonised, compared to 22 in 2022.

- **The right actions to take to combat tiger mosquitoes**

**Tiger mosquitoes are particularly fond of man-made habitats** (even small ones such as bottle caps thrown on the ground) **rather than natural habitats** such as ponds and pools. According to a study conducted by the Syndicat de lutte contre les moustiques 67 ([www.slm67.fr](http://www.slm67.fr)), cesspools are the first places to be colonised.

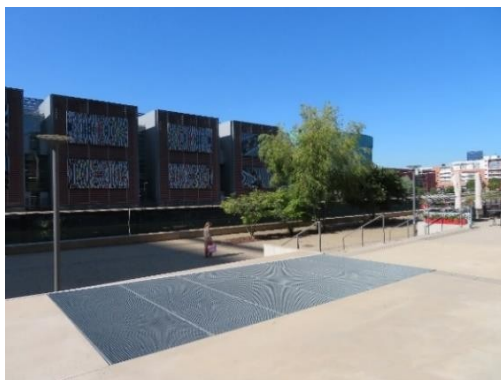
**To eliminate mosquito larvae:**

- In terms of layout and construction:
  - design well from the outset to prevent any stagnation of water on flat roofs or any landscaped areas
  - do not use terraces on stilts and use other landscaping techniques
  - Provide **drainage systems for rainwater (gutters, downspouts, etc.) and wastewater (manholes, gutters and drains)**, install drainage beds at rainwater settling tanks, equip oil separators with stainless steel mosquito nets, etc.  
See the brochure "Mosquitoes and Urban Development" from the Var-Estérel-Méditerranée urban community:  
<https://esterelcotedazur-agglo.fr/wp-content/uploads/2022/06/Plaquette-moustiques-et-amenagement-urbain-2022.pdf>
  - Integrate this risk into the chosen systems (upkeep, cleaning, maintenance).
  - design integrated outdoor furniture to prevent water retention (benches, railings, bollards, posts, etc.)
- Remove objects in which water can stagnate (tyres, cups, bulky items, etc.), including on construction sites (by turning them over or filling them with sand)
- Cover water tanks with mosquito netting (jerry cans, water collectors)
- Cover swimming pools that are not in use
- Avoid small natural shelters (dead leaves or plant debris on the ground)

To report the presence of tiger mosquitoes and find out more: [https://signalement-moustique.anses.fr/signalement\\_albopictus/sinformer](https://signalement-moustique.anses.fr/signalement_albopictus/sinformer)

***In point 7, we observe...***

- A ventilation grille conducive to the establishment of larval breeding sites, with stagnant water below



No. 8	Behind the Docks – Malraux Peninsula
	<i>Invasive species: ragweed, giant hogweed Rodents and waste management</i>

#### ▪ Ragweed

Ragweed is native to the United States. It is believed to have first appeared in France at the end of the 19th century. Today, it is spreading across Europe like a weed.

Ragweed (*Ambrosia artemisiifolia*) thrives on bare land, embankments with little or no vegetation, poorly maintained soil, such as industrial wasteland, housing developments under construction, construction sites, roadsides, vacant lots, transport routes, fallow land, gardens, crops and stubble fields..

*Ambrosia* germinates from late April to mid-June and pollinates from mid-August to late October.

**From June onwards, the plant is sufficiently developed to be recognisable. As a major preventive measure, ragweed plants must therefore be destroyed before they start flowering in mid-July, in order to limit their reproduction and spread.**

The National Aerobiological Surveillance Network (RNSA) issues its ragweed pollen alert every year.

According to a study conducted by researchers from the CNRS, allergies could intensify. By 2050, the concentration of ragweed pollen could increase fourfold, which would also increase allergic reactions in the population.

Map showing the distribution of ragweed in mainland France between 2000 and 2019 [Map showing the spread of ragweed](#)

To combat the spread of ragweed in the Bas-Rhin region: Extract from the prefectural decree Bas-Rhin 18 July 2018

**ARRETE :**

**Article 1<sup>er</sup> :** L'arrêté préfectoral du 24 juillet 2002 prescrivant la destruction obligatoire de l'ambrosie (*Ambrosia artemisiifolia* L.) dans le département du Bas-Rhin est abrogé.

**Article 2 :** Afin de lutter contre la prolifération de l'ambrosie, et de réduire l'exposition de la population à son pollen, les propriétaires, locataires, exploitants, gestionnaires de terrains bâtis et non bâtis, ayants droit ou occupants à quelque titre que ce soit sont tenus :  
- de prévenir le déplacement des graines d'ambrosie (déplacement de terres infestées, dissémination par les engins agricoles, de chantier, etc.),  
- de mener des actions visant à empêcher la pousse de plants d'ambrosie,  
- de détruire sans délai les plants d'ambrosie déjà développés, et dans les conditions définies par le présent arrêté.

Page 2 sur 5

Ambrosia allergy develops after several years of exposure to its pollen. Just five grains per cubic metre of air are enough to trigger allergic reactions in sensitive individuals: rhinitis, conjunctivitis, respiratory symptoms such as tracheitis, coughing and sometimes hives or eczema.

In 50% of cases, ragweed allergy can lead to the onset of asthma or cause it to worsen.

ANSES (2017) estimated **the annual health costs in France associated with the impacts of ragweed** to be

- between €59 and €186 million per year for medical care (e.g. medication and consultations),
  - between €10 and €30 million per year in production losses based on sick leave,
  - between €346 and €438 million per year for the cost of loss of quality of life (well-being) for people with allergies.
- The difference between the lower and upper values of these costs is explained by uncertainties regarding the prevalence of ragweed allergy at the national level, which is estimated to be between 1.7% and 5.4%, or between 1,115,000 and 3,504,000 allergy sufferers. ANSES estimates that these costs could increase further in the future if ragweed continues to spread, leading to higher levels of pollen in the ambient air.

Find out more: <https://ambrosie-risque.info/>

What if France were as badly affected as the Rhône-Alpes region: predictive mapping: [https://ambrosie-risque.info/wp-content/uploads/2021/04/carte\\_impacts-sante\\_ambrosie\\_scenario-2.pdf](https://ambrosie-risque.info/wp-content/uploads/2021/04/carte_impacts-sante_ambrosie_scenario-2.pdf)

Studies show that **50% of the population in Hungary suffers from ragweed pollen allergy**.

### L'AMBROISIE À FEUILLE D'ARMOISE



### L'AMBROISIE TRIFIDE



## ■ Giant hogweed

**Giant hogweed** (*Heracleum mantegazzianum*) contains toxic substances that cause burns (up to second degree) to the skin when exposed to sunlight. The risks of exposure are significant for children, amateur gardeners and local authority workers during manual mowing. The risk of harm from this invasive species extends from April to November. It also monopolises space and light to the detriment of local flora.

Origin: North America Introduction:

ornamental and melliferous

Habitat: grasslands, wasteland, roadsides and railway tracks, forest edges, riverbanks Identification



Source: Ragweed Observatory  
[observatoire.ambrosie@fredon-france.org](mailto:observatoire.ambrosie@fredon-france.org)

Size: 1 to 5 metres Leaves divided into 1 to 3 smaller leaves, deeply cut and pointed, up to 1 metre long and 50 cm wide.

White flowers form umbels 25 to 50 cm in diameter

Sturdy, hollow stem (4 to 10 cm in diameter) with purple spots, covered with white hairs, especially at the base of the leaf stems.

Not to be confused with giant hogweed (*Heracleum sphondylium*): a smaller plant (maximum height 1.5 m) that is not phototoxic

## ■ Rodents and waste management

As in many cities, rodent infestations are nothing new in Strasbourg. They are just as prevalent in tourist areas as they are in residential areas.

Rodents affect areas and spaces where food is available, in addition to access to water. Their presence is directly correlated to the abundance of food in an area. All it takes is a little waste (leftover food, accessible waste from bins or baskets) or food stocks (food in restaurants and other food shops, in cellars and homes, animal feed) to attract them and encourage them to settle.

The most severe infestations occur very regularly and continuously in public recreational and tourist areas with high population density where litter is left behind: the banks of the island ellipse, certain squares, plazas, etc.

As a result, the City's Environmental Health and Hygiene Department's Vector Control Unit regularly treats large squares in the city centre (Place Kleber, Place Broglie, etc.), quays near schools, universities and tourist attractions (Place du Marché aux Poissons, Quai des Bateliers, Quai Koch, etc.) and areas with a high concentration of restaurants (Place du Vieil Hôpital, etc.). Interventions are regularly carried out in parks and squares (Jardins des Deux Rives, Parc de l'Orangerie, etc.) and in the public areas of large social housing estates such as those in the Elsau, Cronembourg, Neuhof and HautePierre neighbourhoods.

Green spaces are also likely to be preferred habitats for rats. Low-growing plants and shrubs create dense vegetation cover that is favourable to rodents and the establishment of burrows. Furthermore, this type of vegetation makes it more difficult to collect waste and to carry out treatments close to the burrows.

Unlike the black rat, the brown rat, which is present in our territories, does not seem to have played a role in the development of the plague, but it is still a carrier of many zoonoses for humans. Indeed, even though, contrary to popular belief, the brown rat grooms itself regularly, it still lives in constant contact with waste. In addition, it marks its territory and communicates with other rats by urinating wherever it goes and on the food it consumes. It thus contaminates ten times more food than it consumes. A number of the diseases it carries are transmitted through its faeces.

Zoonoses that can be traced back to wild rats include rabies, which was eradicated in France in 2001, leptospirosis, salmonellosis, murine typhus and hepatitis E virus.

Rats can also cause noise pollution. This can occur when rodents scratch, move around or chew on various objects. As rats are nocturnal animals, these noises are more likely to occur at night. Although the noise levels are low, the disturbance caused by these noises can disrupt sleep.

**The Information and Assessment Mission on the management of rodents in cities and liminal animals**, carried out in Strasbourg between October 2020 and March 2021 (see website <https://www.strasbourg.eu/documents/976405/1598729/0/9f4c3b19-75f7-1d61-2f98-> ) made it possible to assess the situation in the area. It was observed that the practices of users who abandon de waste could largely encourage the development of rodents,

urban planning and, in particular, street furniture designed for waste storage can amplify the phenomenon.

- ⇒ In the presence of inappropriate behaviour, the shelters installed in social housing estates and private collective housing complexes are facilities that can provide rodents with a place to sleep and facilitate the supply of food for rodents.  
The alternative to cubicles is an underground platform with a waste reception terminal. This equipment is fireproof and rat-proof. It represents a significant investment and requires sufficient space for collection lorries to manoeuvre. Observation of the use of these underground containers seems to demonstrate a certain effectiveness in combating poor waste disposal practices and, as a result, the presence of rodent colonies in the vicinity.
- ⇒ The existence of waste storage areas inside residential buildings also poses a number of difficulties, which may be related to their design but also to the behaviour of users.

***In point 8, we observe...***

- The layout of waste storage areas for households and businesses, which can be conducive to the proliferation of rodents.
- Littering around litter bins
- The surface of the water amplifies noise



No. 9	Heart of the Presqu'île Malraux neighbourhood
	Neighbourhood noise and health complaints Light pollution

This eighth point provides an opportunity to discuss the issue of neighbourhood noise, which is a major nuisance for residents and is linked to development/construction, as well as light pollution.

**Noise pollution** (excerpts from "Factors contributing to a healthy living environment" HCSP 2019):

While there is theoretically no physical difference between sound and **noise**, the latter is distinguished by its nuisance aspect. The definition of environmental noise is as follows: "**A physical phenomenon**

**that causes discomfort or unpleasantness. Although it is measurable, its perception remains an individual and subjective sensation."**

In the 2018 WHO document on healthy environments, noise is identified as one of the most threatening environmental factors to health, **with an estimated 1.6 million years of healthy life lost each year in Western Europe.**

Noise can affect daily activities and impact health, resulting in **hearing disorders**, such as tinnitus, for example, as well as **non-auditory effects** such as discomfort, impaired sleep quality, cardiovascular events, cognitive deficits and other metabolic consequences on, for example, the immune and endocrine systems or mental health. These extra-auditory health effects are also found in the conclusions of the collective expert report by the French Agency for Food, Environmental and Occupational Health & Safety (ANSES) [36] in 2013. **Sleep disturbances and discomfort are listed among the immediate effects, while learning difficulties and myocardial infarction are listed among the medium- and long-term effects.** ANSES points out that there are still many sources of uncertainty and recommends improving knowledge of the impact of noise on health. Recommendations are also made to public authorities to raise awareness and inform the public about the risks associated with noise exposure and ways of protecting themselves, as well as to implement a comprehensive policy to reduce noise exposure.

### ▪ **Neighbourhood noise**

As soon as the new residents arrived, this expanded area quickly became the subject of complaints about noise pollution, odour pollution and the presence of rodents.

This is an opportunity to address the issue of neighbourhood noise.

Exposure to noise can have direct effects on the auditory system (tinnitus, hearing loss) and, following prolonged exposure, can cause extra-auditory effects (i.e. effects that do not affect the auditory system).

Neighbourhood noise includes:

- **noise related to the behaviour** of a person or something under their control ([Art. R1336-5](#) of the Public Health Code);
- **noise from professional, sporting, cultural or leisure activities** ([Art. R1336-6 CSP](#));
- **noise from construction sites** ([Art. R1336-10 CSP](#)).

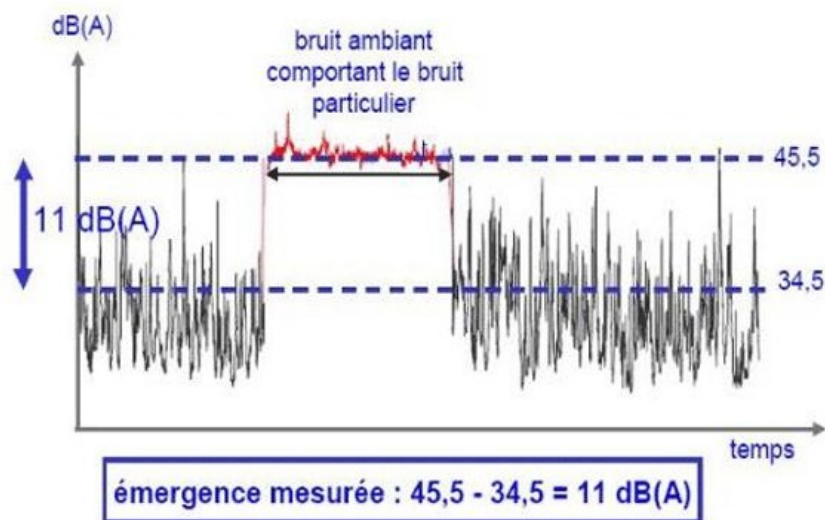
Neighbourhood noise is strongly felt by residents and leads to complaints to local authorities, whereas noise from roads, which also has an impact on health, is clearly more accepted (see point 1).

Among the noises that concern us, we will focus **on those related to professional activities, which are objectively measured using acoustic measurements.** For this category of noise, **the disturbance to neighbourhood peace and quiet or human health is characterised if the overall emergence of this noise perceived by others exceeds the limit values set by [Article R1336-7](#) of the CSP.** This defines **emergence** as the difference between the ambient noise level, including the specific noise in question, and the residual noise level consisting of all usual noises.

exterior and interior, corresponding to the normal occupation of the premises and the usual operation of equipment, in the absence of the specific noise in question.

When the noise perceived inside the main rooms of any residential dwelling, with windows open or closed, is generated by **equipment used for professional activities**, the infringement will also be characterised when **the spectral emergence** of this noise exceeds the limit values set (Article R1336-8 of the CSP).

Illustration of **overall emergence**:



**Technical ventilation, air conditioning and extraction equipment** (e.g. extractor hoods) installed in new or renovated buildings are a regular source of complaints from neighbours. Particular attention must be paid to the design of buildings and their associated equipment, particularly with regard to noise exposure.

The installation of noisy activities (e.g. bakeries, shops with night-time deliveries, craft activities, etc.) in mixed-use residential and commercial complexes is likely to cause significant nuisance if noise is not fully taken into account in the planning and construction process.

E.g.: bakery equipment installed in a commercial unit in a residential/shopping complex (impact and airborne noise), ventilation equipment on the Docks building (7.6 dB(A) noise level compared to the authorised 3 dB(A)), ventilation equipment in the nursing home causing justified complaints even though the buyers have not yet moved in, etc..

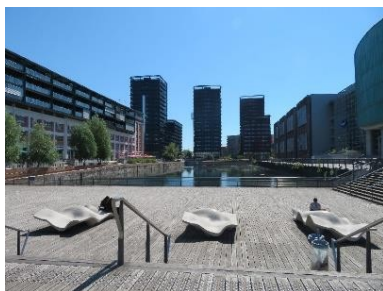
Noisy extraction equipment at Les Docks:



In addition to "macro" measures for designing a territory, such as distancing noise sources (noisy activities) and installing acoustic barriers (embankments, intermediate buildings, screens, etc.), it is important to consider the noise impact of elements associated with buildings (ventilation, extraction and heating systems, etc.) in the development and construction process.

### *Some solutions to be implemented...*

- Decision to install noisy equipment in basements, etc.
- Study the noise impact by modelling the noise of the equipment upstream of the project
- Verify that regulatory objectives have been met before commissioning buildings by means of acceptance measurements
- Organise housing taking into account noise sources, etc.



### ▪ Light pollution

**Natural light is a factor in psychological well-being and good health, particularly in combating seasonal depression.** This is why rooms in a dwelling without windows, known as windowless rooms, are classified as unfit for habitation (see housing unfitness grid) and sufficient separation between two buildings must be ensured to prevent one building from being insufficiently exposed to natural light.

The High Council for Public Health (HCSP) reiterates the importance of natural light for human health in housing (see page 25/95 - Source: Report of the High Council for Public Health (HCSP) - Factors contributing to healthy housing - Review of current knowledge and recommendations for establishing public policies for healthy housing - 31 January 2019 <https://www.hcsp.fr/explore.cgi/avisrapportsdomaine?clefr=729>). He writes: "**A genuine physiological need, natural light affects the synchronisation of biological rhythms and contact with the outside world.** Playing a role in metabolic and immunological processes, light can influence the mood and state of mind of occupants, thus directly affecting their behaviour. **It therefore plays an essential role in physiological, psychological and social balance.**"

People's exposure to artificial lighting is real, and the AVEX association has posted a European satellite image of light pollution online (<https://avex-asso.org/dossiers/pl/europe-2016/index-sodium.html>).

Article 3 of the Decree of 27 December 2018 on the prevention, reduction and limitation of light pollution specifies: **"Artificial light emissions from outdoor lighting installations and indoor lighting emitted to the outside shall be designed in such a way as to prevent, limit and reduce light pollution, in particular excessive disturbance to people, fauna, flora or ecosystems, leading to energy waste or preventing observation of the night sky."**

In Article 3, paragraph II, point 5, it is explicitly stated: **"Lighting installations must not emit excessive intrusive light into dwellings, regardless of the source of that light."**

In the book "Electromagnetic Fields, Environment and Health", written by doctors of medicine (ANSES, CSHPF, INSERM), it is stated on page 174: **"Beyond the phototoxic aspects, the growing development of artificial lighting has given rise to new environmental health issues, particularly in urban and peri-urban areas.** In fact, it can be estimated that, in urban habitats, an illuminance of **2 lux** is common at night in bedrooms. However, it has been shown **that an illuminance of 1.5 lux may be sufficient to disrupt the secretion of melatonin**, which helps regulate the biological clock. Disruption of the biological clock appears to be associated with an increased risk of breast cancer, obesity, diabetes and psychological disorders. Added to this is the ubiquity of screens (televisions, computers, tablets, mobile phones) in homes, the use of which at late hours can also shift the melatonin secretion curve. Finally, in natural environments, artificial lighting disrupts nocturnal ecosystems, for example by reducing the territories of certain species. "

The same HCSP report (see page 39) states: **"The French Society for Radiation Protection also highlights the health risks of LED (light-emitting diode) lamps, particularly white and blue lights, which can cause photoretininitis.** (See page 25/95 - Source: Report of the High Council for Public Health (HCSP) - Factors contributing to a healthy living environment - State of knowledge and recommendations for establishing public policies for a healthy living environment - 31 January 2019).

It is interesting to note that many cities are drawing up black grids, just like blue and green grids.

Finally, the National Health and Environment Plan 4 (PNSE 4), published in May 2021, includes measures to reduce the harmful effects of artificial light on health and the environment.

No. 10	<b>Playground in front of Rivétoile – Place Jeanne Helbling</b>
	<i>Greening: benefits and associated risks - Allergies and pollen Playground Heat islands Water use in the city</i>

Planting trees and shrubs contributes to residents' comfort and promotes cooling.

**Benefits of vegetation and green spaces:**

According to the HCSP, the benefits associated with the creation of additional green spaces are proportionally higher for the most disadvantaged populations. These same populations, surrounded by nature, are those with the lowest level of inequality in terms of mortality rates in England (WHO, 2016c).

**According to the ISADORA guide**, recent studies and literature reviews conducted by various research groups agree on the multiple health benefits of green spaces (Bowler et al., 2010; Lee and Maheswaran, 2010; Kuo, 2015; WHO, 2016; van den Bosch and Ode Sang, 2017; Twohig-Bennett and Jones, 2018). **Numerous studies show positive associations between access to different types of green spaces and health status as measured by various indicators such as overall health, mental health, obesity, birth weight, child behavioural development and mortality (WHO, 2016).** According to the most recent meta-analysis conducted by Twohig-Bennett and Jones (2018), which included 143 studies, the most significant associations in terms of health outcomes relate to a reduction in heart rate, risk of type II diabetes, and all-cause mortality. Thus, even though some results remain mixed and some studies are considered to be of lower quality, the evidence for physical, psychological, social, economic, and environmental benefits is relatively well established (Hunter et al., 2019).

According to Dutch urban forestry researcher Cecil Konijnendijk, every resident should be able to see three trees from their home or workplace, their neighbourhood should have 30% canopy cover, and everyone should live within 300 metres of a park or garden. When this "3-30-300" rule is fully respected, residents live better and statistically show better mental health, according to a Spanish study<sup>6</sup>. In addition, the study's researchers note "lower consumption of medication and fewer visits to a psychologist".

More specifically, green spaces contribute to:

- **Reducing exposure to air pollution:** in 2019, ATMO estimated that air pollution was responsible for the deaths of 1,976 people each year in Alsace. According to the ISADORA guide, empirical data does not suggest that green spaces are an effective means of sustainably reducing air pollution, but they can help to *mitigate people's exposure to pollution through various mechanisms*: absorption of gaseous pollutants (NOx, ozone, VOCs, CO), trapping particulate pollutants, for example, but the effectiveness of these mechanisms varies and may even be reversed depending on the urban form (e.g. street canyons).
- **Improved mental health:** the presence of green spaces is associated with a reduction in symptoms associated with depression and a reduction in stress. People living more than one kilometre from a green space are on average 1.5 times more stressed than those living less than 300 metres away. The poorest communities are said to benefit most from these advantages.

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<sup>6</sup> M. Nieuwenhuijsen, P. Davdand, S. Marquez. X. Bartoll, E. Barboza, M. Cirach, C. Borrell, W. Zijlema. (2022). *The evaluation of the 3-30-300 green space rule and mental health*.  
<https://www.sciencedirect.com/science/article/pii/S0013935122017145?via%3Dihub>

- **Providing islands of coolness:** Heat combined with air pollution has a harmful effect on health: high temperatures increase the formation of ozone and harmful particles, leading to an increase in chronic and respiratory diseases. Extreme temperatures can result in rapid and significant excess mortality. According to INSERM, the number of deaths due to the 2003 heatwave in France was nearly 20,000. Vegetation improves people's comfort and lowers temperatures during heat waves. The combined effects of evapotranspiration and shade help to significantly lower air temperature and combat the urban heat island phenomenon.
- **Noise pollution mitigation:** Green spaces can mitigate the health impacts of noise, but this is mainly true for densely populated forests, which can act as acoustic barriers by reducing noise exposure levels. However, more open or less dense green spaces can also, in some cases, exacerbate noise levels by reflecting sound or not providing sufficient cover to block out surrounding noise. It is therefore important to consider the density of vegetation and the layout of green spaces when assessing their effectiveness in reducing noise.

These areas also form tree-lined and grassy corridors. Ecological corridors connect biodiversity reservoirs, providing species with favourable conditions for movement and completion of their life cycles.

## ■ Allergies and pollen

The development of green spaces can increase the risk of allergies in some individuals. In a society where the pollen-allergic population is increasing (*4% in 1968, 25% today and 50% predicted by the WHO in 2050*), pollen management in green spaces exposed to urban pollution is a major issue, as pollen is more aggressive to the respiratory system.

ANSES 2014: **Estimated prevalence of pollen allergies at most:**

- 7% among children aged 6-7,
- 20% in children aged 9 to 11, with nearly 27% of children sensitised to at least one airborne allergen,
- 18% among adolescents aged 13-14,
- 31 to 34% among adults.

In sensitised individuals, air pollutants can promote allergic reactions by lowering the threshold for bronchial reactivity and/or increasing irritation of the nasal or ocular mucous membranes.

Pollen (size 5 to 250 µm) suspended in the indoor air of buildings has a lasting effect (ANSES, 2019).

A **guide to less allergenic planting for professionals involved in landscaping** in the Champagne region is available on the Atmo Grand Est website (under the Publications section).

The "**Végétation en Ville**" (**Vegetation in the City**) information guide from the Réseau National de Surveillance Aérobiologique (RNSA) details the allergenic potential of trees and plants and suggests alternatives by promoting species diversification and appropriate maintenance.

## ■ **Playground**

According to the Ehlass survey, 14% of accidents that occur on playgrounds require hospitalisation. Boys between the ages of 5 and 10 are particularly affected.

The DGCCRF website summarises the rules governing the design of communal playgrounds:

<https://www.economie.gouv.fr/dgccrf/Amenagement-d-une-aire-collective-de-jeux>

When designing a playground, it is also important to:

- prohibit the use of pesticides (ECOPHYTO PRO);-
- avoid, as a priority, creating a playground on a polluted or potentially polluted site or soil (Circular of 8 February 2007);
- to develop the playground in such a way as to avoid noise pollution in the neighbourhood (see CNB Guide - 2011);
- prohibit the use of treated wood (railway sleepers, etc.);
- in cases of extreme necessity, create a playground with shock-absorbing surfacing that complies with Decree No. 96-1136 of 18/12/96 and the ANSES opinion of 2018 (shaded area), and only if the soil study is compatible with this use (see page 29 - ADEME);
- prohibit smoking (R3512-2 Public Health Code (CSP));
- comply with regulations on artificial lighting (decree of 27/12/2018);
- move the playground away from a busy road and provide additional protection with a screen building, if effective;
- signposting toilets and drinking water points (local public facilities)
- monitor the water quality (risk related to Legionella) of water games (Decree No. 96-1136 of 18/12/96) or misters (R1335-15 to 23 CSP).

**Additional note: Synthetic sports surfaces** raise questions about their impact on health and the environment due to the potentially hazardous substances present in the granules produced from the recycling of used tyres (polycyclic aromatic hydrocarbons, heavy metals, phthalates, volatile or semi-volatile organic compounds, etc.).

In 2018, based on the results of data from the literature, ANSES concluded that there was a negligible health risk to athletes and children using these synthetic pitches. However, ANSES recommends continuing research to assess the risks to human health posed by these pitches.

### **Additional note: materials and endocrine disruptors:**

National Cancer Institute: "The World Health Organisation (WHO) defines endocrine disruptors as 'chemical substances of natural or artificial origin that are foreign to the body and can interfere with the functioning of the endocrine system, thereby inducing adverse effects on the body or its descendants'. Several of these substances are present in our everyday environment.

The level of evidence regarding their impact on health varies from one molecule to another. Nevertheless, some have a proven or suspected carcinogenic effect on humans and may be responsible for the development of certain hormone-dependent cancers (breast, uterus, prostate, testicles).

Depending on the substance, there is also the possibility of reproductive function impairment, earlier onset of puberty, disruption of thyroid function, nervous system development and cognitive development, and metabolic disorders (type 2 diabetes and obesity).

Fact sheet on endocrine disruptors:

<https://www.oncorif.fr/une-nouvelle-fiche-reperes-sur-les-perturbateurs-endocriniens/>

#### *In point 10, we observe...*

- The presence of a playground with little shade.
- With the help of specific technical measures, the playground was installed on polluted ground.
- The car park acts as an acoustic barrier against road traffic noise. Equipment such as a fountain could have further improved the sound quality of this space.



**This raises the issue of climate change and urban heat islands.**

#### ▪ **Heat waves**

Excerpts from the High Council for Public Health OPINION on the decision support document "Closure of primary schools" during a red heatwave alert (28 April 2020):

"Heat waves are one of the manifestations of climate change and are part of the major trends identified by the Intergovernmental Panel on Climate Change (IPCC). These meteorological events have major health consequences that must be mitigated. Such situations are highly likely to recur (Pascal, 2019). The impact on health can be reduced through individual and collective preventive measures."

"Exceptional heat waves have been observed in the past (2003, 2006, etc.), but they occurred in the middle of summer, during the school holidays. For the first time in **2015, then in 2017 and 2019, these heat waves occurred during the school year**, before the start of the holidays.

holidays. In 2015 and 2017, an increase in the use of healthcare for children was noted, probably linked to school and extracurricular activities (Pascal, 2019)."

"The body surface area/body mass ratio of children is 30 to 36% higher than that of adults. As the ratio is higher in children, heat transfer from the body to the outside is greater in children than in adults per unit of body mass, which is an advantage for children in a moderate and slightly warm environment."

"The degree of adiposity determines part of thermolysis and thermogenesis. In summary, the significant difference in the body surface area/body mass ratio between children and adults is the most important factor to consider in explaining why children have a lower heat tolerance than adults."

#### **Effects of heat waves on children: epidemiological data**

"The link between mortality and heat waves is controversial, but **mortality does not appear to be increased in children** (Xu, 2014 – Basagaña, 2011 – Auger, 2015).

With regard to morbidity, the following have been reported in the literature (Xu, 2014, Ahdoot, 2015):

- **An increase in the number of cases of asthma attacks.** Children are more exposed than adults because they spend more time outdoors and their basic respiratory rate is higher than that of adults (increased exposure to ozone and atmospheric particles).
- **An increase in cases of** hay fever and, consequently, asthma attacks (increased production of certain pollen allergens linked to higher atmospheric CO<sub>2</sub> concentrations and temperatures).
- **An increase in the incidence of certain infectious diseases:** - gastroenteritis, particularly bacterial (salmonella, shigella, campylobacter, E. coli) → hand, foot and mouth disease (in Japan, an 11% increase was recorded for each additional degree of temperature (Onozuka, 2011))."

"There is broad agreement that young children (0-4 years old) are more vulnerable."

"**The vulnerability of children with chronic conditions** includes obese or overweight children, asthmatics, those with cystic fibrosis, or chronic respiratory conditions (Kovats, 2004 – Stafoggia, 2008-Sheffield, 2011), diabetes (Xu, 2019), heart disease (Cui, 2014) or disabilities that limit their ability to apply preventive measures."

#### **Recommendation 2: Rapidly adapt school buildings with simple transitional solutions.**

This preparation includes:

- The implementation of cooling and ventilation systems, at least in one common room. This is a short-term solution, which is not sustainable and will need to be followed up by an assessment of the energy performance of school buildings in the medium term (role of local councils). The Centre for Disease Control and Prevention (CDC) includes in its heatwave management guide the possibility of constructing green roofs in schools to combat heat islands, particularly in cities (CDC, 2016).
- Installing blackout devices, shutters and curtains to limit temperature rises.
- Ventilating rooms at night when building security permits.

- Air conditioning certain areas for children to use during the hottest hours of the day (10 a.m. to 4 p.m.). - Providing easily accessible water points for all ages (water fountains, glasses available for drinking from the tap), mist sprayers (State of Queensland, Australia). Under normal circumstances, children do not drink enough water; between the ages of 4 and 17, 60% of them do not meet European recommendations (Bottin, 2019); this provision is even more crucial during a heatwave.
- Adapting the appropriate means of transport. Where relevant, provide air-conditioned transport with window shades.
- Provision of a sprinkler system in school playgrounds and perforated hoses to allow children to cool off.
- Checking food storage conditions and redesigning canteen menus to favour fresh meals and foods rich in water, while ensuring that the cold chain is maintained.

**The urban heat island: the guide Cooling cities: a variety of solutions ADEME 2021** outlines a number of solutions.

While daytime temperatures vary without any clear distinction between urban and rural areas, **the urban heat island effect is mainly evident at night in cities, where air temperatures are higher than in the countryside.**

It should be noted that this leads to:

Phenomena at play during the day	Phenomena at play at night
Disruption of wind flow by the urban landscape Absorption of solar energy by the urban landscape, by mineral surfaces with low albedo (concrete, asphalt, etc.) Anthropogenic heat emissions from air conditioners Heat trapping by the urban form	Limited heat dissipation due to urban form with little exposure to the sky and weakened winds Heat emitted by air conditioners and cars Some dwellings and residents are particularly vulnerable to overheating Release of heat stored by mineral coatings with high thermal inertia, with a phase shift time

**The levers for action are:**

- **limiting heat trapping through an urban design that is open to the wind and sky** and through urban surfaces with high albedo and low inertia;
- **promoting evaporation and evapotranspiration** in cities through nature-based solutions;
- **reducing anthropogenic heat emitted by vehicles and air conditioners.**

This guide specifies on pages 17 and 18, respectively, the effectiveness of the solutions and the impact and co-benefits of these solutions.

It should be noted that ICU mitigation measures are more effective when combined with each other (Mohajerani *et al.*, 2017).

**Health benefits of the solutions:**

Green solutions	Refreshment at city level	Refreshment at pedestrian level	Health benefits	Comfort (acoustic, visual)	Comfort
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<b>Park</b>	+++ : Lower temperatures due to evapotranspiration	+++ : In dry climates, shade is a factor of cooling	+++ : Promotes physical activity and stress reduction. Has a noticeable effect on air quality by binding particles. Pollen can be a vector for allergies however	+++ : creates a calming visual and acoustic environment
<b>Tree</b>	+++ : Effect on reducing of temperature through evapotranspiration	+++ : Shading and evapotranspiration greatly improve comfort during the day. At night, the effect is neutral	+ : Mental health benefits associated with the sight of plants. Filtration of fine particles. But sometimes harbours unwanted organisms, allergenic potential allergenic.	++ : Improvement in visual comfort due to shading, improvement acoustic environment
<b>Lawn</b>	++ : Effect mainly through evapotranspiration	+ : Irrigated, lawns have a cooling effect, particularly when in contact with it, if otherwise, the effect is negligible.	+ : Mental health benefits, allergenic potential.	++ : Improved acoustic environment through noise reduction
<b>Green roofs</b>	+ : The contribution of green roof is low on a city-wide scale	+ : In the case of accessible roofs, the cooling effect is very low for pedestrians	+ : Mental health benefits, allergenic potential.	+++ : Improvement in the acoustic environment through noise reduction, visual comfort if the roof
<b>Green walls</b>	0 : The effect of green facades is negligible	+ : The effect shading effect of the walls and evapotranspiration improve comfort.	+ : Mental health benefits, but allergenic potential	+ : Improved acoustic environment through noise reduction
<b>Plan Water/ rivers</b>	++ : Evaporation from bodies of water and rivers has a large-scale effect	++ : Evaporation cools the air and contact with cool water improves comfort for pedestrians	+ : Mental health benefits associated with the sight of vegetation and recreational uses of water, but risk of disease (wetlands) and drowning	+ : Calming atmosphere, but risk of glare from water reflection
<b>Landscaping works for water</b>	+ : similar impact to lawns	+ : effect similar to lawns	+ : Mental health benefits associated with seeing plants, but risk of infectious diseases (wet areas)	+ : Acoustic damping of the soil
<b>Grey solutions</b>	<b>Cooling at city level</b>	<b>Cooling at pedestrian scale</b>	<b>Health benefits</b>	<b>Comfort (acoustic, visual)</b>
<b>Form Urban bioclimatic</b>	++ : The openness to the sky and winds of urban form	+ : Mainly related to shading or wind effects	+ : Density promotes active mobility	0 : Density limits access to light and generates more noise

	reduces heat trapping heat			
<b>Fountain (1 °C), misting (4 °C)</b>	0: no impact	+: strong impact in close proximity	+++ : social sociability, intergenerational + : Infectious risks, legionellosis, risk of drowning	++: Creates atmosphere and urban well-being
<b>Shade structures</b>	0	++: Impact related to shading	+++ : Place for gathering and socialising + : Protection from harmful UV rays, reduces the risk of skin cancer	+ : Impact on acoustics depending on the material used, improved visual comfort, protection against la rain
<b>Photovoltaic panels</b>	+: Slight reduction in ICU	0: Very localised heating, creates shade in shading structure	0:	0:
<b>High albedo coatings with high albedo</b>	+++ : Reduction in UHI	0: Less heating but potential discomfort for the fact radiation reflected back onto pedestrians	- : VOC risk from paints	- : glare
<b>Drainage materials</b>	To be studied	++: moderate reduction in air temperature	0	0: function of the material (noise, glare)
<b>Insulation and thermal inertia of buildings</b>	+: Impact interesting, but no large-scale studies have been conducted scale	+: Impact Local average	0	++: Improved comfort in winter, acoustic comfort, summer comfort
<b>Soft solutions</b>				
<b>Reduction in road traffic and combustion engines</b>	++: Moderate impact	+: Impact only on busy streets	+++ : Improved noise and air quality, fewer accidents, active mobility reduce sedentary lifestyles	+++ : Calm acoustic environment
<b>Limited air conditioning</b>	++: medium impact	++: moderate impact	+ : less of drying outdoor air	+ : Calmer acoustic environment
<b>Societal adaptation to high temperatures</b>	0	++: Improved perception of heat Improved mortality/morbidity	+++ : Improved sensation de la heat, significant health impacts on mental and physical health	0

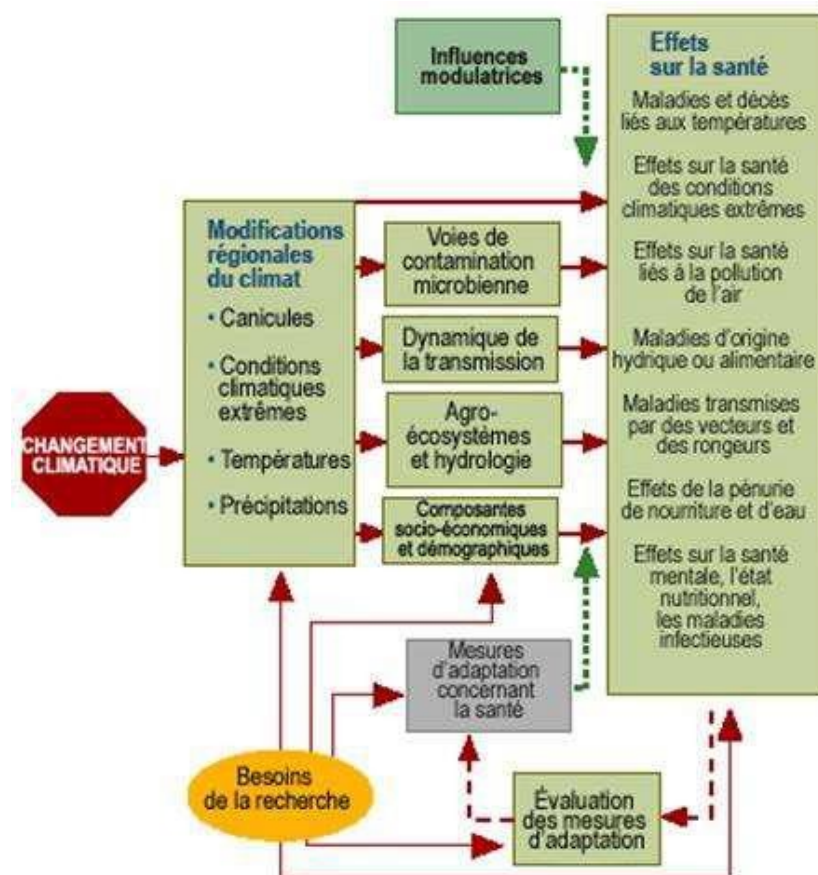


Figure: causal link between climate change and health

From LE POINT VILLES-SANTÉ SUR... Climate change and its impact on health FRENCH NETWORK OF HEALTHY CITIES OF THE WHO

Combating climate change requires action on various public policy fronts, such as transport, housing, construction and public procurement, as well as the development of an adaptation strategy (greening, presence of water in the city, urban development, invasive species, management of extreme weather events).

## ■ Water use in cities

Water is playing an increasingly central role in the development of contemporary cities, as evidenced by the partnership agreement between the City of Strasbourg and Voies Navigables de France, which aims to develop the tourist, economic and recreational uses of water. The emergence of new uses, particularly recreational ones, is responding to the challenges of urban liveability. As mentioned in the previous point, heat waves will become increasingly frequent. It is therefore necessary to consider creating cooling spaces in the city.

In the context of climate change and the quest for a resilient city, diversifying water uses by promoting recreational and cooling activities such as swimming is a goal of the local authority. The organisation of open water sporting events in recent years reflects this desire and focus on the part of the local authority. In 2016, Strasbourg hosted the first edition of the Open Swim Star, an open water swimming competition in Lake Baggersee.

Baggersee. Conceived in 2012 by Sport Swim Organisation to revive legendary events such as "La Traversée de Paris à la nage" (Swimming Across Paris), the Open Swim Stars Harmonie Mutuelle are events created by former swimming champions who want to share their passion and bring open water swimming back to the heart of cities. Since then, subsequent editions have moved closer to the heart of the city, with the 2019 edition starting at Quai des Bateliers.

In order to establish a sustainable bathing project, there are a few precautions to take. This type of development must be carefully planned, as it also involves challenges such as water quality management.

**Definition of a bathing area (Art. L1332-2 of the Public Health Code):**

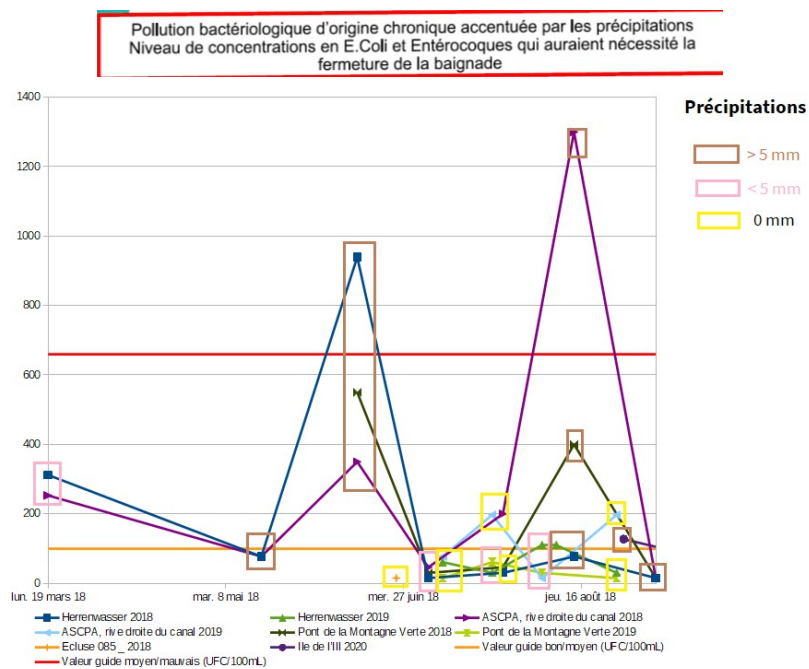
**"Bathing water is defined as any part of surface water in which the local authority expects a large number of people to bathe and in which the competent authority has not permanently prohibited bathing.** The following are not considered bathing water: - swimming and therapeutic pools; - confined waters that are subject to treatment or used for therapeutic purposes; - artificial confined waters separated from surface water and groundwater."

However, **in Strasbourg, the municipal decree of 25/04/1955 states:** "It is **forbidden to bathe** in any part of the rivers, canals or waterways of any kind that cross the territory of the City of Strasbourg, outside of enclosed bathing areas designed for this purpose."

The legislator has imposed **the establishment of a bathing profile** for all new bathing areas and all existing bathing areas prior to 1 December 2010.

The bathing profile **consists of identifying sources of pollution that may have an impact on bathing water quality and affect the health of bathers** and, where a risk of pollution is identified, **defining the management measures to be implemented to ensure the health protection of the population and actions to eliminate these sources of pollution.**

**The impacts of activities and pollution risks** related to domestic wastewater, rainwater, agricultural and industrial activities, wildlife, marinas, leisure activities, the potential for cyanobacterial proliferation, etc. are examined and assessed.



### At point no. 10, we observe...

- the local configuration of the sewerage network (stormwater overflows, Ziegelwasser outlet), water sports activities (marina located further east not connected to the network), the presence of wildlife fed by residents, the health impact of which must be assessed and, if necessary, corrective measures taken to ensure the safety of bathing,
- the clarity and transparency of the water,
- aquatic plants (elodea, etc.) requiring periodic mowing.

