


How the environment shapes well-being



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1. Air, noise, and greenery of cities can shape citizens' well-being

Poor environmental quality **significantly reduces well-being** by harming health, disrupting daily life, and creating social and economic burdens.

Analysis of European Social Survey (ESS)¹ data, along with regional surveys in Catalonia, Estonia, Øresund (Greater Copenhagen Region, Region Zealand and Region Skåne), and Kosovo, indicates that **health, income, social ties, and trust are key drivers of well-being**. However, **air pollution from fine particulates (PM_{2.5}), noise, and loss of urban greenery** also play major roles.

Fine Particulate Matter 2.5 (PM_{2.5})

PM_{2.5} are fine particles ($\leq 2.5 \mu\text{m}$) that can reach deep into the lungs and bloodstream, harming respiratory and cardiovascular health.

Reducing PM_{2.5} levels, **expanding green infrastructure, and raising public awareness** are essential measures to improve well-being.

2. Environmental quality and its impacts on well-being

Poor environmental quality significantly reduces quality of life by affecting health, daily activities, the environment, and social well-being. Air pollution, for instance, increases the risk of respiratory diseases such as asthma and bronchitis, cardiovascular problems like strokes, and even cognitive decline. Long-term exposure to fine particulates (PM_{2.5}) can **shorten lifespans**, while poor air quality, including bad odors, worsens **stress, anxiety, and sleep quality**. Daily routines are also affected: polluted environments limit outdoor activities, reduce opportunities for exercise, and disrupt school or work.²

The economic costs are substantial, with rising healthcare expenses, lost productivity, and declining property values in heavily polluted regions. Socially, **low-income groups and marginalized communities face disproportionate risks**, often residing near industrial sites or highways where both air and noise pollution are highest.³

Noise pollution compounds these problems. Urban traffic, construction, and industrial zones **generate both noise and air pollution**, intensifying stress, disturbing sleep, and increasing cardiovascular risks. At the same time, the expansion of these infrastructures often comes at the expense of urban greenness—trees, parks, and other green spaces—since traditional models of city growth prioritize built development over ecological planning. This reduces natural air filtration, shade, and recreational areas, while limiting relief from heat and stress.

Together, **air pollution, noise, and declining urban greenery erode well-being**, undermining both the length and quality of life for present and future generations.⁴

Beyond their objective health impacts, air pollution and poor environmental quality are also subjectively experienced. People's perceptions of these conditions **can contribute to mental distress, which is an important determinant of poor health-related quality of life (HRQoL)** like life satisfaction and happiness.

3. Pollution, happiness, health and risks: what the data reveals

3.1 European-wide analysis: air pollution, life-satisfaction, and happiness interactions

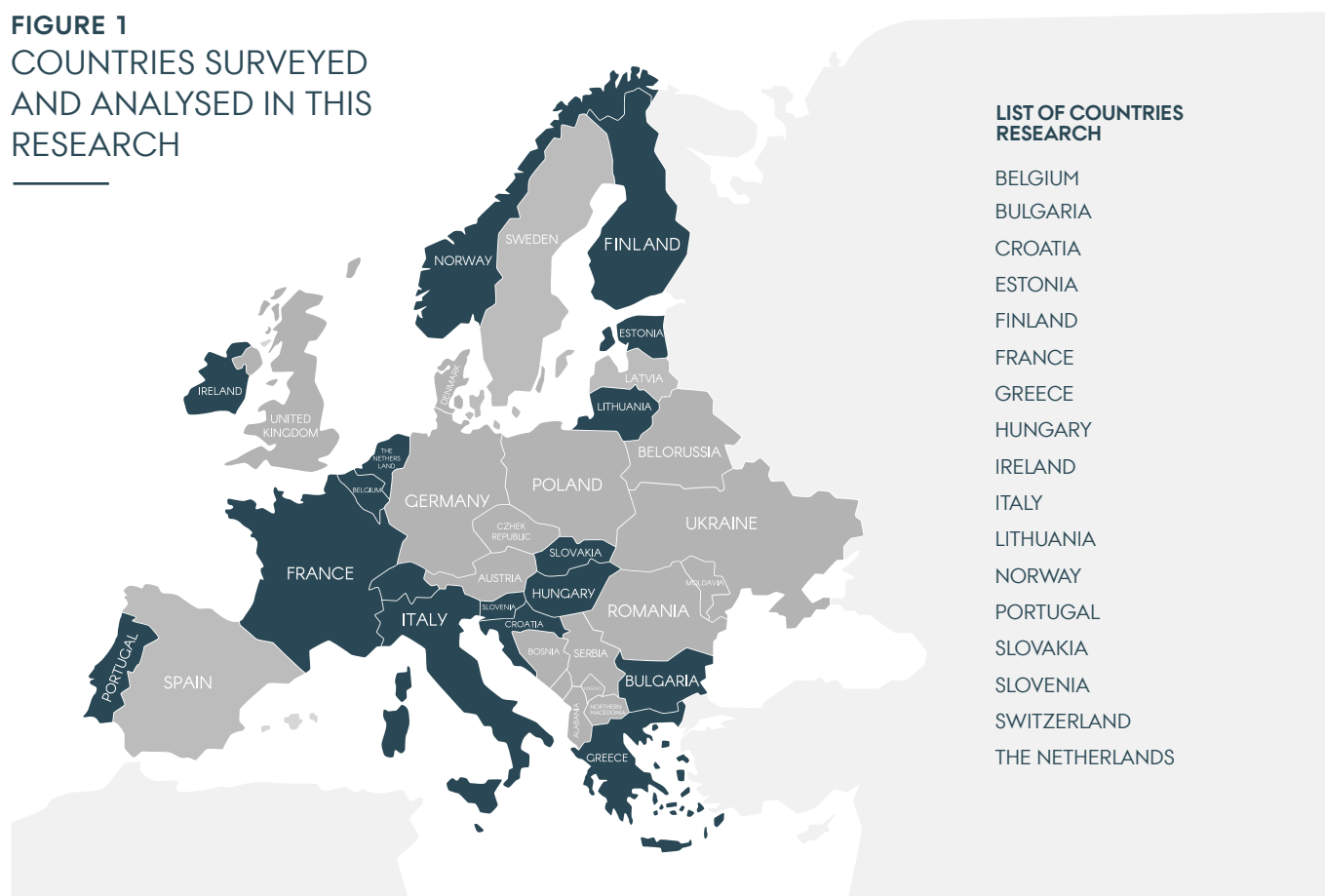
The ESS¹ is an international survey conducted every two years in around 30 countries. It collects data **on attitudes, beliefs, and behaviour patterns of diverse populations**. In each round, face-to-face interviews are conducted, **ensuring high-quality, comparable data across countries**.

The questionnaire covers a wide range of themes, from media use, politics, and social trust to well-being, identity, discrimination, and socio-demographic characteristics.^{5,6}

A set of variables from ESS 2020-2022 and 2023-2024 (such as life satisfaction, happiness, education, income, health, and social trust) was analysed to examine subjective well-being and its social and demographic correlates. In addition, air pollution data were incorporated to investigate how exposure to air pollution affects subjective well-being.

The analysis explored the **interplay between personal, social, institutional, and environmental factors on individual well-being** across countries (Figure 1).

FIGURE 1
COUNTRIES SURVEYED
AND ANALYSED IN THIS
RESEARCH



The findings show that **life satisfaction and happiness mostly depend on people's health, finances, social connections, and trust in their government and democracy**, in the stated order, while age and education have smaller effects. Individuals who are unemployed, financially

struggling, or without a partner report the lowest satisfaction, whereas those in good health, with strong social ties, and greater trust in institutions report much higher levels of happiness and satisfaction.

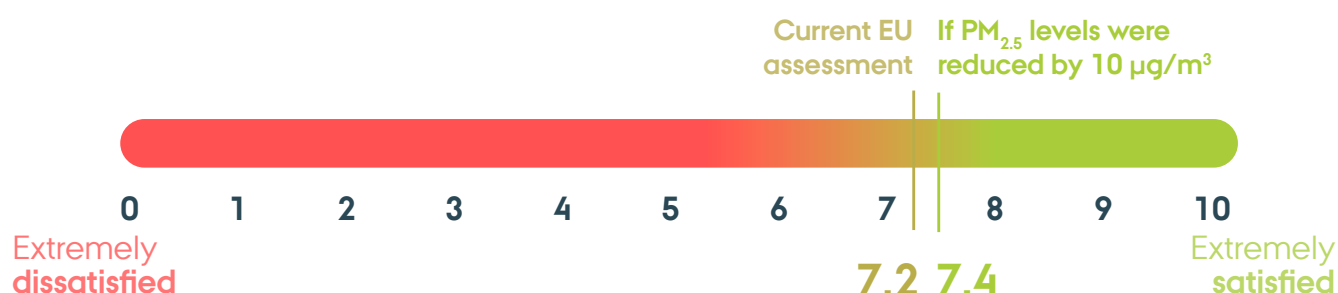
Importantly, **exposure to fine particulate matter air pollution (PM_{2.5}) significantly reduced both life satisfaction and happiness.** The higher the level of air pollution, the lower people's life satisfaction and happiness.

A decrease of 10 µg/m³ in PM_{2.5} is associated with an increase in life satisfaction of 0.19 points.

Considering that the average life satisfaction score for the EU is 7.2, this corresponds to a score of 7.4 (Figure 2).

A decrease of 10 µg/m³ in PM_{2.5} is associated with an increase in happiness of 0.11 points. With the EU average happiness score at 7.4, this results in a score of 7.5.

FIGURE 2
LIFE SATISFACTION INCREASE ASSOCIATED
WITH A 10 µg/m³ PM_{2.5} REDUCTION



In the ESS, **life satisfaction** and **happiness** are measured with single-item 11-point scales. People were asked: "All things considered, how satisfied are you with your life as a whole nowadays?" and "Taking all things together, how happy would you say you are?", respectively.

Life satisfaction is a long-term, cognitive evaluation of one's life overall, while **happiness** is a more short-term, emotional experience of how one feels.

3.2 Four-region survey: perceptions, health, and environmental risks

Moreover, an **online population-based questionnaire survey** in four case study areas –Kosovo, Estonia, Catalonia (Spain), and Øresund (Greater Copenhagen Region, Region Zealand and Region Skåne)- was conducted to investigate well-being, health burden, sociodemographic factors, perceptions and beliefs of environmental pollution, and opinions on mitigation measures.

Regarding the populations' perceptions and beliefs of environmental pollution, the survey captured: perceived pollution levels, health-risk perceptions associated with pollution, annoyance evoked by

pollution, and sensitivity to pollution. These aspects are based on the more than 4,000 individuals' perceptual, cognitive, emotional, and behavioural reactions to environmental pollution, and are known to play important roles in well-being and health, for example, through stress-related processes.

Data were also collected on perception and beliefs of environmental noise pollution, drinking water quality, urban greenness, and extreme weather events, since these factors influence the overall quality of life.

Regional differences in well-being and health burden perceptions:

- Health-related quality of life problems (mobility, self-care, usual activities, pain/discomfort, anxiety/depression) were rated worst in Øresund, followed by Estonia, Catalonia, and Kosovo (Figure 3).
- Overall self-rated health was highest in Kosovo, followed by Catalonia, Estonia, and Øresund.
- Mental distress (anxiety, depression, sleep problems, burnout) was higher in Øresund, Estonia, and Catalonia than in Kosovo.
- Air-pollution-related symptoms (e.g., coughing, headache, and throat irritation) were most prevalent in Kosovo, followed by Catalonia, Øresund, and Estonia. Particularly, hypertension and cardiovascular diseases were more common in Estonia.



Øresund citizens may be aware of the relatively poor health-related quality of life, Kosovo may require stronger pollution control measures and awareness programs, while Estonia may benefit from public health interventions related to pollution and Catalonia from better green infrastructure.

FIGURE 3
HEALTH-RELATED QUALITY OF LIFE PROBLEMS



Sociodemographic inequalities in well-being and health:

- Sociodemographic factors and mental distress are key determinants of poor HRQoL.
- Younger age, women, minority status, and lower income are associated with poorer perceived general health, higher mental distress, and more air pollution-related symptoms.

Air pollution and other factors influencing well-being and health:

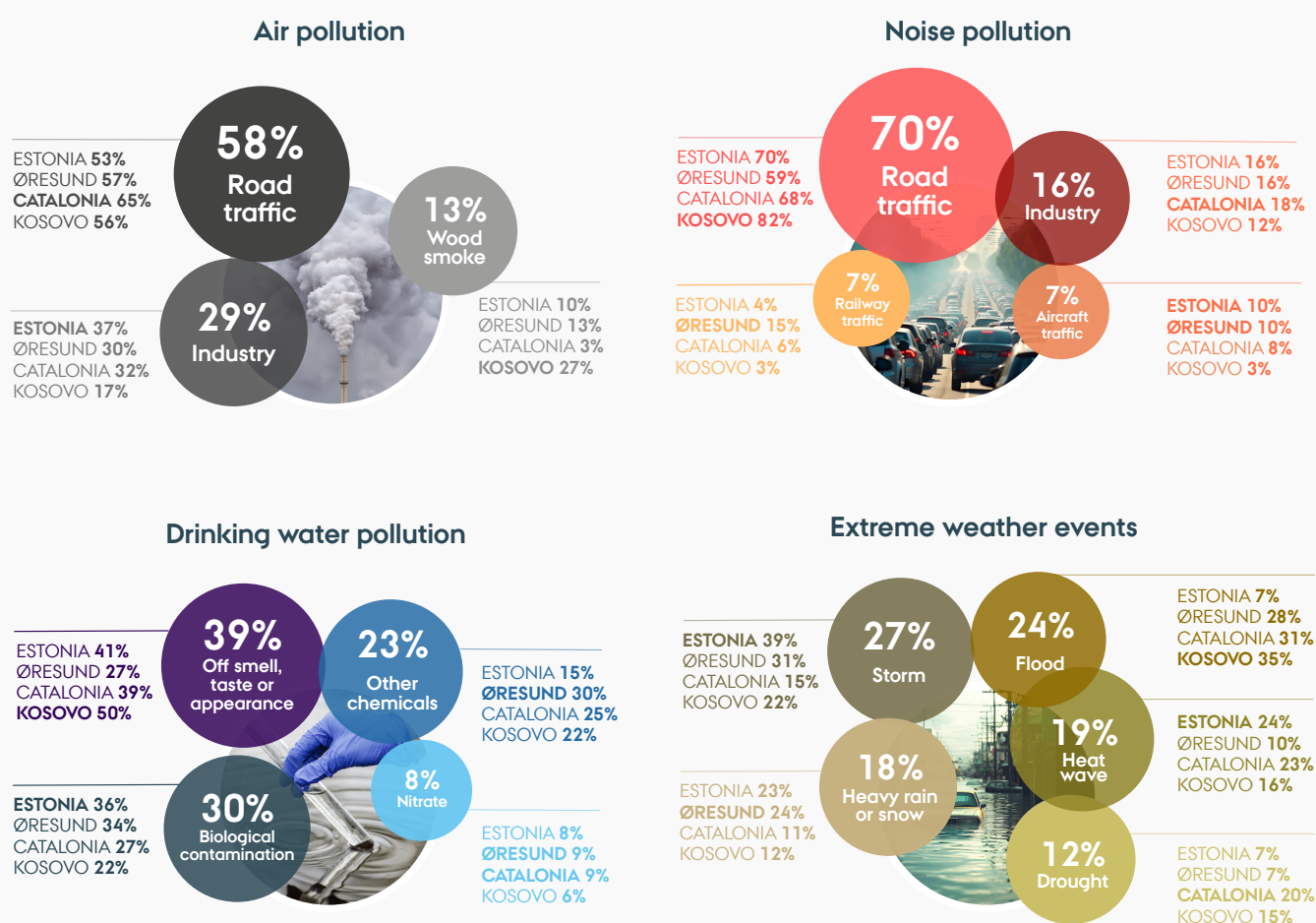
- There is no universal link between exposure to PM_{2.5} and HRQoL across the four regions, as air pollution is only one of many factors that can affect citizens' health status.

Who perceives air and noise pollution the most?

- Perceived environmental pollution of both air and noise is highest in Kosovo, followed by Catalonia, Øresund, and Estonia (**Figure 4**).
- Determinants of perceived environmental pollution include younger age, women, low or high education levels, minority status, financial discomfort, sleep disturbance, and symptoms of anxiety, depression, and burnout.

FIGURE 4

SOURCES OF ENVIRONMENTAL POLLUTANTS AND EXTREME WEATHER EVENTS OF GREATEST PUBLIC CONCERN IN THE FOUR STUDY REGIONS



4. Cleaner, greener, and happier: steps for better neighbourhoods

Urban environmental quality – air, noise, drinking water, and green space – interacts strongly with **social and psychological factors**, jointly shaping health and happiness.

Perceptions of poor environmental quality are influenced not only by actual exposure but also by **socioeconomic vulnerability and mental health conditions**, reinforcing the subjective experience of reduced well-being.

Air pollution impacts differ by region, with Kosovo showing the highest concern and symptom burden.



FIGURE 5

COMPARISON OF THE EU AIR QUALITY DIRECTIVE 2024 ANNUAL MEAN $PM_{2.5}$ LIMIT VALUE AND THE WHO 2021 AIR QUALITY GUIDELINES



The WHO recommendation is twice as strict as the forthcoming EU standard.



Actions and recommendations for local policy-makers to improve citizens' well-being

- Cut $PM_{2.5}$ through LEZ, limits on older diesel vehicles, and strict industrial emissions, while ensuring monitoring to fulfill EU Air Quality Directive⁵ limits and WHO recommendations⁷ (Figure 5).
- Expand green infrastructure with street trees, preserve larger parks and create pocket parks, green roofs, and green buffers in high-exposure areas.
- Run clear public campaigns with air-quality alerts and simple guidance on what to do during those events for protecting physical and mental health.
- Improve cross-sector coordination by creating a joint taskforce across transport, health, planning, and education to improve air quality.
- Link actions to climate adaptation by designing green spaces for cooling, flood control, and pollution filtering.
- Integrate mental-health support into environmental programs, focusing on vulnerable groups and community-based activities.

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MARCHES Project

The Horizon Europe MARCHES (Methodologies for Assessing the Real Cost to Health of Environmental Stressors) project aims to advance methodological rigor and consistency in accounting for the welfare economic health costs of pollution, based on systematic reviews of health effects.

It aims to assess the impact of emissions, air pollutants, and extreme weather events on public health, and to quantify the benefits of reducing exposures and emissions.

Conducting robust analyses is essential for accurately estimating the health impacts of air pollution and for demonstrating the value of implementing effective mitigation measures.

This will be demonstrated in case studies where MARCHES partners with public authorities in six countries (Czechia, Denmark, Estonia, Kosovo, Spain, and Sweden). Learn more

about the research and activities of the MARCHES project here: <https://projects.au.dk/MARCHES>

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