



LA SALUTE AL CENTRO DELLE CITTÀ
Bologna, 15 luglio 2026



URBAN HEALTH FRAMEWORK

Daniel Velázquez-Cortés, MD, MGH, PhD (candidate)
ISGlobal - Barcelona Intitute for Global Health



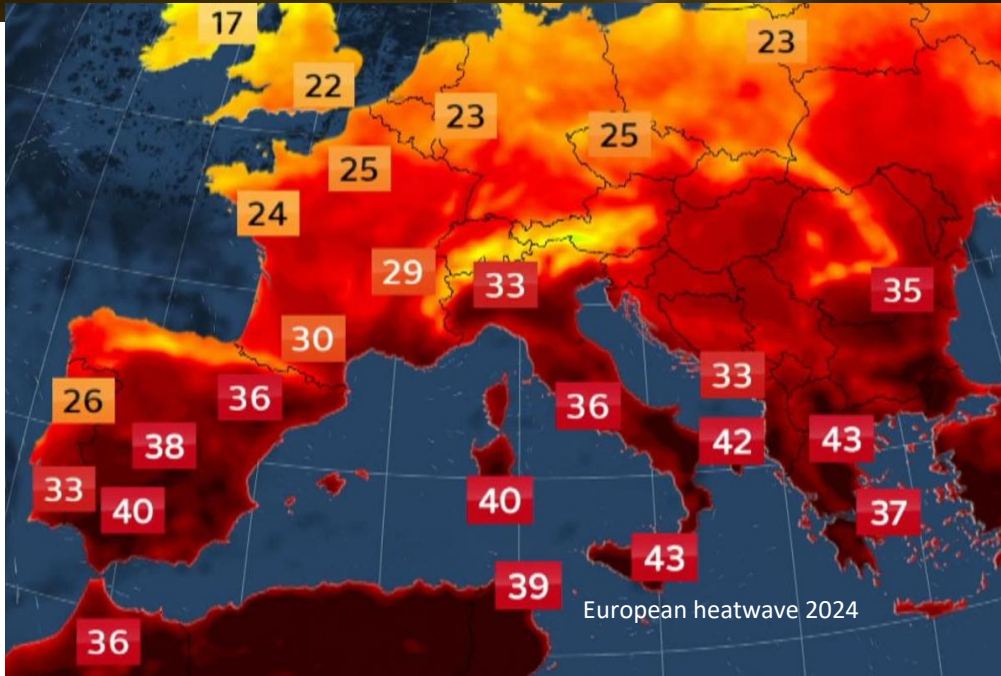
CLIMATE CRISIS



The streets of St Pölten, Austria, are submerged in floodwater. Photograph: Christoph Reichwein/Avalon



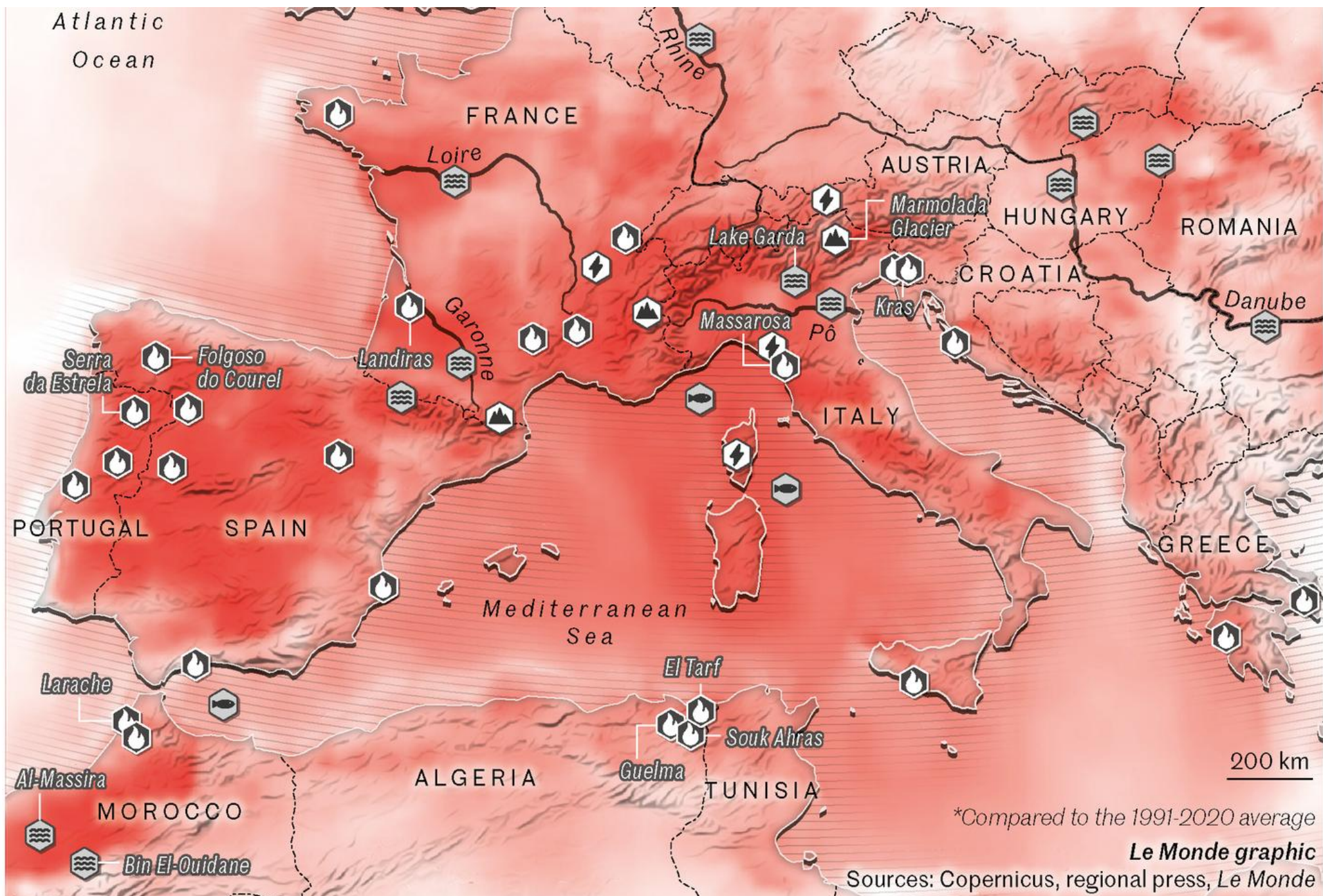
Wildfires Portugal



European heatwave 2024



The usually submerged Sant Romà de Sau church on March 4, 2023 / Nia Escolà





**Valencia Gota fría
Depression aislada niveles altos (DANA)**



Heat deaths in Europe may triple by end of the century, study finds

Countries in south most at risk, with rise likely to outstrip fall in cold-related deaths if global heating hits 3C or 4C

Ajit Niranjana

Thu 22 Aug 2024 00:30 CEST

Share

Heat deaths in Europe could triple by the end of the century, with the numbers rising disproportionately in southern European countries such as Italy, Greece and Spain, a study has found.



Climate crisis

Global heating 'doubled' chance of extreme rain in Europe in September

Researchers find climate crisis aggravated the four days of heavy rainfall and deadly floods

● 'We're getting rid of everything': floods destroy homes and lives in Czech Republic

Ajit Niranjana
Europe
environment
correspondent

Wed 25 Sep 2024 05:00 CEST

Share



- More extreme weather events (heatwaves, cold spells, floods, droughts, storms/hurricanes), wildfires, migration, landscape changes are brought about by deforestation, deglaciation, river disappearance, desertification, water shortage, and biomass extinction, economic decline and social disruption, loss of urban forest, allergen increase
- Health effects including premature mortality, poor mental health (anxiety, stress, schizophrenia, mood disorder and depression, suicide, aggressive behaviors), cardiorespiratory disease (strokes..), respiratory disease (asthma...). infectious disease (...)
- Recent few years have been the hottest on record and high temperatures claimed over 60000 lives in Europe alone in 2022



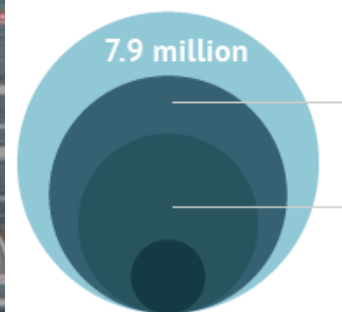
Air pollution continues to be the second leading risk factor for early death, surpassed only by high blood pressure.

7.9 million

deaths attributed to air pollution in 2023,



about **1 in 8** deaths worldwide.



Of this total, **4.9 million deaths** were attributable to ambient PM_{2.5} exposure,

2.8 million were from household air pollution, and

470,000 were from ozone.

**CITIES IN EUROPE
COULD AVOID
UP TO**

166,000 deaths each year

by meeting the

**New WHO Global
Air Quality Guidelines**

ISGlobal ——— Ranking of Cities

200K+ deaths due to
air pollution

AVOIDABLE DEATHS IN EUROPEAN CITIES

	WHO GUIDELINES	PM _{2.5}	NO ₂
2005		51,213	900
2021		109,188	57,030



#ISGlobalRanking

Khomenko et al 2021

NOISE FROM ROAD TRAFFIC



60 MILLION PEOPLE ARE
EXPOSED TO **NOISE** LEVELS
HARFUL FOR HEALTH IN
EUROPEAN CITIES

Khomenko et al 2021

Compliance with WHO guidelines on noise cities could prevent more
than **3,600** annual deaths from ischaemic heart disease alone.

#ISGlobalRanking

**CITIES IN EUROPE
COULD PREVENT UP TO**

43.000 deaths each year

if they achieved the WHO
recommendations on access to

green space.

Over
60% of population has
insufficient access
to green space.

#ISGlobalRanking

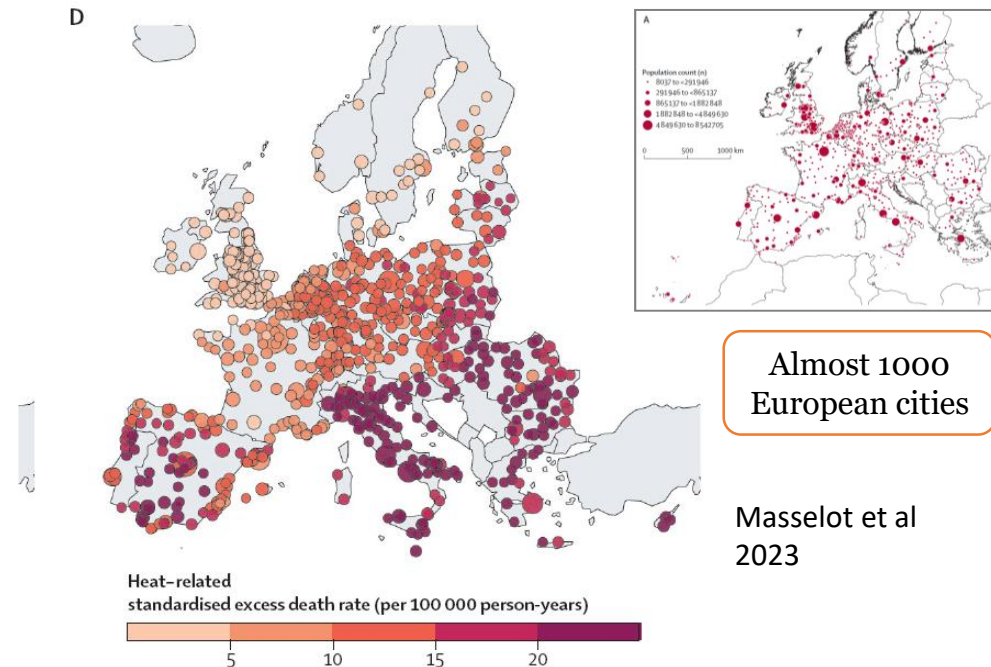


ISGlobal ——— Ranking of Cities

Pereira Barboza et al 2021

ESTIMATES FROM NEARLY A 1000 CITIES IN EUROPE

D



Masselot et al
2023

ISGlobal

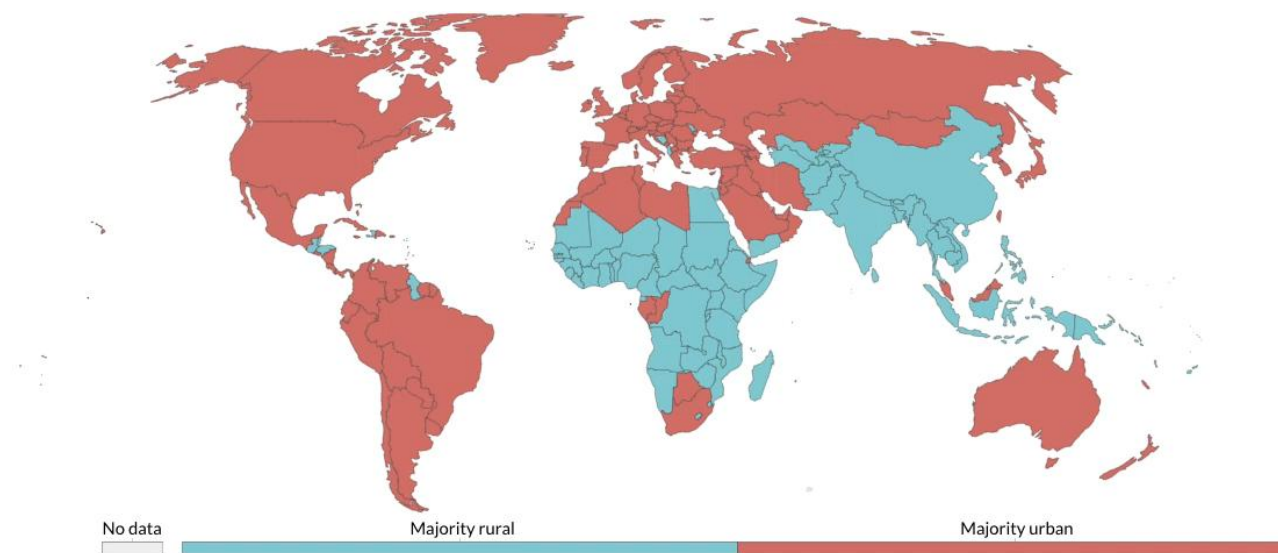
<https://isglobalranking.org/>

ARE WE STRIVING FOR BEAUTIFUL PEOPLE OR BEAUTIFUL CITIES?

Is urban planning about physical design, or about making things easier for the people who live in our urban spaces?

Urbanization

- Urbanization is one of the major global trends of the 21st century.
- By 2050, seven out of ten people will live in urban areas.

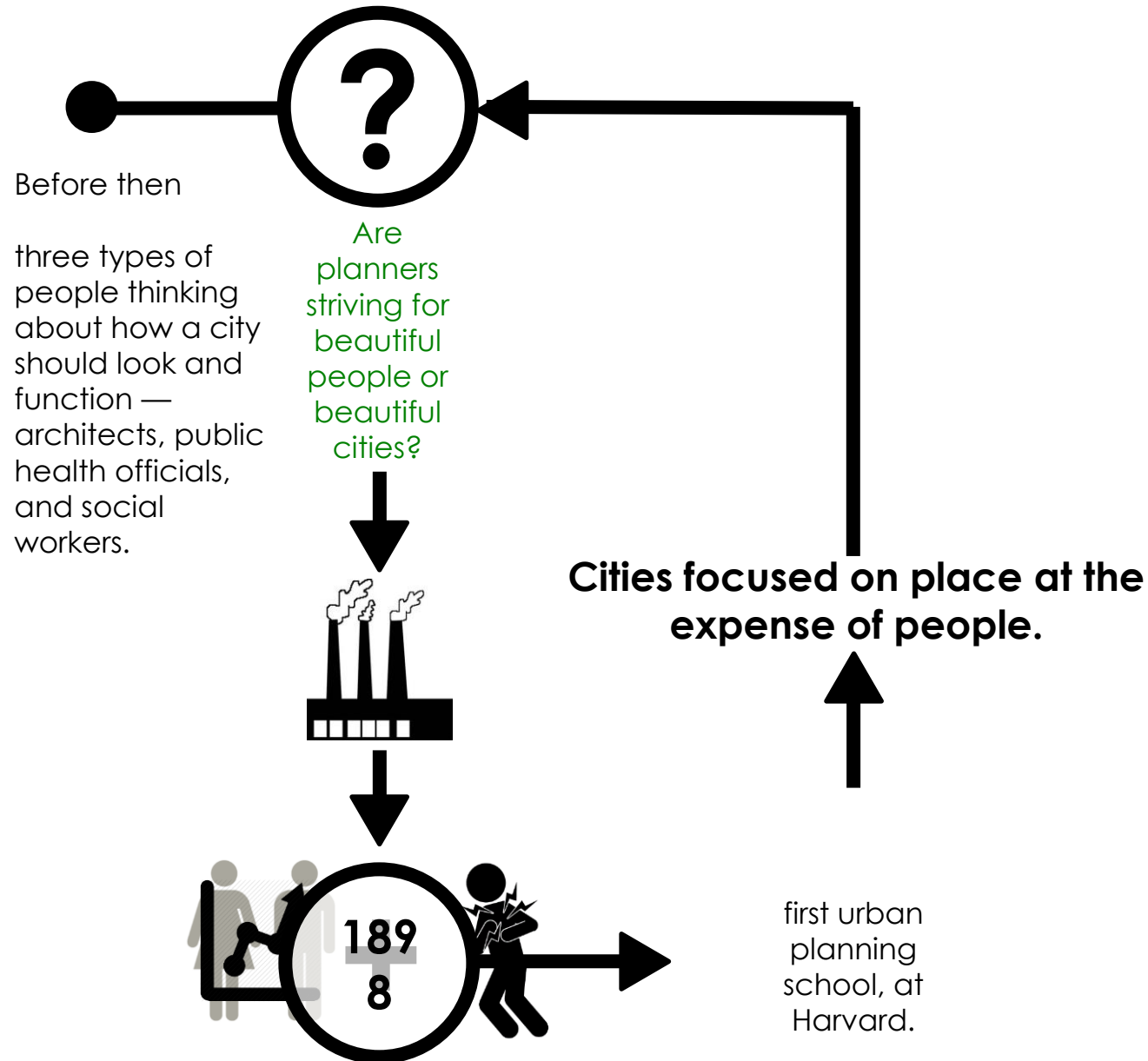


Source: OWID based on UN World Urbanization Prospects (2018) & Historical Sources (see Sources tab)

CC BY

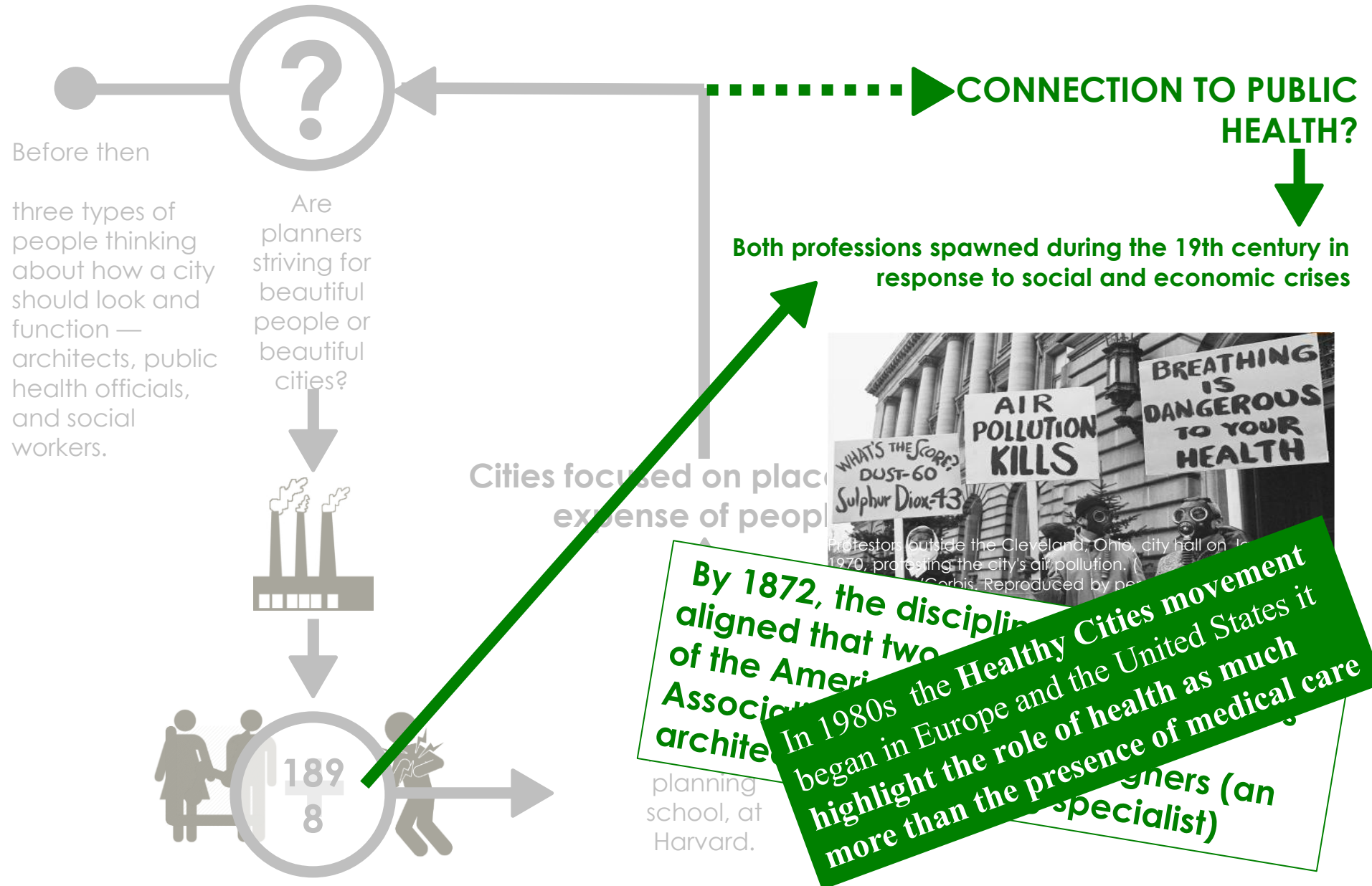
THE STORY BEHIND....

A Brief History of the Birth of Urban Planning

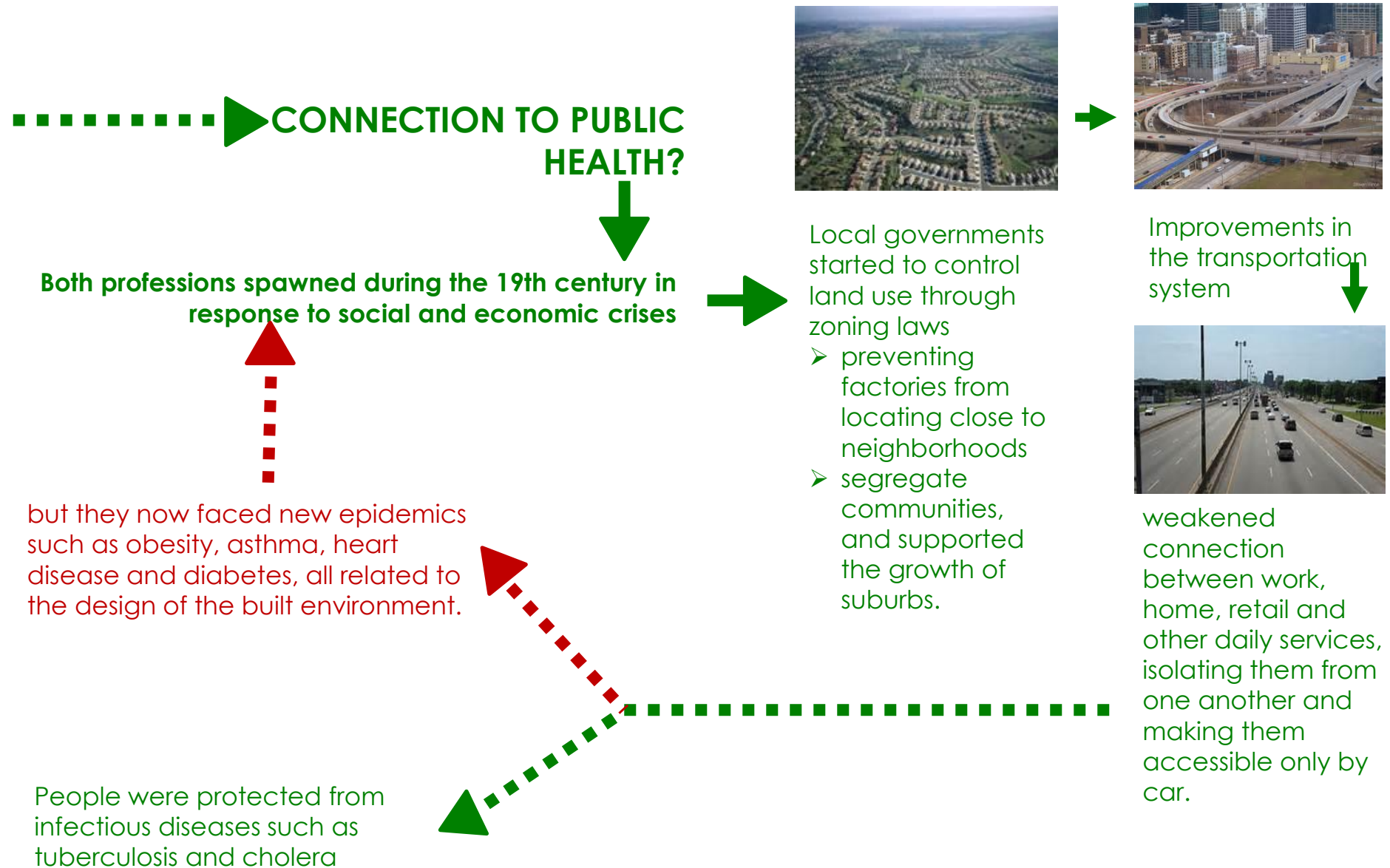


THE STORY BEHIND....

A Brief History of the Birth of Urban Planning



THE STORY BEHIND....



WHAT IS HAPPENING NOW?

Rapid population growth outpaces the municipal capacity to build essential infrastructure

- **Leading to the proliferation of informal settlements.**
- **Urbanization, both in the developed and particularly in the developing world, is accompanied by a concentration of poverty.**



PUBLIC HEALTH **VERSUS** URBAN PLANNING



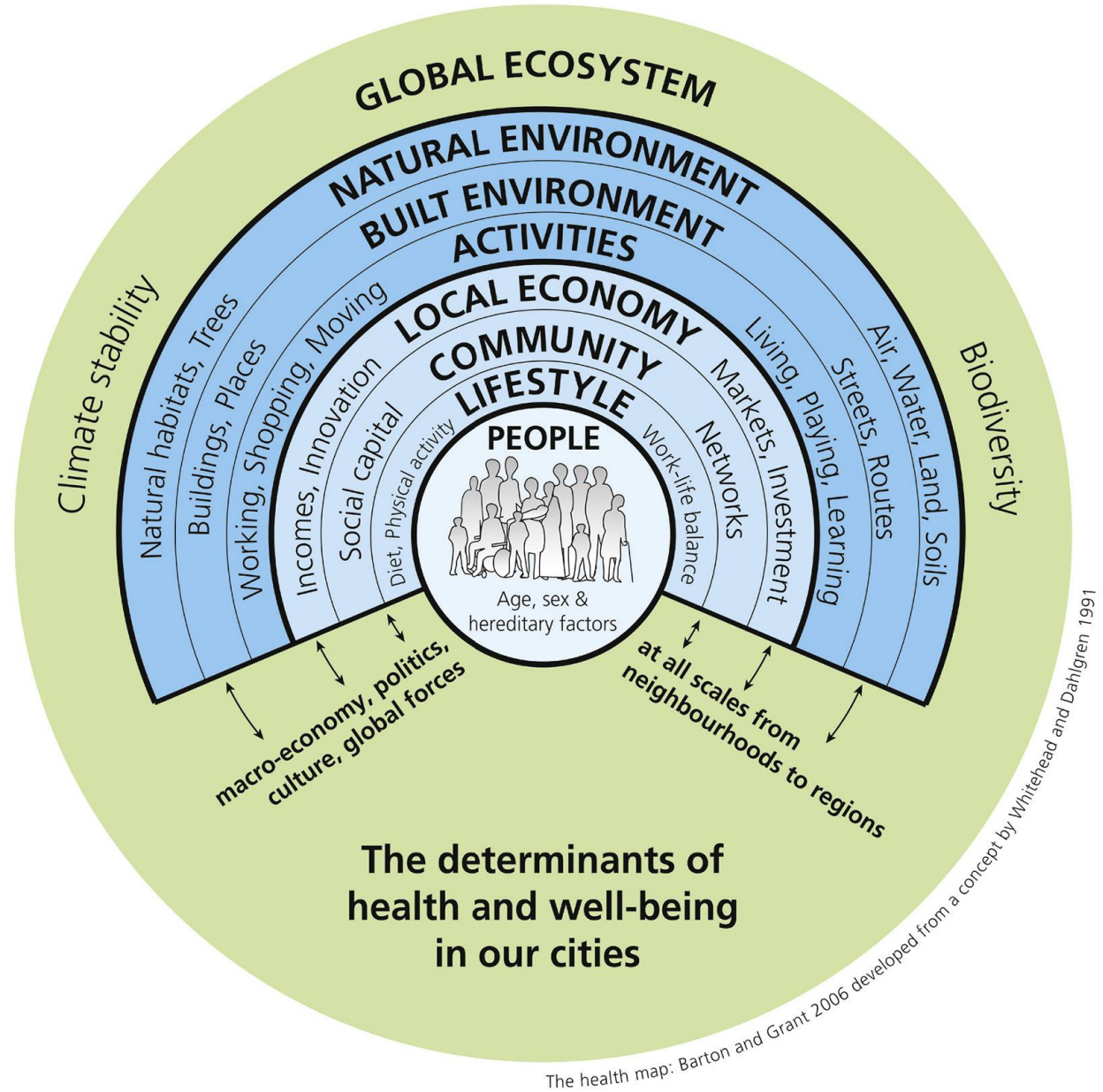
It creates
**community-based
strategies** to
prevent disease
and promote
health.

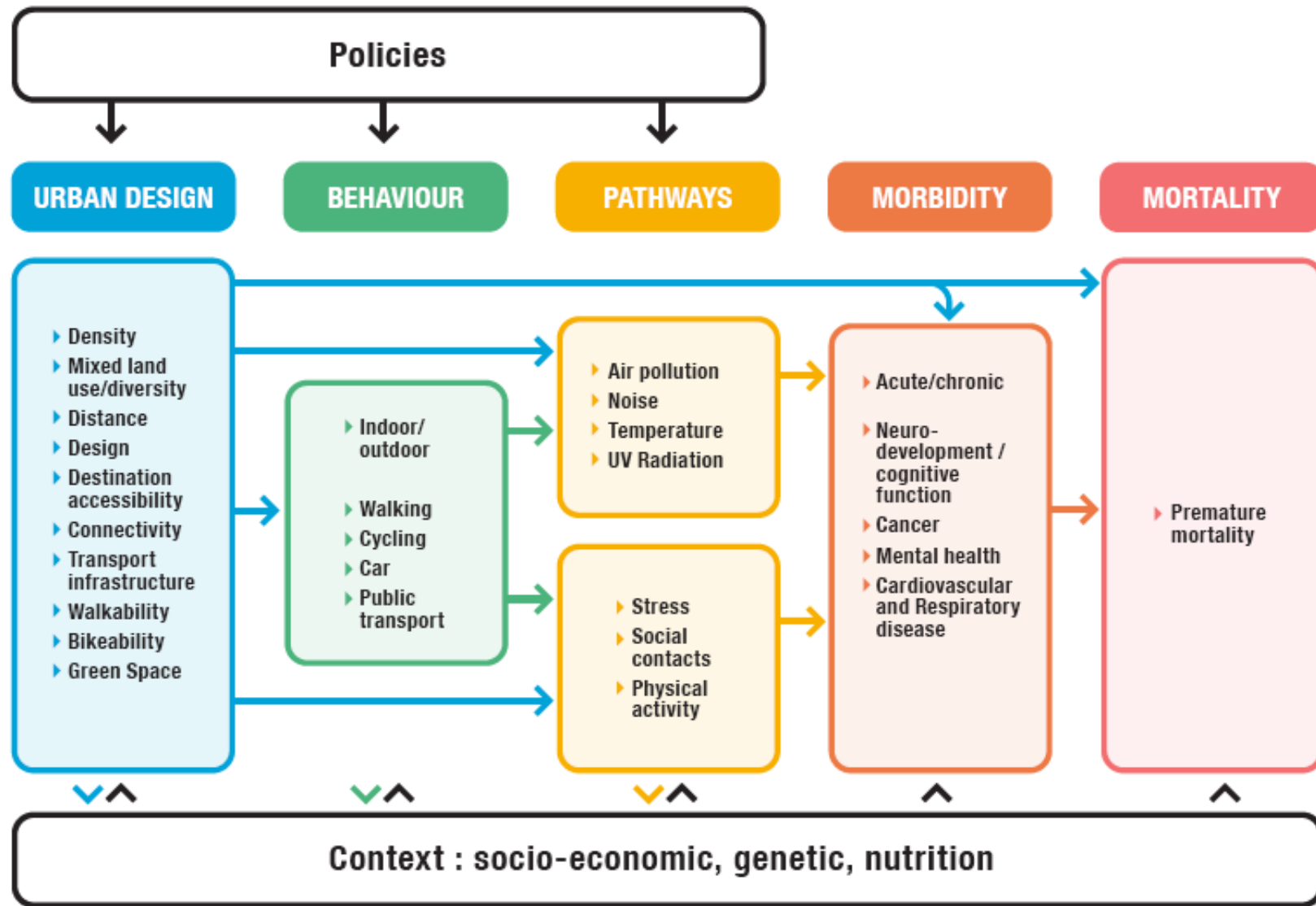


Planners deal with;
transportation
systems, economy,
natural resources,
urban design, and
physical facilities.
That all come
together to **define
our cities.**

DEFINITION

The **World Health Organization** defines the social determinants of health (SDH) as "the circumstances in which people are born, grow up, work, live and age, including the broader set of forces and systems that influence the conditions of everyday life."

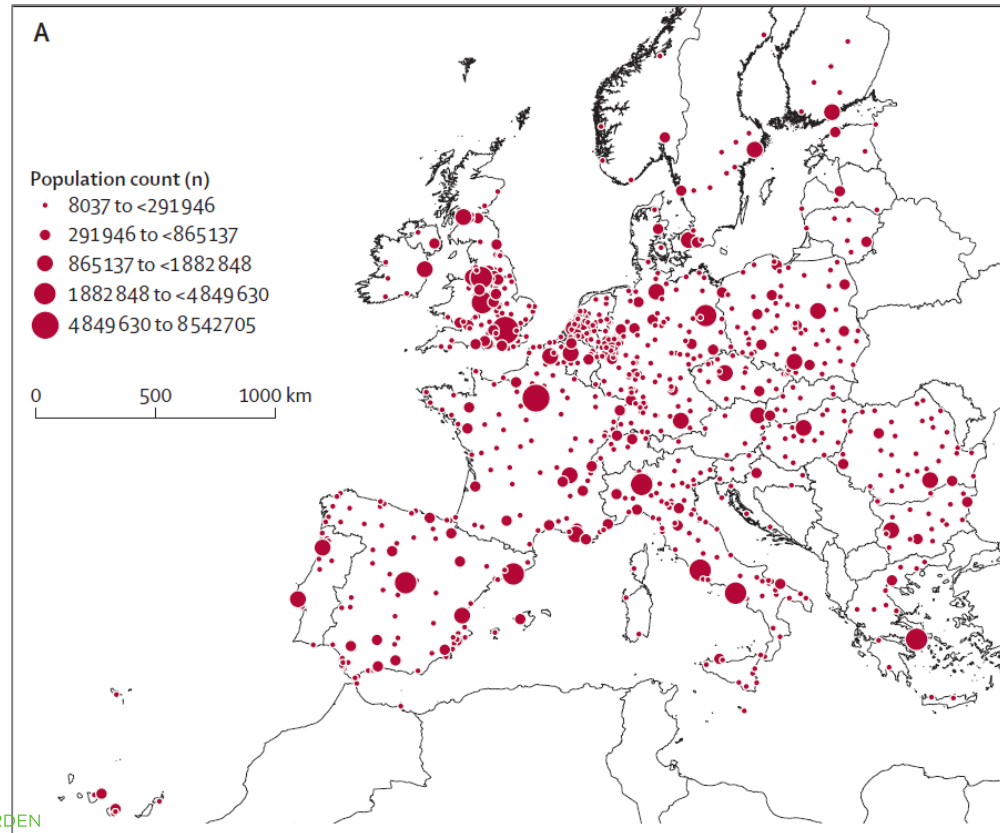




Nieuwenhuijsen 2016 and 2018
2020, 2021

Holistic and systems-based approach

European cities



Almost 1000
European cities

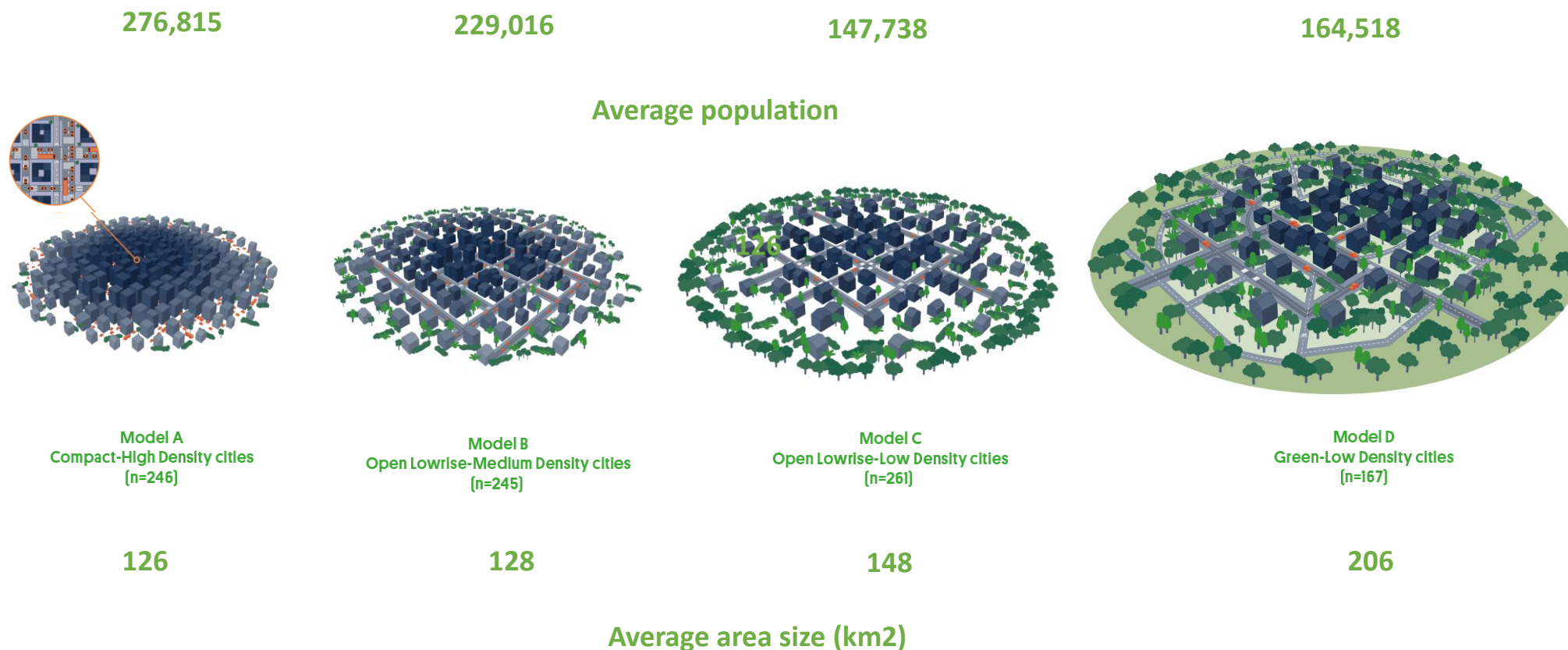
Health impact
assessment

2015

The impact of urban configuration types on urban heat islands, air pollution, CO₂ emissions, and mortality in Europe: a data science approach

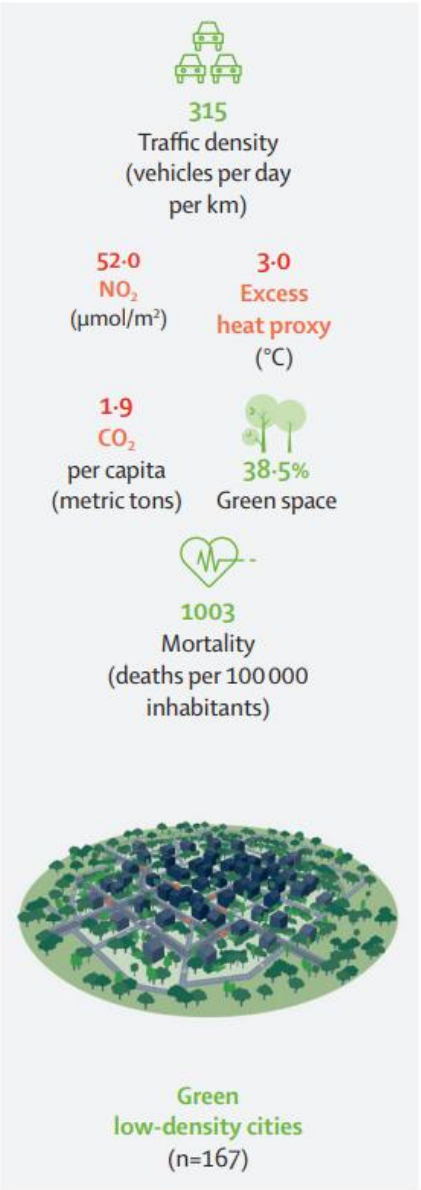
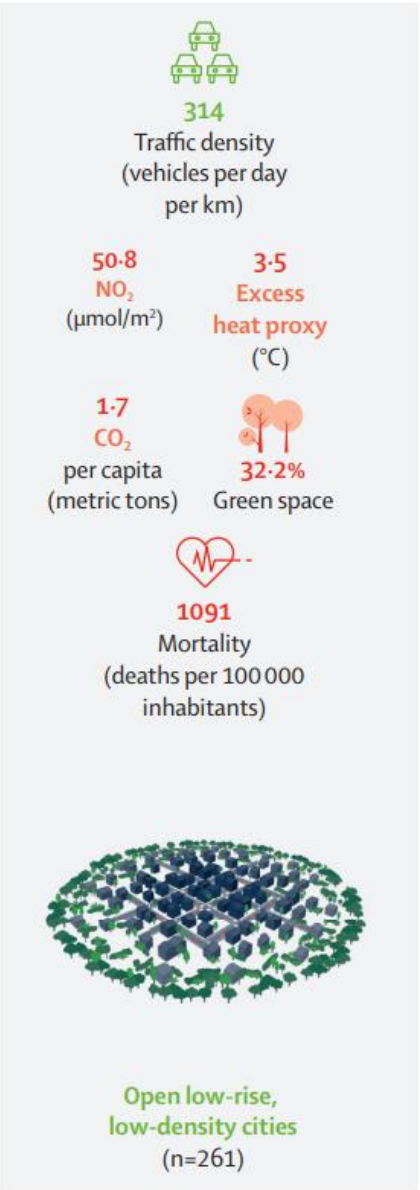
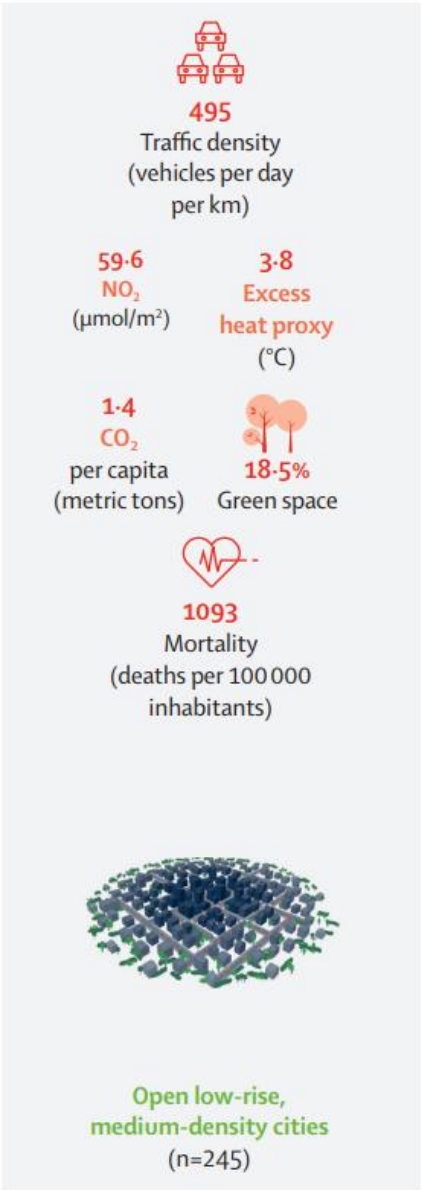
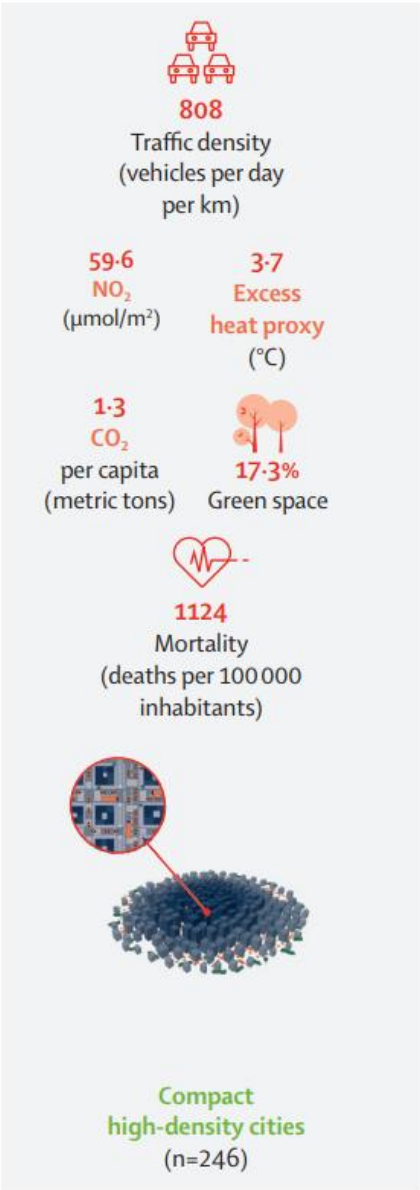


Tamara lungman*, Sasha Khomenko*, Evelise Pereira Barboza, Marta Cirach, Karen Gonçalves, Paula Petrone, Thilo Erbertseder, Hannes Taubenböck, Tirthankar Chakraborty, Mark Nieuwenhuijsen



The impact of urban configuration types on urban heat islands, air pollution, CO₂ emissions, and mortality in Europe: a data science approach

Tamara Iungman*, Sasha Khomenko*, Evelise Pereira Barboza, Marta Cirach, Karen Gonçalves, Paula Petrone, Thilo Erbertseder, Hannes Taubenböck, Tirthankar Chakraborty, Mark Nieuwenhuijsen





Calle Aragón/carrer Aragó

2904 premature deaths (20%) annually in Barcelona due to suboptimal urban and transport planning

Due to high air pollution and noise levels, heat island effects and lack of physical activity and green space

Mueller et al EHP 2017; 125: 89-96



Ajuntament
de Barcelona

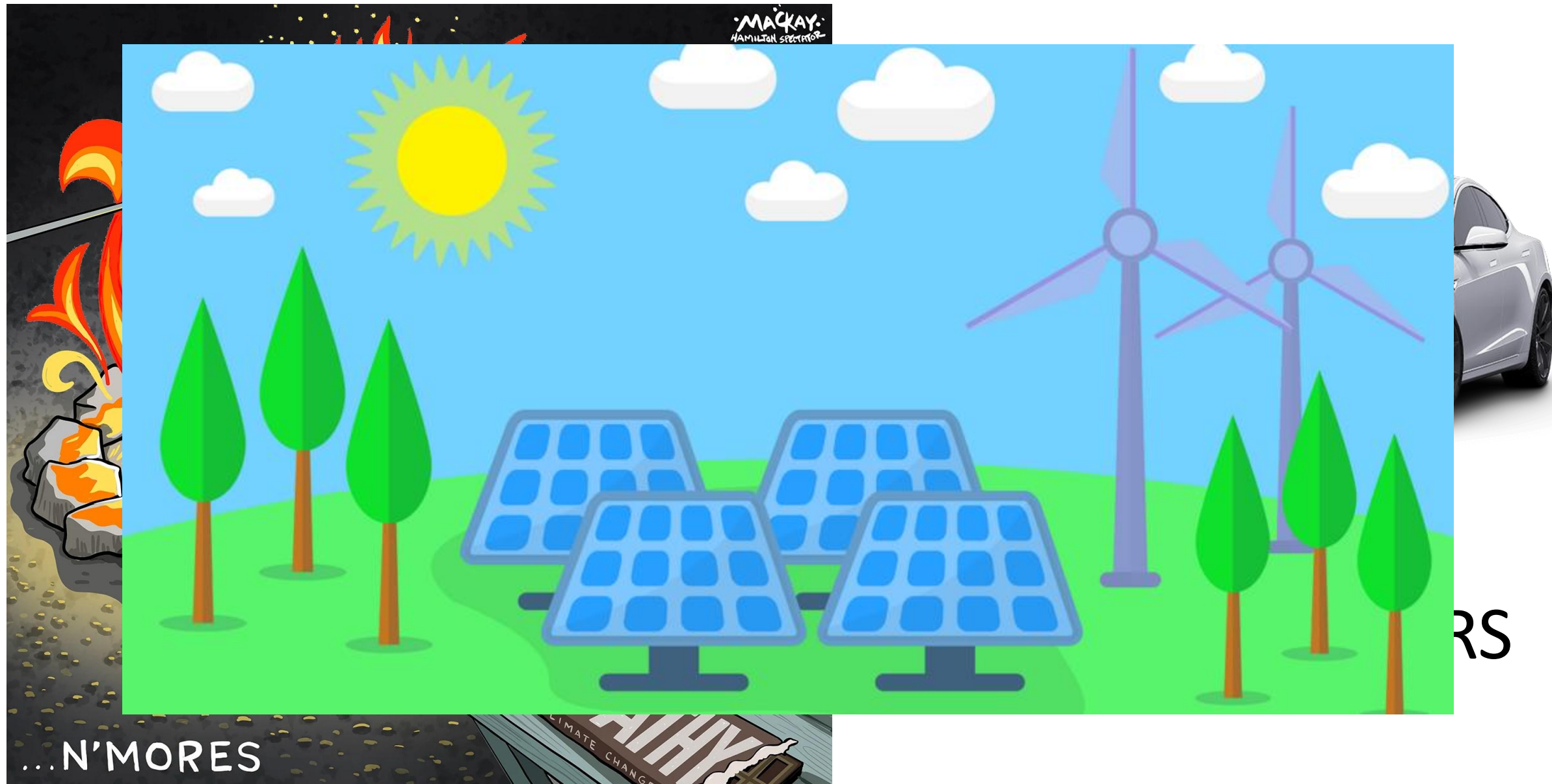
ISGlobal Instituto de
Salud Global
Barcelona

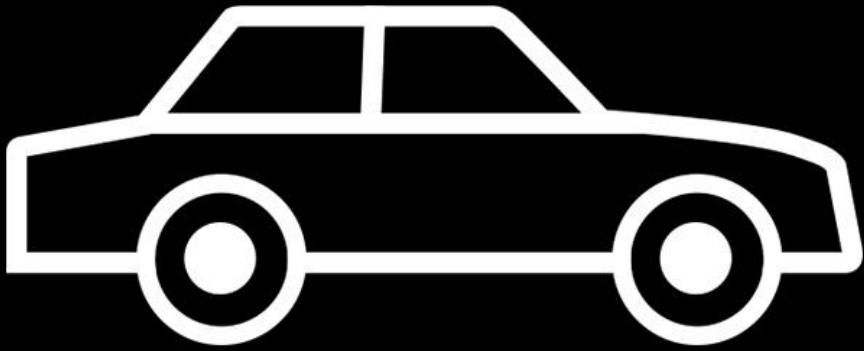
	Reduced annual number of premature deaths	Reduced annual mortality rate per 100 000 individuals
Reducing air pollution, noise, and excess heat to internationally recommended levels; increasing green space and physical activity to the levels recommended by WHO ³⁴	2904	213
Reducing air pollution levels to the new WHO recommended levels ³⁵	1886 air pollution 1307 PM _{2.5} 829 NO ₂	139 air pollution 96 PM _{2.5} 61 NO ₂
Implementing 503 of the original Superblocks in Barcelona, which prioritise people over cars, reduce private car use, air pollution, and noise levels, and increase physical activity and green space, all of which contribute to better health ³⁶	667	51
Increasing green space to provide every citizen with sufficient access to green space according to WHO ³⁷	337	27
Providing every street in Barcelona with a cycle lane, cycling rates would increase to an estimated 19% of the transport mode share ³⁸	248	15
Either shifting 40% of all short car trips to cycling or shifting half of short car trips to cycling and half to public transport ³⁹	76 cycling only 54 cycling and public transport	5 cycling only 3 cycling and public transport

Barcelona has a mortality rate similar to the mean rate of the compact cities in the study (ie, 1124 deaths per 100 000 people) and much higher than the mortality rate in green low-density cities (ie, 1003 deaths per 100 000 people). The estimates are rough calculations that deduct the attributable mortality burden of a specific exposure from the total mortality. PM_{2.5}=particulate matter with particles that are 2.5 microns or less in diameter.

Table: Policy measures to reduce mortality rates in Barcelona, Spain







THIS ONE
RUNS ON MONEY
AND MAKES
YOU FAT



THIS ONE
RUNS ON FAT
AND SAVES
YOU MONEY

20-30% of people's income for running a car

50% of car trips < 7 km

Air pollution deaths attributable to fossil fuels: observational and modelling study

Jos Lelieveld,^{1,2} Andy Haines,³ Richard Burnett,⁴ Cathryn Tonne,^{5,6} Klaus Klingmüller,¹ Thomas Münzel,⁷ Andrea Pozzer^{1,2}

ABSTRACT

OBJECTIVES

To estimate all cause and cause specific deaths that are attributable to fossil fuel related air pollution and to assess potential health benefits from policies that replace fossil fuels with clean, renewable energy sources.

DESIGN

Observational and modelling study.

METHODS

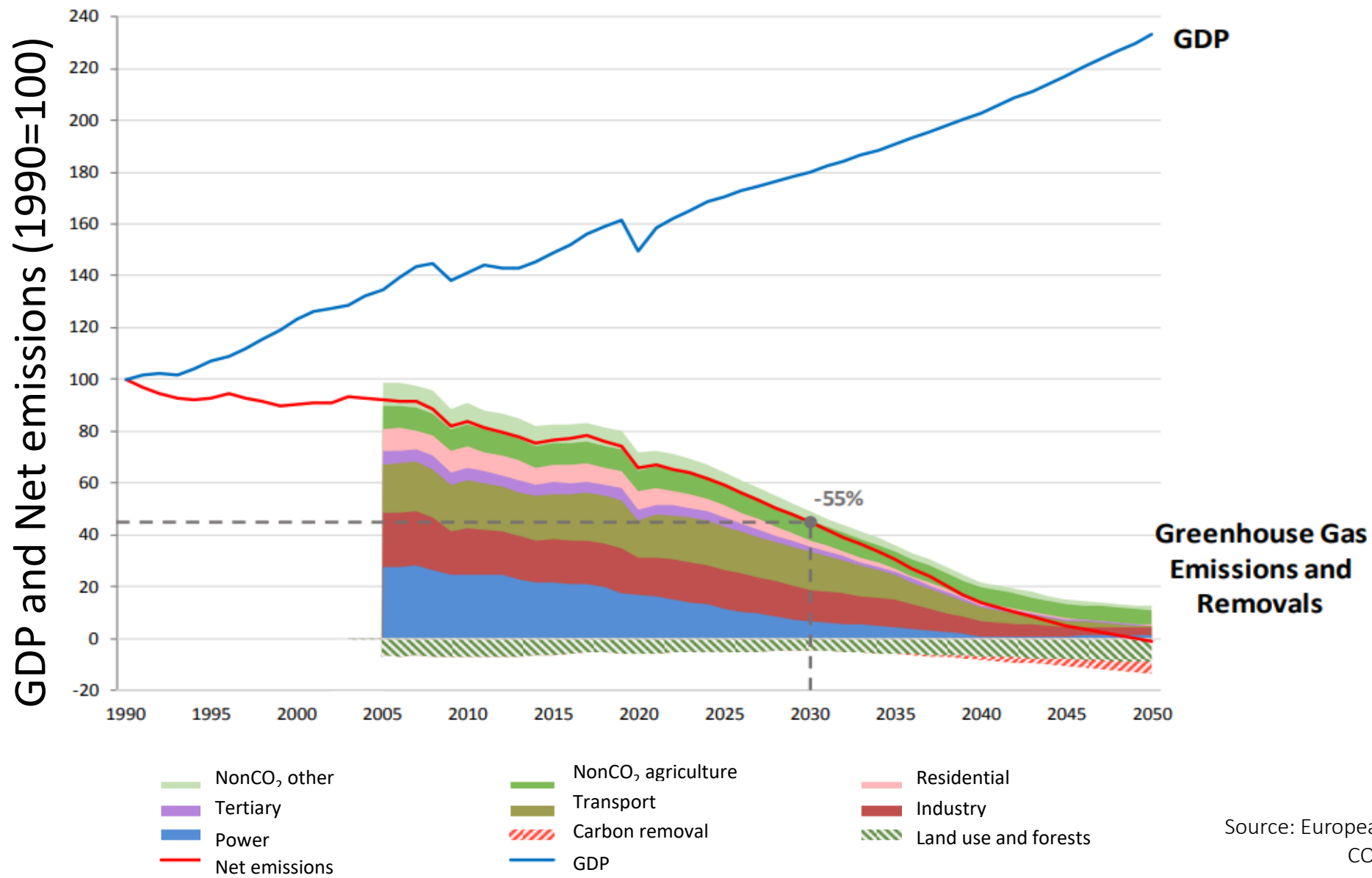
An updated atmospheric composition model, a newly developed relative risk model, and satellite based data were used to determine exposure to ambient air pollution, estimate all cause and disease specific mortality, and attribute them to emission categories.

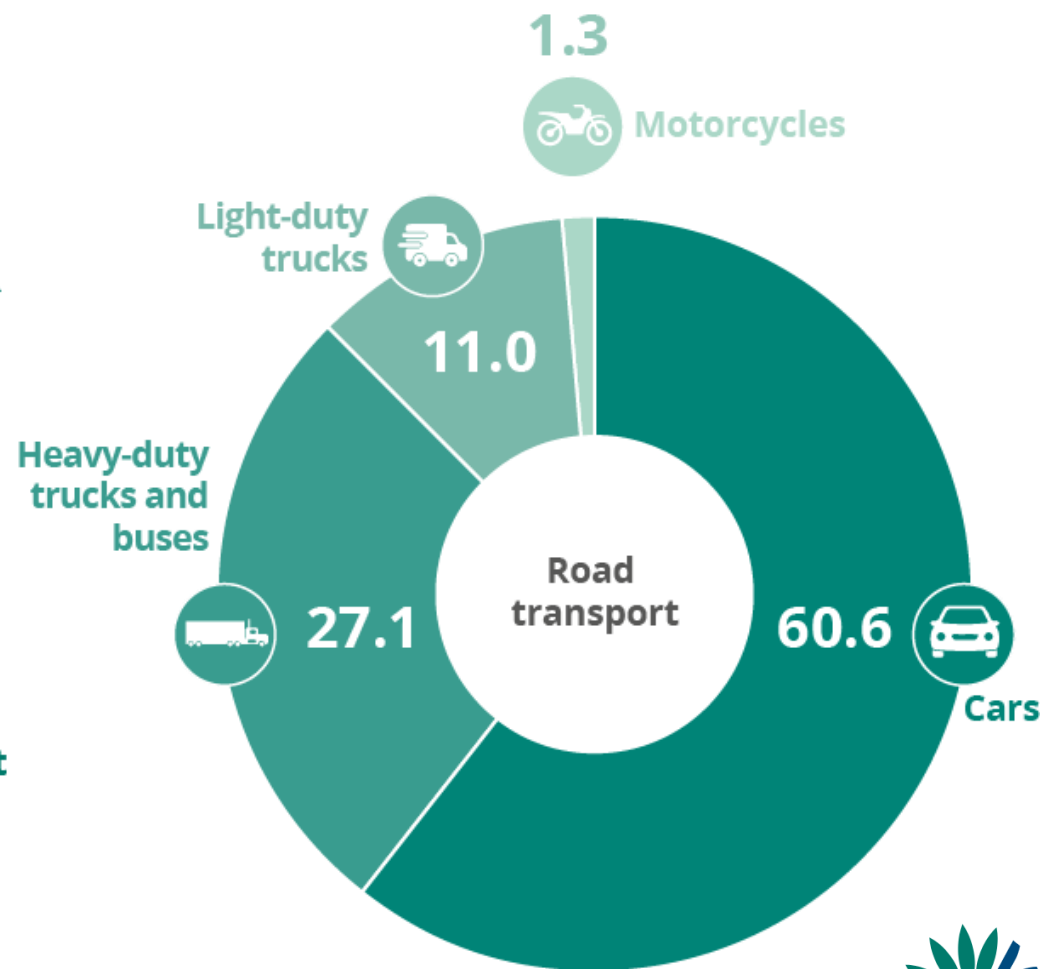
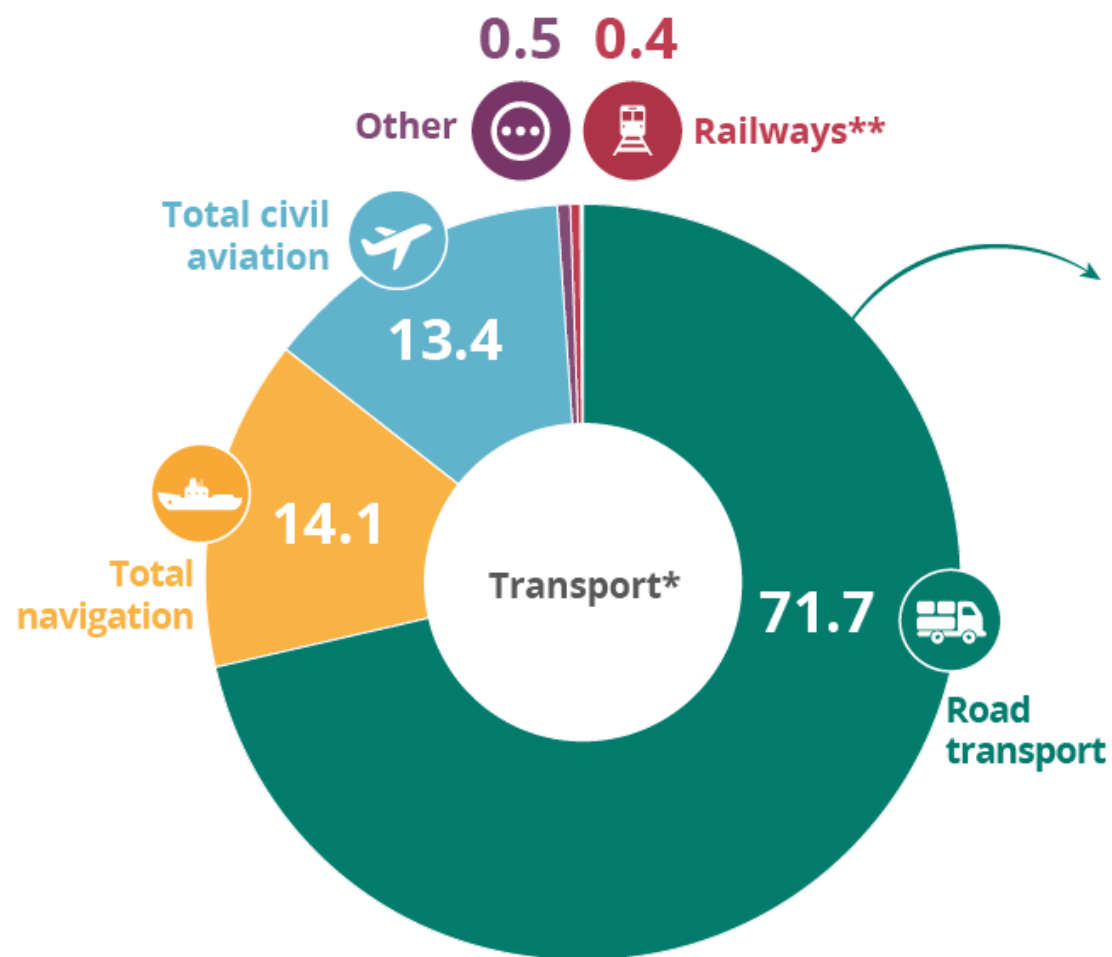
CONCLUSIONS

Phasing out fossil fuels is deemed to be an effective intervention to improve health and save lives as part the United Nations' goal of climate neutrality by 2050. Ambient air pollution would no longer be a leading, environmental health risk factor if the use of fossil fuels were superseded by equitable access to clean sources of renewable energy.

5.13 million (3.63 to 6.32) excess **deaths per year** globally are attributable to ambient **air pollution from fossil fuel** use and therefore **could potentially be avoided** by phasing out fossil fuels.

EU Green Deal 2020/21







**Transport demand in
Europe increased by...**

+18%

in car transport

between 2000 and 2019



**European
Environment
Agency**



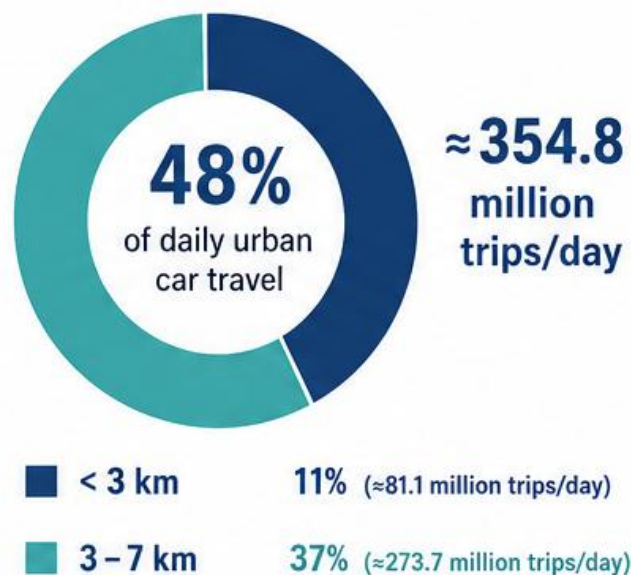
Journal of Transport & Health
Volume 50, July 2026, 102346



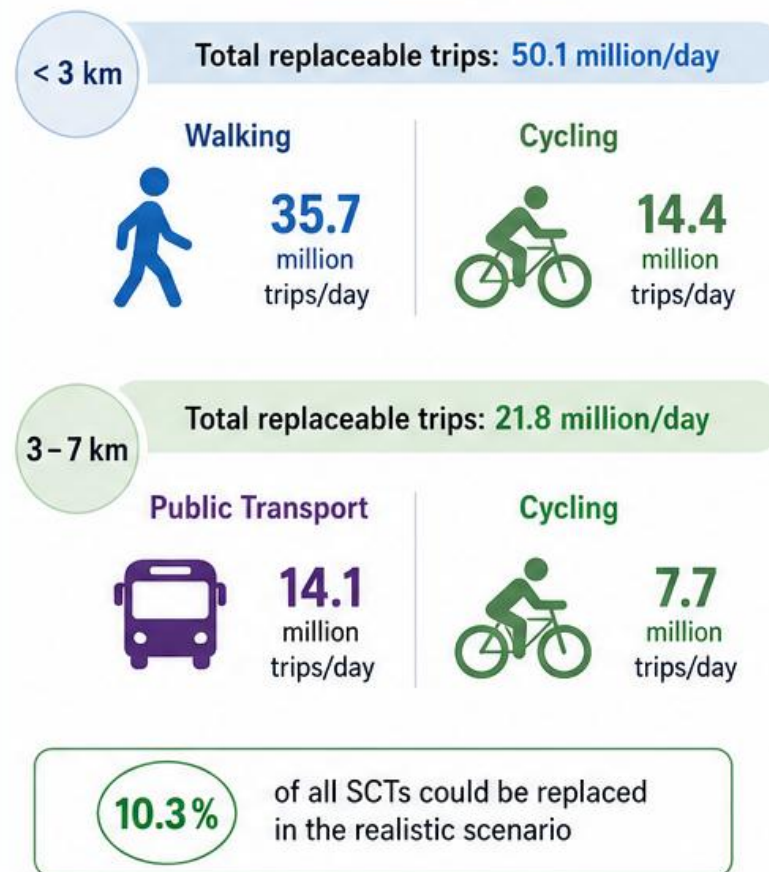
Substituting car trips with public and active transport in European urban areas: Quantifying potential modal shift across the EU27

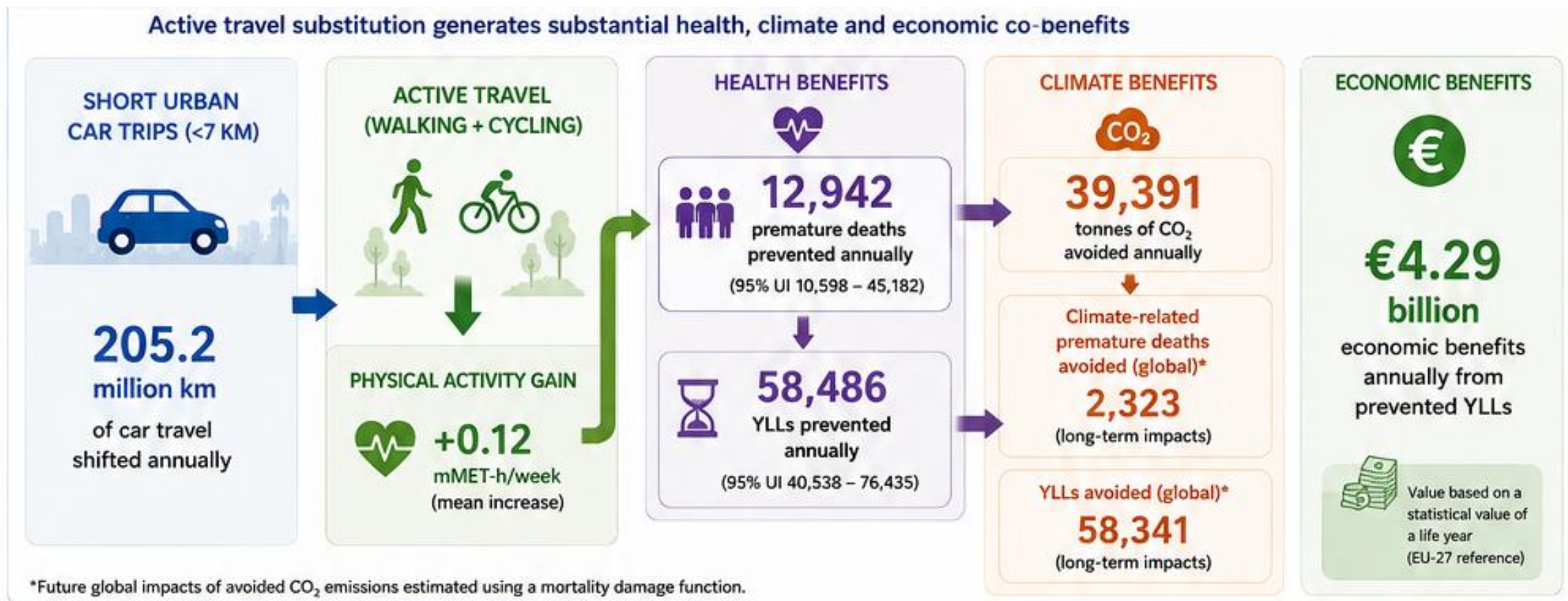
Daniel Velázquez-Cortés ^{a b c}, David Rojas-Rueda ^{d e}, Cathryn Tonne ^{a b c}, Natalie Mueller ^{a b c}, Mark J. Nieuwenhuijsen ^{a b c}  

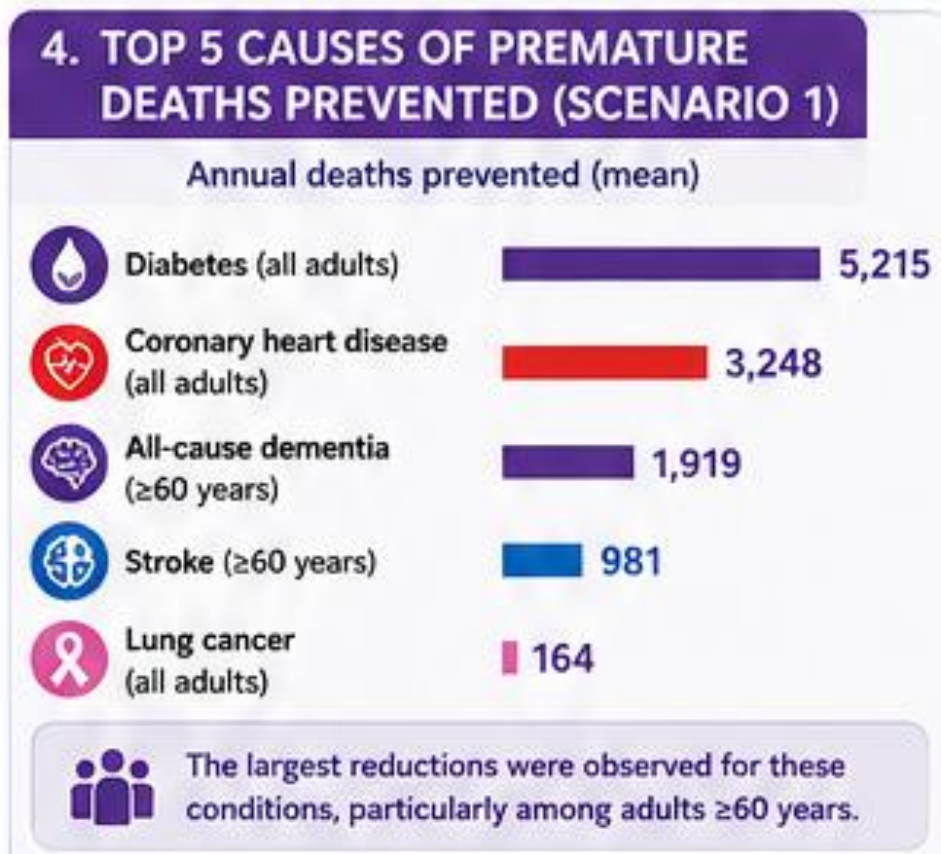
SCTs ARE A MAJOR SHARE OF URBAN CAR TRAVEL IN THE EU27



POTENTIAL MODAL SHIFT OF SCTs IN THE REALISTIC SCENARIO

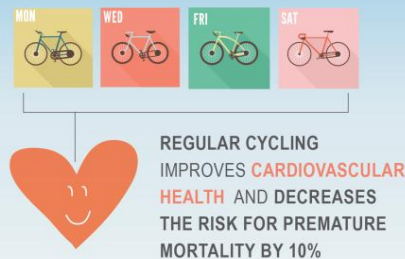








1 LESS RISK OF PREMATURE MORTALITY



1. SOURCE: KELLY ET AL., 2014. INT J BEHAV NUTR PHYS ACT. 11:1

2 CYCLING COMBINES TRANSPORT WITH THE GYM



ON AVERAGE CYCLISTS WEIGH 2 KG LESS THAN CAR DRIVERS

2. SOURCE: PASTA PROJECT

3 LESS AIR POLLUTION

A 40% SHIFT FROM CAR TRIPS TO CYCLING IN BARCELONA'S METROPOLITAN AREA



COULD AVOID AT LEAST 28 PREMATURE DEATHS A YEAR DUE TO REDUCED AIR POLLUTION

3. SOURCE: ROJAS-RUEDA ET AL., 2012. ENVIRON. INT. 49:100-109

4 LESS NOISE POLLUTION

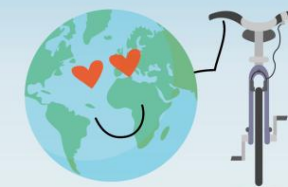


ON CAR FREE DAYS NOISE LEVELS CAN BE REDUCED BY UP TO 10 DECIBELS

4. SOURCE: NIEUWENHUIJSEN & KREIS 2016

5 ZERO EMISSIONS TRANSPORT MODE

CYCLING DOES NOT DEPEND ON FOSSIL FUELS AND CAN HELP STOP GLOBAL WARMING



A 40% SHIFT FROM CAR TRIPS TO CYCLING CAN REDUCE 200,000 TONS OF CO2 EMISSIONS ANNUALLY IN BARCELONA'S METROPOLITAN AREA

5. SOURCE: ROJAS-RUEDA ET AL., 2012. ENVIRON. INT. 49:100-109

6 MORE PUBLIC SPACE

ONE CAR OCCUPIES THE SAME PARKING SPACE AS 10 BICYCLES



BICYCLES ARE A DOOR-TO- DOOR TRANSPORT THAT CAN HELP AVOID TRAFFIC JAMS AND CONGESTION IN CITIES

7 MORE HAPPINESS!!

ACTIVE TRANSPORT IS ASSOCIATED WITH BETTER MENTAL AND PHYSICAL WELL-BEING, LESS STRESS AND MORE HAPPINESS!

7. SOURCE: NIEUWENHUIJSEN ET AL., 2012. PREV MED. 100:100-109



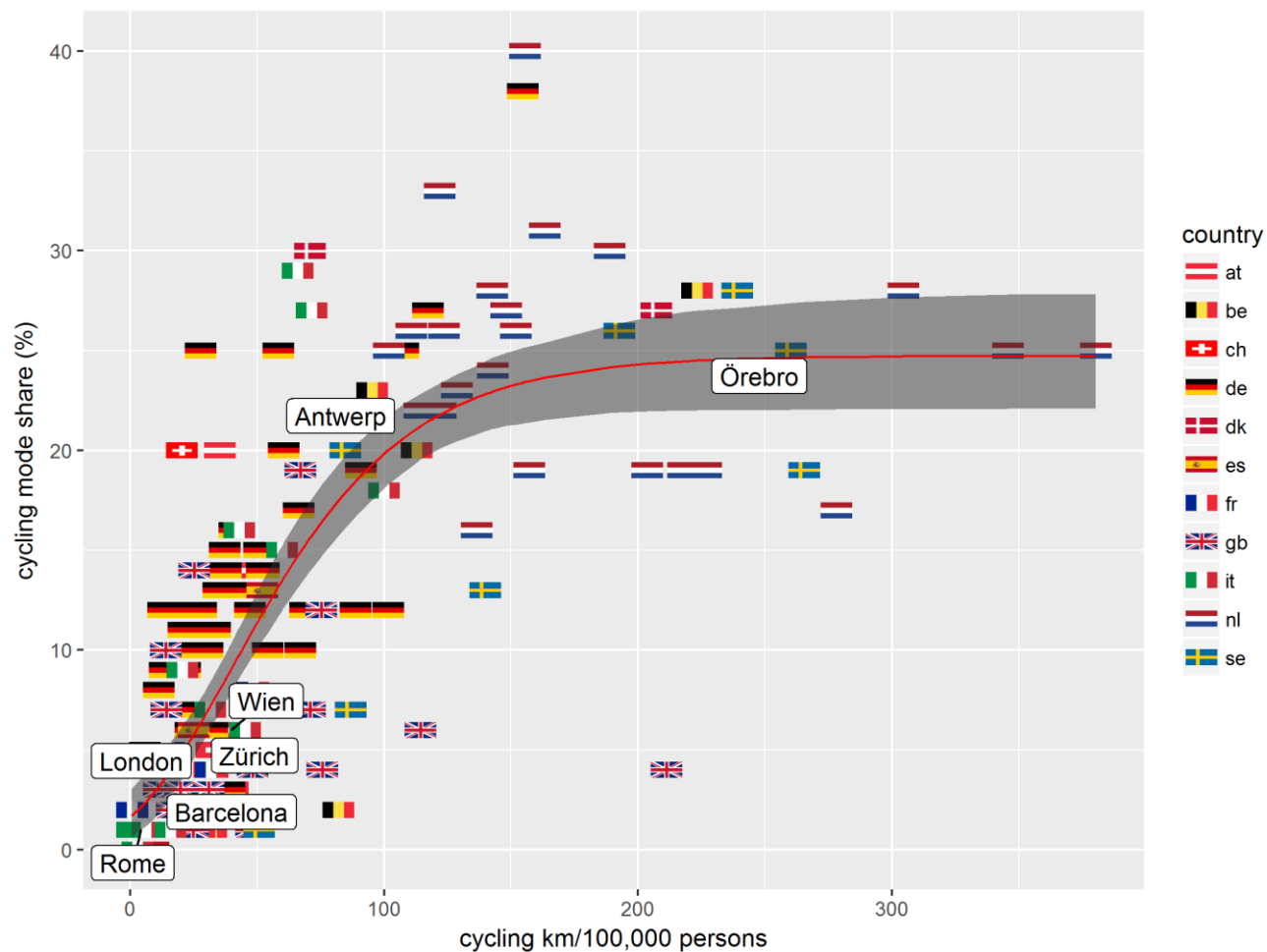
FOR MORE INFORMATION, VISIT
WWW.ISGLOBAL.ORG/EN/URBAN-PLANNING

GRAPHIC DESIGN: UNICELL, JILL PATTERSON

Benefits of physical activity well outweigh the risks of air pollution and accidents for cyclists



Utrecht, NL



- 10,091 premature deaths prevented annually in 167 European cities (75M people) if the mode share of cycling went up to 24.7%

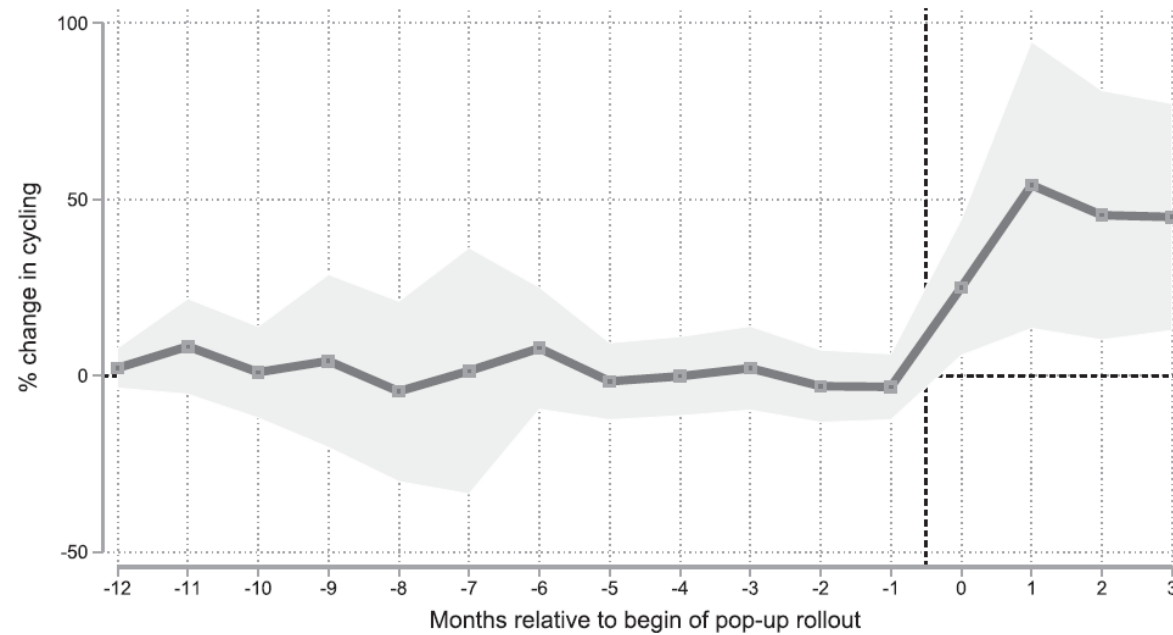


Fig. 2. Treatment effect (difference between treated and control cities) in months before and after the beginning of the pop-up bike lane policy. Observations are binned into months. Treatment for this plot is hard coded to March 2020 and the baseline category and the beginning of the sample are set to February 2019. Estimates are from Poisson regressions that include city and country–day fixed effects (*SI Appendix, Eq. S1*). The shaded area shows the 95% confidence interval. Data for the outcome variable are from the European Cyclists’ Federation (3) and data for the treatment variable are from municipal bike counters (*Materials and Methods*).

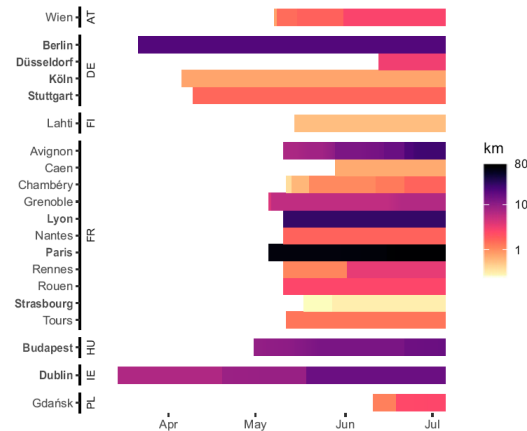


Fig. 1. Treated cities and their treatment intensities in terms of implemented kilometers of public bike lanes in service (cumulative) on a given day between March and July 2020. Cities used in the estimation sample for Fig. 3 are marked in boldface type. Control cities are plotted in *SI Appendix, Fig. S2*. London, Milan, Rome, and Lisbon are missing from the sample due to a lack of daily bicycle counter data. Data are from the European Cyclists’ Federation (3).

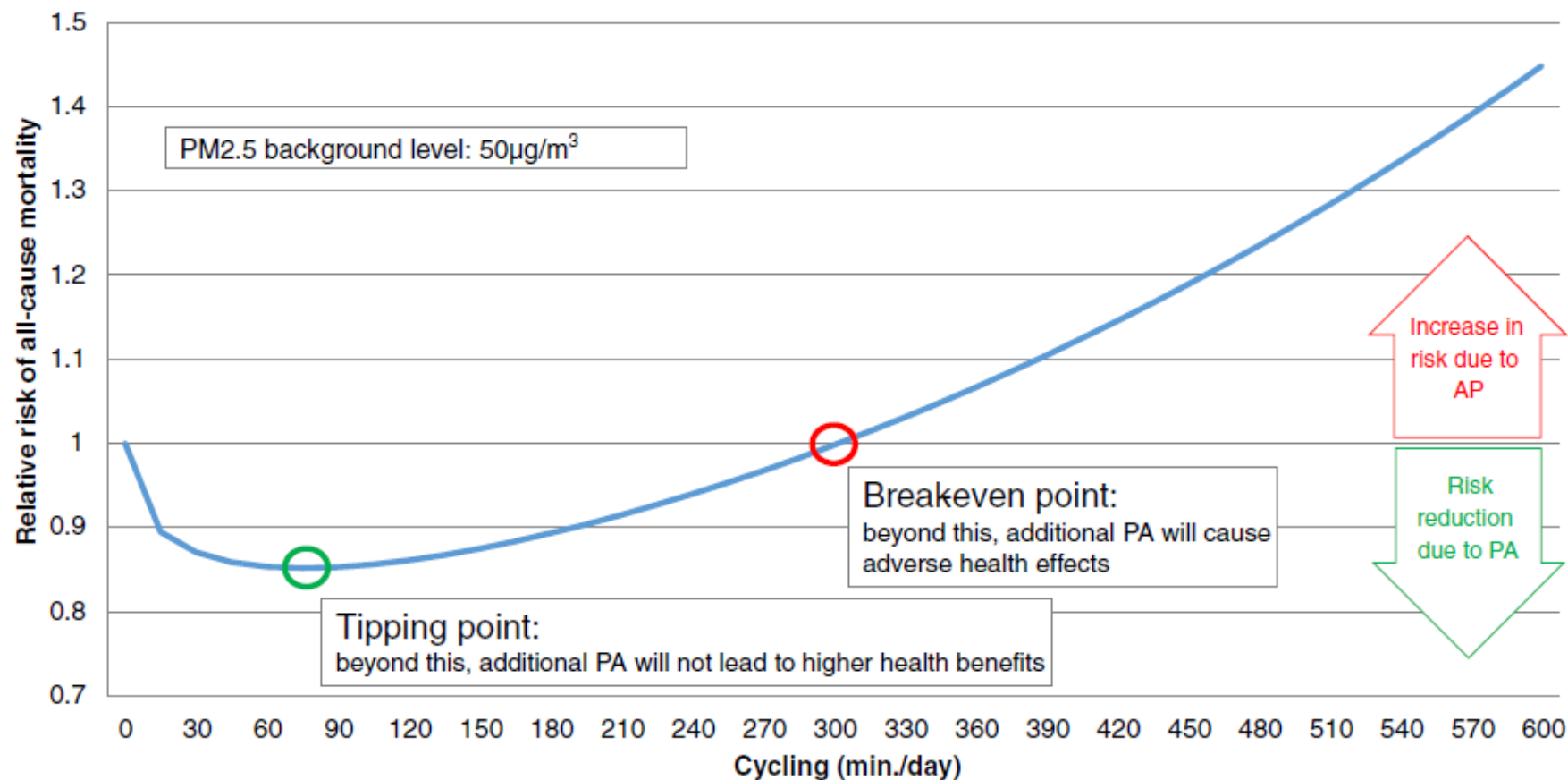
Within 4 months, an average of 11.5 km of provisional pop-up bike lanes have been built per city and the policy has increased cycling between 11 and 48% on average.

Where are the bike lanes placed?



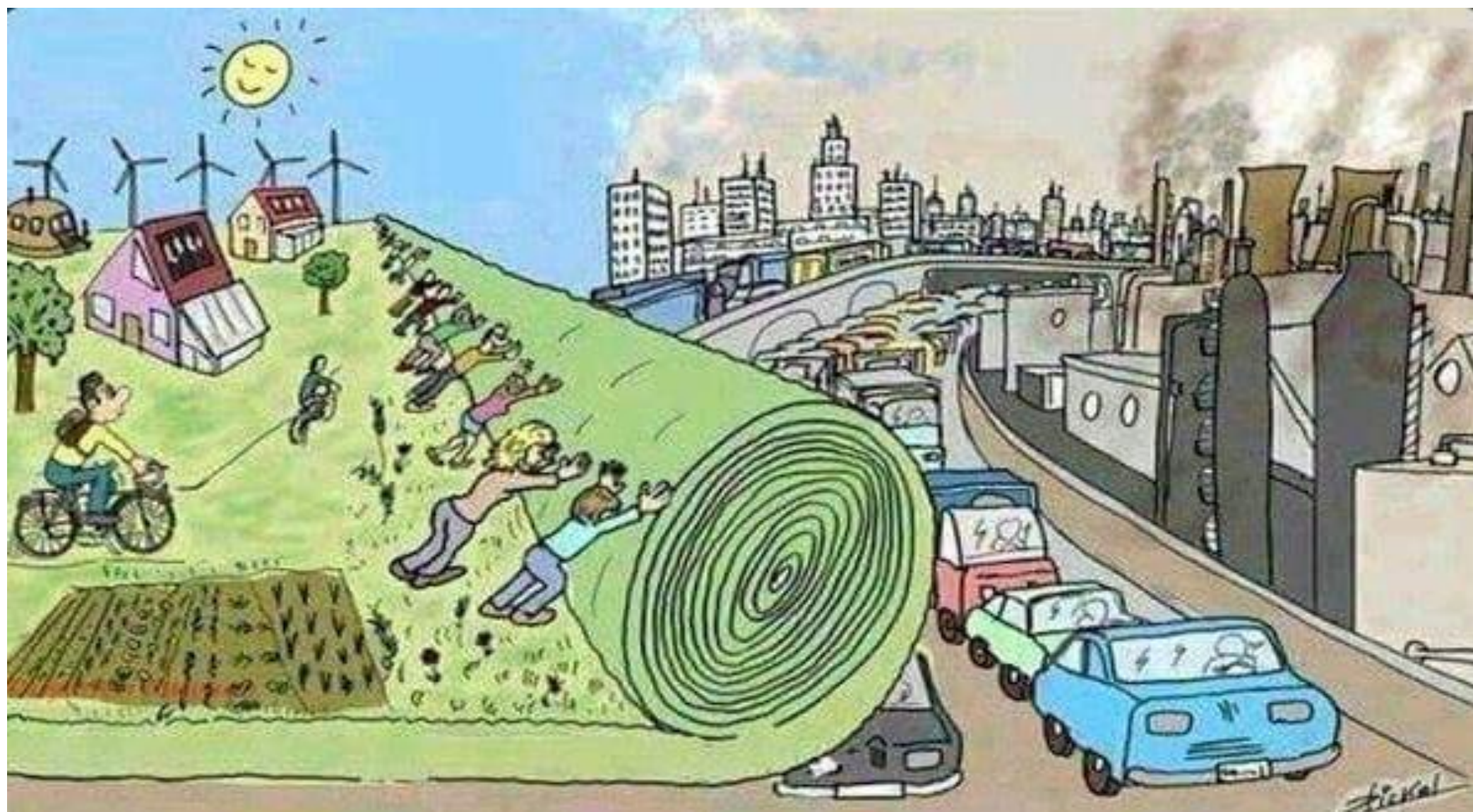
At a certain level of air pollution and active travel, the risks could outweigh the benefits, which would directly imply that, from a public health perspective, **active travel cannot always be recommended.**

Health risks of air pollution versus physical activity-related health benefits derived from active transportation across a wide range of potential air pollution concentrations and active transportation levels.



	Average city			Most polluted city		
Region	PM2.5 ($\mu\text{g}/\text{m}^3$)	Tipping point (walking /day)	Break-event point (walking /day)	PM2.5 ($\mu\text{g}/\text{m}^3$)	Tipping point (walking /day)	Break-event point (walking /day)
Africa	26	-	-	66	6h15min	-
Americas	21	-	-	44	14h	-
Eastern Mediterranean	72	5h30min	-	117	2h15min	7h45min
Europe	37	-	-	90	3h30min	13h15min
South-East Asia	43	14h45min	-	153	1h30min	4h45min
Western Pacific	39	-	-	80	4h30min	-

Even in areas with high PM2.5 concentrations, such as 100 $\mu\text{g}/\text{m}^3$, up to 1 h 15 min of cycling and 10 h 30 min of walking per day will lead to a net reduction in all-cause mortality.



Benefits of urban green infrastructure



Reduces risk of **cardiovascular disease** and **cancer**



Reduces **air** and **noise pollution**



Promotes **physical activity**



Improves **mental health** and increases **life satisfaction**



Improves **memory** and **attention**



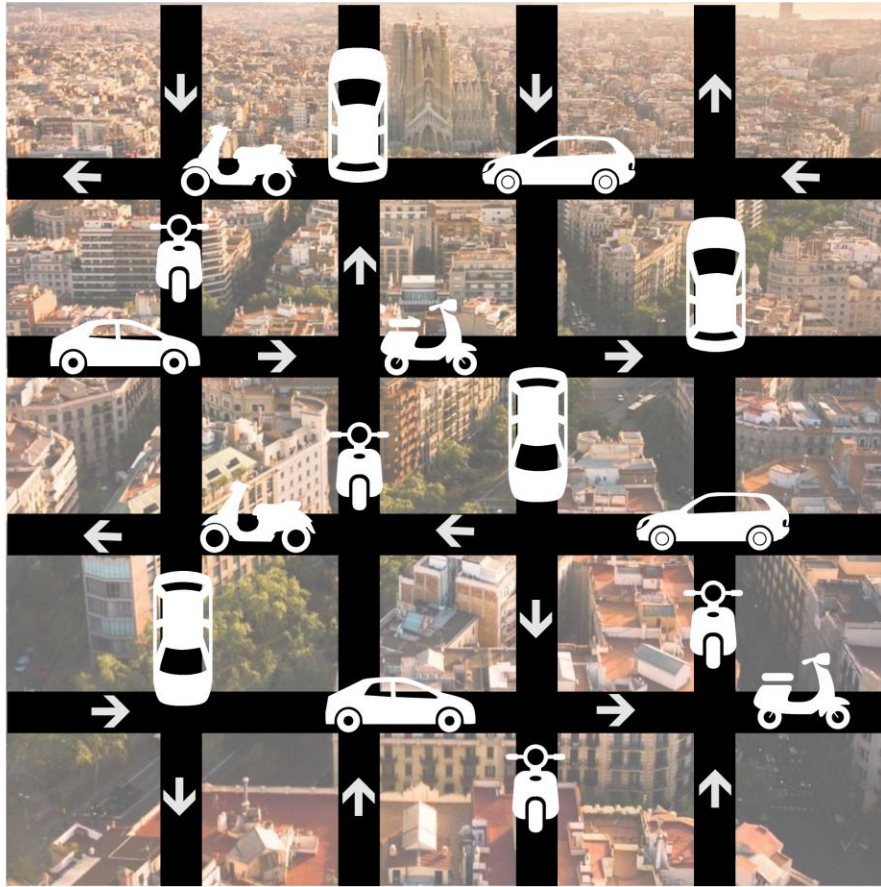
Decreases the **urban heat island effect**

Source: Lingman T., et al., *The Lancet*, 2023.

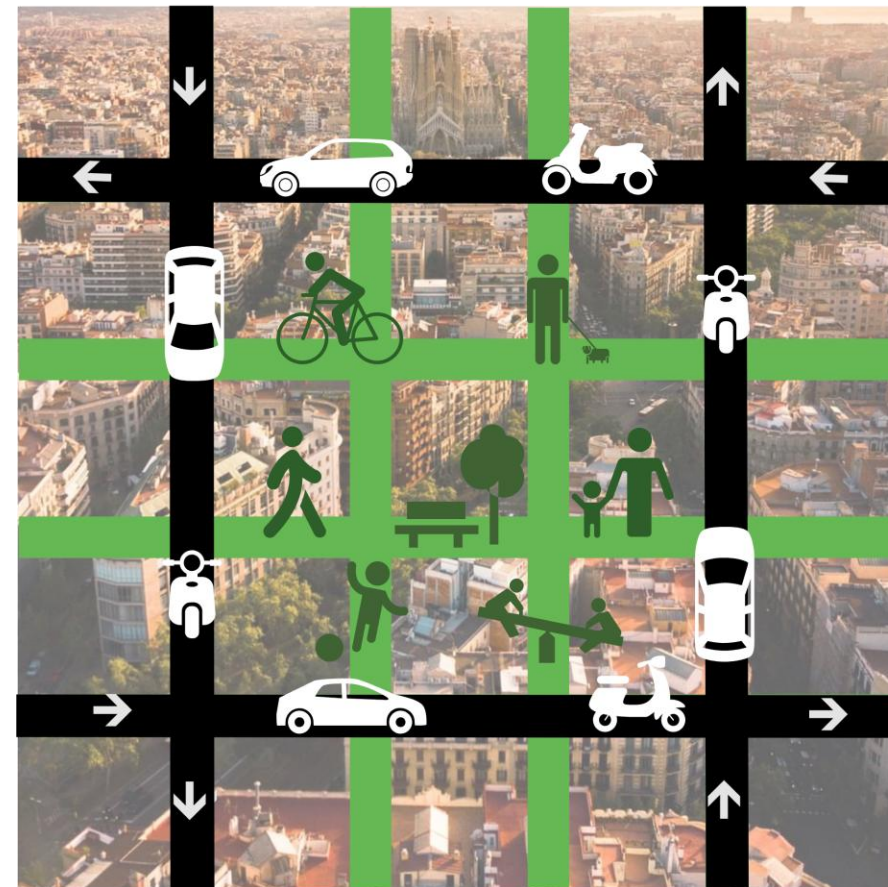
REDUCED PREMATURE MORTALITY



BARCELONA SUPER BLOCK MODEL



Baseline situation



Superblocks model



Before

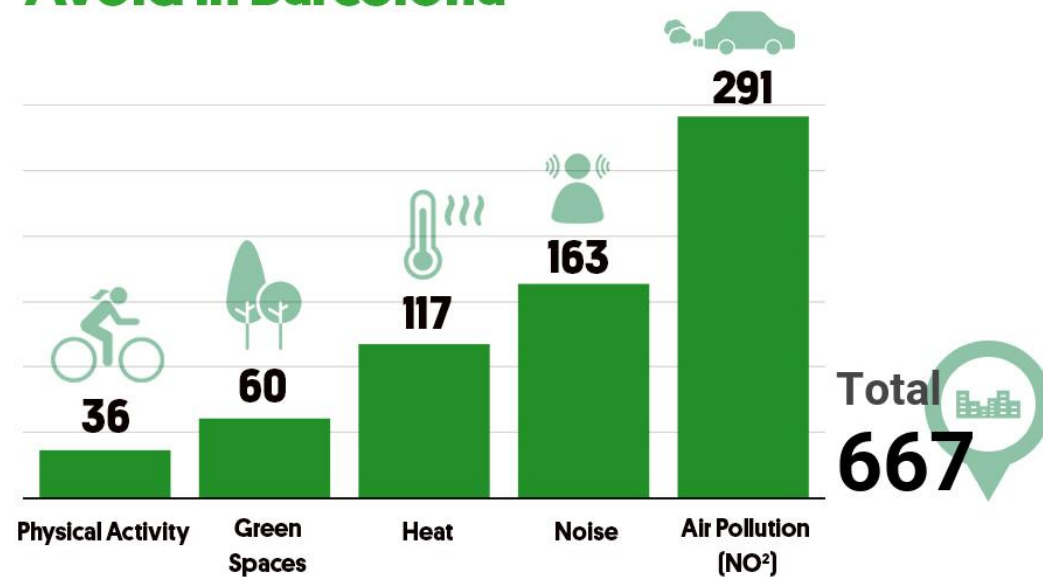


Superblock Sant Antoni

After

BARCELONA SLIPER BLOCKS

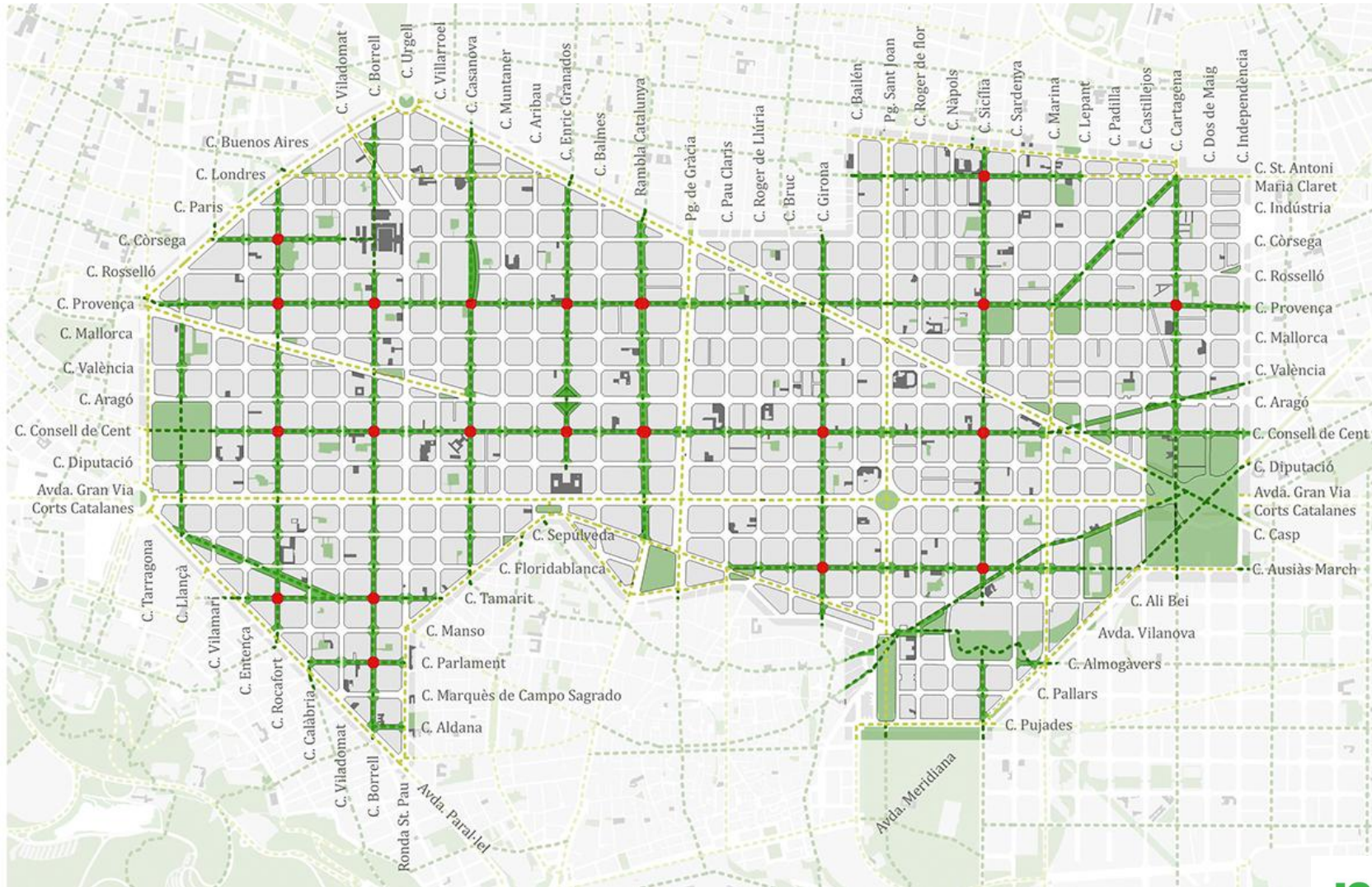
Annual Premature Deaths that the "Superblocks" Model Could Avoid in Barcelona



Source: Mueller et al. Changing the urban design of cities for health: the Superblock model. *Environment International*. 2019

ISGlobal

- 19.2% car reduction, 11.5 ug/m3 (24.3%) NO₂ reduction, 2.9 dB noise reduction, 3 fold increase green space (6.5% to 19.6%), 20% Surface temperature reduction





Green corridors

Ejes Verdes – Eixos Verds Superblock

<https://www.barcelona.cat/pla-superilla-barcelona/es/ejes-verdes-y-plazas-de-leixample>

GREEN SPACES AND MENTAL HEALTH

A study led by ISGlobal estimates that implementing **Green Corridors** throughout the city of **Barcelona**:

 **COULD REDUCE:**

14% of cases of self-perceived mental ill health



13% of visits to mental health professionals



13% of antidepressant use



8% of the use of tranquillisers or anxiolytics



 **AND INCREASE:**

5,7% of Barcelona's green surface



Estimated savings in direct and indirect mental health costs are:

45 million euros per year



Annual preventable mental health problems through Green Corridors in Barcelona

Mental health indicator	Preventable cases (total)	Preventable cases (%)
Perceived risk of poor mental health 	31,353	14.03%
Tranquilliser /sedative use 	9,476	8.11%
Antidepressant use 	13,375	13.37%
Visits to mental health specialists 	16,800	13.37%

NATURE EXPERIENCE REDUCES RUMINATION AND SUBGENUAL PREFRONTAL CORTEX ACTIVATION

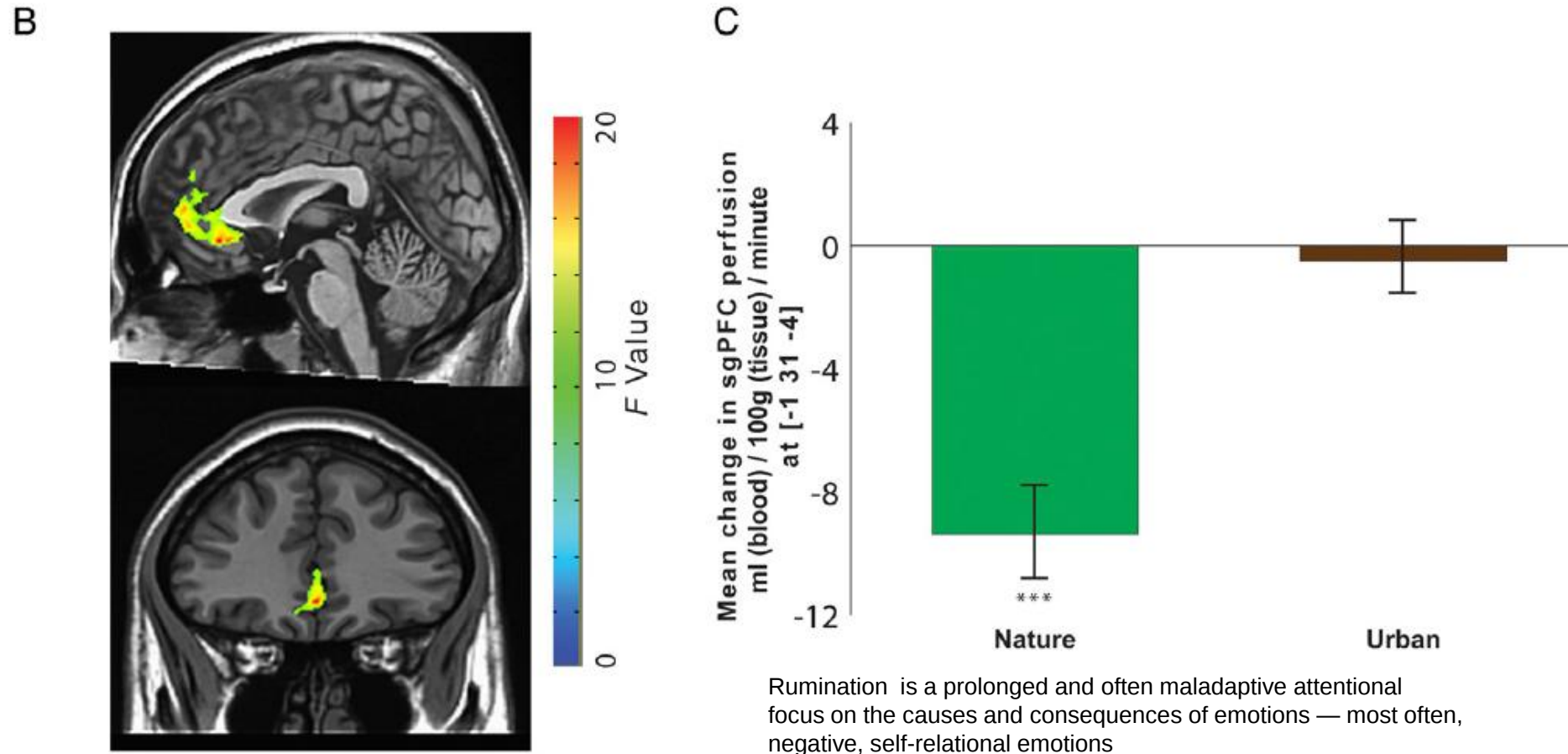
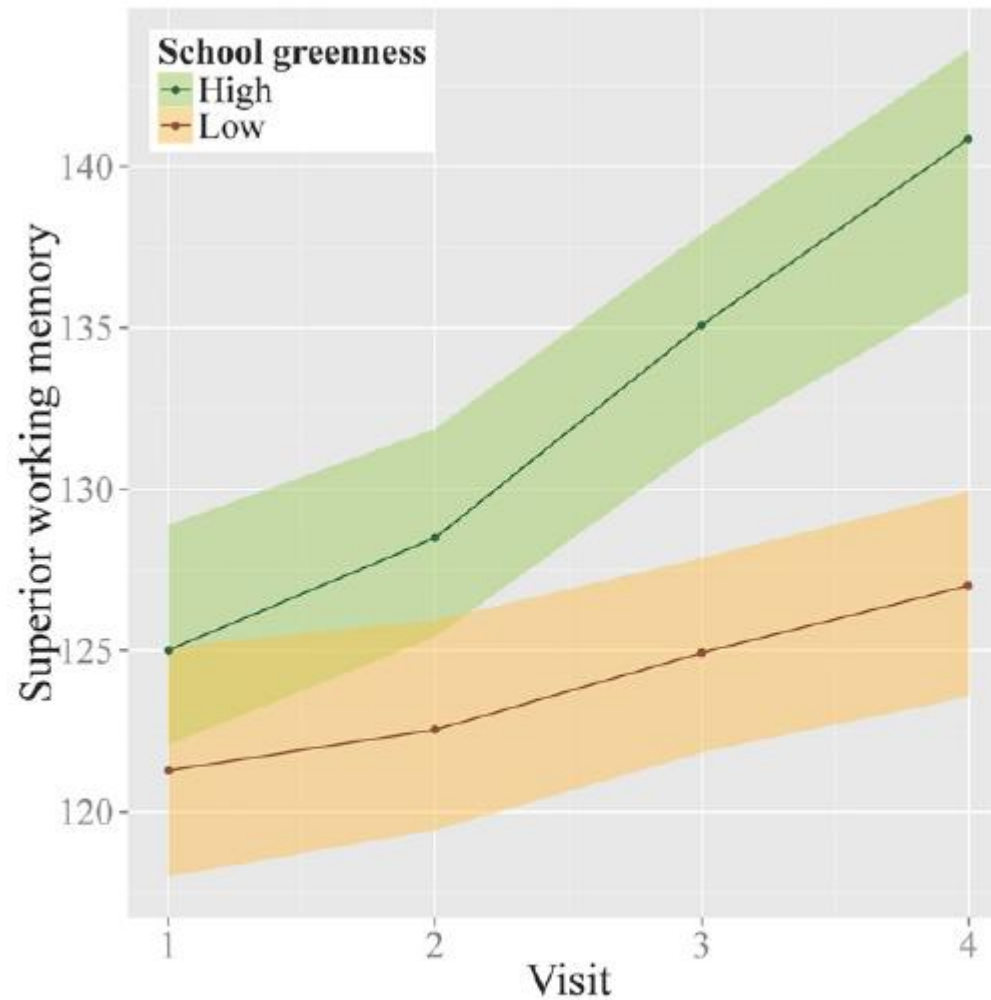


Fig. 1. The impact of nature experience on self-reported rumination and blood perfusion to the sgPFC. (A) Change in self-reported rumination (postwalk minus prewalk) for participants randomly assigned to take a 90-min walk either in a natural setting or in an urban setting. (B) A time-by-environment interaction in blood perfusion was evident in the sgPFC. F map of significant interactions at a threshold of $P < 0.05$, FWE corrected for multiple comparisons. (C) Change in blood perfusion (postwalk minus prewalk) for participants randomly assigned to take a 90-min walk either in a natural setting or in an urban setting. Error bars represent SE within subjects: * $P < 0.05$, *** $P < 0.001$.

GREEN SPACE AND WORKING MEMORY



Dadvand et al 2015
PNAS

Fig. 1. Twelve-month progress (with 95% confidence bands) in superior working memory for participants with the first (low greenness) and third (high greenness) tertiles of greenness within the school boundaries.

N=2,593 children, 7-10 yrs

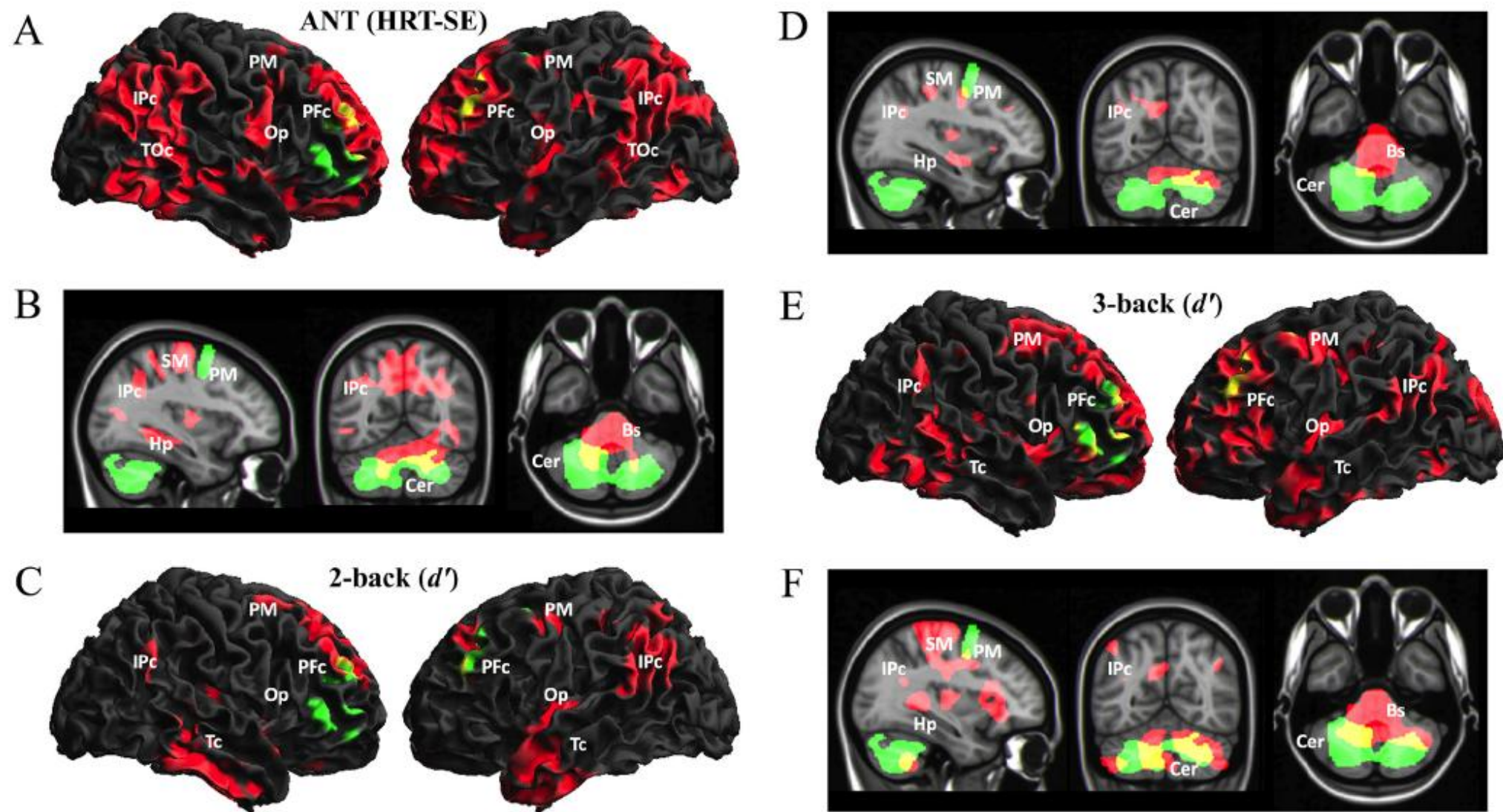


Figure 2. Regional gray and white matter volumes associated with lifelong residential surrounding greenness and cognitive performance. Results are displayed using conventional canonical templates [Cortex_20484 surface mesh in (A), (C), and (E) and MNI152_T1 template in (B), (D), and (F)] in Montreal Neurological Institute (MNI) space with statistical parametric mapping (SPM8; FIL Methods Group 2013) software. Green areas indicate regional volumes significantly associated with greenness (see Figure 1). Results were considered significant with clusters of 2.2 mL (650 voxels) at a height threshold of $p < 0.01$, which satisfied the family-wise error (FWE) rate correction of $p_{FWE} < 0.05$. Red areas indicate regional clusters with volumes significantly associated with cognitive functions: hit reaction time standard error (HRT-SE; an indicator of inattentiveness) in (A) and (B); 2-back d' (an indicator of working memory) in (C) and (D), and 3-back d' (an indicator of superior working memory) in (E) and (F). The overlaps between regions associated with greenness and those associated with cognitive functions are shown in yellow. Voxels with signifi

Billions of people exposed to increasing heat but decreasing greenness from 2000 to 2022

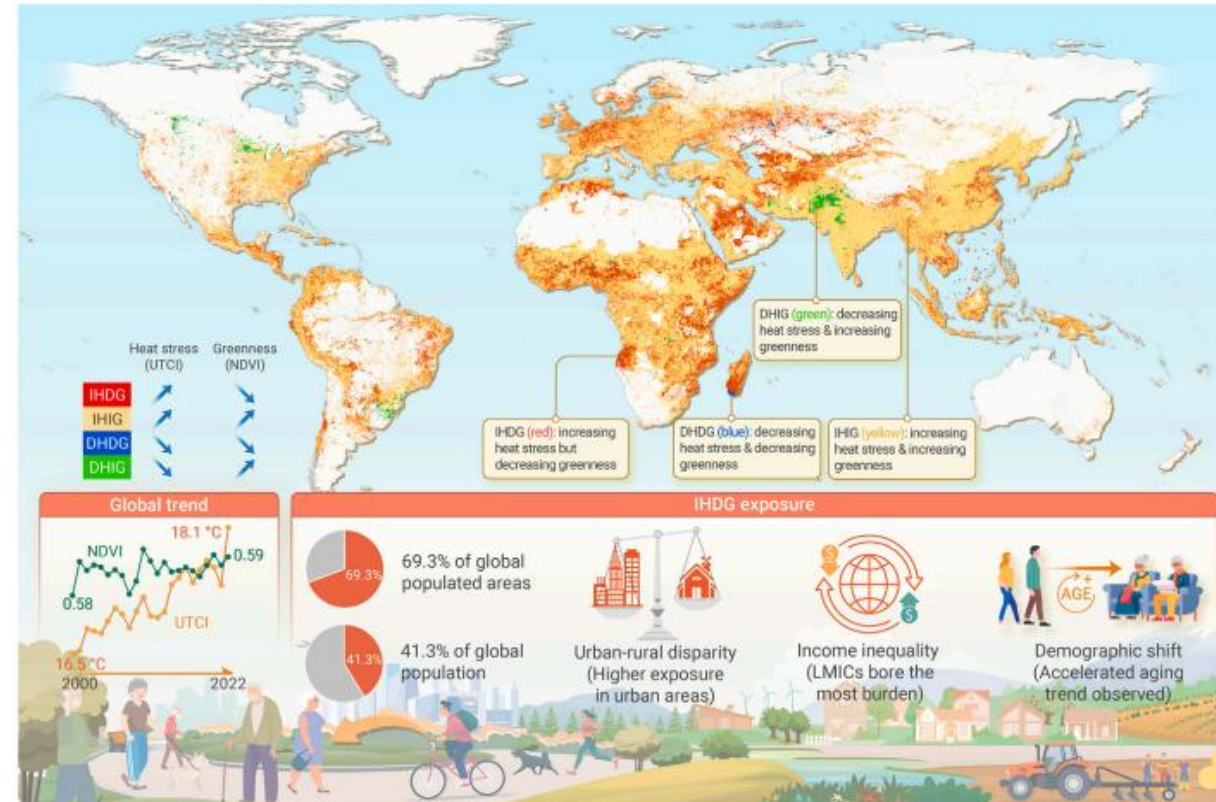
Tingting Ye,^{1,2,8} Rongbin Xu,^{1,2,8} Wenzhong Huang,² Zhengyu Yang,² Pei Yu,² Wenhua Yu,² Yanming Liu,² Yao Wu,² Bo Wen,² Yiwen Zhang,² Jaime E. Hart,^{3,4} Mark Nieuwenhuijsen,^{5,6,7} Michael J. Abramson,² Yuming Guo,^{2,*} and Shanshan Li^{2,*}

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GRAPHICAL ABSTRACT

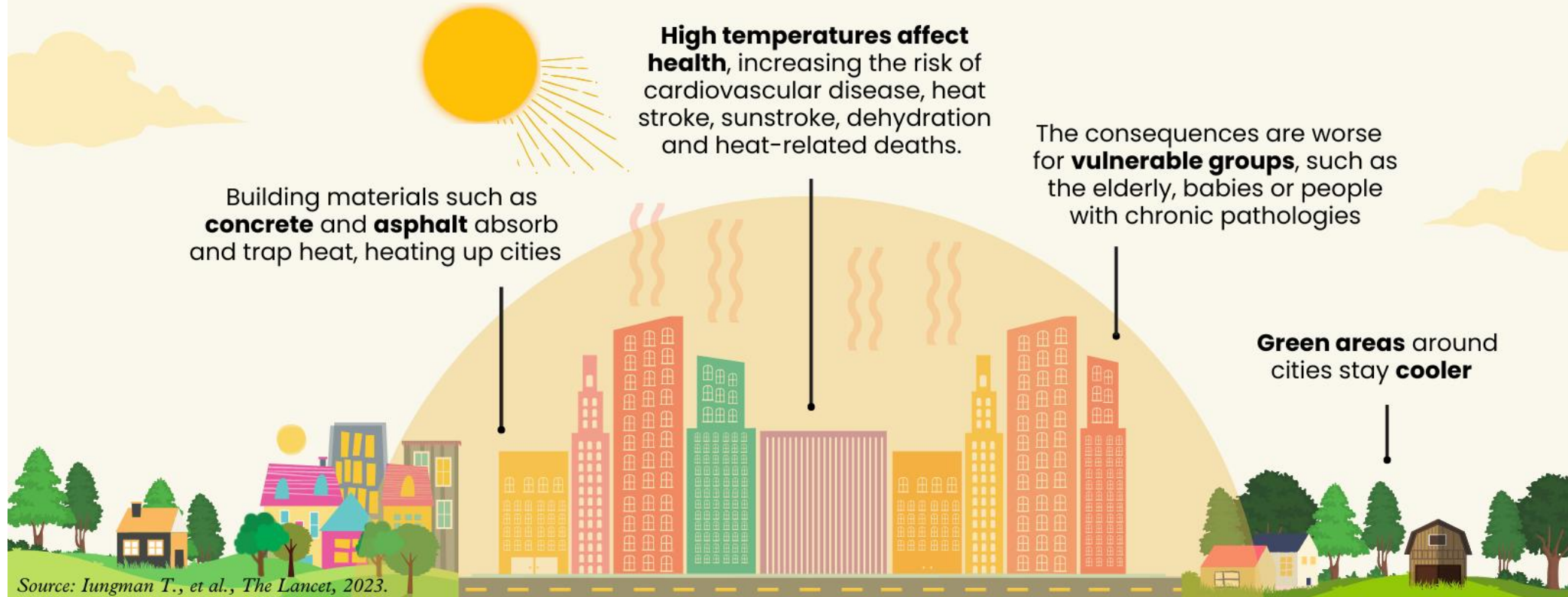


PUBLIC SUMMARY

- 69.3% of global populated areas experienced increasing heat but decreasing greenness (IHDG).
- 41.3% of the global population (~2.9 billion people) was exposed to IHDG.
- Low- and middle-income countries bore 85% of this burden, with urban areas more affected than rural ones.
- An accelerated aging trend was observed in populations exposed to IHDG.

The urban heat island effect

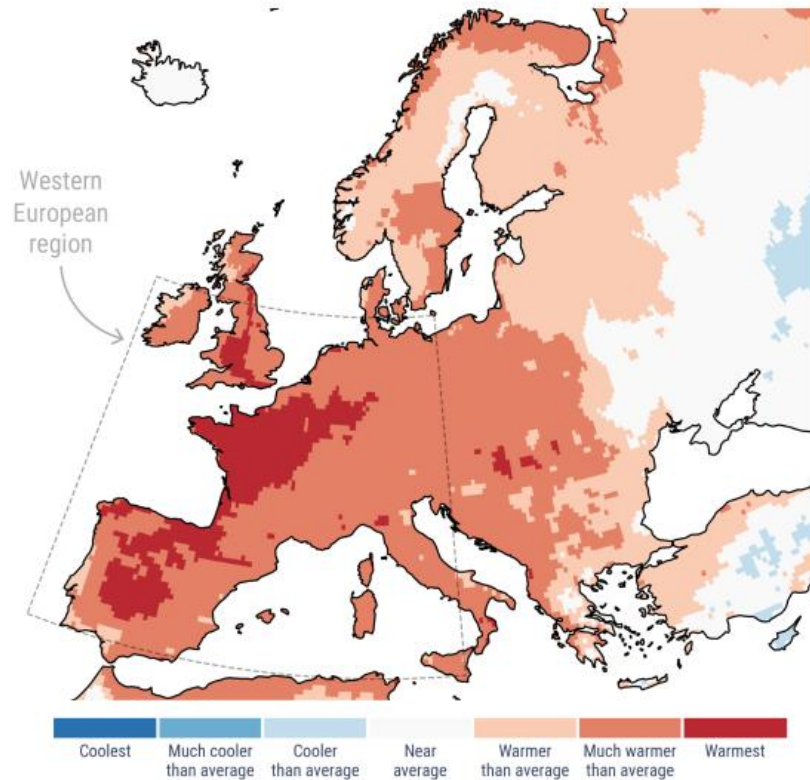
Refers to the **increase in temperature** in **urban environments** compared to surrounding areas.



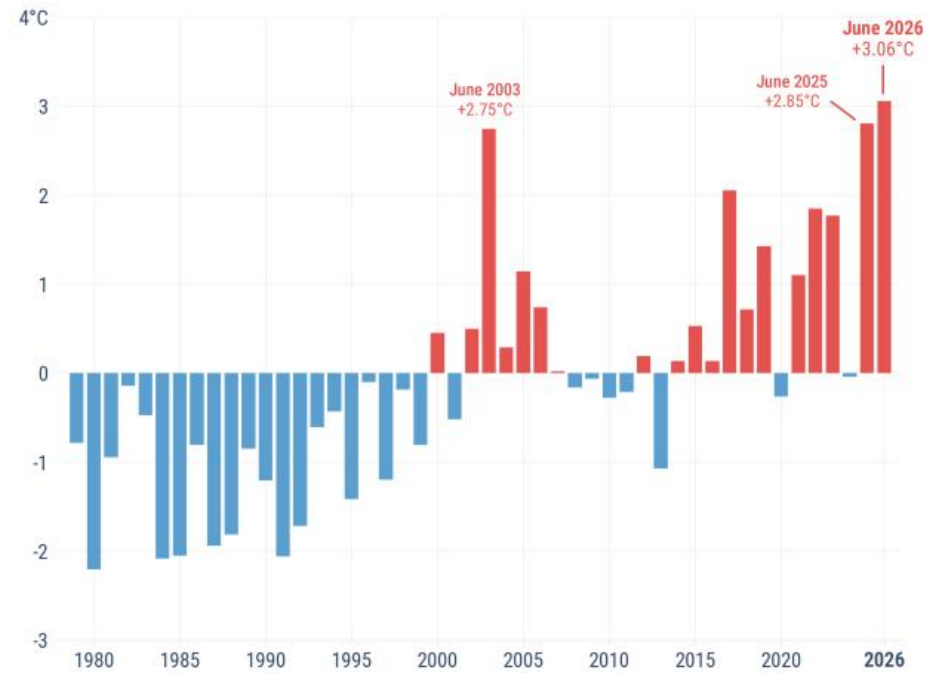
June 2026 was the warmest June on record for western Europe

Data: ERA5 • Reference period: 1991–2020 • Credit: C3S/ECMWF

Anomalies and extremes in surface air temperature for June 2026



Surface air temperature anomalies in June averaged over western Europe



Colour categories refer to the percentiles of the temperature distributions for the 1991–2020 reference period. The "coolest" and "warmest" categories are based on June rankings for the period 1979–2026. The western European region outlined in the map and used for the time series covers all land area within 11°W–15°E, 37°–55°N.



PROGRAMME OF
THE EUROPEAN UNION



IMPLEMENTED BY



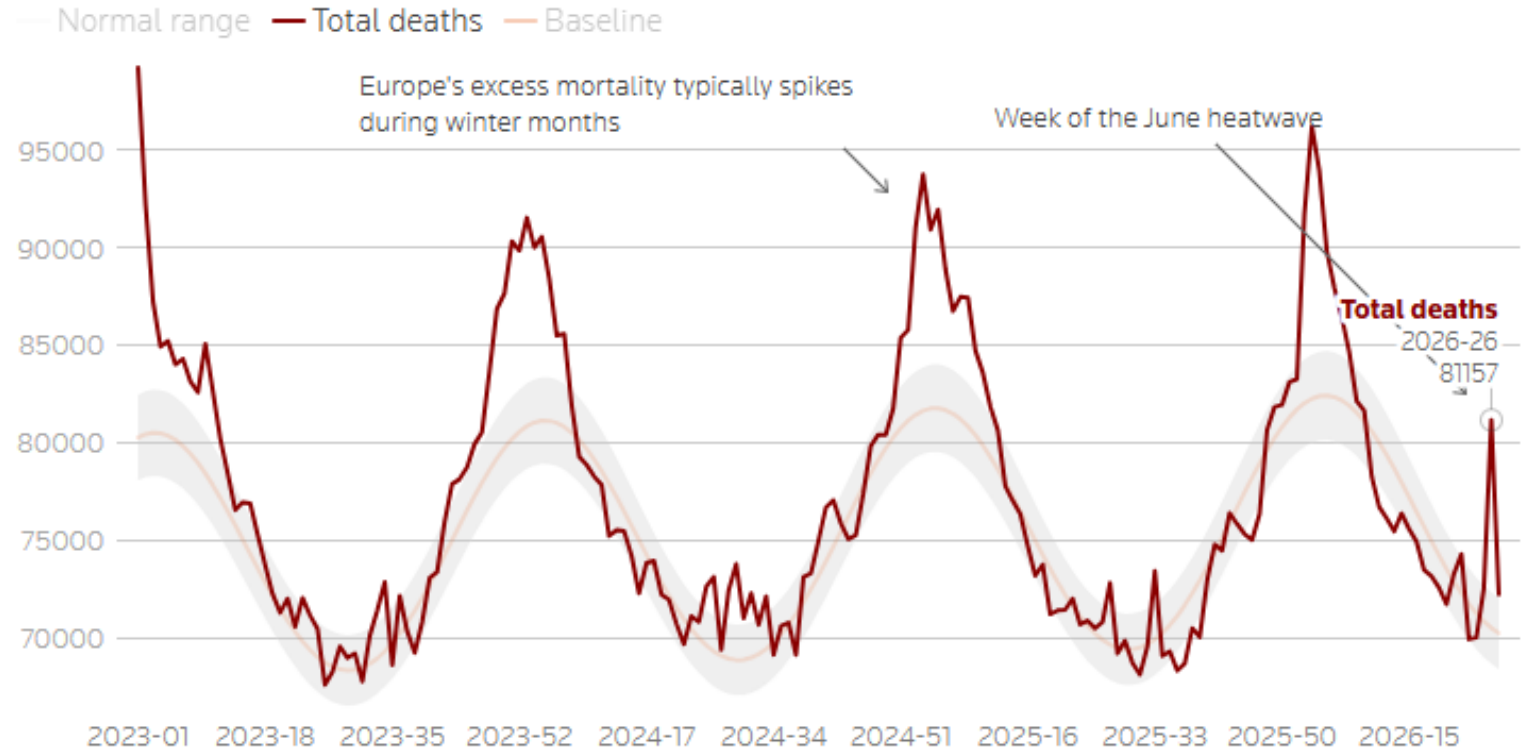
Europe recorded 10,000 excess deaths during late June heatwave, data show

By Kate Abnett



Jump in excess mortality during western Europe's June heatwave

Total weekly reported deaths in 27 European countries



Source: EuroMOMO | Kate Abnett

<https://climate.copernicus.eu/copernicus-record-heatwave-brings-hottest-june-western-europe-during-second-warmest-june-globally>

Over 4% of summer mortality in European cities is attributable to urban heat islands



30%

Increasing **tree cover**
in cities to **30%**



can reduce the
temperature of
urban environments
by up to **1.3 °C**



and **prevent 1/3 of
premature deaths**
attributable to urban
heat islands in summer

Source: Iungman T., et al., The Lancet, 2023.



3-30-300 GREEN SPACE RULE AND MENTAL HEALTH

the 3-30-300 rule:



Konijnendijk 2021

Few people (6%) achieved the 3-30-300 green space in Barcelona. Meeting the rule was associated with a 23-76% reduction in mental health indicators (poor mental, medication use and psychologist/psychiatrist visits)

Nieuwenhuijsen et al 2022

Why health and wellbeing should be at centre of urban planning

Scientists are examining how building and use of infrastructure relates to the burden of illness

Gary Fuller

🐦 @drgaryfuller

Fri 20 Oct 2023 07.00
CEST



CITY VISION

- “Often the problem is the absence of a shared vision of a better city, no clear rationale such as better respiratory health, and pathways to get there. Too often citizens think that restrictions and costs are imposed by a city council to pester them. We need more co-creation and engagement to create and implement a vision of a sustainable, livable and healthy city.”

Mark Nieuwenhuijsen

<https://www.theguardian.com/environment/2023/oct/20/why-health-wellbeing-should-centre-urban-planning>

PUBLIC HEALTH **VERSUS** URBAN PLANNING



It creates **community-based strategies** to prevent disease and promote health.

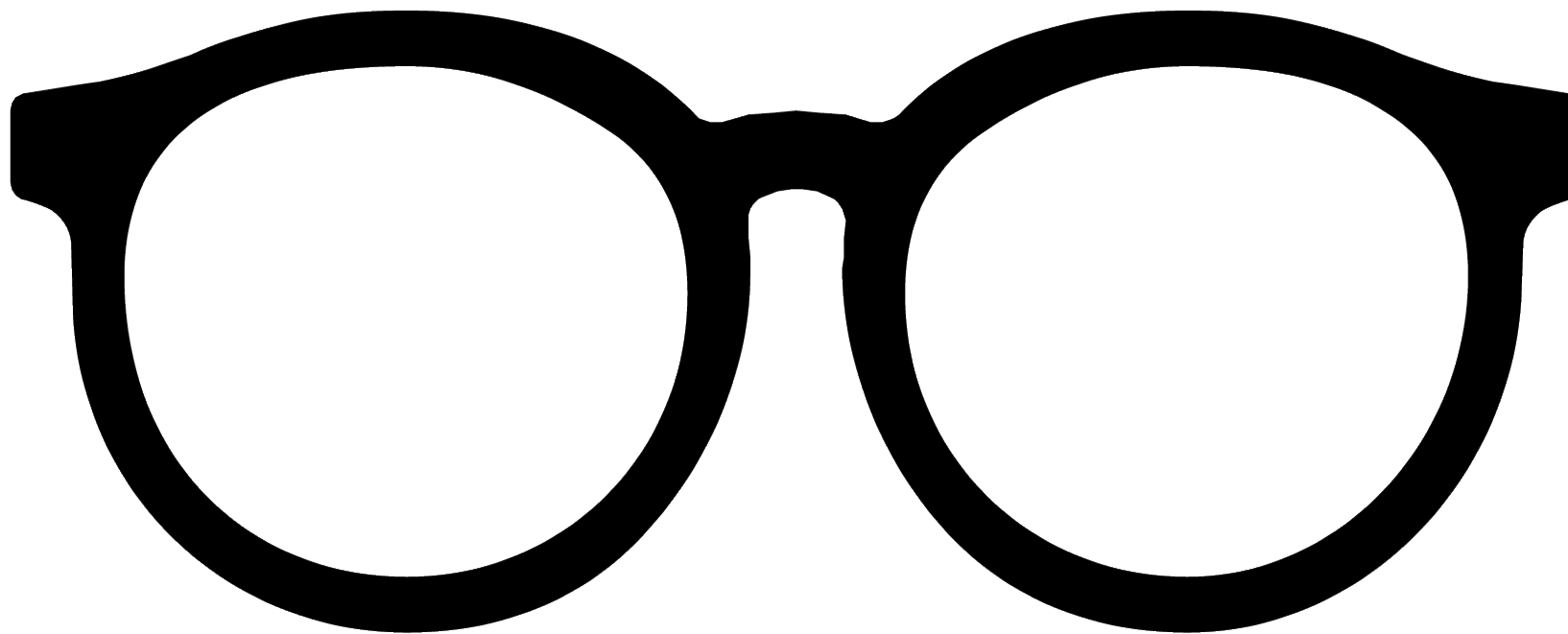


Planners deal with; transportation systems, economy, natural resources, urban design, and physical facilities. That all come together to **define our cities.**

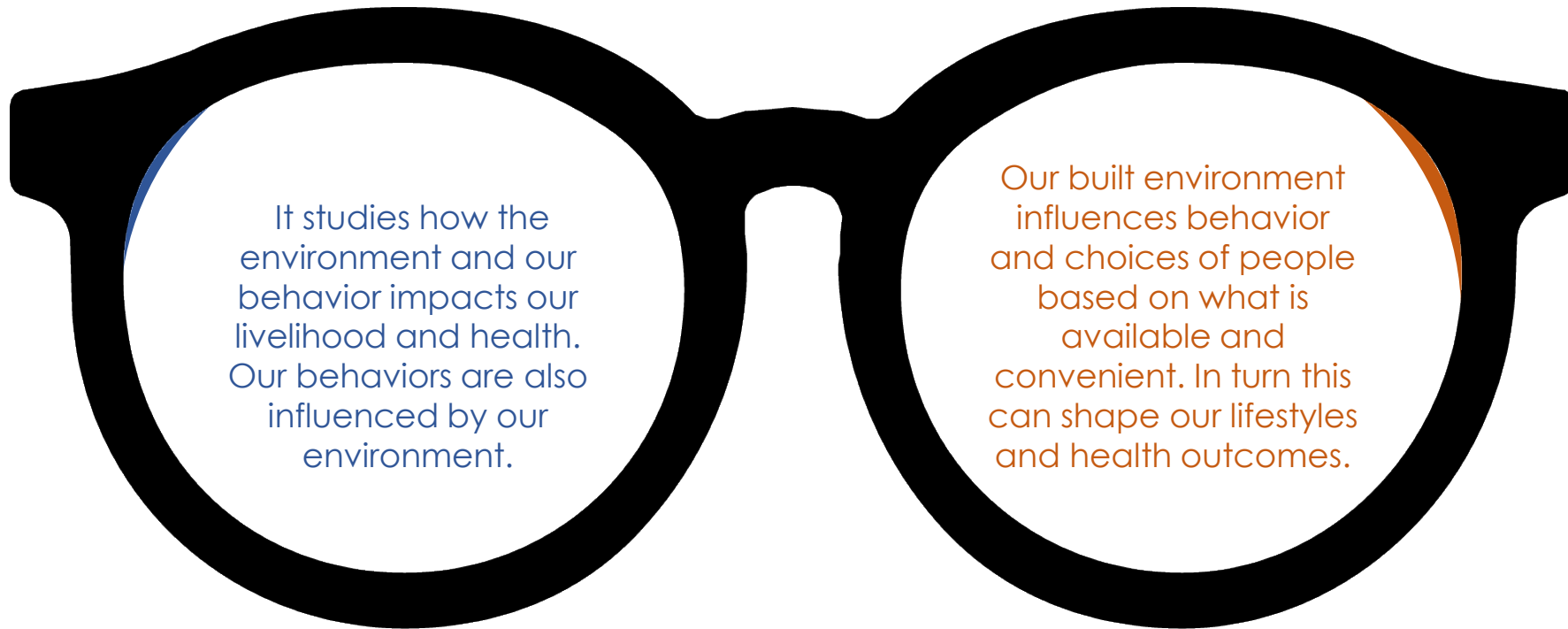
DEFINITION

PUBLIC HEALTH **VERSUS** URBAN PLANNING

vis-à vis



THE LINK

PUBLIC HEALTH **vis-à vis** URBAN PLANNING

It studies how the environment and our behavior impacts our livelihood and health. Our behaviors are also influenced by our environment.

Our built environment influences behavior and choices of people based on what is available and convenient. In turn this can shape our lifestyles and health outcomes.

THE LINK

Applying health trends knowledge helps create new community policies, building codes, and changes the practice of urban planning.

Multisectoral approach

Multi sectorial and systemic approaches are needed to address current problems and find solutions



Building a Healthy Urban Design Index (HUDI): how to promote health and sustainability in European cities



Federica Montana*, Natalie Mueller, Evelise Pereira Barboza, Sasha Khomenko, Tamara Lungman, Marta Cirach, Carolyn Daher, TC Chakraborty, Kees de Hoogh, Alice Battiston, Rossano Schifanella, Mark Nieuwenhuijsen



Summary

Background As global urbanisation accelerates, alongside declining environmental quality and increasing climate challenges, it is increasingly vital for urban planners and policy makers to integrate health and wellbeing considerations into urban planning. This study introduces the Healthy Urban Design Index (HUDI), a high-resolution spatial index developed for European cities. HUDI combines policy-relevant indicators related to urban design, sustainable transportation, environmental quality, and greenspace accessibility—key factors influencing human health and wellbeing. Unlike existing indices, which often focus on few or large metropolitan cities and lack spatial granularity, HUDI offers high resolution and extends its scope to small-sized and medium-sized cities, home to over 50% of Europe's population.

Methods We analysed 917 European cities in total, 916 cities and one larger city, on the basis of the 2018 Urban Audit database. Using open-source spatial data, we mapped cities at a fine 250 m grid cell scale. To compare cities effectively, we grouped them into five city clusters on the basis of population size, following the definition of the Organisation for Economic Co-operation and Development: large metropolitan (11), metropolitan (53), medium-sized (177) and small (638) cities, and small towns (38). A set of 13 indicators, across four overarching domains of urban design, sustainable transportation, environmental quality, and green space accessibility was calculated spatially at the 250 m grid cell scale and then aggregated to the city level. The 13 indicators were optimal dwelling density, compactness, mid-rise development, permeability, opportunity to walk, opportunity to cycle, public transport stops, air quality (PM_{2.5} and NO₂), surrounding greenness (Normalized Difference Vegetation Index), lower urban heat islands, universal access to green spaces, and access to large green spaces. To ensure comparability, all indicators were standardised on a scale from 0 to 10, considering data quality, indicator target levels, and specific evaluation criteria. The HUDI was then calculated by applying different weights to these indicators, allowing us to rank cities within their respective city size cluster. We visualised overall city performance using spider plots and did Local Moran's *I* and Local Indicators of Spatial Association analyses to pinpoint areas with poor urban planning. We did sensitivity tests and correlation analyses, incorporating external datasets where available, to validate our findings.

Lancet Planet Health 2025;
9: e511–26

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ISGlobal **RankingOfCities**

Urban health study in
1,000 European cities

RANKINGS

Which European
cities have the highest
and lowest mortality
due to urban exposures?



How is your city ranked?

Check the air quality,
green space, noise and mortality data



CITY NAME



AIR POLLUTION

SEE THE RANKING



GREEN SPACE

SEE THE RANKING



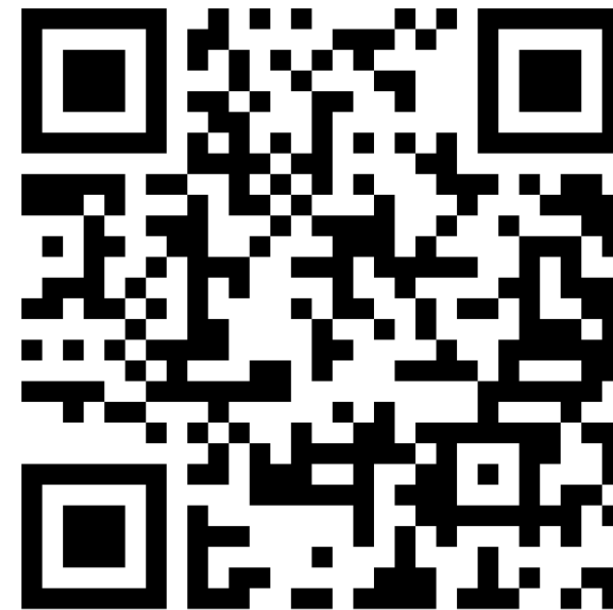
NOISE

SEE THE DATA



HUDI

SEE THE RANKING



<https://isglobalranking.org/hudi/>



RANKING POSITION ⓘ

Category: Large metropolitan areas

2 /11

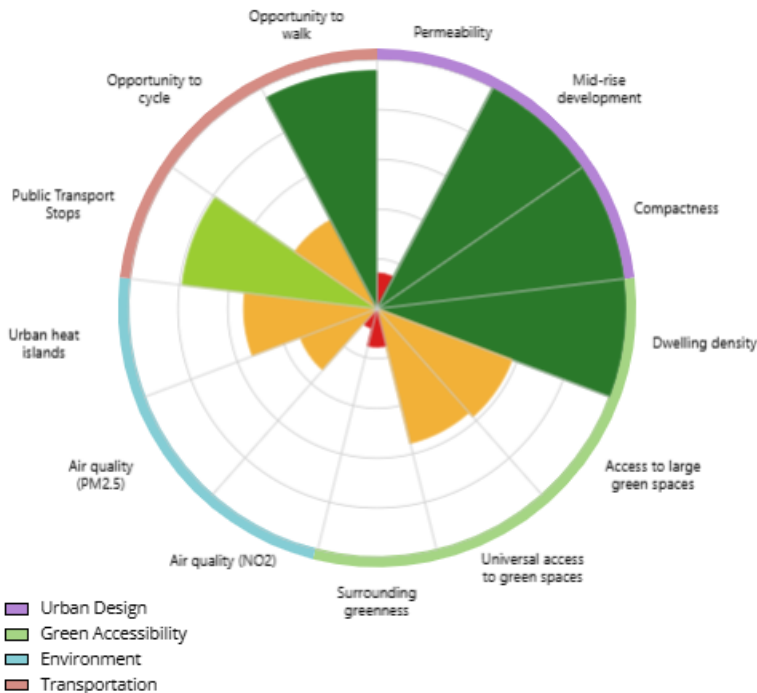


AVERAGE SCORE ⓘ

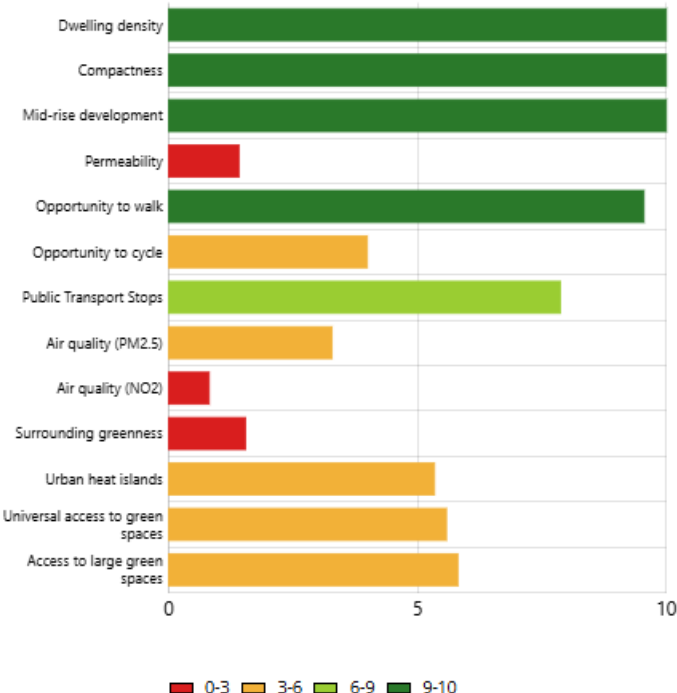
5.67 /10



INDICATOR SCORES ⓘ



INDICATOR SCORES ⓘ





SPECIFIC VALUES

**Dwelling density:**

92,68 dwellings per hectare. The number of dwellings per hectare considered optimal is between 45 and 175.

**Compactness:**

100 points (out of 100), based on the concentration of buildings and urban development. Higher scores indicate more compact cities

**Mid-rise development:**

99,3% of buildings with 5-6 stories.

**Permeability:**

14,09% of people with access to the target level of permeable surfaces.

**Opportunity to walk:**

63,86% of walking infrastructure (versus total road length).

**Opportunity to cycle:**

5,56% of cycling infrastructure (versus total road length).

**Public transport stops:**

78,73% of population with access to at least one bus stop within a 300 m buffer from home.

**Air quality (PM2.5):**

17,27 $\mu\text{g}/\text{m}^3$ (mean annual levels).

**Air quality (NO2):**

41,23 $\mu\text{g}/\text{m}^3$ (mean annual levels).

**Surrounding greenness:**

15,42% of people with access to the target value of NDVI.

**Urban heat islands:**

0,08 points on a scale between -8 and 7 based on the urban heat island effect, where higher values indicate higher urban heat island effect.

**Universal access to green spaces:**

55,78% of people with access to a green space of at least 0.5 ha within 300m of their home.

**Access to large green spaces:**

58,13% of people with access to a green space of at least 5 ha within 2 km of their home.



Greening cities

Seoul, Korea

DÜSSELDORF, ALEMANHA
1990



2019







ALDERHEY HOSPITAL LIVERPOOL BEFORE AND AFTER





Vauban, Freiburg





Poble Nou, Barcelona

Climate crisis, cities, and health

Mark J Nieuwenhuijsen



Introduction

More than ever, the climate crisis is becoming a health crisis. An estimated 5 million people globally die each year because of suboptimal temperatures,¹ with a large proportion of heat-related mortality (37%) attributable to human-induced climate change.² The last few years have been the hottest on record and high temperatures claimed over 60 000 lives in Europe alone in 2022, with cities the most affected³ and temperatures in cities projected to increase.^{4,5} Urban heat islands that result from excessive asphalt and concrete in cities contribute to an increase in temperature and premature mortality.⁶ Just over half of the world's population (56%) now lives in cities and that percentage is expected to reach nearly 70% by 2050.⁷

The Conference of the Parties (COP) had its first health day at COP28 and over 120 countries have endorsed the COP28 UAE Declaration on Climate and Health. This historic and important event recognises and provides evidence that the climate crisis is also a health crisis and that people's health can benefit from climate action. The

improve health. The health co-benefits of climate action are well recognised and documented, but the urgency to implement them is still missing. Climate mitigation strategies targeting land use, transport, buildings, and waste management have shown multiple quantified health co-benefits, such as reduced premature mortality and rates of disease.¹⁹

In this Lecture, I provide an overview of potential climate action measures at the nexus of urban planning, environment, climate, and health to achieve climate neutral, liveable, and healthy cities. This Lecture is not a comprehensive or systematic review, but provides a brief overview of possible climate actions that cities can implement and that can improve the health of citizens.

Climate change and health

The impacts of climate change are by now well documented. Climate change leads to increased extreme weather events, such as, heatwaves, cold spells, floods, and droughts, wildfires, and increased exposure to allergens. Landscape changes are caused by loss of urban

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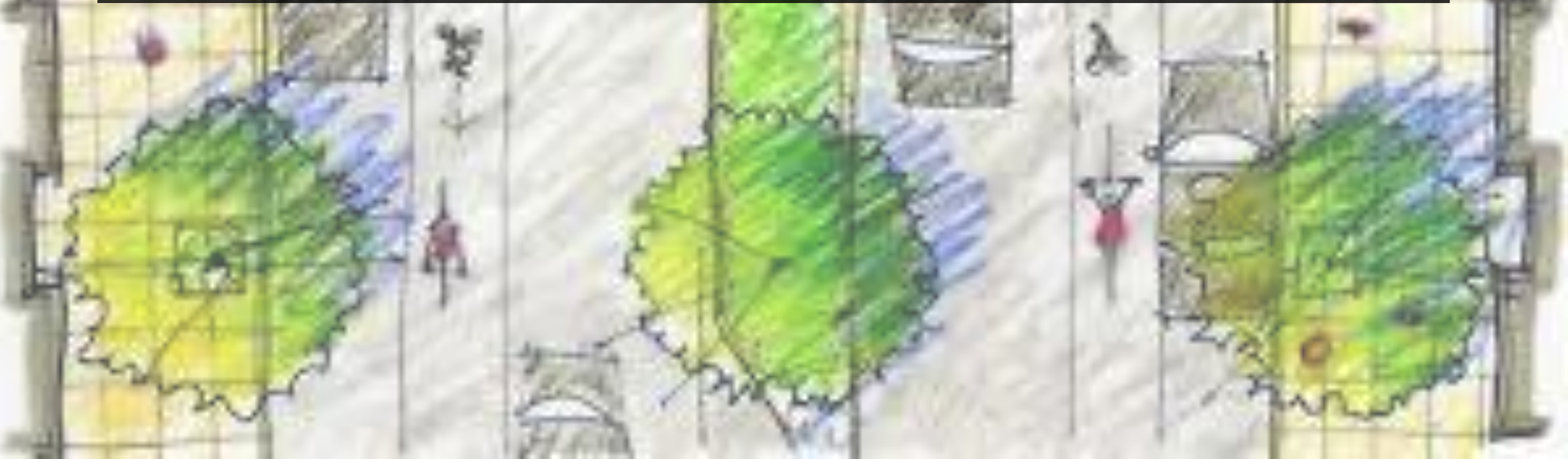
For more on COP28 see www.cop28.com

Lecture: <https://www.youtube.com/watch?v=6TeUSV-Q-w4>

<https://healthpolicy-watch.news/cities-face-severe-degradation-without-meaningful-climate-action-warn-experts/>

“Urban planning and public health share common missions and perspectives. Both aim to **improve human well-being**, emphasize needs assessment and service delivery, manage complex social systems, focus at the population level, and **rely on community-based participatory methods.**”

*Center for Disease Control and Prevention
Report on Urban Planning and Public Health*





LA SALUTE AL CENTRO DELLE CITTÀ - Bologna, 15 luglio 2026

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