



**Resilience Management for Healthy Cities in a
Changing Climate**

**Thomas Elmqvist
Stockholm Resilience Centre**



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Goal 11.

**Make cities and human settlements inclusive, safe,
resilient and sustainable**

Journals could share peer-review data

Before dispensing with peer review in favour of open science, responsible scientists need to do everything they can to improve this centuries-old system. Our experience shows that journals that share information on all aspects of the peer-review process can foster transparency and accountability in publishing, while protecting the interests of authors, reviewers, editors and researchers.

As part of PEERE, a large European Cooperation in Science and Technology (COST) Action project funded by the European Union, researchers teamed up with the publishers Elsevier, Springer Nature (which publishes *Nature*) and Wiley to devise a protocol for sharing such information (see go.nature.com/2rx5ort). Our publicly available protocol has already been piloted in hundreds of journals and is tackling issues such as anonymity, privacy and data management.

This systematic investigation of the review process will enable more journals to recognize biases against the publication of innovative research, to test different peer-review models and to work out how best to engage and reward reviewers.

We invite scholars, editors and publishers to participate in the PEERE initiative by contacting us. **Flaminio Squazzoni** University of Brescia, Italy. **Francisco Grimaldo** University of Valencia, Spain. **Ana Marušić** University of Split, Croatia. flaminio.squazzoni@unibs.it

NIH competition to create 'eye in a dish'

The National Eye Institute of the US National Institutes of Health (NIH) has launched a competition to develop a working model of the human retina from stem cells — namely, the 3-D Retina Organoid Challenge

(see www.nhlbi.nih.gov/3dret). This will help to clarify the mechanisms of retinal disease, stimulate new technologies and develop more effective therapies (see also G. Quadrato et al. *Nature* 545, 48–53; 2017).

There are other promising examples of NIH-funded 3D human-tissue models. Tissue chips are being derived from induced pluripotent stem cells in the Microphysiological Systems Program at the National Center for Advancing Translational Sciences in Bethesda, Maryland. And 3D biomimetic systems are being developed in the National Cancer Institute's Cancer Tissue Engineering Collaborative Research

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their connections to the brain (www.nhlbi.nih.gov/audacious). **Paul A. Sleving** National Eye Institute, Bethesda, Maryland, USA. paulesle@nei.nih.gov

Pay countries to stop whaling

We raise the possibility that countries opposed to whaling could stop other nations that continue the practice simply by paying them compensation. This idea is inspired by a survey we conducted in February 2016 in Australia and Japan.

We found that the maximum amount Australians would be willing to pay to discourage Japan's whaling programme was Aus\$1.4 (US\$23.6) per year per household. This exceeded the minimum compensation required by the Japanese for giving up their current whaling activities (see M. Wakamatsu et al. *Mar. Policy* 81, 312–321; 2017).

The benefits would go beyond those of a monetary transaction. Non-whaling countries would gain assurance of cetacean welfare

and conservation worldwide. Whaling countries would no longer be ostracized by the international community.

Global evaluation of whaling involving all stakeholders would refine this bargaining. Important non-economic factors such as cultural values would need to be taken into account. These could be offset by, for instance, public education programmes in the ecological and conservation advantages of giving up whaling, and by developing alternatives to whale products that are acceptable to consumers. **Shunsuke Managi**, **Mihoko Wakamatsu** Kyushu University, Fukuoka, Japan.

Sustainability and Resilience differ

moved forward last year, when the United Nations adopted both the Sustainable Development Goal 11 on cities and the New Urban Agenda (see go.nature.com/2qz8fows). Unfortunately, these international policy documents interchangeably use two quite different concepts — sustainability and resilience. We are concerned that policymakers confuse the two because academics do, which hampers implementation.

Resilience is a property of a complex system. For example, the Internet is resilient because it continues to function even when major nodes collapse. Resilience may not always be desirable — witness dictatorships that are resilient across generations. It may also run counter to sustainability goals: for instance, efficiency reduces diversity and redundancy, both of which are key features of resilience.

This conflict is illustrated by high-density urban areas, which can be more efficient to run in terms of, say, energy distribution, communications and waste collection. However, these areas can also be vulnerable to extreme

events such as flooding because they are less diverse (with few green areas, for example) and have few redundancies (in the form of back-up facilities and disaster-management processes).

The research community needs to be clear about the differences and synergies between sustainability and resilience. Only with clarity can such concepts be applied in policy and practice. **Thomas Elmqvist** Stockholm Resilience Centre, Stockholm University, Sweden. thomas.elmqvist@su.se *On behalf of 4 correspondents (see go.nature.com/2r23okn for full list).

5 35

to fix
could
resilient on
ignoring

Nature 545, 7; 2017). Moreover, their efforts are likely to make little difference without the participation of senior colleagues.

Young researchers, especially women and those from ethnic minorities, are already forced to challenge the existing culture if they are to advance professionally. They face overt and unconscious bias, barriers to recruitment and unequal pay. They receive fewer grants and citations and must work harder for recognition than those with similar qualifications (see *Nature* 495, 22–24; 2013).

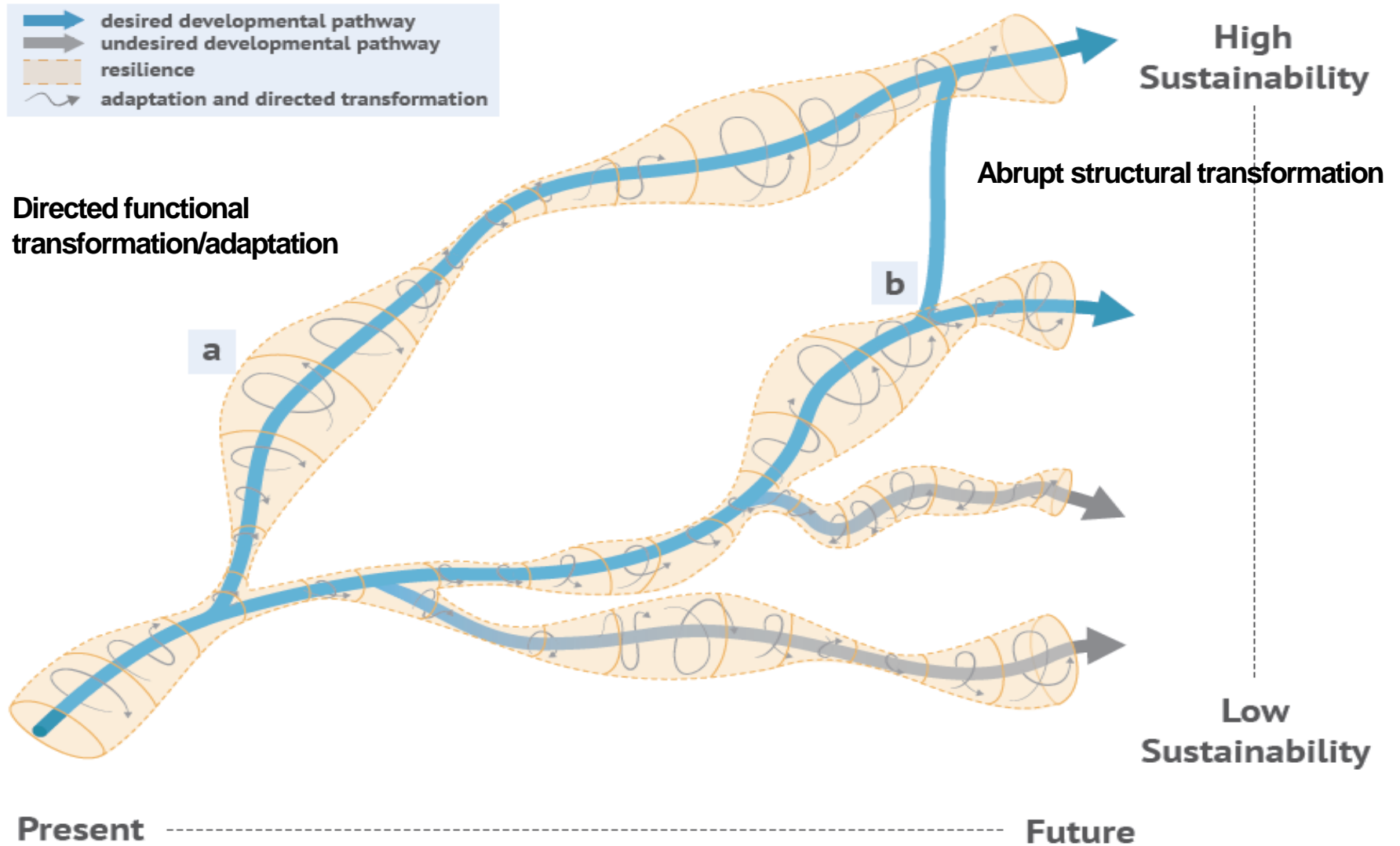
Such inequality could be corrected with the support of peers, as Tregoning proposes. But without higher-ranking allies, the efforts of young scientists face obstacles. To bring about change, senior scientists should couple their insight, experience and enthusiasm to that of younger colleagues. This would highlight problem areas, implement policy solutions and lead to cultural reform. **Christina Simkanin**, **Alison Carwood** Smithsonian Environmental Research Center, Edgewater, Maryland, USA. simkaninc@si.edu

Common (narrow) interpretation

Sustainability – *increased efficiency in resource use*

Resilience – *capacity to recover from disaster*

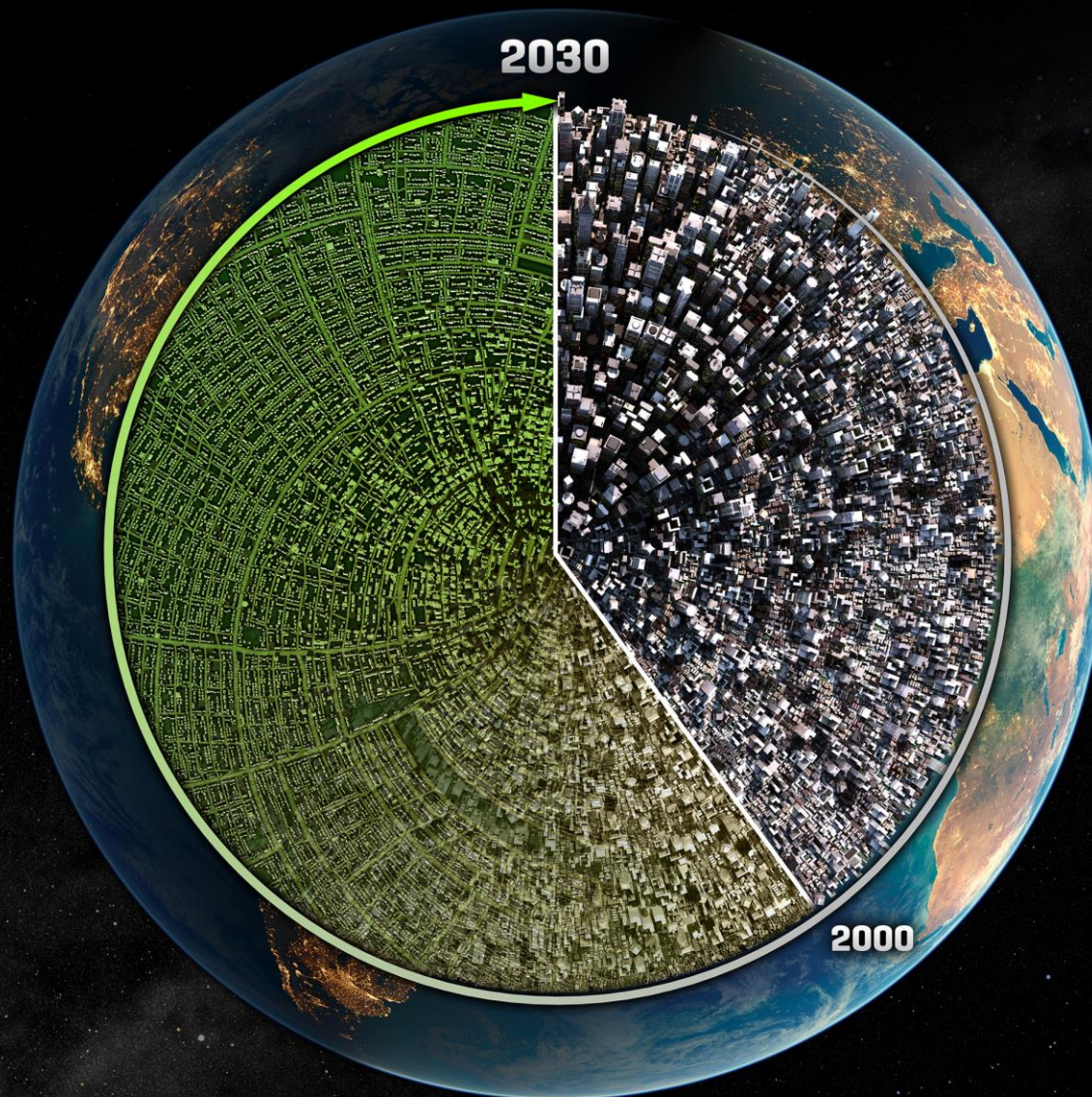
Linking Resilience-Sustainability-Transformation



CHALLENGES & OPPORTUNITIES

MORE THAN 60% OF THE AREA PROJECTED TO BE URBAN IN 2030

HAS YET TO BE BUILT



Singapore - Green cover 1980 - 36%, 2016 - 47%



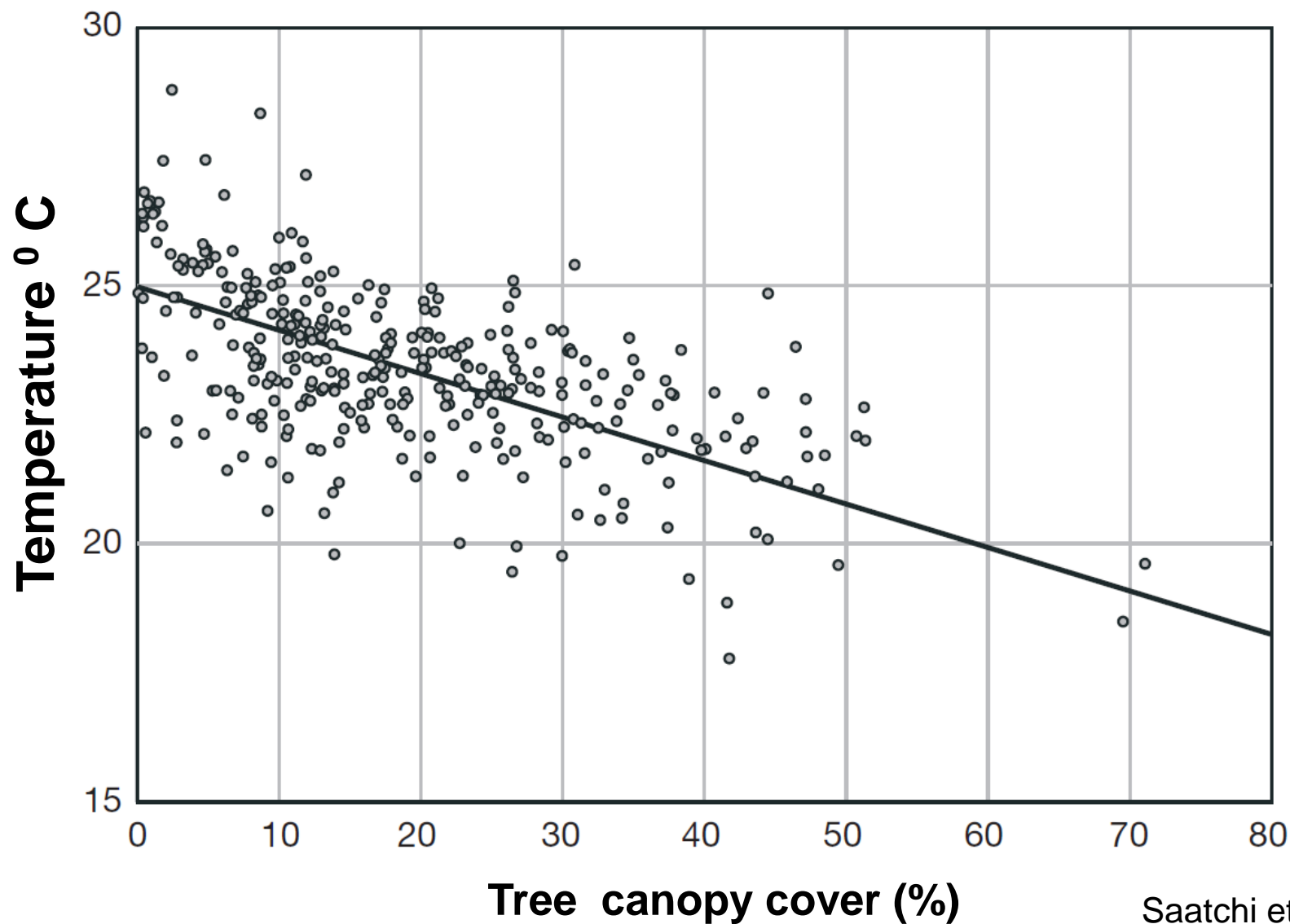
Singapore - 100% urban - rated as the most healthy country in the world. *Bloomberg rankings 2015.*

Urban heat waves



Estimated 70.000 excess deaths as a result of a heat wave in Europe in 2003 (Robine et al 2007)

Cooling effect of trees in the urban landscape



Urban Health Crisis



Mortality due to air pollution

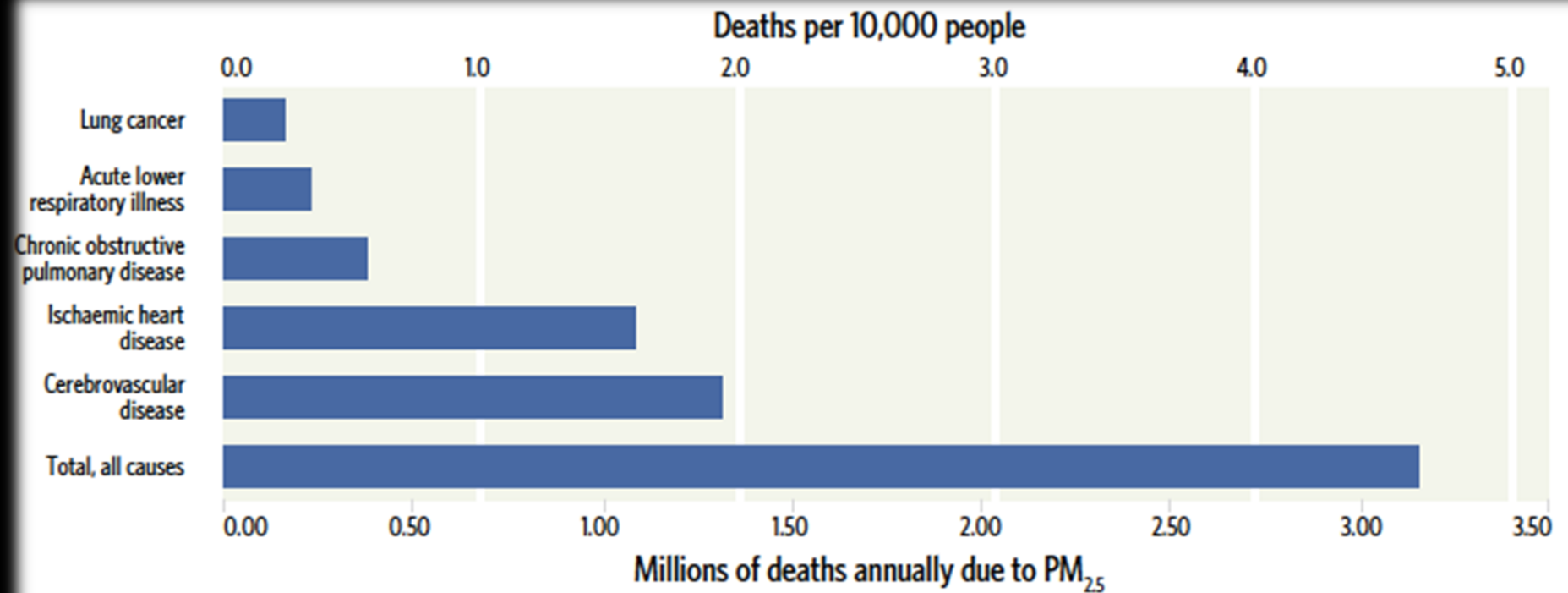


Figure 1. Estimated global mortality from PM_{2.5}, expressed either as the total number of deaths (bottom axis, in millions), or as the number of deaths per 10,000 people (top axis). All figures are for the year 2010. Data taken from Lelieveld et al. (2015).

Cost-effectiveness to reduce particulate matter

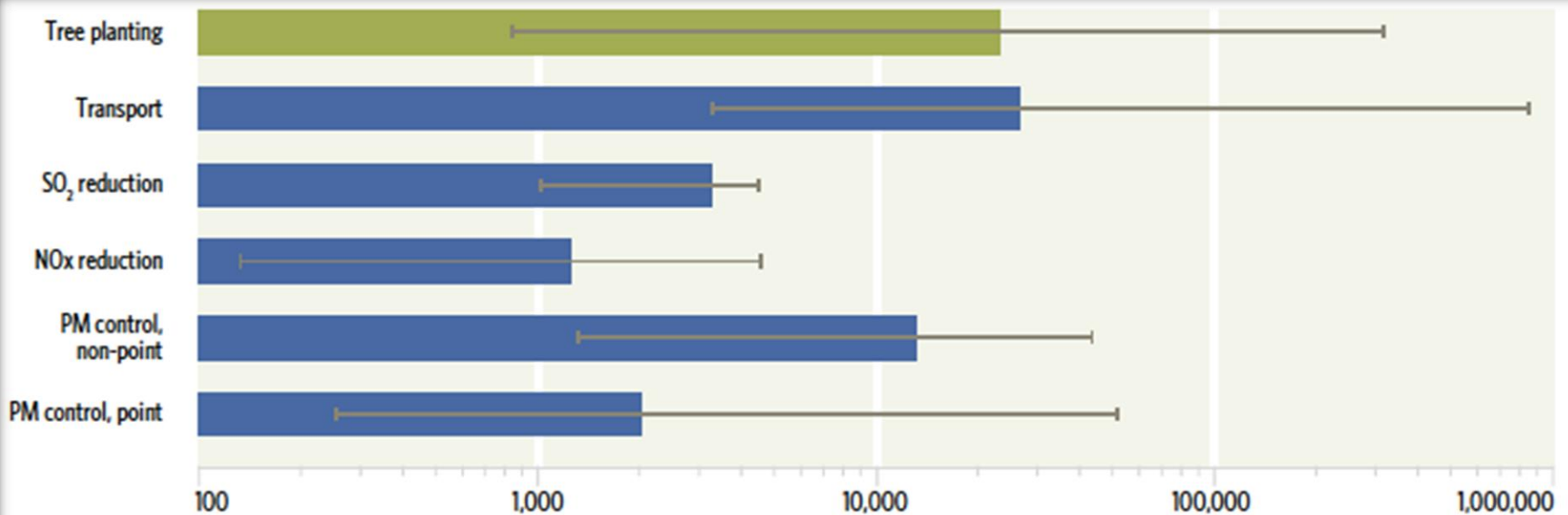
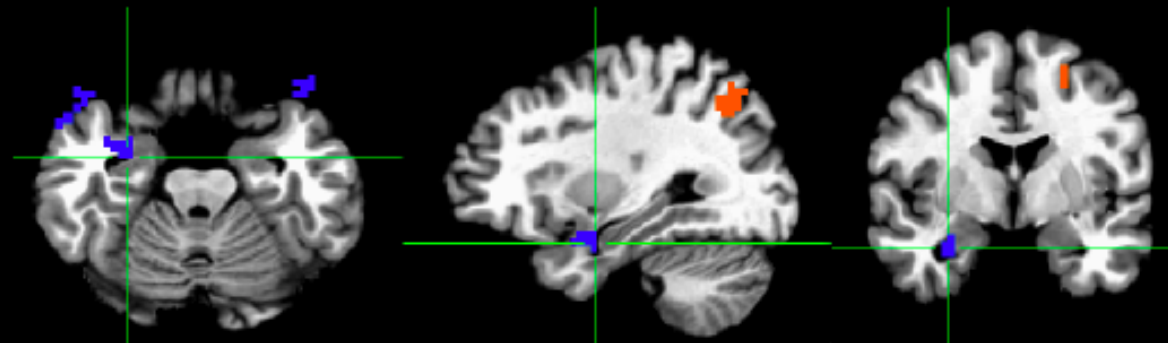


Figure 3. Cost-effectiveness of grey infrastructure strategies to reduce particulate matter. Each category contains multiple individual technologies cited in the literature, in the United States, Chile, Mexico, Taiwan, and the UK. The bar shows median cost-effectiveness, while the error bars show the minimum and maximum cost-effectiveness observed in the category. All values for cost-effectiveness are standardized to US2015\$/ton.

Urban Mental Health

The
Economist

Urban brains behave differently from rural ones



(Lederbogen et al. 2011 *Nature*)

Exposure to different Urban environments and mental capacity

(G. Daily, Natural Capital Project, Stanford, CA)

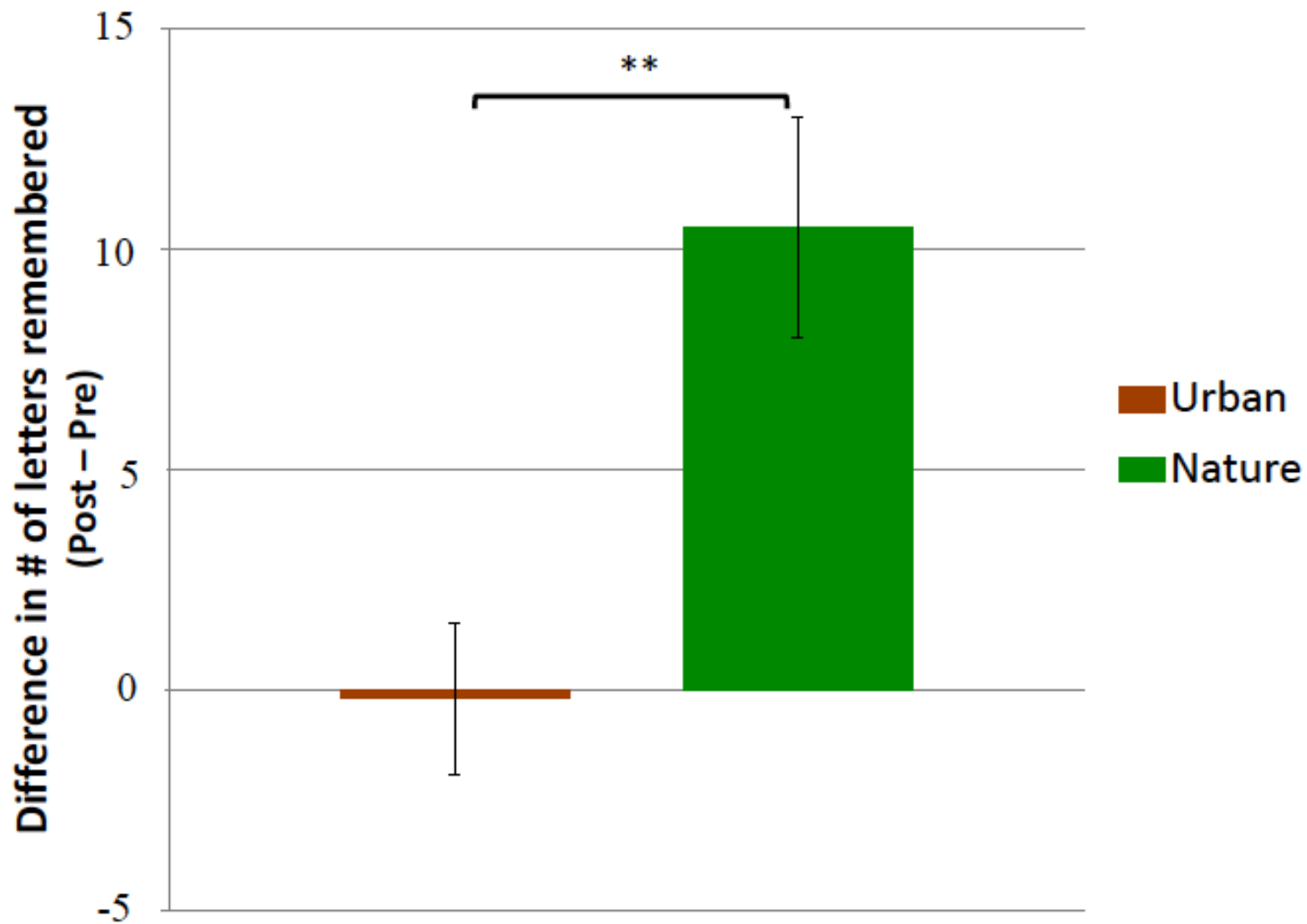


TESTS → BUS → WALK → BUS → TESTS

Exposure to different Urban environments and mental capacity

$$(2 * 2) + 4 = 8$$

O-Span Task



(Bratman et al. 2015 *Land & Urban Planning*)

Urban Greenspace Innovations



Pocket parks



Pop up parks



Linear Park in Mumbai



Linking affluent and poor neighbourhoods together



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Current Opinion in
**Environmental
Sustainability**

Benefits of restoring ecosystem services in urban areas

T Elmqvist¹, H Setälä², SN Handel³, S van der Ploeg⁴,
J Aronson^{5,6}, JN Blignaut⁷, E Gómez-Baggethun^{8,9},
DJ Nowak¹⁰, J Kronenberg¹¹ and R de Groot⁴

Published online May 25, 2015

Table 2**Average value in US\$/ha/y (2013) of selected services provided by green spaces in urban areas**

Service	Average value (US\$/ha/y [*])	Range
1. Pollution and air quality regulation	647 (<i>n</i> = 9)	60–2106
2. Carbon sequestration (annual flow)	395 (<i>n</i> = 5)	58–702
Carbon storage (stock value)	3125 (<i>n</i> = 3)	1917–5178
3. Storm water reduction	922 (<i>n</i> = 6)	615–2540
4. Energy savings/temperature regulation	1412 (<i>n</i> = 4)	34–1908
5. Recreation and other amenity services	6325 (<i>n</i> = 2)	2133–10 517
6. Positive health effects	18 870 (<i>n</i> = 1)	N/A
Total (excl. health effects and carbon storage)	9701 US\$/ha/year	3212–17 772

* See ESM for details.



Towards an
EU Research and Innovation policy agenda for
**Nature-Based Solutions &
Re-Naturing Cities**

*Final Report of the Horizon 2020
Expert Group on 'Nature-Based Solutions
and Re-Naturing Cities'
(full version)*



120 million € invested in
demonstration projects -
starting 2017

Questions

- Are we putting too much hope in that living systems will provide the needed solutions?
- How do we develop mechanisms for “framed innovations” of hybrid ecological-technological systems with strong social and equity dimensions? (EU Innovation Policy Initiative).

Bird, W. and van den Bosch, M (eds). 2018. Nature and Public Health. Oxford University Press

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