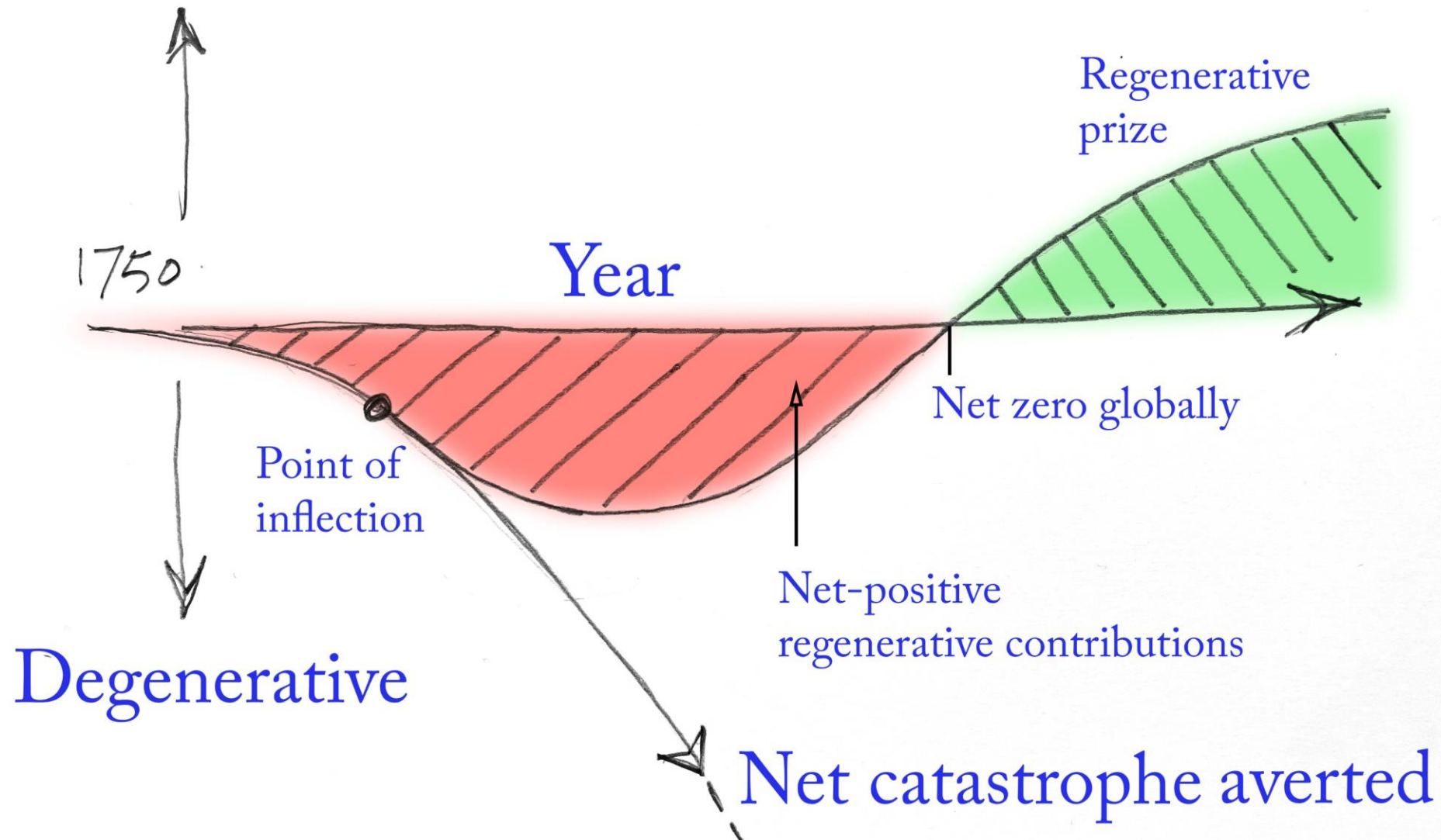


Decarbonising the built environment

Chris Wise FREng
Expedition and the Useful Simple Trust
1851 Royal Commissioner

Regenerative



Systems integration



Design occupancy for office building with 16 floors and 30,000m² office area
Calculations are approximate to illustrate variation between disciplines.

Ventilation

3,000 people



BSRIA Rules of Thumb Guidelines for Building Services 5th Edition, Table 3

10m² per person = 3,000 people

Space Planning

3,750 people



BCO Specification for Offices, 2014

High Density = 8m² per person = 3,750 people

Low Density = 13m² per person = 2,308 people

Fire Design

7,500 people



BS 9999:2017 Table 9, Typical Office Floor Space Factors

High Density = 4m² per person = 7,500 people

Low Density = 10m² per person = 3,000 people

Structural Design

85,500 people



BS EN 1990, BS EN 1991-1-1

Ultimate Limit State, $\gamma_q = 1.5$ (live load partial factor), $\alpha_N = 0.50$ (reduction factor at ground floor column)

$q_k = 3\text{kN/m}^2$ over 95% of floor area (Typical value not including partitions or 5% more heavily loaded areas)

Total load ($\gamma_q \alpha_N q_k A$) = 64MN. Assuming each occupant = 0.75kN = **85,500 people**

Without reduction α_N = 171,000 people

Serviceability Limit State, $\gamma_q = 1.0$ (partial factor for live load), $\alpha_N = 0.5$ (reduction factor for multi-storey)

Total load ($\gamma_q \alpha_N q_k A$) = 43MN. Assuming single occupant 0.75kN = **57,000 people**

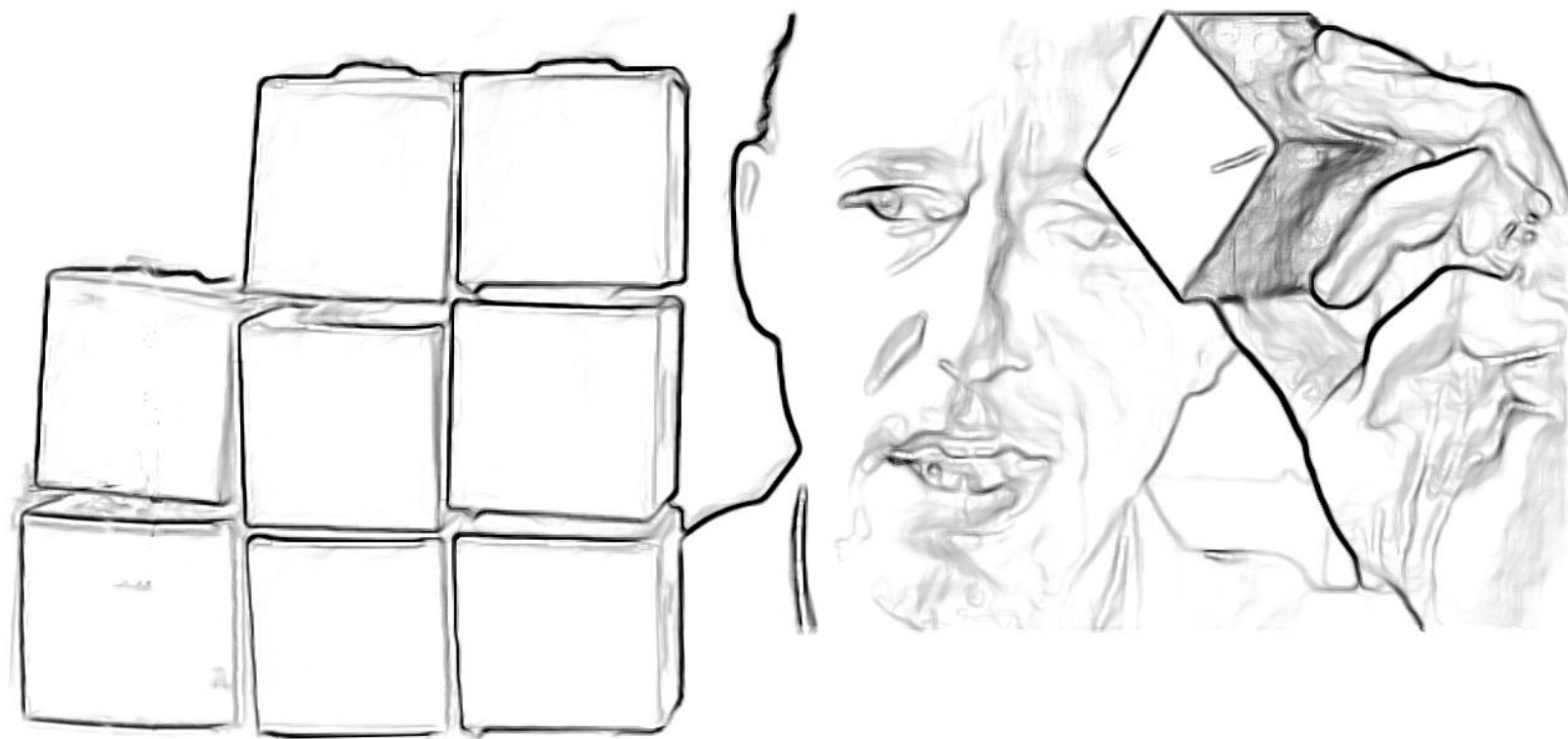
Without reduction α_N = 114,000 people

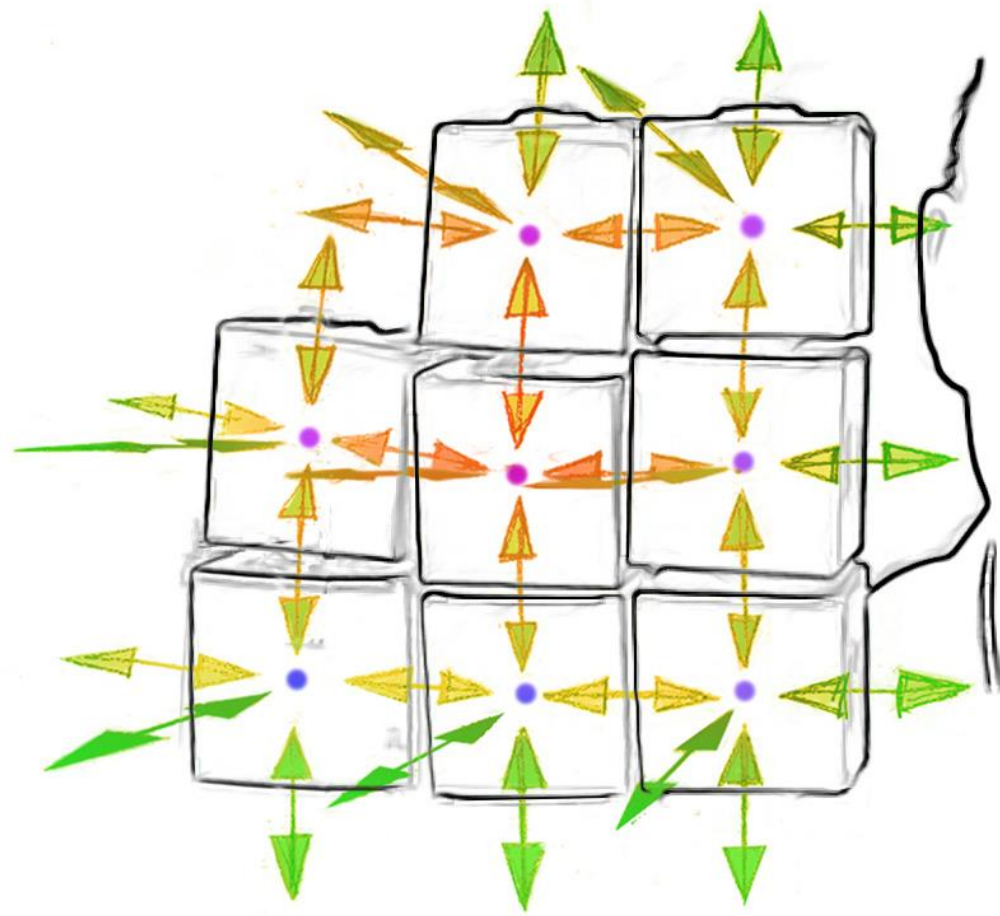
IQ4: What might the benefit be of design code floor loading values being based on data gathered from a systematic global survey of loading levels in buildings?

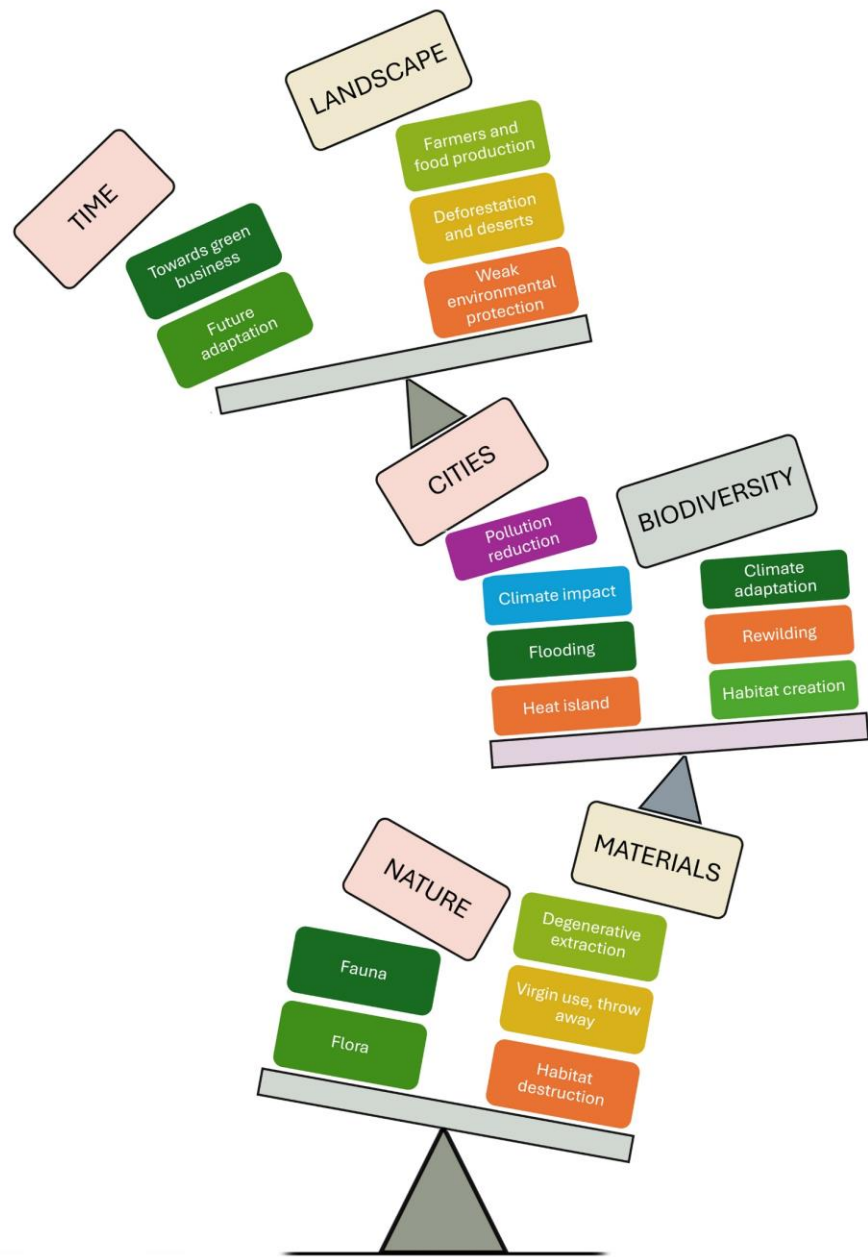
Help answer this, and other "Industry Questions" given in our latest report:

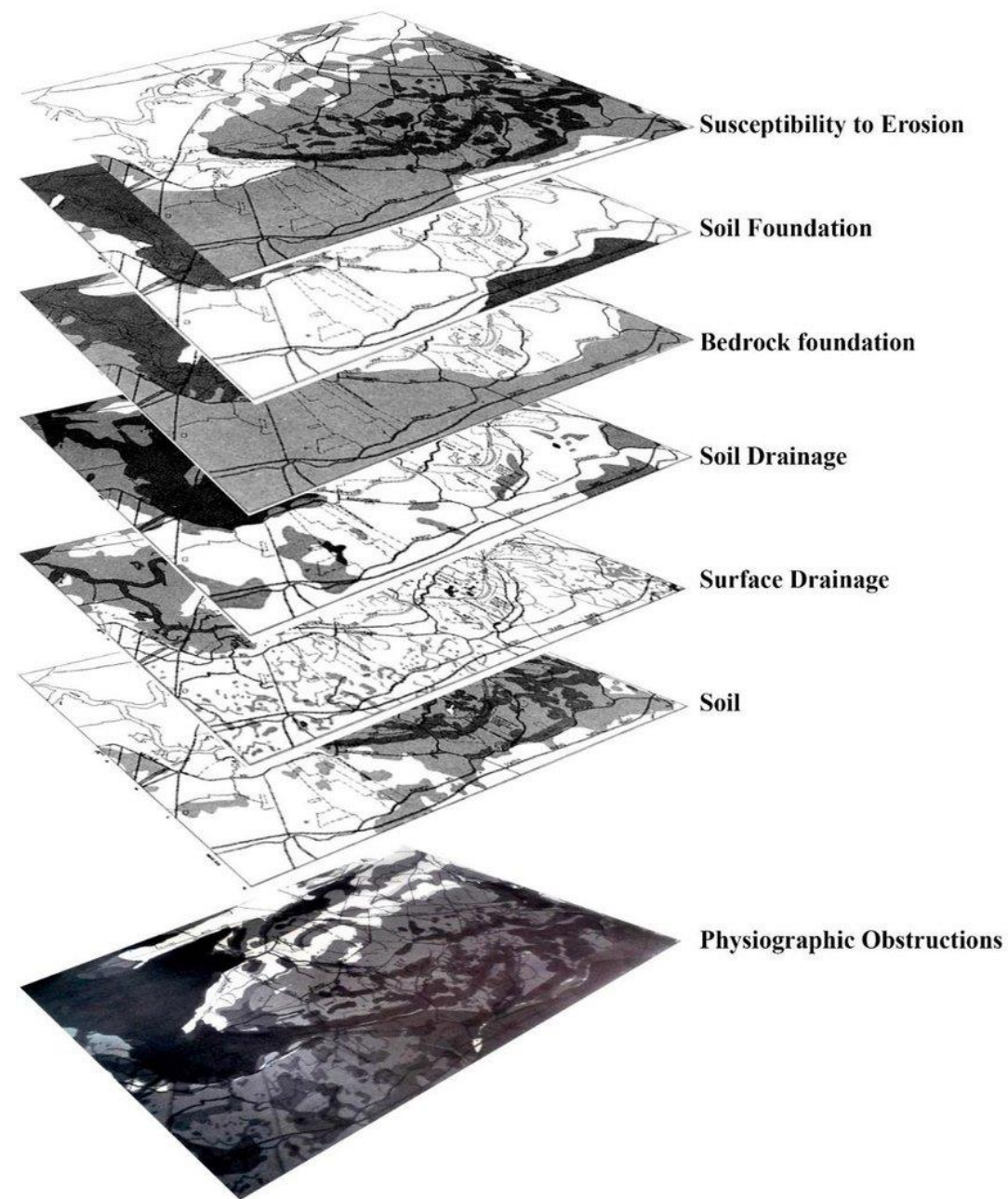
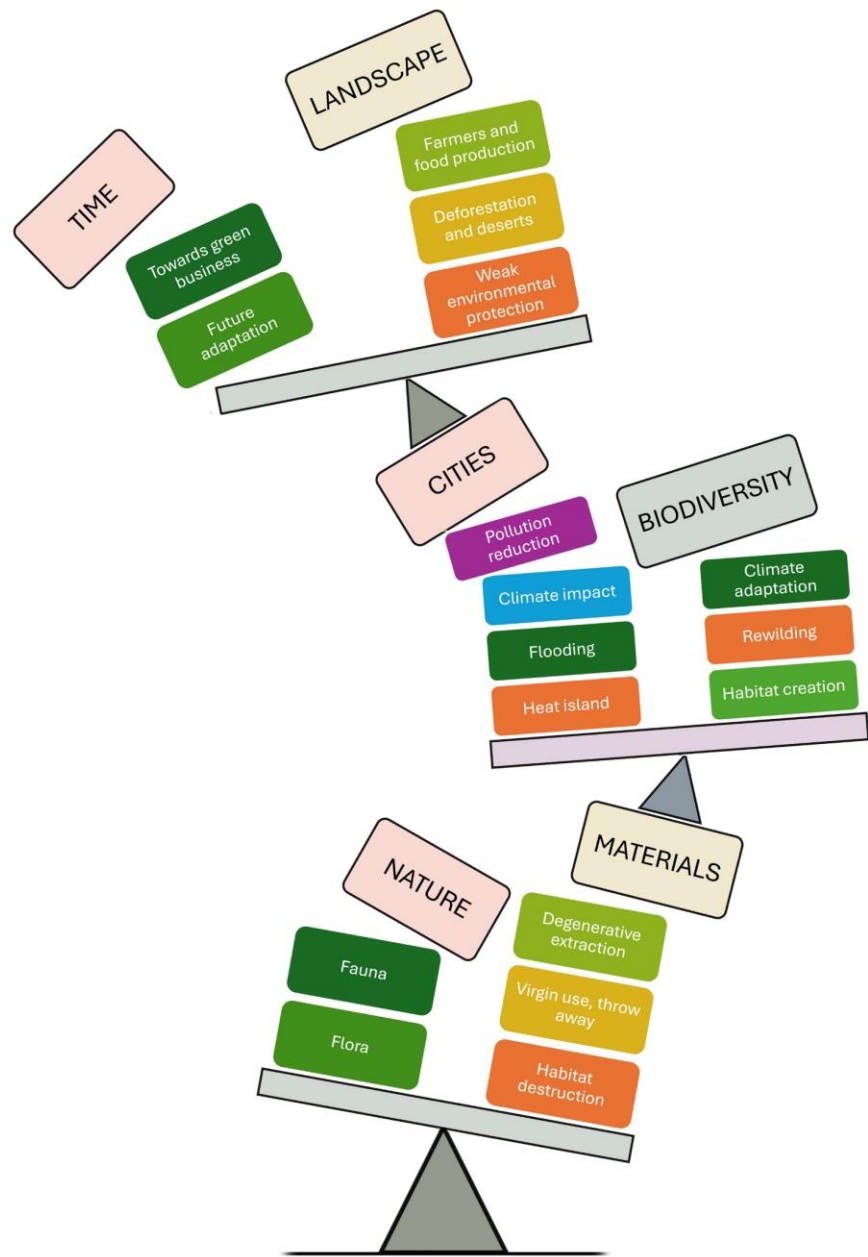
<http://bit.ly/meiconreport>



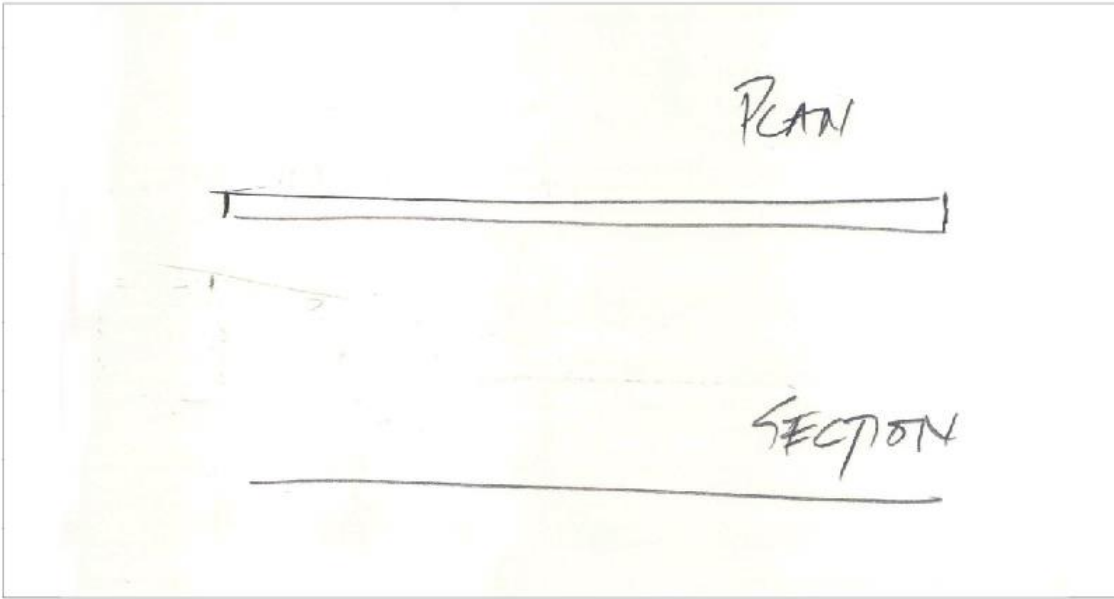




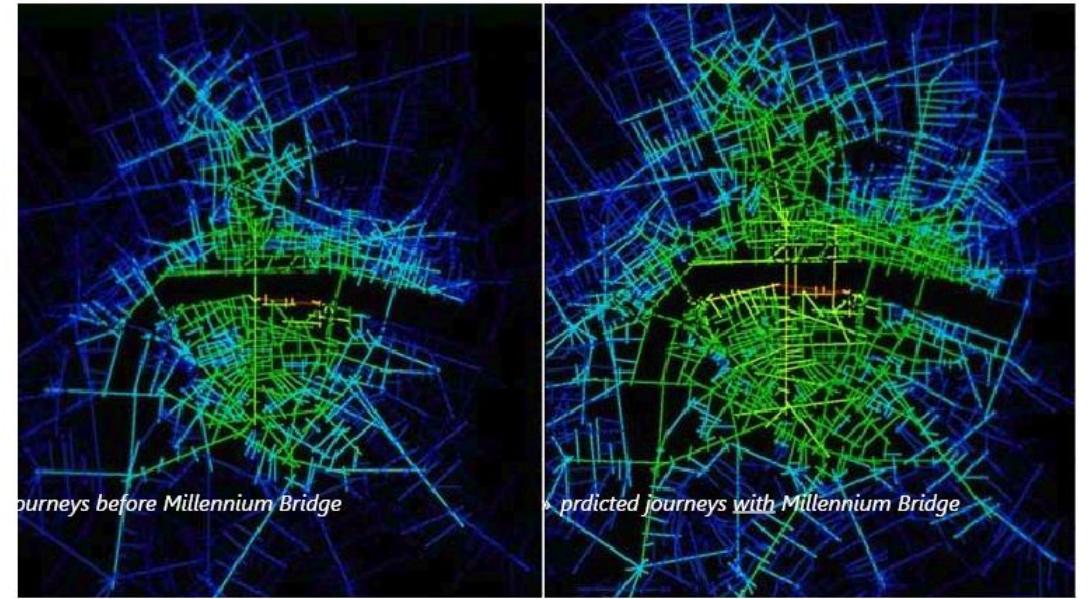




Connected



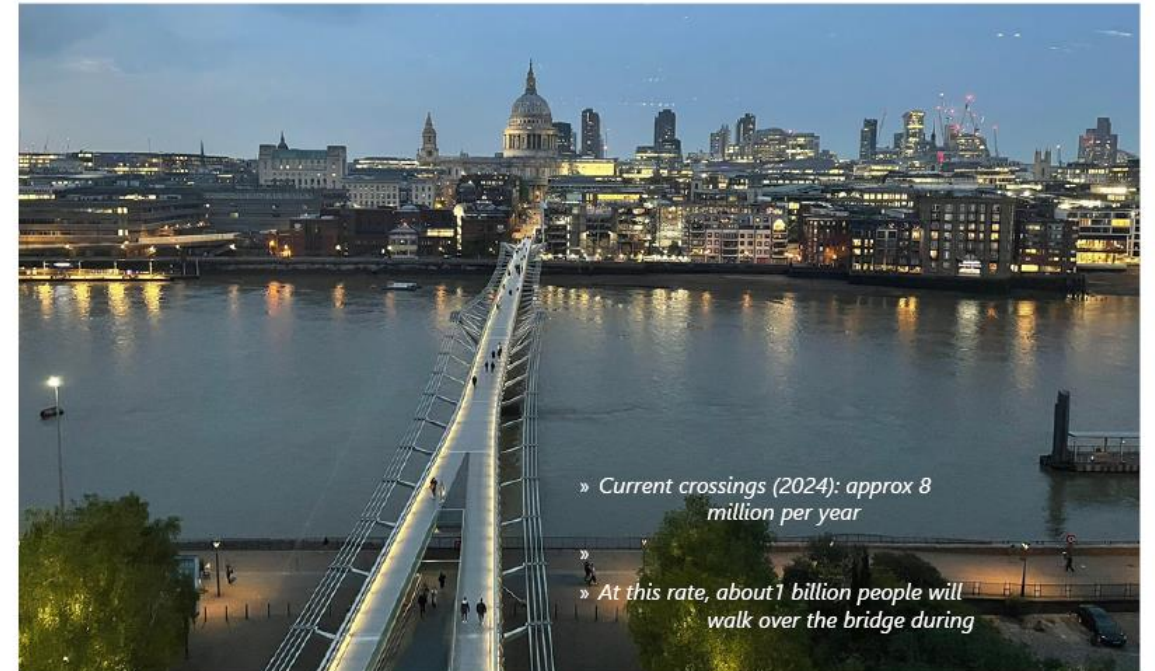
» Millennium Bridge concept sketch: drawn in Zelda's wine bar; Chris Wise and Roger Ridsdill-Smith at Arup



» Predicted River Thames crossings (1997: Space Syntax)

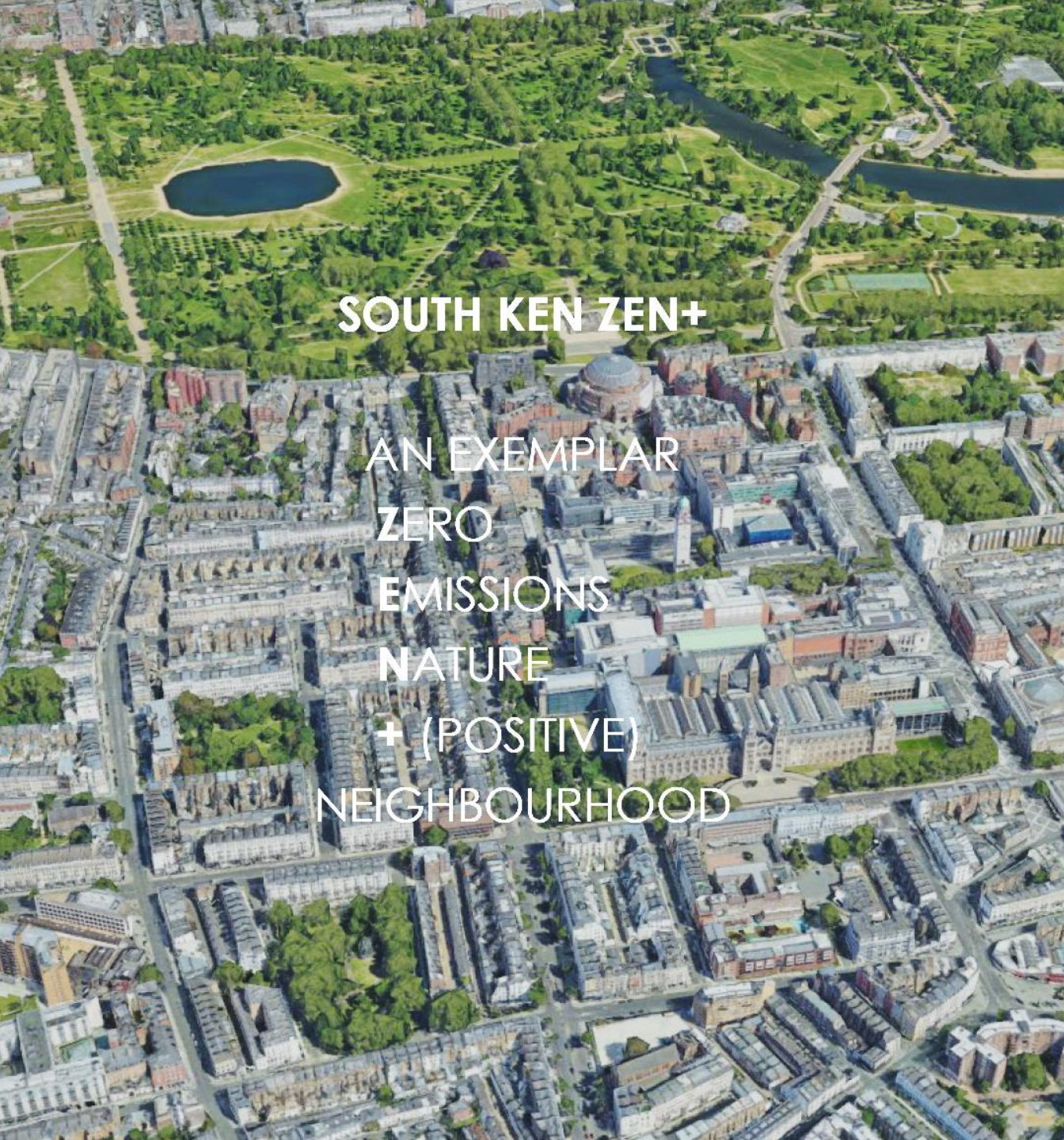


Millennium Bridge: London



» Current crossings (2024): approx 8 million per year

» At this rate, about 1 billion people will walk over the bridge during



SOUTH KEN ZEN+

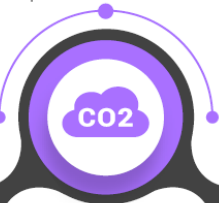
AN EXEMPLAR ZERO EMISSIONS NATURE + (POSITIVE) NEIGHBOURHOOD

KNOWLEDGE, INNOVATION & OUTREACH

The investment in pioneering research and development, application of new products and services and sharing of learnings and best practice to all stakeholders to drive a shared vision and deliver positive change.

NET ZERO

The reduction of green house gas produced by human activity by reducing emissions and delivering methods of absorbing carbon dioxide from the atmosphere to address climate change.



NATURE POSITIVE

The halting and reversal of the degradation of nature to support the recovery of biodiversity, species and ecosystems.



SOUTH
KENSINGTON
ZERO EMISSIONS
NATURE POSITIVE
NEIGHBOURHOOD

SUSTAINABLE TRAVEL

The use of low/zero emissions forms of responsible public and private of transportation to reduce GHG emissions.



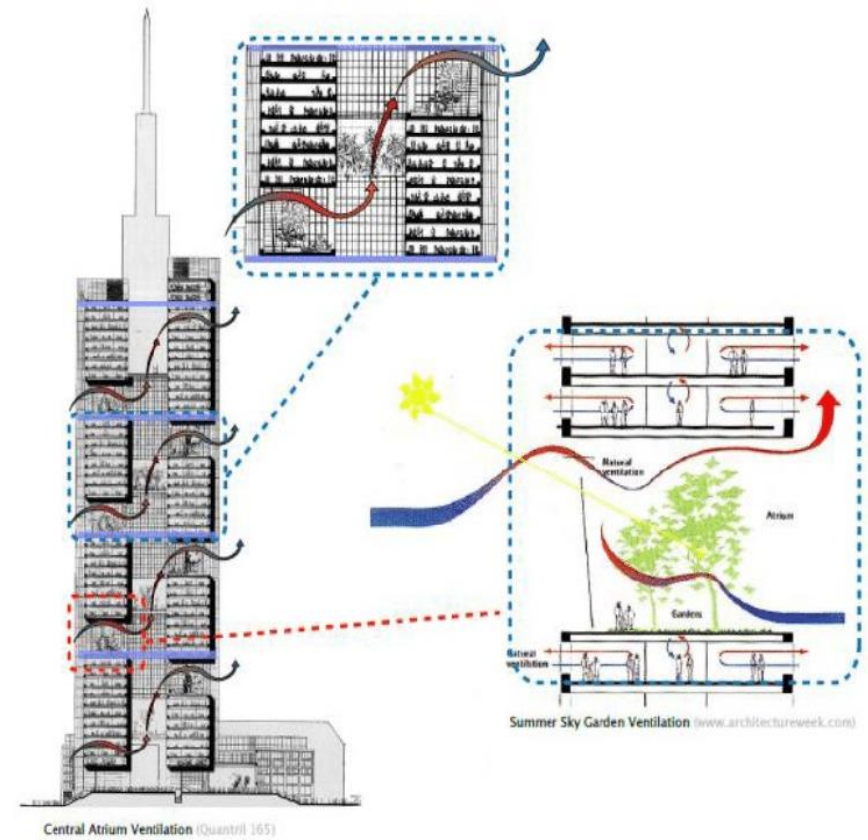
CIRCULAR ECONOMIES

The conservation of all resources through responsible production, consumption, reuse and recovery of products and services to minimise the impacts on and regenerate the natural systems.



South Ken Zen +

Natural



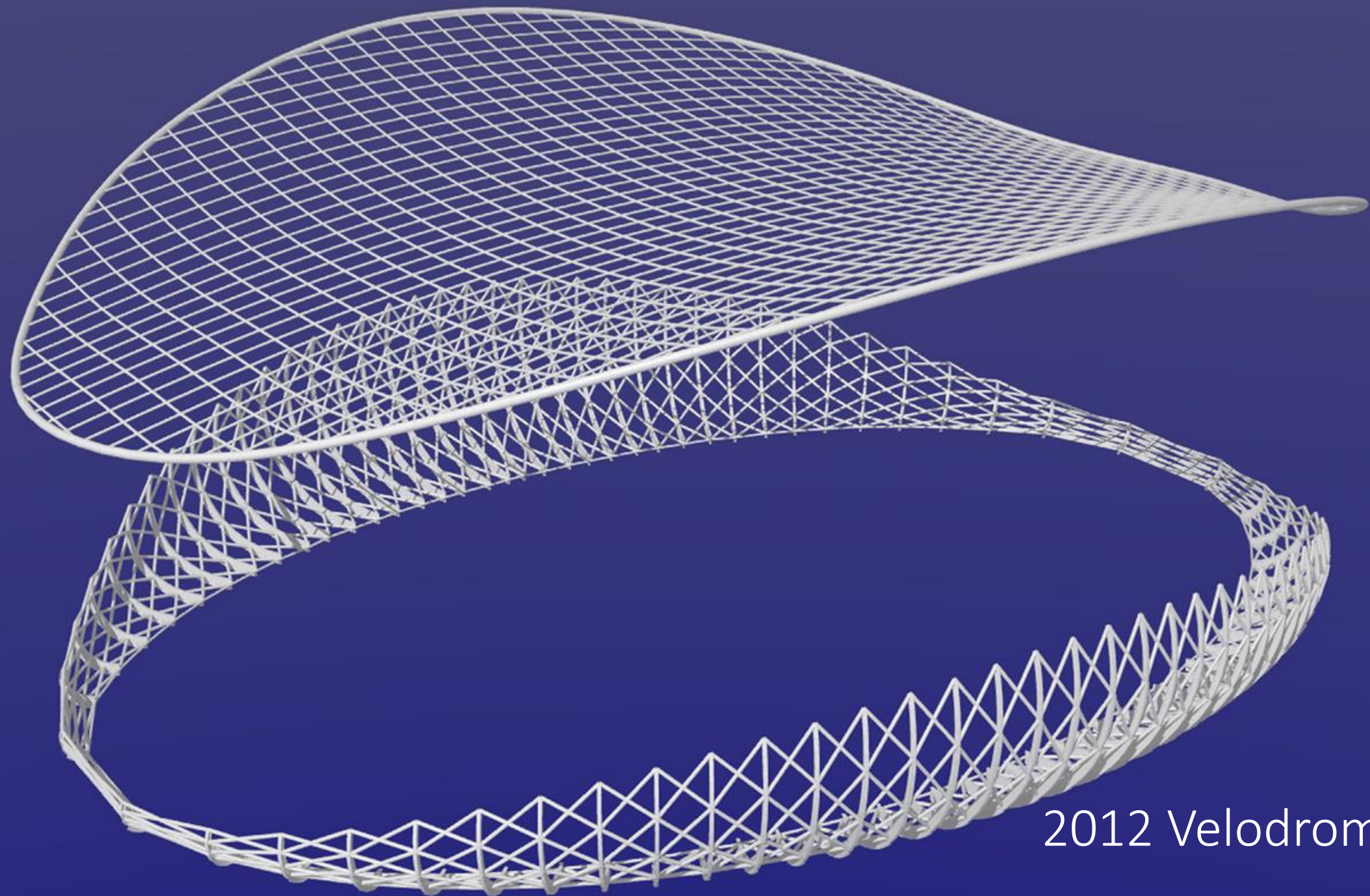
Commerzbank Frankfurt



American Air Museum, Duxford



Lean

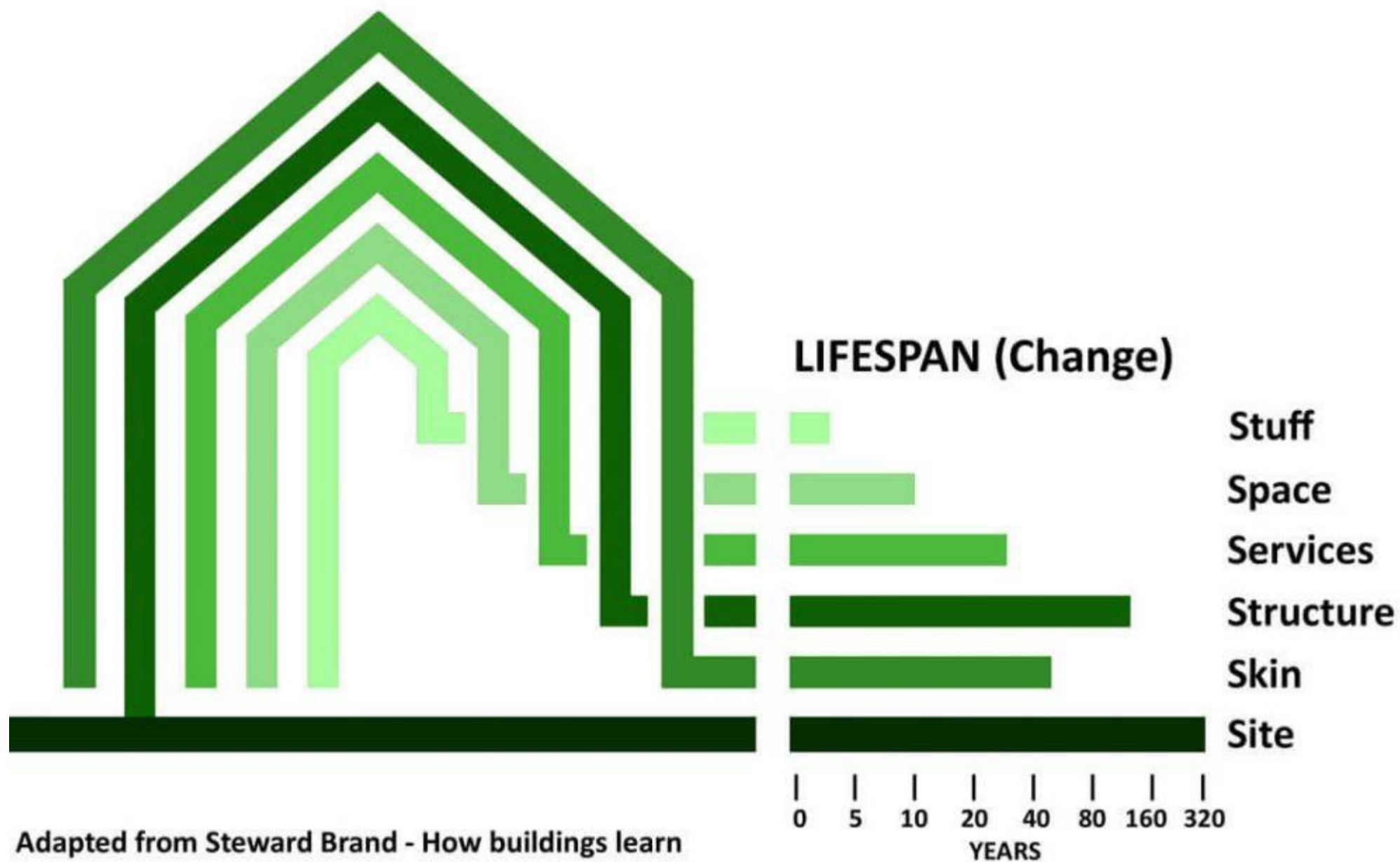


2012 Velodrome





Adaptive

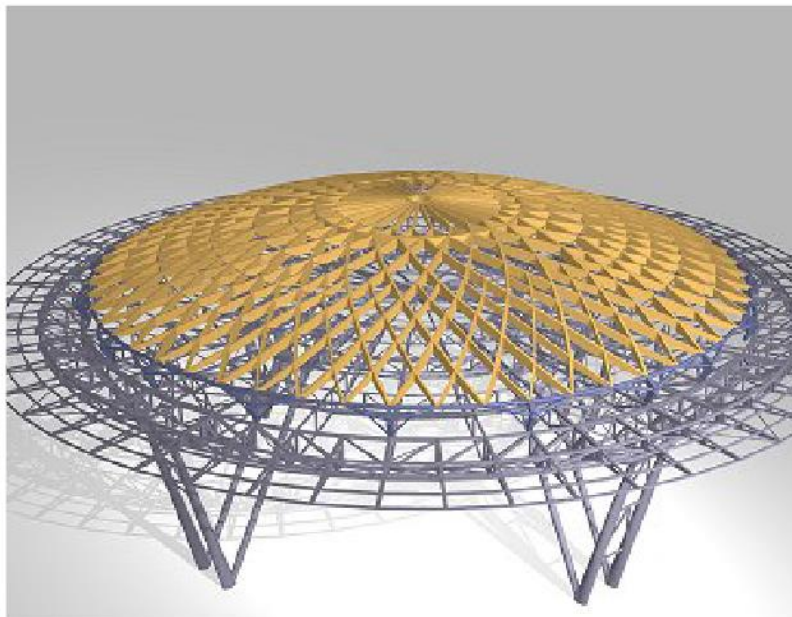




55 Baker Street, London:
13,000 tonnes of carbon sequestered in the 1950's rc frame



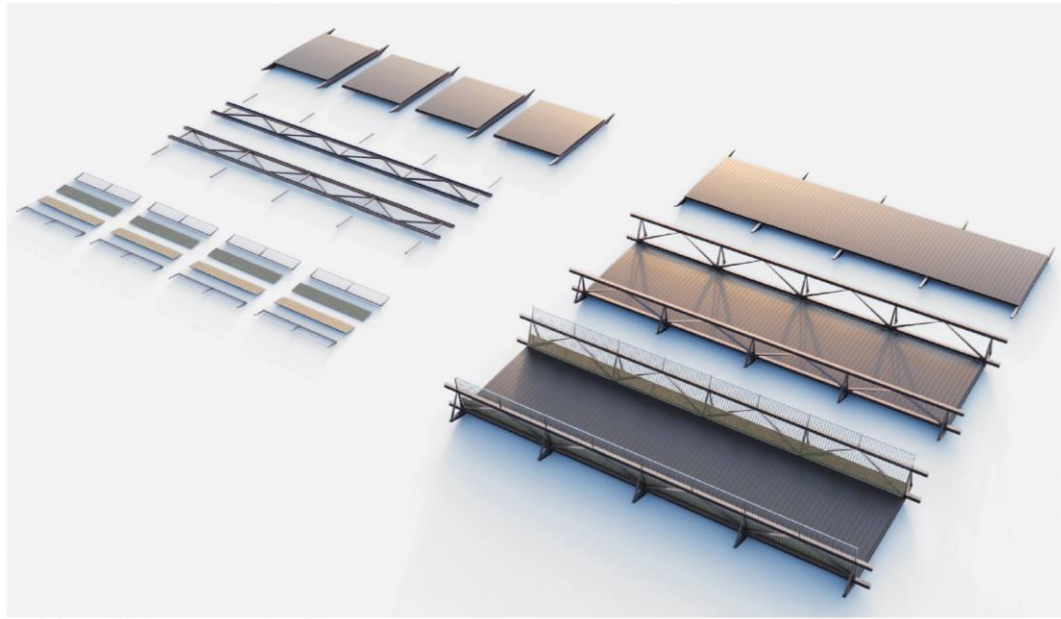
USING



Las Arenas, Barcelona



View looking north - a calm, intuitive and inclusive journey



16m bridge assembly showing factory made modular components



Elevation view - subtly distinct and complimentary to the natural landscape and roadway

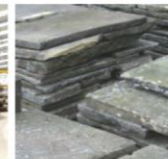
We propose an elegant bridge designed on the regenerative principles of lean start, long life, and circularity.

A delicately robust bridge archetype that is systematically conceived and made: beautiful, long-lasting, quick to build, and economical, with low materials use, low carbon, and high social and environmental benefits compared to traditional bridge forms.

The bridge is designed to be manufactured, not simply constructed, as the product of a high-quality industrial process. This delivers

predictable, repeatable, highly accurate and efficient manufacture and erection.

We are sensitive participants in a much wider system: delivering social benefit through the reconnection of communities and with employment through the encouragement of local and regional suppliers and manufacturers.



Lean with rescued, recycled and locally sourced materials as priority



A++ for whole bridge

Nearly 100% reclaimed steel: Lower Thames Crossing

Folly ?



600 more London skyscrapers to transform city skyline

Jonathan Pryn Business Editor

LONDON is on course to become a "Manhattan-on-Thames" with almost 600 more planned skyscrapers set to fill gaps in its already crowded skyline, according to a new report.

The 10th annual tall buildings report from think-tank New London Architecture (NLA) finds that there are 583 tall buildings of more than 20 storeys "queuing up in the pipeline".

That is more than twice as many as the 270 built over the past decade, according to the NLA. There have been 71 skyscrapers completed in Tower Hamlets alone over that time, more than in any other borough.

The report, London's Growing Up: A Decade of Building Tall, says the rapid change to the capital's once predominantly low-rise skyline "has been fuelled by burgeoning demand for office and residential space, overseas investment and a supportive planning environment".

The NLA's co-founder Peter Murray, said: "Tall buildings have changed the

MAN THE BARRIER! FLOOD WALL TO RISE

FLOOD defence walls through London will need to be half a metre higher in the future to protect against climate change, officials said as they marked the 40th anniversary of the Thames Barrier.

The barrier, officially opened by the late Queen on May 8 1984, and operated by the Environment Agency, was designed to protect London from flooding until 2030, but the "sleeping giant" is now expected to function until 2070. Since its construction, it has been closed 221 times to prevent flooding of the capital, working with other flood defences along the Thames to protect 1.42 million people, residential property worth £321 billion, hundreds of schools, hospitals, railway and train stations, and four World Heritage sites.

But with sea levels expected to rise by a metre by 2100 along with intense storms driven by climate change, officials say greater defences against flooding will be needed in the coming decades.

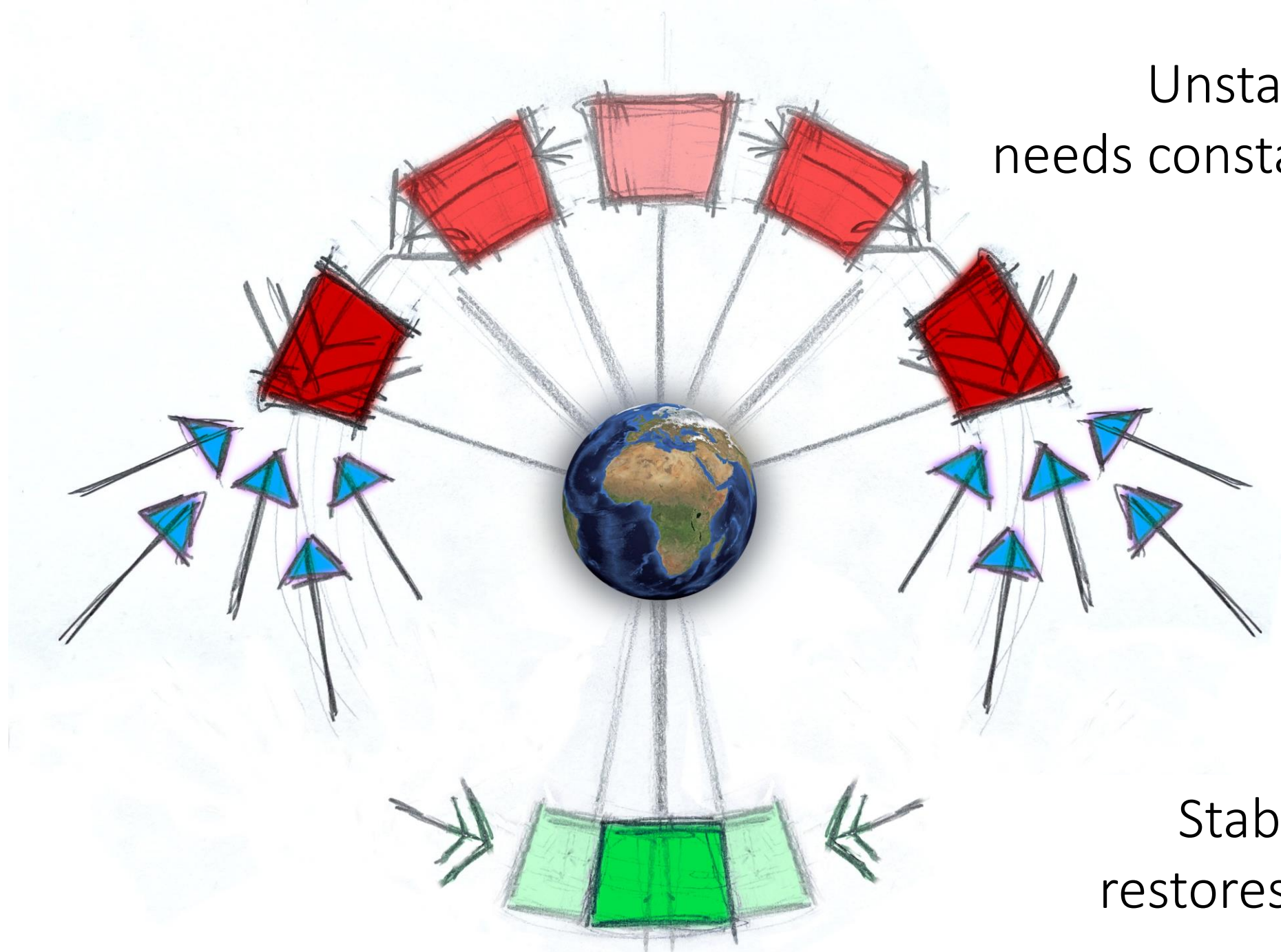
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Equilibrium

Unstable:
needs constant energy



Stable:
restores itself

