

Trees & Design Action Group

Understanding the value & fragility of soils

Protecting soils through ecologically
guided project implementation
starts with planning & design

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founder of studio engleback

World Soils Day - December 5th

An estimated 75% of Earth's land surface has been degraded by human activities costing more than 10% of annual global gross product

<https://www.nhm.ac.uk/discover/soil-degradation.html>

Code Red for humanity!



Human society under urgent threat from loss of Earth's natural life

Scientists reveal 1 million species at risk of extinction in damning UN report

- Editor's pick: best of 2019. We're bringing back some of our favorite stories of the past year. [Support the Guardian's journalism in 2020](#)



The climate and biodiversity emergencies are interlinked and need addressing together

Climate Change & Biodiversity Loss

“The next few years are probably the most important in our history”

Debra Roberts, Co-Chair of IPCC Working Group II

“The loss of biodiversity is a silent killer”

Cristiana Paşca Palmer, executive secretary of the UN Convention on Biological Diversity

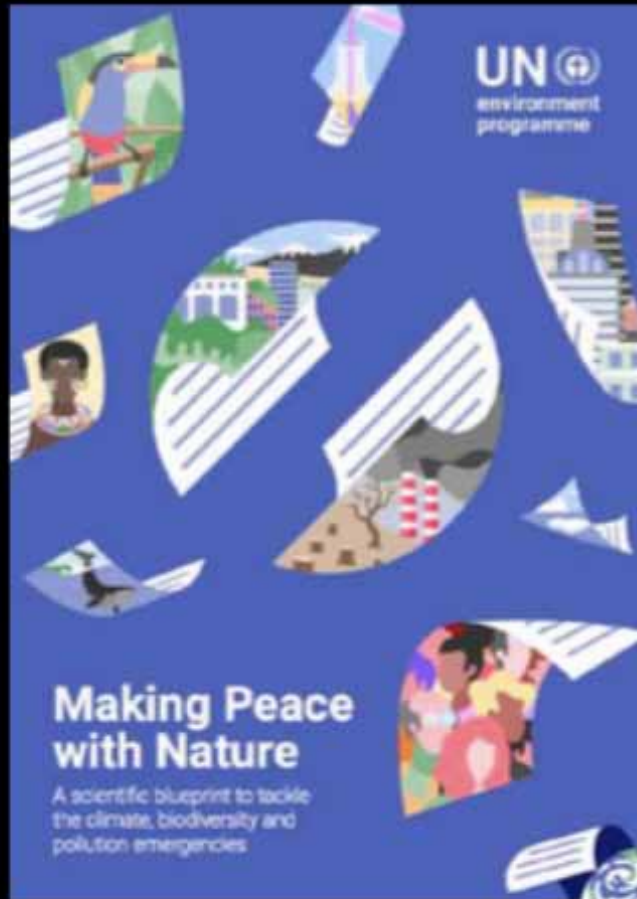


UK Landscape
Architects Declare
Climate &
Biodiversity
Emergency

12 principles include:

- **Advocate faster change to resilient regenerative design**
- **Adoption of whole systems approach to landscape design**
- **Mitigation, adaptation & resilience-building as primary tools**
- **Sharing knowledge**

Making Peace with Nature



- **Biodiversity Loss Emergency**
- **Climate Change Emergency**
- **Pollution Emergency**

“Earth’s environmental emergencies & human well-being need to be addressed together to achieve sustainability.”

Cities - complex socio-ecological systems

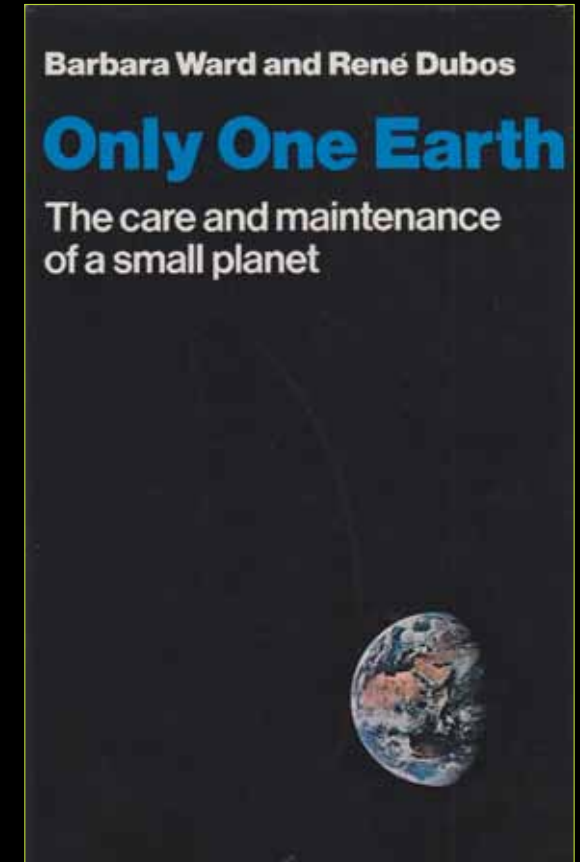
“once we see the relationship between structure & behaviour, we can begin to understand how systems work, what makes them produce poor results, and how to shift them into better behaviour patterns”

Donella Meadows, 'Thinking in Systems' 2008

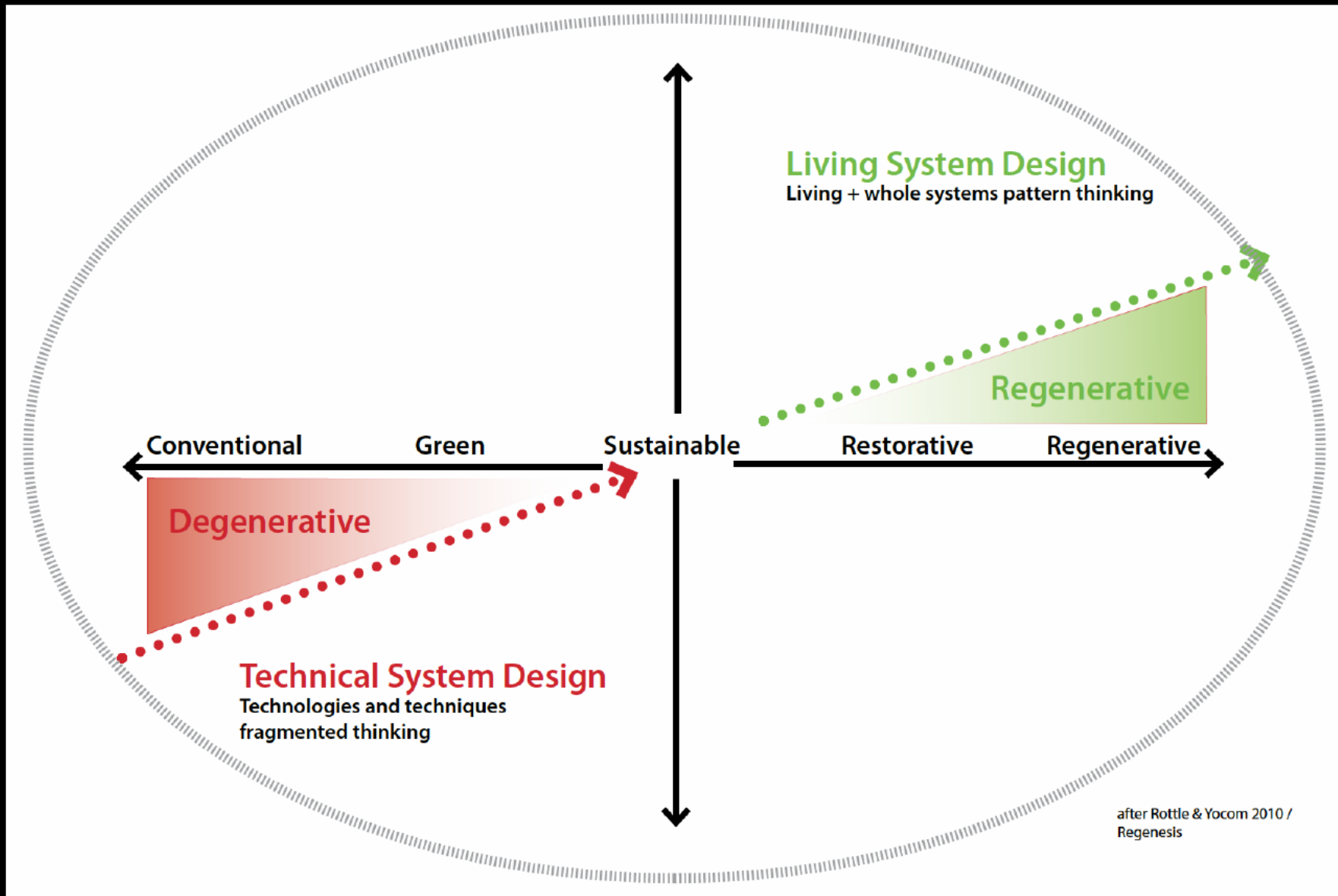
Limits

“there are limits to the amount of manipulation that man can exert upon the natural balances without causing a breakdown in the system”

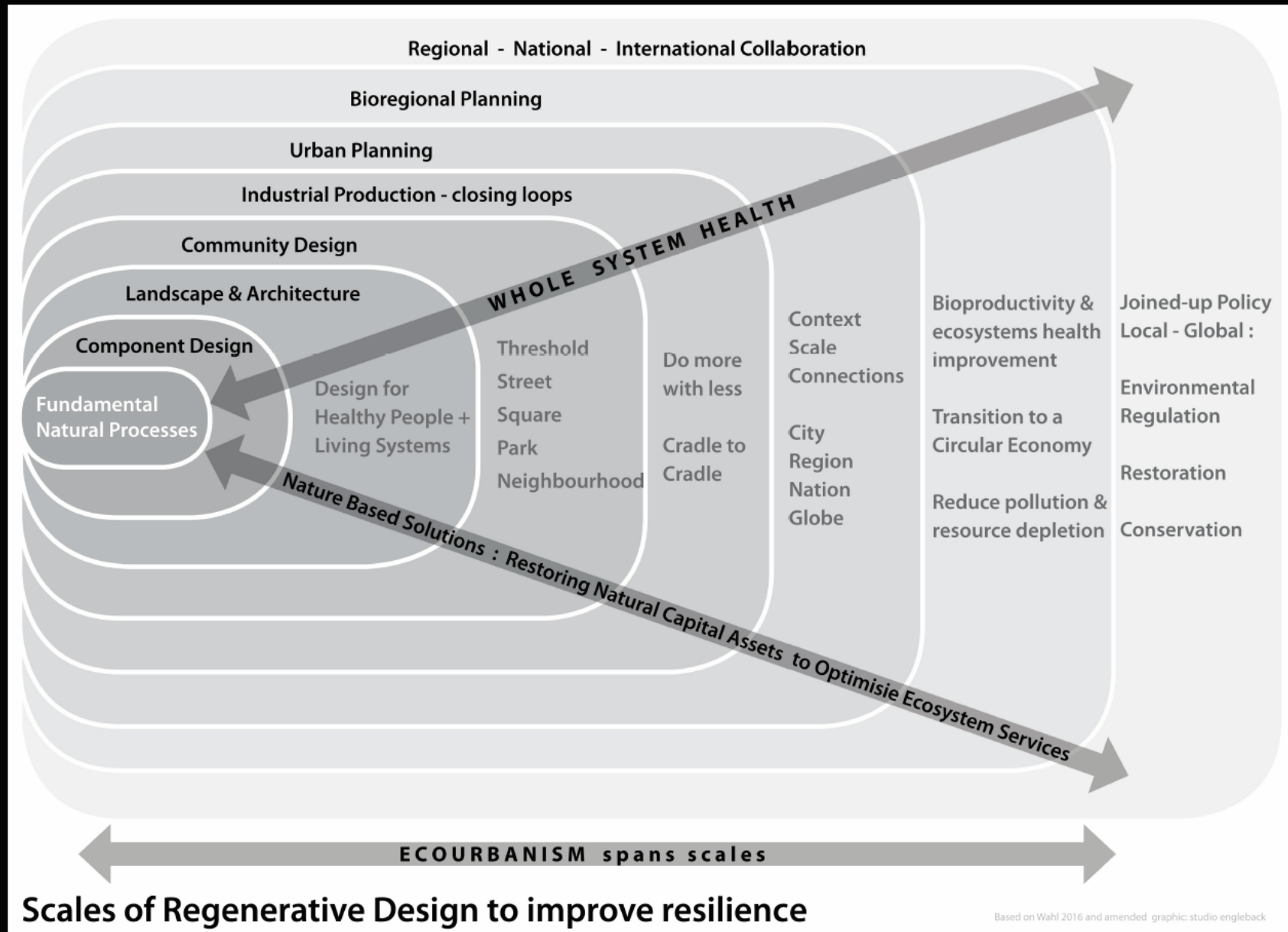
Ward & Dubois, 1972



Living System Design



Scales of Regenerative Design



Fundamental importance of soil

“A nation that destroys its soil destroys itself”

Franklin D. Roosevelt

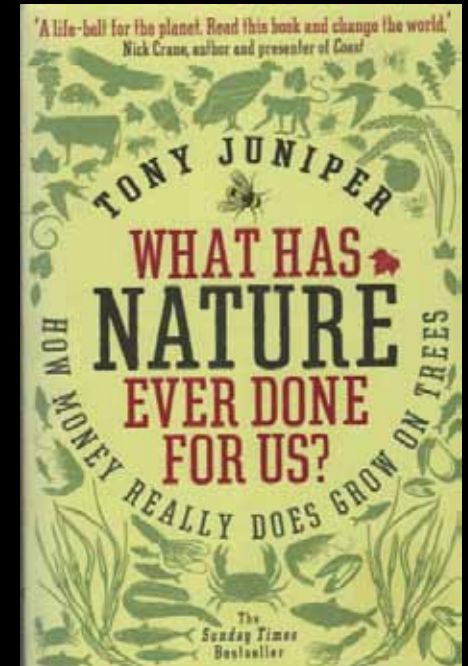


The value of soil

Soil is a cornerstone of human welfare.

The benefits it provides:

- ***food***
- ***fuel***
- ***fodder***
- ***fibre***
- ***fresh water***
- ***carbon capture & storage***



Urban Soil

- **Urbanisation changes soil carbon pools and fluxes**
- **Minimise soil carbon emissions by managing certain soil biophysical parameters**
- **Urban soils respiration gives off a lot of CO₂**
 - **The most from flower beds & lawns reflecting use of fertilizers and mulches**
 - **The least from urban forests**
- **Soil is affected by coupled human / natural eco-systems**

Urban Soil Biomes

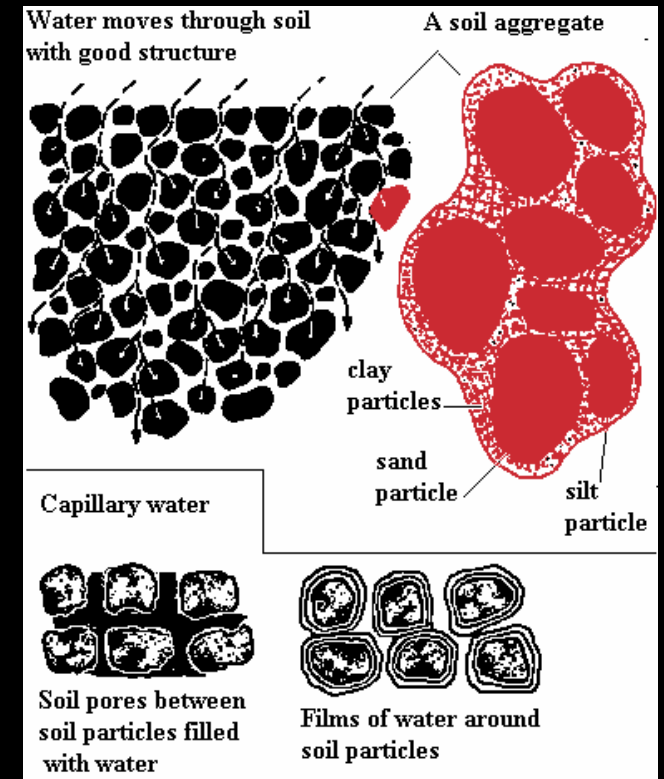


**“Central Park’s soils harboured nearly as many distinct soil microbial phylo-
types & types of soil communities as we found in biomes across the globe”**

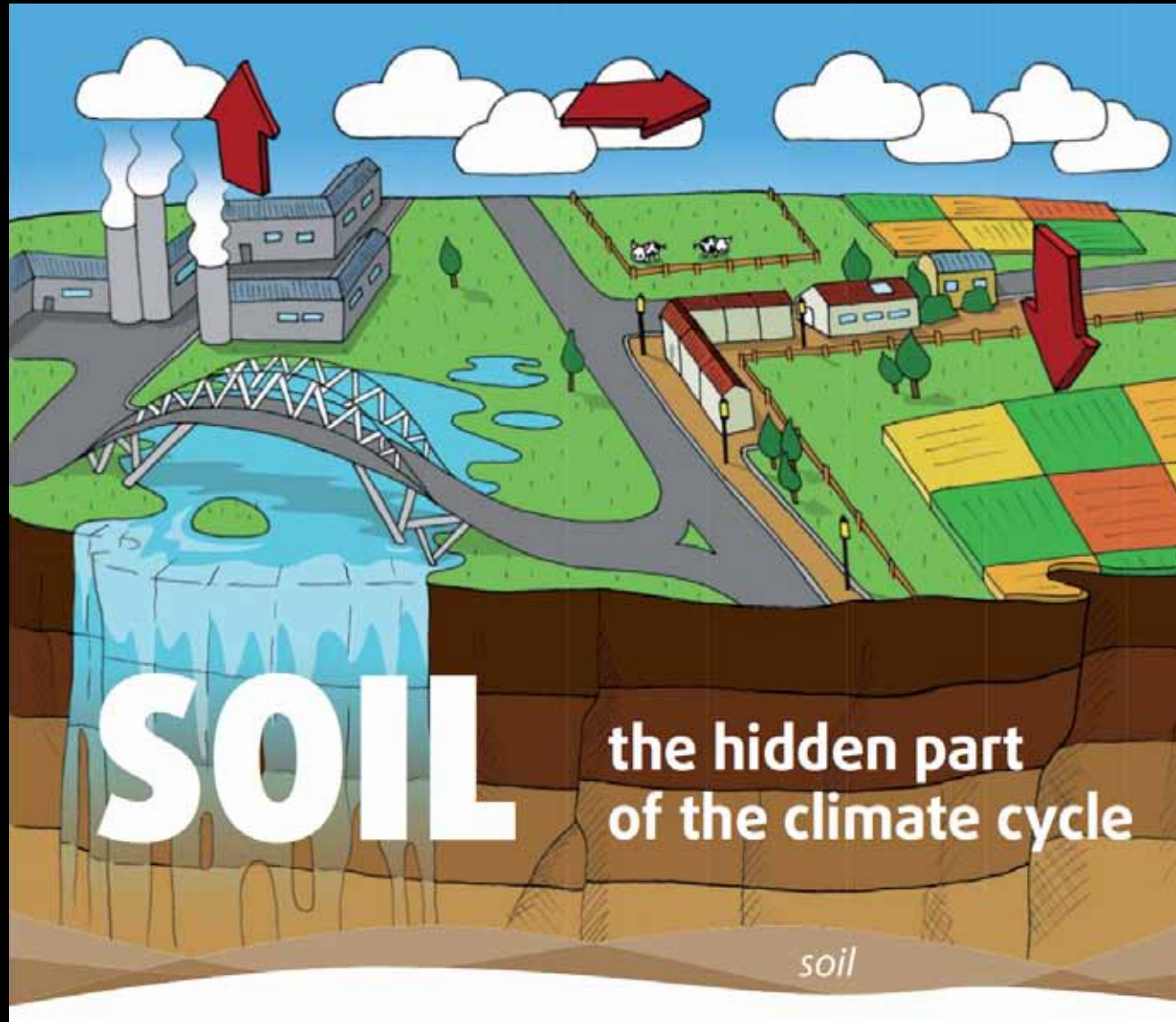
Ramirez et. al 2014

Soil Peds & Pores

- **Roots & soil life need air & water**
- **Soil texture & structure influence ecosystem processes**
- **Soil mineral components aggregated by humus, root exudates & microbial excretions**
- **Soils evolve slowly but easily destroyed**



Climate Change & Soils



Climate Change & Soils

- **Soils hold 4 x more carbon than all plant biomass about 2500 gigatonnes - mostly in peat & permafrost soils**
- **Soil microbial respiration releases 60 pentagrams of carbon per year as CO₂**
- **Global heating induces increases in CO₂ emissions**

Karhu et. al Nature (4.9.2014)

Mineralisation of CO₂ by dolorite



Green Infrastructure Facility, Newcastle University Science Campus

First you need soils.....



First you need soils.....



Sunderland



Newcastle

De-paving is a start...



Reisenfelt, Germany



Freiburg, Germany

Sustainable Drainage needs soil



Glen Coe School SUDS, Portland , USA



Holman 'park' SUDS, Portland, USA

Plants help soil formation

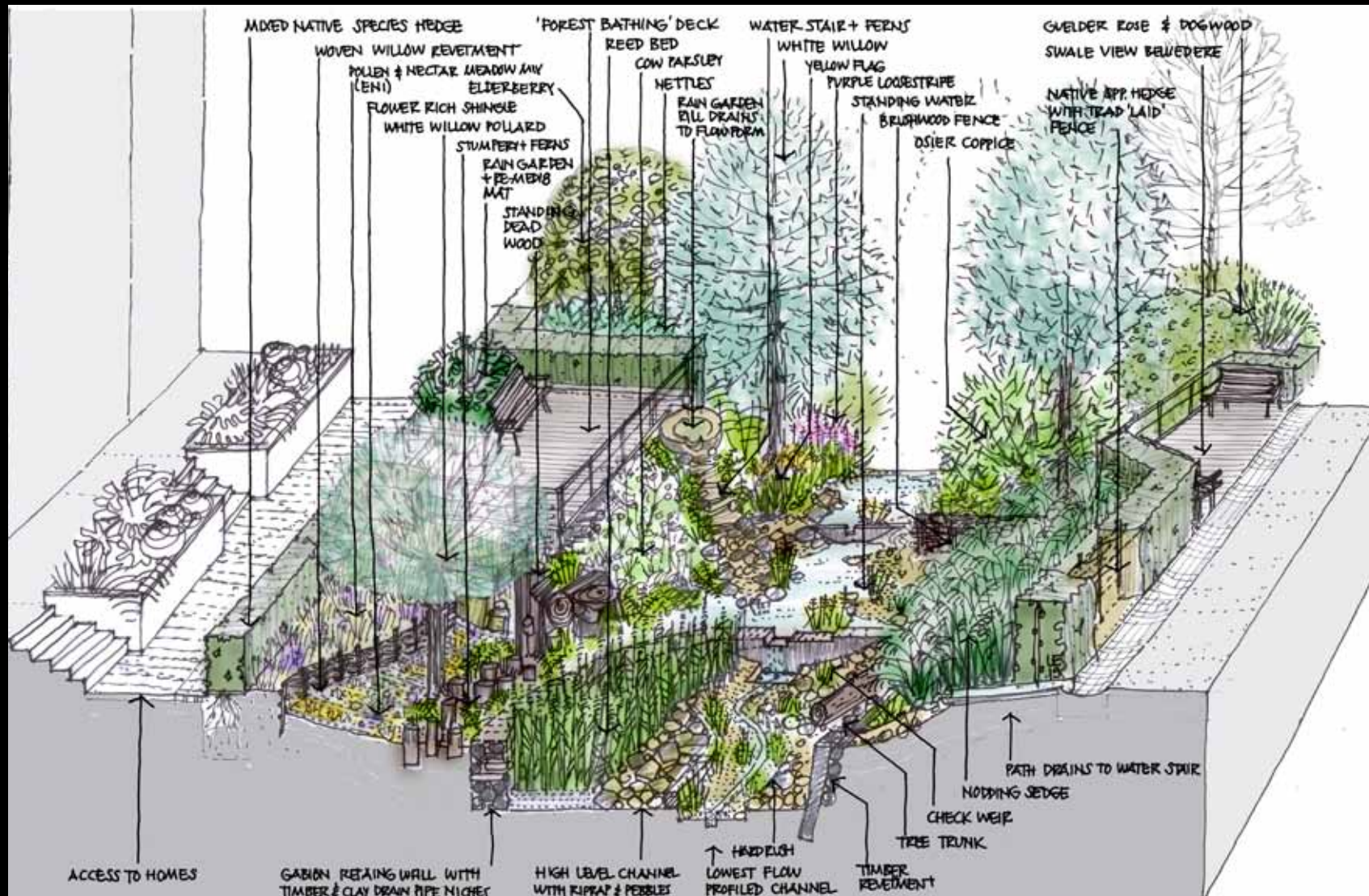


Typical under realised 'storm water lagoon' UK



Native species, at Hobsonville, New Zealand

Prime niches for a richer biodiversity



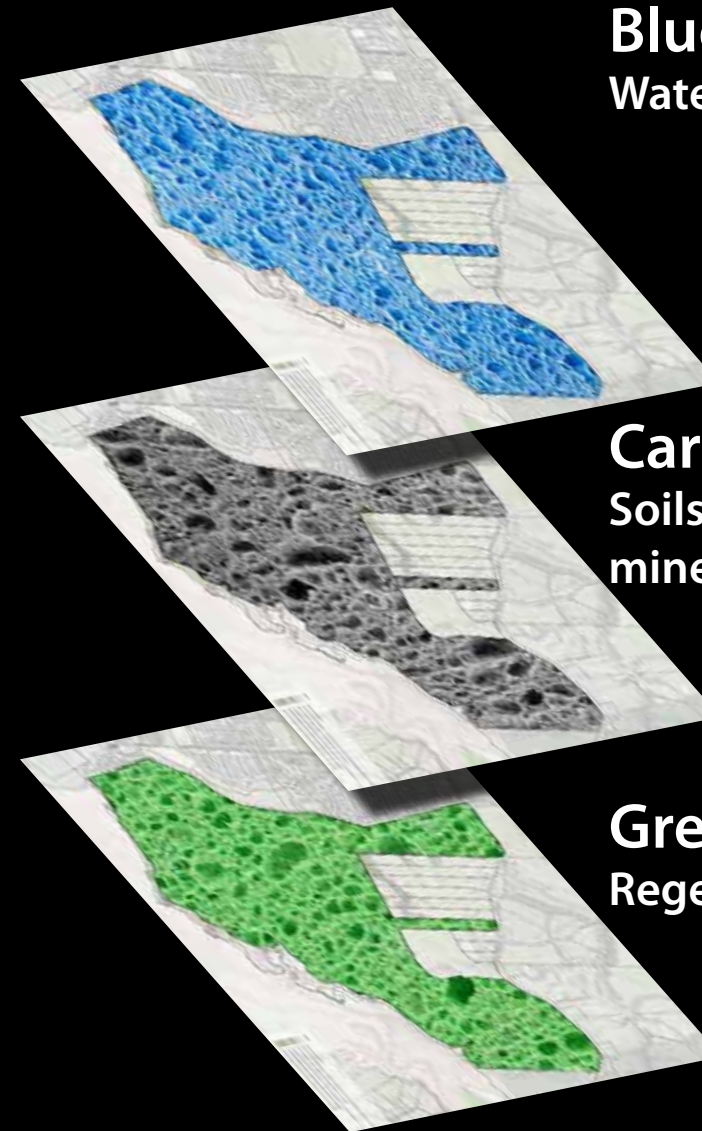
Greenwich Millennium Village, London

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Start with Planning



Urban extension, New Zealand



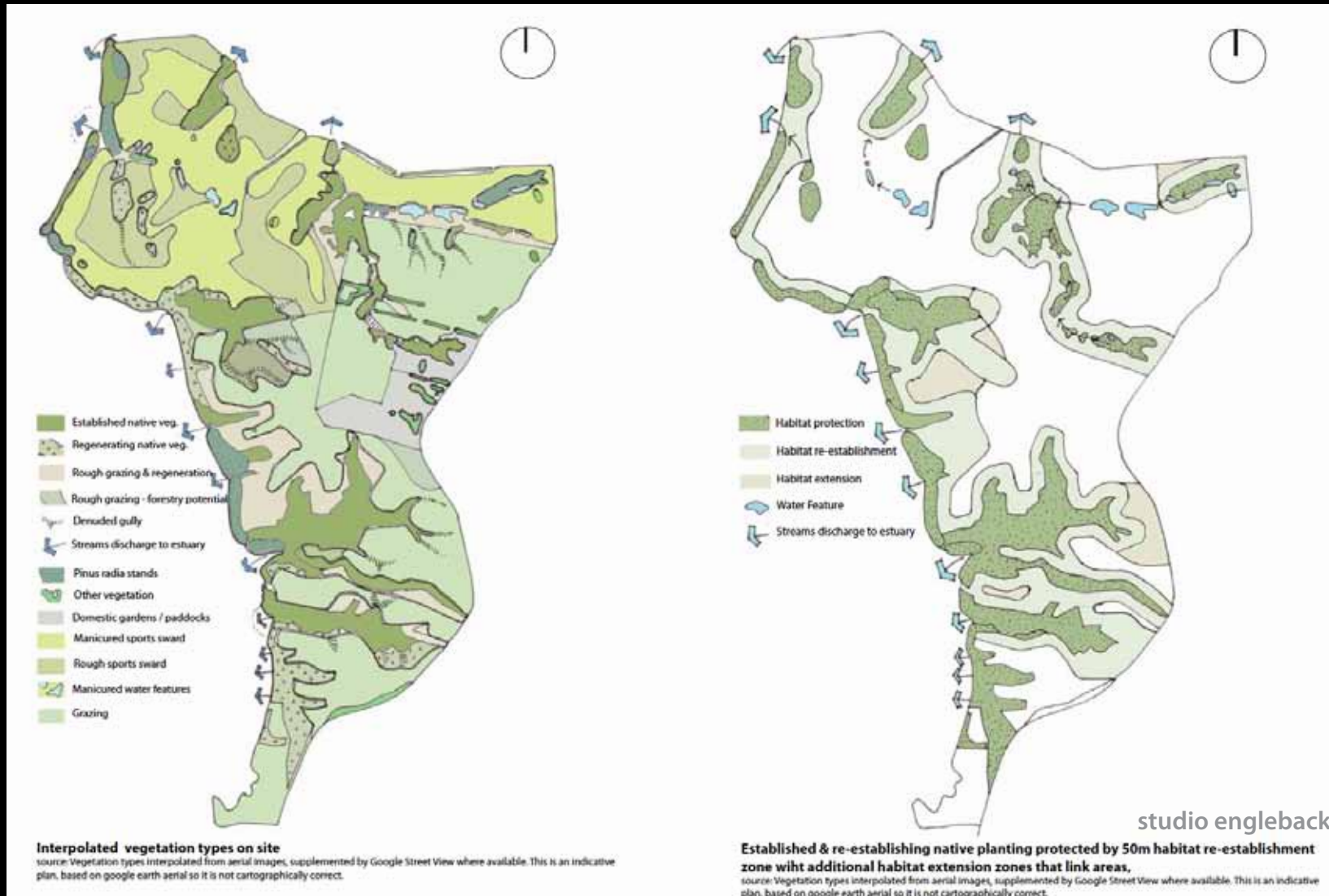
Blue Sponge
Water wise planning

Carbon Sponge
Soils, vegetation,
mineralisation,

Green Sponge
Regenerative design

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Extend existing soil biomes ancient vegetation



Soil microbial activity may extend 50m beyond canopies

Conserve soils & retain using terracing & plants



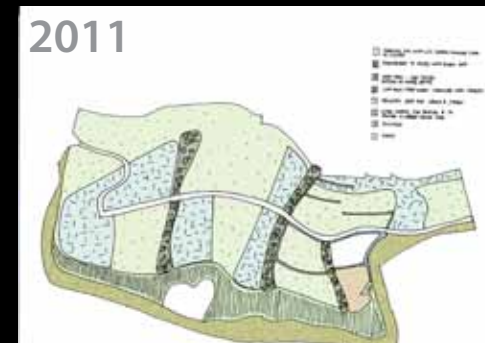
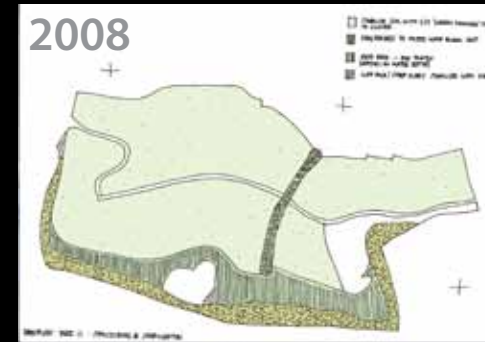
Cactus Green Park, Kigali, Rwanda

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Start to make soils on site 'meanwhile'



Ebbsfleet Garden Village Site in 2008

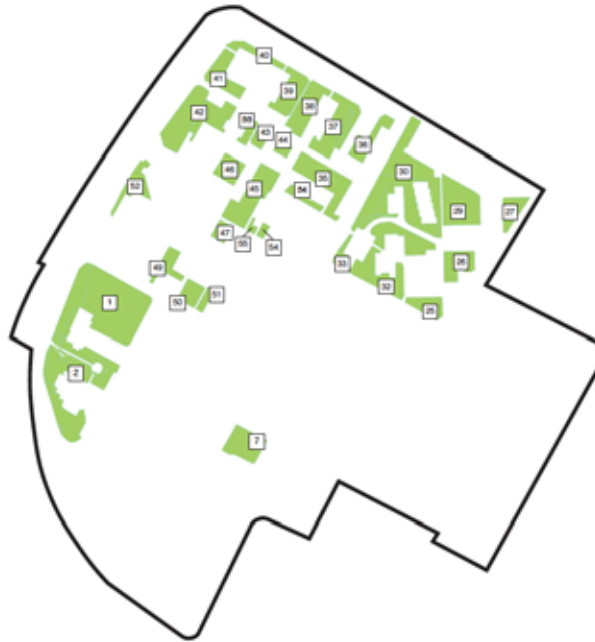


Reclaim Soils for re-use

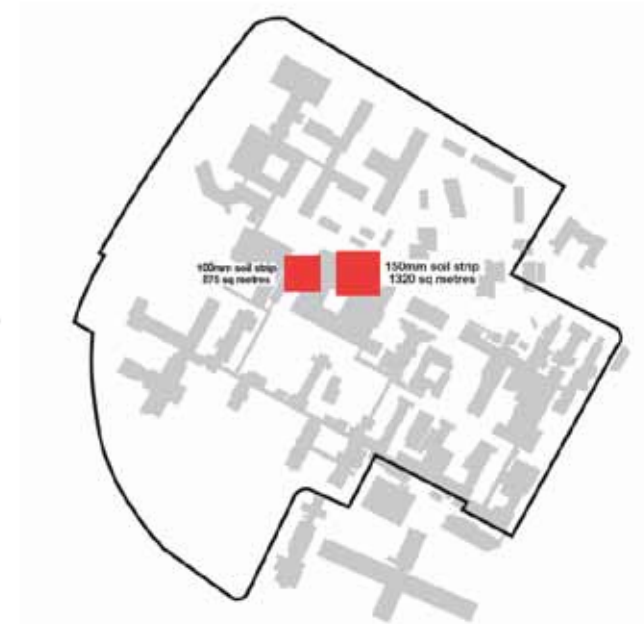
Soil Reclamation Strategy



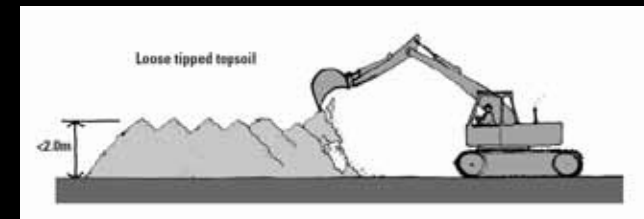
Existing green areas on extended site



Areas available in phase 1 clearance for potential soil strip



Areas required for storage (in piles not greater than 2m high)



Prevent soil loss



Geotextile silt fence combined with straw on a housing site in New Zealand



Temporary Geotextile sand roll protects a rain garden from siltation near a construction site in Hobsonville, New Zealand

silt trap fence location - to be agreed



Location of soil barrier, Cannock Mill,

SE



Geotextile sand bag roll on a vacant site in Portland, Oregon

Light Impact Design



Cannock Mill, Colchester

Think before you develop....



Soils at Applewood, Stroud conserved by limiting development

Limit soil sealing



... and massing soils for tree planting next to porous surfaces

Retrofitting Streets - de-pave



Giving urban trees a chance to flourish



Depave Car Parks



Normandy



Verona, Italy

Let urban soils develop in SUDS Parks



Jardin Abbe Pierre. Paris

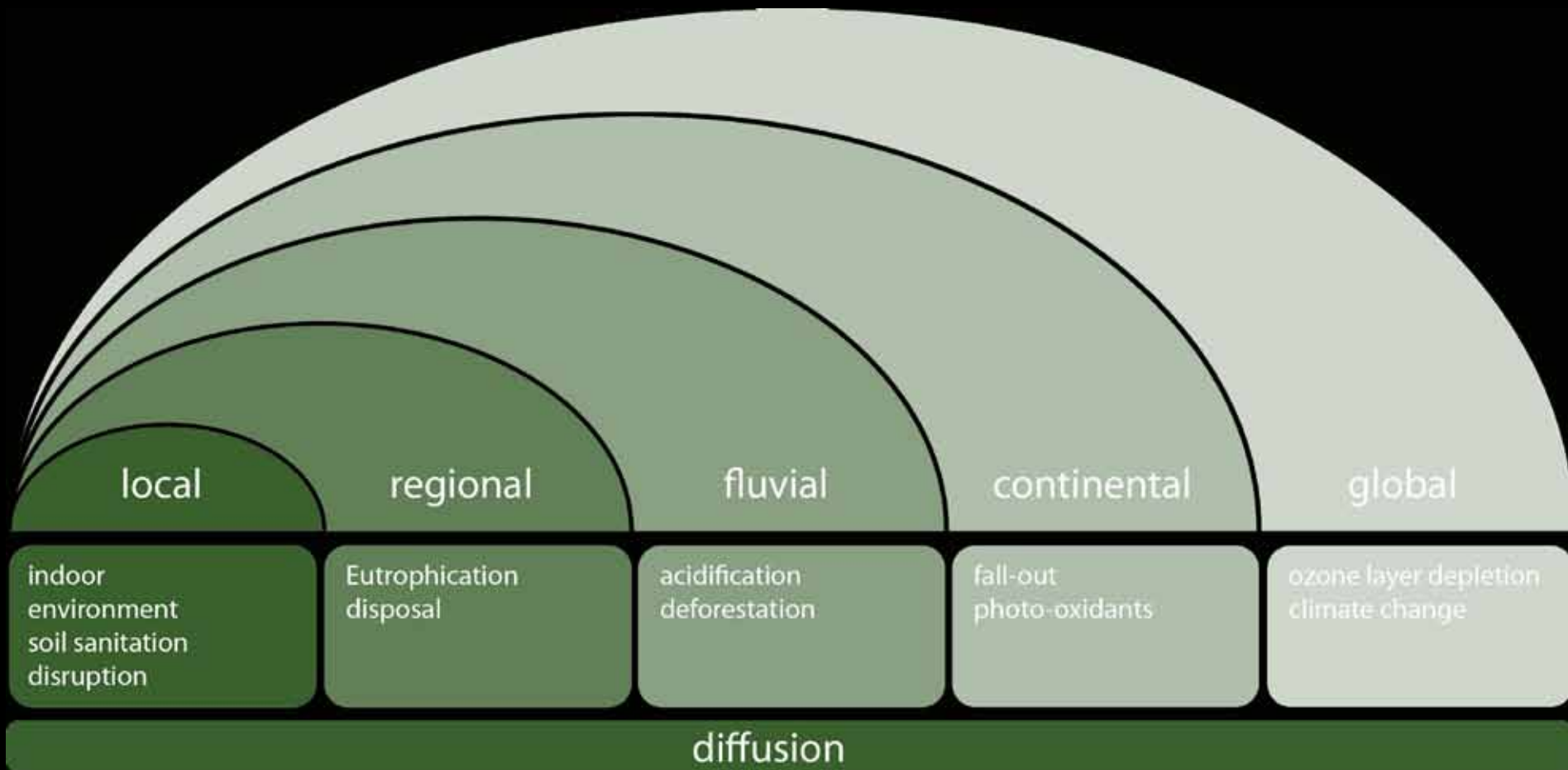


Waitangi Park, Wellington

Regenerative & restorative design is about optimally functioning, resilient ecosystems delivering ecosystem services for better health

This starts with biodiversity functioning soils

The Cumulative effect of actions



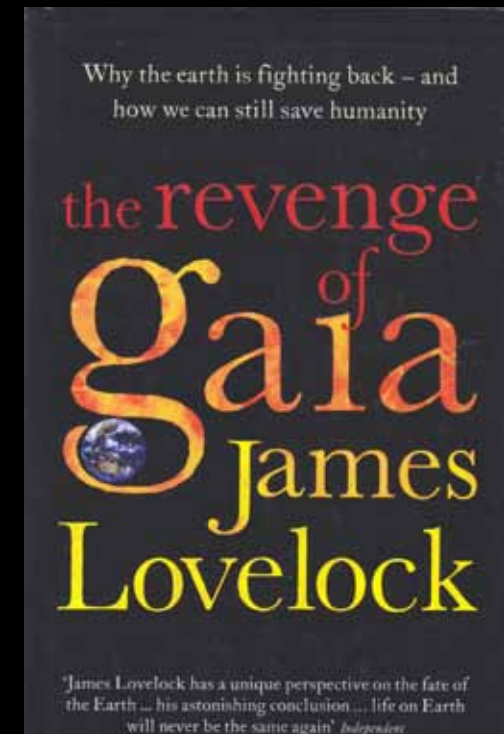
source: carley and christie (1992: 199, Fig. 9.2)
graphic: studio engleback

Solutions begin at the small scale, but they need coordination and vision to be effective

Beyond sustainability - a paradigm shift

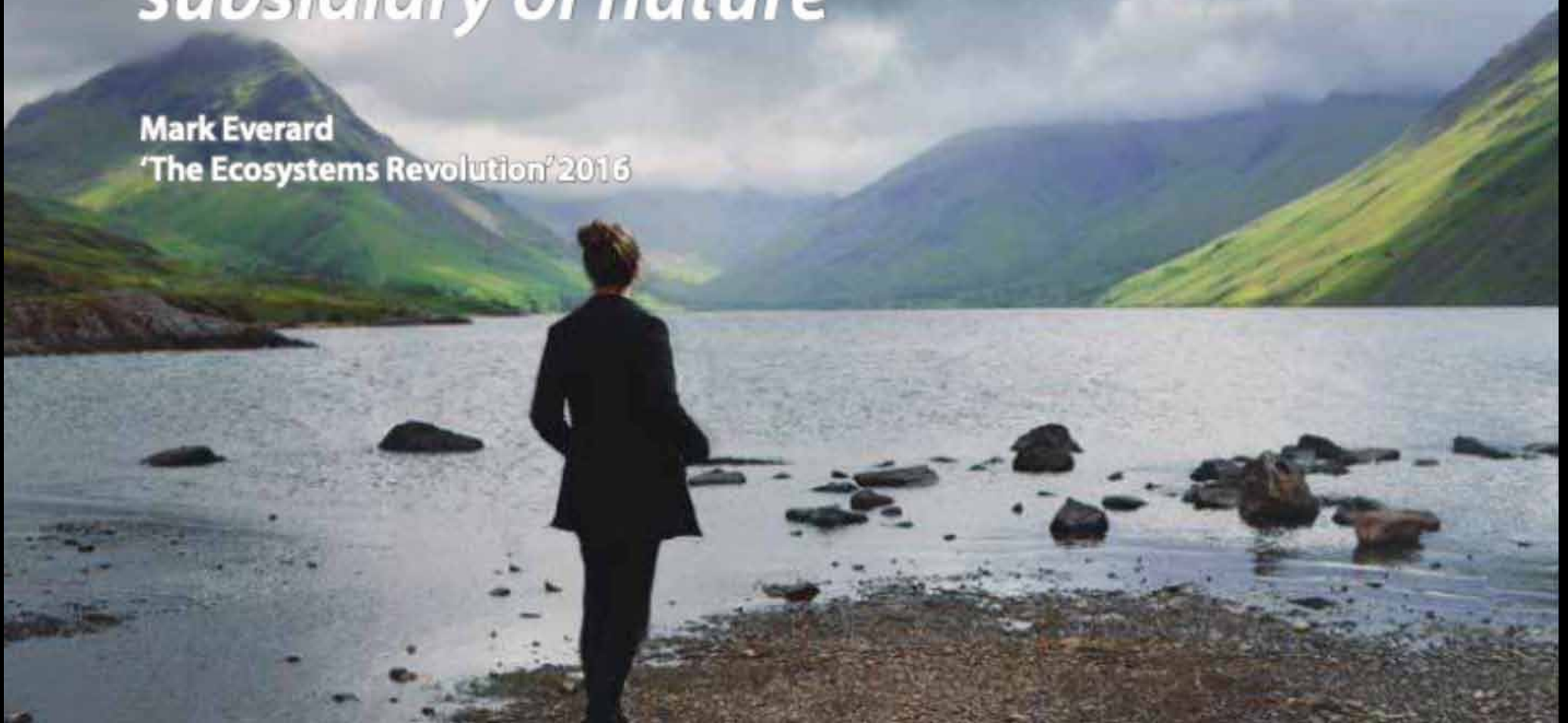
“it is much too late for sustainable development;
what we need is **sustainable retreat**”

Prof. James Lovelock, (2006)
'The revenge of Gaia'



“Humanity is not merely indivisible from, but evolved as a wholly owned subsidiary of nature”

Mark Everard
‘The Ecosystems Revolution’ 2016



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CARPE
DIEM

Thank you
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