Renaturing Cities:
Theories, Strategies and Methodologies

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Outline

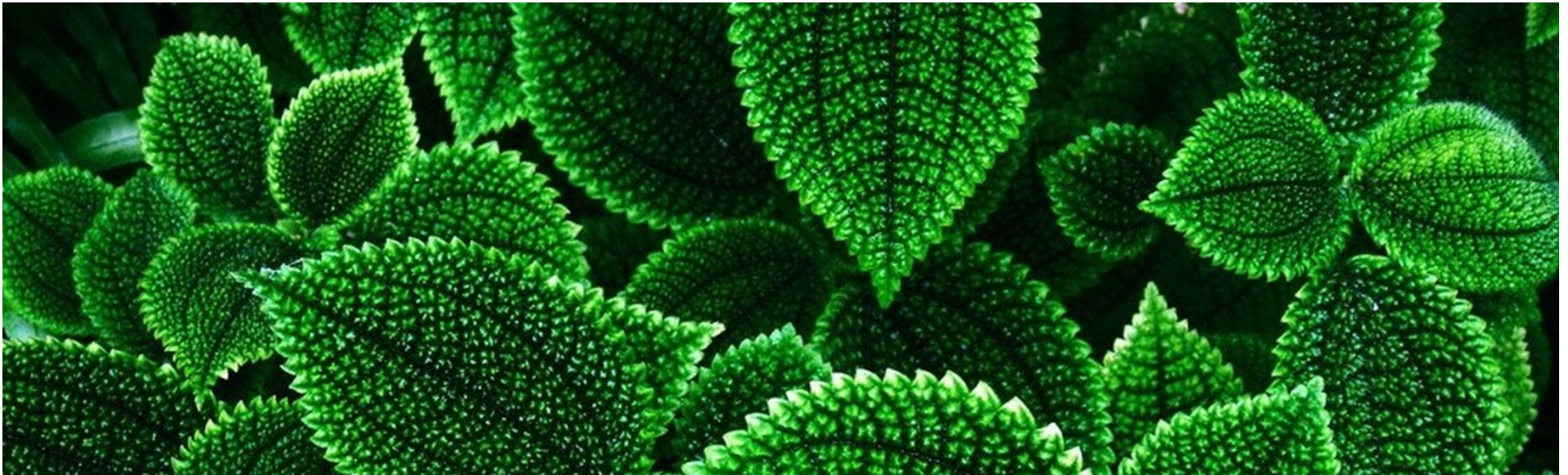1. Background and research focus

2. Theories

3. Strategies

   - Research

   - Community

   - Practice

3. Methodologies

   - Research

   - Practice

4. Summary and conclusions

Background and Research Focus

Background

Suilven, Assynt, Scotland (Colin Prior)

Measuring Rn fluxes, Calders Geo, Shetland

95-99 | MA Geography (Uni. Aberdeen)

99-00 | MRes Research in the Natural Environment: "Observations and modelling of O_3 and NO_x of Edinburgh" (Uni. Edinburgh Sch. Geosciences)

00-04 | PhD "Radon emissions from soils and its use as an atmospheric tracer" (IAES, UoE Sch. Geosciences – Dr Franz Conen and Prof Keith Smith)

Background

06-10 | Scottish Environment Protection Agency

09- | Scottish Green Infrastructure Forum (SGIF)

10-13 | OPENspace Research Centre, ESALA, ECA,
University of Edinburgh

The research centre for
inclusive access
to outdoor environments

14- | MEARU, MSA, Glasgow School of Art

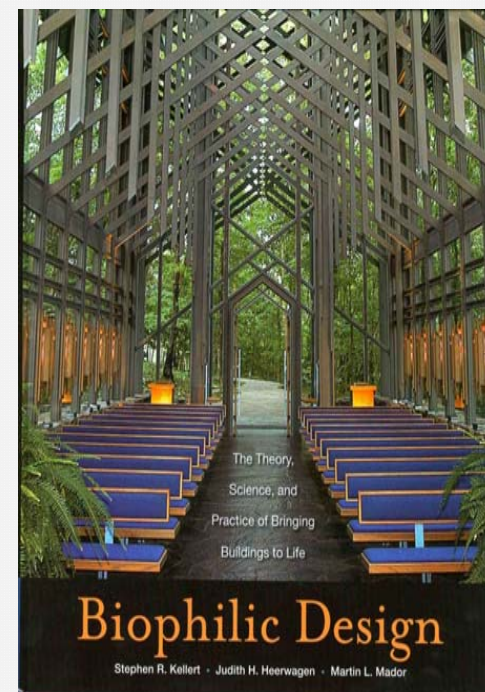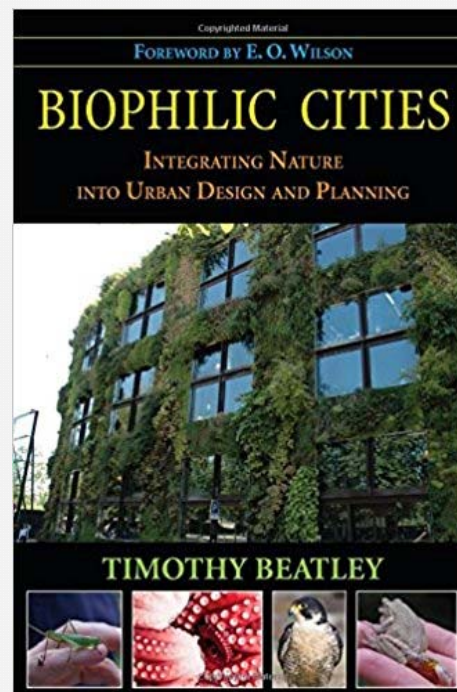15- | Scottish Universities Green Infrastructure Research Group
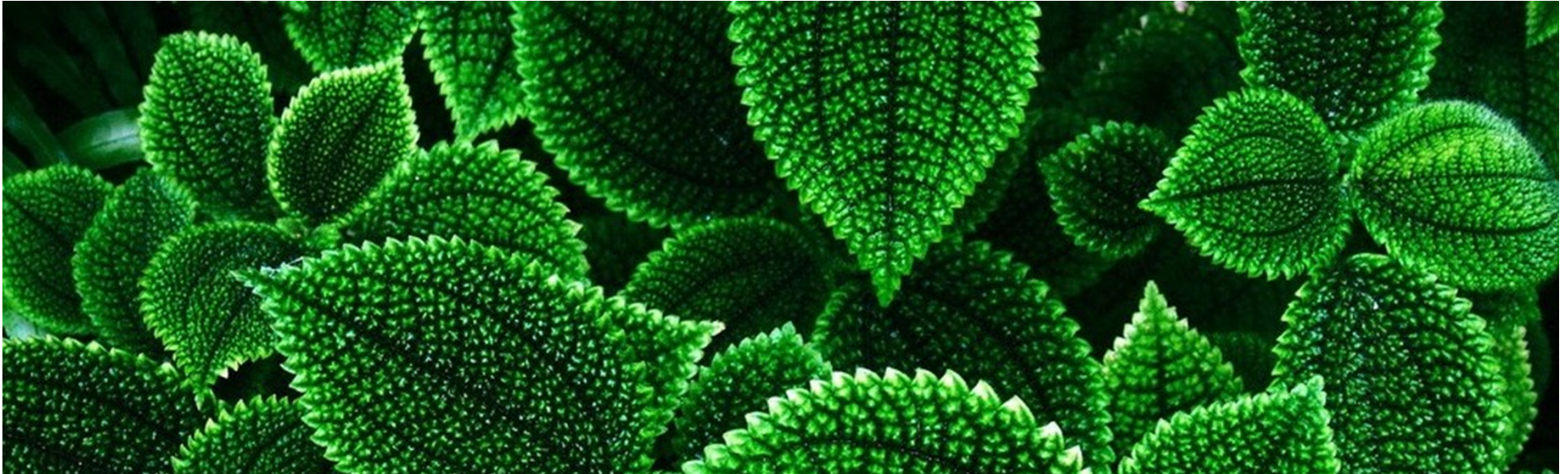(SUGIR)

Research Focus: Human Health and Wellbeing

Environmental Epidemiology (Built Environment)

Urban Green space / Green Infrastructure

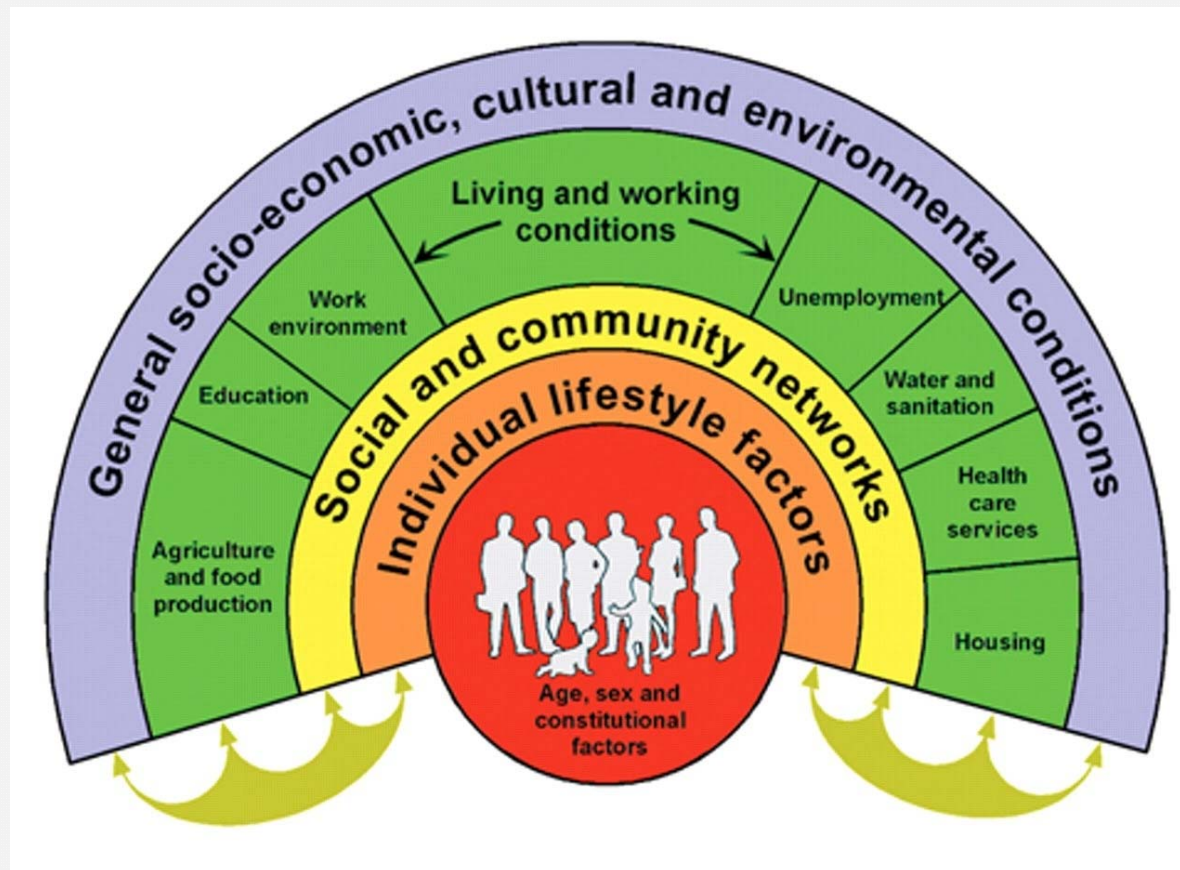Biophilic Environmental Design (Landscape, Architecture, Urban)

Theories

Theories (I): Ecological model of human health

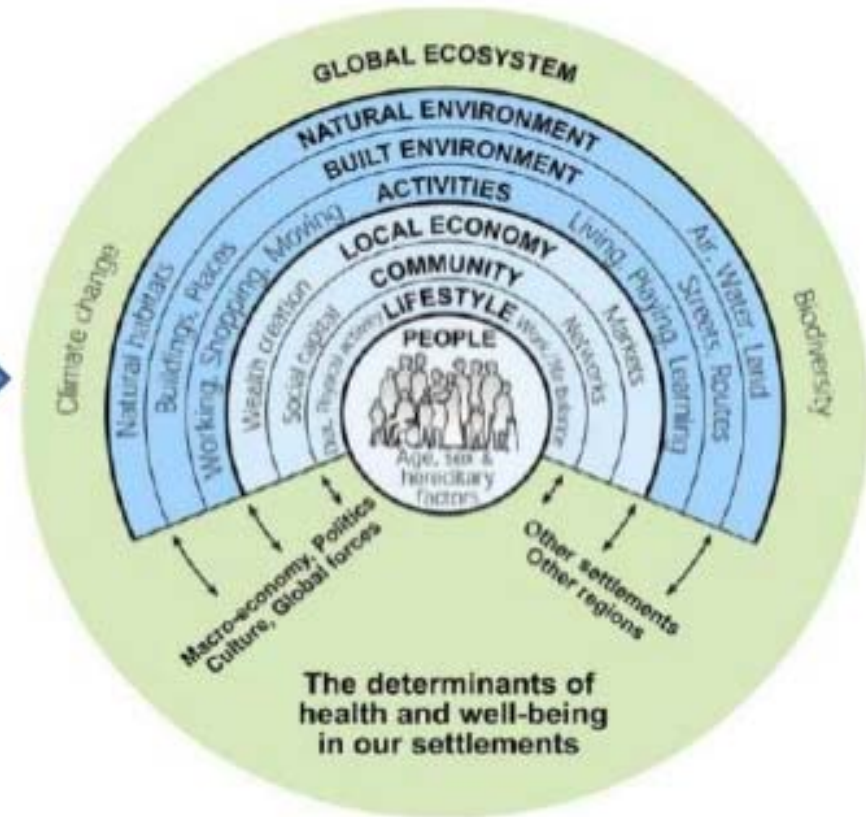Dahlgren and Whithead (1992) "" – Wider Determinants of Health

Theories (I): Ecological model of human health

The Main Determinants of Health

Dahlgren and Whitehead model

The determinants of health and well-being in our settlements

Source: Barton and Grant, 2006

Barton and Grant (2006) "A health map for the local human habitat" (*J. Royal Soc. Promotion Health*, 126 (6)) – Planning of Human Settlements
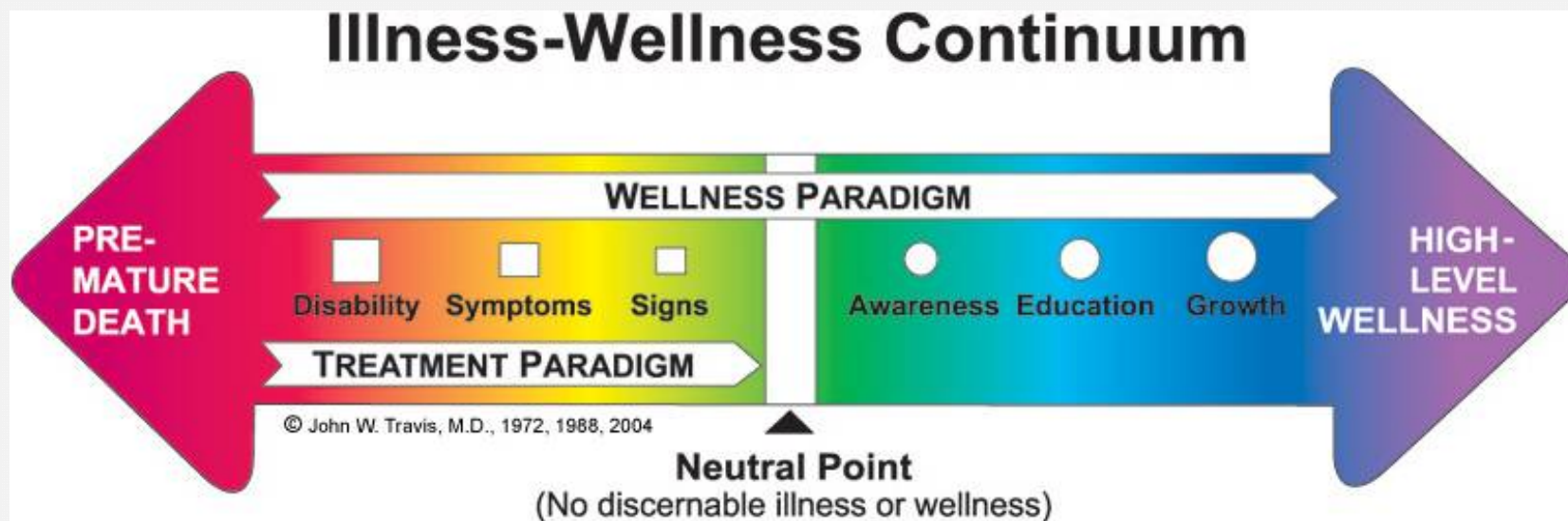
Theories (II): Salutogenic environments

Salutogenises = "Health origin"

Aaron Antonovsky (1979) "Health, Stress and Coping"

Focus on factors that support human health and well-being, rather than on factors that cause disease (pathogenesis)

Illness-Wellness Continuum

WELLNESS PARADIGM

PRE-MATURE DEATH

Disability   Symptoms   Signs

TREATMENT PARADIGM

Awareness   Education   Growth

HIGH-LEVEL WELLNESS

© John W. Travis, M.D., 1972, 1988, 2004

Neutral Point
(No discernable illness or wellness)

# Theories (III): Equigenic environments

Prof Rich Mitchell & colleagues, University of Glasgow / Centre for Research on Environment, Society and Health (CRESH)

Health inequalities: Green space as an inexpensive health intervention

> We hypothesise that some places are *equigenic*; features of their social, physical or service environments act to create health equality. We are interested in finding, defining and using the notion of *equigenesis*

http://www.gla.ac.uk/media/media_451168_en.pdf

Kuo (2015) **How might contact with nature promote human health?**
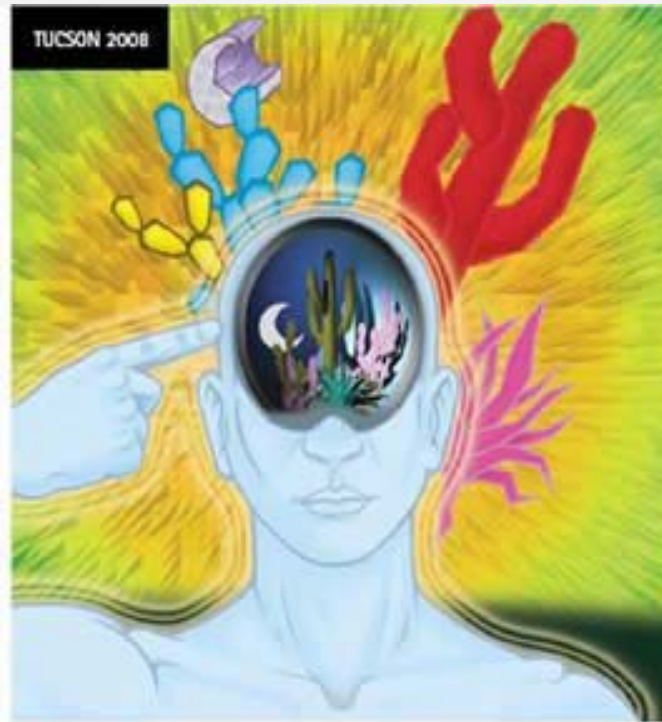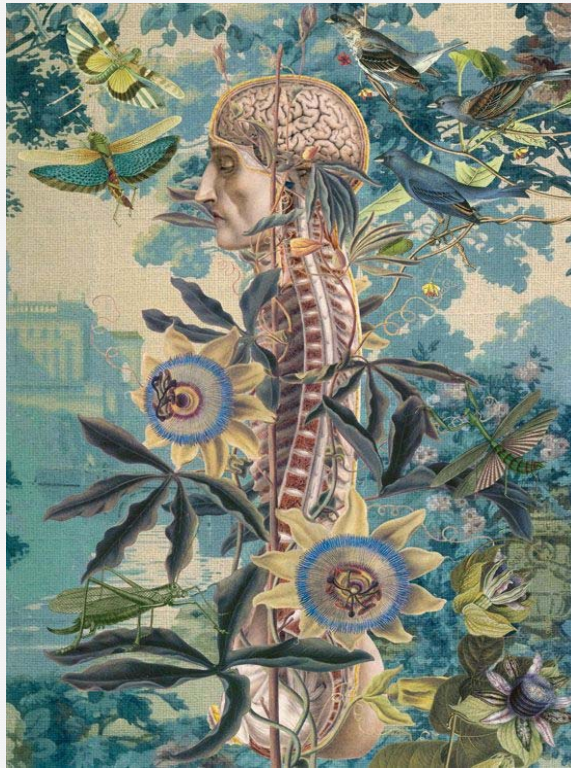Promising mechanisms and a possible central pathway. *Front. Psychol.*
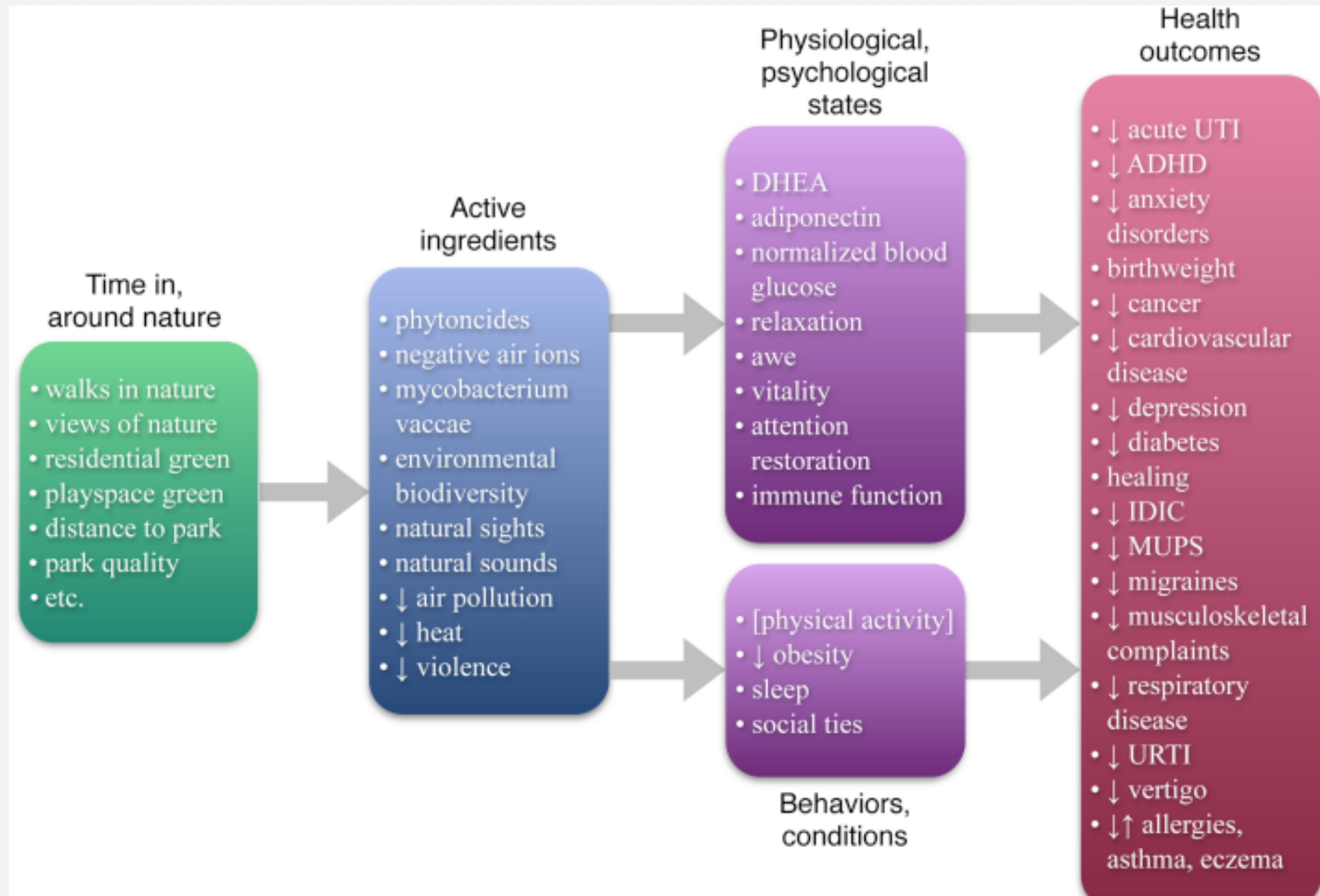
Theories (IV): Environmental psychology

Stress Reduction Theory (Ulrich, 1983; Ulrich et al ., 1991)

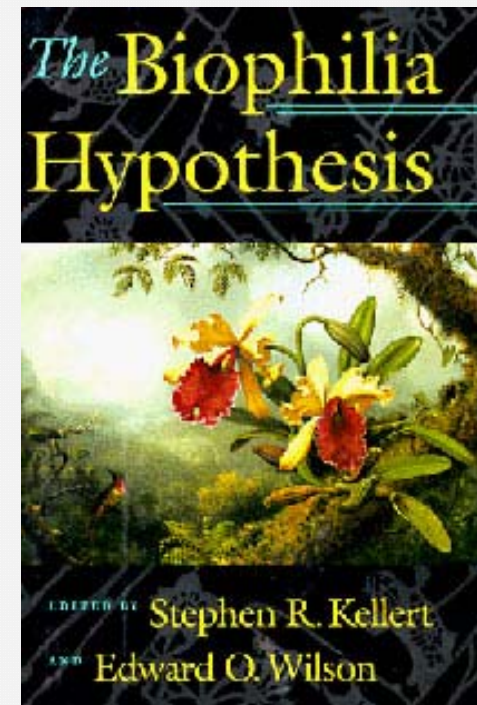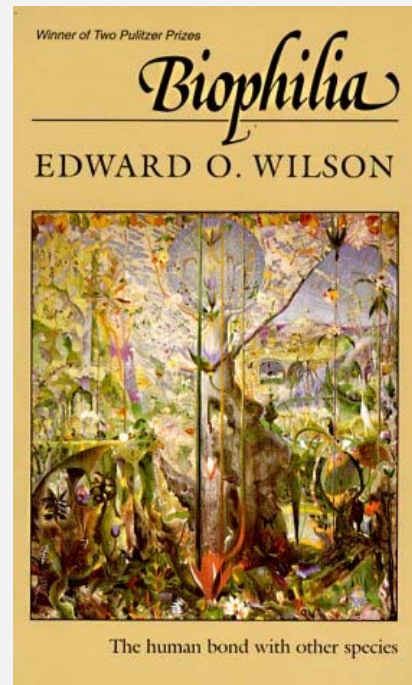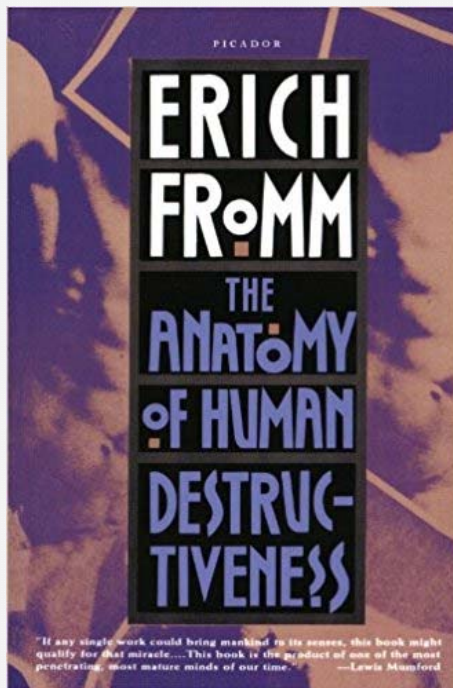Attention Restoration Theory (Kaplan & Kaplan, 1989; Kaplan, 1995)
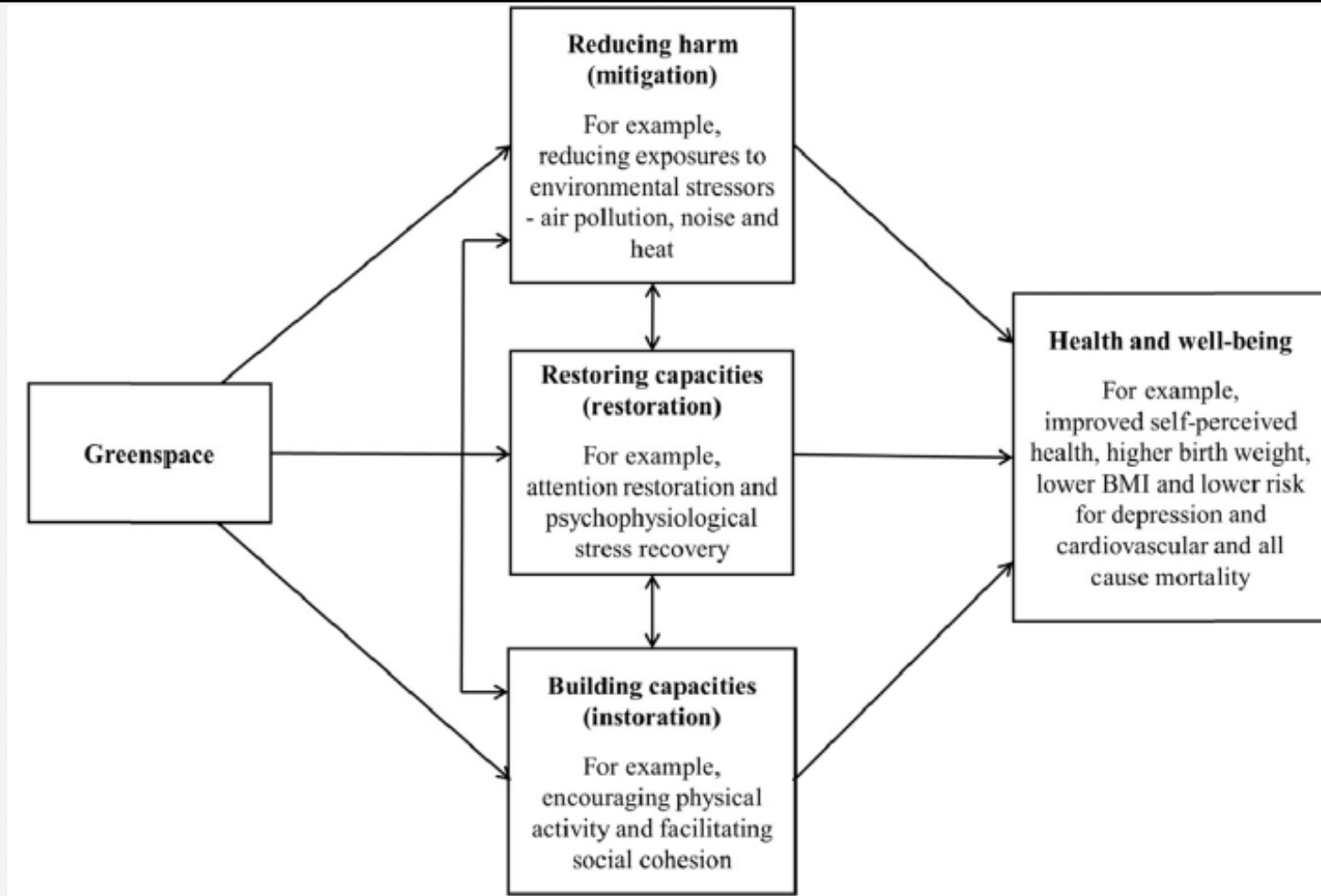
Theories (V): Biophilia

Erich Fromm *The Anatomy of Human Destructiveness* (1973)

E O Wilson *Biophilia* (1984)

Kellert and Wilson *The Biophilia Hypothesis* (1995)

Theories (VI): Green space, Health & Wellbeing

Markevych et al. (2017) Exploring pathways linking greenspace to health: Theoretical and methodological guidance. *Environmental Research*, 158.

Markevych et al. (2017) recommendations for future epidemiological research in the field of greenspace and health: *Study Areas*

"Most research has been conducted in high-income countries in Europe, North America and Australia. Asia, Africa, and South America as well as less affluent European countries remain under-researched settings where little evidence has been accumulated on greenspace-health relationships".

"Large international collaborations would allow inter-country comparisons to be conducted, so that a better understanding of the impact of climate and culture on greenspace-health associations can be developed and used to inform city planning"
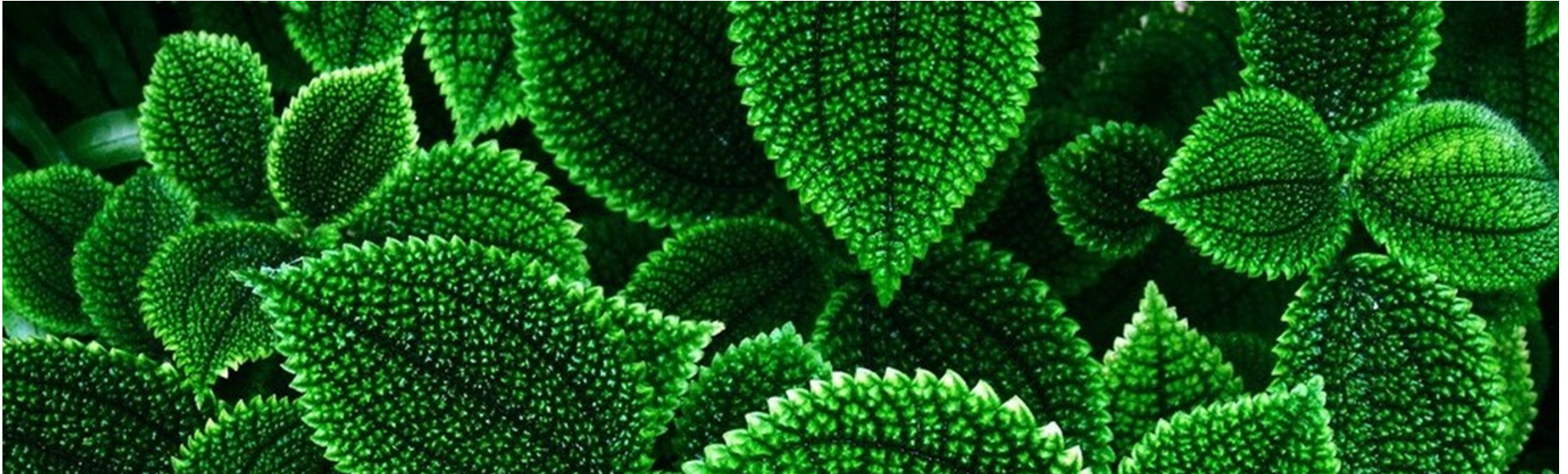
Strategies

Strategies (I): Applied research (policy and practice)

OPENspace Research Centre (ESALA, ECA, University of Edinburgh)

1. *Walking for Wellbeing in the West*: Urban / Street Design and Walking levels Glasgow, Scotland (SPARColl/ S. Gov)

[Robertson et al., 2012: The Influence of the local neighbourhood environment on walking levels during the WWW pedometer-based community intervention, *Environ. and Public Health*]

2. *Inclusive Design for Getting Outdoors (I'DGO) TOO*: Urban Design and Physical Activity levels, older people, UK-wide (EPSRC)

3. *GreenHealth*: Residential green space, health and wellbeing in disadvantaged urban communities, Scotland (S. Gov)

GreenHealth Research

Gender differences in the relationship between green space quantity and mental health:

(i) Effect sizes; (ii) Underlying factors (Robertson et al. in prep)
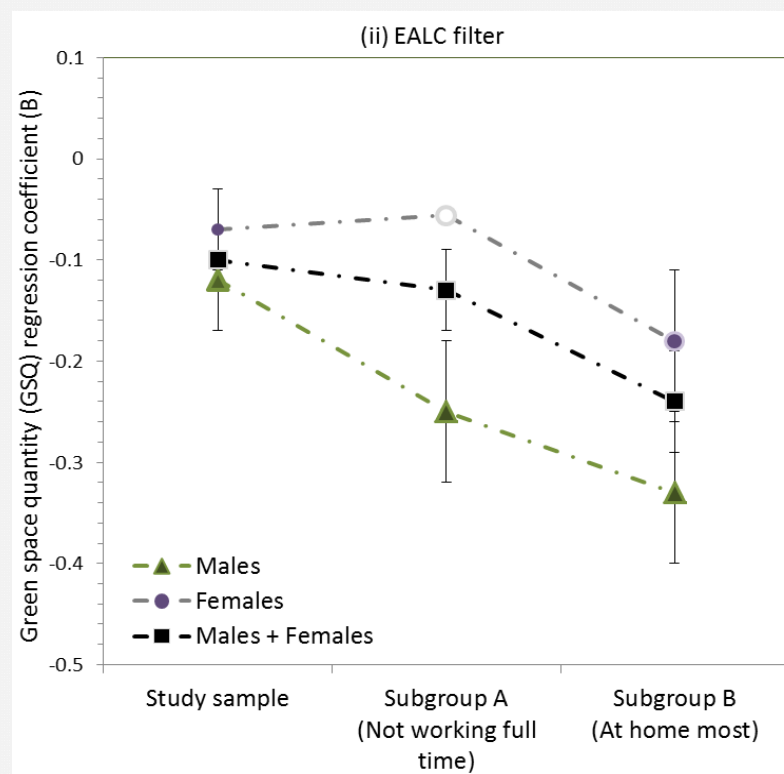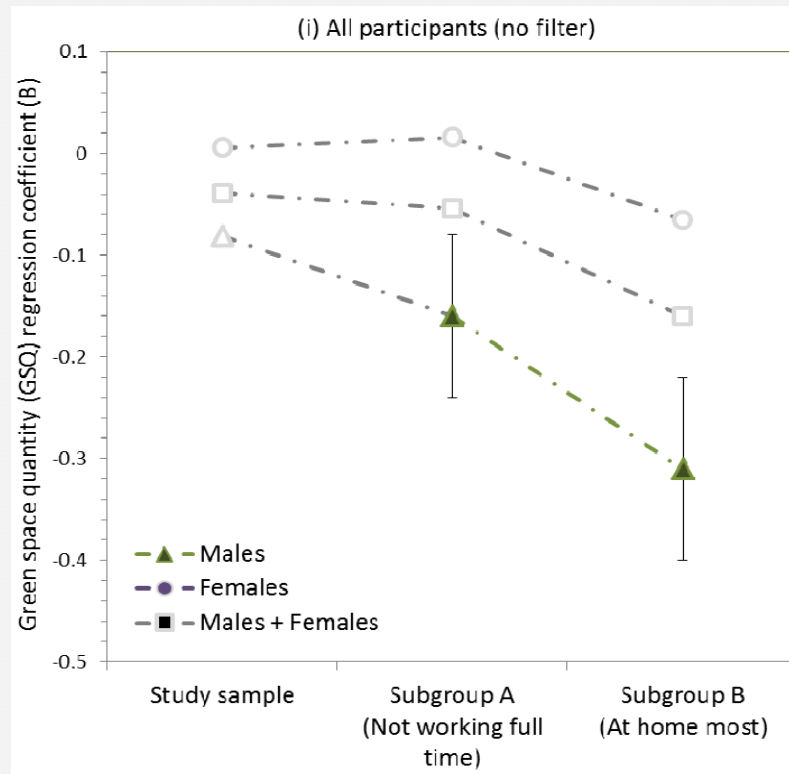
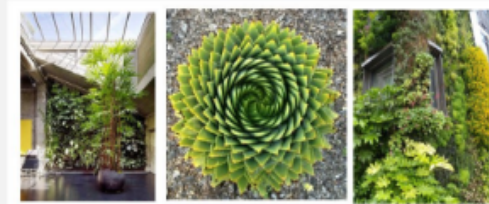# Strategies (I): Applied research (policy and practice)

Mackintosh Environmental Architecture Research Unit (MEARU)

- 'Sunshine project': sunlight accessibility indoors and mental health
   (VELUX Daylight Symposium - Robertson et al., 2015)

- Thermal comfort / ventilation (McGill et al., 2016)

- Green Infrastructure and Indoor Environmental Quality (IEQ):
   Indoor plants, green roofs and green walls

MACKINTOSH ENVIRONMENTAL ARCHITECTURE RESEARCH UNIT THE GLASGOW SCHOOL OF ART

BUILDING RESEARCH & INFORMATION
International Research, Development, Demonstration & Innovation
SPECIAL ISSUE
Overheating in buildings: adaptation responses

Guest editors: K.J. Lomas and S.M. Porritt

Improving indoor environmental quality and supporting health and wellbeing with indoor plants, green roofs and green walls

Strategies (I): Applied research (policy and practice)

Scottish Green Infrastructure Forum (SGIF)
 - '10,000 Raingardens' scoping study (Robertson et al., 2014)
 - Scottish Universities Green Infrastructure Research Group (SUGIR) -
GI research specific to Scotland, including MSc and PhD projects

Strategies (II): Community, Activism, Lobbying

www.sgif.org.uk

www.sgif.org.uk/index.php/sugir

Strategies (III): Practice - SGIF Raingardens Project
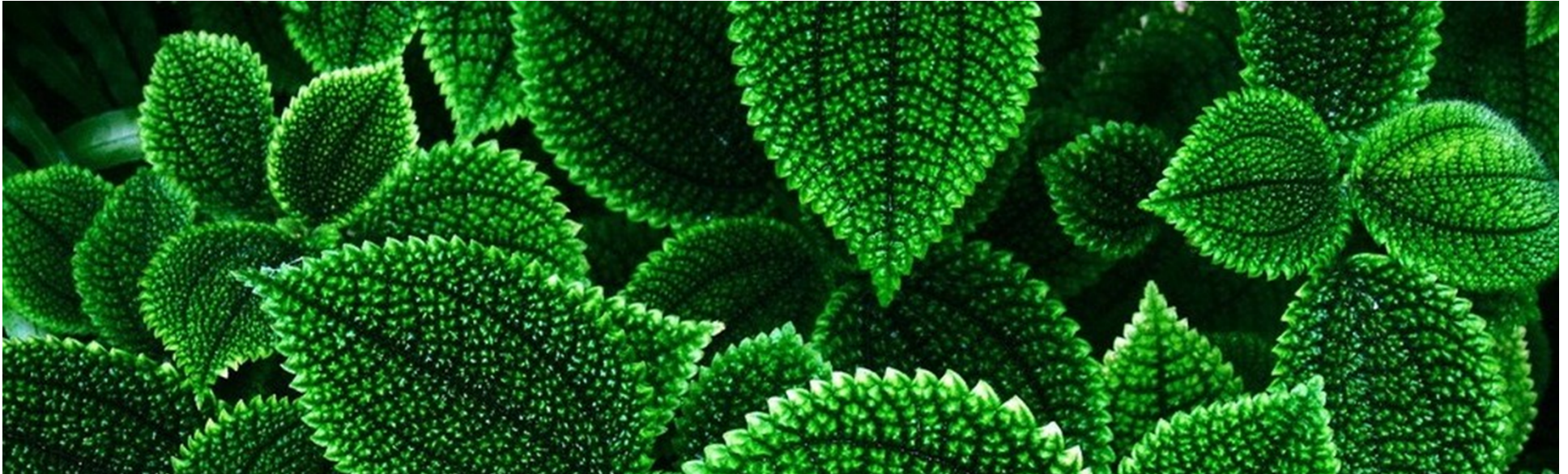

Raingardens - box basics

"A Raingarden is a vegetated area designed to attenuate rainfall"

10,000 Rain Gardens Scotland

www.sgif.org.uk/index.php/10-000-raingardens-for-scotland

Methodologies

Methodologies (I): Research – Statistical Methods

- Principle Component Analysis (Street audits - Robertson et al., 2012)

- Hierarchical Multiple Linear Regression (Green space quantity + MH)

- Correlated Component Regression (Aspinall et al., in press; Ward Thompson et al., 2016)

	Conventional Predictive modelling	Correlated Component Regression (CCR)
Sample requirements	Large samples / large sample to predictor ratio - model assumptions break down if this is violated	Works with what is available (used on data sets with as few as 20 cases)
Model Selection	Based on hypothesis testing and large sample assumptions i.e. how well model SHOULD perform on new cases under IDEAL sample conditions	Based purely on cross-validated performance i.e. how well model REALLY performs on new cases
Predictor Correlations	Multicollinearity makes hypothesis testing less robust and can produce counter-intuitive coefficients	Can appropriately handle even severe multicollinearity & uses a stabilising algorithm which produces more robust coefficients
Over-fitting Noisy data	Tendency to over-fit noisy data	Designed specifically to MINIMISE overfitting and MAXIMISE ability to predict new cases

Methodologies (II): Practice - Green Walls

Methodologies (III): Practice – Green Walls

Marc Grañén 'Edible' green wall schools project with Central Scotland Green Network (CSGN Ideas Fund competition winner 2016)
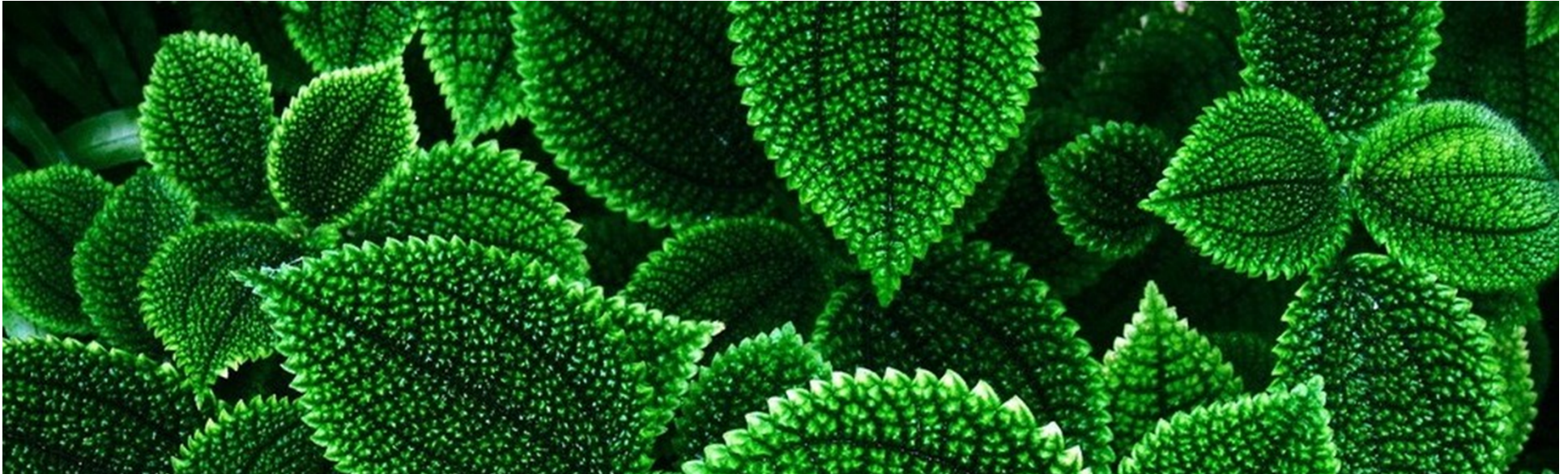
Summary and Conclusions

Summary and conclusions

Aim: Support and enhance human health and wellbeing, and reduce health inequalities, through the use of green infrastructure / green space as a public health intervention

Theories, Strategies and Methods:

 - Applied research (built environment epidemiology), using innovative statistical research methods

 - Green Infrastructure activism, installations, and contribution to SGIF community initiatives

Research ambitions:

 - Mechanisms underlying the relationship between urban green space / contact with nature, health & WB

 - Green space quality: designing for health and wellbeing
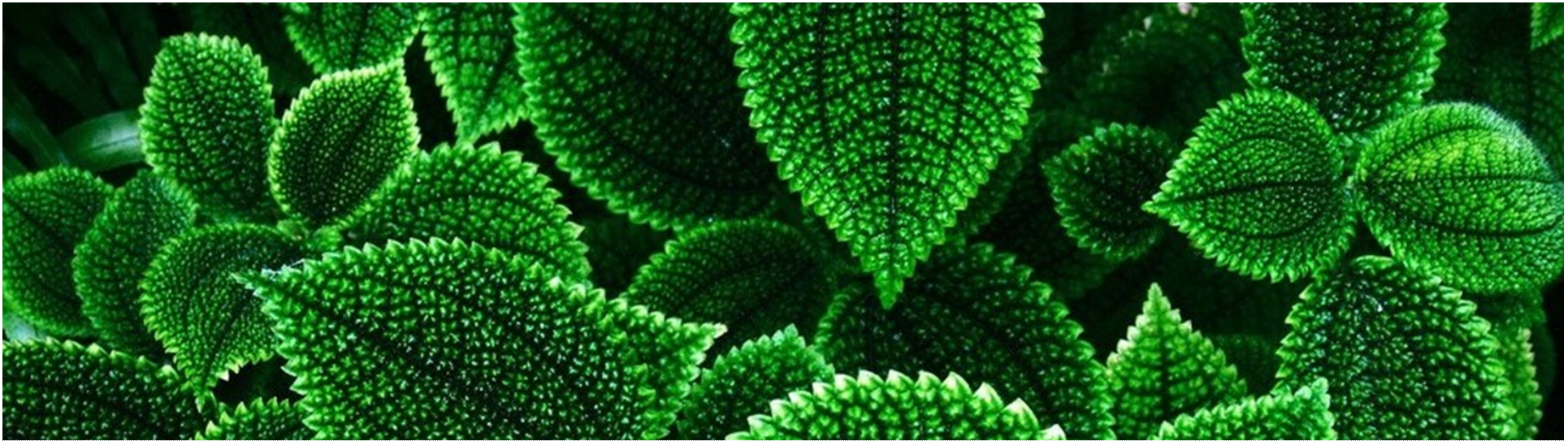
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