

Urban green spaces and health

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OVERVIEW

- State of the art
- Theories
- Experimental work
- Ecosystem services framework
- Policy impact



HEALTH OUTCOMES THAT HAVE BEEN SYSTEMATICALLY REVIEWED IN THE LITERATURE AND ASSESSMENT OF EVIDENCE LEVEL

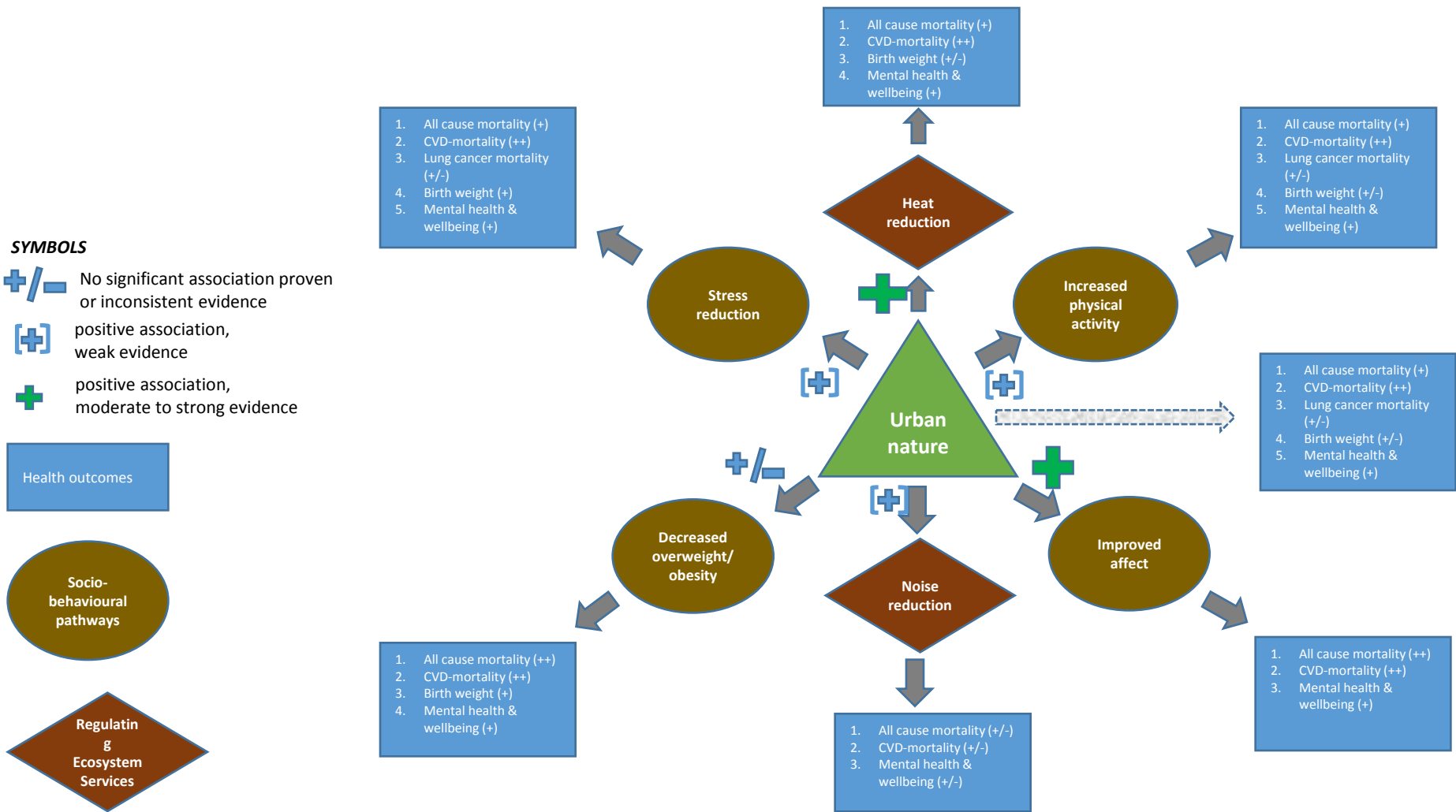


1. CVD-mortality (++)
2. All cause mortality (+)
3. Mental health & wellbeing (+)
4. Lung cancer mortality (+/-)
5. Birth weight (+/-)

PATHWAYS THAT HAVE BEEN SYSTEMATICALLY REVIEWED IN THE LITERATURE AND ASSESSMENT OF EVIDENCE LEVEL

1. Improved mood/affect (++)
2. Heat reduction (++)
3. Stress reduction (+)
4. Increased physical activity (+)
5. Decreased overweight/obesity (+/-)
6. Noise reduction (+/-)





POTENTIAL PATHWAYS AND HEALTH OUTCOMES NOT REVIEWED IN THE LITERATURE

Possible pathways

- Social cohesion (*e.g. de Vries et al. 2013*)
- Moderation of health inequalities (*e.g. Mitchell & Popham, 2008*)
- Improved cognitive development (*e.g. Dadvand et al. 2015*)
- Storm water management, air pollution reduction (*MA, 2005*)
- Immunoregulation (*e.g. Rook, 2013*)



Possible health outcomes

- ADHD (*e.g. Kuo & Taylor, 2004*)
- Asthma (*e.g. Sbihi et al. 2016*)
- Depression (*e.g. McEachan et al. 2016*)
- Other (?): Dementia, autoimmune diseases, infectious diseases, disaster related morbidity/mortality (*e.g. drowning, heat related morbidity*)

BIOPHILIA

(E.O. Wilson)



The inherent **love** for nature

Trust for nature, shelter and safety

Evolution – adapted to respond to natural stimuli,

not to artificial input

Genetically **predisposed**



Savannah, Uganda by Rod Waddington_ CC BY-SA 2.0

STRESS REDUCTION THEORY

(Roger Ulrich)

- **Immediate** response to nature
- Non-conscious
- Physiological reactions – **stress recovery**, relaxation
- The **savannah** – vegetation, trees, and water, no threats
- We are **prepared to react to nature** but not to built settings



*Ulrich, 1981, Ulrich, 1984 , Ulrich et al. 1991,
Parsons et al. 1998, van den Berg & Custers, 2011*

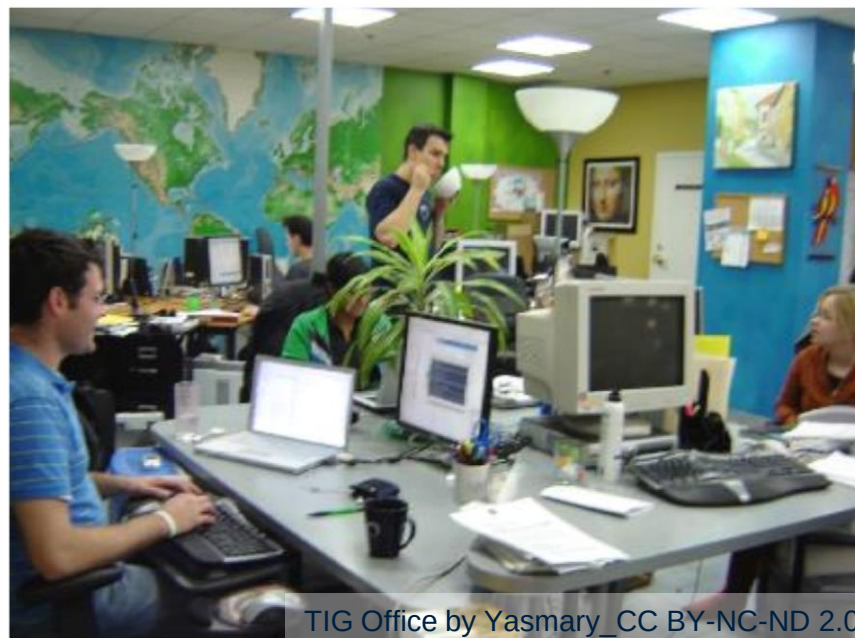
ATTENTION RESTORATION THEORY

Rachel and Stephen Kaplan

- The universal meaning of nature to people
- General, positive value to everyone
- Cognitive mechanisms – attention restoration



Directed attention (energy demanding)



Fascination (no effort)



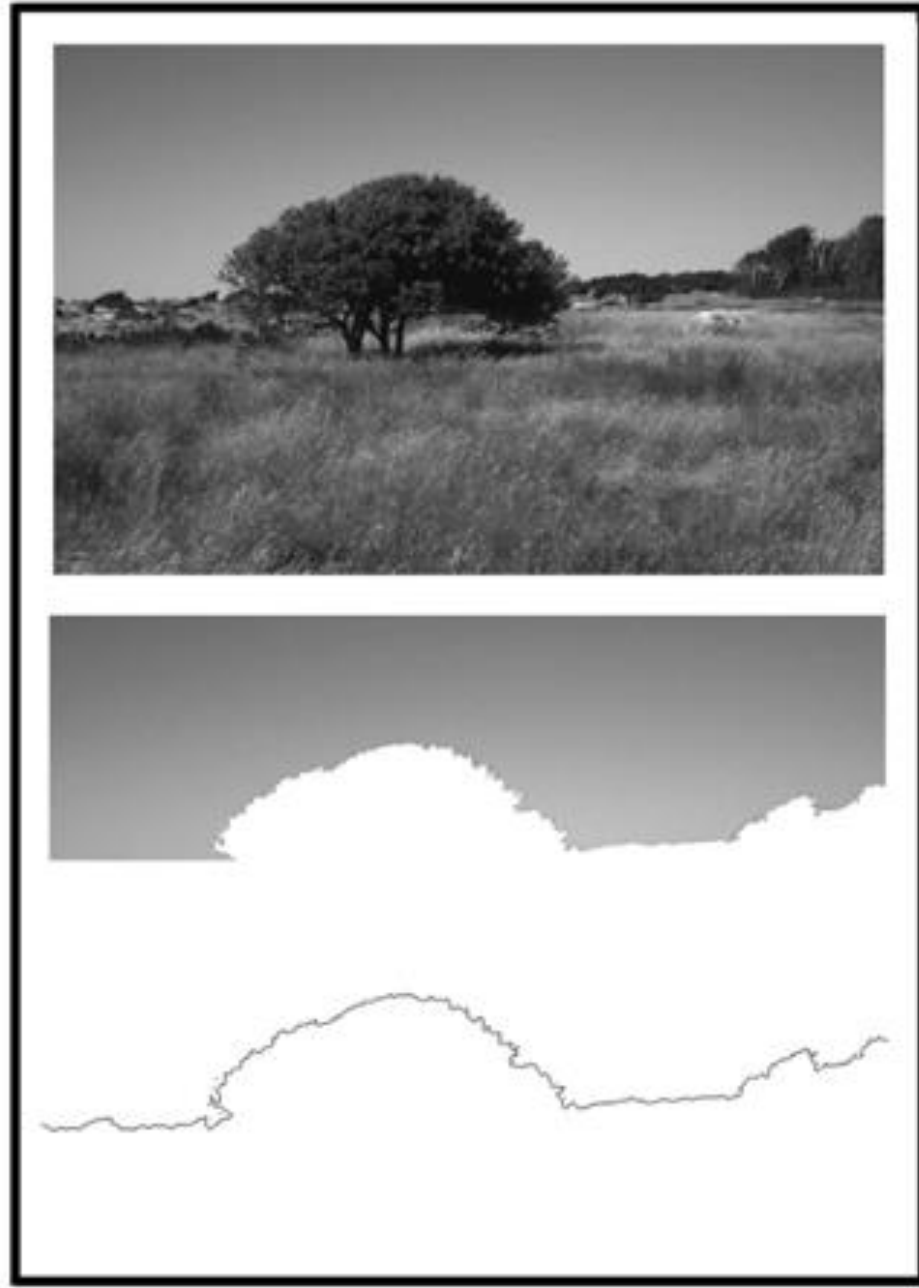
NEURAL MECHANISMS - PERCEPTUAL FLUENCY

Visual information from nature is easier processed in the brain

Fractal patterns (“Neuro-aesthetics”)

- Aesthetically appealing
- EEG activity in the brain:
 - wakeful relaxation

(Hagerhall et al., 2004, Taylor et al. 2005, Hagerhall et al. 2008, Pentland 2009)





The VR-laboratory, Lund University, Sweden



LUND
UNIVERSITY



- CAVE™ system
- 3 rear-projected walls (4x3 m)
- Floor projection (EON development INC.)
- Passive stereoscopy
- Head tracking system
- 5.1 surround system – twittering birds and murmur of water



VR stress provocation: Trier Social Stress Test (TSST)



1. Job interview
2. No emotional feedback





Arithmetic task: 1671-13-13-13-
13.....0

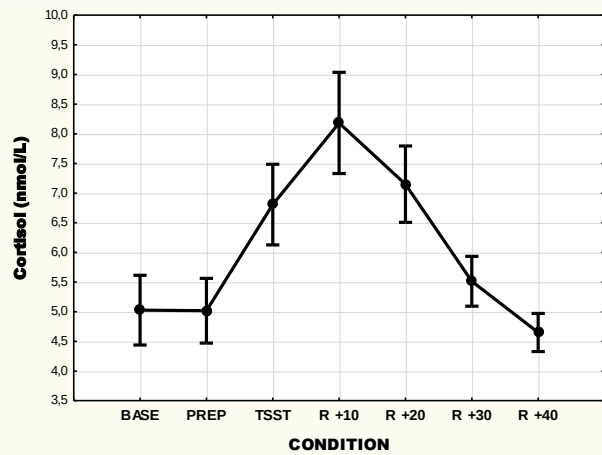
Data collection

Physiological

- Saliva cortisol (x8)
- ECG (continuous):
 - Heart Rate (HR)
 - T-wave amplitude (TWA)
 - High Frequency Heart Rate Variability (HF-HRV)

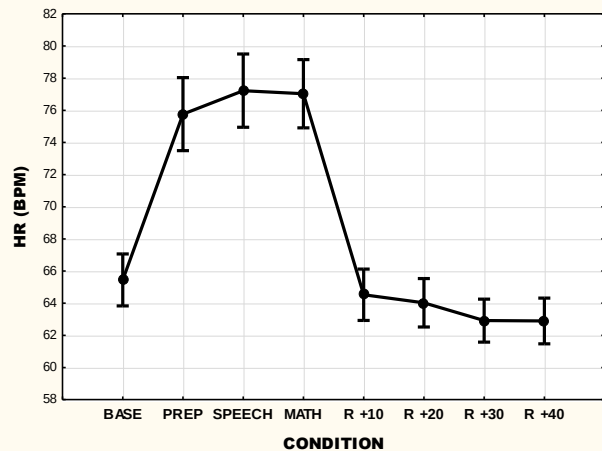
Psychological

- Spielberger state and trait inventory (STAI) (x2)



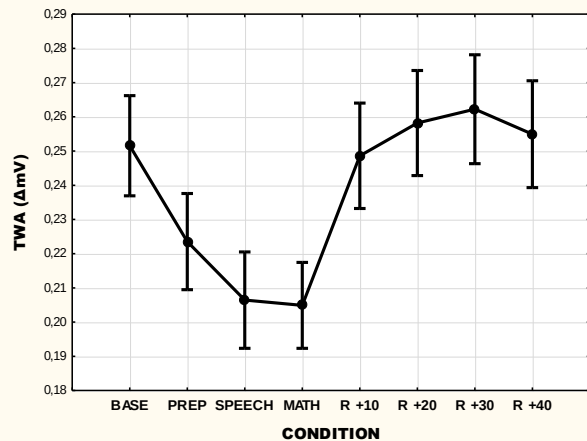
CORTISOL

$F_{linear}=12.95; p<.001$



HEART RATE

$F_{linear}=83.26; p<.001$



T-WAVE AMPLITUDE

$F_{linear}=32.78; p<.001$

Condition 1(n=10): Virtual nature



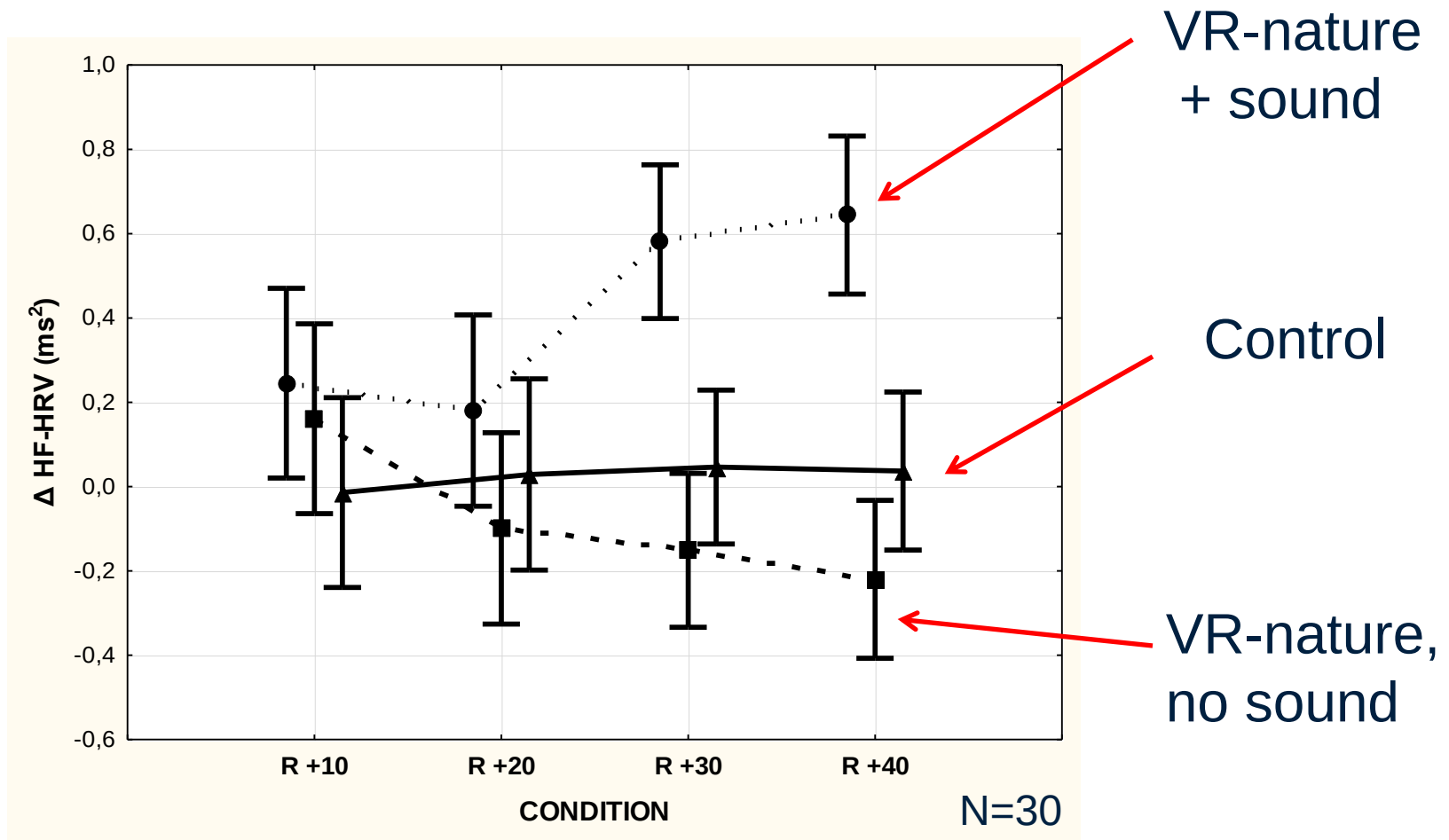
Condition 2 (n=10): VR-nature + sound



Condition 3 (n=10): control

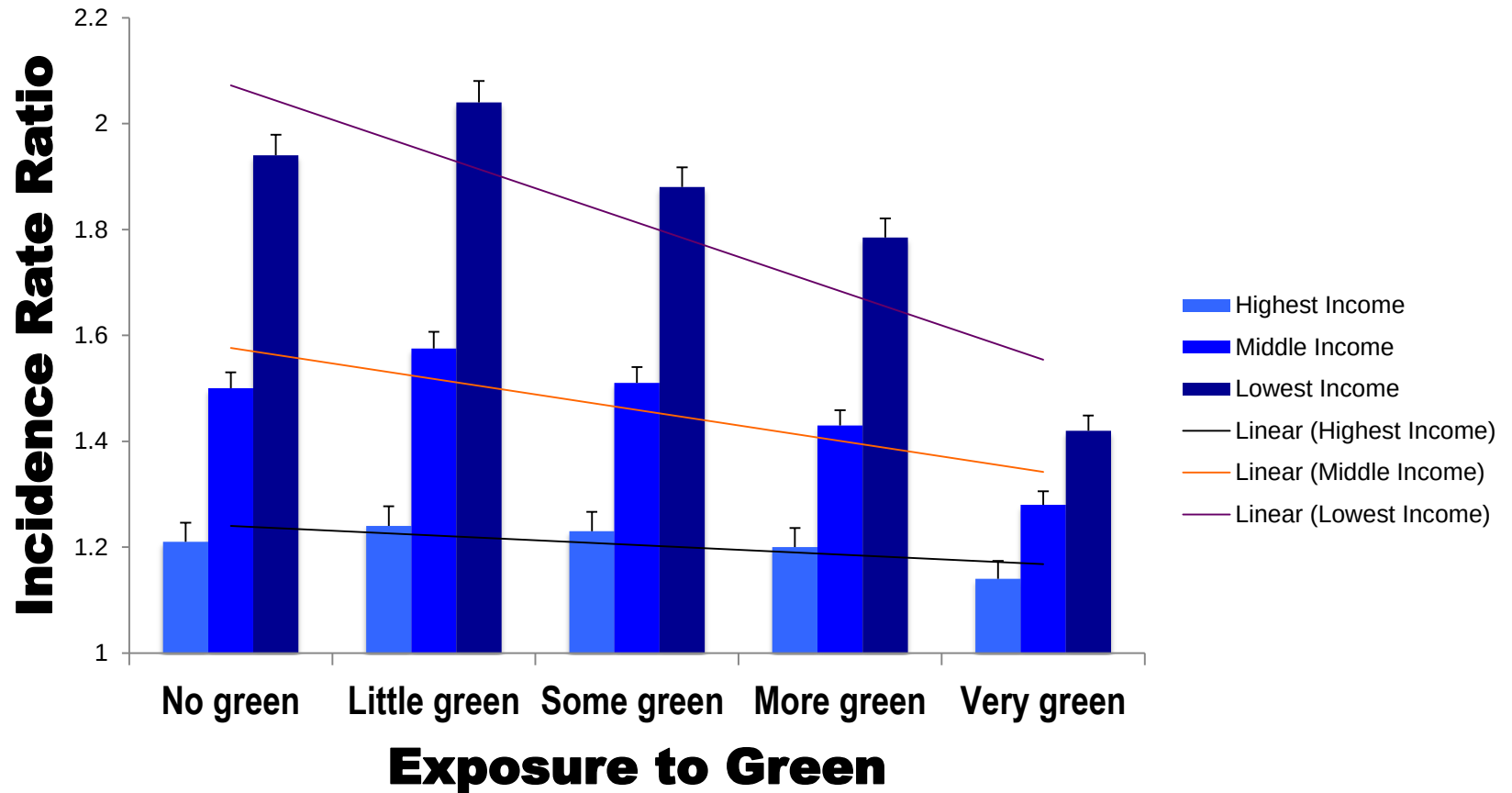


HF-HRV



$$F_{linear}=7.55; p=.003$$

SOCIOECONOMIC INEQUALITIES, HEALTH, AND URBAN GREEN SPACES



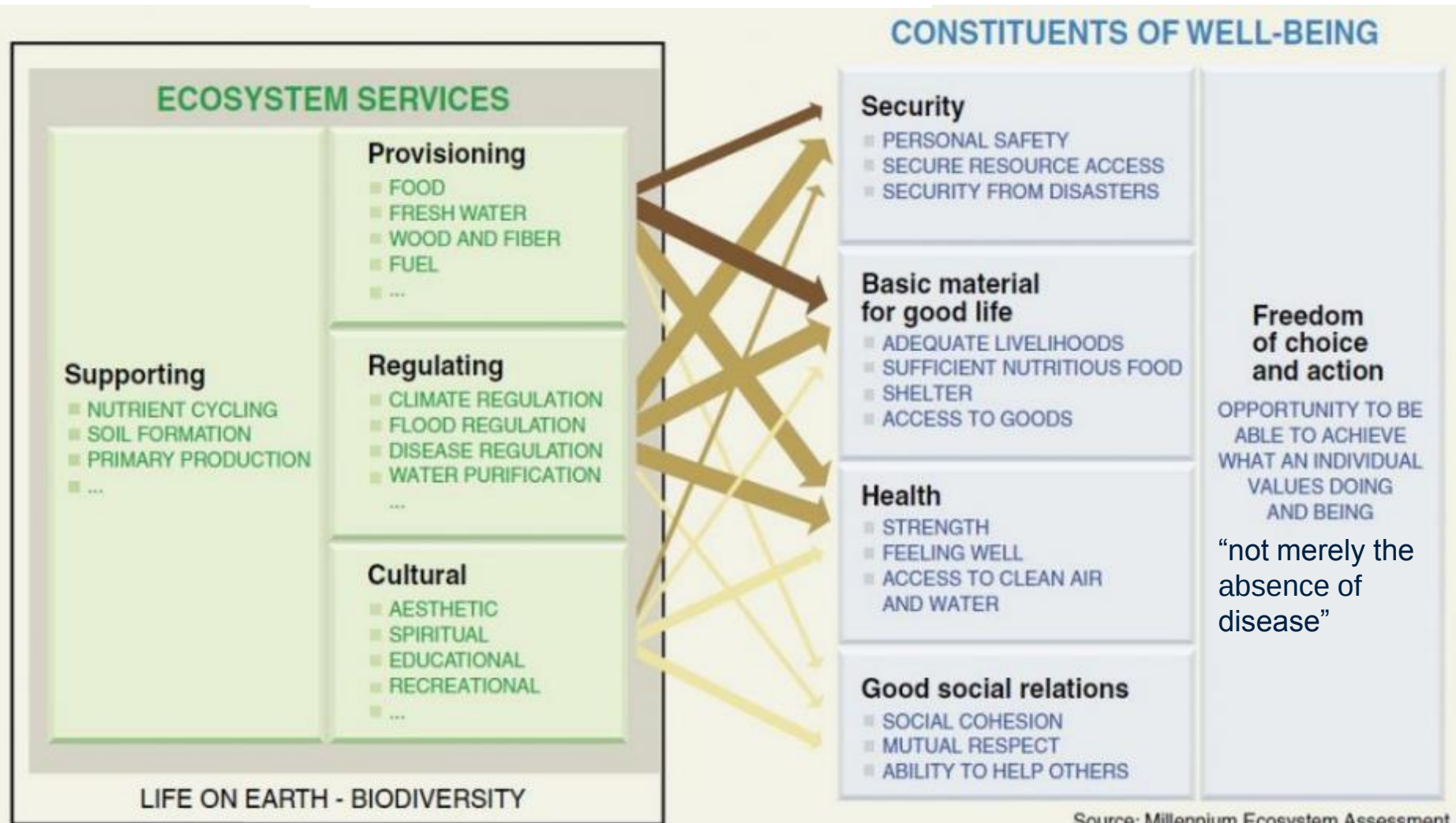
VANCOUVER: URBAN TREES AND INCOME INEQUALITIES



Green= green
Built=red
Paved=grey

Image: Ingrid Jarvis

ECOSYSTEM SERVICES



ARROW'S COLOR
Potential for mediation by socioeconomic factors

- Low
- Medium
- High

ARROW'S WIDTH
Intensity of linkages between ecosystem services and human well-being

- Weak
- Medium
- Strong

URBAN GREEN SPACES AND ECOSYSTEM SERVICES



- Cooling of cities (decrease heat stress and related morbidity and mortality)

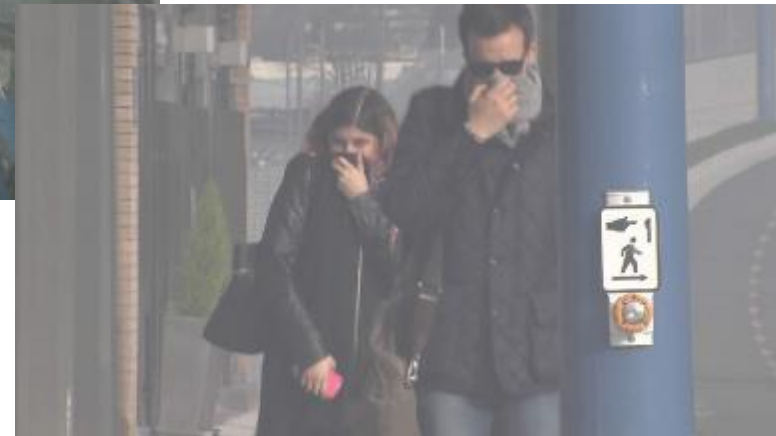


e.g. Bowler et al. 2010; Zupancic & Bulthuis, 2015

- Storm water management (reduced risk of flooding, injuries, and infections following poor sanitation)



➤ Reduced air pollution (improved respiratory health)



e.g. Nowak et al. 2014

- Reduced noise perception (less prevalence of cardiovascular diseases, etc.)



TRANSLATION TO POLICY

- “...scientific knowledge about ES [Ecosystem Services] continues to have **limited impact** on policy and decisions.” (*Posner et al. 2016*)
- Urban tree canopy is declining: **4.0 million trees** per year in US (*Nowak & Greenfield, 2012*)
- **Poor green planning** in rapidly urbanizing countries in developing parts of the world (*Quereshi et al. 2010*).



WHY DO WE FAIL?

- Cognitive bias.
- Different languages.
- Unbalanced messages
- Competing interests.



COGNITIVE BIAS

- The knowledge is not part of the **normative agenda**
- the common position is shaped by **tradition**
- Politicians and/or decision-makers are used to solutions within a **different paradigm** .
- Tendency towards “**quick-fix**” or technological solutions.
- **Short term gains**, long term losses



DIFFERENT LANGUAGES



- What policy and practice **need** is not always what is studied
- **Different terms** for the same things
- The **integrity of science** vs bold policy statements (“There might potentially be an effect, but more studies are needed”)
- Academia having “**low status**” in urban planning practice

UNBALANCED MESSAGES



1. Risk perception. Unfamiliarity, fear
(parents, care takers, schools, stakeholders)

2. “Ecosystem disservices”

- Allergenic pollen
- Vector-borne diseases
- Falling branches

Other solutions than reducing nature exposure, e.g.:

- Use non-allergenic species and genotype
- Use proper clothing
- Invest in maintaining and managing trees.

COMPETING/VESTED INTERESTS

- **Governmental budgets** for green space management have decreased significantly because of **land use competition** (*Buizer et al. 2015*)
- **Economic crisis**
- **Densification**
- **Commercial and industrial investments**



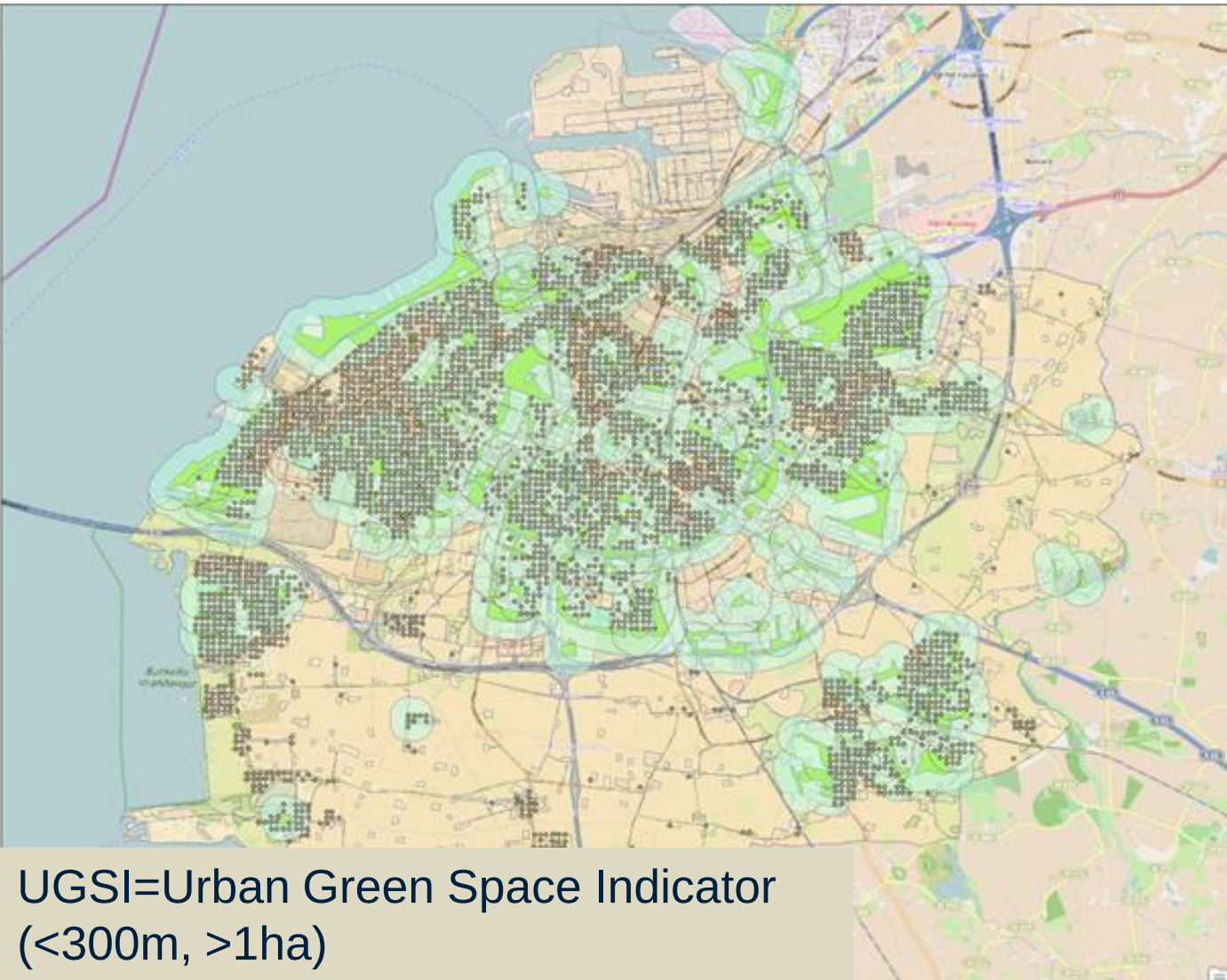
THE WORLD HEALTH ORGANIZATION AND URBAN GREEN SPACES





The Parma Commitments, 2010:

“We aim to provide each child by 2020 with access to healthy and safe environments ..., and to **green spaces** in which to play and undertake physical activity.”



UGSI=Urban Green Space Indicator
(<300m, >1ha)

*Van den Bosch et al. 2016,
Scand J of Publ Health³⁷*



GLOBAL ENVIRONMENT OUTLOOK

GEO-6

ASSESSMENT FOR THE
PAN-EUROPEAN
REGION



van den Bosch et al. Healthy Planet Healthy People. In: UNEP/UNECE 2016. GEO-6 Assessment for the pan-European region. UNEP, Nairobi, Kenya

The Sustainable Development Goals, 2015 (11:7)

“...provide universal access to ... **green and public spaces**, in particular for women and children, older persons and persons with disabilities.”





THANK YOU FOR LISTENING

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