Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

The Changing Face of Global Urban Forestry

Cecil Konijnendijk van den Bosch

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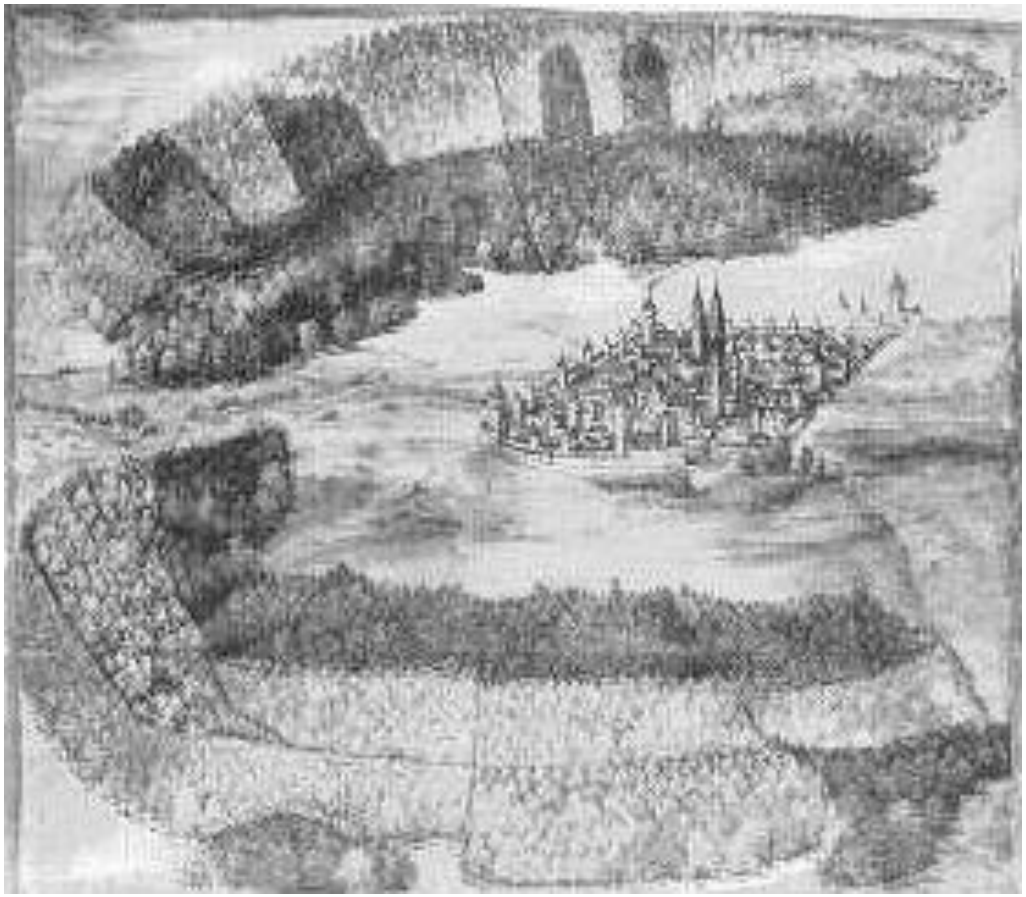
Jenny Svennås-Gillner, SLU

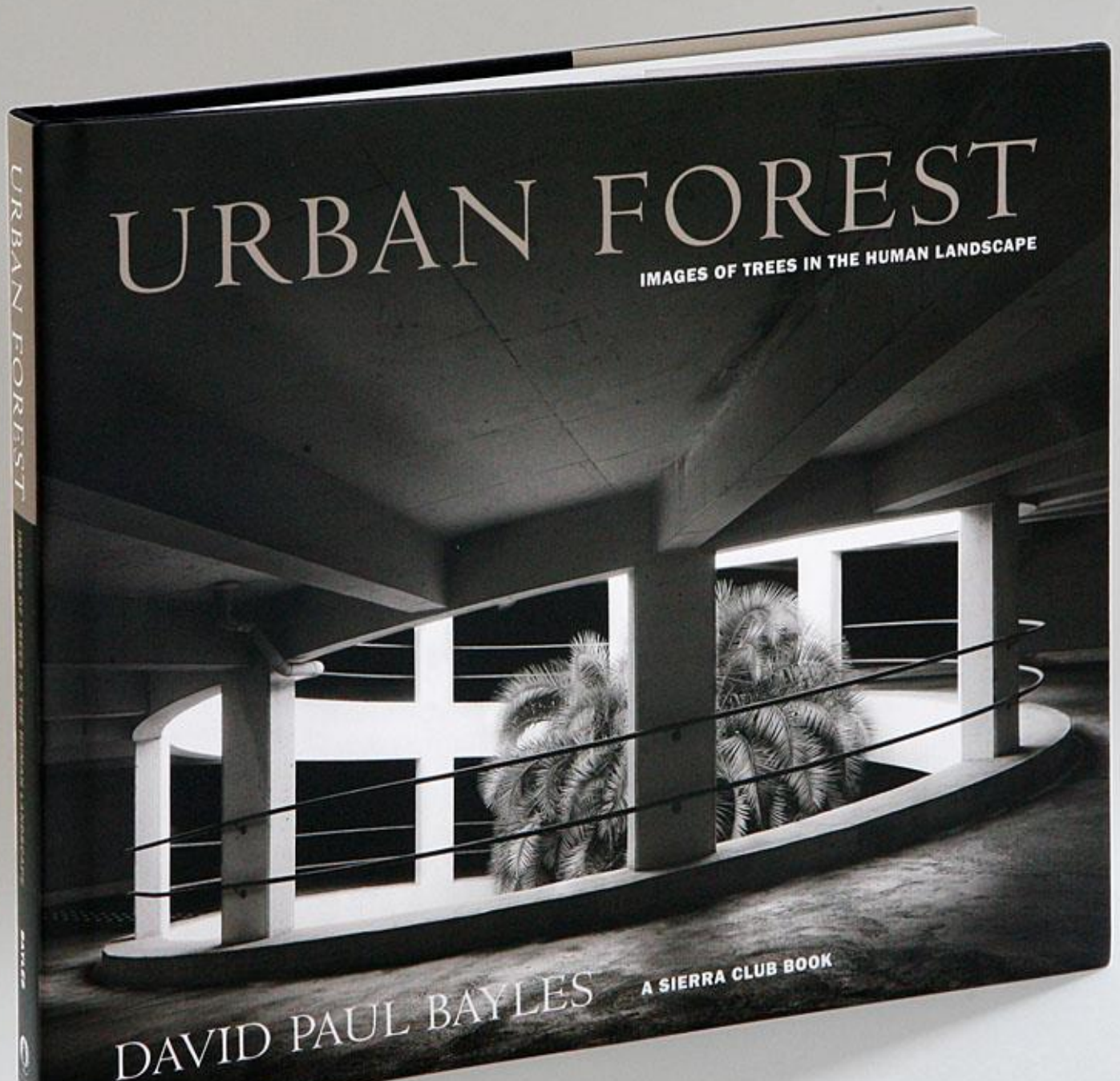
My talk today

- Urban forestry revisited
- Drivers of change impacting urban forestry
- The changing face of global urban forestry
- Ways forward?



Source: Schama (1995)

Paulus Constantijn la Fargue 1729-1782


URBAN FOREST
IMAGES OF TREES IN THE HUMAN LANDSCAPE
DAVID PAUL BAYLES
A SIERRA CLUB BOOK
URBAN FOREST

Glowing trees could light up city streets

25 November 2010 by Frank Swain
Magazine issue 2788. Subscribe and save

IMAGINE taking a midnight stroll, your route lit by row upon row of trees glowing a ghostly blue. If work by a team of undergraduates at the University of Cambridge pans out, bioluminescent trees could one day be giving our streets this dreamlike look. The students have taken the first step on this road by developing genetic tools that allow bioluminescence traits to be easily transferred into an organism.

Nature is full of glow-in-the-dark critters, but their shine is feeble - far too weak to read by, for example. To boost this light, the team, who were participating in the annual International Genetically Engineered Machines competition (iGEM), modified genetic material from fireflies and the luminescent marine bacterium *Vibrio fischeri* to boost the production and activity of light-yielding enzymes. They then made further modifications to create genetic components or "BioBricks" that can be inserted into a genome.

The team managed to produce a range of colours by putting these genes into the *Escherichia coli* bacterium. They found that a volume of bacterial culture about the size of a regular wine bottle gave off enough light to read by.

"We didn't end up making bioluminescent trees, which was the inspiration for

Street lamps with a difference (Image: Theo Sanderson)

Forestry Serving Urbanised Societies

IUFRO European Regional Conference,
in collaboration with EFI
Copenhagen, Denmark, August 27-30, 2002

Organised in conjunction with the 9th EFI Annual Conference
Copenhagen, Denmark, August 26, 2002

Organised by:

IUFRO, International Union of Forest Research Organizations

E F I

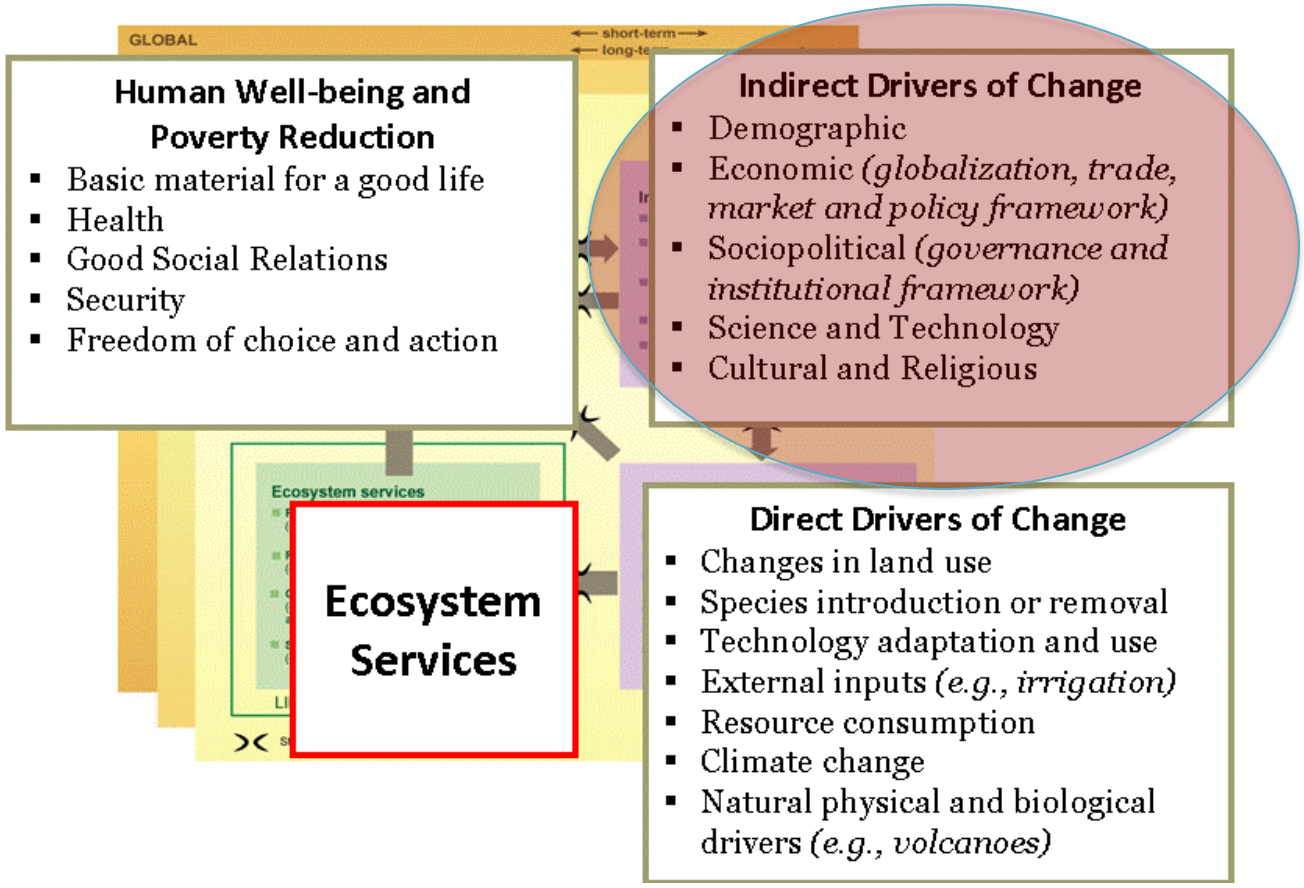
European Forest Institute

Danish Centre for Forest, Landscape and Planning

Change in focus at this conference

- Global changes and Changing cities
- The quest for green, healthy and competitive cities
- Changes and responses: governance and policy; management; research and innovation; education; community-based approaches
- Designing the urban forests of the future

MA Framework



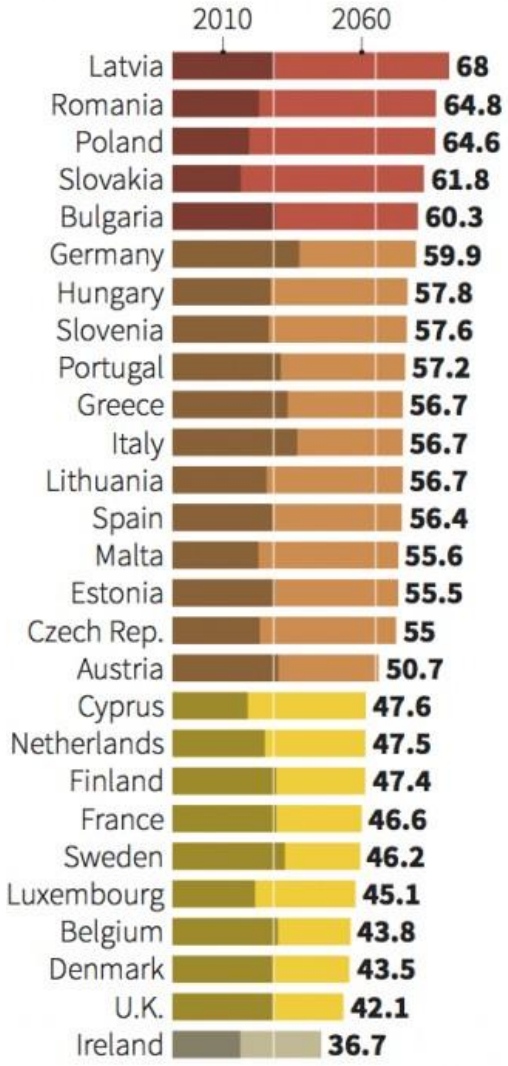
http://www.millenniumassessment.org

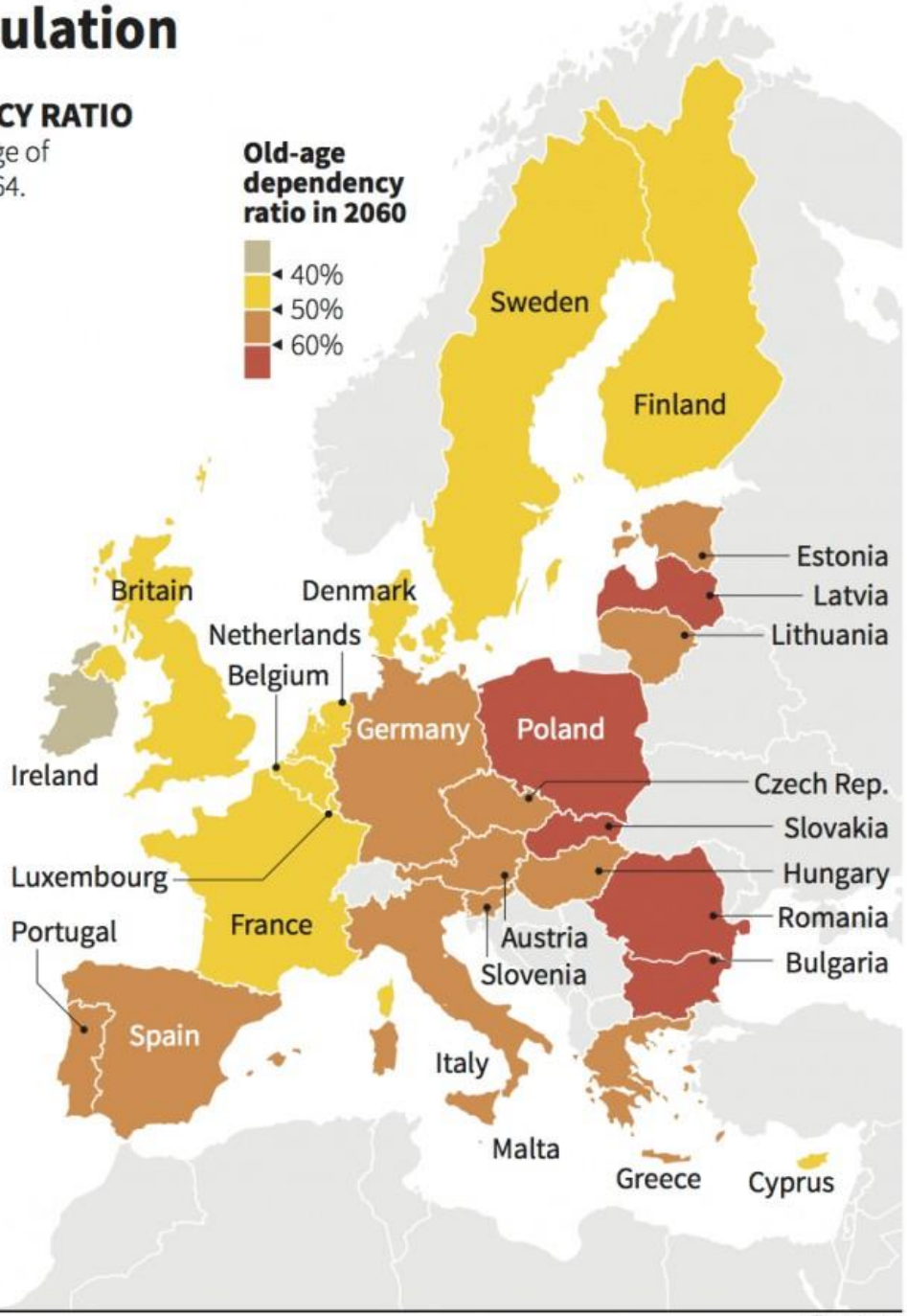
Demographic drivers of change

Europe's ageing population

PROJECTED OLD-AGE DEPENDENCY RATIO

Number of persons aged 65 as a percentage of number of persons aged between 15 and 64.

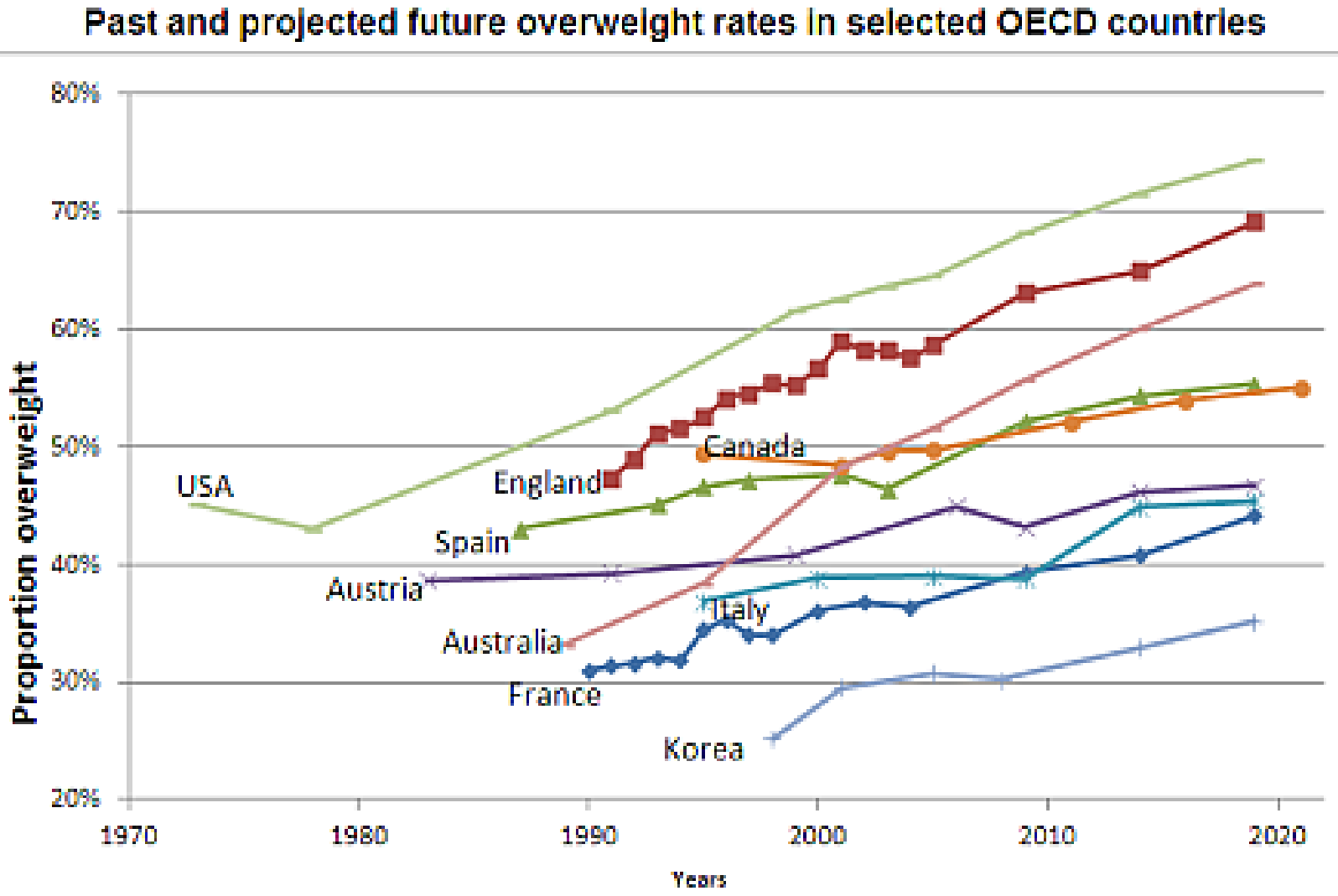




Source: Eurostat

W. Foo, 24/04/2013

REUTERS



OECD, 2010 data

Economic drivers of change

Ecosystem services
=
benefits people obtain from ecosystems

http://www.millenniumassessment.org

The value of the world's ecosystem services and natural capital

Robert Costanza*†, Ralph d'Arge‡, Rudolf de Groot§, Stephen Farber‖, Monica Grasso†, Bruce Hannon¶, Karin Limburg#*, Shahid Naeem, Robert V. O'Neill††, Jose Paruelo‡‡, Robert G. Raskin§§, Paul Sutton‖‖ & Marjan van den Belt¶¶**

* *Center for Environmental and Estuarine Studies, Zoology Department, and † Institute for Ecological Economics, University of Maryland, Box 38, Solomons, Maryland 20688, USA*
‡ *Economics Department (emeritus), University of Wyoming, Laramie, Wyoming 82070, USA*
§ *Center for Environment and Climate Studies, Wageningen Agricultural University, PO Box 9101, 6700 HB Wageninengen, The Netherlands*
‖ *Graduate School of Public and International Affairs, University of Pittsburgh, Pittsburgh, Pennsylvania 15260, USA*
¶ *Geography Department and NCSA, University of Illinois, Urbana, Illinois 61801, USA*
# *Institute of Ecosystem Studies, Millbrook, New York, USA*
** *Department of Ecology, Evolution and Behavior, University of Minnesota, St Paul, Minnesota 55108, USA*
†† *Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831, USA*
‡‡ *Department of Ecology, Faculty of Agronomy, University of Buenos Aires, Av. San Martin 4453, 1417 Buenos Aires, Argentina*
§§ *Jet Propulsion Laboratory, Pasadena, California 91109, USA*
‖‖ *National Center for Geographic Information and Analysis, Department of Geography, University of California at Santa Barbara, Santa Barbara, California 93106, USA*
¶¶ *Ecological Economics Research and Applications Inc., PO Box 1589, Solomons, Maryland 20688, USA*

The services of ecological systems and the natural capital stocks that produce them are critical to the functioning of the Earth's life-support system. They contribute to human welfare, both directly and indirectly, and therefore represent part of the total economic value of the planet. We have estimated the current economic value of 17 ecosystem services for 16 biomes, based on published studies and a few original calculations. For the entire biosphere, the value (most of which is outside the market) is estimated to be in the range of US$16–54 trillion ($10^{12}$) per year, with an average of US$33 trillion per year. Because of the nature of the uncertainties, this must be considered a minimum estimate. Global gross national product total is around US$18 trillion per year.

Because ecosystem services are not fully 'captured' in commercial markets or adequately quantified in terms comparable with economic services and manufactured capital, they are often given too little weight in policy decisions. This neglect may ultimately compromise the sustainability of humans in the biosphere. The economies of the Earth would grind to a halt without the services of ecological life-support systems, so in one sense their total value to the economy is infinite. However, it can be instructive to estimate the 'incremental' or 'marginal' value of ecosystem services (the estimated rate of change of value compared with changes in ecosystem services from their current levels). There have been many studies in the past few decades aimed at estimating the value of a wide variety of ecosystem services. We have gathered together this large (but scattered) amount of information and present it here in a form useful for ecologists, economists, policy makers and the general public. From this synthesis, we have estimated values for ecosystem services per unit area by biome, and then multiplied by the total area of each biome and summed over all services and biomes.

Although we acknowledge that there are many conceptual and empirical problems inherent in producing such an estimate, we think this exercise is essential in order to: (1) make the range of potential values of the services of ecosystems more apparent; (2) establish at least a first approximation of the relative magnitude of global ecosystem services; (3) set up a framework for their further analysis; (4) point out those areas most in need of additional research; and (5) stimulate additional research and debate. Most of the problems and uncertainties we encountered indicate that our estimate represents a minimum value, which would probably increase: (1) with additional effort in studying and valuing a broader range of ecosystem services; (2) with the incorporation of more realistic representations of ecosystem dynamics and interdependence; and (3) as ecosystem services become more stressed and 'scarce' in the future.

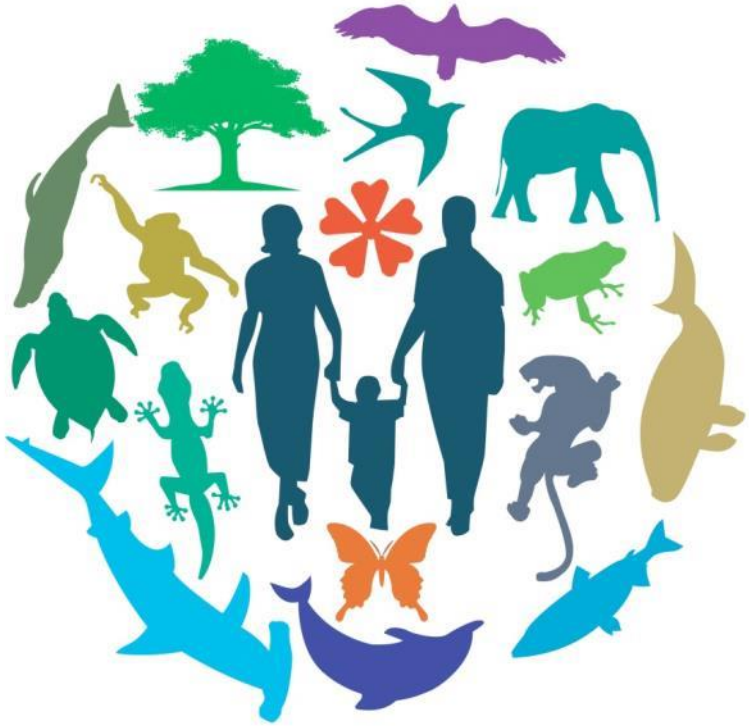
Ecosystem functions and ecosystem services

Ecosystem functions refer variously to the habitat, biological or system properties or processes of ecosystems. Ecosystem goods (such as food) and services (such as waste assimilation) represent the benefits human populations derive, directly or indirectly, from ecosystem functions. For simplicity, we will refer to ecosystem goods and services together as ecosystem services. A large number of functions and services can be identified[1–4]. Reference 5 provides a recent, detailed compendium on describing, measuring and valuing ecosystem services. For the purposes of this analysis we grouped ecosystem services into 17 major categories. These groups are listed in Table 1. We included only renewable ecosystem services, excluding non-renewable fuels and minerals and the atmosphere. Note that ecosystem services and functions do not necessarily show a one-to-one correspondence. In some cases a single ecosystem service is the product of two or more ecosystem functions whereas in other cases a single ecosystem function contributes to two or more ecosystem services. It is also important to emphasize the interdependent nature of many ecosystem functions. For example, some of the net primary production in an ecosystem ends up as food, the consumption of which generates respiratory products necessary for primary production. Even though these functions and services are interdependent, in many cases they can be added because they represent 'joint products' of the ecosystem, which support human

* Present address: Department of Systems Ecology, University of Stockholm, S-106 91 Stockholm, Sweden.

Sociopolitical drivers of change

We are all connected.



From the smallest ant to the tallest tree,

FROM THE BIRDS ROAMING THE SKIES TO THE FISH SWIMMING IN THE SEA,

Each and every creature is part of the biodiversity family.

LET'S PROTECT OUR FAMILY.

Conserve biodiversity now.

FOR MORE INFORMATION ON BIODIVERSITY CONSERVATION, LOG ON TO

www.aseanbiodiversity.org or chm.aseanbiodiversity.org

ASEAN CENTRE FOR BIODIVERSITY

2011-2020 United Nations Decade on Biodiversity

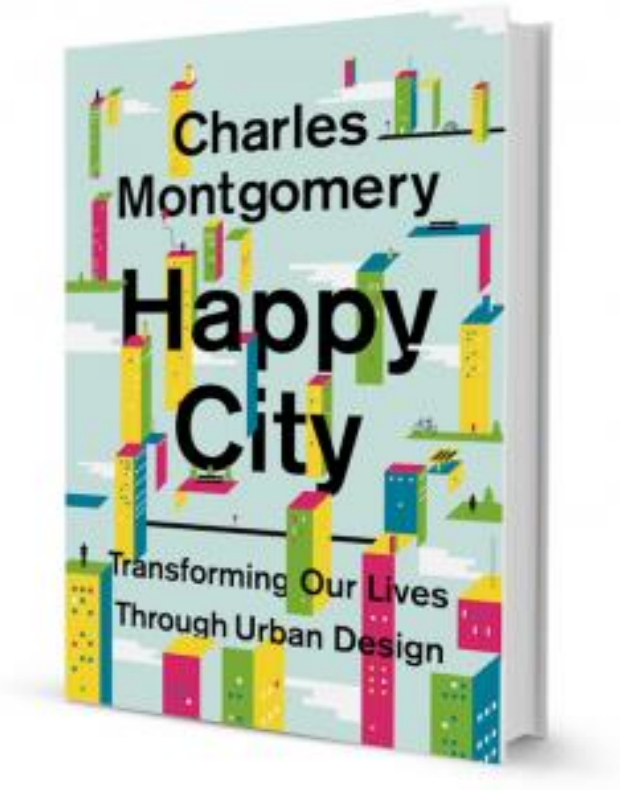
asean

How Our Health Depends on Biodiversity

Eric Chivian M.D. and Aaron Bernstein M.D., M.P.H.

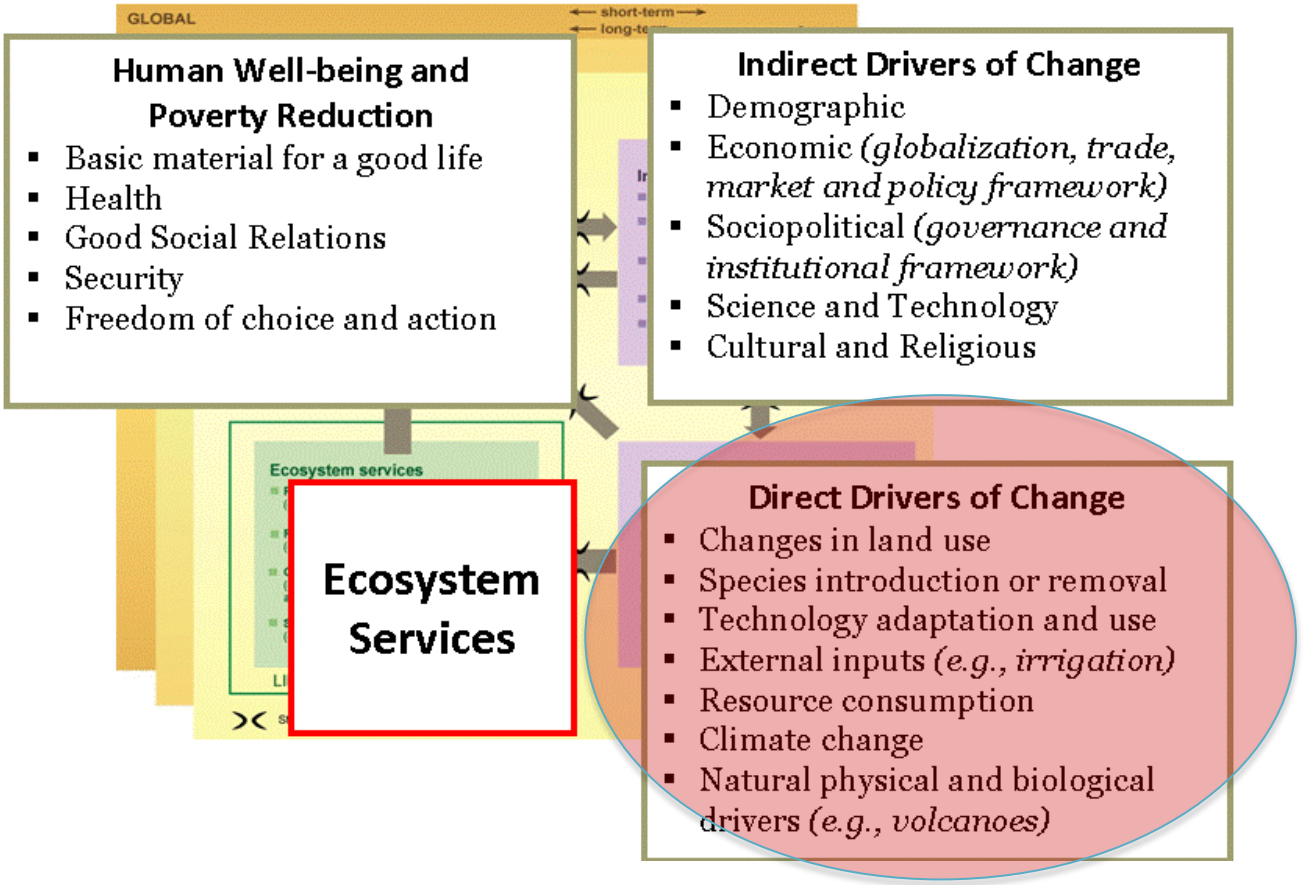
Cultural and religious drivers of change

Slide courtesy of Kristian Skaa



- Focus on Urban Design
- “Retrofitting our cities for *happiness*”
- Soft traffic, shared space
- Density and the ’savannah trap’
- Importance of biological complexity

MA Framework



http://www.millenniumassessment.org

Direct drivers of change

- Changes in land use
- Species introduction or removal
- Technology adaptation and use
- External inputs
- Resource consumption
- Climate change
- Natural and physical biological drivers

Urbanisation in Europe
2000 - 2006

Change from natural to artificial surface area per 100 km² (10x10 km cells)

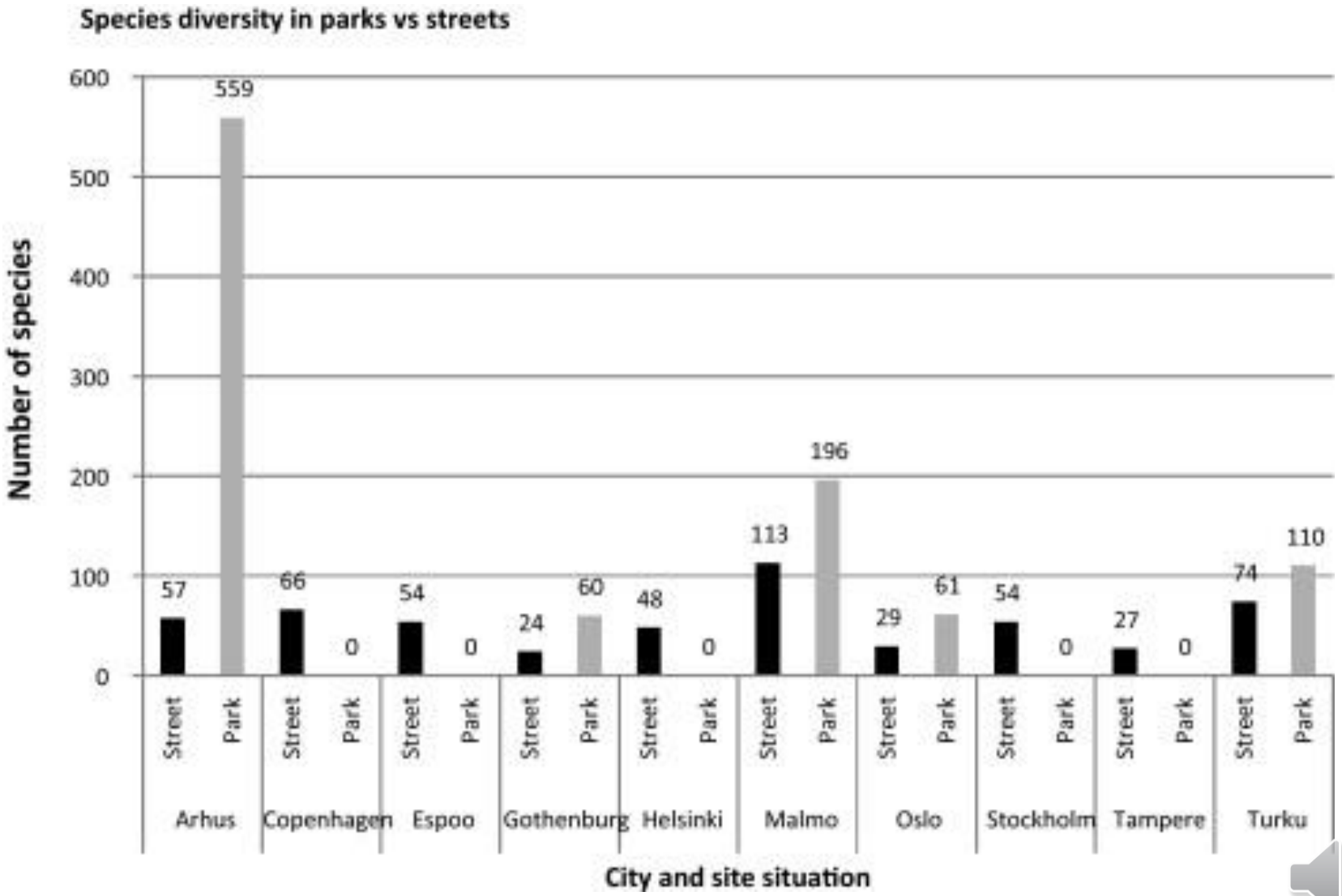
- **< 0.5 km2**
- **0.5 - 1 km2**
- **1 - 2 km2**
- **2 - 5 km2**
- **> 5 km2**
- **Urban areas 2000**
- **no data**

Source:
EEA Corine land cover 2000 / 2006, Version 14
(UK is included from version 15)

0 125 250 500
km

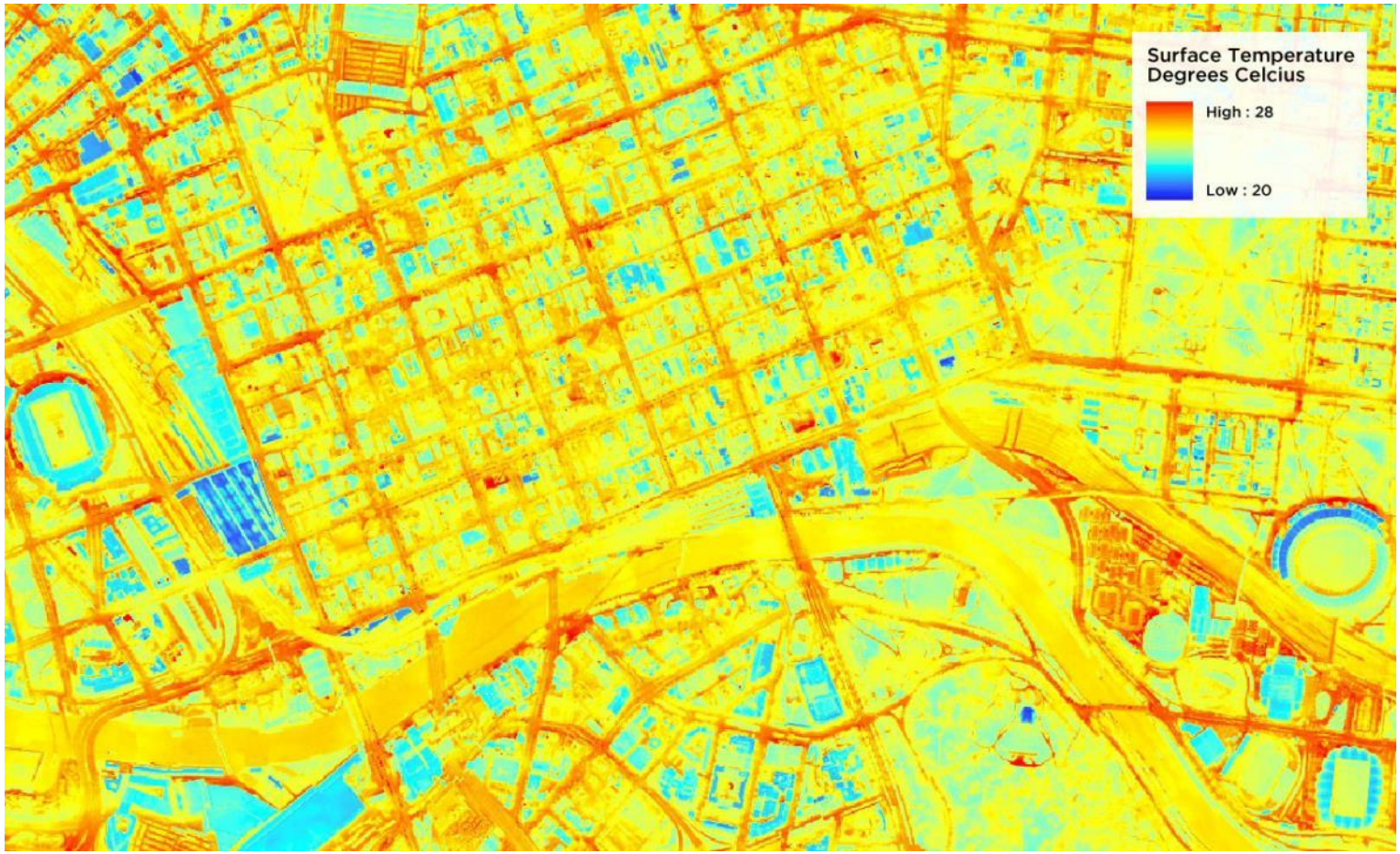
Christian Fertner
University of Copenhagen
chfe@life.ku.dk
July 2011

Sjöman et al. (2012)



SLU

i-Tree



www.melbourneurbanforestvisual.com.au

Contents lists available at SciVerse ScienceDirect

Physiology & Behavior

journal homepage: www.elsevier.com/locate/phb

Inducing physiological stress recovery with sounds of nature in a virtual reality forest — Results from a pilot study

Matilda Annerstedt [a,*], Peter Jönsson [b], Mattias Wallergård [c], Gerd Johansson [c], Björn Karlson [b,d], Patrik Grahn [a], Åse Marie Hansen [e], Peter Währborg [a]

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[b] Department of Laboratory Medicine, Division of Occupational and Environmental Medicine, Section of Behavioral Medicine, Box 188, Lund University, 221 85 Lund, Sweden
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[d] Department of Psychology, Lund University, P.O. Box 118, SE-221 00 Lund, Sweden
[e] National Research Centre for the Working Environment, 2100 Copenhagen, Denmark

HIGHLIGHTS

- Stress reactions were induced with virtual reality TSST.
- Virtual reality nature facilitated the recovery from stress.
- Nature sounds combined with virtual nature activated the parasympathetic system.
- Experimental studies on human-nature interactions may use virtual techniques.

ARTICLE INFO

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Cortisol
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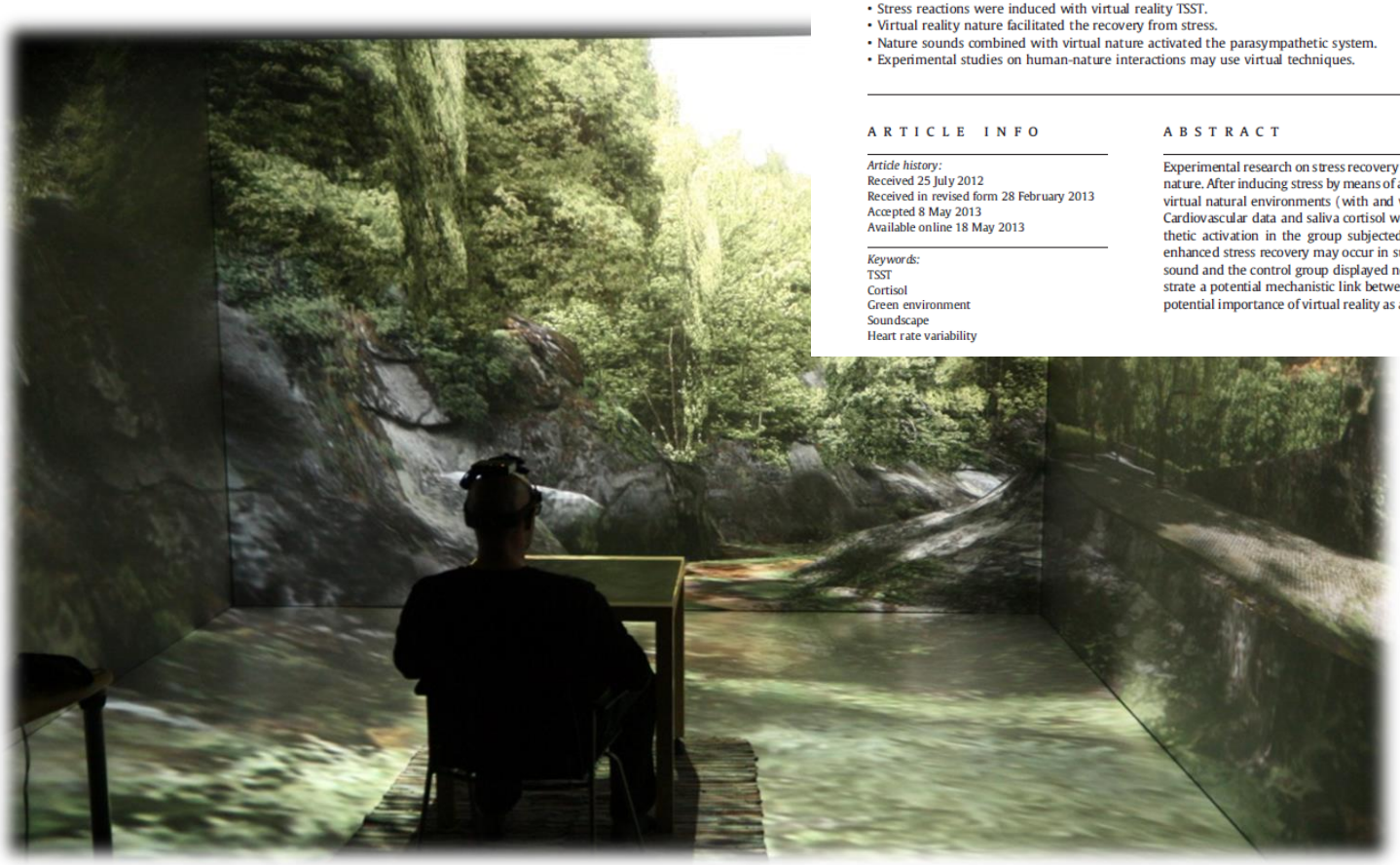
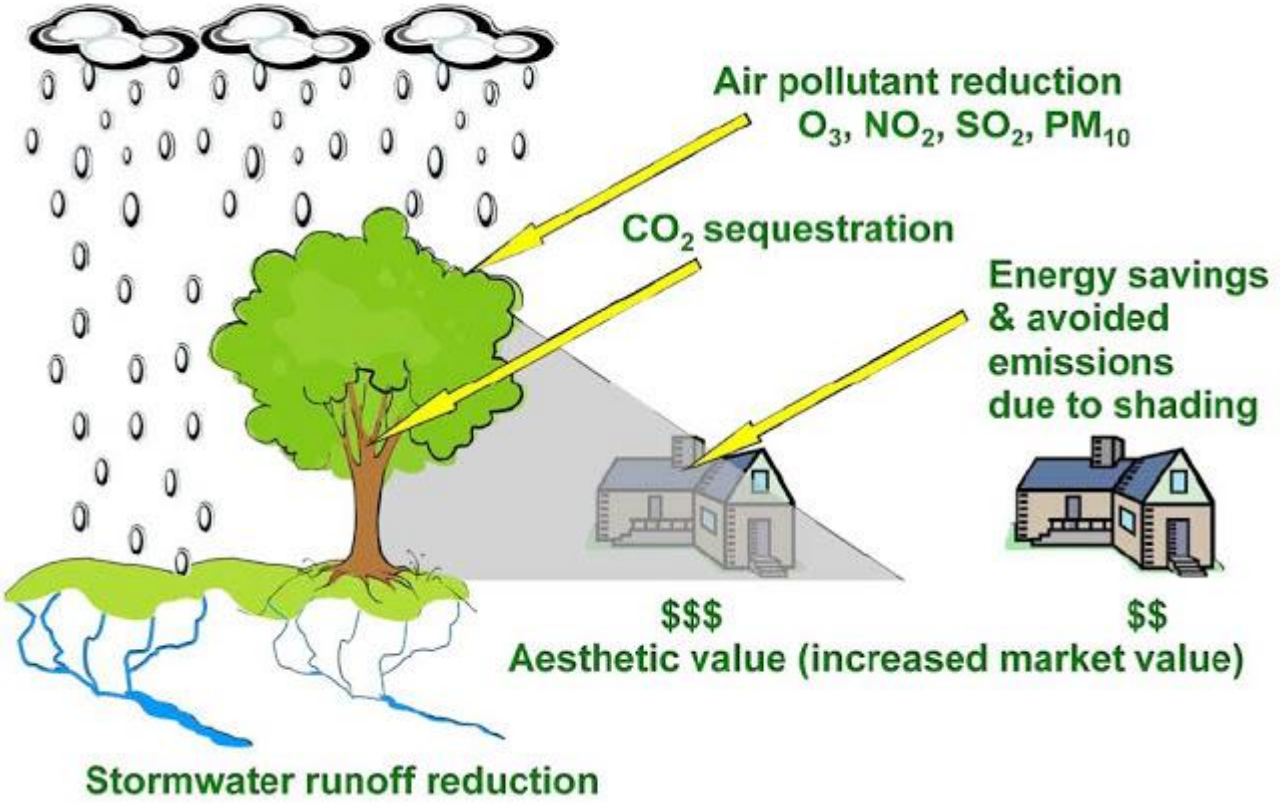
Soundscape
Heart rate variability

ABSTRACT

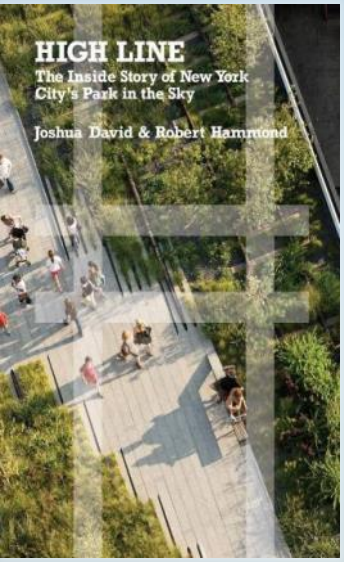
Experimental research on stress recovery in natural environments is limited, as is study of the effect of sounds of nature. After inducing stress by means of a virtual stress test, we explored physiological recovery in two different virtual natural environments (with and without exposure to sounds of nature) and in one control condition. Cardiovascular data and saliva cortisol were collected. Repeated ANOVA measurements indicated parasympathetic activation in the group subjected to sounds of nature in a virtual natural environment, suggesting enhanced stress recovery may occur in such surroundings. The group that recovered in virtual nature without sound and the control group displayed no particular autonomic activation or deactivation. The results demonstrate a potential mechanistic link between nature, the sounds of nature, and stress recovery, and suggest the potential importance of virtual reality as a tool in this research field.



Ecosystem services provided by urban trees



http://theriverwhisperer.blogspot.se/2012/01/ecosystem-services-provided-by-urban.html


HIGH LINE
The Inside Story of New York City's Park in the Sky
Joshua David & Robert Hammond

Essential urban forests

Wikipedia, Wikimedia, PD-USGOV-USDA

Resilience

The capacity to recover quickly from difficulties; toughness

http://www.oxforddictionaries.com/definition/english/resilience

Tree Diversity Conference 2014

Our urban forests are under siege from disease, aging canopy, budget constraints and more. Leading experts on creating a vibrant urban canopy from across America will launch this first event of its kind in Colorado.

Continuing Education Credits available for arborists.
Certification with International Society of Arboriculture (ISA)

MORE. TREE. TYPES.

Lindsay Auditorium, Room 281
Sturm Hall, University of Denver

Map and directions to the Lindsay Auditorium and Parking options on campus will be provided to all registrants.

Attendance $60 per person. $35 for registered students. Includes Panera box lunch. Prompt payments made by credit or debit card by logging on to www.paypal.com and clicking on the "Send Someone Money" button. Specify that the payment be made to 2014treediversityconference@gmail.com in the field "Their Email." Please include the names of all the people you are registering in the comments box on the PayPal form . The charge will show up on your credit card statement as 2014treediversityconference." Refunds of fees will not be available after 2/28. Contact Sonia John (soniajoao@aol.com) for details.

Friday, March 7, 2014

Time: 9AM-4:30PM

Presented by

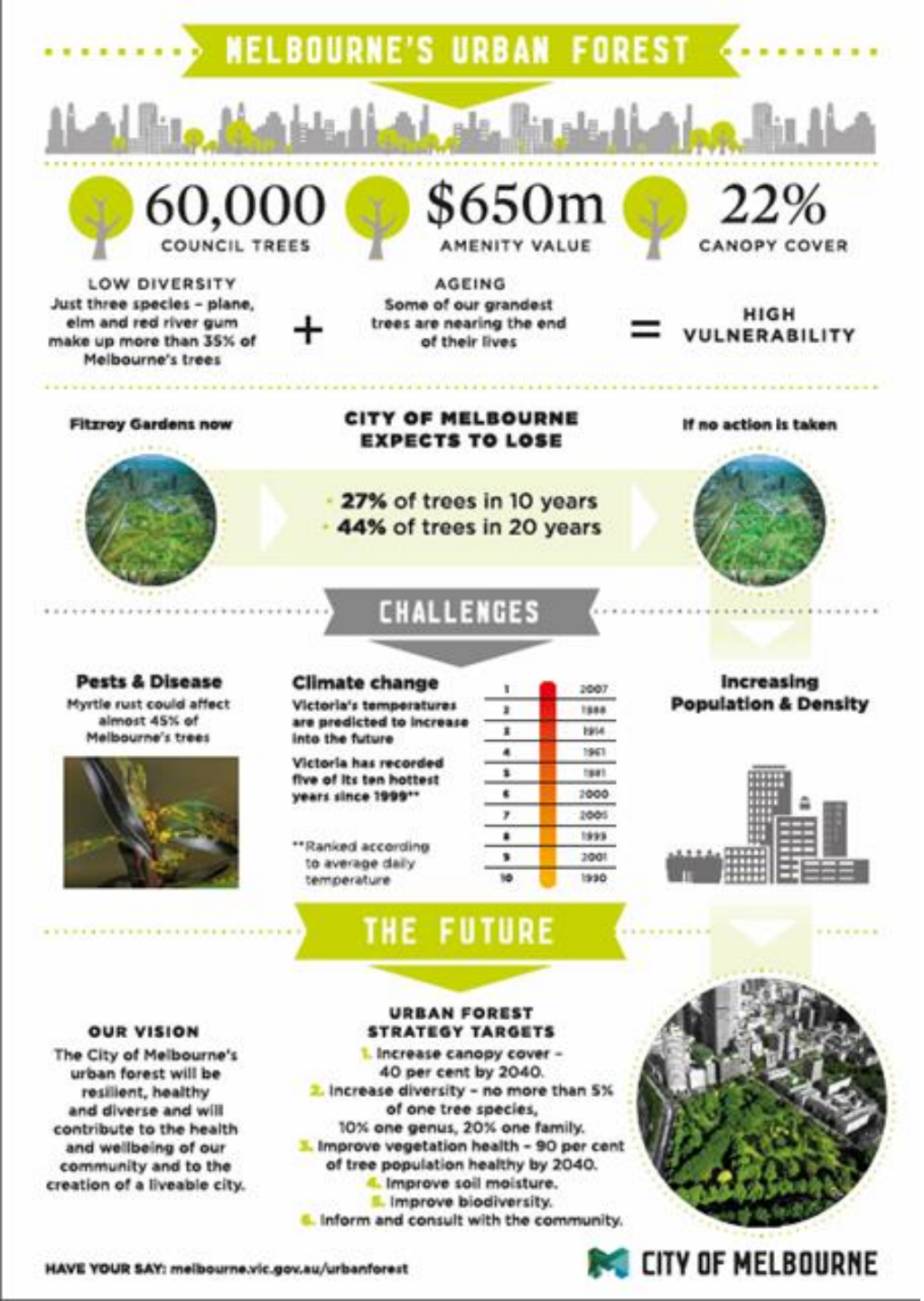
The University of Denver Chester M Alter Arboretum & Denver Botanic Gardens

Committee: Rob Davis, Denver City Forester; Sonia John; Panayoti Kelaidis, Denver Botanic Gardens; Martin Quigley, D.U.

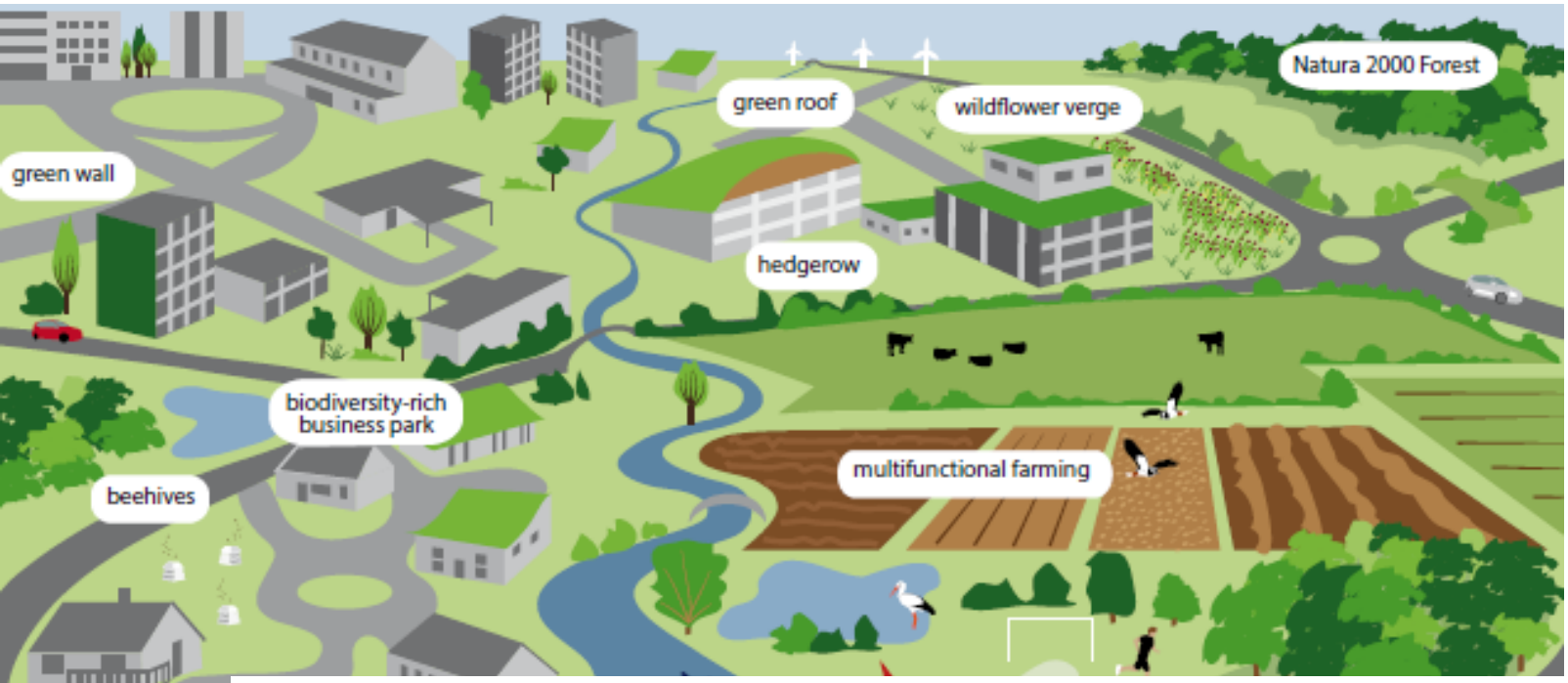
Urban Tree Diversity congress

Alnarp, Sweden, June 2014

- Diversity is desirable
- Long-term thinking – build on ’future tree species’
- Awareness raising
- Diversity starting from the nursery
- Linking planning, design, establishment, maintenance
- Native versus Exotic (or: non-debate?)
- Tree diversity, People diversity
- Need to challenge ourselves and step away from ‘business as usual’
- Good practices exist across the globe



Slide courtesy of Ian Shears, City of Melbourne



What is Green Infrastructure?

Green Infrastructure can be broadly defined as a strategically planned network of high quality natural and semi-natural areas with other environmental features, which is designed and managed to deliver a wide range of ecosystem services and protect biodiversity in both rural and urban settings.

More specifically GI, being a spatial structure providing benefits from nature to people, aims to enhance nature's ability to deliver multiple valuable ecosystem goods and services, such as clean air or water.

http://biophiliccities.org/

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Green Surge – University o... Web Slice Gallery Web Slice Gallery

BiophilicCities

HOME | THE PROJECT | BIOPHILIC CITIES | RESOURCES | BLOG | LAUNCH HOME | JOIN THE BIOPHIL

Welcome!

We need nature in our lives more than ever today, and as more of us are living in cities it must be urban nature. Biophilic Cities are cities that contain abundant nature; they are cities that care about, seek to protect, restore and grow this nature, and that strive to foster deep connections and daily contact with the natural world. Nature is not something optional, but absolutely essential to living a happy, healthy and meaningful life. This site is devoted to understanding how cities can become more biophilic, more full of nature, and to telling the stories of the places and people working to creatively build these urban-nature connections.

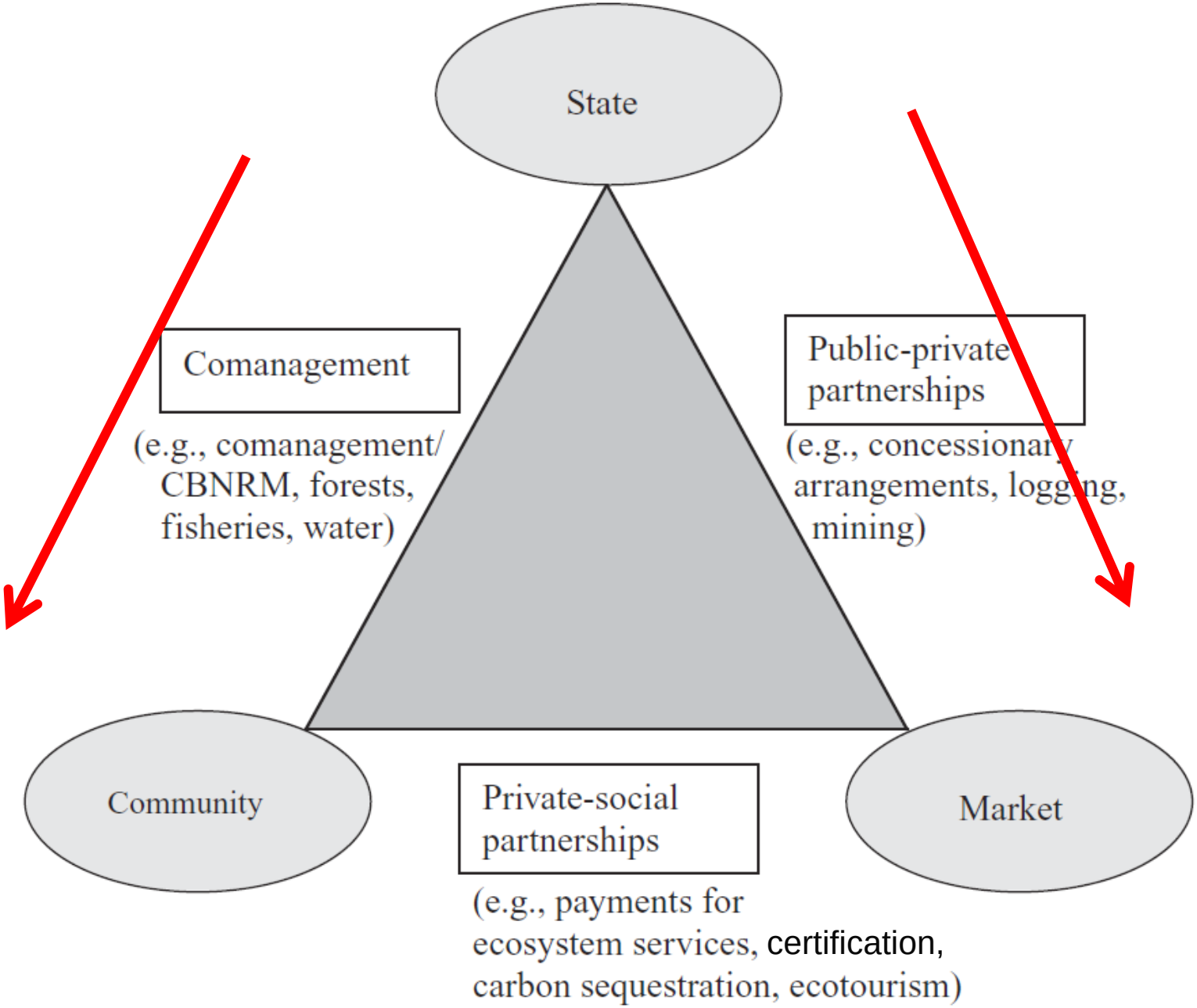
LAUNCH

Biophili

Octob

Unive

Charlo



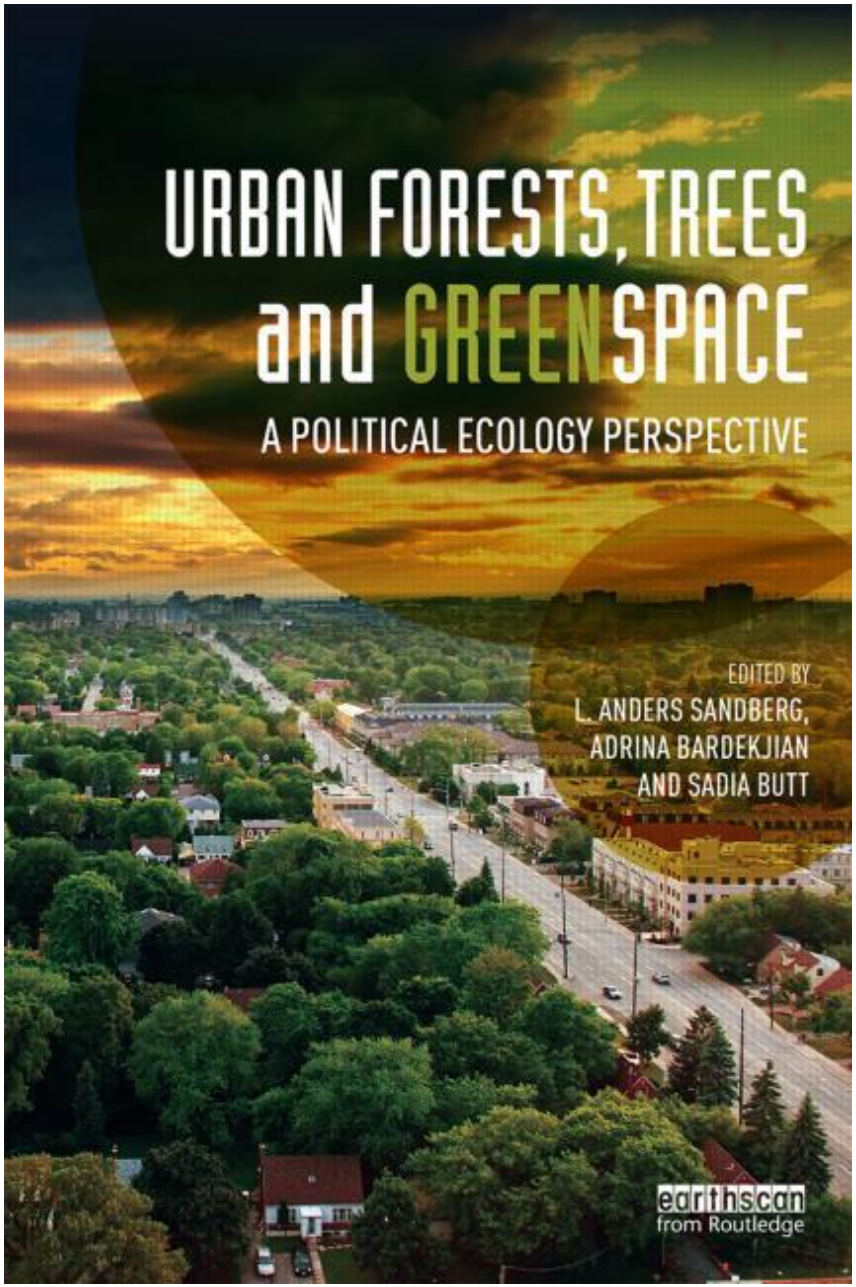
Slide courtesy of Bas Arts

Combining abilities, creating synergies, enhancing performances.

www.hybridparks.eu



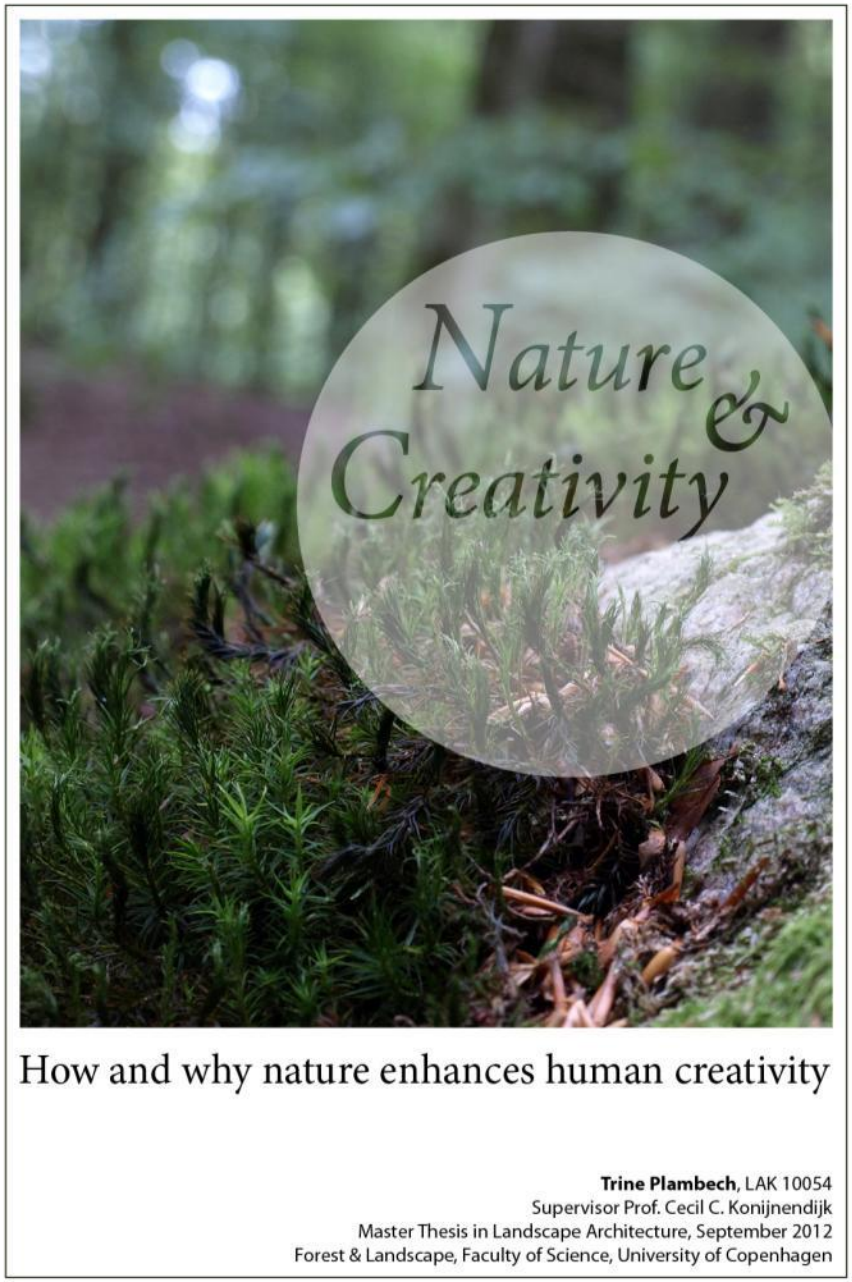

HYBRID PARKS


URBAN FORESTS, TREES
and GREENSPACE
A POLITICAL ECOLOGY PERSPECTIVE
EDITED BY
L. ANDERS SANDBERG,
ADRINA BARDEKJIAN
AND SADIA BUTT
earthscan
from Routledge

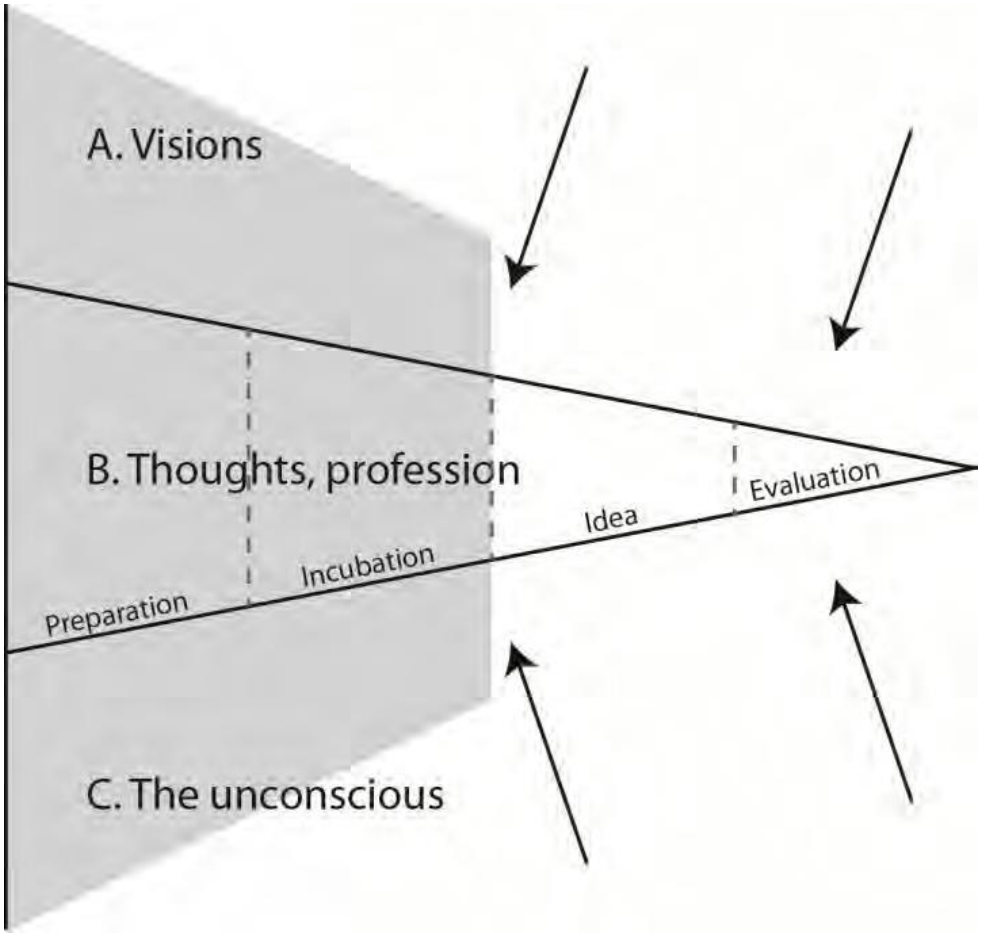
Biocultural Diversity

"(...) the diversity of life in all of its manifestations: biological, cultural, and linguistic, which are interrelated (and likely coevolved) within a complex socio-ecological adaptive system" (Maffi & Woodley, 2010)

- Human valuations and uses of nature
- Biocultural expressions – focus on concepts, physical elements
- Public ecology, transdisciplinary inquiry – social learning, connecting professionals, people and places


Nature & Creativity
How and why nature enhances human creativity
Trine Plambech, LAK 10054
Supervisor Prof. Cecil C. Konijnendijk
Master Thesis in Landscape Architecture, September 2012
Forest & Landscape, Faculty of Science, University of Copenhagen

Nature and the creative process



Source: Plambech (2012). Adapted from Mikkelsen (2009)

Parks and Public Spaces

Sustainable and healthy mobility

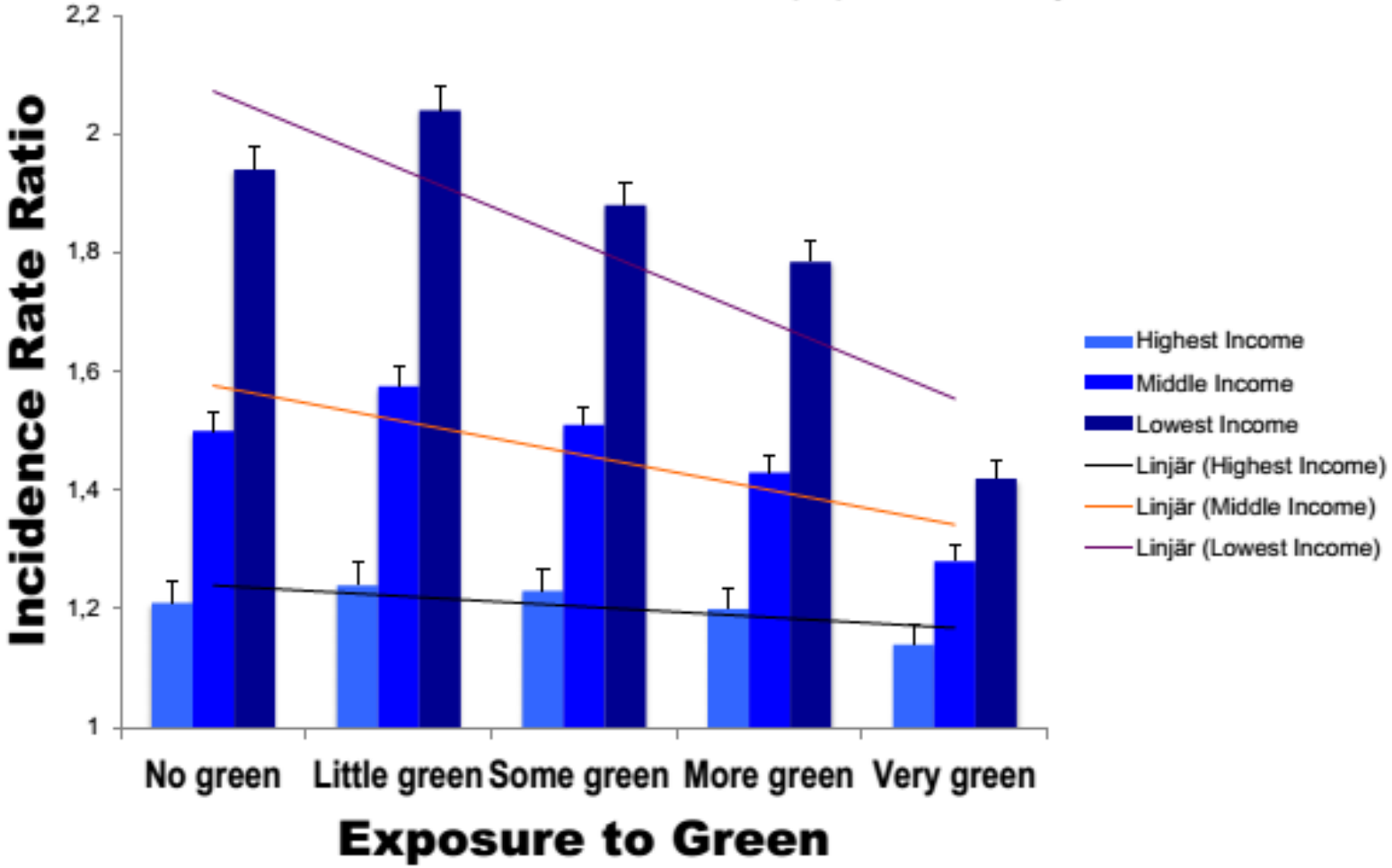
People friendly public realm

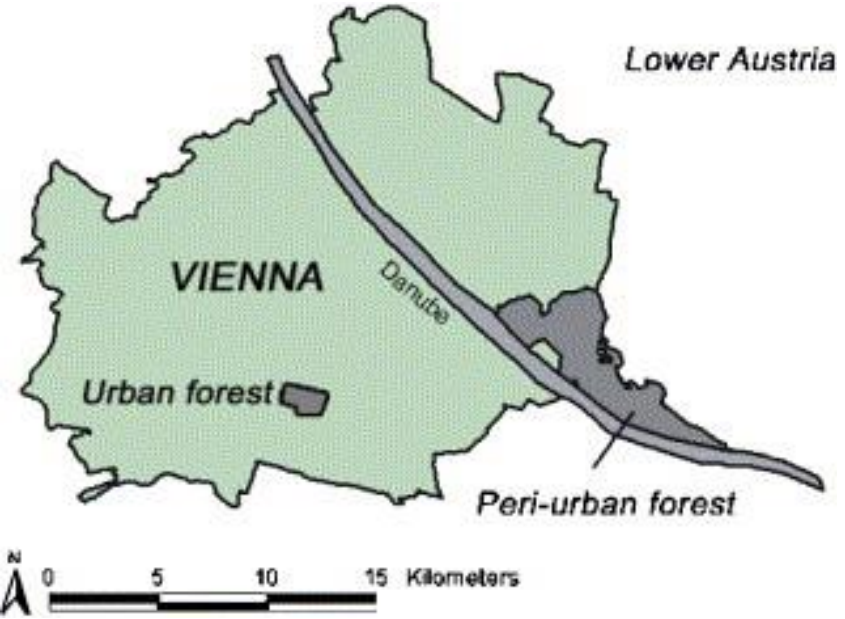
OpenStreets Programs

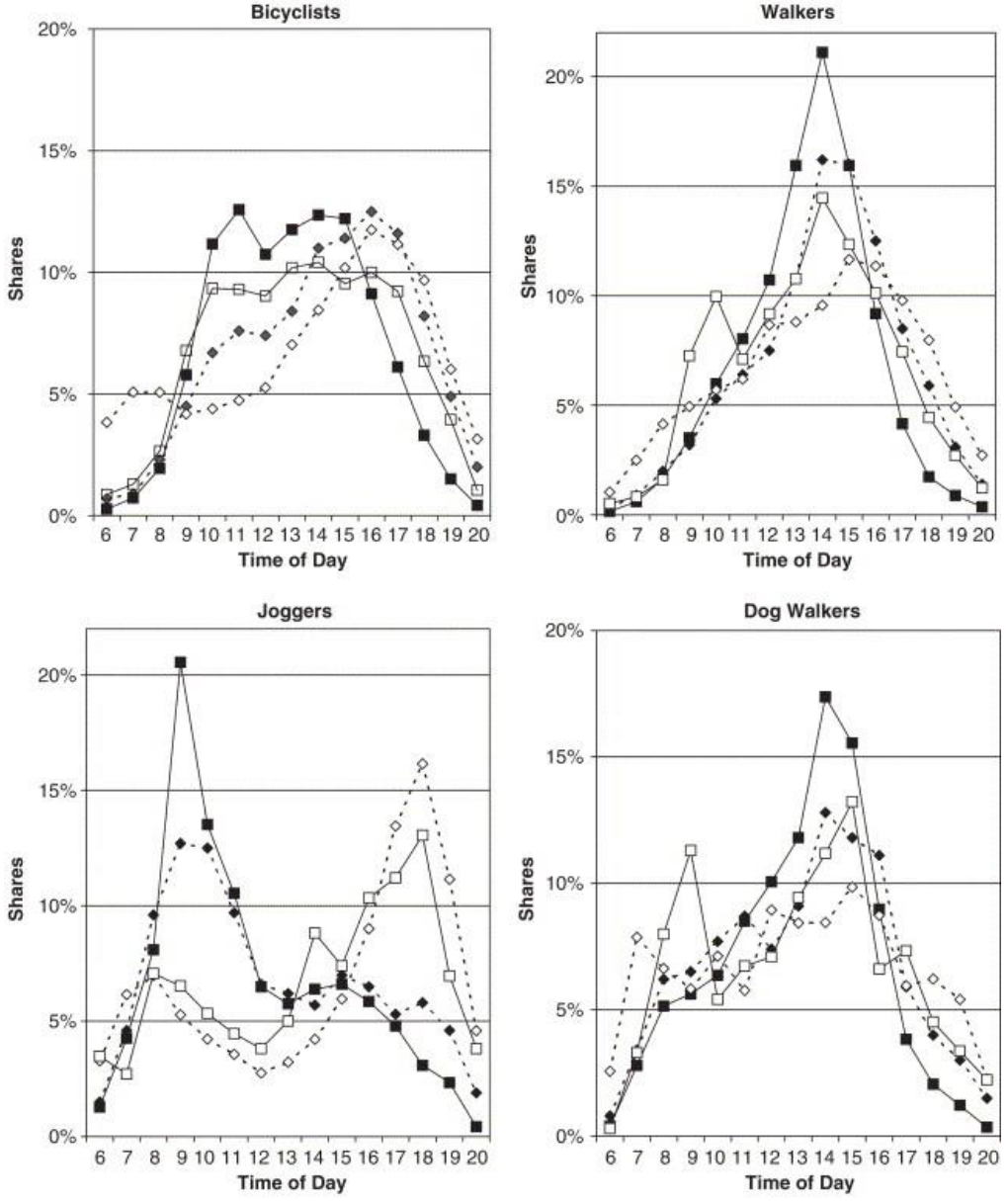
http://www.8-80cities.org

Reduced health inequalities in green areas (*Mitchell & Popham, 2008)*

"Effect of exposure to natural environment on health inequalities: an observational population study"







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Urban Forestry & Urban Greening 4 (2006) 135–144

URBAN FORESTRY & URBAN GREENING
www.elsevier.de/ufug

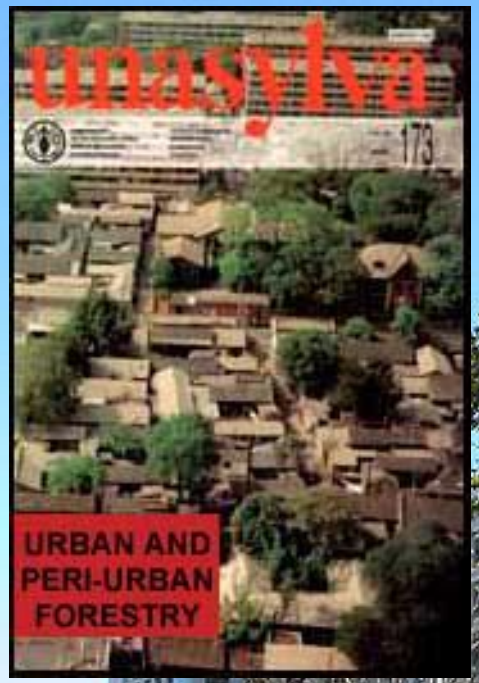
Recreation use of urban forests: An inter-area comparison

Arne Arnberger*

SLU

EFUF European Forum on Urban Forestry

Photo: Wikimedia



Perspective

- Urban forestry has become global – but is also at a crossroads
- Urban forestry with resilience, biocultural diversity and ecosystem services in mind
- Urban forestry as contributor to e.g., urban resilience, green infrastructure
- Finding the essence of urban forestry