WELCOME TO THE ANTHROPOCENE AND AN URBANIZING WORLD

% URBAN POPULATION (UN ESTIMATION)

- Fig. 1. (A) Change in world urban and rural population (%) from 1950 to 2030 (projected); plotted from data in (1). Inset shows comparable data for the United States from 1790 to 1990; plotted from data in (73). (B) Change in population of the 10 largest urban agglomerations from 1950 to 2010 (projected), ranked from left (largest) to right by their projected population size in 2010: Tokyo, Japan; Ciudad de México, Mexico; Mumbai, India; São Paulo, Brazil; New York–Newark, USA; Delhi, India; Shanghai, China; Kolkata, India; Jakarta, Indonesia; Dhaka, Bangladesh.

Source: UN Environment Program 2009

http://www.youtube.com/watch?v=mPi4ewEpwe8&feature=player_embedded
Welcome to the Anthropocene and an Urbanizing World

Urban areas ~ living environment of the people!!!
Welcome to the Anthropocene and an Urbanizing World

How can we ensure the quality of life in our current and future cities?!
This urbanization and globalization context forces us to think of alternative solutions to cope with our living environment. It is clear that we urgently need additional environmental policy measures and smart urban planning schemes to secure our quality of life in this changing environment.
SUSTAINABLE URBAN PLANNING/DEVELOPMENT/MANAGEMENT?

URBAN BIOPHYSICAL MODELS

SUSTAINABLE URBAN PLANNING
SUSTAINABLE URBAN PLANNING/DEVELOPMENT/MANAGEMENT?

URBAN BIOPHYSICAL MODELS

URBAN INFRASTRUCTURE

type of material
height of buildings
roof exposition
etc.

PLANT & ECOSYSTEM PROPERTIES

moisture content
chl-a concentration
species diversity
habitat Quality
vegetation Height
etc.

SUSTAINABLE URBAN PLANNING
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URBAN BIOPHYSICAL MODELS

SUSTAINABLE URBAN PLANNING

- moisture content
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- etc.

- type of material
- height of buildings
- roof exposition
- etc.

URBAN INFRASTRUCTURE
URBAN REMOTE SENSING
THE STARTING POINT OF SUSTAINABLE URBAN PLANNING/DEVELOPMENT/MANAGEMENT?
**OBJECTIVES**

**URBAN REMOTE SENSING**

Explore the potential of the combined use of recent multi- and hyperspectral sensors, in combination with structural information derived by LiDAR, for detailed, characterization of morphological and (bio)physical properties of the urban environment.

**URBAN FLUX MODELING**

Incorporating remote sensing derived information on the urban environment into modeling of water and heat fluxes.

**URBAN PLANNING**

The dynamics of the urban environment will be accounted for by coupling biophysical modeling approaches (urban climate, hydrology) to urban growth simulation.
A detailed urban material map was made for Brussels using **Support Vector Classification of APEX data** in combination with post-classification correction based on LiDAR derived geometric features.

The performance of **Spectral Unmixing via MESMA** for urban land cover mapping was significantly improved using height information derived from LiDAR data.

Tested on both airborne hyperspectral (APEX) data and satellite multispectral (Sentinel-2) data and was found to increase the accuracy of subpixel fraction estimation by roughly 60% in both cases.

**Priem F. & Canters F., Synergistic use of LiDAR and APEX hyperspectral data for high-resolution urban land cover mapping, Remote Sensing, 2016, 8(10), 787; doi:10.3390/rs8100787**

The synergenic use of an (external) spectral library and image data resulted in significant improvements in urban land cover mapping.

MESMA was used in combination with a new library optimization technique to show its potential for urban land cover mapping based on generic spectral libraries.

We could illustrate that the transferability of Support Vector Regression models using external spectral libraries could work.


URBAN HEAT MONITORING

REMOTE SENSING AS A HEAT ASSESSMENT TOOL? THE LOCAL CLIMATE ZONE CONCEPT

Local Climate Zones

Morphology

Lack of vegetation

1. Compact highrise
2. Compact midrise
3. Compact lowrise
4. Open highrise
5. Open midrise
6. Open lowrise
7. Lightweight lowrise
8. Large lowrise
9. Sparsely built
10. Heavy industry

A. Dense trees
B. Scattered trees
C. Bush, scrub
D. Low plants
E. Bare rock or paved
F. Bare soil or sand
G. Water

After Stewart and Oke (2012)
WE PROVIDE A TOOLSET FOR SUPPORTING SUSTAINABLE URBAN PLANNING ACCOUNTING FOR HEAT AND WATER FLUX IMPACTS
We provide a toolset for supporting sustainable urban planning accounting for heat and water flux impacts.
We provide a toolset for supporting sustainable urban planning accounting for heat and water flux impacts.

Thermal evaluation

Future heat stress

Legend
- LCZ 2: Compact Midrise
- LCZ 3: Compact Lowrise
- LCZ 6: Open Lowrise
- LCZ 8: Large Lowrise
- LCZ 9: Sparsely built
- LCZ 5: Open Midrise
- LCZ A: Dense Trees
- LCZ B: Scattered Trees
- LCZ D: Low Plants
- LCZ G: Water

Credits: Frieke Van Coillie, Marie-Leen Verdonck en Matthias Demuzere
WE PROVIDE A TOOLSET FOR SUPPORTING SUSTAINABLE URBAN PLANNING ACCOUNTING FOR HEAT AND WATER FLUX IMPACTS

Credits: Boud Verbeiren & Charlotte Wirion
SUSTAINABLE URBAN PLANNING/DEVELOPMENT/MANAGEMENT?
ACKNOWLEDGEMENTS

Frank Canters, Jeroen Degerickx, Martin Hermy, Hans Hooyberghs, Ahmed Khan, Bino Maiheu, Joe McFadden, Akpona Okujeni, Frederik Priem, Dar Roberts, Philip Stessens, Frieke Van Coillie, Sebastian van der Linden, Boud Verbeiren, Marie-Leen Verdonck, Erin Wetherley, Charlotte Wirion, Matthias Demuzere

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