URBANEARS - URBAN ECOSYSTEM ANALYSIS SUPPORTED BY REMOTE SENSING

BELGIAN EARTH OBSERVATION DAY 2016

RESEARCH PROGRAMME FOR EARTH OBSERVATION ‘STEREO III’
THEMATIC PROJECT PROPOSALS CALL 2013
% Urban Population (UN estimation)

http://www.youtube.com/watch?v=mPi4zwEpwE&feature=player_embedded
Urban heating

Air pollution

CO₂ emissions

Flooding

Noise pollution

Biodiversity loss

Source: Living Planet Report (2012)
RESEARCH TOPIC

URBAN BIOPHYSICAL MODELS

SUSTAINABLE URBAN PLANNING
**Research Topic**

**Urban Infrastructure**
- type of material
- height of buildings
- roof exposition
- etc.

**Urban Biophysical Models**

**Plant & Ecosystem Properties**
- LAI
- moisture content
- chl-a concentration
- species diversity
- habitat quality
- vegetation height
- etc.

**Sustainable Urban Planning**
RESEARCH TOPIC

URBAN BIOPHYSICAL MODELS

SUSTAINABLE URBAN PLANNING

- Moisture content
- Chlorophyll-a concentration
- Species diversity
- Habitat quality
- Vegetation height
- Type of material
- Building height
- Roof exposition
- Infrastructure properties
- Urban heat island effect
- Urban water cycle
- Anthropogenic heat flux into the subsurface
- Urban aquifer
URBAN REMOTE SENSING?

A BIRD ’S EYE VIEW ON THE CITY

PLANT & ECOSYSTEM PROPERTIES

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

URBAN INFRASTRUCTURE

- type of material
- height of buildings
- roof exposition
- etc.
Urban Remote Sensing?

Multi-source Multi-resolution Approach

Hyperspectral Airborne (2 m)
- 2-5 meter resolution
- >200 bands

LiDAR

Sentinel2/Landsat

Enmap/HyspIRI

Multispectral Hyperspectral Spaceborne (30 m)

Brussels
Berlin
Santa Barbara
Overall kappa before correction = 0.80
Overall kappa after correction = 0.87

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
If wrong: next best class (SVC class probabilities)
Urban Remote Sensing?

Credits: Jeroen Degerickx, Ann Crabbé, Frieke Van Coillie et al.
APEX

Hyperspectral library

Multispectral library

resample

Sentinel-2

Support Vector Regression

Vegetation – Impervious - Soil fraction maps
VIS fractions map

Red = Impervious
Green = Vegetation
Blue = Soil

Validation on block level

Credits: Frederik Priem et al.
A BIRD’S EYE VIEW ON THE CITY

PLANT & ECOSYSTEM PROPERTIES
- LAI
- moisture content
- chl-a concentration
- species diversity
- habitat Quality
- vegetation Height etc.

URBAN INFRASTRUCTURE
- type of material
- height of buildings
- roof exposition etc.
Research Topic

Urban Infrastructure

Urban Biophysical Models

Plant & Ecosystem Properties
**URBAN MODELING?**

**URBAN INFRASTRUCTURE**
- Distribution
- Fractional cover
- Albedo
- Emissivity
- Heat capacity
- ...

**PLANT & ECOSYSTEM PROPERTIES**
- Distribution
- Fractional cover
- Composition
- Height
- LAI
- ...

- Sky view factor
- Frontal and planar area index
- Human activity
- ...

Local Climate Zones

Adapted from Steward & Oke (2012)
Urban water regulation

**Urban Infraestructure**
- type of material
- height of buildings
- roof exposition
- etc.

**Urban Green**
- LAI
- moisture content
- chl-a concentration
- species diversity
- vegetation height
- etc.

**Parameterisation**

**Water Balance Model**
- groundwater

**Hydro Response**

**Retention Capacity**

**Storage Capacity**

**Evaporative Capacity**

**Ecosystem Service Indicator Maps**
RESEARCH TOPIC

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URBAN INFRASTRUCTURE

PLANT & ECOSYSTEM PROPERTIES
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SUSTAINABLE URBAN PLANNING
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