

Assessment of urban ecosystem services: from rhetoric to action. The interests of the habitat approach

Évaluation des services écosystémiques : de la rhétorique à l'action. L'intérêt de l'approche par habitat

Wissal SELMI

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Findings

- Dominance of economic assessment
- Relevance of the transversal aspect
 - Social
 - Economic
 - Ecological ?!
- Conceptual uncertainties: « multi-function » and « ecosystem services »

The main assessment approaches

Assessments of urban ecosystem services

Bottom-up approach

Potential of
ecosystem to
provide services

Haines-Young et Potschin,
2006

Impact of human
activity

De Groot, 2010

Top-down approach

Prospective
approach

Busch et al, 2012

Socio-political
interests

Defra, 2008

Research questions

- How to assess ecosystem services provided by urban vegetation? And what criteria would be used?

Research Purpose

- Operational research
- Propose and test an ecological assessment to quantify the potential of urban vegetation to provide services



- Confirmed impact on human well-being
- Quantification gap
- Services of regulation

Main principle: bottom-up approach

Functions and ecosystem services



Study of environmental and human factors



Determination of its structural aspect
(distribution, dendrometric characteristics)



Determination of habitat composition
Identification and quantification of species



i-Tree model: Required data and indicators

Input data

Field measurement data
(diameter, total height, height to live top, height to crown, canopy missing, etc.);

Local climate data
(temperature, precipitation, wind direction, sky cover, etc. ;

Air pollution concentration (NO_2 , O_3 , CO , SO_2 , PM_{10} and $\text{PM}_{2.5}$, ppm and $\mu\text{g}/\text{m}^3$;

Spatial data



Tree density (tree/ha)
Leaf area(km^2)
Biomass (kg)
Pollutant flux ($\text{gm}^{-2}\text{s}^{-1}$)
Deposition velocity (ms^{-1})
VOC emission rate(t)

Output data

Urban forest structure
(species composition, number of trees, tree density; tree health, leaf area, leaf biomass, etc.);

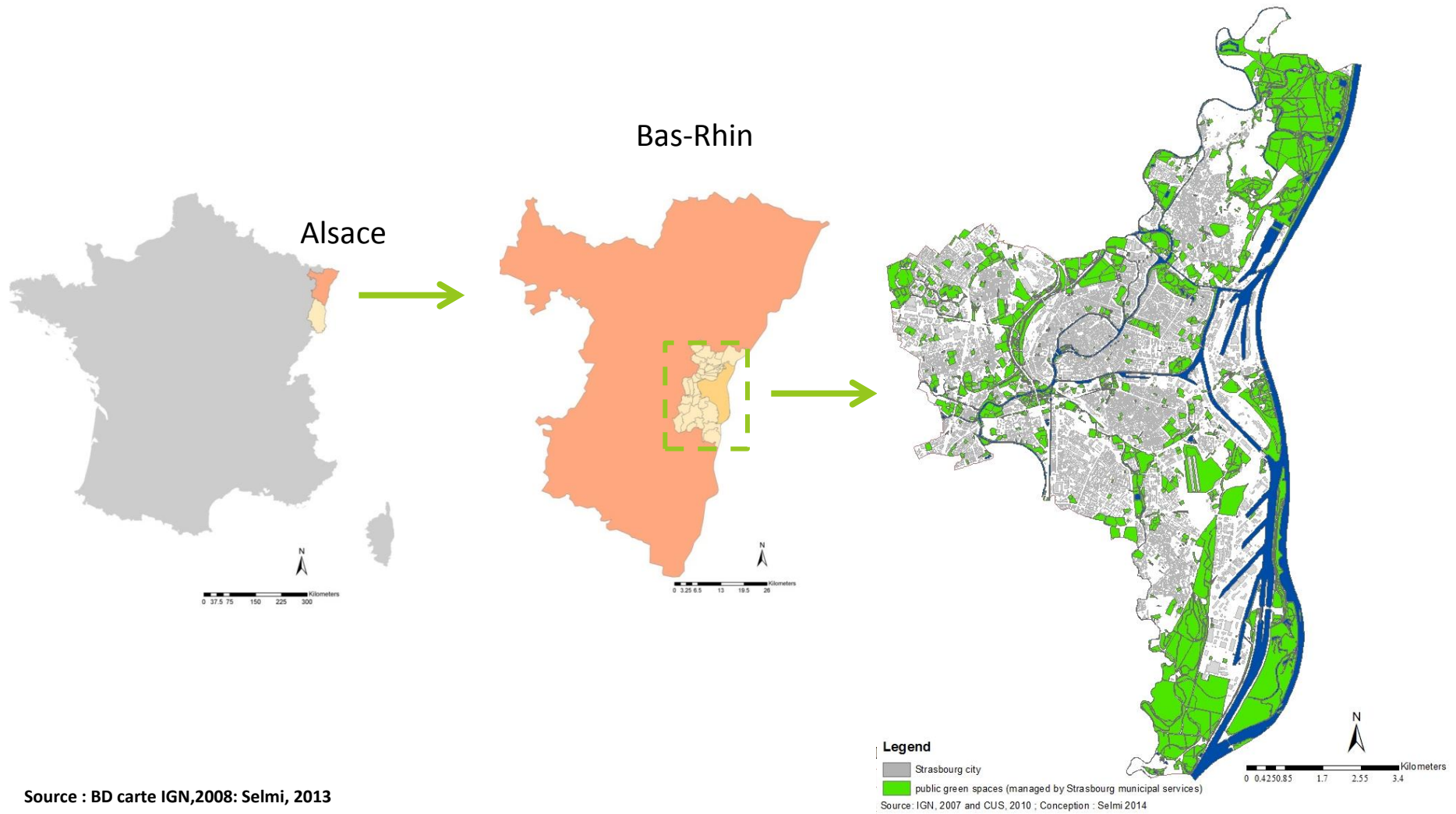
Air pollution removal
throughout a year;

Biogenic volatile organic compounds emission;

Carbon storage and sequestration

Study area: Strasbourg city, France

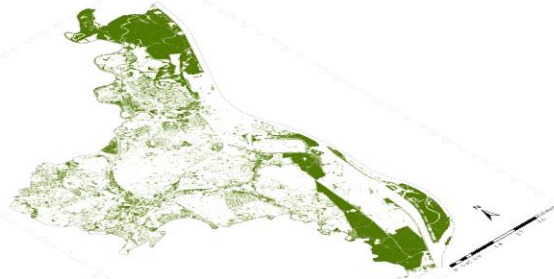
Municipal green spaces



Source : BD carte IGN,2008: Selmi, 2013

Survey

Tree cover (BDSERTIT, 2012)



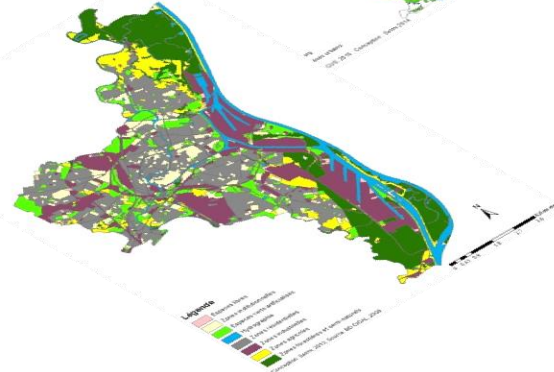
Municipal greenspaces within land use classes (BDCUS, 2010; BDCIGAL, 2008)



Municipal greenspaces (BDCUS, 2010)



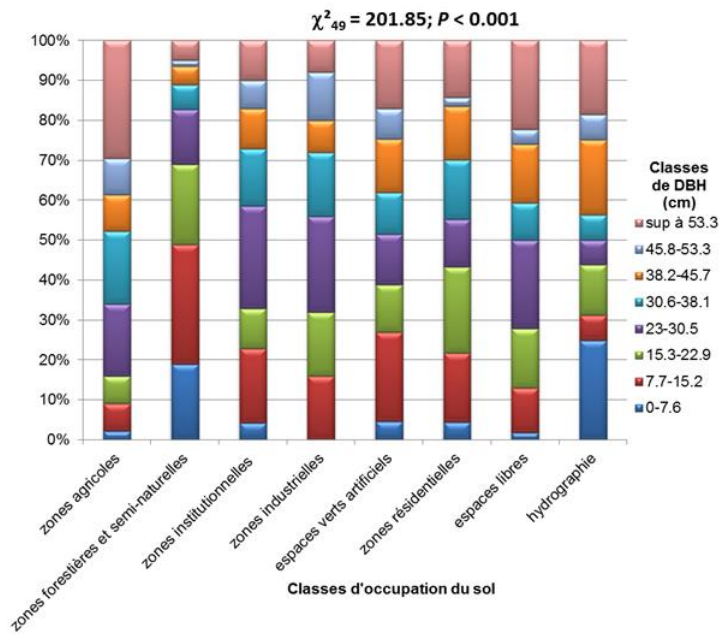
Land use classes (BDOrtho, 2007; BDCIGAL, 2008)
8 classes



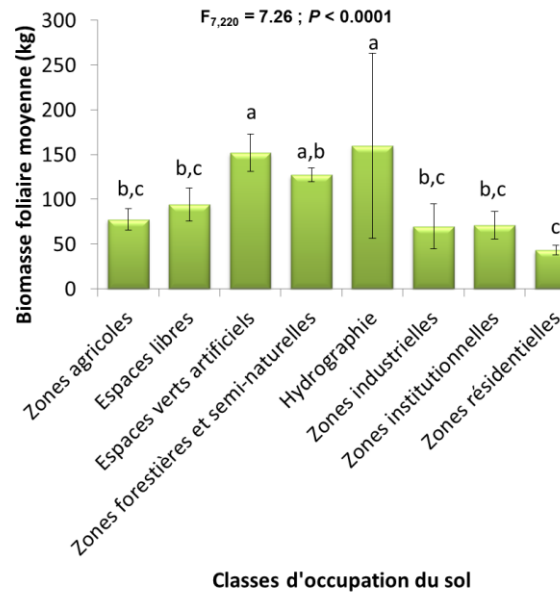
Auteur: Selmi, 2013

Results

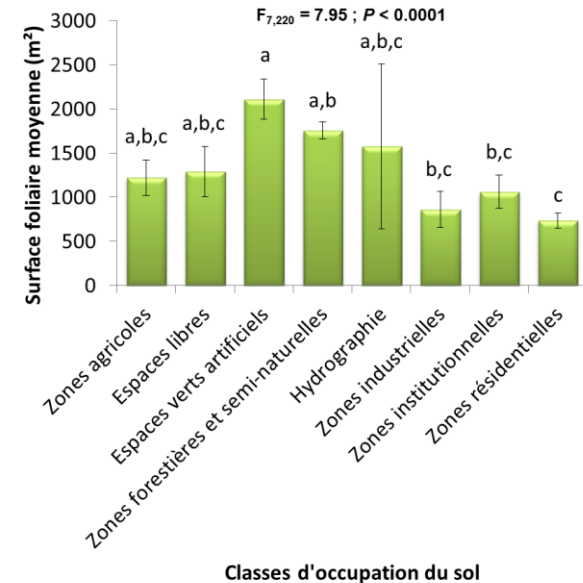
State indicators



DBH classes



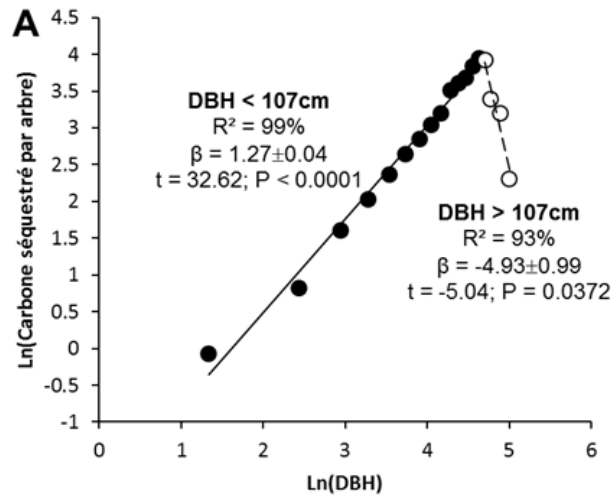
Leaf biomass



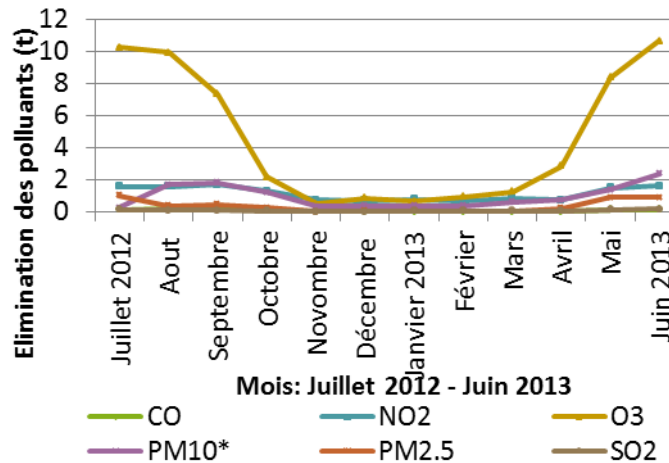
Leaf area

Results

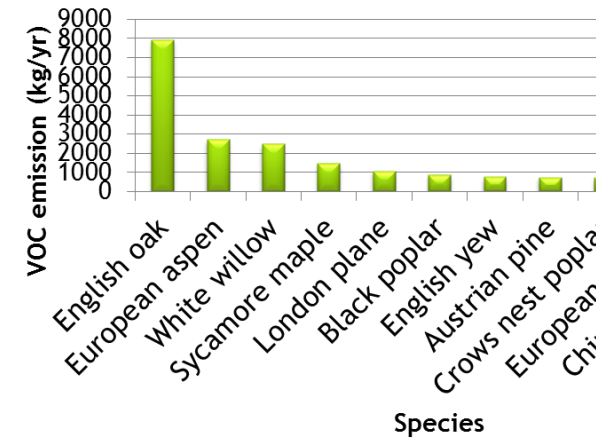
Performance indicators



Carbon storage and sequestration:
 128 000 tC et 4059.75 tC/an



Pollutant removal:
 88.23 t/an ; 5.9 g/m²



VOC emission
 27 t/an; 21 g/m²

Results and decision making

- Removal of PM₁₀: 7 %
- Plantable trees in vacant area :38 %
- Spatial distribution of ecosystem services
- Ecosystem services and Citizen science

Discussions: Advantages and limitations

- Privileged ecological approach
 - Articulation of different numerical models
 - Link: structure-function-service, non-linear
 - Tree: « THE » solution?!
-
- *Adaptation in France*
 - *Map database: source of uncertainty*

Conclusions

- Exploratory approach and first order estimation
- Habitat approach to overcome the lack of knowledge
- Provision of knowledge to decision-makers

Thanks
wissalselmi@yahoo.fr

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Air pollution removal by trees in public green spaces in Strasbourg city, France[☆]



Wissal Selmi^{a,*,+}, Christiane Weber^a, Emmanuel Rivière^b, Nadège Blond^a, Lotfi Mehdi^a, David Nowak^c

^a Laboratoire Image, Ville, Environnement LIVE UMR 7362 (CNRS/Université de Strasbourg), 3 rue de l'Argonne, 67000 Strasbourg, France

^b Association pour la Surveillance et l'Etude de la Pollution Atmosphérique en Alsace (ASPA), 5 rue de Madrid, 67300 Strasbourg, France

^c USDA Forest Service, Northern Research Station, 5 Moon Library, SUNY-ESF, Syracuse, NY 13210 USA