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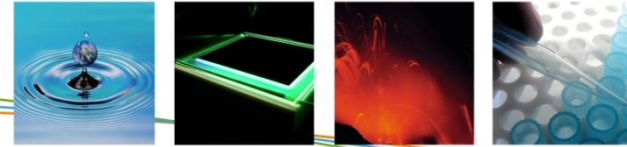
vision on technology



Universiteit
Antwerpen



bc³
BASQUE CENTRE
FOR CLIMATE CHANGE
Klima Aldaketa Ikergai



10/09/2012

ESSENSE - Mapping regulating Ecosystem Services using remote SENSing imagEry

Birgen Haest, Jan Staes, Sander Jacobs, Fernandino Villa, Ben Somers, Stéphanie Delalieux and Patrick Meire

ESSENSE – Administrative details

- » Project Period: Feb 2012 – Dec 2013
- » Innovation project
- » Partners:

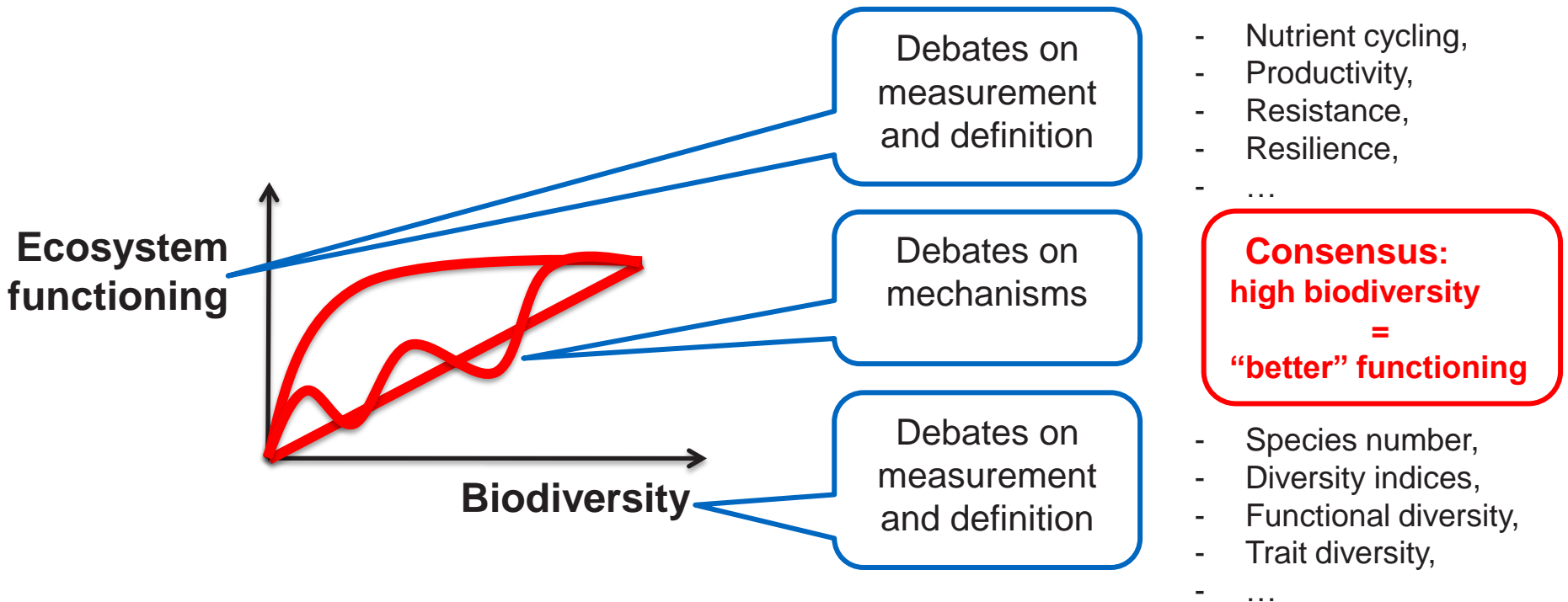


ESSENSE – Project background

- » **Biodiversity is rapidly declining** worldwide, and this decreases ecosystem functioning and services
- » Biodiversity loss, and **loss of the services** it supports, highly **impacts human well-being** and **increases the replacement costs** for technical measures
- » **This represents a high socio-economic risk**, mostly in densely populated areas subjected to global change
- » **Well-informed land-use management can decrease this risk** by conserving critical hotspots of ecosystem service delivery
- » **Determining ES-hotspots and gradients is essential**

ESSENSE – Project background

» Biodiversity is the support and insurance of ecosystem functioning



High plant diversity is needed to maintain ecosystem services

Forest Isbell¹, Vincent Calcagno¹, Andy Hector², John Connolly³, W. Stanley Harpole⁴, Peter B. Reich^{5,6}, Michael Scherer-Lorenzen⁷, Bernhard Schmid², David Tilman⁸, Jasper van Ruijven⁹, Alexandra Weigel¹⁰, Brian J. Wilsey⁴, Erika S. Zavaleta¹¹ & Michel Loreau¹

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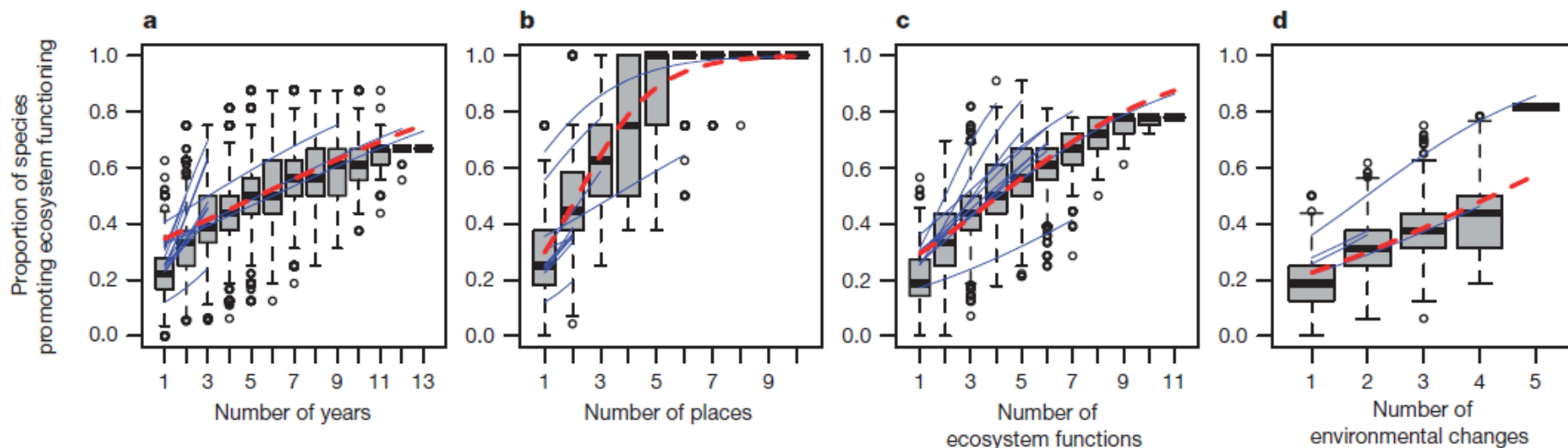
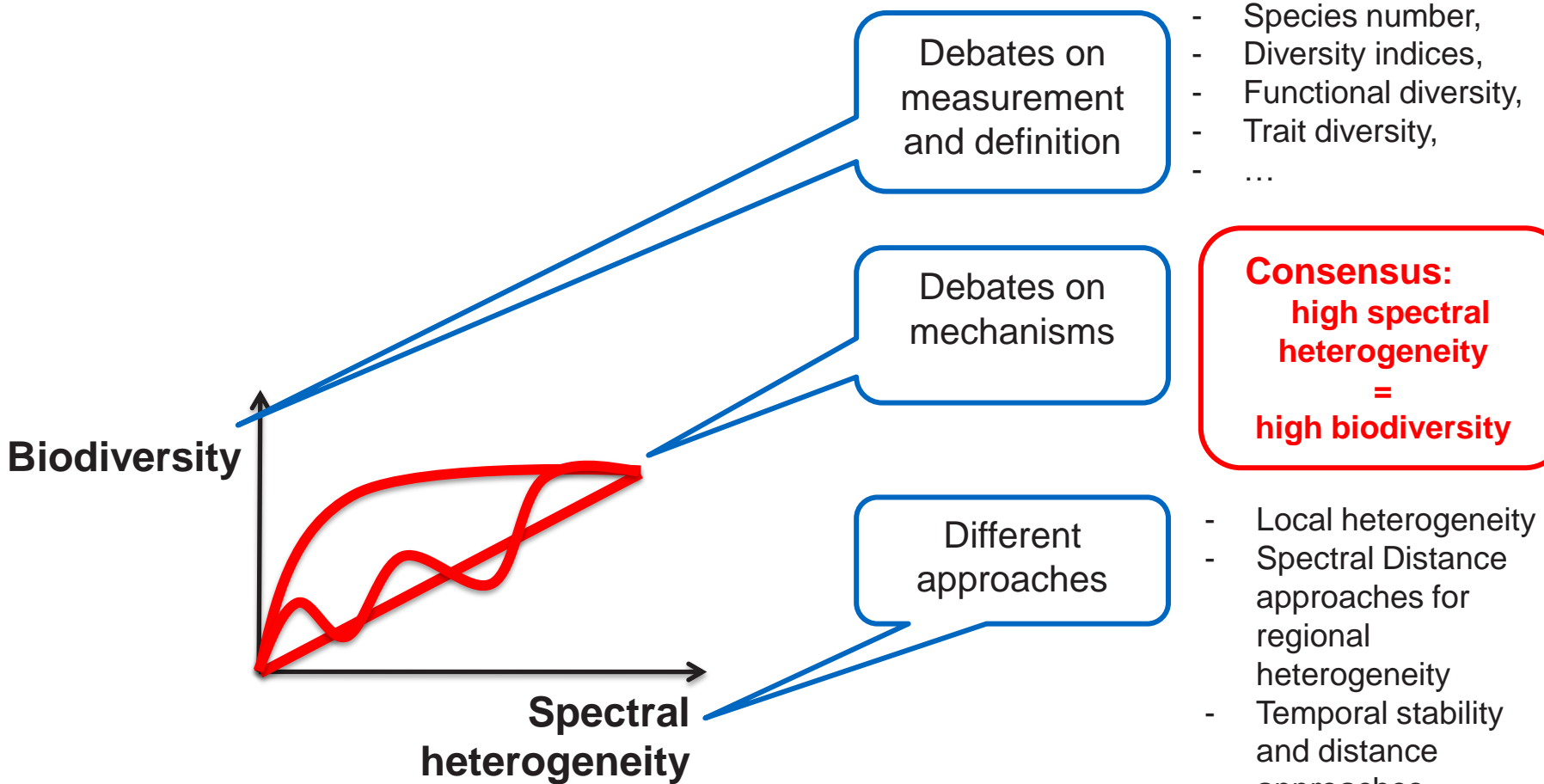


Figure 3 | The proportion of study species that promoted ecosystem functioning increased when more (a) years, (b) places, (c) ecosystem functions and (d) environmental change scenarios were independently considered. Solid blue lines indicate generalized linear model fits for each study; dashed red line indicates grand mean generalized linear model fitted

across all studies. Box plots summarize observed data: black band, median; bottom and top of boxes respectively correspond to lower and upper quartiles; error bars, ± 1.5 times the interquartile range. See Supplementary Data for the specific years, places, functions and environmental change scenarios considered in each study.

ESSENSE – Project background

» Biodiversity is related to spectral heterogeneity



- Species number,
- Diversity indices,
- Functional diversity,
- Trait diversity,
- ...

Consensus:
high spectral heterogeneity
=
high biodiversity

Different approaches

- Local heterogeneity
- Spectral Distance approaches for regional heterogeneity
- Temporal stability and distance approaches...
- Indices vs full reflectance
- ...

ESSENSE – Project background

Ecological Informatics 5 (2010) 318–329



Contents lists available at ScienceDirect

Ecological Informatics

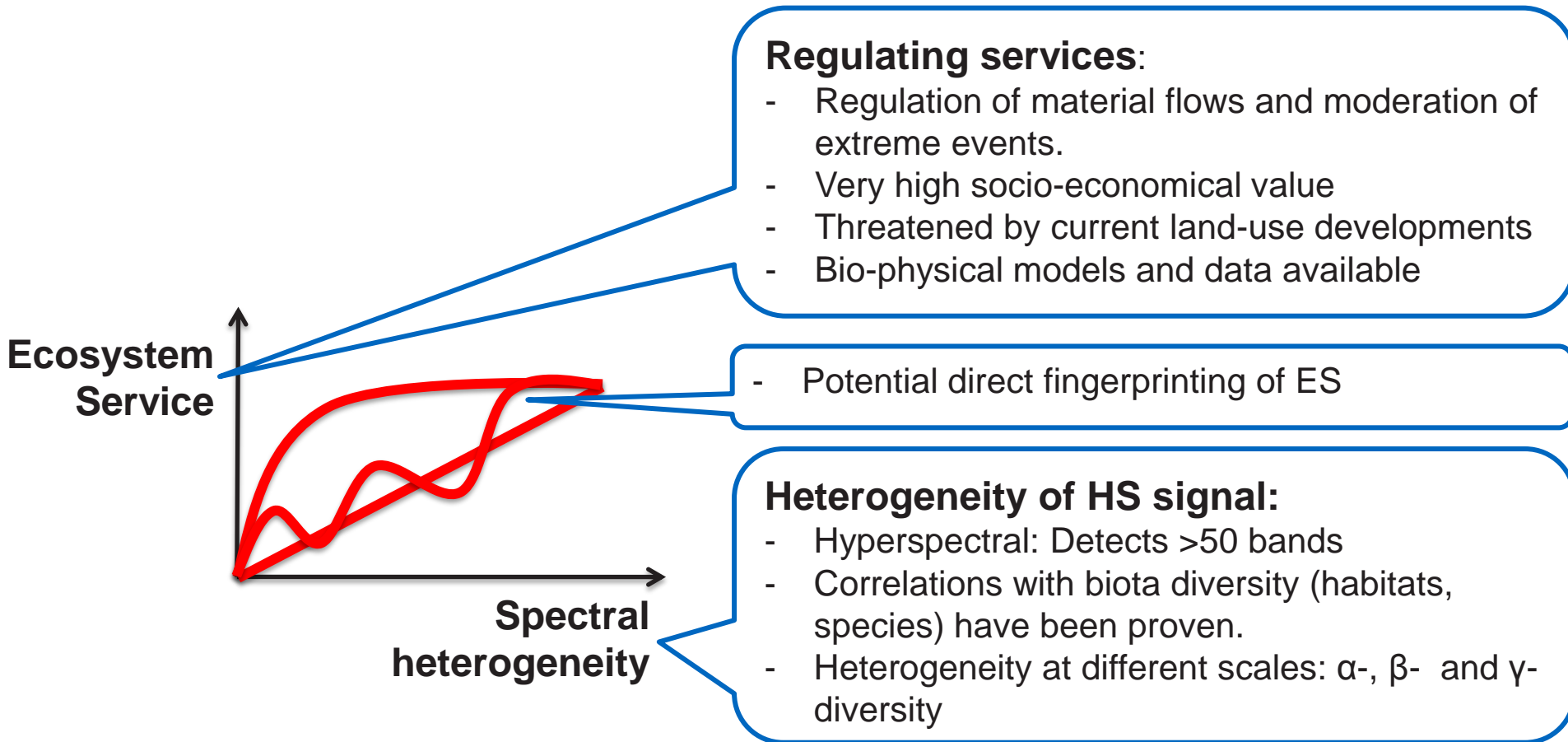
journal homepage: www.elsevier.com/locate/ecolinf



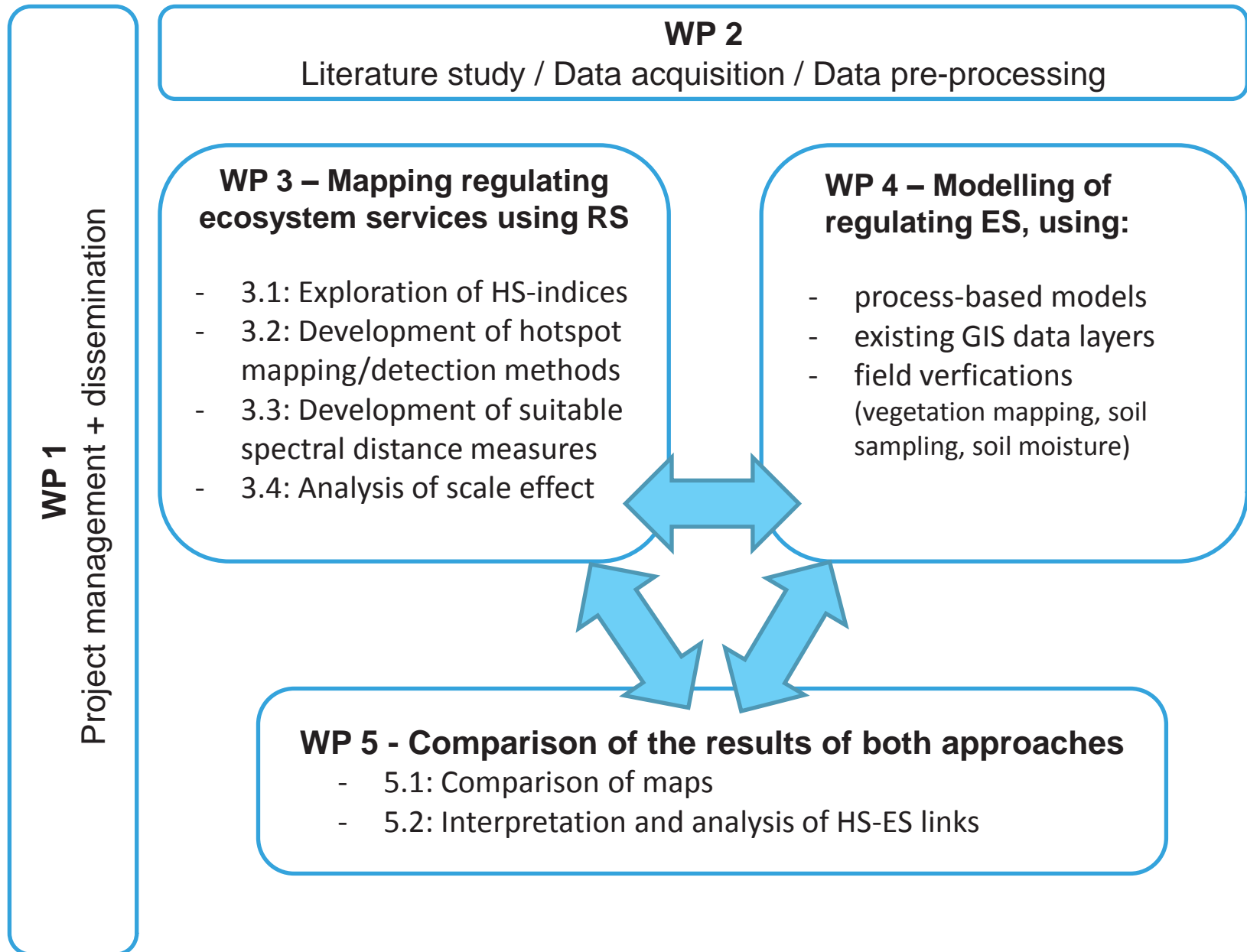
Remotely sensed spectral heterogeneity as a proxy of species diversity: Recent advances and open challenges

Duccio Rocchini^{a,*}, Niko Balkenhol^b, Gregory A. Carter^{c,d}, Giles M. Foody^e, Thomas W. Gillespie^f,
Kate S. He^g, Salit Kark^h, Noam Levinⁱ, Kelly Lucas^c, Miska Luoto^j, Harini Nagendra^{k,l}, Jens Oldeland^{m,n},
Carlo Ricotta^o, Jane Southworth^p, Markus Neteler^a

ESSENSE – Project objectives



ESSENSE – Project approach – WP breakdown



ESSENSE – Project approach – Study areas

» *De Vennen*

- » Grote Nete catchment region
- » many nature reserves and momentum for reserve expansion
- » ongoing EU-LIFE-project “between Dune and Nete”
- » Anthropogenic pressure:
 - » afforestation, eutrophication, habitat fragmentation, intensification of agriculture, and disturbances of the natural hydrology
- » Mainly wetland (semi-)natural habitats

Habitats

- Transition mires and quaking bogs
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)
- Dry sand heaths with *Calluna* and *Genista*
- Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Nanojuncetea*
- Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation
- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- European dry heaths

ESSENSE – Project approach – Study areas

» *Turnhouts Vennengebied* and *De Liereman*

- » Campine region
- » Highly heterogeneous area
- » Anthropogenic pressure:
 - » habitat fragmentation, conifer plantations, changes in the natural hydrology and lack of appropriate land use

» Habitats different from *De Vennen*:

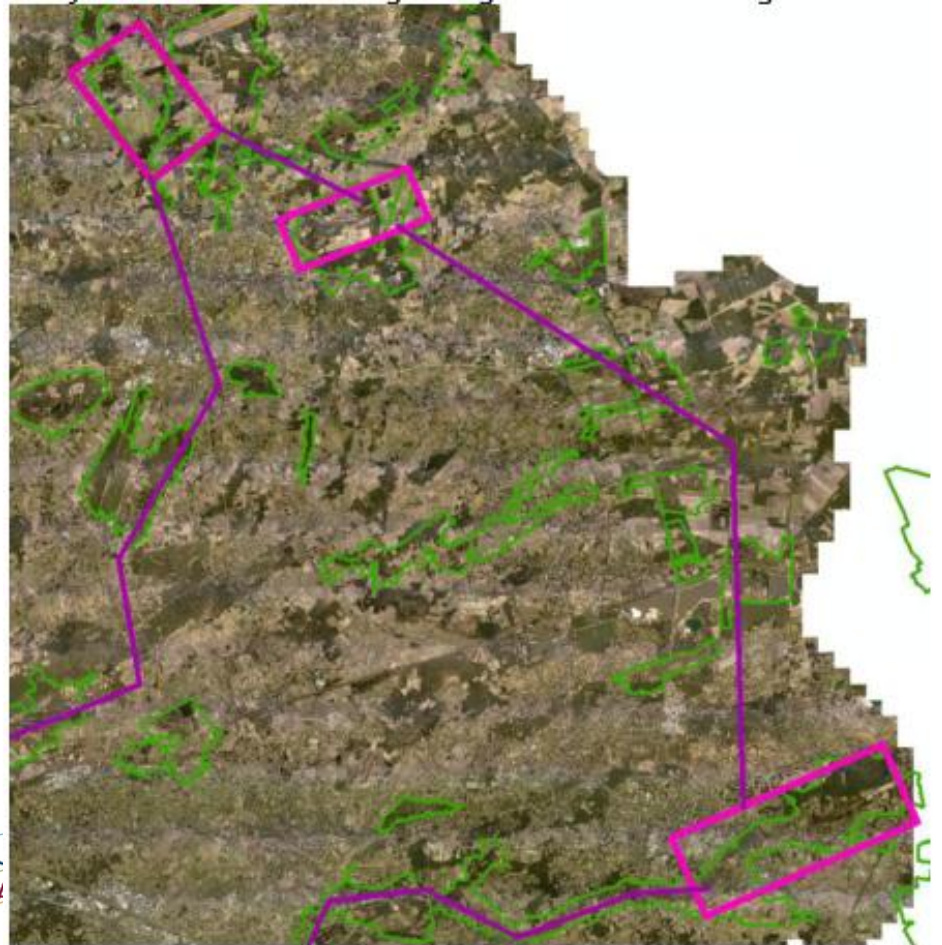
Habitats

- Depressions on peat substrates of the Rhynchosporion
- Old acidophilous oak woods with *Quercus robur* on sandy plains
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)
- Malcolmietalia dune grasslands
- Dry sand heaths with *Calluna* and *Genista*
- Oligotrophic waters containing very few minerals of sandy plains
- Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoetes-Nanojuncetea
- Northern Atlantic wet heaths with *Erica tetralix*
- European dry heaths
- Species-rich *Nardus* grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)



ESSENSE – Project approach – Study areas

- » *One long flightline crossing various ecosystems*
- » mosaic of natural and anthropogenic (e.g. agricultural land and urban environments) ecosystems



Time for Questions..

Under construction..

<http://essense.vgt.vito.be>