



futurearth  
research for global sustainability

GLOBAL  
**IGBP**  
CHANGE

<http://globallandproject.org>

*Coordinating, inspiring, networking, enabling, summarizing & supporting*

## **Global research on land systems and land change**

Scientific Steering Committee (SSC)

International Project Office (IPO; Brazil >> Switzerland)

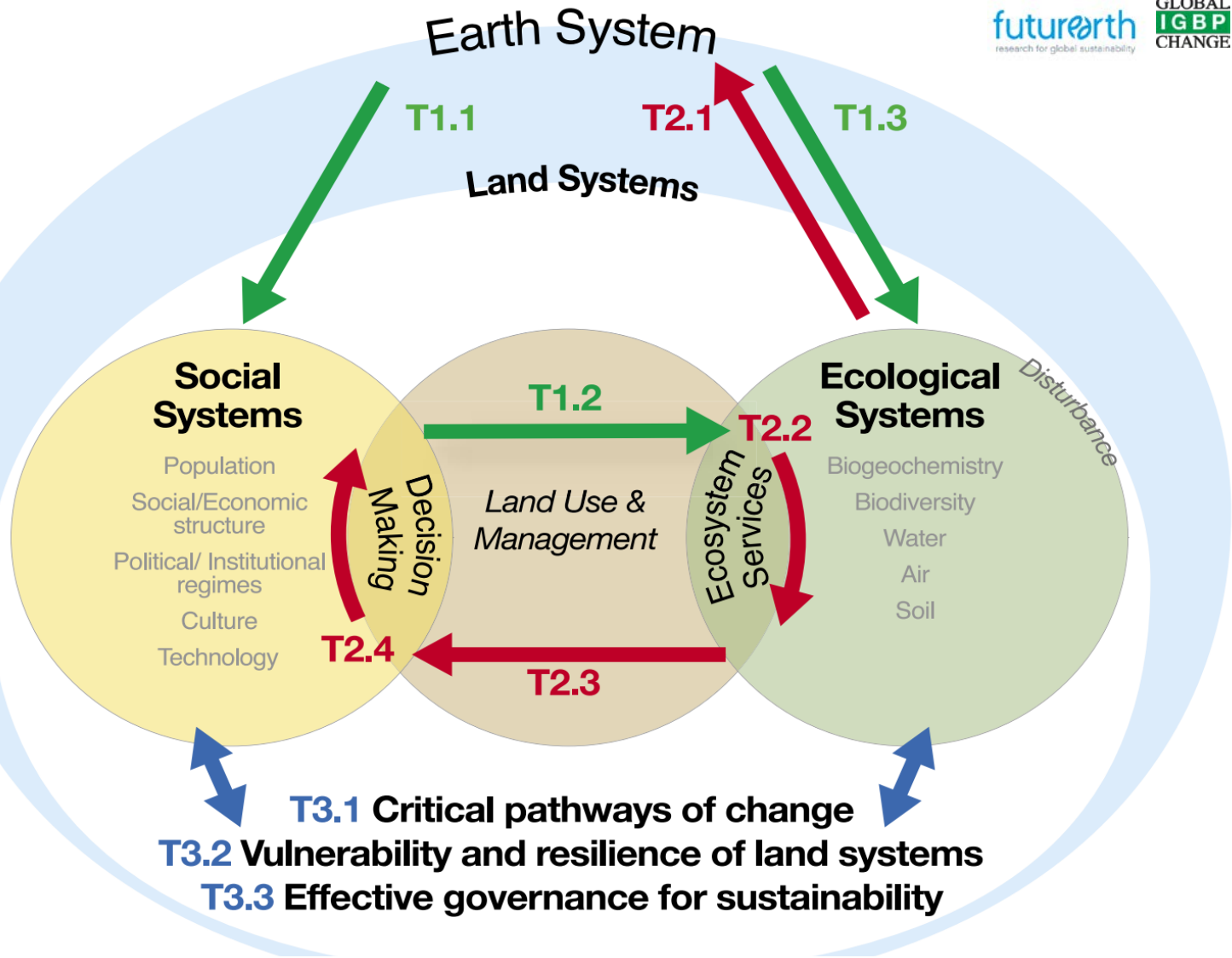
Nodal Offices (Taiwan, Japan, China, Germany, Cypress, Cote d'Ivoire, Argentina)

**Open Science Meetings** (Next in Beijing, October 2016)

# Land systems

## Nexus of Society & Ecology

## GLP Analytic Structure



T1. Dynamics of land systems



T2. Consequences of land system change



T3. Integrating analysis and modelling for land sustainability

*Beyond human impacts*

# Land Systems

Social-Ecological Systems

**Why does land change?  
What are the consequences?**

**Observing | Understanding | Modelling | Collaborating**

**Land Use & Land Cover**

**Management | Decisions**

**Structure | Function**

**Stakeholders | Governance**

***Multifunctional Landscapes***

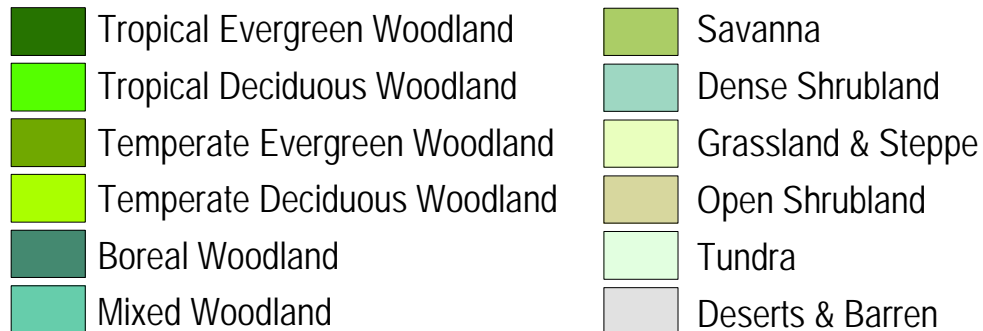
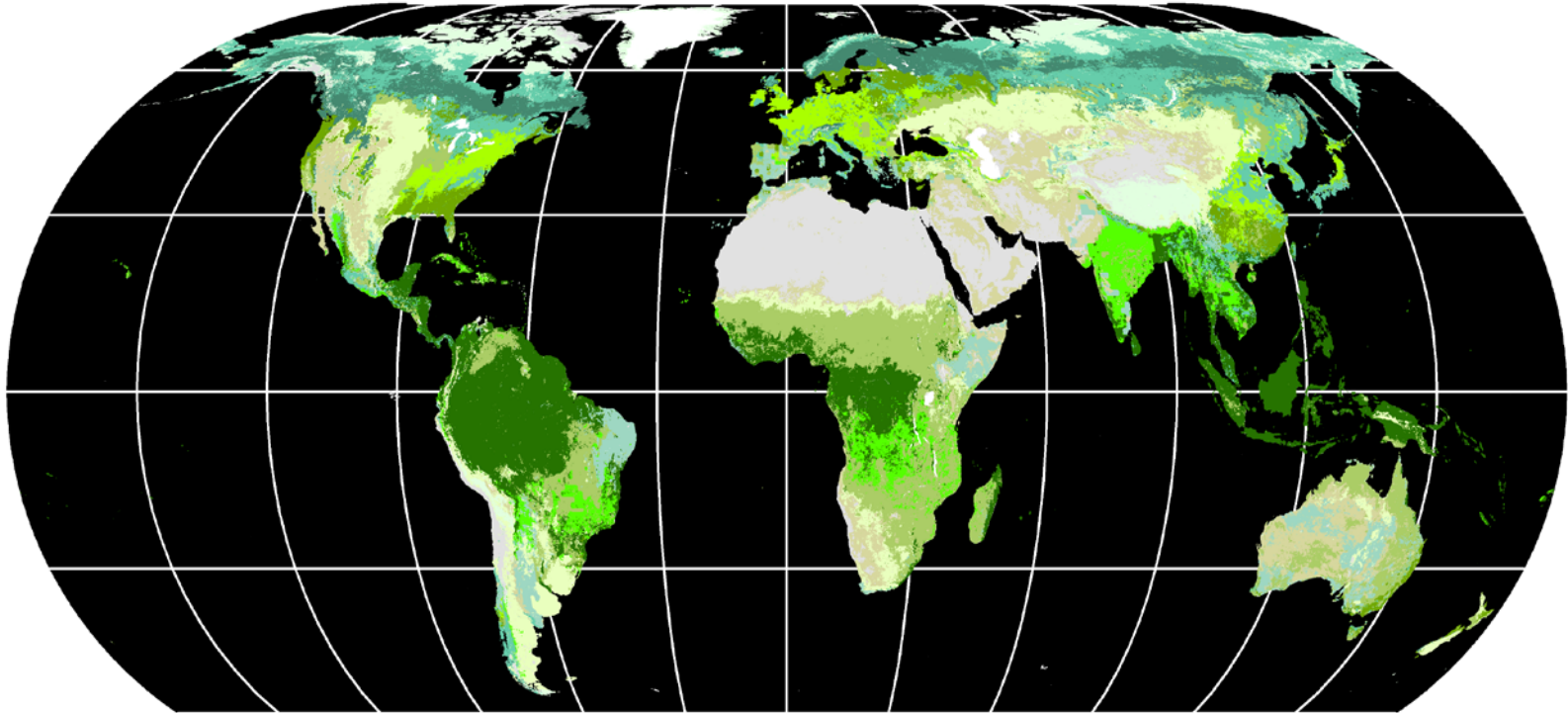
**Institutions | Markets | Telecoupling**



$$\text{Ecosystems} = f(C)$$

$C$  = Climate

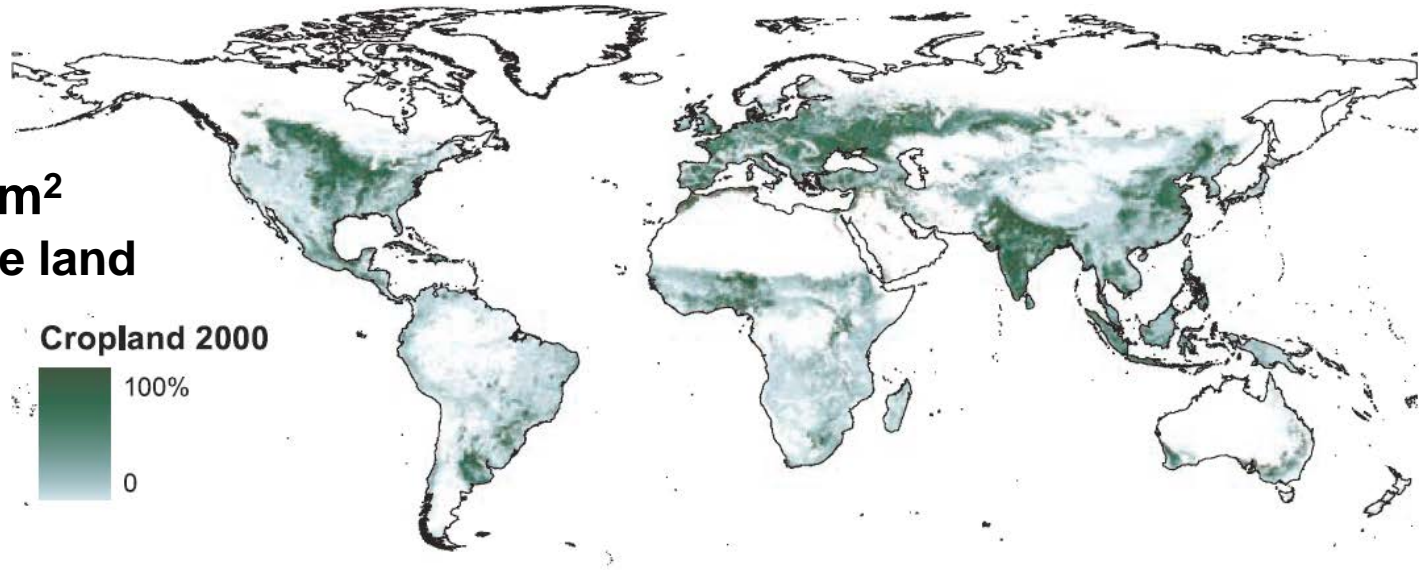
# The Wild Biosphere



# Cropland and Pasture 2000

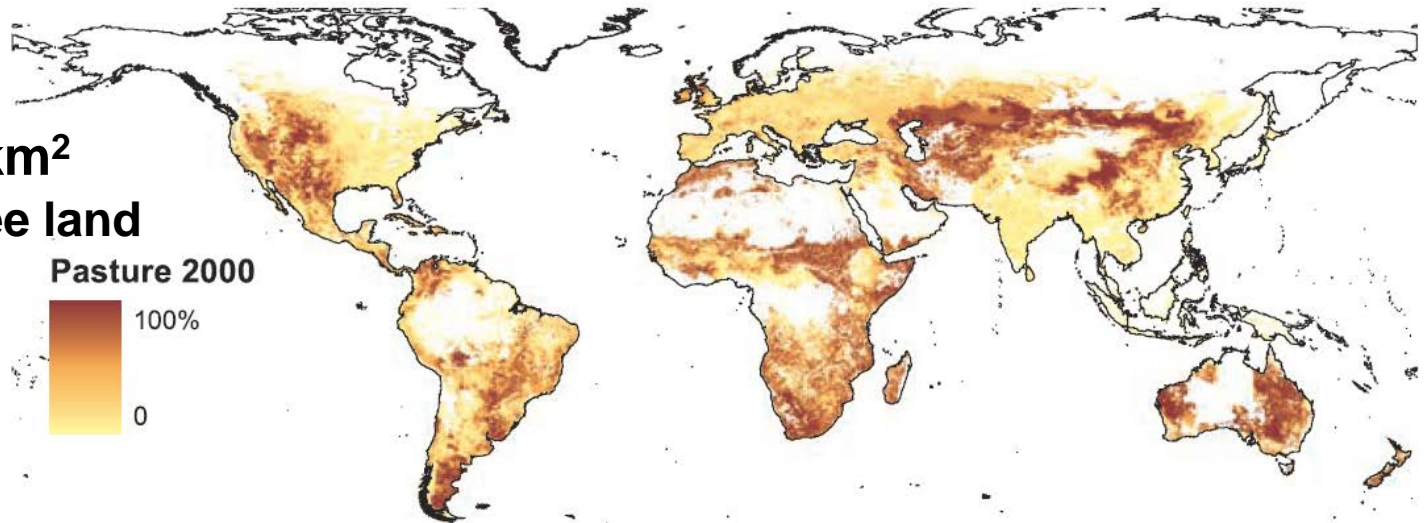
## Cropland

**15 million km<sup>2</sup>**  
**12% of ice free land**

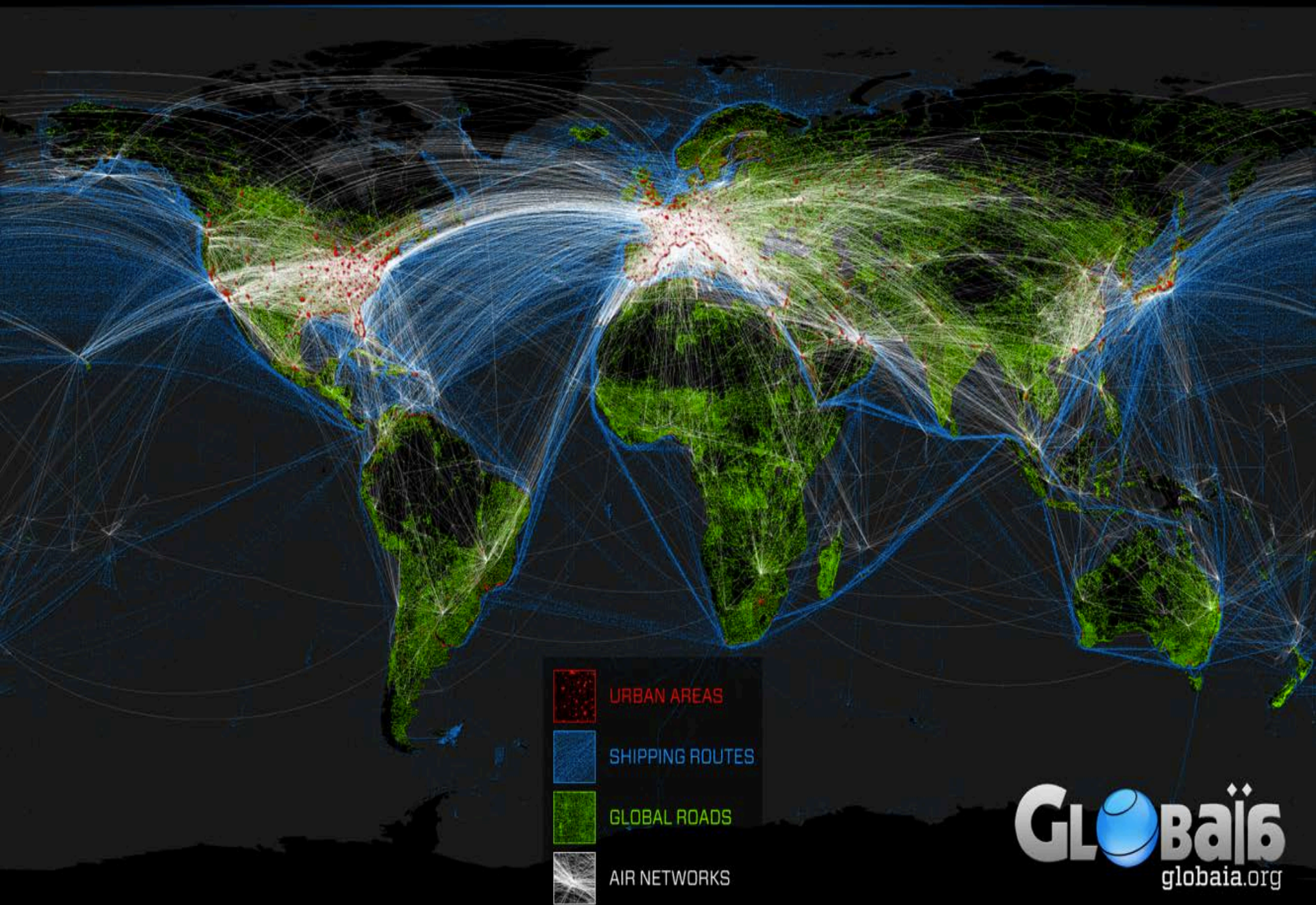


## Pasture

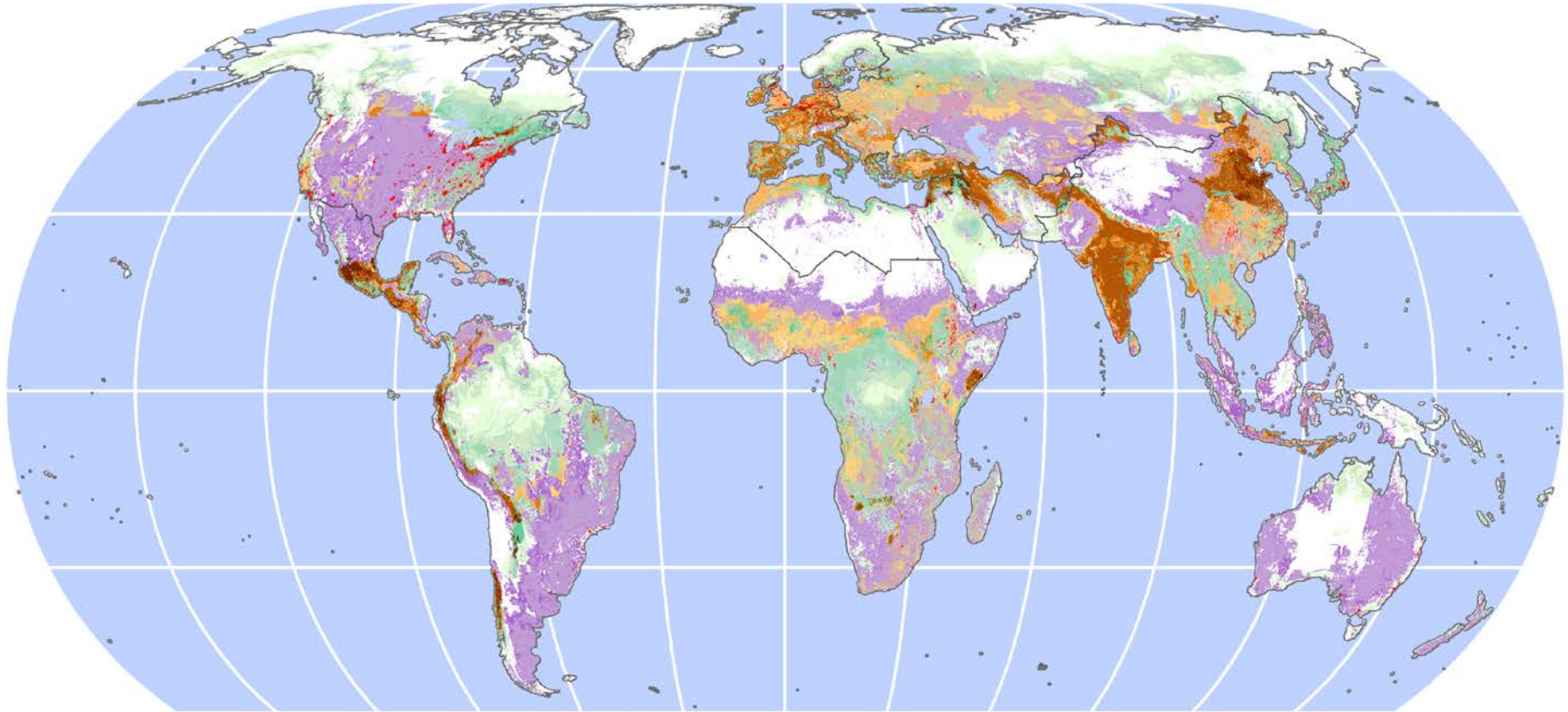
**28 million km<sup>2</sup>**  
**22% of ice free land**



# THE ANTHROPOGENIC PLANET



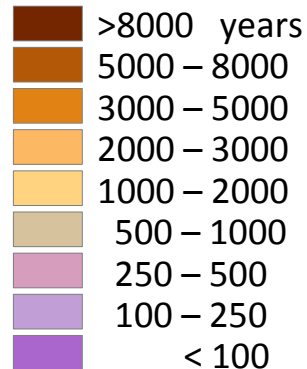
# USED PLANET: The Anthropogenic Biosphere



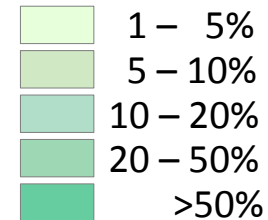
Period of first  
**Significant Use**

**Dense  
Settlements**

AD 2000



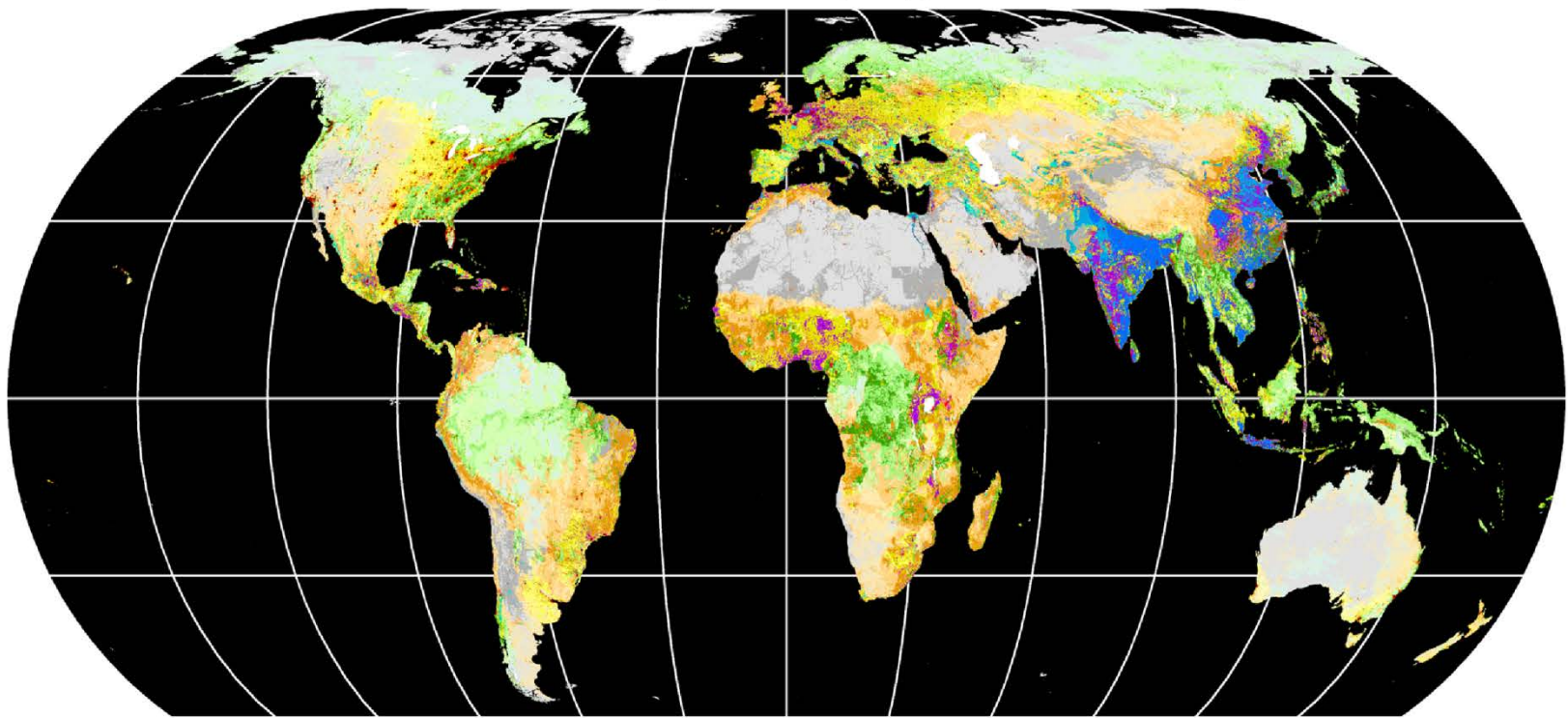
**Recovery**  
(% from peak use)



Ecosystems =  $f(P, T)$   
 $P$  = Population Density  
 $T$  = Land Use

# The Human Biosphere

## Anthromes (Anthropogenic Biomes)



**Used**      *Seminatural*      **Wild**

**Dense Settlements**  
Urban Dense settlements

**Villages**  
Rice Irrigated | Rainfed Pastoral

**Croplands**  
Residential Irrigated | Populated Rainfed | Remote

**Rangelands**  
Residential Populated | Remote

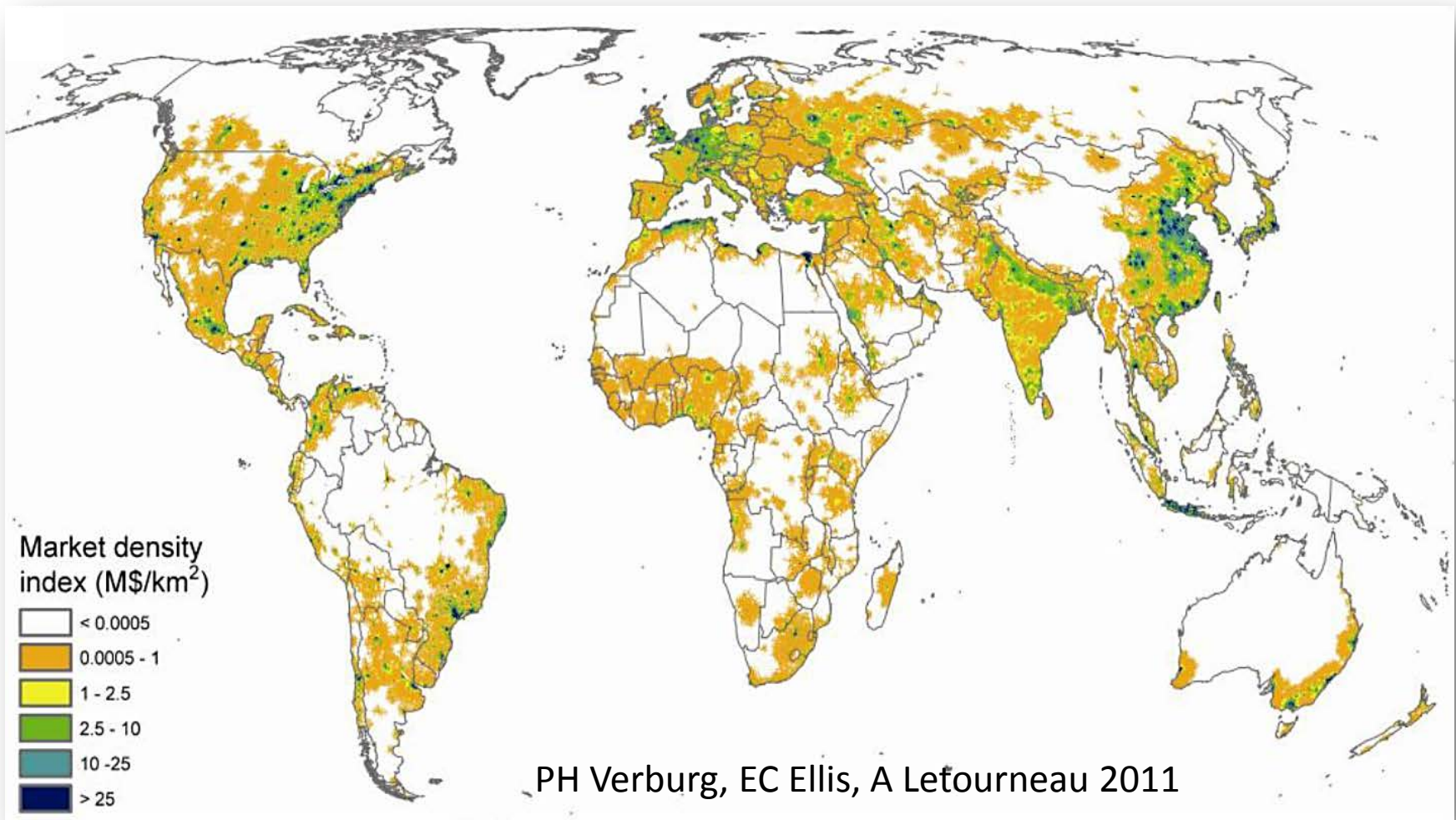
**Seminatural**  
Woodlands Residential Populated | Treeless & Barren Remote

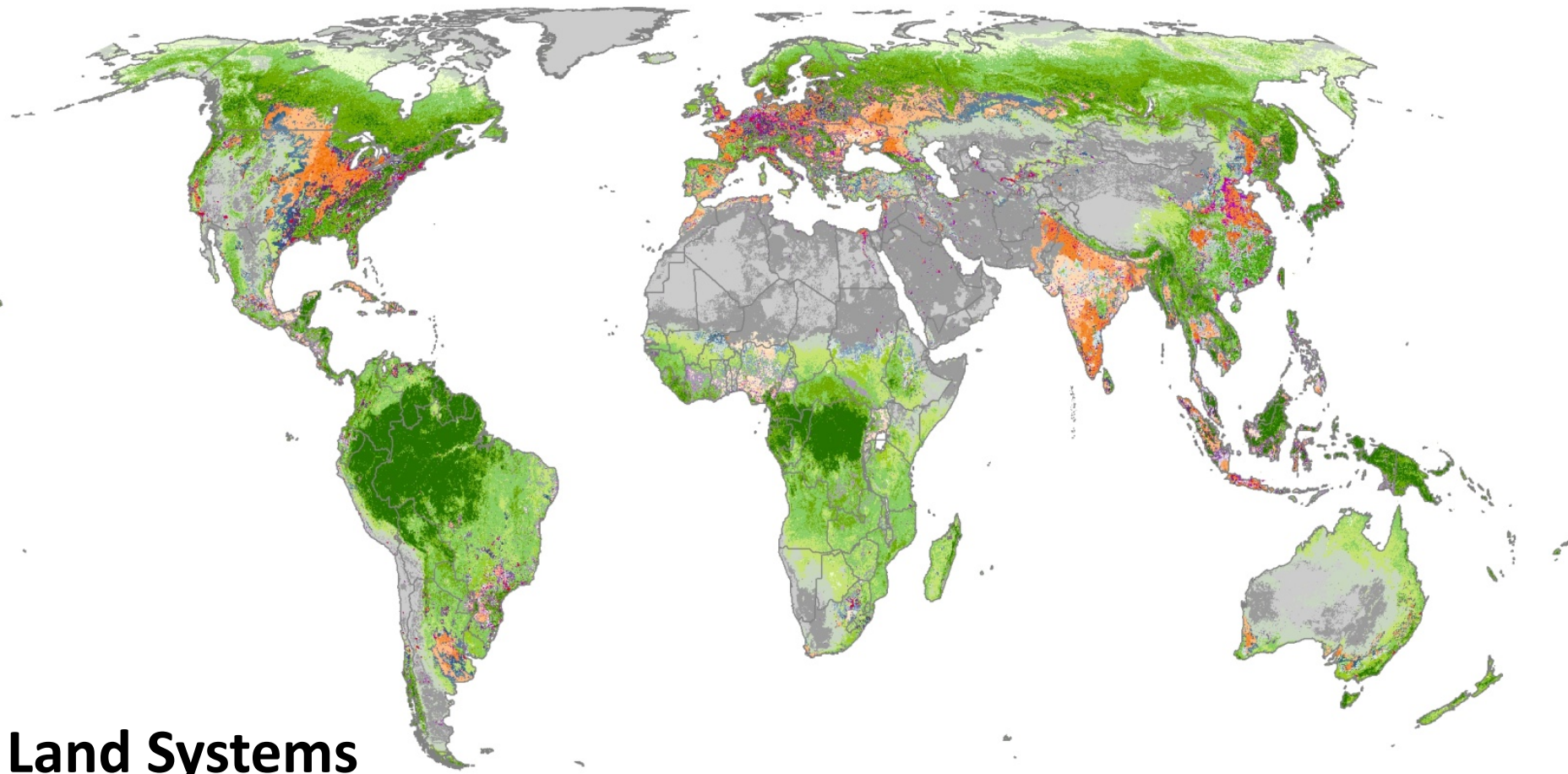
**Wildlands**  
Woodlands Treeless & Barren



# Are we observing the global changes that matter?

## Market Influence on Land Use





# Land Systems

van Asselen & Verburg (2012) *Global Change Biology* 18:3125–3148

Eckert IV projection.

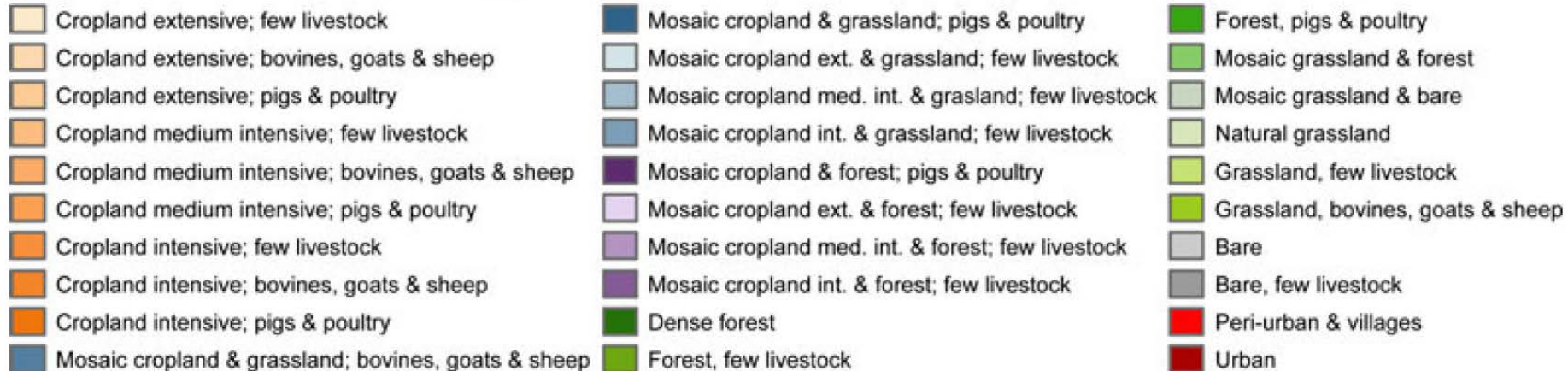


# Land System Change: Intensification / Extensification

Year 2040

## Simulated Land Systems

### Legend



# Bias in Ecological Field Research Sites






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## Ecological Research Sites Top 10 Ecology Journals: 2004 – 2009

- ❖ *2/3 in “protected areas”*
- ❖ **Temperate Zone Bias, Wealthy Nation Bias**
- ❖ *Just 1/6 in agricultural & settled lands*

**Anthromes**  
(Levels)

### Anthromes (Levels)

	Dense Settlements
	Villages
	Croplands
	Rangelands
	Seminatural Lands
	Wild Woodlands
	Wild Treeless & Barren

# Online Tools for Global Synthesis of Local Knowledge

globe.umbc.edu

Welcome back, Erle  
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### Representativeness Analysis for a GLOBE Collection

[View Collection](#) Switch Collection

**Deforestation**

Cases found by searching for "deforestation" on March 21, 2014

Analysis Parameters

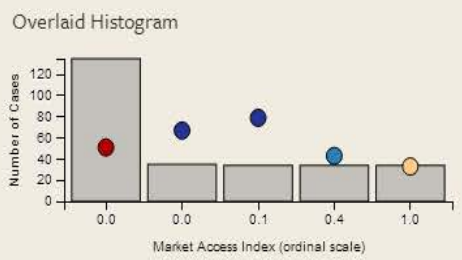
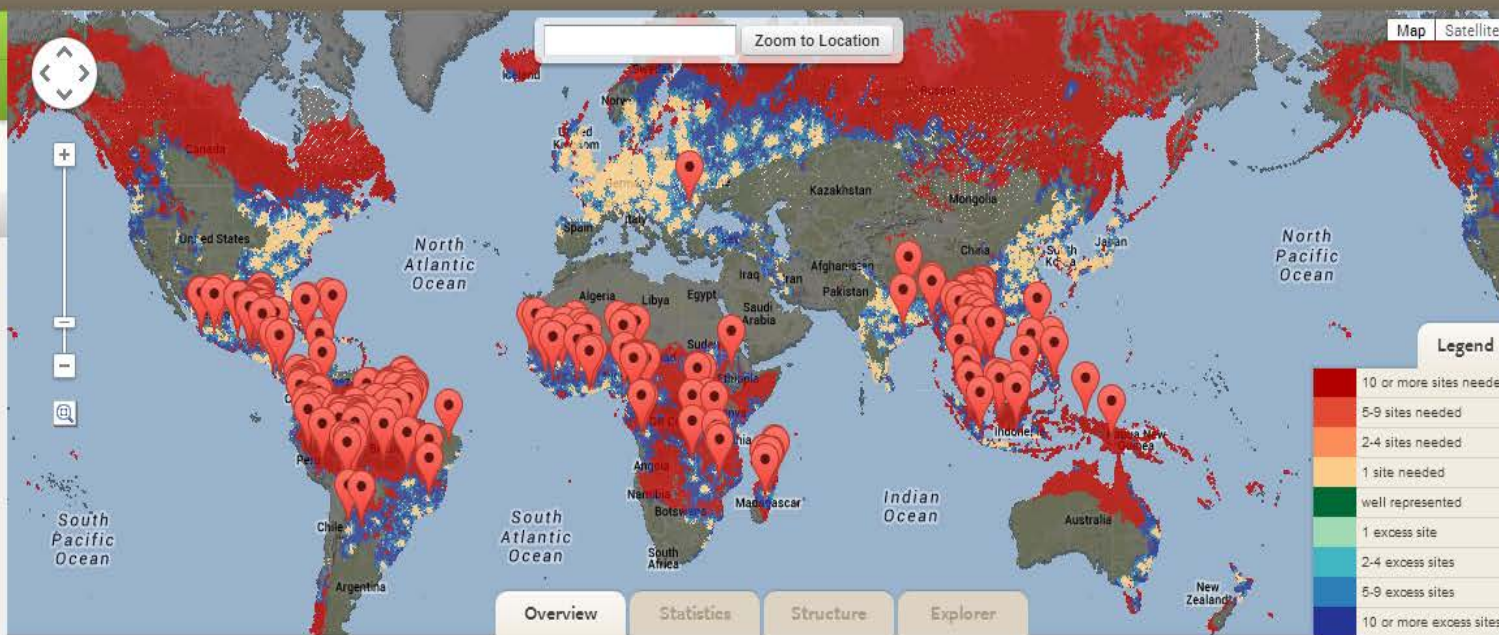
**Land Variable**  
Market Access Index? [Change](#) | [Show distribution](#)

**Filters (1)**  
Filters limit the land area used in analysis.  
Add a filter predefined by the GLOBE team:  
[Ice-Free Land ?](#) | [Tropical ?](#) | [Non-Wildlands ?](#)  
or Add a new filter

Olson Biomes ?  
 6 categories

**Options**

Cases In Collection



**Summary**

$\chi^2$  Test

$\chi^2$ (ess)	142.502
p value (ess)	0
$\chi^2$ (actual)	142.502
p value (actual)	0

**Explanation**

The representativeness analysis compares observed data at your collection's sites against the distribution of those data for the global extent you have selected. Gaps between the two distributions indicate areas where your collection may be biased.

A  $\chi^2$  analysis is a statistical test that compares a discrete distribution of expected values against a distribution of observed values to determine whether the hypothesis that the observed values could have been drawn at random from the population can be rejected or not. The  $\chi^2$  test computes the probability of incorrectly rejecting the hypothesis of an unbiased collection as

Allocation Analysis