

Visualizing Semantic and Geographical Networks



Hadrien **Commenges**, Univ. Paris 1
Clementine **Cottineau**, UCL-CASA



CyberGeoNetworks

20 years of Cybergeo, European Journal of Geography

The Project

Overview

Citation network

Semantic network

Keyword network

Geo-semantic Networks

About

Global Stats

Time Range

1,996



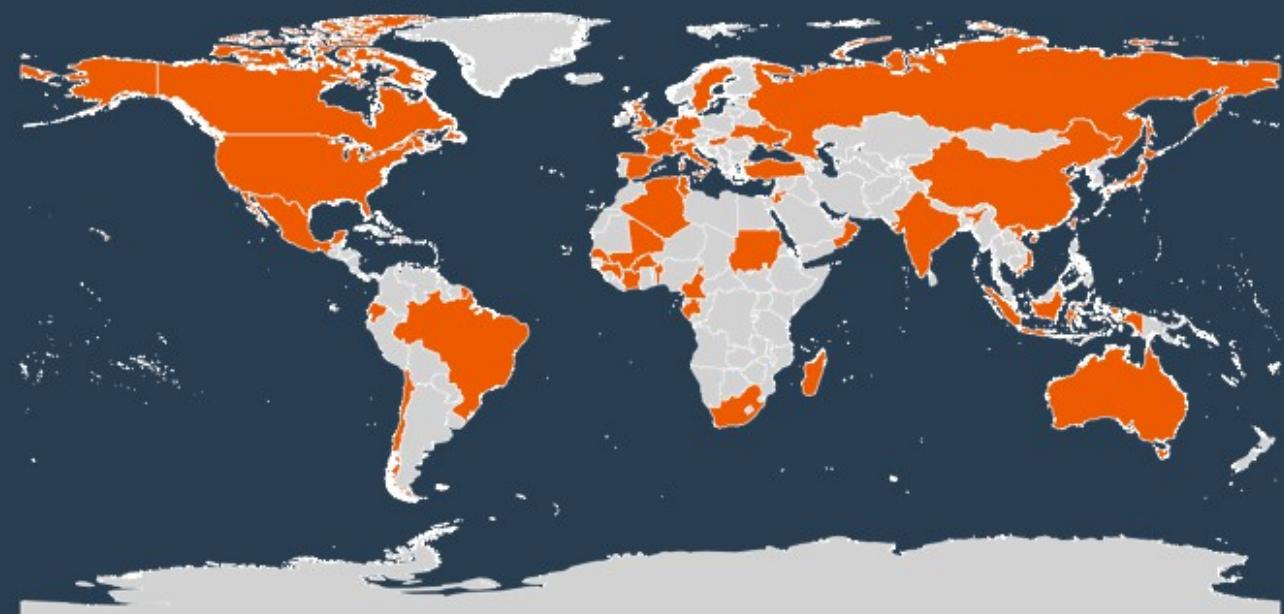
2,015

1,996 1,998 2,000 2,002 2,004 2,006 2,008 2,010 2,012 2,014 2,015

Indicator to map

Countries Studies by Locals

Countries studied by locals in Cybergeo articles | 1996 - 2015



Indicator

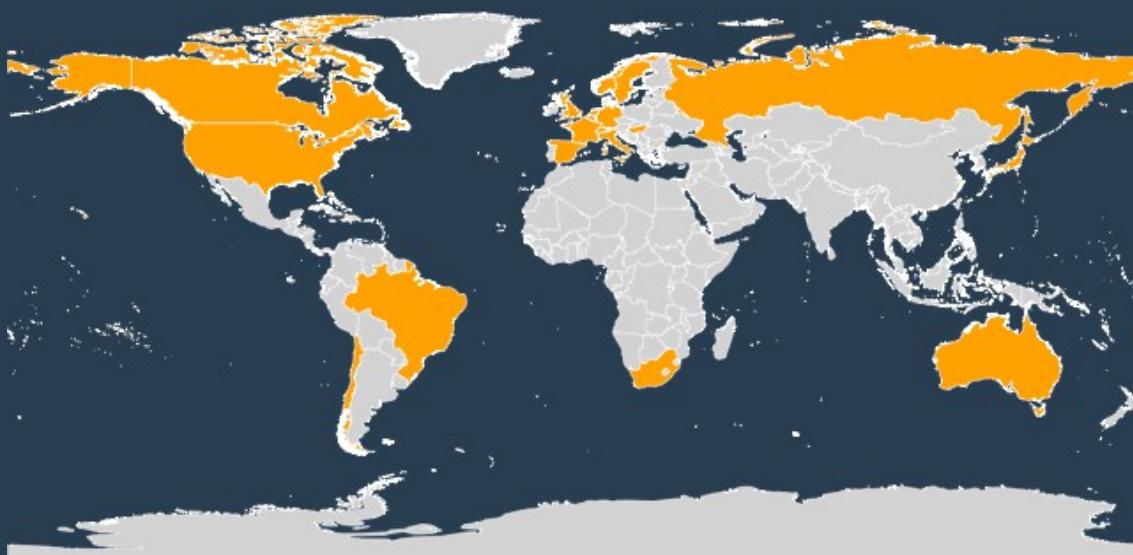
Value

Number of scientific articles

737

1996–2000

Authoring



Number of scientific articles 181

Number of authors 273

Number of countries authoring 21

Top countries authoring FR (128), IT (8), UK (8), US (8), CA (4)

Studied



Number of countries studied 62

Top countries studied FR (73), DE (11), UK (11), IT (10), ES (9)

Number of citations from other articles 767

Number of citations of other articles 376

2001–2005

Authoring



Number of scientific articles 164

Number of authors 280

Number of countries authoring 23

Top countries authoring FR (130), BE (8), UK (7), CA (6), IT (6)

Studied



Number of countries studied 89

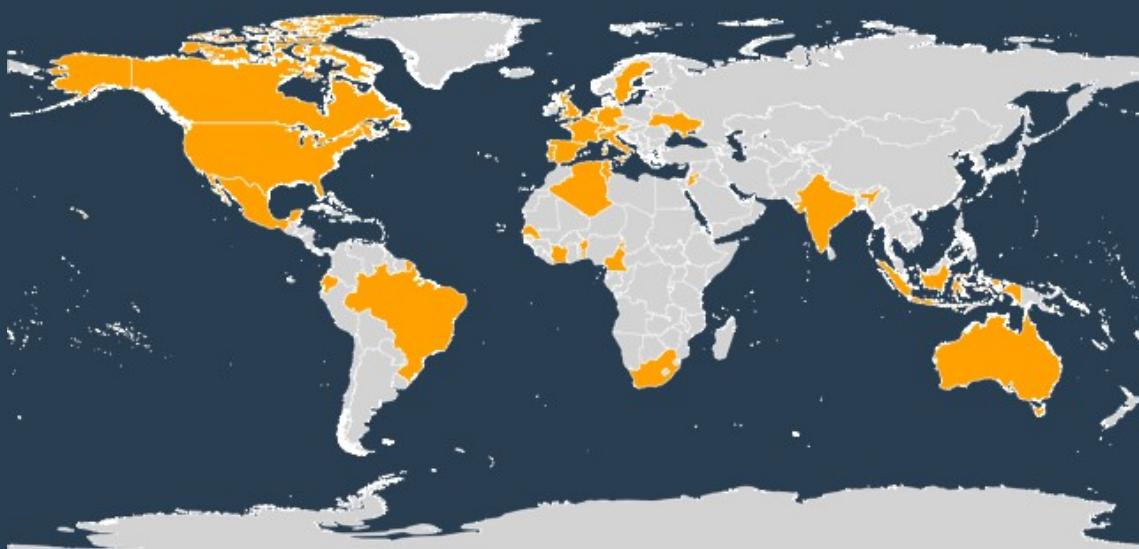
Top countries studied FR (75), ES (9), UK (8), BE (6), IT (6)

Number of citations from other articles 856

Number of citations of other articles 826

2006–2010

Authoring



Number of scientific articles 208

Number of authors 384

Number of countries authoring 30

Top countries authoring FR (162), CA (11), BE (6), UK (6), US (5)

Studied



Number of countries studied 90

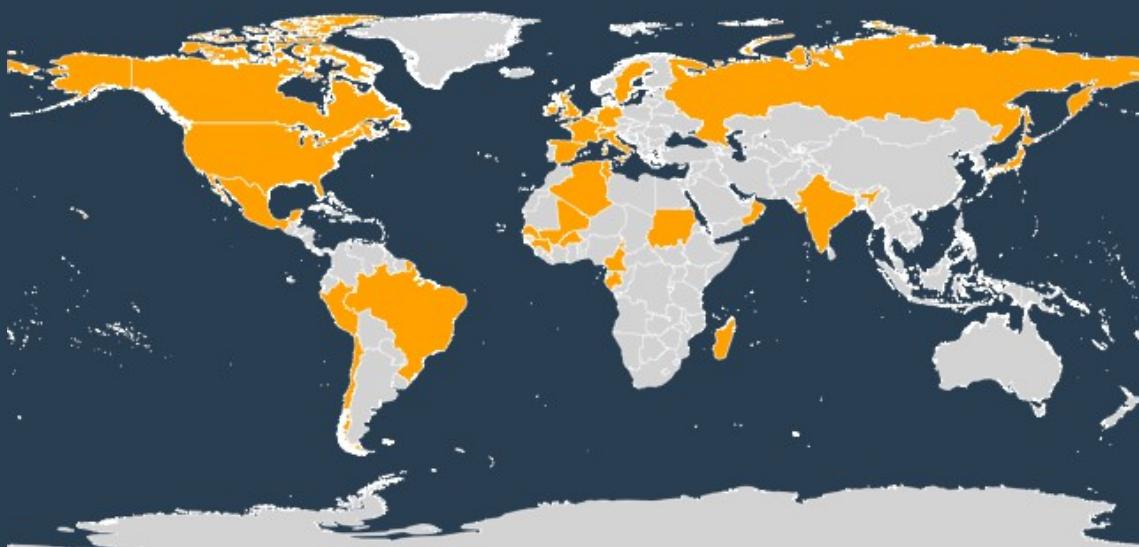
Top countries studied FR (77), UK (13), BE (11), DE (11), ES (11)

Number of citations from other articles 850

Number of citations of other articles 1483

2011–2015

Authoring



Number of scientific articles 184

Number of authors 414

Number of countries authoring 29

Top countries authoring FR (141), CA (14), CH (13), SN (6), BR (3)

Studied



Number of countries studied 89

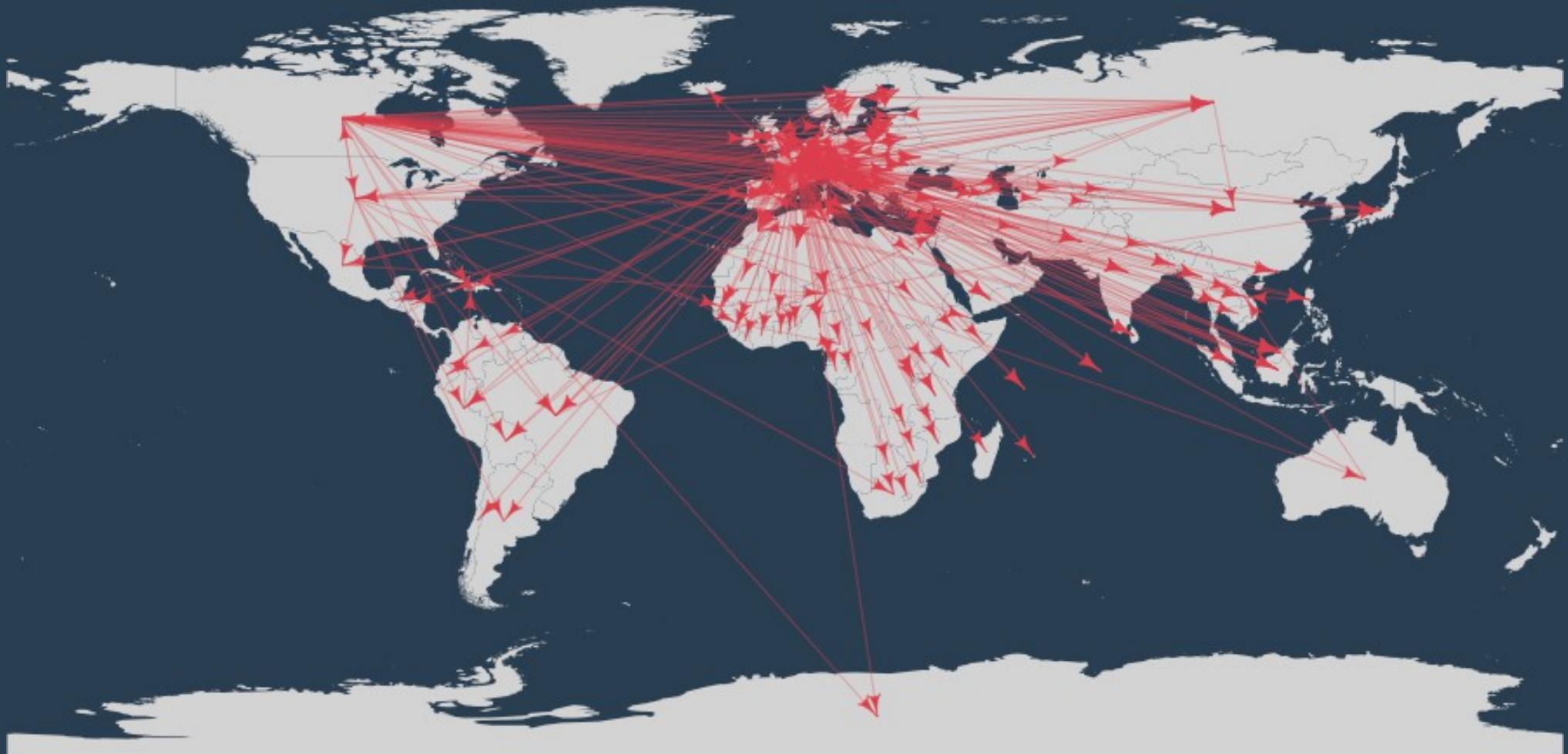
Top countries studied FR (67), SN (9), US (9), CA (8), RU (8)

Number of citations from other articles 237

Number of citations of other articles 2860

Geo-authoring networks

Who studies who? | 1996-2015



20 years of Cybergeo

More articles published

Spread of geographical Objects

Diversification + French-speaking
predominance for authorship

Growing connexion in citation networks

Declared keywords

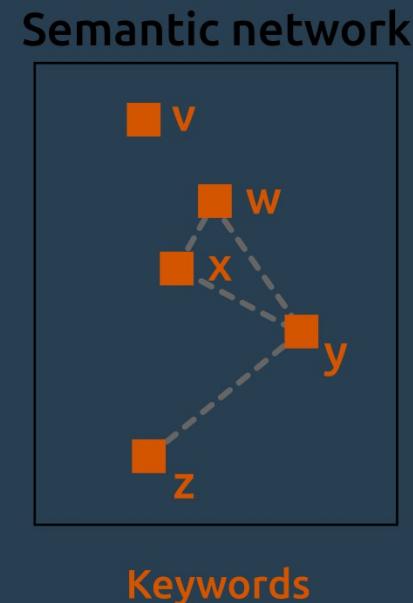
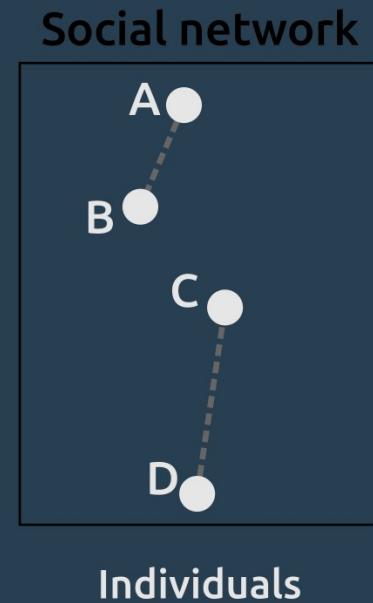
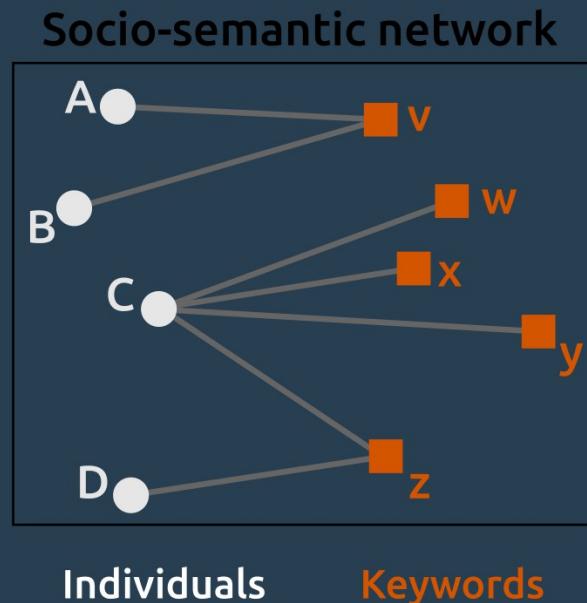
Two main approaches in bibliometrics:

- Studying **actual research**: co-publications, colloquium participation, formal research networks
- Studying **declared research**: themes, trends, keywords

Declared keywords

An **undirected valued semantic network** is built:

- 2 keywords are linked if they are shared in the research interests of one researcher
- individual networks are collapsed and summed



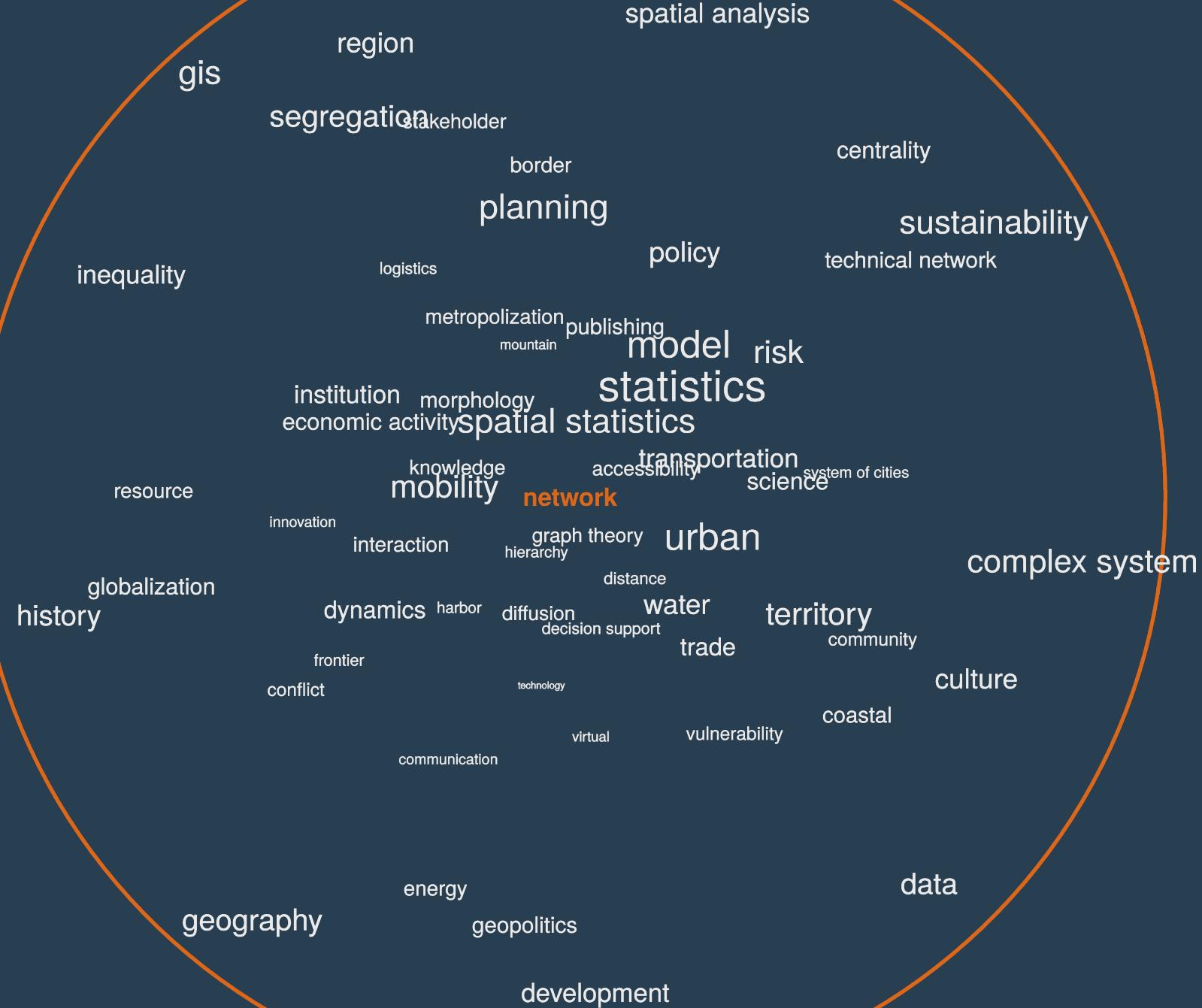
Declared keywords

- **Correspondence analysis:** 250 dimensions poorly correlated
- **Network metrics:** for two keywords i and j , comparison between observed weight (w_{ij}) and expected weight (w_{ij}^e)

$$(1) \quad P_{i \rightarrow j} = \frac{w_i}{w} \times \frac{w_j}{w - w_i} \quad P_{j \rightarrow i} = \frac{w_j}{w} \times \frac{w_i}{w - w_j}$$

$$(2) \quad P_{i \leftrightarrow j} = P_{i \rightarrow j} + P_{j \rightarrow i}$$

$$(3) \quad w_{i \leftrightarrow j}^e = \frac{w}{2} P_{i \leftrightarrow j}$$

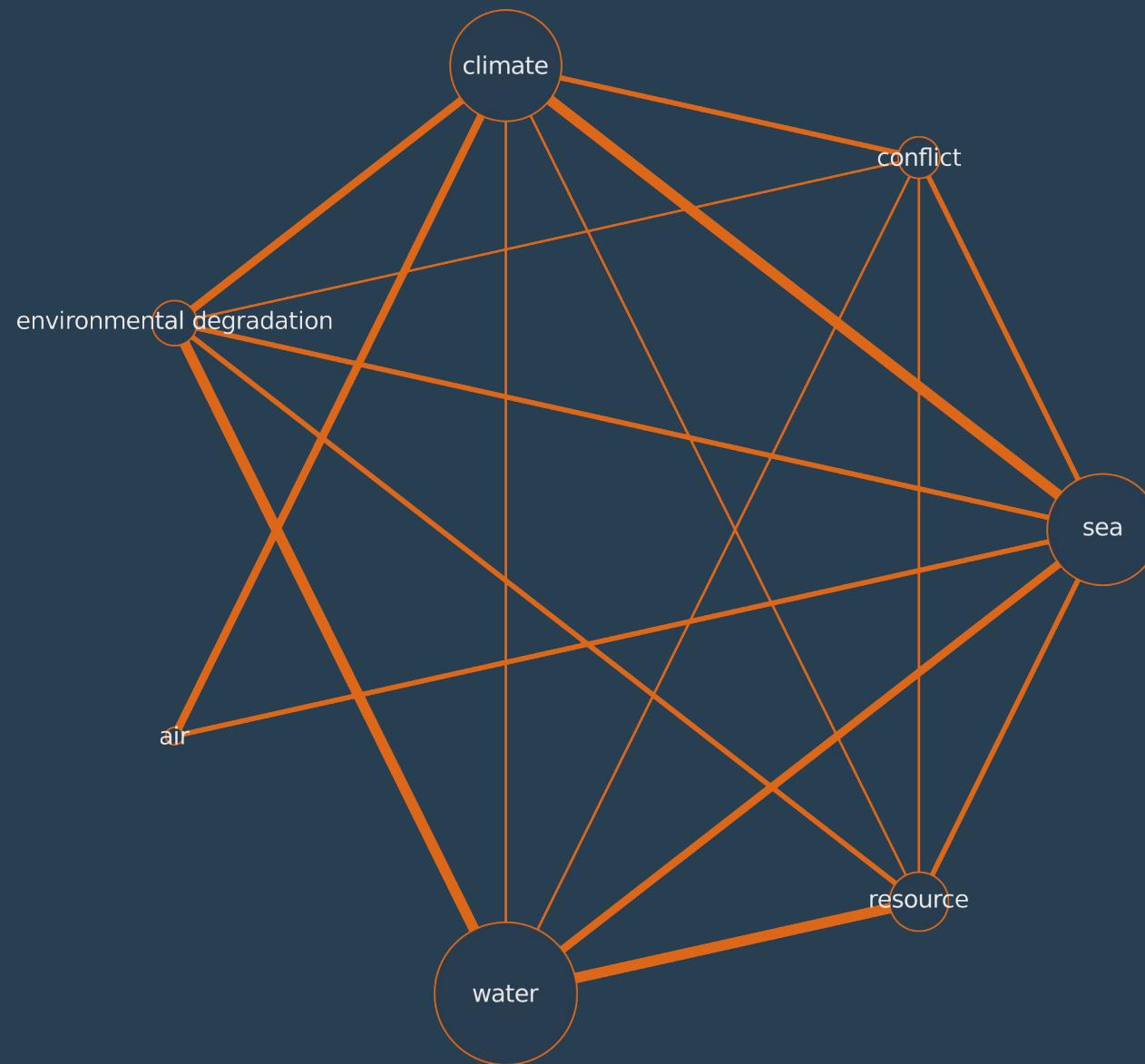


Declared keywords

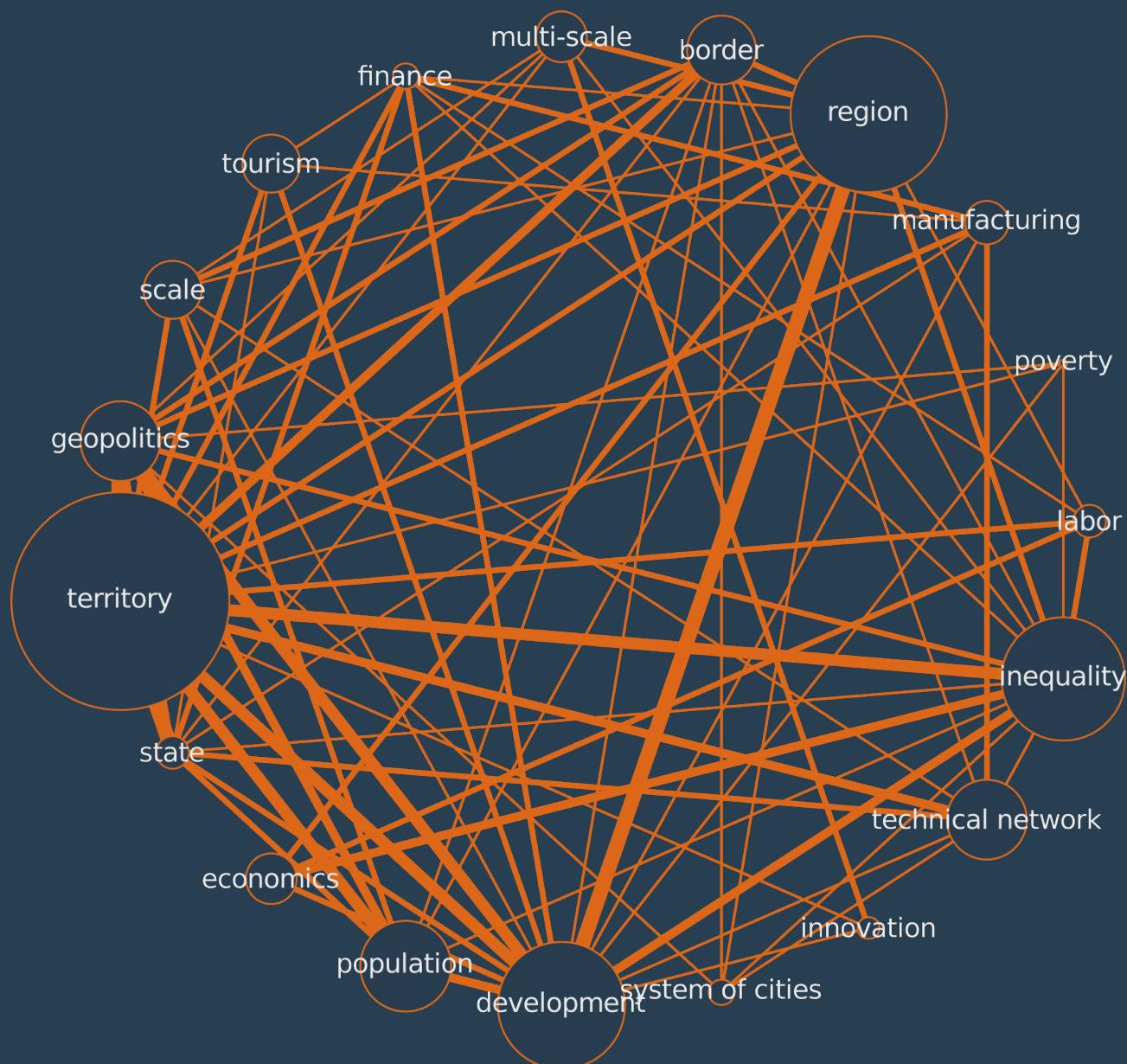
- **Community detection:**
 - modularity optimization (Louvain algorithm)

$$Q = \frac{1}{2w} \sum_{ij} \left[A_{ij} - \frac{w_i w_j}{2w} \right] \delta(c_i, c_j)$$

Environment



Territory



Imagery & GIS



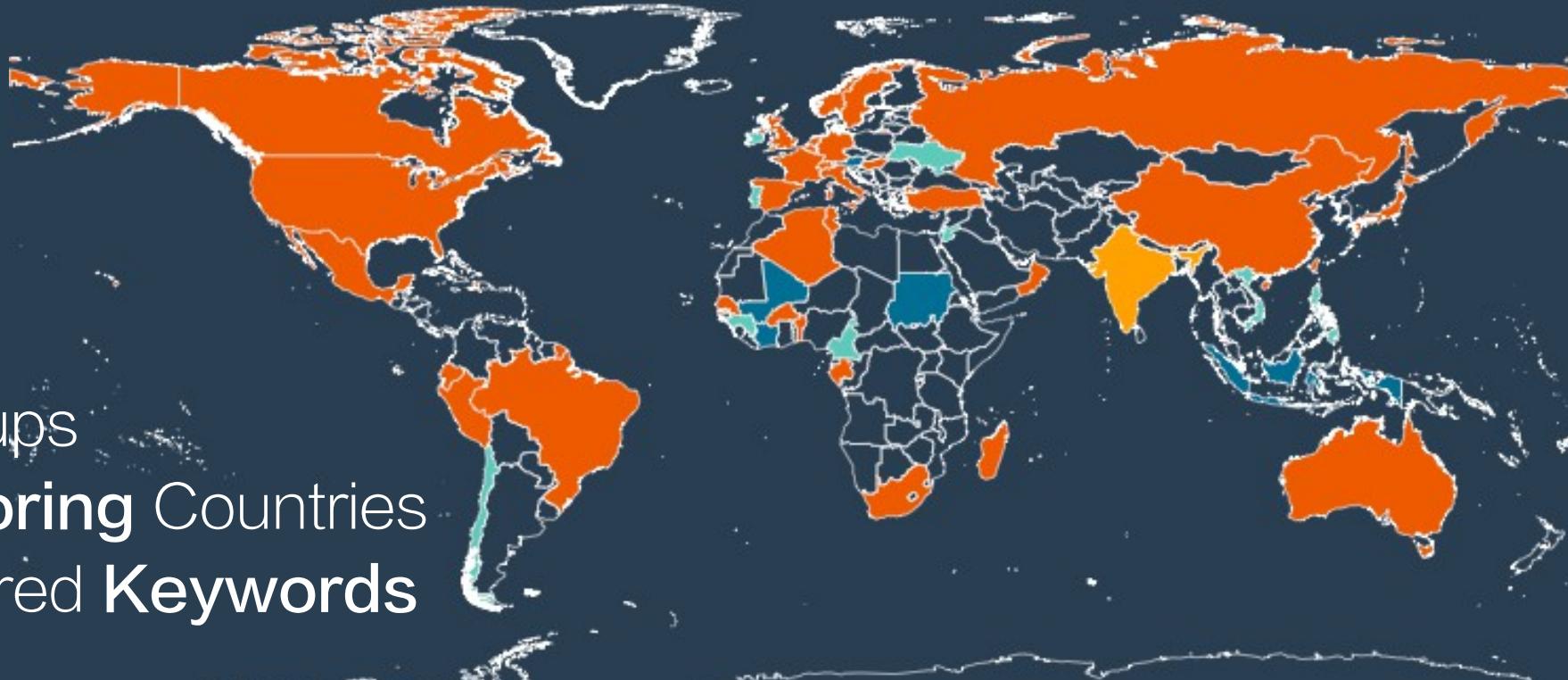
Geo-Semantic Networks

Each article **geocoded**

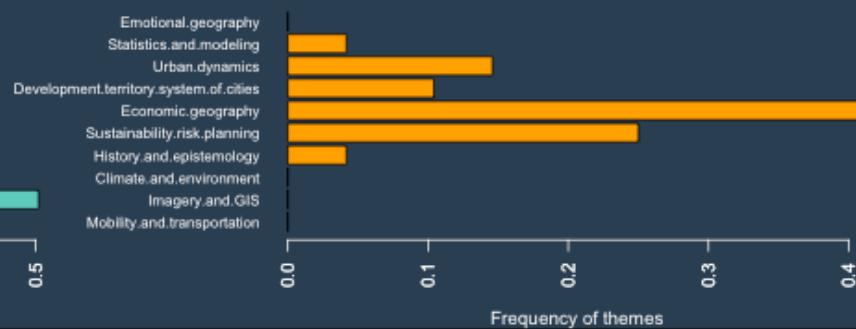
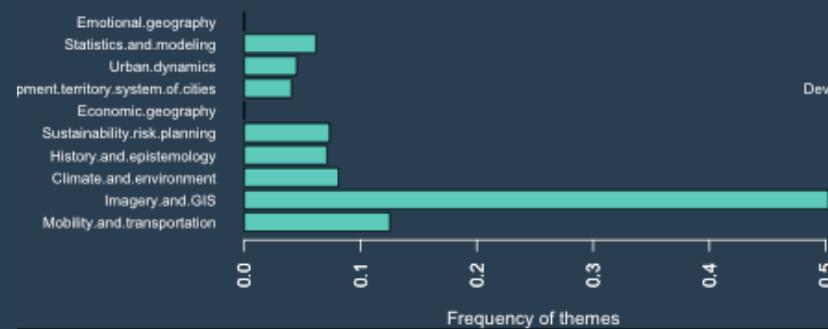
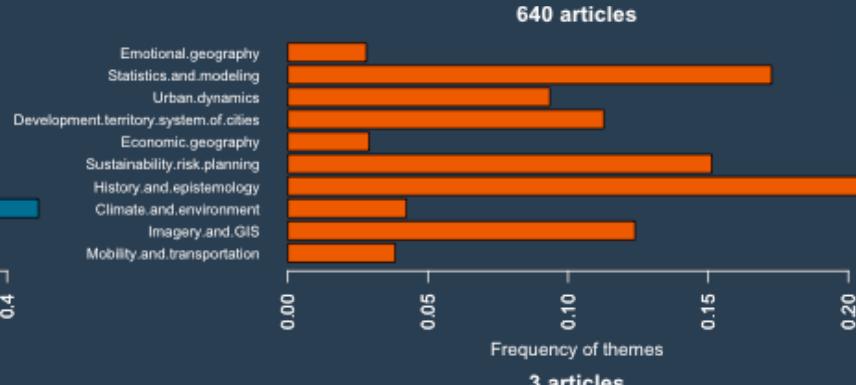
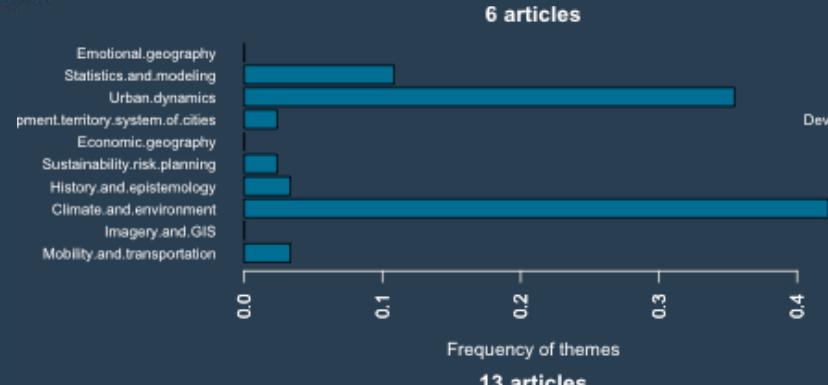
Aggregation by country

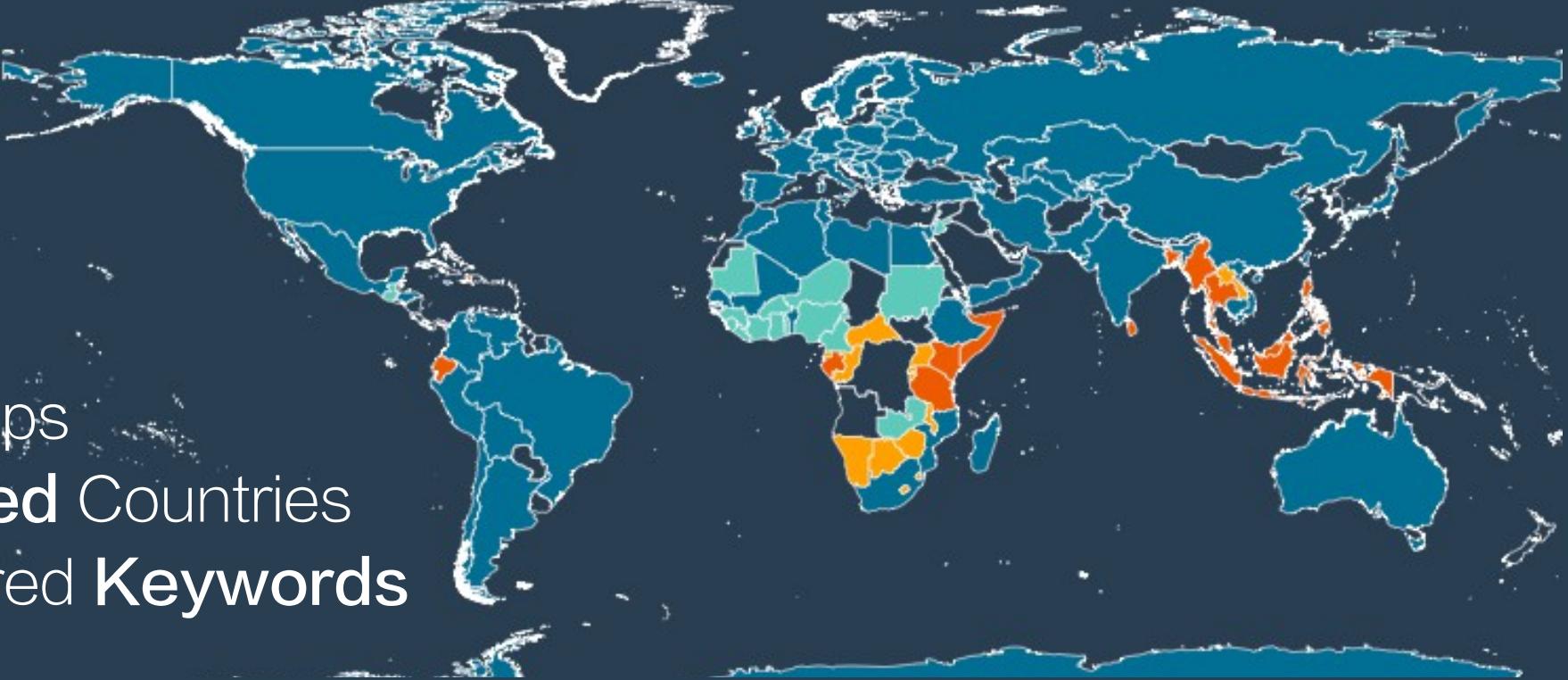
Hierarchical **clustering** based on semantics:

- **Keywords** Communities(HC)
- **Citations** Communities (JR)
- **Terms** Communities (POC)



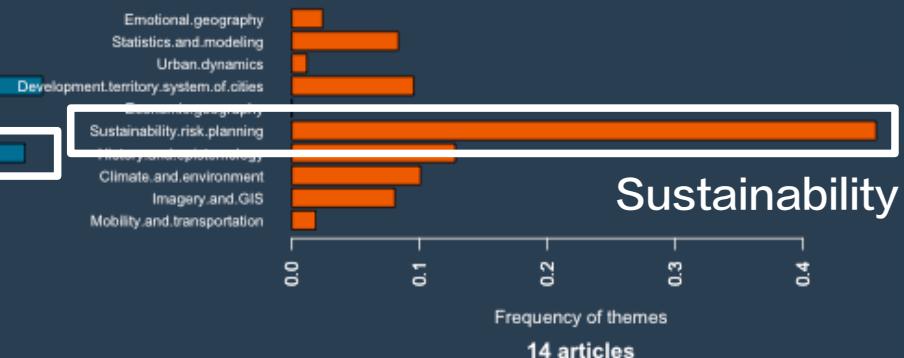
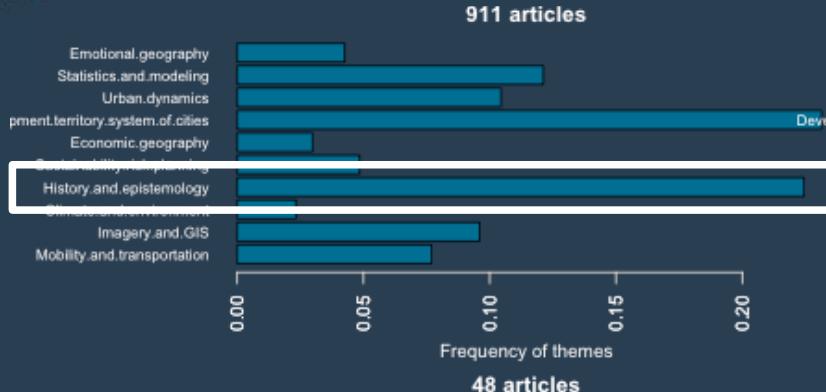
4 groups
Authoring Countries Declared Keywords





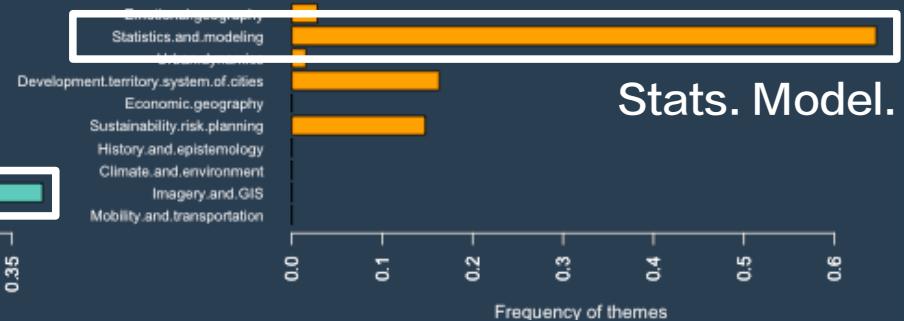
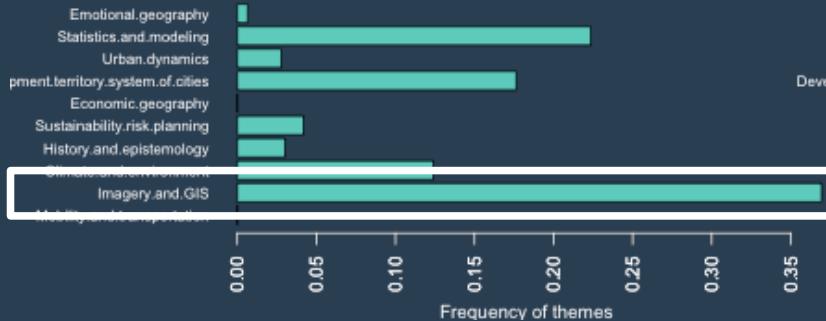
4 groups Studied Countries Declared Keywords

Hist. Epistemo.



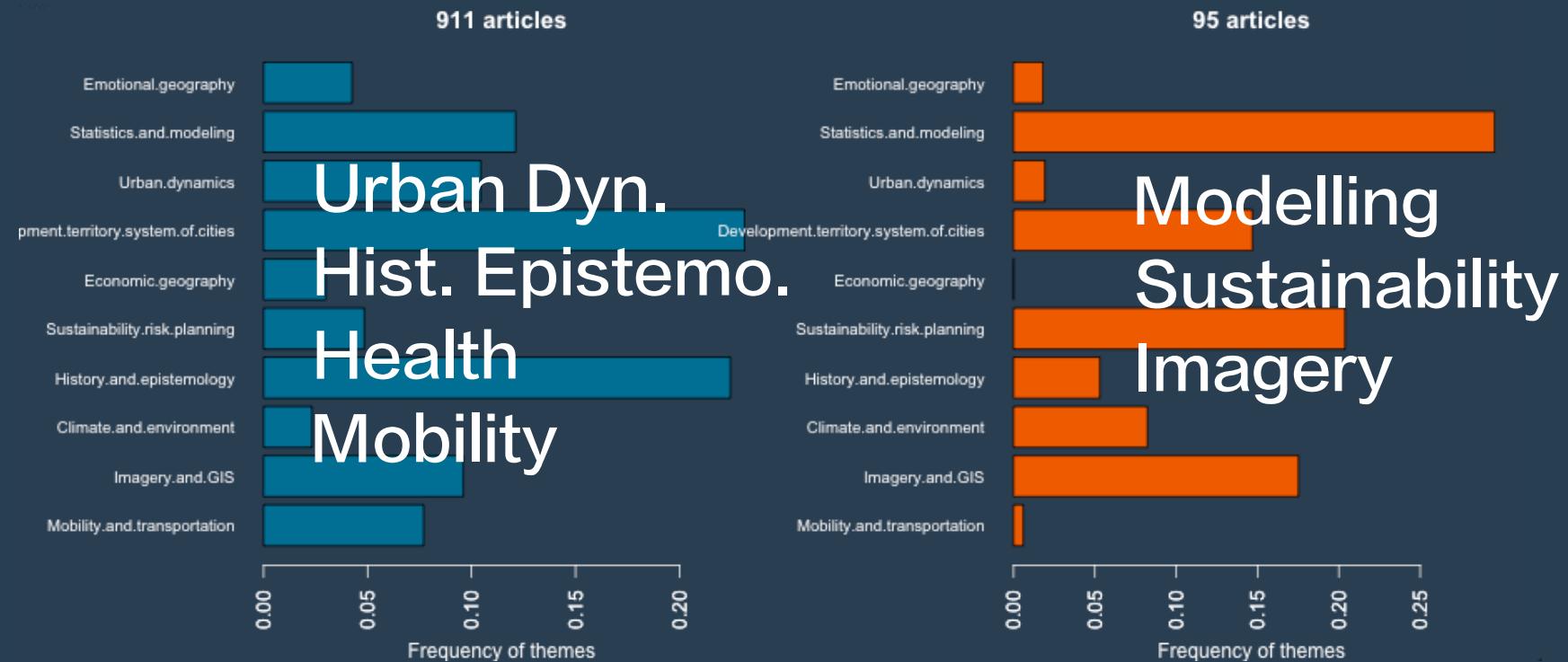
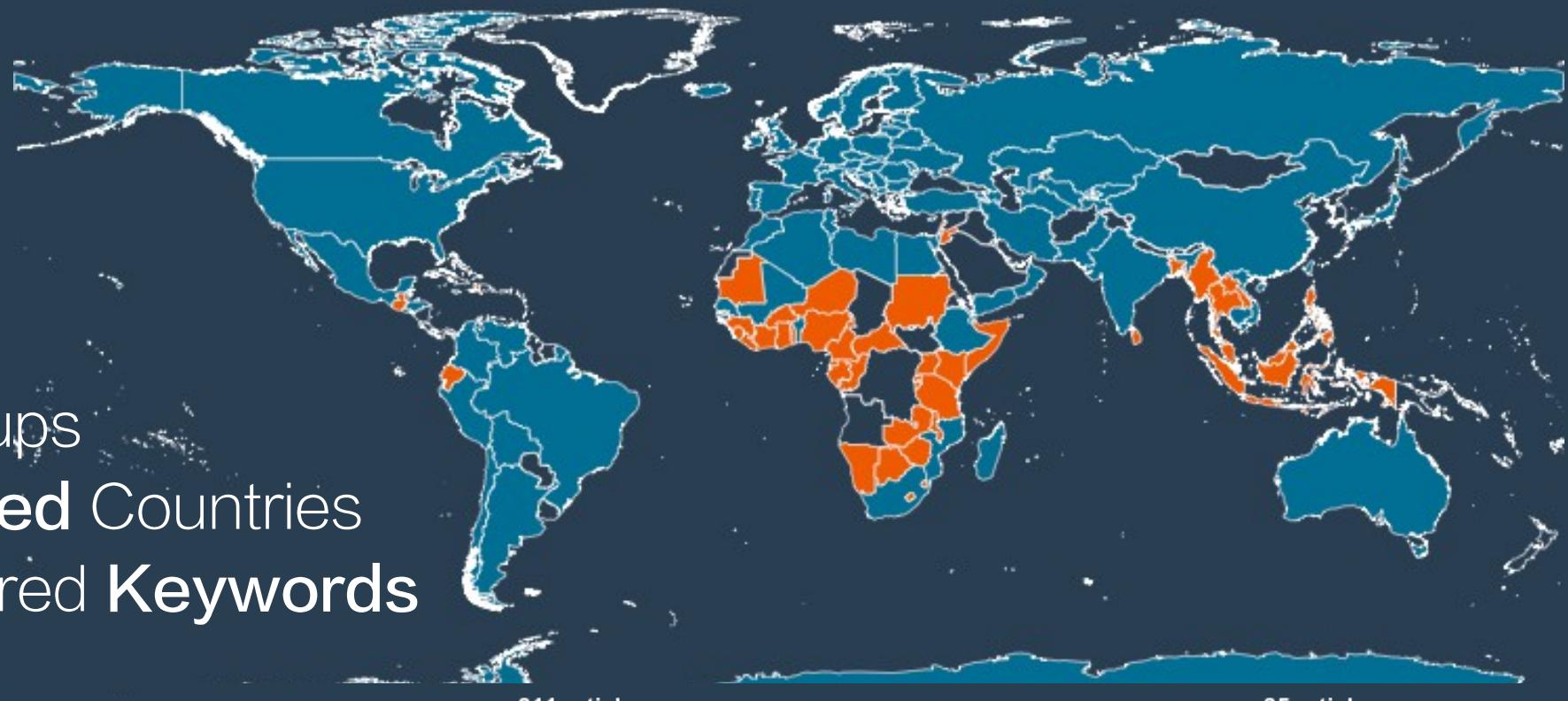
Sustainability

Imagery & GIS



Stats. Model.

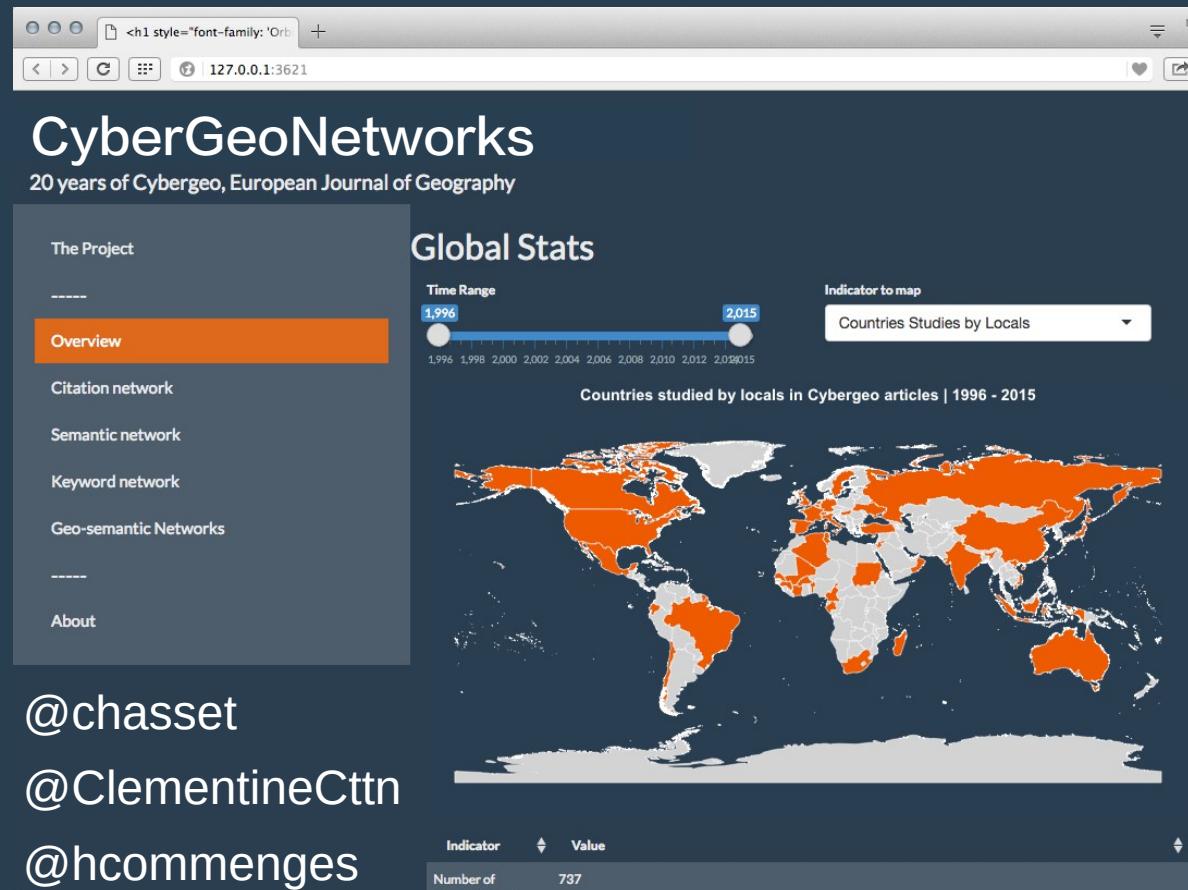
2 groups
Studied Countries
Declared **Keywords**





cybergeo.revues.org

Thank you.



@chasset

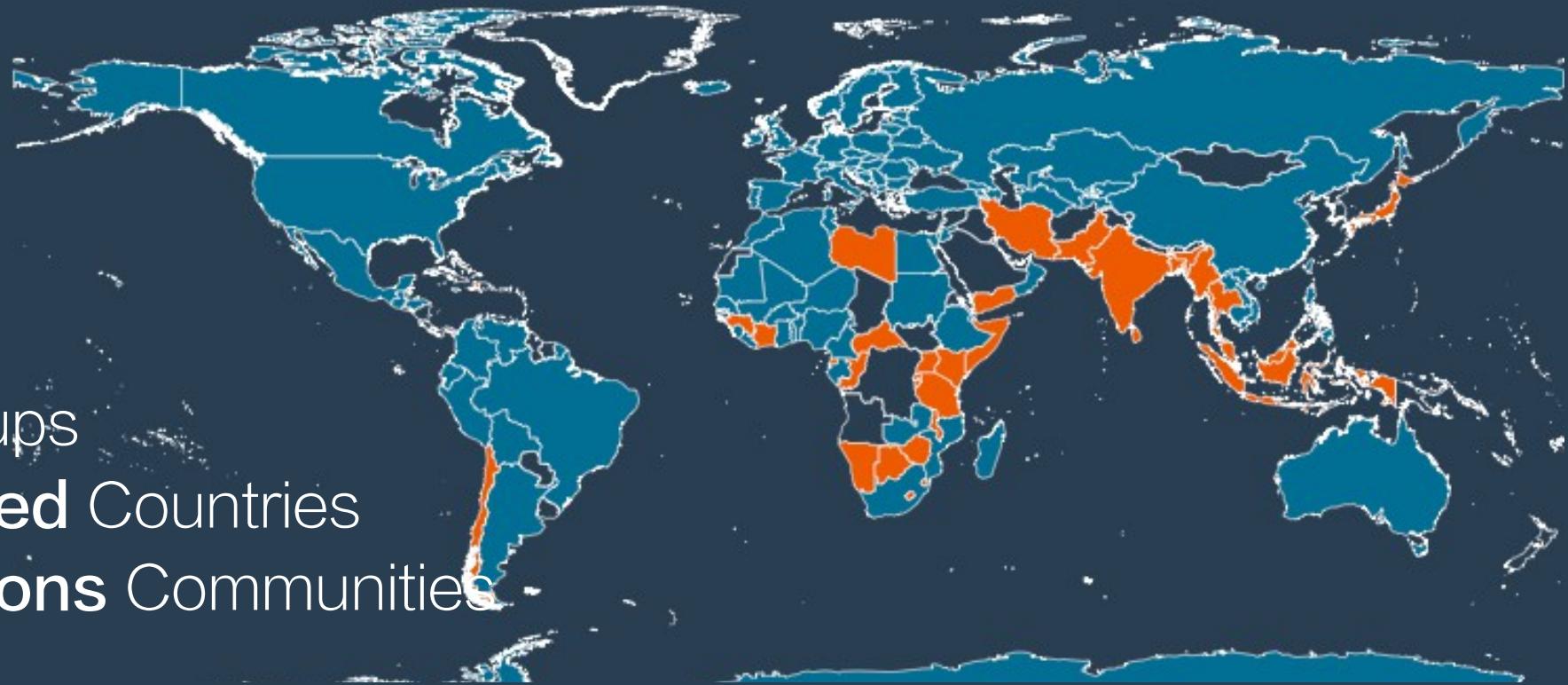
@ClementineCtn

@hcommenges

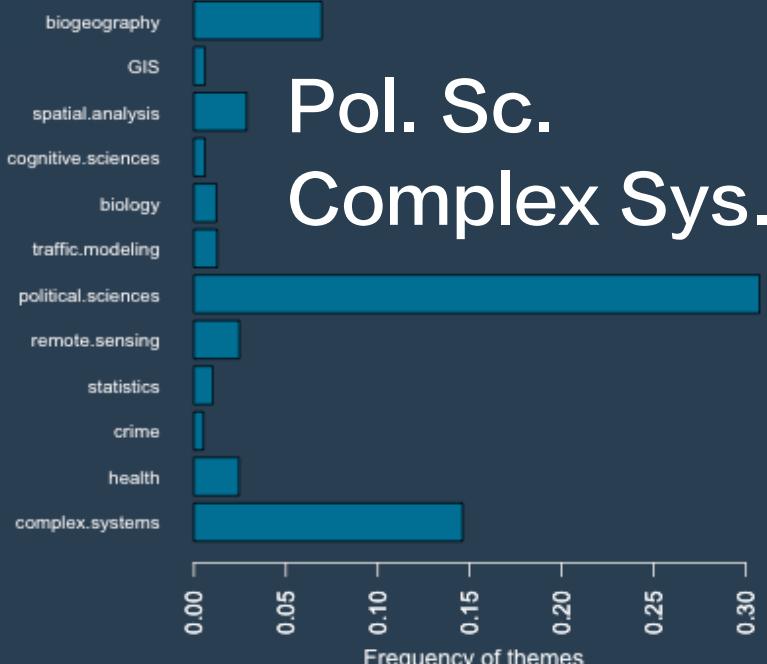
@JusteRaimbault

github.com/Geographie-cites/cybergeo20

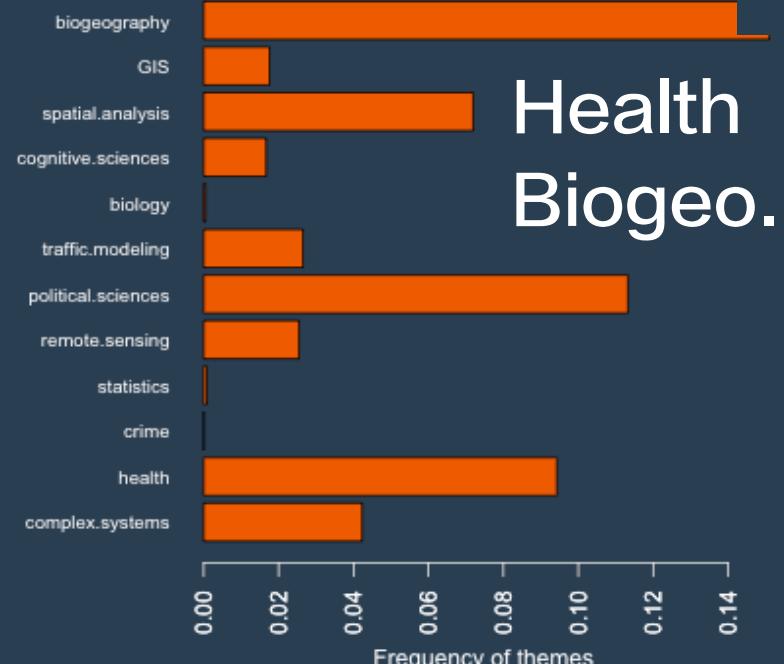
2 groups
Studied Countries
Citations Communities



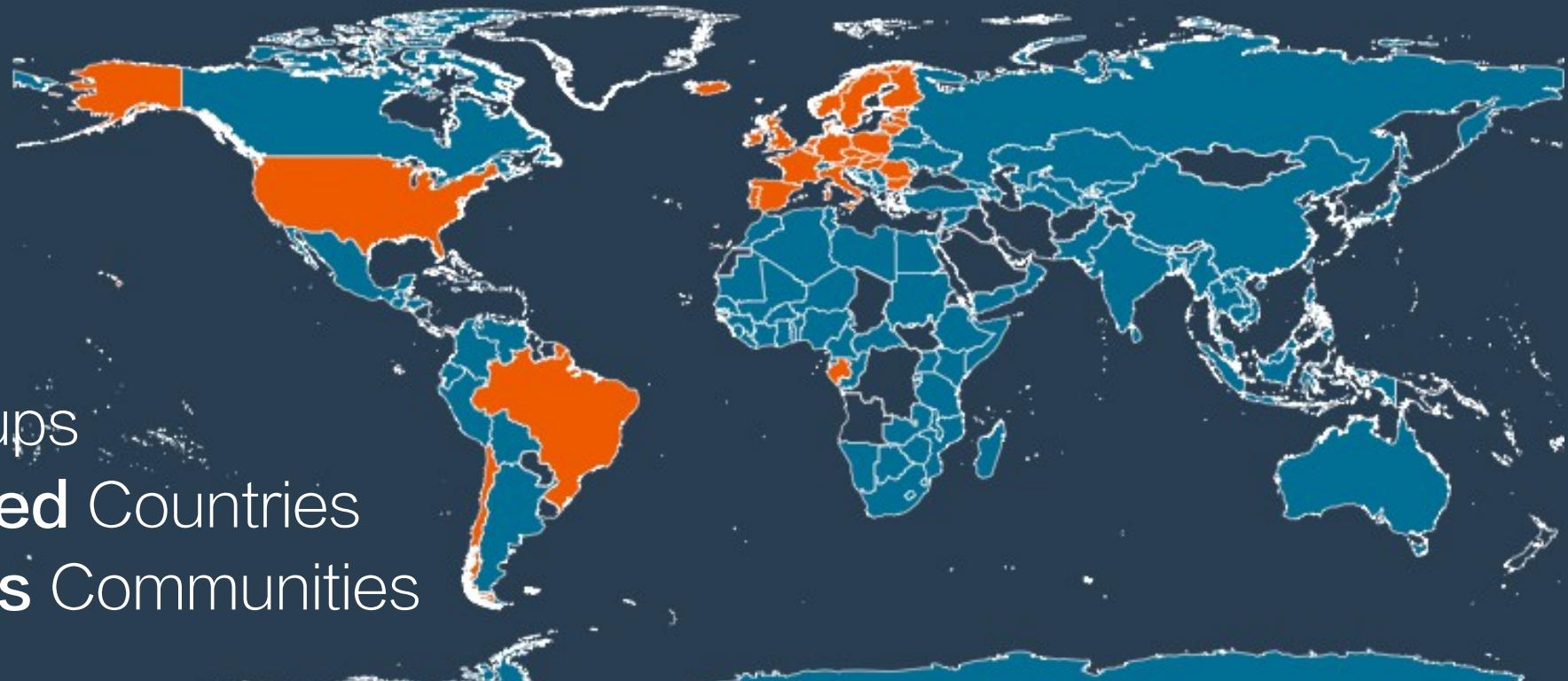
831 articles



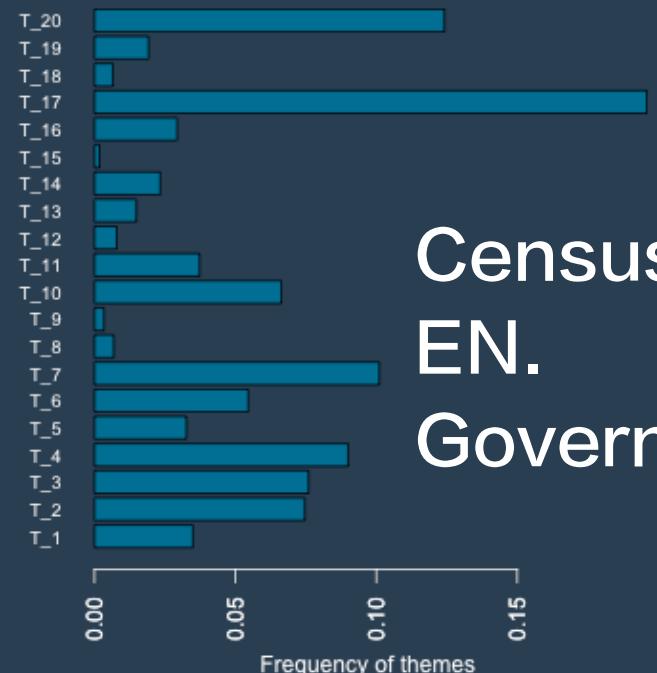
59 articles



2 groups
Studied Countries
Terms Communities



292 articles



Census
EN.
Governance

537 articles



Tradition
State & Id.
Urban & art

Geo-Semantic Networks

Each semantic method...

… gives a different insight!

- Keywords Communities: **how the paper is advertised**
- Citations Communities: **who the paper talks to**
- Terms Communities: **how the paper is written**