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MINISTÉRIO DA EDUCAÇÃO E CIÊNCIA

Monitoring National Smart Specialization Strategy: Linking strategic priorities with scientific fields

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Challenge

- Monitoring the evolution of national R&I strategic priorities
  - Delimiting the content of the priorities
  - Mapping the corresponding S&T content
  - Understanding linkages, actors and scientific field contributions
  - Not using patent data due to scarce numbers

Project

- Portugal 2020: monitoring indicators of POs and ENEI - DG REGIO
- Developing internal competencies
- Collaboration with IFRIS-LISIS-ESIEE (Paris-Est Université) in January 2015
- Ocean economy as pilot case
- Other priorities following
- Internal application to assess alignment

National R&I Priorities

- The priorities in ENEI are themes where Portugal has:
  - S&T and Economic Competitive advantages (EU level)
  - Comparative advantages (natural resources)
  - Emergent potential competitive and strategic advantages
  - Combine competences and knowledge and explore the synergies and complementarities among scientific disciplines and technologies to address economic sectors with a common or related S&T basis.
- Priorities reflect socio-economic dynamics

National R&I Priorities
Criteria for selection

- Economic potential
- Societal challenges
- Natural resources
- Potential for qualified human resources and employment
- Critical mass or emerging potential
- Horizontal
- Related variety
- Consistency among themes
- National/transnational dimension
- Strategic positioning, internationally

Strategic Priorities

- Horizontal Technologies and their applications
  - Energy
  - Information and comunication technologies
  - Materials and Raw-Materials
- Production industries and technologies
  - Production technologies and product-based industries
  - Production technologies and process-based industries
- Mobility, Space and Logistics
  - Auto, Aeronautics and Space
  - Transports, Mobility and Logistics
- Natural Resources and Environment
  - Agro-food
  - Forestry
  - Ocean economy
  - Water and environment
- Heath, Well-Being and Territory
  - Health
  - Tourism
  - Cultural and Criative Industries
  - Habitat

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Ocean Economy

- Food safety
- Climate change
- Highways of the sea, mobility, ports and logistics
- Species biodiversity and sustainability
- Maritime Biotechnology
- Disease and pathogenic organisms prevention and treatment
- Technology Development of fisheries
- Blue energy (wave-marginal)
- Efficient exploration of resources
- Mapping and monitoring of maritime resources
- Coastal protection
- Advanced technologies applied to the ocean
- ICT applied to blue growth
- Smart maritime transportation
- Coastal tourism and leisure – not covered
- Sustainable use of seafood resources

Methodology

- **Keywords** – identification of terms relevant to the priority by experts
- **Building the Query and database -** extraction of relevant papers to the priority from the WoS database (tittle, abstract and Keywords)
- **Normalisation/cleaning database** (institutions/countries and cities) – the main problem related to the retrieval of information from the WoS is the enormous number of unstructured data
- **Analysis of the dataset** in CorTEXT – digital plataform
  a) **Co-word analysis** - identification of interrelationships among these terms using co-word analysis
  b) **Clustering** (mapping the structure and the dynamics of the dataset) - The contents of these articles were analysed and organized into thematic clusters through Heterogeneous Networks Mapping.
- **Filtering and refining the query** – removing terms based on level of generality and speciality
- **Geo-location** - enabling us to map how a given priority is distributed over the regions, to see how they evolve in each region and make comparisons with relevant countries.

Methodology

- Keywords – identification of terms relevant to the priority by experts
- Building the Query and database - extraction of relevant papers to the priority from the WoS database (tittle, abstract and Keywords)
- Analysis of the dataset in CorTEXT – digital plataform
- Identification of actors
- Co-word analysis - clustering
- Filtering and refining the query
- Validation by experts
- Geo-location - map a given priority over the regions, identifying agglomerations
- Identification of other sources of data – projects / other public participation processes

Ocean Economy

FOS areas		Priority ENEI
OCDE Code	Description OCDE	OCEAN ECONOMY
1	Natural Sciences	69,6
2	Engineering and Technology	15,8
3	Medical and Health Sciences	6,2
4	Agriculture and veterinary sciences	6,8
5	Social sciences	2,1
6	Humanities and the arts	0,4

Ocean Economy

Natural Sciences	1.01	Mathematics	0,40
	1.02	Computer and information sciences	1,09
	1.03	Physical sciences and astronomy	1,02
	1.04	Chemical sciences	2,58
	1.05	Earth and related environmental sciences	31,98
	1.06	Biological sciences	31,49
	1.07	Other natural sciences	1,06
Engineering and Technology	2.01	Civil engineering	1,92
	2.02	Electrical eng, electronic eng	0,51
	2.03	Mechanical engineering	1,63
	2.04	Chemical engineering	1,98
	2.05	Materials engineering	0,66
	2.06	Medical engineering	0,06
	2.07	Environmental engineering	5,94
	2.08	Environmental biotechnology	1,11
	2.09	Industrial biotechnology	0,07
	2.10	Nano-technology	0,08
	2.11	Other engineering and technologies	1,83

Áreas FOS		Portugal	Prioridades ENEI				
Código OCDE	Descritivo OCDE		AGRO-ALIMENTAR	FLORESTA	BCON MAR	ÁGUA AMB	SAÚDE
1.1	Mathematics	7,8980	0	0	0,770	0	1,070
1.2	Computer and information sciences	3,5895	0	0	2,087	0	6,775
1.3	Physical sciences and astronomy	16,8777	0	0	1,958	0	3,104
1.4	Chemical sciences	20,0184	0	0	4,912	0	11,540
1.5	Earth and related environmental sciences	11,7548	0	0	61,093	0	4,602
1.6	Biological sciences	26,0156	0	0	60,154	0	29,889
1.7	Other natural sciences	0,9657	0	0	2,033	0	2,965
2.1	Civil engineering	2,4155	0	0	3,669	0	0,799
2.2	Electrical eng, electronic eng, inf eng	0,5716	0	0	0,973	0	0,490
2.3	Mechanical engineering	3,9797	0	0	3,113	0	3,783
2.4	Chemical engineering	8,0455	0	0	3,776	0	2,293
2.5	Materials engineering	8,5802	0	0	1,252	0	2,945
2.6	Medical engineering	1,1583	0	0	0,118	0	4,869
2.7	Environmental engineering	3,2053	0	0	11,539	0	0,971
2.8	Environmental biotechnology	3,0240	0	0	2,118	0	3,483
2.9	Industrial biotechnology	0,7130	0	0	0,128	0	2,220
2.10	Nano-technology	1,2354	0	0	0,150	0	1,046
2.11	Other engineering and technologies	7,4216	0	0	3,487	0	2,873
3.1	Basic medical research	9,4806	0	0	8,098	0	21,757
3.2	Clinical medicine	13,0824	0	0	1,220	0	34,656
3.3	Health sciences	5,1444	0	0	2,502	0	15,938
3.4	Health biotechnology	0,0000	0	0	0,000	0	0,000
3.5	Other medical sciences	0,0000	0	0	0,000	0	0,000
4.1	Agriculture, forestry, fisheries	3,6232	0	0	10,263	0	2,938
4.2	Animal and dairy science	0,6208	0	0	0,203	0	0,834
4.3	Veterinary science	0,9819	0	0	0,781	0	2,050
4.4	Agricultural biotechnology	0,0000	0	0	0,000	0	0,000
4.5	Other agricultural sciences	3,1899	0	0	1,775	0	3,425
5.1	Psychology	1,7194	0	0	0,525	0	2,430
5.2	Economics and business	3,5000	0	0	0,962	0	1,132
5.3	Educational sciences	0,6915	0	0	0,171	0	0,734
5.4	Sociology	0,8543	0	0	0,267	0	0,868
5.5	Law	0,0522	0	0	0,053	0	0,046
5.6	Political science	0,2981	0	0	0,366	0	0,038
5.7	Social and economic geography	0,9079	0	0	3,434	0	0,290
5.8	Media and communications	0,2028	0	0	0,032	0	0,150
5.9	Other social sciences	0,2981	0	0	0,128	0	0,316
6.1	History and archaeology	0,5747	0	0	0,599	0	0,116
6.2	Languages and literature	0,4671	0	0	0,064	0	0,081
6.3	Philosophy, ethics and religion	0,1690	0	0	0,000	0	0,093
6.4	Art	0,1905	0	0	0,107	0	0,073
6.5	Other Humanities	0,1045	0	0	0,021	0	0,013

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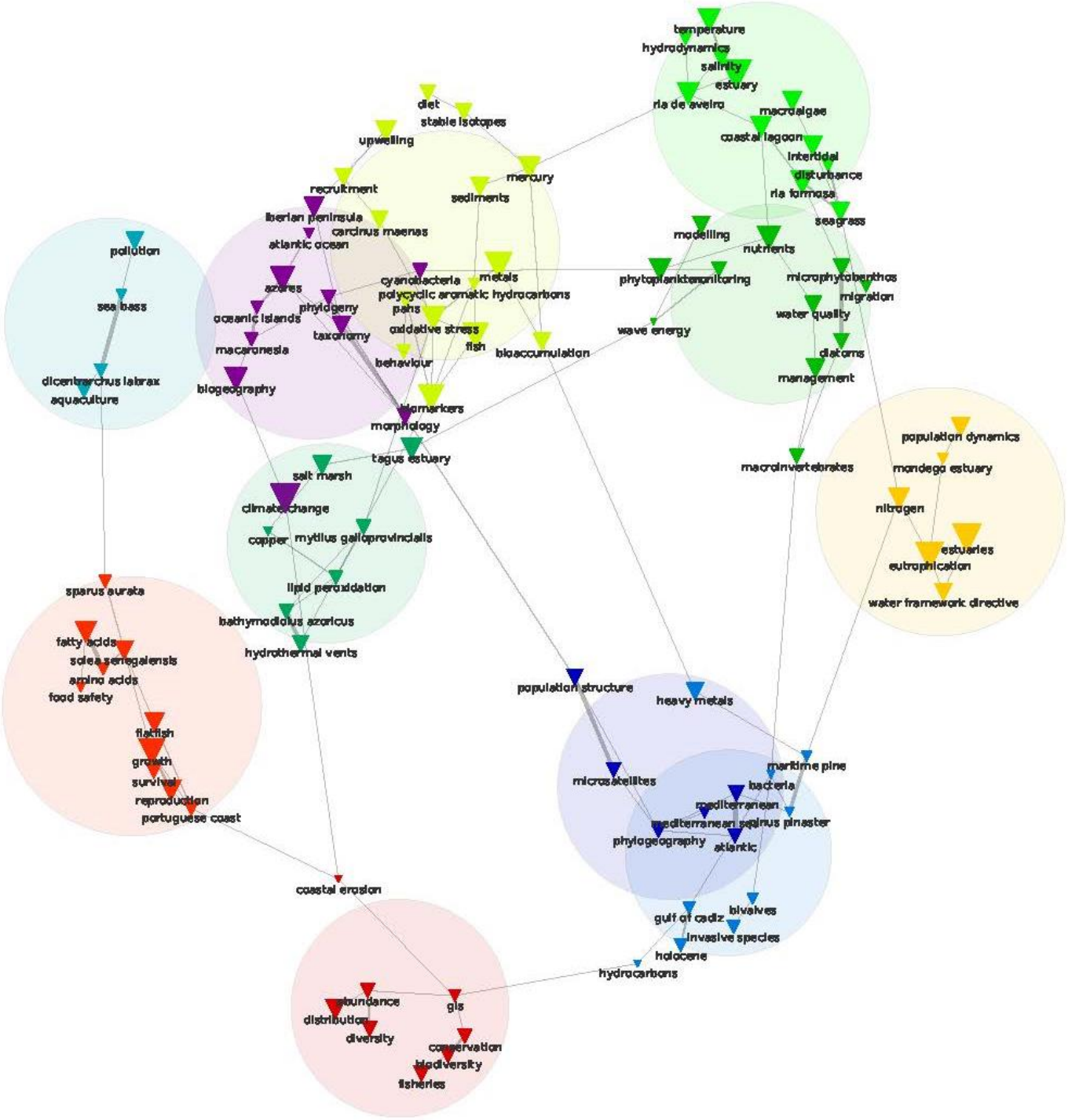
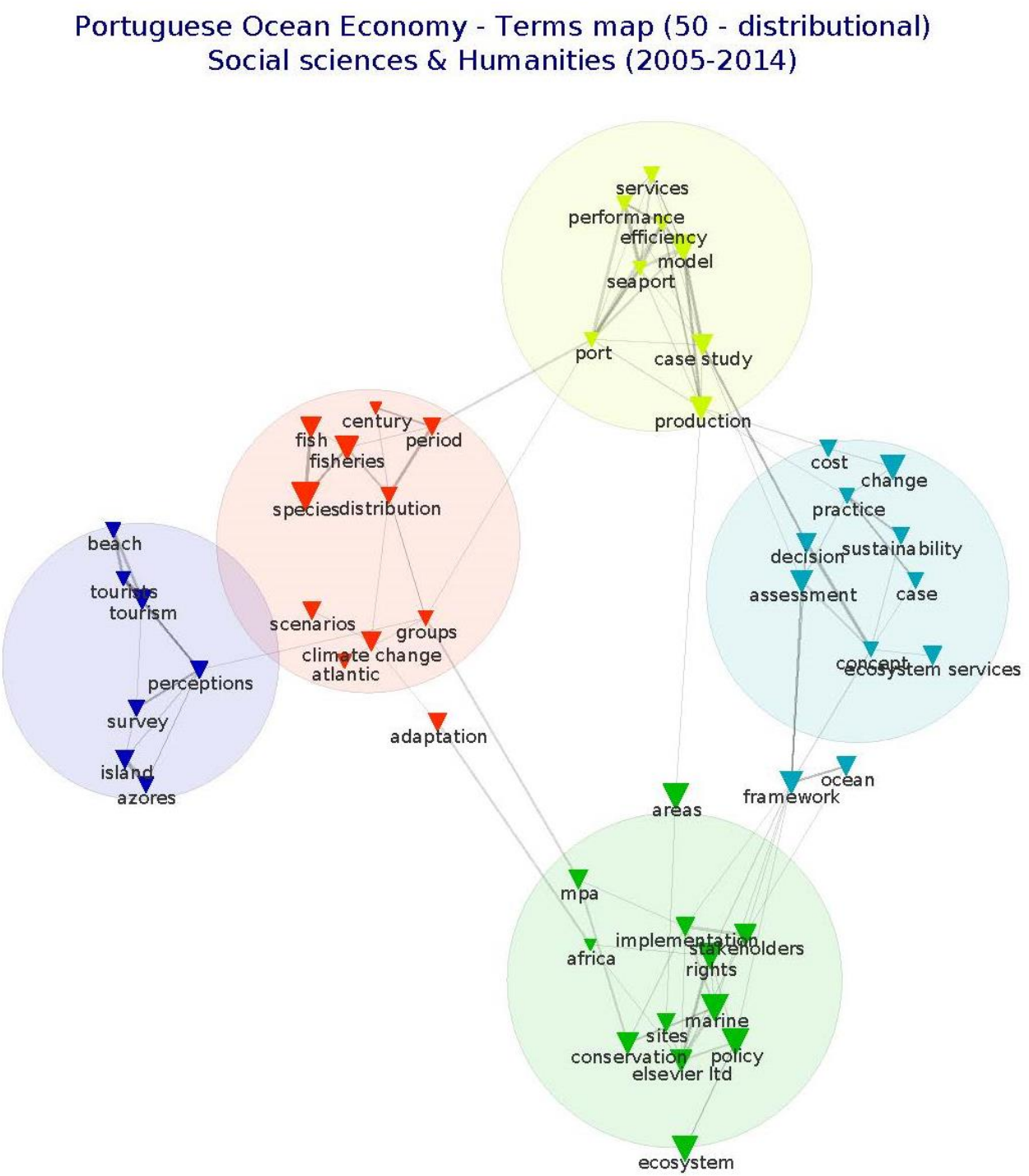
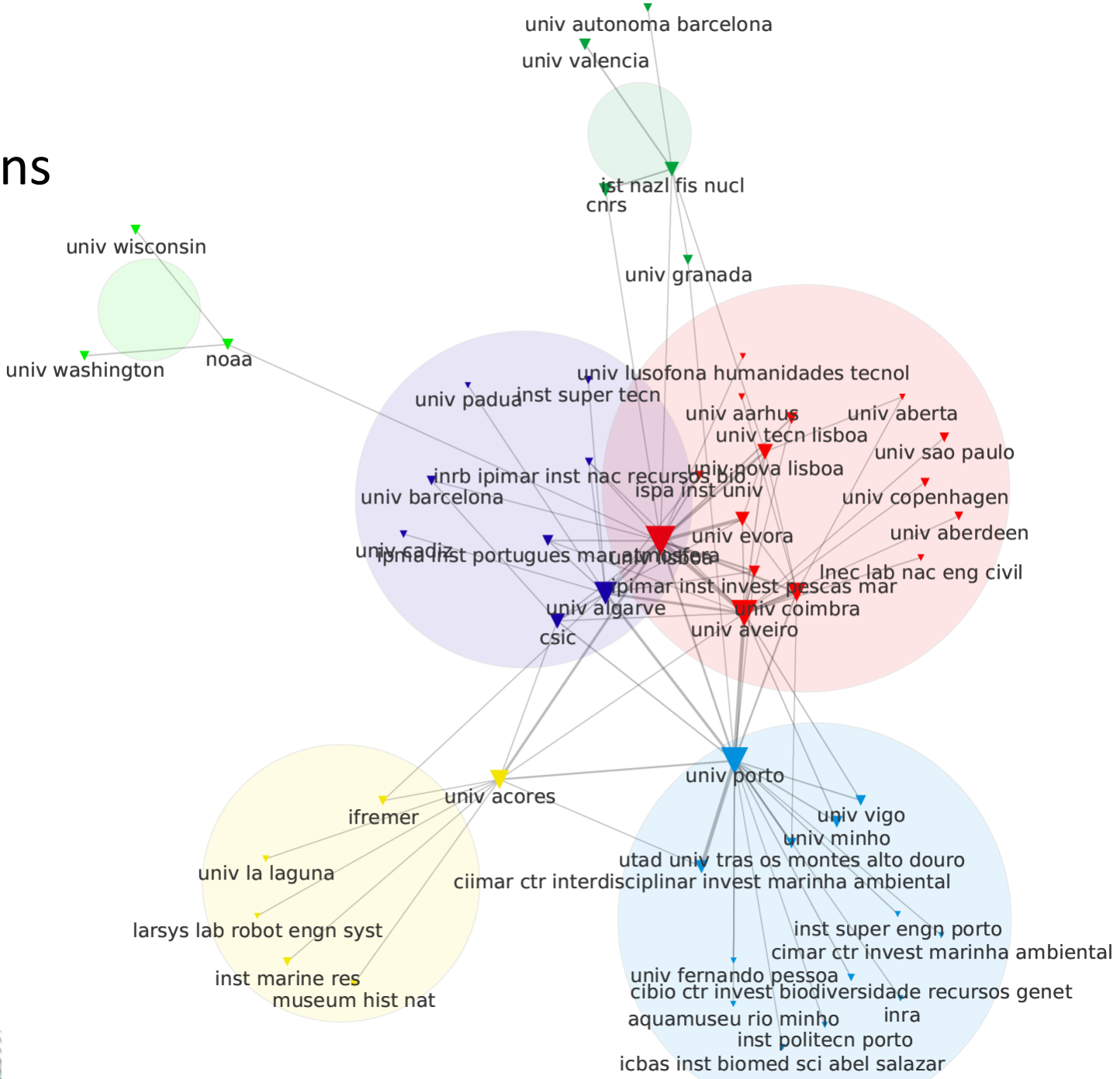
Full keywords map



Full keywords map



Institutional collaborations



Conclusions

- Monitoring progress of national strategy requires identifying relevant actors and linkages
- Need to identify links between technology and scientific fields, at the national level
- Mapping allows identifying local context and overcoming lack of traditional technology indicator (patents)
- Broad identification of actors (research and innovation) may contribute to identify local agglomeration dynamics