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Navigating Regional Transformation

University of Porto

EU place-based Research and Innovation ecosystems as ERA Hubs. Theoretical framework and main findings from territorial case-studies

a potential tool for a territorial sustainable growth

This research originates from the EU project ERA_Fabric

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ERA FABRIC

ERA_FABRIC Framing And Bridging Regional Research and Innovation ecosystems capacities for a renewed ERA

The ERA_FABRIC project aims to develop and test the **ERA Hubs concept** across different geographies and structures in Europe, based on common compliance criteria.

The process acts as an incentive for advanced ecosystems to seek recognition, and for less advanced ecosystems to reach the criteria facilitating support from European, national and regional level

Aim of the contribution

Immediate objective

Defining robust theoretical and empirical boundaries of the concept of ERA Hub in the light of theoretical assumptions and effective experiences of entrepreneurial and institutional agglomerations of private and public actors in the European regions

Final goal

Enhancing the level of knowledge for researchers and policy makers of one of the potential pillars of the European Research and Innovation policy and territorial development

Policy background

The European Research Area (ERA) is the initiative aimed at creating a single, borderless market for research, innovation and technology across the EU. ERA was launched in 2000 and a process to revitalise it began in 2018.

In order to relaunch the R&I development, in the EU communication launched on September 30th 2020 four key strategic objectives were defined:
1.prioritising investments in R&I; **2. improving access to excellence**; **3. translating R&I results into the economy**; 4. deepening policies that promote the free circulation of knowledge.
Recent developments: Oct 2024 communication from the Commission to the EU parliament, the Council, the European economic and social committee and the committee of the regions
Implementation of the European Research Area (ERA)
Strengthening Europe's Research and Innovation: The ERA's Journey and Future Directions

The ERA policy agenda

The European Research Area (ERA) Policy Agenda three-year roadmap that guides collaboration and policy coordination in the EU for research and innovation.

The first and second ERA Policy Agenda 2022-2024, 2025-2027

.Deepening a truly functioning internal market for knowledge
.Green and digital transition increasing society's participation in the ERA
.Amplifying access to research and innovation excellence across the Union
.Advancing concerted research and innovation investments and reforms

The wide variety of instruments of the ERA policy

The European Research Area (ERA) policy uses several instruments to foster research and innovation, most of them based on the territorial/regional/interregional development dynamics e.g.

ERA Hubs

Regional Innovation Valleys

Smart Specialization

A lot of projects and initiatives were launched in the recent years to stimulate research and innovation at the territorial level

Characteristics of the ERA Hubs

In the light of the objectives described and the most recent EU publications on R&I policies the main distinctive ingredients of an ERA Hub should be:

- **Directionality** (EC 2024): directionality refers to the mobilization of the public and private stakeholders around shared objectives
- **Multi-level governance processes** (Larrea et al 2019) : an ERA Hub is inherently multi-level in its intervention/composition/membership. This means that the integration and mobilization effort across the diversity of stakeholders needs to be made across vertical governance and implementation levels
- **Horizontal integration**: an ERA Hub is a formal bridge to other knowledge ecosystems (ideally, other ERA Hubs), independently of regional or national borders.
- **Holistic approach** (Edquist 2014): an ERA HUB brings together all the public and private stakeholders and support co-creation and joint ownership of the goals and process.

It is the combination of these characteristics that make ERA Hubs unique and create added value when compared to other existing initiatives.

The three dimensions of the ERA Hubs

The ERA Hubs, on the basis of our research approach, could be understood along three potential different dimensions:

1) **ERA Hubs as Knowledge Ecosystems**: fostering the dynamic interaction of R&D and innovation actors at regional and multiregional levels, taking into account the different knowledge and cultural contexts and the alignment of research foci and industrial needs;
2) **ERA Hubs as Multi Stakeholder Platforms**: bringing together the representatives of the various involved interest groups in a seamless and uninterrupted discussion and deliberation on strategic priorities, actions and results evaluation;
3) **ERA Hubs as a Policy Co-Creation Toolbox**: a transformative set of measures and tools operating in a "middle ground" configured as a distinct space from both the EU and the MS/Regional levels

The first of the three dimensions - ERA Hubs seen as territorial ecosystems - will be specifically analysed in this work

Theoretical framework: knowledge and innovation ecosystems, a critical review of the concept

The concept of ecosystem has gained momentum in managerial, business and economic science in the last 15-20 years. However the concept still lies in a vague and uncertain definition.
According to a wide and varied literature there would be different types of ecosystems potentially different from other traditional prototypes of agglomerations of economic, research and knowledge entities such as the Marshallian districts, the innovation systems, the triple/quintuple helix models, the territorial clusters

Three foundational questions:

1) What would distinguish an innovation (or knowledge) ecosystem from other traditional agglomerations of economic actors (clusters, innovation systems, Marshallian districts, etc) ?
2) Are the knowledge and innovation ecosystems two different things or one single thing? And if they are two different things, as the literature emphasizes, can they be combined together in one single unified concept?
3) Do the knowledge and innovation ecosystems, as a potential unified concept, represent an ideal reference for the ERA hubs and the ERA Hubs policy

Theoretical framework: knowledge and innovation ecosystems, a critical review of the concept

Different scholars enucleate some basic characteristics that would distinguish an innovation (and/or) knowledge ecosystem from other similar entities. *Grandstram et al (2019)* emphasize these aspects as specific of the ecosystems:

- More explicit systemic interactions and collaboration
- Extended digitalization of the innovation process
- Open innovation (open access to the relevant data)
- More attention to the specific and differentiated role of the actors involved
- A strong territoriality as well as a clear attitude to the internationalization
- Greater importance given to market forces than to the role of the government (with respect to the traditional triple helix model), although public institutions and significant public objectives maintain a fundamental role
- Possible crucial focus on the environmental sustainability of the innovation process.

Theoretical framework: knowledge and innovation ecosystems, a critical review of the concept

Different types of ecosystems

- Scaringella and Radziwon (2018) identifyied four types of similar entities: business ecosystems, innovation ecosystems, entrepreneurial ecosystems and knowledge ecosystems
- According to Voda et al (2023) the types of ecosystems conceptualized would be five, three of which overlap the previous categorization: business ecosystems, innovation ecosystems, ecological ecosystems, digital ecosystems and knowledge ecosystems
- According to Valkokari (2015) the business ecosystems focus on creating customer value; the knowledge ecosytems focus on generating new knowledge and technology while the innovation ecosystems would integrate exploration (knowledge) and exploitation (business).

Theoretical framework: knowledge and innovation ecosystems, a critical review of the concept

- **Is a knowledge and innovation ecosystem a unifiable concept? Does it match the concept of ERA HUB?**

Putting together the baseline, the relationships, the logic of action and the type of partners involved of the innovation ecosystems and the knowledge ecosystems it is possible to enucleate a typology of agglomeration of economic actors well definable as **knowledge and innovation ecosystem** that shows the presence of:

1. ***Co-creation of innovation processes as well as creation and transmission of knowledge in the short-medium and long run***
2. ***Public and private actors, tools and objectives variously distributed but somehow well-balanced in their direct and indirect roles***
3. ***Market-driven processes as well as a public regulation or, at least, a clearly recognized and certified (in different way) collective relevance, under a clear directionality***

The characteristics of the **innovation and the knowledge ecosystems** seem **to match in different ways the conceptual assumptions and the declared aims of the ERA Hubs.**

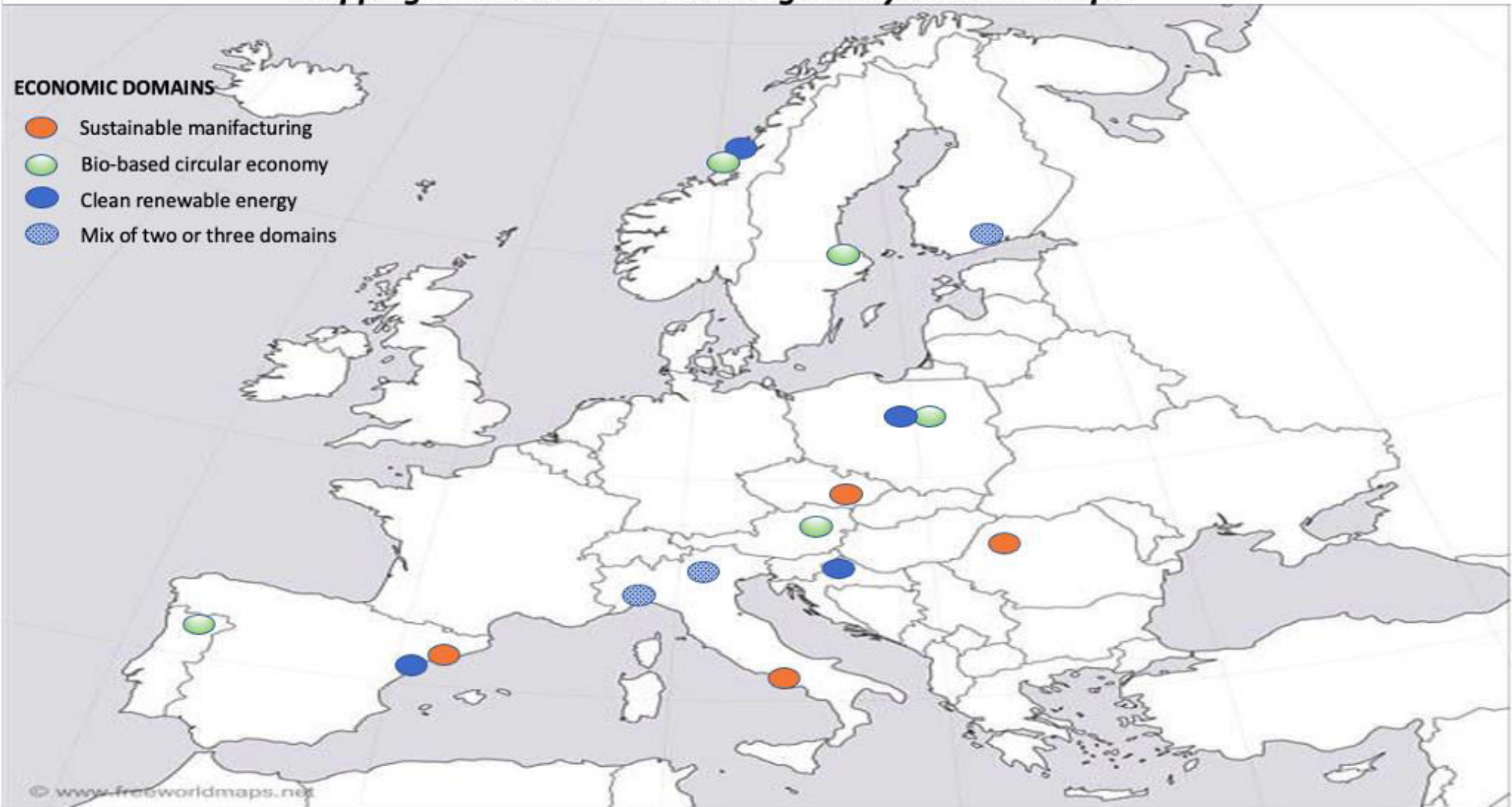
Census of related experiences and good practice of knowledge and innovation ecosystems within the EU

Activity: Mapping existing place-based research ecosystems in advanced and emerging EU regions focusing on three domains:
Sustainable manufacturing,
Bio-based circular economy,
Clean Renewable energy
26 ecosystems initially considered → selection of 15 ecosystems (5 ecosystems per domain)

Methodology: Through online and in presence interviews with referents of the 15 ecosystems as well as a desk research and submission of the questionnaires significant data were collected and classified through conceptual categories and a wide description of the results

Goals
1) Modelling, through categories, the variety of the ecosystems analysed
2) Better defining the concept of ERA Hubs in the face of the real existing ecosystems
3) Fostering the ERA Hubs policy promoting and sustaining the replication of different good practices

Mapping innovation and knowledge ecosystems in Europe



13 Regions, 11 Countries involved

- ***Region Trøndelag - Norway–***
- ***Region Stockholm: Sweden***
- ***Greater Helsinki: Finland***
- ***Lower Austria (Austria)***
- ***Catalonia (Spain)***
- ***Norte (Portugal)***
- ***Emilia Romagna, Liguria, Campania (Italy)***
- ***Mazowieckie (Poland)***
- ***South Moravia (Czech Republic)***
- ***-Jadranska Hrvatska (Croatia)***
- ***Nord-Vest (Romania)***

ERA HUBS

ERA HUBS

8 typologies of Partners / stakeholders involved

- Private companies (in 13 out of 15 ecosystems)

- Non-profit associations (in 6 out of 15 ecosystems)

- Business associations (in 4 out of 15 ecosystems)

- Clusters (in 4 out 15 ecosystems)

- Regional or national agencies (in 6 out of 15 ecosystems)

- Universities (public or private) (in 8 out of 15 ecosystems)

- Research centers (public or private) (in 8 of 15 ecosystems)

- Public administration (regional, national level): in 4 cases out of 15 direct participation of the PA in different forms. In all the ecosystems the Public Administration exerts the role of explicit stakeholder

The 15 ecosystems analysed

ECOSYSTEMS	Country	Type of research carried out	General domain	Specific domains
Bioeconomy Austria	Austria	Questionnaire and online interview	Bio-based circular economy	Wood-based circular bioeconomy.
Biokraft AS	Sweden/Norway	Desk research	Bio-based circular economy	Renewable energy based on compressed biogas and liquefied biogas; Climate smart recycling; Certified bio-fertilizer; efficient biogas production
CoLab - ForestWISE	Portugal	Questionnaire and online interview	Bio-based circular economy	Forest and wood management; fire prevention
VTT	Finland	Questionnaire, online interview and desk research	Bio-based circular economy (also CRE and SM)	Carbon neutral solution, sustainable products, biotechnology; food solutions, industrial chemistry, biomaterial processing and products
Waste Management and Recycling Cluster	Poland	Questionnaire and desk research	Bio-based circular economy	Creation of raw material facilities for industry
ECOSISTER	Italy	Questionnaire and desk research	Clean renewable energy also BBCE	Materials for sustainability and ecological transition; Clean energy production, storage and saving; Green manufacturing;Smart mobility, housing and energy solutions for a carbon-neutral society; Circular and blue economy; Ecological transition based on HPC and Data Technology
H2 Valley	Spain	Questionnaire and interview in presence	Clean Renewable energy	Production of green hydrogen; Implementation of green hydrogen in industry and mobility
Intelligent Energy cluster	Croatia	Questionnaire and desk research	Clean Renewable energy	Green technologies in areas of hydro-energy (small hydro power plants), solar-energy (PV and thermal systems), biomass and energy efficiency
RENERGY	Norway	Interview scheduled	Clean Renewable energy	Hydrogen, Mobility, Energy production, Energy systems, Maritime transport, Harbours,
Mazovia Cluster ICT	Poland	Questionnaire and desk research	Clean Renewable energy	ICT, Energy
IMAST	Italy	Questionnaire and interview in presence	Sustainable Manufacturing	Engineering of polymeric and composite materials and structures for: sustainable mobility; Automotive; Aeronautics, Defense, Pharmaceutics
INTEMAC	Czech Republic	Questionnaire and desk research	Sustainable Manufacturing	Construction,control and diagnostics of mechanical engineering technology
Packaging cluster	Spain	Questionnaire and interview in presence	Sustainable Manufacturing	Packaging and development of sustainable packaging
Transilvania IT Cluster	Romania	Questionnaire and online interview	Sustainable Manufacturing	Information technology
RAISE	Italy	Questionnaire and online interview	Bio-based circular economy (also SM)	Robotics and artifical intelligence; Cities and environment; Health and digital medical assistance; protection of local territory; Sustainable harbours

18 categories adopted for the ecosystems'analysis

- Country
- Mission
- General domain
- Specific domains
- Territorial dimension
- Kind of activities
- Type of partners
- Co-creation and co-production processes
- Connection with other ecosystems
- Role of the public administration
- Prevalence of Private/Public objectives
- Stakeholder mobilization
- Juridical form
- Methods for defining strategic priorities
- Governance processes
- Funding and financial sources
- Results evaluation
- Critical areas

Extensive description of 6 representative ecosystems

. Bioeconomy Austria - Circular Bioeconomy (Austria)
. CoLAB - Collaborative Laboratories – ForestWISE (Portugal, Norte)
. ECOSISTER (Italy – Emilia Romagna)
. RENERGY – Renewable Energy Cluster (Norway, Trondheim region)
. IMAST – Italian technological district for the engineering of polymeric and composite materials and structures (Italy - Campania)
. Packaging cluster (Spain, Catalonia)

Several aspects of the ecosystems were analyzed and categorized. Main focus on three crucial dimensions

Territoriality

Public /Private dimensions

Role of sustainability

1. **Territoriality:** strong local/regional and national impact together with well developed international connections. Both dimensions well balanced in all the case-studies; variety of regional and/or national dimension. The ecosystems foster local sustainable developmet

2. Public/private (P/P) dimensions, impacts and goals of the ecosystems

Three models (P/P) of ecosystems here emerged

1)MODEL 1P/P) (7 case-studies) : Ecosystems promoted by a private initiative and essentially aimed at fostering and strengthening an entrepreneurial territorial fabric. Weak role of the public subjects (low or zero level of public direct funds). Relevant public impact and possible systemic changes

2)MODEL 2P/P) (6 case-studies): Ecosystems promoted by a public (or mixed private/public) initiative aimed at strengthening an entrepreneurial fabric in a territory. Relevant, but not predominant, role of the public subjects (significant share of direct public funds). Strong public impact and possible systemic changes.

3)MODEL 3P/P) (2 case-studies): Ecosystems promoted by a public initiative, essentially aimed at developing public collective objectives and systemic deep changes; predominant role of the public (and public direct funds), strong indirect impact on the entrepreneurial fabric.

3. Role of the sustainability (S): core/added value.

Two models (S) here emerged

MODEL 1S) Sustainability as an added value (7 case studies)

MODEL 2S) Sustainability as a core objective (8 case studies)

Cross sectional variable within the three models based on the public/private dimensions

Public private dimensions/sustainability

ECOSYSTEMS	Country	Region	Geographical dimension	Public/Private dimension; basic aims	Sustainability core/added value
Biokraft AS	Sweden/Norway	Trøndelag/Region Stockholm	National/International	Group 1	Core
RENERGY	Norway	Trøndelag	National	Group 1	Core
Waste Management and Recycling Cluster	Poland	Mazowieckie	National	Group 1	Core
Mazovia Cluster ICT	Poland	Mazowieckie	National	Group 1	Added value
Intelligent Energy cluster	Croatia	Jadranska Hrvatska)	National	Group 1	Core
Transilvania IT Cluster	Romania	Nord-Vest	Regional/National	Group 1	Added value
Packaging cluster	Spain	Catalonia	Regional	Group 1	Added value
VTT Technical Research Centre	Finland	Greater Helsinky	National	Group 2	Added value
INTEMAC	Czech Republic	South Moravia	Regional/National	Group 2	Added value
RAISE	Italy	Liguria	Regional	Group 2	Core
IMAST	Italy	Campania	National	Group 2	Added value
H2 Valley	Spain	Catalonia	Regional	Group 2	Core
CoLAB - ForestWISE	Portugal	Norte	National	Group 2	Added value
Bioeconomy Austria	Austria	Lower Austria	Regional/National	Group 3	Core
ECOSISTER	Italy	Emilia Romagna	Regional	Group 3	Core

In spite of the wide variety of real experiences the case-studies deemed in the research share a common ground essentially based on these 9 elements:

- ***Territorial vocation***
- ***Multi-level governance process***
- ***Explicit systemic interactions among the actors***
- ***Strong dynamic towards innovation processes***
- ***Balanced equilibrium between private and public actors and aims***
- ***Horizontal integration, regional interconnection, internationalization***
- ***Mobilization of the stakeholders on shared objectives***
- ***Environmental sustainability of the innovation process***
- ***Differentiated roles of the actors involved***

The 15 heterogeneous case studies represent different types of knowledge and innovation ecosystems. Although in distinct forms they are all similarly oriented to transformative innovation, knowledge creation, territorial sustainable development, systemic changes, approaching the ideal ERA hub aligned to the priorities of the EU ERA policy.

Directionality:

In all the case-studies, in different ways and with different nuances, there is the evidence of directionality in the proces intended as a convergence and coordination of intentions and actions towards common relevant objectives.

Transformative attitude:

In all the case studies, with a different degree and intensity, the ecosystems operate under the explicit mandate to continuously transform and innovate processes and products

Territorial sustainable development (green transition)

The processes of innovation and transformation (transformative attitude) are in all the cases analysed oriented (directionality) towards a more sustainable economy starting from the territories and local/regional contexts

CONCLUSIONS

. The theoretical analysis permitted to extrapolate some assumptions about the characteristics of an ERA Hub as a potential entity adequate to the goals of the new ERA policy.
. The study of a sample of 15 heterogenoeus case-studies of knowledge and innovation ecosystems (reinforced by the results of a Survey among the stakeholders) allowed to understand their variety and to categorize different typologies, emphasizing at the same time their common elements which are:

1. A strong territorial vocation together with a clear tendency towards internationalization
2. A coexistence of knowledge and innovation processes led by the actors involved at different levels and strongly coordinated among them
3. A coexistence of public and private actors, stakeholders and final goals as well as a coexistence of market driven processes and ultimate goals defined by the public authorities, following a clear **directionality**
4. A clear focus on the environmental sustainability as a goal reachable through constant research and innovation activities oriented to well-defined intermediate and final objectives
5. A tendential dynamics towards potential systemic changes from the local context to the general context

. These common elements make the ecosystems potential ERA hubs strongly based on directionality, multi-level governance processes, horizon integration, holistic approach

REFERENCES

. Benner, M. (2022) "An institutionalist perspective on smart specialization: Towards a political economy of regional innovation policy", *Science & Public Policy,* 49(6): 878-889

Clarysse, B., Wright, M., Bruneel, J., & Mahajan, A. (2014) "Creating value in ecosystems: Crossing the chasm between knowledge and business ecosystems", *Research Policy*, 43(7): 1164–1176

CoR, (2021) "Opinion of the European Committee of the Regions — A new European Research Area (ERA) for research and innovation" (2021/C 106/0)

EC, (2017) "Strengthening Innovation in Europe's Regions: Strategies for resilient, inclusive and sustainable growth" (COM 2017 376 final)

EC, (2020) "A new ERA for Research and Innovation" (COM 2020 628 final)

EC, (2020), "A Robust innovation ecosystem for the future of Europe", Report on the Results of the Stakeholder Consultation, Directorate Generale for Research and Innovation, Horizon 2020

EC, (2021) "Briefing Note for Stakeholder Consultation", Technopolis Report

EC (2024) Directorate-General for Research and Innovation, Veugelers, R., Directionality in R&I policy – "A methodology to assess practices in the EU Member States and associated countries", Publications Office of the European Union

European Committee of the Regions (2021) Opinion on "A new European Research Area (ERA) for research and innovation"

Edquist, C., (2014) "Striving towards a holistic innovation policy in European countries-but linearity still prevails!", *STI Policy Review*, 5(2), pp.1-19

Eisenhardt, K. M., (1989) "Building Theories from Case Study Research", *The Academy of Management Review* 14, no. 4, pp. 532–50

FoSS, (2021) "ERA Hubs as an engine for transformative place-based innovation investment priorities - Policy note for the JRC-CoR joint workshop on Smart Specialisation for the Recovery"

OECD, (2013) Innovation-driven Growth in Regions: The Role of Smart Specialisation (last access 30 June 2023)

REFERENCES

. Granstrand, O., & Holgersson, M. (2019) "Innovation ecosystems: A conceptual review and a new definition". *Technovation*, 102098

Glaser, B., & Strauss, A., (1967*). The discovery of grounded theory: Strategies of qualitative research*. London: Wiedenfeld and Nicholson.

Jackson B D J 2011, What is an innovation ecosystem? Washington DC, Retrieved from (http://erc-assoc.org/sites/default/files/topics/policy_studies/DJackson_Innovation Ecosystem_03-15-11.pdf)

Larrea, M., Estensoro, M. and Pertoldi, M., (2019) "Multilevel governance for smart specialisation: basic pillars for its construction", Publications Office of the European Union

Midgley, G.,Lindhult, E. (2017) "What is Systemic Innovation?" Working Paper, University of Hull

Oh, D.-S., Phillips, F., Park, S., & Lee, E. (2016). "Innovation ecosystems: A critical examination." *Technovation*, 54, 1–6.

Parks, D. (2022), "Directionality in transformative innovation policy: who is giving directions?" *Environmental Innovation and Societal Transitions*, Volume 43, June 2022, Pages 1-13

Powell W.W., Packalen K., Whittington, K. Organizational and institutional genesis: the emergence of High-Tech Clusters in the life science, Queen's School of Business Research Paper N° 03 -10

Ritala, P., & Almpanopoulou, A. (2017) "In defense of "eco" in innovation ecosystem", *Technovation*, 60-61, 39–42

Valkokari, K. (2015). "Business, innovation, and knowledge ecosystems: How they differ and how to survive and thrive within them", *Technology innovation management review*, 5(8).

Voda, A.I., Bortos, S., Soitu, D.T.,(2023) "Knowledge ecosystems: a sustainable theoretical approach", *European Journal of Sustainable Development,* 12, 2, 47-66