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KNOWLEDGE FOR PLACE-BASED POLICYMAKING: TOWARDS INTERACTIVE SCIENCE-FOR-POLICY ECOSYSTEMS

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ABSTRACT

This paper explores how science-for-policy ecosystems can integrate advisory, reflexive and evaluative functions to support place-based, evidence-informed policymaking in the face of contested and transformative challenges. The roles of science, technology and innovation (STI) policies in economic development processes are being reshaped in a new global context characterised by grand environmental and social challenges alongside rising geopolitical tensions, fast-changing technologies and high uncertainty. Amidst these changes we see shifting demands from policymakers for the translation of theoretical and empirical knowledge in more agile cycles of real-time policy experimentation. Drawing on in-depth comparative analysis of cases characterised by two distinct institutional settings and levels of maturity, the paper identifies key structural, operational and practical characteristics that enable more dynamic, co-produced and politically aware knowledge use in STI policy. The findings suggest that strengthening science-for-policy ecosystems requires moving further beyond linear models of evidence use toward more dynamic, co-created approaches that embed evaluation and learning within policy processes. This involves fostering institutional capacities for experimentation, supporting intermediaries who can navigate between knowledge and action, and creating spaces for deliberation and reflexivity. Importantly, the study highlights the need to recognise and manage the political dimensions of knowledge use, particularly in areas where policy goals are contested or evolving.

Keywords: *Place-Based Policymaking, Evidence-Based Policymaking, Science-for-Policy Ecosystems, Knowledge Co-Production, Policy Evaluation.*

1. INTRODUCTION

Shifting global economic and political landscapes are reshaping the roles of science, technology and innovation (STI) policies in economic development processes. Specifically, the imperative to foster place-based resilience in the face of technological, economic and environmental disruptions have placed STI policy at the centre of competing demands. These include demands to promote strategic autonomy and technological sovereignty to ensure economic resilience and national security, and demands to enable green and just societal transitions. The tensions across these demands are further exacerbated by the increasing speed of change and growing politicization and contestation of STI policy objectives and instruments, particularly around mission-oriented and transformative approaches. In this context, the role and structuring of knowledge for policy interfaces is evolving, calling for actors to integrate various functions and pursue more participatory and action-oriented approaches. Specifically, the integration of advisory and evaluative functions within science-for-policy ecosystems at a range of different territorial scales becomes both critical and increasingly challenging.

The specific STI policy issues can be framed in broader debates around the evolution of the roles of universities, which are increasingly seen not only as producers and curators of learning, knowledge and thinking, but also as proactive catalysts and co-creators of sustainable development and transformation in their territories (Aranguren et al., 2016; Benneworth & Fitjar, 2019; Canto-Farachala et al., 2024; Pugh et al., 2022; Schwaag Serger et al., 2021; Trencher et al., 2014; Trippl et al., 2023). Yet while there is a strong trajectory of research that explores how universities and their academics engage with firms and/or as entrepreneurial agents (Bozeman, 2000; Meerman & Davey, 2025; Miller et al., 2018), there is less research on how academic knowledge in the STI field engages with policymakers.

The existence of an important knowledge gap as regards the key interface between academic knowledge and policy is highlighted in the context of the evolution of discourse around STI policy over the last decade towards transformative, third generation, or mission-oriented policies (Mazzucato, 2018; Schot & Steinmueller, 2018; Weber & Rohracher, 2012). While arguments for the need for more transformative STI policies that can respond in real time to key societal challenges such as sustainability, ageing populations and economic resilience are conceptually compelling, designing and implementing policy in this way in practice is challenging, requiring experimentation, organisational innovation and multi-actor governance (Uyarra et al., 2017).

This paper explores how STI knowledge can be more effectively mobilised to support place-based and evidence-informed policymaking in an era of complex, contested and transformative challenges, contributing to ongoing debates about how to design and sustain science-for-policy ecosystems that are both robust and adaptable. Concretely, it addresses two related research questions. Firstly, as policy seeks to become more transformative, how are the modes of operation changing in the relationship between knowledge and policy? Secondly, what implications do these changes have on advisory, reflexive and evaluative practices and the interactions between them in science-for-policy ecosystems? These research questions are explored by synthesizing lessons from two cases with different levels of maturity and set in different, experimental institutional contexts.

The paper is structured as follows. In the next section we provide some background on the parallel evolution of STI policy itself, on the one hand, and the role played by policy-relevant research within place-based innovation systems, on the other hand. We then set out our methodology, which is based on understanding emerging practice in the day-to-day practice of the knowledge-for-policy interface. After an in-depth comparative analysis of two cases characterised by distinct institutional settings and levels of maturity, we discuss the key findings with respect to each of the research questions. The final section concludes with reflections on limitations, implications and ideas for further research.

2. PLACE-BASED INNOVATION SYSTEMS, STI POLICY AND THE ROLE OF POLICY RESEARCH

The main contribution of this paper is to explore the contemporary knowledge-for-STI-policy landscape and dynamics on the ground. By doing so we aim to offer practical implications for policymakers and researchers, responding to the growing demand for more integrated, reflexive and politically attuned approaches to supporting place-based policy with academic knowledge. To contextualise our case analysis, we first provide some background on how thinking on place-based innovation and STI policy have evolved over recent years, and the implications for policy-relevant research.

A key place-based framing for contemporary STI policy is the national and regional innovation system concept that emerged during the 1990s (Cooke et al., 1998; Lundvall, 1992; Freeman, 1995; Nelson, 1993). Nelson built his conception of a national innovation system from the evolutionary theory of technical change (Nelson & Winter, 1982), whereby diversity is introduced into organisations within a system by technical change and selection mechanisms support the emergence of new technologies and organisational forms. Lundvall, on the other hand, conceived innovation as a learning process and stressed the relevance of user-producer interactions and institutions, leading to a broader definition of a national innovation system that includes all the economic and institutional actors that affect learning within the production system (Mytelka & Smith, 2002). Cooke et al. (1998) and others adapted the scale of analysis, conceiving the regional innovation system concept that has become a mainstay of regional innovation policy.

Universities and other research organisations are considered integral components of innovation systems, where their role has evolved from a technology transfer function (Bozeman, 2000; Falani & Torkomian, 2024) to a richer entrepreneurial role (Bercovitz & Feldman, 2006; Cerver Romero et al., 2021; Clark, 1998; Guerrero & Urbano, 2012; Feldman, 2001). As innovation systems thinking takes a more transformative direction, this role continues to evolve, placing increasing emphasis on

addressing complex societal challenges alongside the more established economic objectives of innovation (Schot & Steinmueller, 2018; Lundvall, 2024). In this context universities' mission of external engagement and collaboration is becoming more complex, for example embracing sustainability transitions (Cai & Ahmad, 2023; Trippl et al., 2023) or the transformative agendas associated with smart specialisation strategies (Canto-Farachala et al., 2022). This implies universities becoming engaged in more sophisticated forms of multi-actor engagement that are often conceived in terms of applied knowledge co-creation processes under labels such as "civic universities" (Goddard et al., 2016), "transformative academic institutions" (Canto-Farachala et al., 2024) or "fourth generation universities" (Lukovics & Zuti, 2017).

Beyond the strictly place-based context, such changes in the roles of universities and other research institutions have evolved in line with changing STI policy thinking, especially over the last decade. In the wake of the adoption by the UN of Agenda 2030 and the Sustainable Development Goals in 2015, STI policy embraced more directional and normative transitions with a broader socioeconomic focus, adding to its more traditional economic focus on the commercialisation of research, competitiveness and growth. In particular, greater priority has been given to environmental and social sustainability, a change that can be discerned both in theory (Schot & Steinmueller, 2018; Haddad et al., 2022) and in practice (Schwaag Serger & Palmberg, 2022; Avdeitchikova & Schwaag Serger, 2024). Mission-oriented innovation policy emerged as one specific manifestation of attempts to target societal and environmental challenges (Mazzucato, 2017; European Commission, 2017; OECD, 2021; Larrue, 2022). This evolution has profound implications for the knowledge base for, and the design and implementation of, STI policymaking, which we return to below.

A second significant shift saw STI policy evolve from working with complicated problems to struggling with complex problems, partially because of the pivot towards more directional and normative policy. Complex problems (sometimes also called 'wicked problems') tend to be difficult to identify or pinpoint precisely, are often contested, generally

require a systems approach, and are rarely fully solved (Rittel & Webber, 1973). They also tend to be characterised by significant uncertainty, urgency and interconnectedness, and addressing them often requires stakeholder engagement (Head, 2022). To put this in the context of STI policy, while promoting innovation for growth can be characterised as 'complicated' in that it requires various policy instruments that target a range of different actors, challenges such as inclusion, cohesion, climate change and biodiversity are 'complex' in the sense of also having many of the characteristics identified above. As STI policy seeks to, or is expected to, tackle societal challenges, the combination of complexity and urgency highlights the need for different policy approaches. The required approaches tend to push beyond the traditional scope, reach or remit of policymakers in the innovation policy domain, as challenges intersect with other policy domains. Their effectiveness may also require new policy instruments or innovations to existing policy instruments, implying a gradual evolution in the STI policy toolbox.

The two shifts in STI policy outlined above lead inevitably to a third change: the need for different types of knowledge upon which to base policies that are more directional, normative and complex. The normative turn in STI policy, manifested especially of challenge-oriented societal goals and a holistic sustainability agenda, has important implications for the types of knowledge that can support policy design and implementation, including how it is created and used. More specifically, the complexity, urgency, uncertainty and contestation of challenges call for opening policy processes to new sources and types of evidence, including more reflexive approaches to policy learning that embrace a greater variety of perspectives.

The difficulties for policymakers in tackling complex, wicked or intractable problems are not new. Several authors have discussed issues such as policy contestation, the need for multiple and different sources of knowledge, and the importance of interactive policy processes (Nelson, 1974; Lindblom, 1959,1979; Wildavsky, 1973; Rittel & Webber, 1973; Head, 2022). As STI policy enters the realm of such problems, it becomes clear that the traditional STI policy toolbox – which is filled with

a combination of, usually stand-alone, supply-side, demand-side and systemic instruments oriented towards correcting distinct market failures - is not well equipped to address the complexities of transformation. Moreover, in many cases nor does it have the reach or mandate to do so. Different instruments, competencies, policy-mixes and governance structures are needed. The question then becomes whether the current providers and sources of knowledge (universities, research institutes, think tanks) and the ways of accessing, disseminating and utilizing them (academic research and papers, publications, consultation, evaluation) are appropriate for a new, normative, transformative and fundamentally place-based innovation policy. Specifically, it opens debates around a more proactive approach for policy-related research that fulfils roles such as knowledge brokering (Bergenholtz, 2011; MacKillop et al., 2023) or boundary spanning (Williams, 2012) within territorial innovation systems. Such roles imply engagement with a wide range of regional stakeholders with a specific role for policy engagement, in what might be labelled science-for-policy ecosystems.

In such ecosystems researchers are called on to complement traditional functions of knowledge production and dissemination with "systemic intermediation functions": articulation (of demand and strategic options), alignment (of actor networks and complex actions over time), and support of learning processes (van Lente et al., 2003). In networks and systems (compared to more traditional one-to-one interactions), learning processes move beyond knowledge and technology transfer and capacity building to include translation and synthesis of knowledge, and action-oriented system-level learning (learning by doing, using/applying, reflecting and sensemaking, all in interaction) (van Lente et al., 2003; van Mierlo et al., 2010; Beers & van Mierlo 2017; Hilger et al., 2021).

Given both the different nature of the relationship between academics and policymakers (as opposed to between academics and businesspeople) and the different disciplinary mixes required for policy engagement (primarily social sciences), we need to understand more about the institutional settings that facilitate effective science-for-policy

engagement relationships. Moreover, these relationships must be forged in the context of an STI policy landscape that is itself rapidly changing in response to the demands of complex societal challenges such as ecological transition and demographic change.

3. METHODOLOGY

To better understand the evolving demands and the changing modes of operation in the knowledge-for-STI-policy relationship, this research has followed a qualitative approach based on an in-depth comparative analysis of two cases that are characterised by distinct institutional settings and levels of maturity. The research was conducted in two phases, described below.

Selection of cases and exploratory questions

The research was initiated as a peer learning exercise within the context of a two-year experimental initiative (GReaTr) in Sweden.[1] The organisations and initiatives that participated[2] were selected to represent a range of perspectives and experiences from regional, national and supra-national levels, as well as a range of institutional settings. The two exploratory cases included in this research (GReaTr and Orkestra) were selected based on the following criteria:

- They represent different geographies, policy contexts and experience in supporting the implementation of transformative innovation policies (Mazzucato, 2018; Schot & Steinmueller, 2018; Weber & Rohracher, 2012) directed at addressing complex societal challenges.

1 GReaTr was a two-year experimental project (Oct '22 – May '24) that gathered policymakers, academics and policy experts from several countries, the EU Commission and the OECD to co-create and co-curate knowledge that could be of use and relevance in 'governing resilience and transformation (GReaTr)'. The initiative was funded by Vinnova, the Swedish Government Agency for Innovation with significant in-kind contributions from senior researchers and experienced practitioners (policymakers and other policy experts).

2 Austrian Institute of Technology (AIT), Fraunhofer Institute for Innovation Systems Research (ISI), Governing Resilience and Transformation (GReaTr) initiative, Mission-Oriented Innovation Policy Observatory (MIPO) at Utrecht University and Orkestra – the Basque Institute of Competitiveness, as well as the Joint Research Center of the European Commission in Seville, and the OECD Directorate for Science, Technology and Innovation.

- They represent knowledge actors with different levels of institutional maturity and practical experience in actively working to support effective place-based TIP (transformative innovation policy) knowledge-for-policy processes.

Initial data was presented from each academic institution, responding to five common questions:

1. What changes in the policy context have you observed in recent years? (new policy aims and/or programmes, governance/organisational structures, budget changes, etc.)
2. How/how often do you/your research group interact with policy practitioners? (informal vs. formal, types of practices/processes)
3. What types of knowledge products result from the interaction?
4. (How) do you determine value/relevance/ impact?
5. What are the biggest challenges in your context with regard to working with/on knowledge-for-policy?

Initial identification of key similarities and differences were discussed at the workshop, and it was agreed to pursue a written cross-case analysis.

Elaboration of case studies and comparative analysis

Initial case descriptions were elaborated over the course of three months. A common template and example case description was provided by researchers leading the GReaTr initiative. Then, each peer representative took responsibility for providing a written draft of their case study using a combination of primary (synthesis of interviews and experiences over recent years provided by participating researchers) and secondary data (e.g. from institutions' websites and strategy documents).

These initial case descriptions were further developed as written (5-6 page) briefs, from which a comparative analysis was conducted and refined. Building on the cases and previous work within the innovation policy practitioner and research communities (Eu-SPRI SAB, 2024), we used an interpretive and inductive approach (Alvesson & Sköldberg,

2000) to identify from the cases the core structural, operational and practice-oriented characteristics that underscore effective knowledge for policy processes and that could be applied in different settings:

- Structural characteristics include territorial and cultural setting, governance arrangements, and institutional mandates;
- Operational characteristics include transdisciplinary knowledge and skill base, as well as capacities, tools and methods for co-design, evaluation, and learning;
- Practice-oriented characteristics include different forms of interaction for trust-building, reflexivity, and iterative engagement in real-time empirics over time.

These three characteristics were used as the framework for comparative analysis. Case descriptions were manually coded according to these characteristics and restructured to enable a more transparent comparative analysis of the cases. The common key questions (for setting up case studies) and the common analytical framework provided an important basis for balancing the dual role of case contributor and analyst and delivering a neutral comparison of cases. In addition, authors sought perspectives from colleagues (internally) and used the broader peer group to validate the analysis, An overview of highlights from the case descriptions and key findings from the comparative analysis are provided in the next sections.

4. SUMMARY OF CASES

The two cases represent different sizes and types of transformative academic institutions, located within different regional and national innovation ecosystems and policy contexts in Sweden and Spain (see overview in Table 1). A short synopsis of key policy trends and relating structural, operational and practice-oriented characteristics is presented for each case below. An overview follows in Table 1.

Governing Resilience and Transformation (GReaTr) initiative

In Sweden, the rise of transformative innovation policy (TIP) is apparent with the launching of several new innovation programmes (including Impact Innovation and other mission-oriented innovation programmes e.g. Food system, Viable Cities, etc.) or instruments for system transition (like system demonstrators for climate neutral cities). These new policy instruments give rise to new knowledge and capacity demands. In parallel, the changing geopolitical context (including Sweden's membership in NATO) and focus on green "new industrialisation" has led to relatively greater focus on other policy objectives (e.g. security, defense, tech/AI, energy, resilience) and how innovation policy can contribute to achieving these.

Driven by an acknowledged need for more agile and timely knowledge inputs to inform and support reflection for policy development, GReaTr was formed as an experimental project initiative with the aim of serving as a forum for interactive knowledge generation and curation to inform and support policy development in Sweden. The initiative (hosted at Lund University, Department of Economic History) mobilised resources in the form of time from senior researchers and experienced practitioners (consultants and policymakers), together with co-financing from Vinnova, the Swedish innovation agency, as a core base. The small (3-person) core engaged other researchers, experts and policymakers from Austria, Finland, the UK and elsewhere in Sweden (in total 30) in agile "learning spaces" on two thematics: the medium-term effects of recovery and stimulus measures on innovation, transformation and resilience; and the evaluation and design of transformative innovation policy. These two thematics were chosen based on expressed demand for knowledge development in combination with researchers' interest and experience in these thematic areas. While other themes were considered, these two thematics were prioritized as a starting point for developing and testing different scopes and modes of interactive knowledge generation. The first theme (on the medium-term effects of recovery and stimulus measures) had a narrower scope and more targeted ambition for collaborative analysis between policy and researchers across three

countries – feeding into national and international policy debate in real time. The second theme (on the evaluation and design TIP) had a broader scope and more exploratory ambitions to coalesce perspectives of researchers, policy design and analysis to better understand new needs for evaluation of TIP. This learning space – and the researchers and policy practitioners engaging in it – continues to evolve with various interactive and accompanying research projects (in Sweden and internationally).

GReaTr attempted to address policymakers' changing demands for knowledge and capacity by testing new, more agile, forms of interaction with policymakers and expert practitioners (including facilitated learning processes and co-production of various knowledge products). Each topic's interactive knowledge development process was developed through ongoing dialogue and flexible decisions on appropriate next steps or questions to explore. Common to both themes was the blend of perspectives from theory and practice, the agile approach to interactive learning processes, and the active work to compare (or co-learn) with similar cases internationally and plug into relevant international and supra-national networks.

The main product that GReaTr generated was a transdisciplinary and cross-sectoral platform that mobilised researchers and policy experts in interactive knowledge exchanges and co-development spaces (structured around the two thematics mentioned above but also exploring the topic of interactive knowledge development itself). In addition to producing various written knowledge products, the experimental initiative contributed to initiating a new national platform for system innovation research in interaction (SIRI)[3]. The SIRI platform and parallel calls for interactive research projects continue to serve as instruments to push forward a more demand-led and interactive (cross-sectoral, cross-disciplinary and in real-time) approach to addressing key questions and challenges faced in the design, implementation and evaluation of TIP. While this is a positive step in the right direction, the path dependent nature of "normal modes of operation" (both in research

3 For more detail on SIRI, see: https://www.siri-transformation.se.

and policymaking) pose challenges to further developing and scaling the interactive approach to address other thematics.

Orkestra – Basque Institute of Competitiveness

The Basque Country is an autonomous community or region in the north of Spain, whose innovation policy context has similarly experienced a sharpening of the environmental sustainability agenda in all areas of policy, with clear implications for the economic and social dimensions of regional development. In addition, there has been a sharp increase in concern with attracting and rooting talented people within the region and with addressing skills gaps, an issue that has implications for policies in multiple areas. A consequence of these shifts has been important changes in how policy is designed, implemented and evaluated. There is increased interaction between policy domains, greater recognition of the need for multi-level policy coordination, and a widening of the realm of 'policymakers' to extend across the quadruple helix.

Orkestra was established in 2006 within Deusto Foundation (the foundation for knowledge transfer of the University of Deusto) with an explicit mission to undertake action-oriented research to foster the competitiveness of the Basque Country and improve the well-being of its citizens. Orkestra's funding is largely independent of the university, coming from a mix of direct funding from regional stakeholders and competitive research funding. Given the rooting of its research agendas in the problems and challenges being faced by regional stakeholders in the pursuit of sustainable regional competitiveness and wellbeing outcomes, Orkestra's work is very sensitive to changes in the Basque (and international) policy context, which impact both 'what' is researched and 'how' it is researched.

Orkestra has around 40 full-time researchers and research-related staff working within four transformative research labs.[4] Rather than formal structures, these labs are conceived as fluid spaces for the co-creation

4 In the areas of (i) public policy; (ii) smart business; (iii) wellbeing; and (iv) energy and environment. For more detail, see: https://www.orkestra.deusto.es/en/research/research-labs-territorial-competitiveness.

of knowledge and action among Orkestra researchers and the regional stakeholders with which they are working. Indeed, they are dynamic spaces that change continually, in terms of the challenges being worked on, the researchers and stakeholders involved, the methodologies being employed, and the specific projects in which concrete research questions are grounded.

Across the four research labs, Orkestra typically develops 30-40 projects a year, each of which is associated with one or more regional stakeholders or external stakeholders. A significant proportion of Orkestra's projects pursue different forms of action-oriented research, based on regular or continuous interaction with policy practitioners. Indeed, Orkestra actively develops a research agenda focused on the methods of action research alongside the thematic research agendas within the four research labs, a key result of which is the action research for territorial development (ARTD) framework that provides a methodological anchor for many projects (Karlsen & Larrea, 2014; Larea, 2019; Larrea, 2020). This framework emphasises collective knowing that is generated through cycles of reflection and action in which researchers engage with policymakers around a shared problem or challenge, such as exploring regional futures (Izulain et al, 2024). In addition to traditional academic publications, knowledge products from these research projects include frameworks, observatories or platforms, practitioner-oriented reports, as well as action research processes and events.

	Policy context (trends in economic development and innovation policy)	**Structural characteristics** (mandate/institutional setting, funding, types of policy stakeholders with whom engage)	**Operational characteristics** (staffing, research focus areas/skills, infrastructure)	**Practice-oriented characteristics** (modes of interaction, forms of knowledge creation)
Governing Resilience and Transformation (GReaTr) initiative	The Swedish innovation agency's launch of mission-oriented policy initiatives (addressing societal challenges); created a demand for new knowledge and capacity (e.g. system mapping and analysis, new approaches to monitoring, evaluation and learning, etc.); Greater focus on aligning R&I investments across levels of governance Increasing focus on security, defense, tech/AI, energy, resilience	Experimental initiative (10/21-3/24); organised within dept. of Economic History, LU Aim of providing more agile and timely knowledge inputs to inform policy developments Co-financed from Vinnova (national innovation agency) and in-kind financing from LU senior researchers and external policy practitioners and experts	Core team of 3 researchers; mobilised engagement of other researchers, students and practitioners in Sweden and internationally (total 30 engaged researchers and policymakers) Focused on two thematics (Transformative impact of EU recovery and resilience packages, TIP evaluation)	Tested new, more agile, forms of interaction (facilitated learning processes, short-term affiliations to a theme, co-production of knowledge) between researchers, policymakers and practitioners Knowledge products included written briefs and articles, but also syntheses/overviews from learning processes and international benchmarking exercises Key outcome was initiation of a cross-disciplinary and cross-sectoral platform for interactive knowledge exchange and co-development spaces (evolved into SIRI)

Orkestra – the Basque Institute of Competitiveness	Growing emphasis on environmental sustainability (with implications for economic and social dimensions of regional development) Focus on attracting and retaining talent and tackling skills shortages (to maintain competitiveness) Greater interaction/ convergence between policy domains and multi-level coordination in policy design and implementation, as well as a widening realm of 'policymakers' (all sectors of the quadruple helix) New demands for/ research emphasis on governance analysis and new governance mechanisms	An independent institute (est. 2006) as an initiative of the University of Deusto, through the Deusto Foundation Explicit mission to foster the competitiveness of the Basque Country through action-oriented research that improves the well-being of its citizens Funding largely independent of the university, coming from a mix of direct funding from regional stakeholders (government institutions at different levels and firms) and competitive research funding Annual budget around €3m	43 people (of which 60% PhDs and PhD students) Transformative research focused on competitiveness and regional development, with regularly updated research agendas driven by changes in (and interactions with) the Basque (and international) policy context Research organised in four transformative research labs, acting as fluid spaces for co-creation of knowledge and action, in which specific projects are identified and developed	Response to (policy) challenges addressed by action-oriented research projects with different levels and types of engagement with regional actors (leveraging own "action research for territorial development" framework) 30-40 projects/ year across the four research labs (each project associated with one or more regional or other external actors) Knowledge products include frameworks, observatories or platforms, reports, action research processes, events and academic publications

Table 1: Overview of peer institutions
Source: authors

5. KEY FINDINGS

Changing roles and modes of operation

The two cases reflect similar policy trends towards addressing complex societal challenges in their respective territorial settings. These include an increasing focus on security, resilience and strategic autonomy (especially in the Swedish case) and enhanced efforts to address environmental, social and related human resources agendas (especially in the Basque case). In both cases these agendas are developing under rising demands for strategic coordination of research and innovation investments across policy domains and levels of governance. Their experience is consistent with growing interest in cities and regions to formulate and mobilise action on place-based transformative agendas anchored in local challenges (Schwaag Serger et al., 2023).

The increasingly complex set of challenges that policymakers are facing are generating new demands on knowledge, encompassing both the types of knowledge sought (spanning a broad range of disciplines and application settings) and the dynamic modes in which it is developed and put into practice. The two cases illustrate these new demands, which are more concretely expressed in terms of demands for advice and agile/reflexive approaches to policy learning (leveraging real-time empirics), as well as demands for more interactive forms of monitoring and learning (e.g. accompanying or action research) that can be applied as an integrated part of policy implementation.

Related to these changing demands and the evolution of more interactive relationships between knowledge and policy, the cases highlight changing modes of operation in terms of structural characteristics, operational characteristics and practice-oriented characteristics. Findings and insights from the comparative review of the two cases are presented for each set of characteristics below.

Structural characteristics

'Structural characteristics' are not easy to change, and they condition academic institutions' possibilities for 'doing' knowledge-for-policy. They include: (i) the territorial and cultural setting, (ii) the institutional mandate, and (iii) the funding arrangements.

The two cases present quite different structural characteristics. Orkestra is an independent regional institute with a mandate for action-oriented research to benefit the territory, while GReaTr was an informally-organised network of researchers (from multiple academic institutions) with a mandate to test new (agile) knowledge inputs to inform policy developments. The different institutional contexts were reflected in different approaches to funding and governing. For example, Orkestra defines its research agenda to align with the needs of their key stakeholders, is more actively engaged in expert advisory functions, and has the challenge of continually adapting to changes in regional stakeholders (and their needs). GReaTr, on the other hand, had a more traditionally stable organisational framework rooted within the host university (and other universities involved in the network), but tended to be more distanced from the dynamics and practical questions of policymaking. In both cases, the engagement with policy stakeholders was conditioned by history, and specifically by the trust relationships (between individuals and institutions) that had been built over time.

The comparative analysis highlights the benefit of stable funding for generating a structure that can support: sustained efforts to build trust and understanding of the context and its particular challenges; engagement on an ongoing/continuous basis (and the ability to more easily be part of real time empirics); and the possibility to take on new roles, such as systemic intermediaries, process conveners/facilitators, and action-oriented researchers. Whereas Orkestra's organisational and financial structures are based on more active engagement with stakeholders and alignment with their needs, GReaTr's university-base may present challenges with regards "organisational distance". However, this can be alleviated with alternative operational practices (see next characteristic).

Operational characteristics

Innovation policy and economic development research are a social science, yet span multiple disciplines within technical, economic and other academic fields. Thus 'operational characteristics' refer primarily to the staff and range of skills that organisations have at their disposal to engage in knowledge-for-policy. However, it also encompasses enabling infrastructure (e.g. databases and advanced data analysis tools), resourcing practices (e.g. mobility programmes, research affiliations, etc.) and methods for co-design, evaluation and learning.

Both cases are rooted in a core expertise in innovation research (spanning technical, economic, social, policy, historical and geographic perspectives), yet highlighted an increasing need for literacy in a mix and broader range of knowledge fields (now spanning e.g. systems design, behavioural sciences and big data analysis). The two institutions also highlighted an increasing demand for translational and action-oriented research and process leadership capacities to enable (and actively facilitate) the co-development of knowledge.

The two cases provided examples of several emerging instruments and changing modes of operation, including hiring (or training) individuals with new skill sets and methodologies (including action research and foresight methods, big data analysis and visualisation/communication of data). Another changing mode is the adoption of new, more agile, operational practices to enable interaction, such as formation of "transformation labs" (or similar) and dynamic affiliation (of researchers and others) to "thematic spaces" or processes for co-design, exploration and co-development of knowledge. At Orkestra, the introduction of new practices to train PhD students in action research has not only built organizational capacity but also influenced the 'normal' mode of interaction with policymakers – deepening relationships and integrating an interactive approach to addressing transformative challenges in real-time. The introduction of 'affiliation' to agile knowledge spaces in GreaTr created an initial impetus for coalescing efforts (across disciplines, different universities and research institutions, and policy practitioners from different organisations) on the

topic of evaluation of TIP. This informal community continues to evolve – contributing not only to the knowledge base on the evaluation of TIP but also to an evolution in practice (with increasing attention to accompanying research and learning-oriented evaluation).

Practice-oriented characteristics

'Practice-oriented characteristics' are the day-to-day practices and mechanisms that characterise how academic institutions do knowledge-for-policy, including different modes of interaction with stakeholders (for trust-building, reflexivity, and iterative engagement in real-time empirics over time), as well as different types of knowledge products and methods of communication.

Despite the significant differences in institutional contexts and capacities, both cases highlighted an evolution of practice. In addition to more traditional forms of engagement, newer modalities of interaction that leverage real-life empirics, such as action/accompanying research and co-designed/co-created research, are becoming more prevalent. This is seen, among many other examples, in governance innovations that are helping to adapt policies to local competitiveness challenges (Arrona et al., 2020) and in a research-led process that has supported the emergence of a new private-public institution (a cluster management organisation in the field of financial services) oriented to tackling emerging challenges related to rooting local industry and financing industrial transition (Gil de San Vicente & Wilson, 2025).

In a similar way, we see an evolution in the types of knowledge products that are being generated. While both organisations continue to produce academic articles and analytical reports, there is clear evidence of increasing demand for more accessible and practice-oriented written products, as well as frameworks, observatories and data-driven platforms that enable benchmarking, analysis and trend tracking over time. There is also a rising demand for other types of knowledge products and processes that foster a common understanding of strategic aims (e.g. development of system maps or theories of change), shared approaches

to doing (e.g. guides and training material), and support to reflexivity (e.g. accompanying research and facilitated sensemaking).

Enabling conditions, challenges and implications for science-for-policy ecosystems

Together, the dimensions above help to illuminate the conditions under which science-for-policy ecosystems can integrate advisory, reflexive and evaluative functions in ways that are context-sensitive, politically aware, and oriented toward agile knowledge development. They also highlight a number of challenges that may hinder the ability to foster effective science-for-policy ecosystems that balance between advisory, reflexive and evaluative practices and embed real-time policy learning. Key enabling conditions and challenges are presented in Table 2 below.

	Enabling Conditions	Challenges
Structural	Neutral spaces for co-development of knowledge Dynamic research agendas (oriented towards relevant questions/challenges in the context) Stable funding for sustained efforts (for the interactive infrastructure)	Stable organisational frameworks may lack outward (policy-focused) orientation Institutions with 'self-centred' mandates and research agendas Funding generally oriented to short-term projects
Operational	Combination of disciplines and perspectives (theory and practice) Agile forms of affiliation/engagement in "transformation labs" or "thematic spaces" Capacities and tools/methods for facilitating interactive knowledge development processes	Inflexible organisational (human resource and management) structures – for both knowledge and policy organisations Lack of incentives (career development and merit structures) for taking on facilitation and process leadership roles
Practice-oriented	Regular/ongoing (formal and informal) interactions between knowledge and policy actors; mutual engagement to address shared questions Possibility to take on intermediary roles (convening and facilitating/coordinating learning processes) in ongoing (real-life) empirics	Clarity of (shared?) responsibilities in relation to actions based on co-developed results Managing the combination of practice-oriented and academically relevant knowledge products and processes

Table 2: Science-for-policy ecosystems: enabling conditions and challenges
Source: authors

The enabling conditions highlighted in the table above mirror many of the characteristics of "transformative academic institutions" (Canto-Farachala et al., 2024) or "fourth generation universities" (Lukovics & Zuti, 2017), for example connecting with diverse stakeholders in local ecosystems, developing research agendas that respond to external needs (outside-in), and actively guiding challenge-based learning processes that deliver impact in real time. Indeed, there is a call for academic organisations to move beyond traditional teaching, research and commercial valorisation and engage as an integrated part of local ecosystems, facilitating the co-creation of solutions to address complex questions as they emerge. In effect, these characteristics are associated with leveraging academic knowledge in processes of action-oriented facilitation of reflexive learning. Yet as more transformative academic institutions undertake changes to their structures, roles and modes of operation to meet the evolving demands of (transformative innovation) policy, there are implications not only for how their researchers interact with policymakers, but also for the "functional rigging" of science-for-policy ecosystems.

For **policymakers**, the changing modes of operation desired from academic institutions necessitate changes in their operations as well. Specifically, there are two primary changes required, referring to: (i) the ways in which policymakers themselves engage with researchers (i.e. not just reactively receiving knowledge but also being an active participant in knowledge co-creation); and (ii) the support that policymakers provide for facilitating different engagement spaces (i.e enabling "agile/dynamic knowledge spaces" through institutional support and adjusted aims and criteria in research funding calls[5]).

For **researchers** and research groups in transformative academic institutions, as structural, operational and practice-oriented conditions evolve, there is a need to work continuously to deepen, broaden and innovate in how interactions with policymakers take place. This requires building a culture of stronger awareness and understanding of

5 A recent example of such a change is Vinnova's 2024 call for Research in interaction for transition to sustainable societies and institutional support to SIRI.

the knowledge needs of policy, and openness to more action-oriented approaches to evaluation exercises and policy learning processes.

Overall, the findings suggest that strengthening **science-for-policy ecosystems** requires moving beyond linear models of evidence use toward more dynamic, co-productive approaches that more fundamentally embed evaluation and learning within policy processes. This involves fostering institutional capacities for experimentation, supporting intermediaries who can navigate between knowledge and action, and creating spaces for deliberation and reflexivity. Importantly, the analysis highlights the need to recognise and manage the political dimensions of knowledge use, particularly in areas where policy goals are contested or evolving.

6. CONCLUSION

This paper has examined how knowledge-for-STI-policy can be mobilised more effectively to support place-based, evidence-informed policymaking under conditions of complexity, urgency and contestation. Through a comparative analysis of two contrasting, yet complementary, initiatives – GReaTr in Sweden and Orkestra in the Basque Country – we have explored how structural, operational and practiceoriented characteristics jointly shape the evolving functioning of scienceforpolicy ecosystems.

A key conclusion is that advisory, reflexive and evaluative functions are evolving and becoming more interactive and integrated in transformative policy agendas. To address demands for more context sensitive, politically aware and agile advisory support in this context, academic knowledge creation in the STI policy sphere itself needs to be more co-productive, iterative and embedded in realtime policy processes, affecting how interactions are structured and implemented.

- The cases show that durable engagement infrastructures (neutral spaces, stable funding, flexible mandates) are important **structural** ingredients that enable researchers and policymakers to navigate contested goals, bridge domains and maintain momentum.

- **Operationally**, transdisciplinary skill mixes and process leadership capacities –spanning action research, facilitation, data analytics, foresight and communication – are increasingly pivotal.
- **Practically**, modality shifts are evident: from static reports towards living frameworks, observatories, platforms, and accompanying research that support sensemaking, benchmarking and adaptive course correction.

Together, these changes position transformative academic institutions as systemic intermediaries that convene actors, align actions over time and foster *collective learning* that is rooted in (and contributes to) an *academic knowledge base*.

Implications follow for multiple communities. Policymakers should invest and participate in agile knowledge spaces, adjust funding and commissioning criteria to tolerate experimentation in the knowledge-for-STI-policy relationship, and value process stewardship alongside outputs. Researchers should deepen boundary-spanning competencies, strengthen translational practices, and mainstream action-oriented evaluation designs that capture learning-by-doing. For the policy evaluation community, more specifically, there is a need to complement summative assessments with developmental, theory-of-change-based approaches, to measure not only outcomes but also capacities, trust, alignment and adaptability, and to make learning loops explicit within governance arrangements. At the same time, political dimensions – goal contestation, timing, and potential capture – must be recognised and managed transparently.

The study has clear limitations as it draws on two cases with distinct territorial contexts and relies on an interpretive, inductive approach. However, this exploratory analysis has highlighted a set of key features underpinning science-for-policy ecosystems that provides a solid basis for future research extending in a variety of possible directions: multicountry, longitudinal comparisons; testing and adapting action-research frameworks across governance settings; developing robust indicators for co-production quality and ecosystem health; or exploring

incentive structures that reward facilitation and reflexive practice in universities and agencies. Ultimately, strengthening science-for-policy ecosystems requires reimagining universities and allied institutes as civic, fourth generation, transformative organisations, and treating evaluation as a shared, reflexive and continuous practice embedded within policy implementation. Building the enabling infrastructure—stable yet flexible mandates, skilled intermediaries, and open learning spaces—will be decisive for developing the policy needed to advance green, just and resilient place-based transitions.

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