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Discovery processes for transformative innovation policy

Lessons learned from the entrepreneurial discovery process (EDP) practice

M. Laranja, I. Perianez-Forte, R. Reimeris

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Contact information

Name: Ramojus Reimeris

Email: Ramojus.REIMERIS@ec.europa.eu

EU Science Hub

<https://joint-research-centre.ec.europa.eu>

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Abstract

Smart Specialisation Strategies - S3, designed and implemented through entrepreneurial discovery processes – EDP during 2014-2020, are likely to continue to play an important role under the policy objective of a Smarter Europe in the next EU funding programming cycle 2021-2027. Innovation policy and S3 now should be aligned with EU Green and Digital transitions with the aim to contribute to systemic transformation. By selectively reviewing conceptual and empirical studies, this paper identifies critical lessons from Smart Specialisation implementation and EDP that may be relevant for Member States and regions adopting a new S3 innovation policy frame. In particular, in the context of the Partnerships for Regional Innovation (PRI), lessons from EDP practices may be useful for conceptualisation and development of the proposed Open Discovery Processes - ODP.

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Authors

Manuel Laranja

Inmaculada Perianez-Forte

Ramojus Reimeris

Executive summary

To promote a new innovation policy frame and strengthen the next innovation policy cycle, European Commission's Joint Research Centre launched **the Partnerships for Regional Innovation (PRI)**. This is a new strategic approach to innovation-driven **territorial transformation**, linking **EU priorities** with national plans and **place-based** opportunities and challenges. PRI initiative **builds on the European experience with S3 and aims to enhance the directionality of regional and national innovation policies towards Europe's green and digital transitions**. The initial approach which is followed by the PRI Pilot Action, is documented on the "PRI Playbook"¹ (Pontikakis et al., 2022) and structured around three blocks: a Strategic Policy Framework, an Open Discovery Process and a Policy and Action Mix.

The purpose of this paper is to review available studies on how "Entrepreneurial Discovery Processes" were practiced and identify which lessons learned are relevant to the new context of transformative innovation policies, where "discovery and experimentation" processes will continue to be a key aspect.

Policy context

Relative to the previous period, the next innovation policy cycle associated to the Cohesion funds programming period 2021-2027 requires significant policy making changes. First, Smart specialisation strategies (S3) should now be aligned with the Green and Digital transitions. Second, without obligation for this, S3 should include a perspective of system level transformation geared towards the current broad ecological, social and human challenges. We believe that the lessons learned from how the concept of EDP was perceived and applied are relevant to this new policy context. This is because processes of "discovery and implementation" are one key aspect of transformative innovation policies.

However, the urgency of counteracting the accelerating climate change (IPCC, 2022), loss of biodiversity and resource depletion (e.g. clean water, forests and fish stocks) and unsustainable social and human actions (e.g. consumption and production patterns in socio-technical systems such as electricity, heat, buildings, mobility and agro-food) (UNEP, 2019) have pushed sustainable development higher in the European policy agenda. Accordingly, many regions and member states in Europe feel the need to adopt a more ecologic and inclusive socio-economic development that do not compromise the planetary boundaries of a healthy biosphere (Rockström et al. 2009; Monkelbaan 2019). These new challenges pose new questions to innovation policy and to innovation policy making.

Main findings

Five lessons are identified and explained in this report. The first lesson relates to how the new concepts of S3 and EDP were translated or transferred into policy practice of entrepreneurial discovery. In our view **there is a need to improve communication and policy learning about the new concepts and about what changes in innovation policy making are required for implementing this new directional innovation policy**. While the PRI pilot will have a decisive role in this regard, there is a need to reinforce guidance and training in relation to the use of participatory processes in public governance and the use of social technology methods. Conceptual training workshops, as well action-training initiatives led by experts who are familiar with the use of different collaborative event formats and facilitation techniques in the context of system level change and systems thinking, will be a key aspect for the practices of discovery and experimentation in this new cycle.

The second lesson to be carried forward, relates to how should initial priority setting be set and how should the priorities be defined. In **this new cycle priorities should be taken as "directions for transformative change" i.e., acceptable transition pathways**. This means that directions for transformation are not to be carried out vertically with respect to science domains, technologies, sectors, but need to be seen as broader policy agendas for change across sectors and across knowledge disciplines.

The shift in policy strategy making, required in this new context, goes beyond taking "priority domains" as directions for industrial change. What is required is a "challenge based" approach to ecological and socially driven priorities i.e., implying a vision of innovation that is no longer only industrial and technological but also environmental, social and organizational.

¹ <https://s3platform.jrc.ec.europa.eu/pri-playbook>

The third lesson to be carried forward relates to changes in governance of innovation policy. **The new approach to innovation policy making requires a more decentralized multi-level governance structure, where large and broader initiatives of national scope are to be combined with regional specific and specialised initiatives at the local level.** In addition, both national and regional government levels need to assume a less directive role. National or regional governments do not “own” the transformation strategy, nor do they direct the collaborative process underlying the discovery of transition pathways and related problems.

The fourth lesson follows from the required changes to governance. **Wider and deeper processes of participatory governance need to be supported by different types of collaborative events and tools.** Finding and defining acceptable pathways, as well as going from pathways to specific problems requires systems thinking i.e., identification and understanding the factors that make up a complex problem, and focus on developing an understanding of the change problems using system thinking tools such as “systems mapping”. Going from specific lower granularity problems to solutions requires design thinking approaches i.e., requires to develop a deep understanding of the problem from the point of view of those who feel it.

There are different (more open) event formats that may greatly enhance dialogic communication and collaboration and therefore contribute to raise the level and the quality of the public participatory governance process. Some of the simplest mentioned include “Open Space Technology” or “World Café” but there are more sophisticated event format methodologies that go further in contributing to enhance the quality of dialogue. The use of these collaborative event formats supported by facilitation tools (and by certified facilitation consultants) will therefore be a key aspect to consider in the new context of transformative innovation policy.

The fifth lesson underscores that EDP implementation was quite different across EU Member States and regions. EDP implementation reflect remarkable differences in policy capacity, in particular with regards less developed regions. It is also associated to existing institutions, local cultures and historical experiences with innovation policy. It also suggests an opportunity to reinforce policy learning through specific training actions.

Policy learning and the build-up of new policy capacities, not just with regards public authorities but including intermediate institutions and relevant actors, was a key aspect in the first cycle of S3 and again will be key in this new cycle. Many actors are not particularly familiar with systems thinking and system level change processes. While they may be willing to participate in the policy making processes, their full contribution will be undermined by lack of skills and resources.

Related and future JRC work

This report offers critical lessons from Smart Specialisation implementation and entrepreneurial discovery process that may be relevant in the context of the Partnerships for Regional Innovation (PRI) and PRI Pilot Action. Lessons identified from EDP practices may be useful for the conceptualisation and development of the proposed Open Discovery Processes - ODP.

1 Introduction

The purpose of this paper is to review available studies on how “Entrepreneurial Discovery Processes” were practiced and identify which lessons learned are relevant to the new context of transformative innovation policies, where “discovery and experimentation” processes will continue to be a key aspect.

The urgency of counteracting the accelerating climate change (IPCC, 2022), loss of biodiversity and resource depletion (e.g. clean water, forests and fish stocks) and unsustainable social and human actions (e.g. consumption and production patterns in socio-technical systems such as electricity, heat, buildings, mobility and agro-food) (UNEP, 2019) have pushed sustainable development higher in the European policy agenda. Accordingly, many regions and member states in Europe feel the need to adopt a more ecologic and inclusive socio-economic development that do not compromise the planetary boundaries of a healthy biosphere (Rockström et al. 2009; Monkelbaan 2019). However, these new challenges pose new questions to innovation policy and to innovation policy making.

First, previous innovation policy rationales have been strongly associated to economic growth, competitiveness and in the case of Smart Specialisation Strategies associated to industrial structural change. The issues we now face are not just about growth and competitiveness, they concern social, ecological and technical changes.

Second, it has been assumed that all technology-based innovations are positive and that there are no “detrimental technologies”. In other words it has been assumed that no directionality was needed. The new challenges will, however, require directionality instead of general R&D and innovation.

Third, the process of social and economic changes induced by technology advances is often assumed to be a linear process. More science leads to more innovation, which leads to competitiveness and higher economic added value. However, change happens in broader social, cultural contexts not just technological and not just in “innovation systems” composed by the usual knowledge producing organisations associated with R&D and technology change. This means that there is a need for broader public-private collaborative processes (Grillitsch et al., 2019) involving other actors such as: creative and culture entrepreneurs and grassroots communities which often experiment with technologies, new ways of doing things and frame new lifestyles.

Finally, all these new social, ecological and human challenges are strongly inter-related i.e. we cannot address climate change ignoring inclusive economic development, poverty, biodiversity, etc. Because of such inter-dependencies the new challenges (which classify as wicket problems), will require different instruments, namely, instruments favouring broad experimentation and discovery enabling clarification of the directions for search, problem definition and pilot testing of promising solutions.

Past innovation policies and in particular the “Smart Specialisation Strategies - S3” (Foray et al., 2009) designed and implemented through “Entrepreneurial Discovery Processes – EDP” during 2014–2020, are likely to continue to play an important role under the policy objective of a Smarter Europe, in the next EU funding programming cycle 2021–2027. For the Cohesion framework of 2021–2027 EU Member states and regions are expected to align R&D and Innovation policies with the EU Green and Digital transitions (see CPR REGULATION EU 2021/1060)². While this strategic commitment does not specify what innovation policy changes are member states and regions expected to undertake, in our view the fundamentally different context, which recognises the dynamic nature of the urgent ecological and social problems highlighted above, calls for introduction of significant changes in innovation policy and innovation policy making.

In our view these changes should not be minor adjustments or optimizations of previous policy practices as they involve the adoption of socio-ecological-technical system transitions (SETS) (Göpel, 2018) or “system level change” perspectives, which in turn will require significant governance changes, introduction of directionality, and a different use of policy instruments favouring discovery and experimentation processes, in line with what was initiated with the practices of EDP in 2014–2020 (Esparza-Masana, 2022; Roman and Nyberg, 2017).

² Article 5 of the Commons Provision Regulation – CPR REGULATION (EU) 2021/1060 defines the following objectives for European Funds ERDF, the ESF+, the Cohesion Fund and the EMFAF:

1. more competitive and smarter Europe by promoting innovative and smart economic transformation and regional ICT connectivity;
2. greener, low-carbon transitioning towards a net zero carbon economy and resilient Europe by promoting clean and fair energy transition, green and blue investment, the circular economy, climate change mitigation and adaptation, risk prevention and management, and sustainable urban mobility;
3. more connected Europe by enhancing mobility;
4. more social and inclusive Europe implementing the European Pillar of Social Rights;
5. Europe closer to citizens by fostering the sustainable and integrated development of all types of territories and local initiatives.

To promote a new innovation policy frame and strengthen the next innovation policy cycle, European Commission's Joint Research Centre launched **the Partnerships for Regional Innovation (PRI)**. This is a new strategic approach to innovation-driven **territorial transformation**, linking **EU priorities** with national plans and **place-based** opportunities and challenges. PRI initiative **builds on the European experience with S3 and aims to enhance the directionality of regional and national innovation policies towards Europe's green and digital transitions**. The initial approach which is followed by the PRI Pilot Action, is documented on the "PRI Playbook"³ (Pontikakis et al., 2022) and structured around three blocks: a Strategic Policy Framework, an Open Discovery Process and a Policy and Action Mix.

However, these expectations of deep changes in innovation policy come without a prescriptive picture of what concepts and practices related to S3 implementation and EDP are relevant to be carried forward and used under a new policy frame. The ambition of this paper is to provide relevant and actionable insights on how "discovery processes" could be practiced as essential components of innovation policies that are attempting to drive social-ecological-technical system transitions.

By selectively reviewing conceptual and empirical studies, including analytical work conducted by the S3 Platform⁴ this paper identifies critical lessons from S3 implementation and EDP that may be relevant for a new innovation policy frame. In particular, in the context of the PRI and PRI Pilot Action, lessons from EDP practices may be useful for conceptualisation and development of the proposed Open Discovery Processes - ODP.

The paper is structured as follows. Section 2 presents the changing policy landscape by comparing the first S3 policy cycle 2014-2020 with the new policy making challenges associated to the current policy cycle (2021-2027). Section 3 then selectively revisits the evidence on how EDP was practiced and identifies relevant lessons learned for further practice of "discovery" and experimentation processes in the context of transformative innovation policy. Finally, section 4 summarises the lessons learned and presents suggestions and recommendations on how "discovery" should be integrated in innovation policies that promote system level change.

³ <https://s3platform.jrc.ec.europa.eu/pri-playbook>

⁴ Over the past programming period the S3 platform has undertaken surveys and collected many cases that highlight practices in implementing Smart Specialisation and Entrepreneurial Discovery Processes. Some cases focusing green-oriented innovation activities are of fundamental relevance to this study.

2 Policy Context

2.1 Smart Specialisation and EDP

Smart Specialisation Strategies

Inspired by the recommendations of the high-level “Knowledge for Growth” group (Foray et al., 2009), Research and Innovation Strategies for Smart Specialization – S3, have been a key element of EU innovation policy. A Smart Specialisation Strategy – S3 is a place-based framework for innovation policy primarily based on new approaches to industrial policy (Hausmann and Rodrik, 2003; Foray et al., 2009). Foray (2015, p.1) defined Smart Specialisation as “the capacity of an economic system (a region for example) to generate new specialities through the discovery of new domains of opportunity and the local concentration and agglomeration of resources and competences in these domains”.

The S3 approach significantly challenged established Research and Innovation policy making practices in Europe. Essentially, public authorities were encouraged to give up the traditional linear approach to innovation policy, based on strengthening public and private R&D infrastructure, and to look for a more complex combination of actual and potential strengths (knowledge assets) and for a competitive (re)alignment of existing and emerging industries.

However, the adoption of S3, drafted and approved according to the EU requirements, became a necessary step for the use of European Regional Development Funds - ERDF Funds in R&D and Innovation, during the 2014-2020 programming period (CPR Regulation EU No 1303/2013). Therefore, because support to S3 investment was placed under the ERDF Thematic Objective 1 (strengthening research, technological development and innovation) and its portfolio of available R&I instruments and categories of intervention, this may have induced an interpretation of S3 as a linear innovation policy focused on thematic priority domains.

Nevertheless, the introduction of S3 coincided with the allocation of considerably more Cohesion funds for research and innovation, **initially planned to exceed 80bn EUR** over the seven-year period (2014-2020), up from 23bn planned during 2007-2013, and with a new focus on innovation for regional economic development, S3 provided a new impetus for innovation-driven economic development in the regions. Overall, according to a comprehensive study conducted on behalf of the European Commission, by late 2020 there were **185 S3 strategies across the EU** that fulfilled the *ex-ante* conditionality (Prognos, 2021). The same study refers that by 2020 approximately **20bn EUR had actually been funded in S3 priority areas**, which represented 62% of the budget identified for all R&I projects.

Policy making changes induced by EDP

The most important change with the introduction of S3 in member states and regions was the need to associate the design and implementation of the strategy to the so called “Entrepreneurial Discovery Processes – EDP”. At the time there was no single and consensual definition about the “process of entrepreneurial discovery” and how it would relate to the S3 policy cycle. The EDP concept originated from the new industrial policy literature where it is defined as the process by which regional actors jointly discover and develop what they are good at producing (Hausmann and Rodrik, 2003). However, for its inclusion in policy making practices the EC (2012) recommended to take EDP as an **inclusive evidence-based process** by which stakeholders – i.e., government, firms, higher education establishments, intermediaries, civil society (in a quadruple helix logic) – define and choose specialisation domains in which regions are likely to excel, given their existing capabilities and productive assets, thus enabling effective targeting of research and innovation policy.

The main purpose of S3, as managed through entrepreneurial discovery processes, was the initial selection of priorities for the support to R&D and Innovation investment under Thematic Objective 1 within the EU Cohesion Policy for the 2014-2020 programming period. However, because the application of the EDP concept had limited guidance, experimentation and intensive sharing of EDP practices among regions led to a conceptual reflection around the original EDP idea and the role of stakeholders in the process. EDP became a good example of policy practices running ahead of theory (Foray, 2015). Hence, the EDP concept evolved from being a process limited to the identification of investment-priorities at the design-phase of a strategy, supporting initial definition of priority domains to a process that keeps going throughout S3 implementation (Gianelle et al., 2016, p.15; Marinelli and Perianez-Forte, 2017; Guzzo and Perianez-Forte, 2019), maintaining stakeholders engaged in the refinement and review of the initially defined priority-domains.

As a result of including EDP in innovation policy making, it appears that policy decisions became more explicit, based on concrete evidence and nurtured by the involvement of a broader array of stakeholders, than in previous

policy approaches (Benner, 2019; Di Cataldo et al., 2021; Tripl et al., 2000). In addition, significant gains were suggested regarding coordination and knowledge exchanges between regional actors, as well as policy learning benefits in policy fields that are too complex to be managed by one single organisation (Kroll, 2015; Polverari, 2017).

2.2 Changes in Innovation Policy

A new cycle of S3 innovation policies aligned with the Cohesion framework period 2021-2027 is now starting, and member states and regions are expected to align S3 with the European Green and Digital transitions. In particular Smart Specialisation Strategies are expected to contribute towards Cohesion Policy Objective 1 – A more competitive and smarter Europe by promoting innovative and smart economic transformation and regional ICT connectivity (CPR regulation EU 2021/1060 of 24 June 2021). In addition, the new Common Provisions Regulation for EU funds, identifies an “enabling condition” that needs to be fulfilled throughout the programming period 2021-2027, that relates not only to the existence of a Smart Specialisation Strategy (S3) at national and/or regional level (as it used to be in the previous 2014-2020 period), but also to the “good governance of the smart specialisation strategy”⁵ – in recognition that this is a most crucial part of S3.

While re-alignment S3 innovation policy objectives and “good governance” are necessary to access EU funds for S3 implementation under Policy Objective 1, no particular approach to innovation policy is defined, therefore leaving room for member states and regions to introduce the innovation policy changes they find more appropriate.

In our view, the need to address such broad ecological, social and human challenges, requires a fundamentally different approach to innovation policy. The new challenges are strongly interdependent and are linked to (and intensified by) strong path-dependencies and lock-in effects (Göpel, 2018) and therefore, demand a more directional approach based on transformation or transition models (Schot and Geels, 2008; Grin et al., 2010) and on “Transformative Innovation Policies – TIP” (Schot and Steinmueller, 2018; Mazzucato et al., 2020),

While there are etymological differences between the terms “system transition” (Elzen et al., 2004) and “system transformation” (Hölscher et al., 2018) and eventually different concerns regarding scales, both concepts share a central aim of conceptualising how system level changes may occur.

Changes in innovation policy for this new cycle may therefore be associated to the adoption of a systems level change perspective in innovation policy. If such a perspective is adopted (and some member states/regions are already attempting to adopt this new perspective⁶), understanding of what changes relative to the previous period is essential to identify what previous EDP experiences and practices can be carried forward and used in this new context. In this section our intention is not to extensively analyse the concepts of S3 and EDP and their evolution (see Foray, 2015; Ginanelle et al., 2016; Benner, 2019; Tripl et al., 2020) but to briefly compare what was requested in the previous S3 cycle with what is being expected in this new cycle, i.e., what major changes are expected when adopting new strategic transformative innovation policy framework aligned with the green and digital transitions.

Table 1 summarises the differences between what was S3 in the previous cycle and what could now be a new transformative approach to innovation policy – a new transformative S3 (Marinelli et al, 2020). This new approach may be taken as an extension or addition to some of the policy practices that were initiated in the previous cycle, namely an addition to previous practices of EDP. Over the next sections we will review in more detail lessons learned from EDP that may enhance the activities of “discovery and experimentation” which are a fundamental component of this new proposed approach – see Table 1. In following we compare in more detail differences between previous S3 policies and a possible new transformative approach to innovation policy (see also Marinelli et al., 2020).

⁵ The enabling condition ‘Good governance of national or regional smart specialisation strategy’ is applicable to specific objectives 1.1 Developing and enhancing research and innovation capacities and the uptake of advanced technologies and 1.4 Developing skills for smart specialisation, industrial transition and entrepreneurship. European regions need to incorporate the following in their smart specialisation strategies: 1. Up-to-date analysis of challenges for innovation diffusion and digitalisation; 2. Existence of competent regional / national institution or body, responsible for the management of the smart specialisation strategy; 3. Monitoring and evaluation tools to measure performance towards the objectives of the strategy; 4. Functioning of stakeholder cooperation; 5. Actions necessary to improve national or regional research and innovation systems, where relevant; 6. Where relevant, actions to support industrial transition; 7. Measures for enhancing cooperation with partners outside a given Member State in priority areas supported by the smart specialisation strategy.

⁶ See for example the case of Catalonia in Fernandez and Romagosa (2020).

Table 1. - What changes in the new S3 cycle?

	Innovation Policies S3 (2014-2020)	Transformative Innovation Policies S3 in the new context (2021-2027)
Underlying Innovation Model	"Innovation Systems"	"Systems level change" MLP - Multilevel Perspective of Socio-Technical Transitions
Aim	Economic structural change "diversified specialisation"	Address societal challenges Broad policy agendas Sustainable transitions Directionality
Actors, networks institutions	4QHelix Stable (local and non-local) networks Static multi-scalar institutional	Broader (beyond the usual R&I stakeholders, users, grass-root communities, vulnerable groups affected by the transformation, culture and art entrepreneurs, and the civil society etc.) Dynamically evolving in networks and in new institutional configurations at multiple scales
Governance	Broad consultation and participatory and interactive engagement with stakeholders. Relying on Regional Innovation Councils, Advisory Boards, workshops, focus groups, platforms for interaction... etc.	Wider involvement, spanning policy domains and levels Wider involvement of all actors Deeper involvement in the change process. Not just Innovation Councils and Boards. Relying also on collaborative events and tools to support participatory and dialogical processes
Discovery and Experimentation Process	Define directions for industrial change EDP	Define acceptable change pathways – local mission approach Define specific problems Experiment tentative innovative solutions
Tools	S3 official Guide / Specific calls Thematic workshops	Systems' change tools Roadmapping Special calls Safe experimentation spaces (see Box for suggestion of tools)
Policy mix	Individual instruments targeted at specific beneficiaries or at collaboration in R&D and innovation, but favoring thematic priority-domains	Wider combination of traditional R&I support instruments with instruments supporting discovery experimentation, skills, non-R&D innovation. Also use of regulatory instruments Policy mix as a policy instruments portfolio
Policy capacity	policy analysis and evaluation planning, budgeting, delegating, directing, communicating, coordinating	Learning and Reflexivity Connecting and facilitating Dynamic portfolio management Flexibility to change
Monitoring of results and success	Economic and R&DI performance and contribution to industrial transition	Economic and social performance and contribution to solve societal problems

Source: authors' own elaboration

The underlying innovation model - Transformation

A major difference is that this new framing emphasizes system level transformation and acknowledges that truly transformative change is rarely just about advances in science and technology but how these advances impact the society. **Transformation requires member states and regions to think and act systemically and holistically about how to transform the economy and society.** In the former S3 policy strategy approach, deep changes or structural transformations were already at the core of the concept. However, this transformation was focused on the economy and its sectors. Foray (2015) proposed four interconnected pathways of structural change to be fostered by S3, namely: transition from an existing sector to a new one; modernisation of existing industries; diversification of regional economy, or; radical foundation of a new domain.

In the new frame, structural transformation is about deep changes to socio-ecological-technical systems that fulfil environmental and societal functions such as, for example, biodiversity, mobility of people and products, access to renewable energy, food systems, etc. (See Box 1 MLP).

Arguably this new approach to innovation policy, emphasising systems thinking, and effective social-ecological-technical systems change requires a “stronger policy narrative”. In our view a stronger policy narrative would be one that rejects the substitutability and competitiveness debate, recognizes the intrinsic value of nature in the economy and focus on societal and ecological transformations together with technological solutions that would enable higher quality of life for all.

Directionality – the need for explicit intended pathways at the start of the process

A major difference in this new context is that innovation policy is not only concerned with increasing rates of innovation and its diffusion to help with industrial transformation, but essentially with **adding directionality to innovation efforts** towards expected economic, ecological and societal impacts (Schot and Steinmueller, 2018; Mazzucato et al., 2020). There is a clear shift from innovation policy aimed at promoting innovation for competitiveness and growth through economic and industrial change (e.g., using S3 to arrive at “specialised diversification”), towards an expectation that innovation and innovation policies should contribute towards social and ecological changes. What this means is that **the aim of the strategy goes well beyond industrial transformation and includes broader ecological and societal impacts**. However the practice of this new transformative innovation policy assumes that there is a process for initial priority setting similar to the EDP. This process should be taken as a collective discovery leading to establishment of “common intent” and to the definition of promising and “acceptable change pathways” (Schot and Geels, 2008) in the direction of the sustainable goals and aligned with local territorial values and resources at different scales. As we will see further, defining these promising pathways for systems’ changes will frame the potential formation of new niche-innovation possibilities (Geels, 2002; Schot and Geels, 2008).

Actors Networks and institutions

Unlike traditional linear innovation policies, which used to concentrate on a narrow group of knowledge producing organisations (Universities, RTOs, Enterprises who practice R&D, etc.), a transformative innovation policy approach will require a broader view of what needs to be changed. Hence, beyond the usual knowledge producing stakeholders other actors such as users, grass-root communities, vulnerable groups affected by the transformation, culture and art entrepreneurs, and the civil society at large should be included.

Governance

Regarding governance, there are also major changes. In the former S3 cycle participatory governance structures such as regional innovation councils and boards composed by a relatively narrow group of knowledge producing organisations (stakeholders) that have traditionally monopolized attention, were extensively used to define the priority-domains of specialisation.

This new policy context requires the involvement of other important actors spanning policy domains horizontally and policy levels vertically. According to Kuhlman and Rip (2014, p.10), addressing societal challenges requires “open-ended missions” concerning social-eco-technical systems as a whole. The same authors also argue that the broad challenges we face require “tentative policy-mixes”, where demand side procurement policies are combined with supply-side interventions in “experimentation pilots”.

Compared with the former policy context, on one hand governance needs to be wider and involve other relevant sets of actors such as users, grass-root communities, vulnerable groups affected by the transformation, culture and art entrepreneurs, and the civil society in general.

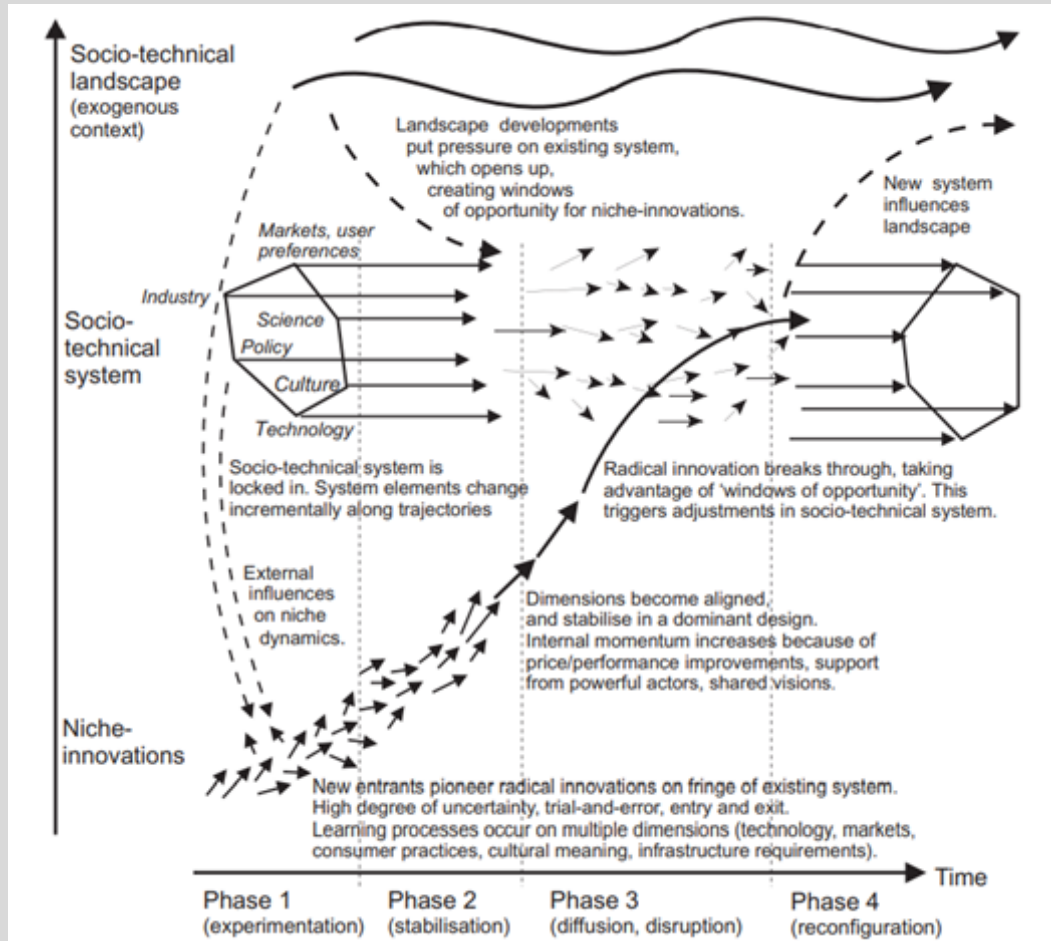
On the other hand, social-eco-technical systems change are long, complex, open-ended processes with specific dynamics, shaped by multiple dependencies and requiring collaborative efforts at individual and collective levels. Governance needs to deal with the politics of long and complex transformation processes i.e. with the continuous alignment of actors and their specific interests, beliefs and values as they change along the process.

To this end, governance needs to be even more reflexive and flexible and to rely on higher levels of public participation, dialogical processes and engagement. In our view, as we will see further, this is also related to the use of particular collaborative event formats possibly supported by facilitation tools and techniques.

Box 1 Multi-Level Perspective (MLP)

The Multi-Level Perspective – MLP suggests that socio-technical transitions are non-linear processes that occur through the interplay between niche-innovations, socio-technical system, and landscape levels (Geels, 2019, 2002; Rip and Kemp, 1998) – See Figure 1 MLP.

Figure 1 Multi-Level Perspective



Socio-technical transitions unfold over time through four phases. The first phase involves discovery and experimentation intended to originate radical innovations that emerge in small niches. This first stage may result from strong policy incentive and support to define change directions and within these directions undertake trial and error innovation experiments leading to discoveries with transformative potential. In the second phase, these small niche innovations build up internal momentum and face resistance from existing entrenched systems. In the third phase, external landscape changes and the pressures brought to the system by the newly discovered niche innovations may help to further destabilise the existing systems, hence fueling the transitions process. Finally, in the fourth phase, wider innovation diffusion will replace the existing system, triggering broad system reconfigurations that become settled in a new status quo.

Note that in the MLP model there is no single cause of driver of the transition process. The model emphasises alignments between processes on multiple dimensions and at different levels which together may culminate in successful system transitions. In addition, innovation is not seen in its technological and economic dimensions only. Grassroots and social innovation (Geels, 2019) will play an important role as well culture and political coalitions, empowerment, etc.

Discovery and experimentation

In the previous S3 (2014-2020) cycle EDP was taken as a continuous interactive process between public authorities and innovation system stakeholders. This process was key to the definition and follow up of priority domains and of promising projects and activities within these domains.

In the context of this new cycle of S3, “discovery processes” remain an important component of the whole transformation process towards a green and digital society. However, in our view, there is a need to disentangle different types of “discovery” processes.

Initially, in a process similar to EDP used to define priority-domains, a broader engagement of actors in a participatory process serves to select which socio-technical system(s), align common intent and co-discover consensual directions to explore systems’ change (acceptable pathways).

However, after this initial “discovery” which establishes “directions” and “visions” a second important step in this co-discovery process, is to co-define specific problem-challenges at lower granularity levels, within each direction for change. This should lead to new challenge-oriented partnerships with variable sets of stakeholders and respective experimentation spaces and activities e.g. policy labs, living labs, prototyping and design experiments, societal experiments, policy instruments experiments, etc. These experimentation spaces should be seen as tools to foster bottom-up niche innovations (Geels 2002; Shot and Geels, 2008). In other words, the aim of these discovery and experimentation spaces and activities is to stimulate existing and/or create new change processes and contexts, modulating them to a more sustainable direction. Beyond niche creation and exploration these discovery and experimentation activities should also contribute to inform about the conditions needed for these new niche-innovations to flourish. Overall, the two types of discovery should also contribute to trigger changes in innovation policy and in the innovation policy-mix.

Tools

There are also major differences in terms of the tools that need to support system level change. Because governance needs to be wider i.e. involving many relevant sets of actors and deal with the complexities of a continuous alignment of actors and their specific interests, over long and complex change processes, engagement and the quality of the public participatory process need to be higher. Hence, there is a need to use specific facilitation methods that in most cases were not used for EDP in the previous cycle - for suggestions on which tools to use to support system change and public participatory governance processes (see Boxes 5 and 6).

Policy Mix

Other interesting change that needs to be addressed relates to the policy mix used to trigger and facilitate the system change process. For this new approach to transformative innovation policy, policy instruments and their mix need to support broad experimentation and discovery enabling clarification of the directions for search, problem definition and pilot testing of promising solutions.

Policy Capacity

Policy implementation depends on who, exactly, will implement the “policy ideas” or models, how can or will they be implemented, or on whether the administrative agencies and intermediaries charged with implementing any and every kind of policy idea have the right policy capacity, and are able abandon current/old policy models and rapidly adopt and learn completely new ones (Andrews et al., 2017).

However, when confronted with the need to adopt completely new policy frames, regions and member states with lower policy capacity may experience great difficulties. Policy capacity for this new policy context of “system level change” is fundamentally different from that needed to implement S3 in the previous cycle. While there is no comprehensive view on what are the policy making skills needed for a systems level change perspective (see Maclaren and Katel, 2022) we can identify a few differences relative to existing capacities. For example, policies for “transformation” based on niche experimentation do not assume that “system level change” can be planned and rigidly executed. The assumption is that policy makers need to engage with a complex systemic process and that reflexivity and flexibility are vital. Accordingly, niche innovation and experimentation may be (or have been already) initiated by some actors, which means that policy makers need to be engaged with what is already underway. Therefore, policy capacity in this new context appears to relate to dynamic portfolio management, connecting and coordinating different interests and activities and to learning and reflexivity. It also relates to the level and quality of the participatory processes used for public governance of the design and implementation of the transformative innovation policies.

Monitoring of results and success

In line with changes in governance towards higher level participatory processes, monitoring in this new transformative approach would need to be substantially different. In the previous S3 cycle monitoring consisted in knowing which actions and initiatives were aligned with priority domains and their relative weight in the overall set of actions supported. For this new S3 cycle some form of participatory monitoring supporting the discovery and experimentation activities referred above should be used as a supplement to the usual public funding monitoring. Participatory monitoring usually refers to the involvement of stakeholders and targeted groups or communities within the monitoring processes (van den Berg et al., 2019.). It has been extensively used in social and environmental policy areas, and it requires engaging regional actors in gathering inputs and in reflection about adjustments as needed, while at the same time contributing to empower regional actors in their experimental actions/projects.

2.3 Partnerships for Regional Innovation and Open Discovery Processes

To help enhance policy capacity for governance of system level transformation processes and to strengthen the impact at regional level, the EU JRC launched the Partnerships for Regional Innovation (PRI) initiative. PRI will be firmly anchored in the EU policy framework, supporting the implementation of the European Green Deal, Horizon Europe, Cohesion policy and Next Generation EU.

PRI aspire to become a strategic framework for innovation-driven territorial transformation, linking EU priorities (with particular attention to green and digitalisation transitions) with national plans and place-based efforts to co-create local transformation pathways, deliver economic, environmental and social co-benefits. PRI aims to test tools to enhance the coordination and directionality of regional, national and EU innovation policies to implement Europe's green and digital transitions and to tackle the innovation divide in the EU.

Build on previous and ongoing S3 experiences, designed from a multi-level perspective, i.e., paying attention to the needs of local, regional and national policy makers and opening opportunities for closer alignment and cooperation, PRIs are launched together with the EU Committee of Regions as a Pilot Action. Pilot participants (national, regional and local policy makers, stakeholders, experts, etc. are invited to co-develop and test new tools and governance mechanisms to integrate initiatives and investment in strategic areas and link placed-based opportunities and challenges to EU priorities and eventually to the PRI framework.

The proposed PRI-framework is structured around three blocks: a Strategic Policy Framework, an Open Discovery Process, and a Policies and Actions Mix (Pontikakis et al., 2022).

The first building block proposes a broader policy process as a set of multiple policy activities crossing different levels of governance and based on the Whole-of-Government approach. The policy framework allows dynamic planning and various framing, according to the goals.

The second building block, Open Discovery Process – ODP, builds on the previous experience with EDP i.e., intents to repurpose existing participatory governance approaches created during the previous period 2014-2020. This second block introduces an alternative idea of organising the discovery processes by local missions - Challenge-Oriented Innovation Partnerships (CHOIRs) defined as multi-stakeholder and, as far as the government is concerned, multi-department partnerships linked to specific territorial challenges, with the aim of achieving systems change within established time frames. Each local mission has its own directionality, enabling the exploration of broad-ranging experimentation and is supported by adequate policy mixes. The process of ODP is set on working backwards from the goal approach and builds on shared agendas and additional actions by stakeholders towards the goal.

Finally, the third block Policies and Action Mix, mobilises instruments to publicly-funded projects, sequences interventions against other actions so that they result in synergies by design and, importantly, co-opts additional actions by stakeholders.

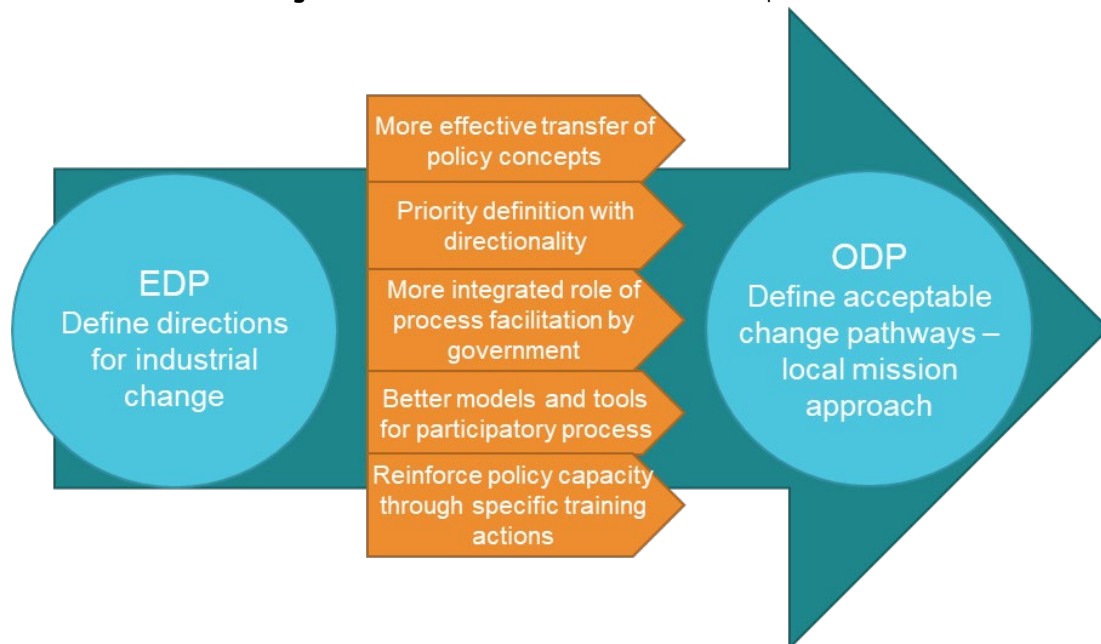
PRI comes as an innovation policy, but it also encompasses and inspires industrial, employment, education and social policies.

3 Evidences from EDP practice

In this section we selectively review evidences related to how the “Entrepreneurial Discovery Process” has been organised during the 2014-2020, in order to draw lessons regarding “discovery and experimentation” processes in this new innovation policy context geared towards system level transformation processes.

Figure 2 summarises the main lessons learned from the EDP’s experiences. These lessons are explained in sub-sections from 3.1 to 3.5.

Figure 2 Main lessons learned from the EDP’s experience



Source: Authors’ elaboration

3.1 Effective communication and transfer to policy practice of policy concepts

The first lesson relates to challenges that may arise when translating ideas or scholarly concepts into policy practice, i.e., the correct understanding of the policy concept, its principles and its application without unintended distortions.

Initially EDP was seen by the EC (2012) as a bottom-up participatory process required for prioritisation of R&D and innovation investment domains, under ERDF-Thematic Objective 1 - strengthening research, technological development and innovation, that was to be driven by public authorities, requiring strong stakeholders’ engagement (Gianelle et al., 2016).

However, since S3 was linked to the ERDF-Thematic Objective 1, the definition of these priority domains was in many cases understood by public authorities as “thematic areas” for concentration of R&D and Innovation funding (Laranja et al., 2020; Gianelle et al., 2020). In addition, because the initial S3 guide (EC, 2012) was largely predicated on a conventional linear science and technology (S&T) model of innovation, some member states and regions, interpreted S3 as a one-time choice of priority-domains registered on an “innovation plan” that once designed, would go the next stage of monitoring of public funding and control of implementation. As will be argued in the next section, and in particular for less developed regions with lower policy capacity, this process led to definition of too many priority domains.

However, real experiences with EDP implementation demanded a re-conceptualisation and therefore, EDP evolved from being a process carried out during the S3 design phase for initial identification of investment-priorities, into a continuous interactive process permeating the whole S3 implementation cycle (Perianez-Forte, Marianelli and Foray, 2016; Gianelle et al., 2016, p.15; Marinelli, Boden, Haegeman, 2017; Marinelli and Perianez-Forte, 2017; Guzzo and Perianez-Forte, 2019). This mean that once investment priorities had been identified at the design stage of a S3 policy process, EDP would keep going throughout the strategy’s implementation and stakeholders would need to be kept engaged in a refinement of the priority-areas, as well as in the S3 governance and monitoring mechanisms (Marinelli and Perianez-Forte, 2017).

Finally, the definition of EDP used by the EC (2012) (i.e. EDP as a policy process initiated and driven by public authorities for prioritisation of R&D and innovation domains) is significantly different from the original concept of “self-discovery” proposed by Hausmann and Rodrik (2003), which is mostly driven by entrepreneurs.

Lesson 1 - The first lesson learned is that there is a need to improve policy learning about how to effectively transfer and operationalise policy concepts. The relative success of innovation policies based on concepts and ideas (from academia), depends on how the concepts are communicated and assimilated by policy makers and on how such concepts are associated to policy instruments for funding. Because having an S3 strategy was an ex-ante condition to access existing standardised R&D and innovation funding instruments under ERDF-T01, EDP was perceived as a policy design process used to define priority domains and later as a policy implementation process used to refine the domains. As result EDP was largely seen as a linear innovation policy process but with thematic priority domains. The original idea was not to reduce EDP to priority setting and refinement processes, but to take it as a collective learning journey, were government authorities and stakeholders would agree on which activities and projects to experiment and explore in order to discover which innovative ideas and niche solutions would show industrial and economic transformative potential.

3.2 Priority setting as an Entrepreneurial Discovery Process

Evidence gathered during the first S3 cycle suggest that, in general, definition of priority domains through EDP was not considered by policy makers as a problem (Guzzo et al., 2018). In general, priority setting was supported by evidence-based approaches such as SWOT analysis, studies on scientific, technological and economic trends, stakeholders' surveys, etc.

However, **policy makers also referred that “lack of specific data”, “lack of evaluation studies and monitoring” and “lack of skills and capabilities” constrained the analysis and selection of priorities** (Guzzo et al., 2018). In addition, there were difficulties in developing common visions that combined the different agendas and expectations at different territorial levels (Guzzo and Perianez-Forte, 2019).

Consequently, this led to definition of too many priority-domains, (Di Cataldo et al., 2021; D’Adda et al., 2019). Proliferation of domains and objectives suggests that the concepts of S3 and EDP were not always fully understood by public authorities (see Foray, 2015; Gianelle et al., 2020; Iacobucci, 2014) in what concerns defining not just priorities to explore but also lower granularity problem-challenges. Possibly, this apparent difficulty is an indication that, under the surface of the S3 and EDP policy narrative, national and regional authorities opted for safe “choices” that would not restrict access to EU funding.

Moreover, and despite S3 being explicitly announced as a strategy that would involve non-technological innovation, because of the association to EU funding S3 was dominated by a narrow understanding of innovation based on formal R&D and knowledge-intensive firms (Hassink and Gong, 2019). Therefore, in some cases, priority setting through EDP led to “high-tech fantasies” and “visionary” approaches (Gianelle et al., 2020) and resulted in definition of priority-domains which were loosely connected with the local science and technology capabilities and with the intrinsic territorial problems and socio-cultural values of each region, which undermined the original S3 place-based rationale.

Lesson 2 - Strongly associated to the first lesson, the second lesson learned is about the priorities that were defined as the outcome of EDP. In many cases too many priority domains were defined. In addition, priority domains are not supposed to be economic sectors nor broad visionary Science and Technology challenges. S3 was requesting a need for industrial transformation and therefore domains would need to contain the directions for such industrial transformation. The way in which in most cases the domains were defined clearly suggests that EDP failed in bringing the intended industrial transformations (Miedzinski et al 2021; Marques & Morgan, 2018; Hassink and Gong, 2019; Benner, 2019).

3.3 Governance of discovery processes

Evidence gathered during this first S3 cycle highlighted a number of important issues related to the quality of the governance process (Guzzo and Gianelle, 2021).

First, regional innovation governance structures such as regional innovation councils, regional innovation advisory boards and regional agencies were extensively used as mechanisms to mobilise quadruple helix stakeholders — policymakers, academics, entrepreneurs, and the civil society. While enabling greater interactions and policy coordination, the effectiveness of such mechanisms **has been weak, both vertically** (across levels of governance and involving external stakeholders) **and horizontally** (across policy areas) and with a persistent silo approach in government that was difficult to overcome (Guzzo and Giannelle, 2021). In addition, there was **unclear attribution of responsibilities** in a multi-level setting, and management bodies responsible for promoting EDP lacked the autonomy to do their job (Guzzo, and Gianelle, 2021).

Second, while there is a large consensus that the adoption of EDP practices (at the design stage and over the policy cycle) contributed to make regional innovation policy-making processes more participated and evidence-based, improving communication and coordination amongst a broader array of actors, (Polverari, 2017; Marinelli and Perianez-Forte, 2017; Tripl et al., 2020) there is also evidence suggesting difficulties in engaging different types of actors. For example, a large survey targeted to public authorities (survey to 170 regions in 18 countries, with 71 valid responses by Guzzo et al., 2018) suggests that these participated processes favoured relationships with research actors and found difficulties in engaging the private business sector in the whole process (Marinelli and Perianez-Forte, 2017; Guzzo and Forte, 2019).

Evidence collected during the Peer eXchange and Learning (PXL) workshops organised by the Smart Specialisation Platform of the EU/JRC (Guzzo and Perianez-Forte, 2019) also suggest difficulties in engaging private sector stakeholders as well as suggesting lack of trust among the authorities and relevant actors. In addition, participants in these workshops pinpointed a lack of continuous political commitment at different levels and the need to re-think the responsibilities between different territorial levels of government and bodies. The same body of evidence also suggests that civil society has thus far not been well represented in these processes (Araguren et al., 2019; Grundel and Dahlström, 2016; Marinelli and Perianez Forte, 2017; Tripl et al. 2020) due to a number of barriers that need to be overcome (see Roman and Fellnhöfer, 2022). This may indicate an insufficient understanding of the heterogeneity of civil society organisations, of their different interests and motives for participation (Perianez Forte and Wilson, 2021).

On the other hand, according to Perianez-Forte and Wilson (2021) and Guzzo, and Gianelle, (2021), involvement of intermediary institutions to promote and facilitate stakeholders' participation in the entrepreneurial discovery process appears to be a key aspect, often overlooked by national and regional authorities.

In summary, in general, definition of S3 priorities through discovery processes was based on participated processes fueled by centralized efforts to assess the strengths and weaknesses of the regional economic structures, through quantitative and qualitative techniques and studies. Overall, the evidence on how governance changed with practices of EDP, point out that despite the adjustments, there was significant institutional resistance and rigidities to more open and participated process.

Box 2 illustrates how a semi-decentralised structure was adopted by the Euskadi Basque Country Agencia. In the Basque Country a strong commitment to the SDG 2030 Agenda originated a wider multi-stakeholder forum at the top which coordinates different working groups. Box 3 suggests how public participatory governance supporting EDP can be materialised through a series of different types of collaborative events for definition of priority-domains and to build transformational roadmaps and identification of specific actions.

Box 2 Basque Country Multi-Stakeholder Forum: quadruple helix interaction at strategic level.

In the period 2015-2020, monitoring of the Euskadi Basque Country 2030 Agenda and the generation of alliances were principally channelled through the **forums of the General Secretariat for External Action**: Inter-departmental Committee and Inter-institutional Committee, complemented with the sectoral forums attached to the different Ministries. The **Inter-institutional Committee on External Action** *united the Basque Government, the three Provincial Councils, the Association of Basque Municipalities (EUEDEL) and the Councils of the three Basque capital cities*. This framework of **inter-institutional alliance and collaboration** was embodied in the Euskadi Basque Country Multilevel 2030 Agenda, which selected 50 Targets and 258 Actions through which the Basque Autonomous Community institutions jointly contribute to the 2030 Agenda.

A new step

The 2030 Agenda is a commitment of the Basque Country, its institutions, its social stakeholders and of Basque society as a whole. **The creation of the Multi-Stakeholder Forum for Social Transition and the 2030 Agenda**, is yet another step forward in the projection of that commitment.

The report on action taken in the Basque Country around the 2030 Agenda and the Sustainable Development Goals describes a positive and constructive outcome, with respect both to achievements and to alliances, collaboration and governance. Based on this legacy, we now address the objective of updating and improving the mechanisms of inter-departmental and inter-institutional coordination and of public, private and social collaboration and participation.

The Multi-Stakeholder Forum for Social Transition and the 2030 Agenda has been created to achieve this. This is a meeting place between the different Basque Government Ministries, the three Provincial Councils, EUEDEL and the Councils of the capital cities and bodies representative of collaboration in the public-private sphere and of organised civil society.

The Multi-Stakeholder Forum will be articulated within a structure including the following bodies:



Source: Text taken from the 2030 Agenda, the Basque Country commitment. Multi-Stakeholder Forum for Social Transition and the 2030 Agenda

Box 3 - Rethinking EDP as a participatory process

Drawing on the work of Foray (2019) and on lessons learned from the first-cycle of S3 implementation in the regions of Alentejo and Algarve in the south of Portugal Laranja et al. (2021) prosed that EDP should not be taken one-time bottom-up process used to construct visions materialised in priority domains (see the top line on figure) and instead should be seen as a three steps process.

1. Identifying Priority domains - The identification of thematic priority domains is the starting point of EDP. The goal of this step is to make explicit what transformations are desirable for what sectors. A priority area would therefore include one (or several) sector(s) with a clear direction for change. At this first stage, public authorities, in particular national or regional government or innovation dedicated agencies, may have to drive the process and consult regional stakeholders to arrive at a first definition of priority domains.

2. Translating priority domains into transformational road maps - The conversion of each priority-domain into a more concrete transformational set of projects and actors – all committed to following the same direction of change – is the second step. This second step requires discovery of which specific problems and obstacles are preventing change and transformation. Discovery comes from experimentation through (collaborative) projects and prototypes in the attempt to find innovations with potential to scale, trigger imitation and related variety, thus potentially inducing longer term structural changes.

3. Implementing the roadmap - The third step centres on the implementation of the transformative activities. It involves mobilising and evaluating projects regarding their financing, designing feedback mechanisms, monitoring and attempting to maximise the informational spillover effects of entrepreneurial discovery – which is more important than ever at this stage.

Source: Laranja et al (2021)

Lesson 3 – Consulting and joining actors in the scope of relatively new governance structures, complemented by workshops and meetings were the main governance changes introduced as a consequence of S3 and EDP. However, these adjustments met significant institutional resistances and rigidities. Articulation of multi-level governance, engaging stakeholders in a continuous participatory process (in particular engaging civil society) and persistent lack of trust between public authorities and relevant actors were the main difficulties found during EDP implementation. This suggests that public authorities need to go further in changing from their traditional role of main policy-coordinator and fully adopt a new role of policy process facilitator, using more open and flexible governance modes.

3.4 The use of models and tools to support public participatory processes

Another important lesson learned from S3 implementation through the practice of EDP, is related to what kind of facilitation methods and tools were used in the participatory processes to support public governance. Public participatory governance processes here include the prioritisation process as well the refinement of priorities into sets of actors and activities.

In their assessment exercise of S3, Perianez-Forte and Wilson (2021) note that the use of participatory mechanisms to facilitate priority setting through EDP and refinement of the priority-areas during strategy implementation, was a key aspect. For example, thematic groups and workshops were very common and useful in allowing depth of discussion and exploration. Workshops were often targeted to specific priorities and sub-priorities to generate granularity and enhance niche knowledge (Perianez-Forte and Wilson, 2021). Already referred in the previous sections, governance structures such as innovation councils or advisory boards, partnerships and public-private committees were also taken as participatory models (Detterbeck, 2018).

Other modes of participation such as websites tailored for stakeholders and citizens participation and formation of working groups in each priority domain, were also common (Detterbeck, 2018; Laranja et al., 2020). However, there is little evidence of the adoption of stronger participatory modes such as co-creation models or methodologies based on action research, to support the quality of the participatory process and the engagement of all actors which to a certain extent may explain the difficulties in overcoming the resistances described in the previous section.

In Boxes 4, 5 and 6 we present concepts, principles and tools related to the practices of public participatory governance, that are needed to understand why previous participatory practices of EDP may be insufficient for the new transformative innovation policy approach.

In Box 4 we suggest that participation in public governance processes have different levels. The higher-level participatory processes referred as system co-design or co-governance, are particularly adequate in face of complex systemic challenges such as the case of “system level” change innovation policy. In addition, these modes of higher-level participation provide a means to increase accountability, transparency and active involvement of relevant actors (Fung, 2006; Addink, 2019).

Mobilizing and engaging actors in participatory processes for public governance is not however, straightforward. Different actors’ claims, their legitimacy and validity needs to be negotiated in the policy process. Participatory processes may also create or further expose existing conflicts and underlying tensions between different participants expressing opposing views. In addition, failure to involve groups who believe they should have been consulted may also lead to conflict and opposition (Uittenbroek et al., 2019). In Box 5 we suggest general principles for the use of participatory process in public policy governance.

Finally, there is a need to take into account that transformative change i.e., changing the structure of social-ecological-technical systems (Göpel, 2018) requires the reorganization of the connections and knowledge flows within the system in order to remove barriers that unblock the systems’ change. When knowledge is not widely shared (or when it is shared amongst the usual narrow group of stakeholders more directly involved with knowledge production) it hinders the capacity to discover and explore ideas with great transformative impact. Likewise, when evidences used are those that match pre-existing beliefs, capacity to change is diminished.

This is why there is a need to find ways to interact differently with a wider set of actors and to move away from seeking a predictable future. Transformative change requires to break the traditional division between analysis and action. One way to do this is to organise frequent meetings and workshop events that envision to listen and dialogue, generating rich information about the perceptions of the actors and communities, while

responding to ongoing initiatives. In Box 6 we propose different formats of collaborative events as well as group facilitation and visual tools that may be used to support the participatory change process.

Box 4 Levels of participation and engagement in Participatory Processes

Participatory public governance has different modes or levels in what regards how public authorities engage with and include participants in policy decision-making.

Here we outline four broad levels of participation in public governance that might be helpful to help characterise levels of participation in processes of “discovery” for smart specialisation strategies and for transformative innovation policies. Note that no process is participatory if the targeted participants (ultimately the general public) cannot find it. In all levels, participatory governance processes require strong public visibility complemented by deliberate efforts to create the opportunity for actors to participate, and efforts to obtain diverse views in a way that is equitable.

At the basic **level 1** of participation, we find the “**request for comment**” or “**consultation**”. Many existing participatory processes rely on a public request for inputs, suggestions or comments. Engagement at this level varies. While some consultations are published and disseminated through various channels, including online, others attempt to go further and proactively seek direct engagement with the public, particularly engagement with less obvious potentially interested groups.

At **level 2** we define “**participatory drafting**”. This is where a policy is still at an early conception phase, and public authorities invite participants to help with policy-design. Participatory drafting may capture some profound ideas, assumptions and experiences very early, that help to shape policies from the start in the right direction. However, the process may lead to quite a different direction than first anticipated.

At **level 3** we define “**system co-design and co-delivery**”. Levels 1 and 2 involved participants at different levels of influence, with increasing levels of flexibility in defining a direction for change. Genuine co-design and co-deliver is rare as it necessarily involves bringing different parties together on an equal position to determine shared goals and actually design and decide the way forward together. This means being very flexible on all aspects of the participatory process. Level 3 is therefore much more disruptive compared with levels 1 and 2 and therefore this is why it is rarely found in the public sector. However, “system co-design” may yield the best results in face of complex systemic challenges such as the case of “systems level change” innovation policy. When initiatives are co-designed and co-delivered, there is a profound impact through systemically motivated partners collaboratively working around common goals.

Finally at the top **level 4**, we define “**shared oversight or co-governance**”. The highest level of participatory public governance is based on taking “system co-design and co-delivery” even further and providing full access to oversight the ongoing public governance process. This requires full transparency and making all decisions widely available to public scrutiny. Co-governance implies the creation of co-governance structures fully accountable for the policy-making decisions.

Box 5 Key principles of participatory policy design and implementation

Higher level participatory processes need to address the following key aspects:

- Be widely disseminated and encourage participation.
- Define question(s), topic(s) or challenge(s) for group reflection and action.
- Create an environment for high-quality dialogic conversation, knowledge sharing and co-creation.
- Harvest the conversation.

Call for participation - With regards the first issue, all kinds of participatory processes need to be widely disseminated. In addition they require complemented by efforts to create the opportunity for all kinds of actors to participate. Participation is usually completely open i.e., participation starts with an open call for participation. This call for participation may already contain the questions or topics that need discussion. In this case the call question is itself a most important issue to convince and attract the relevant actors to participate. Alternatively, there may be no topics associated to the call to participation. In this case topics or questions for group reflection will be defined at the first stages of the process.

Promoting high-quality conversations - Participatory processes supported by collaborative events of various formats (see Box 6) usually encourage the use of “dialogic communication” i.e. a style of communication that respectfully encourages others to want to listen, while also listening in a way that encourages others to want to speak.

Dialogic communication is more than an exchange of ideas. It is a dialogue used to enact reflection processes that help elucidate complex challenges emerging in transformative innovation. It is often combined with techniques such as deep listening and mindfulness that help to develop and change consciousness (also known as conscientization) regarding the interpretive frames associated to the topics or challenges in discussion, as well with regards possible problems and actions or ways of thinking that shape these topics, problems and possible actions.

Dialogic communication between participants, also assumes that dialogue should emerge from an egalitarian process in which people provide arguments based on knowledge, and not on power claims. To help with these requirements there are a number of techniques. For example, participants should sit in circles (some events may use the fishbowl approach). Often there is a need to use a “talking token”. Visual tools such as different types of “canvas”, “boards” may also be used to support dialogic communication. Other important factors that influence the quality of the conversation are related to technical and logistic aspects such as:

- In order to maximise participation, there may be a need to divide participants in small groups (ideally groups of 6).
- Likewise, in order to cover all themes, there may be a need to divide the event time in “rounds” of conversation (e.g., 20 minutes) using different questions / challenges in each round. Different questions may be built round after round to focus the conversation or guide its direction.

Harvesting -Finally, harvest of a meaningful conversation is an essential component of participatory processes. While documentation, newsletter, audio or video, etc. may be used to follow up the process the most difficult harvest is the externalisation of implicit new insights, changes of perspective or mindset, shared clarity, new relationships and contacts, etc. In organisation of events that support the participatory process it is good practice to invite individual participants (often taken as spoken person of the groups where discussion took place) to share insights or other results from their conversations.

Box 6 Collaborative events and group facilitation and visual tools

The practice of public participatory governance, particularly at higher levels of participation, needs to be supported by different types of events organised either by the public authorities or by any of the interested groups of actors. The quality of participation and engagement can, however be greatly enhanced with the use of specific types of collaborative events, and during the events by the use of professional facilitators using group “facilitation” visual tools and methodologies.

Without being exhaustive, in following we suggest some general “group facilitation methodologies” that might be useful to use when organising “discovery processes” for definition of “common intent” and “acceptable change pathways” at the initial stages, or when organising discovery of specific problems and ideas for solutions. We also identify a number of boards and canvas that may be used in processes of design and implementation of innovation policies for system level innovation change.

1. Collaborative events

Open Space Technology - Open Space Technology is an alternative method to the usual organization of meetings, conferences or workshop formats, to use in organizations, communities, groups and networks. Open Space Technology is especially useful for complex questions, involving a wide variety of stakeholders and/or with a wide variety of interests. In addition is particularly helpful when there is potential risk for conflict and the time for decisions and action is very short. (<https://openspaceworld.org/wp2/>)

World Café - World Café is a structured conversational process for knowledge sharing in which groups of people discuss a topic at several small tables like those in a café. Some degree of formality may be retained to make sure that everyone gets a chance to speak. (www.theworldcafe.com/)

Art-of-Hosting - The Art of Hosting is a highly effective method of harnessing the collective wisdom and self-organizing capacity of groups of any size. Based on the assumption that participants will give their time and energy to what matters most to them, AoH joins techniques that promote high quality conversational processes. People are invited to step into a process and take initiative to solve common challenges that the group of participants face, while facilitators act as hosts. (www.artofhosting.org/)

Innovation Camps - In essence an “Innovation Camp” is an event (or a series of events) where groups of participants are presented with a common general challenge. They have to find a specific problem (in the scope of the wider challenge), define and extensively characterise the problem, as well as generate ideas, concepts (models) worth trying to solve the problem. Innovation camps usually “canvas” and “boards” as visual tools to support the process and have been extensively used in many different contexts including Entrepreneurial Discovery Processes for Smart Specialisation Strategies (Rissola et al., 2017) (<https://op.europa.eu/en/publication-detail/-/publication/ecbc234f-fccc-11e7-b8f5-01aa75ed71a1/language-en/format-PDF/source-64631795>)

2. Group facilitation and visual tools such as boards and canvas

MLP canvas – Multi-level Perspective of change canvas - Socio-eco-technical system mapping enables not only to identify the actors of a system, but also to see the connections and alignments. The idea is that mapping actors and linkages enables: a better understanding of the system; to develop a vision of pathways for change; and to identify constraints to more sustainable ways to meet social needs. (www.tipconsortium.net/resource-lab/)

Challenge-led System Mapping – Developed by the EIT Climate-KIC and the Transition Cities Project the “Challenge-led System Mapping Handbook” and its complementary “Visual Tool Box for System Innovation” provide valuable insights and visual tools to support group facilitation (Matti et al., 2020). (<https://transitionshub.climate-kic.org/publications/challenge-led-system-mapping-a-knowledge-management-approach/>) (<https://transitionshub.climate-kic.org/publications/visual-toolbox-for-system-innovation/>)

Pentagonal map for system analysis - The pentagonal map is a system analysis tool enabling to map system actors, materials and rules in relation to the following five system dimensions: Science, Technology and Infrastructure; Policy and governance; Investment and finance; Society and culture; Markets (www.tipconsortium.net/resource-lab/)

Responsible research and Innovation Policy Experimentations for Energy Transition (RIPEET) - Responsible research and Innovation Policy Experimentations for Energy Transition (RIPEET) is a Horizon 2020 project that developed a toolkit that may be useful for Responsible Research and Innovation in the context of Smart Specialisation practices in areas other than energy transitions. (<https://ripeet.eu/toolbox>)

Transformative Innovation Policy radar tool – The transformative innovation policy radar is a tool to help to reflect on which initiatives (projects, prototypes, programmes or policy) to experiment. The tool tests the intended initiative against the 6 guiding principles of transformative innovation: directionality, societal challenge, systemic change, learning and reflection, conflict versus consensus and inclusivity. (www.tipconsortium.net/resource-lab/)

Transformational roadmapping - Transformational roadmapping is a tool to help in a process of determining which projects, actions, steps, and resources are needed to take vision to reality. In the context of transformative innovation policy roadmapping should be taken as a process of transforming the initial vision of “acceptable change pathways” (direction of change previously defined into a set or portfolio of experimental policies, programmes, actions, projects. (www.cambridgeroadmapping.net/roadmapping-as-process).

Lesson 4 – Meetings, thematic workshops and websites appear to have been the most common event formats and tools used to support participatory processes. However, the level of participation and the quality of the participatory processes can be greatly enhanced through the practice of other models and tools. This involves the use of specific formats for collaborative events and techniques and tools for event facilitation.

3.5 Heterogeneity across entrepreneurial discovery processes

Evidence gathered during the first S3 cycle suggests that beyond little use of adequate tools to support governance of public participatory processes required for EDP, lack of skills and capabilities within the (regional/national) administration, significantly hampered the design of the strategy, and the ability to set up a “policy-mix” and manage the policy instruments (Guzzo et al., 2018; Guzzo et al 2019). In addition, not just the public administration and its intermediaries, but stakeholders participating in the process did not have the skills needed to take part in higher level participatory policy decision-making processes (Perianez-Forte and Wilson, 2021).

While EDP implementation was, quite different across EU Member States and regions (Kroll, 2015), challenges were especially felt in structurally weaker regions i.e., those with limited competences and institutional capacities to design and implement effective innovation policies (Morgan, 2018; Marques & Morgan, 2018; Hassink and Gong, 2019; Benner, 2019). In addition, McCann and Ortega-Argilés (2016) and Capello and Kroll (2016) pointed out that because developing regions have a less diversified business fabric and less qualified human resources, they faced higher difficulties in applying S3 principles.

In institutional terms, developing regions also tend to have more formal operating rules that are inadequate for opening up policy decision processes. In terms of governance, they have weaker government systems and tend to have less coordination and cooperation, higher misalignment between actors and lack of social capital. Developing regions also tend to obtain a more significant part of their funding through EU structural a Cohesion funds and/or from central governments, hence creating dependency relationships with other levels of government.

Unequal capabilities to implement EDP is a particularly pertinent remark for this study. If the practices of discovery and experimentation are not universal approaches applicable to all member states and regions, then their potential to address the green and digital transitions is significantly diminished.

Lesson 5 - EDP implementation was quite different across EU Member States and regions. This reflects remarkable differences in policy capacity, in particular with regards less developed regions. It is also associated to existing institutions, local cultures and historical experiences with innovation policy. It also suggests an opportunity to reinforce policy learning through specific training actions.

4 Summary and suggestions on how to improve the “discovery and experimentation” component of transformative innovation policies

Relative to the previous period, the next innovation policy cycle associated to the Cohesion funds programming period 2021-2027 requires significant policy making changes. S3 should now be aligned with the Green and Digital transitions and in our view, however without obligation for this, it should include a perspective of system level transformation geared towards the current broad ecological, social and human challenges. . We believe that the lessons learned from how the concept of EDP was perceived and applied are relevant to this new policy context. This is because processes of “discovery and implementation” are one key aspect of transformative innovation policies.

The first lesson relates to how the new concepts of S3 and EDP were translated or transferred into policy practice of entrepreneurial discovery. The evidence suggests EDP was defined as the S3 policy design process and as a support to follow up of S3 implementation, hence overlooking the realm of the concept which was the idea of having experimental activities and projects enabling to discover and test which innovative ideas and niche solutions would show industrial and economic transformative potential.

Transformative innovation policy is relatively new policy concept that represents a major policy making change that needs to be carefully explained to the policy making community. Practices of “system level” change applied to innovation and innovation policy require significant changes in policy making compared with previous practices. Beyond the need to adapt a more directional approach, understanding of how to go from broad challenges to the identification of specific issues and problems to be tackled by local actors and using higher level participatory processes, is a great challenge and a particularly difficult one for member countries and regions with lower policy capacity.

Just like when S3 was first adopted there is a risk of falling into a “weak transformative policy rhetoric”, meaning that these new concepts are adopted by the policy discourse, but remain much more difficult to effectively introduce into real policy practices.

In our view there is a need to improve communication and policy learning about the new concepts and about what changes in innovation policy making are required for implementing this new directional innovation policy. In particular with regards the changes that are required in discovery and experimentation processes, compared to previous practices of entrepreneurial discovery.

While the PRI Pilot Action will have a decisive role in this regard, there is a need to reinforce guidance and training in relation to the use of participatory processes in public governance and the use of social technology methods. Conceptual training workshops, as well as action-training initiatives led by experts who are familiar with the use of different collaborative event formats and facilitation techniques in the context of system level change and systems thinking, will be a key aspect for the practices of discovery and experimentation in this new cycle.

The second lesson to be carried forward, relates to how should initial priority setting be set and how should the priorities be defined. In this new cycle priorities should be taken as “directions for transformative change” i.e., acceptable transition pathways. This means that directions for transformation are not to be carried out vertically with respect to science domains, technologies, sectors, but need to be seen as broader policy agendas for change across sectors and across knowledge disciplines.

The shift in policy strategy making, required in this new context, goes beyond taking “priority domains” as directions for industrial change. What is required is a “challenge based” approach to ecological and socially driven priorities i.e., implying a vision of innovation that is no longer only industrial and technological but also environmental, social and organizational.

In this new context, we see no problem with broad definitions of change pathways. What we see, as mentioned previously, is the need for those definitions to entail a direction for system level change. In addition, we see a need for a clear distinction of the use of discovery as a participatory process for finding and defining transition pathways (priority domains) from the use of discovery as a process to refine these transition pathways at lower granularity levels i.e., to genuinely introduce the territorial dimension and define specific placed-based problems and challenges to be tackled by local actors. Note also that system level changes need to consider how we “sense” the different system components. While quantitative and qualitative evidences for understanding are still needed, but it is only when emotions are attached that systems change. That is: visions of acceptable change pathways will need to be supported by “sense making exercises” supported by social technologies. These methods are essential to help collectively build a common feel about which problems need to be tackled.

In addition, in this new cycle there is also a need to refine these transition pathways at lower granularity levels introducing the territorial dimension and defining specific place-based problems and challenges to be tackled by local actors i.e., a need to define what the PRI project names discovery processes by local missions - Challenge-Oriented Innovation partnerships (CHOIRs). At this second stage or second generation of more specific entrepreneurial discoveries use of tools such as “pentagonal map of systems analysis” and “transformational road-mapping” may be of great importance (see Boxes 5 and 6).

The third lesson to be carried forward relates to changes in governance of innovation policy. In the previous period practices of EDP contributed to make policy making more participated and explicit. Consulting and joining actors in innovation councils, focus-groups and workshops to support EDP in the previous S3 cycle is a good starting point for the requirements of this new policy context.

However, central design and control of policy implementation was still the prevailing mode of policy strategy thinking in many regions and member states (see Box 3 as an illustration). The new approach to innovation policy making requires a more decentralized multi-level governance structure, where large and broader initiatives of national scope are to be combined with regional specific and specialised initiatives at the local level. In addition, both national and regional government levels need to assume a less directive role. National or regional governments do not “own” the transformation strategy, nor do they direct the collaborative process underlying the discovery of transition pathways and related problems.

Public authorities need to change their role from main actors driving the strategy to knowledge brokers and facilitators, focusing their attention in removing barriers to systemic change so that researchers and entrepreneurs can discover, experiment and explore innovation opportunities. Establishing directions – pathways with transformative potential, and finding problems and solutions within these directions, requires higher level participatory processes i.e., processes where all actors are truly engaged and committed to collectively probe the future, co-discover, test and explore innovative ideas with transformative potential. System level change (the change process of complex systems) requires a higher level of engagement (see Box 4) from all types of actors in a long-term partnership with the objective of defining and agreeing on macro directions for change and micro problems calling the experimentation and prototyping of innovative solutions.

In our view, governance needs to be wider but at the same time needs to be deeper i.e., the new governance process requires:

- broader inclusion of actors in the policy process emphasising the involvement of civil society actors;
- more extensive horizontal coordination with other policy portfolios with central roles in societal purpose-driven transformations (such as environment, employment, education, industrial policy, etc.) as well as line (regional and national) ministries whose budgets play a key role in solutions deployment and demand articulation such as energy, health, waste, infrastructure etc.;
- higher levels of participation and engagement from all actors.

The fourth lesson follows from the required changes to governance. Wider and deeper processes of participatory governance need to be supported by different types of collaborative events and tools. Finding and defining acceptable pathways, as well as going from pathways to specific problems requires systems thinking i.e., identification and understanding the factors that make up a complex problem, and focus on developing an understanding of the change problems using system thinking tools such as “systems mapping”. Going from specific lower granularity problems to solutions requires design thinking approaches i.e., requires to develop a deep understanding of the problem from the point of view of those who feel it.

As referred earlier, there are different (more open) event formats that may greatly enhance dialogic communication and collaboration and therefore contribute to raise the level and the quality of the public participatory governance process. Some of the simplest mentioned include “Open Space Technology” or “World Café” but there are more sophisticated event format methodologies that go further in contributing to enhance the quality of dialogue (see Box 6). The use of these collaborative event formats supported by facilitation tools (and by certified facilitation consultants) will therefore be a key aspect to consider in the new context of transformative innovation policy.

Policy learning and the build-up of new policy capacities, not just with regards public authorities but including intermediate institutions and relevant actors, was a key aspect in the first cycle of S3 and again will be key in this new cycle. Many actors are not particularly familiar with systems thinking and system level change processes. While they may be willing to participate in the policy making processes, their full contribution will be undermined by lack of skills and resources.

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List of abbreviations and definitions

AoH	Art of Hosting
CHOIRs	Challenge-Oriented Innovation Partnerships
CoR	European Committee of Regions
EDP	Entrepreneurial Discovery Processes
ERDF	European Regional Development Fund
EU	European Union
IPCC	Intergovernmental Panel on Climate Change
JRC	Joint Research Centre
MLP	Multi-level Perspective
ODP	Open Discovery Processes
PRI	Partnerships for Regional Innovation
RIPEET	Responsible research and Innovation Policy Experimentations for Energy Transition
R&D	Research and Development
RTOs	Research and Technology Organisations
SETS	Socio-ecological-technical system transitions
S3	Smart Specialisation
S3P	Smart Specialisation Platform
TO1	Thematic Objective 1
UNEP	United Nations Environment Programme

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