Atlantic Social Lab

Cooperation for the promotion of Social Innovation

CAPACITIES FOR TRANSFORMATIVE SOCIAL SYSTEMS INNOVATION:

A TENTATIVE FRAMEWORK FOR PUBLIC POLICIES

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1. INTRODUCTION

1. INTRODUCTION

Policies aligned with the Sustainable Development Goals (SDGs) are becoming increasingly popular. That is policies and policy-making methods that are environmentally and socially responsible. The importance of policies that bring together two different policy domains - the science, technology and innovation policy domain and the social innovation or social development policy domain - has been further reinforced by the recent COVID-19 outbreak. Policies for systemic change towards more sustainable and equitable societies can be integrated across these two policy domains. These system-level processes of change, or transformative processes, are shaped by and depend on a variety of factors, have specific dynamics and require collaborative efforts at the individual and organisational levels.

The ideas stated in this report underline a belief that humanity is not a slave to its path dependencies or current circumstances and trends and that conscious transformative change is possible. However, questions remain about the capacity of current societies to bring about deeper structural and systemic change at the pace required to address current major societal challenges (Fazey et al., 2017). The current societal challenges, such as climate change, inequality, and migration, are wicked systemic problems that cannot be solved by a technological innovation or social innovation policy agenda alone. Assuming that social and technological change is to be and can be managed anyway. In that case, this also raises the question of what capacities are needed to define the direction of change and to initiate, drive and facilitate change processes.

Capacities can be thought of as skills or the ability to do something. In our approach, capacities are not only individual capacities, *i.e.*, something individuals learn and practice. They can also be group practices and organisational capacities, *i.e.*, capacities of economic sectors, value chains, and regions.

Although scholars from the public administration literature highlight the importance of capacities for policy (Painter and Pierre 2005; Andrews et al., 2017; Wu et al., 2018), policy capacities specific to transformative innovation policy remain under-conceptualised (Borrás et al., 2023). In addition, while most policymakers would acknowledge the need for broader agency and mobilisation of actors, in many cases, they address social and environmental challenges using the common policy orthodoxy - which in most cases means strengthening the role of the public sector and traditional top-down policy plans, ensuring that the choice of priorities is well informed by evidence-based analysis, and reducing policy implementation to the control of whether public budgets move according to set targets (Andrews et al., 2017).

The promotion of decentralised policy agency and the "engagement" of a wider range of actors in transformative systems level change is a difficult task (Grillitsch et al., 2019), requiring new policy capacities that public authorities and agencies charged with the design and implementation of new systems change policies may not have. Comparatively little attention has been paid to "how" to implement such broader systems-level transformations and which policy models and capacities public authorities, intermediaries and private sector participants should learn to make a productive contribution to long-term change. Without capacitating the policy-making community, we do not know whether the success or failure of these new policy frameworks stems from the quality of the policy model or from the willingness and political capacity of existing institutions, intermediaries, and actors to implement it (Andrews et al., 2017).

Moreover, even if these new policy frames are supported by policy guidance, playbooks and even 'toolkits' to support the adoption of transformative innovation policy, this may be insufficient to support learning and new policy capacity building, especially if there is no clearer idea of what skills and capabilities are needed to lead or drive the transformative policy process (e.g., Pontikakis et al., 2017).

The reflection developed in this report recognises a considerable diversity among the revised epistemologies in terms of the exact subject addressed (whose capacity?) and the purpose sought (capacity for what?). While some of the areas of study focus on the awareness of system change at the individual level, others focus on the process of system change dynamics. However, the aim is to find commonalities and insights into what constitutes system-level change dynamics and the capacities that appear to be associated with such long-term processes.

In the approach presented here, transformative capacity to deal with major societal issues cannot be limited to the capacity of public authorities, and we, therefore, see our subject 'capacity' as spread across many different actors, influenced by how they interact and by the context in which they operate. This collective capacity is a 'concerted agency' in which public and private actors need to work together to address the challenges facing society.

The overview of different streams of literature informing systems change dynamics and transformative capacity is not, however, a systematic review. Therefore, by definition, it is limited, biased, and largely based on the authors' understandings and perceptions of these different streams of literature and of the gap in connecting existing research to the question of "capacity" for transformative societal change.

This report is part of the project EAPA_246/2016 Atlantic Social Lab (ASL) - Atlantic Cooperation for the Promotion of Social Innovation, a project co-funded by the European Regional Development Fund (ERDF) through the INTERREG Atlantic Area Cooperation Programme. The ASL project aims to develop and promote social innovation to address emerging key social problems. Social innovation is, in this context understood "as an idea that deliberately attempts to better satisfy explicit or latent social needs and problems, resulting in new or improved capabilities and in the transformation of social and power relations, aiming at social change and the establishment of new social practices that positively affect the lives of individuals" (Pinto et al., 2021, p. 65).

The report is structured as follows. While section 2 briefly reviews concepts of 'state and policy capacity', section 3 reviews the literature on transformation and transition studies to define capacity in relation to transformative policies and the dynamics of system-level change. This allows section 4 to identify a preliminary framework of what capacities are needed and when (at what stages of the process). Section 5 summarises and discusses the main findings.

2. STATE CAPACITY AND POLICY CAPACITY

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The capacity of governments to design and implement effective policies is challenged by the increasing complexity of contemporary policy problems and rising public expectations. In development economics and public administration, the concepts of "state capacity" and "policy capacity" have become very popular.

"State capacity" can be defined as the ability of a government to achieve the policy objectives it intends to pursue (Lodge and Wegrich, 2014). State capacity is a multi-dimensional concept that seeks to capture the quality of public organisations and how they relate to one another (Lodge and Wegrich, 2014; Khemani, 2019). The concept takes into account public sector innovations that have sought to add problem-solving capacities to government, considering key areas such as infrastructure, social welfare and social integration. It also includes different types of capacity needed to promote and sustain innovative problem solving, such as regulatory, coordination and implementation capacity.

However, state capacity has usually been associated not with societal change but with economic performance (Hamm et al., 2012; Dincecco and Katz, 2012) and the ability of states (especially smaller states) to maintain their autonomy and 'sovereignty' against the growing power of global multinational corporations and supranational economic and political organisations. One exception is Linda Weiss (1998), who argues that state capacity is key to the adaptability of states in responding to the profound challenges society face.

Macro-level state capacity does not exist in a vacuum, however. It is related to the skills and competencies of individuals and institutions involved in policy design and implementation. Political capacity is a different concept that aims to capture what these capabilities are and who possesses them. However, there is no single definition of policy capacity and there are few systematic efforts to operationalise and measure it (Wu et al., 2018; Painter and Pierre 2005).

First, there is little agreement on the scope, *i.e.*, whether the concept of policy capacity should be limited to the capacity of a government (including its public service agencies) or extended to the parastatal, non-governmental and private sectors.

Second, there is also considerable debate about which dimensions should be included in the concept. Some scholars use narrow definitions, arguing that political capacity is concerned only with the availability and quality of certain skills that support decision-making (Painter and Pierre, 2005, p. 2). These include skills related to the acquisition and use of relevant policy evidence (data, indicators), the application of both qualitative and quantitative research methods to policy problems, the ability to formulate policy options, and effective skills in policy communication and stakeholder engagement (Howlett, 2009). However, other scholars use a broader definition, arguing that it should include not only skills in analysing policy problems and formulating policy but also skills in efficiently implementing preferred policy options. Andrews et al. (2017) distinguish between strong and weak policy capacity. Strong capacity is associated with implementation and the ability of policy actors to take actions that promote policy objectives, while weak capacity is policy design capacity that is divorced from implementation. The authors also distinguish between ideal capacity, policy-compliant capacity, and actual capacity (Andrews et al., 2017, p. 84).

Perhaps one of the most widely used general frameworks is that proposed by Wu et al. (2018). In this framework, policy capacity is defined as the set of skills and resources - or competencies and capabilities - required to perform policy functions. The skills or competencies are divided into three types: analytical, operational, and political. Each involves resources or capabilities at three levels: individual, organisational, and systemic – table 1.

Table 1. **Policy capacity: Skills and resources**

Levels of resources and capabilities	Skills and Competences: Analytical	Skills and Competences: Operational	Skills and Competences: Political
Individual	• Knowledge and skills in policy analysis and evaluation	• Expertise in planning, staffing, budgeting, delegating, directing, and coordinating	• Knowledge about policy process and stakeholders' positions • Skills in communication, negotiation, and consensus building
Organizational	• Availability of individuals with analytical capacity • Machinery and processes for collecting and analysing data • Organizational commitment to evidence-based policy	• Organizational commitment to achieving goals • Availability of fiscal and personnel resources • Coordination of internal processes • Performance management • Administrative accountability	• Legitimacy of the policy process • Processes for stakeholder engagement • Access to key policymakers
Systemic	• Systems for collecting and disseminating information • Access to competitive policy advisory systems • Political support for rigorous policy analysis and evaluation	• Inter governmental and inter-agency coordination • Coherence of policy communities and networks • Clarity in agencies' roles and responsibilities	• Political accountability for policies • Trust in government • Participation of non-state actors in the policy process • Presence of policy entrepreneurs

Source: Based in Wu et al. (2018)

While the concepts of 'state capacity' and 'policy capacity' provide useful insights into the different types of capacity needed at different ontological levels (individual, organisational and systemic), they do not consider capacities that are specific to long-term broader social-economic transformation processes. In addition, when political processes are linked to longer-term and deeper, structural societal transformation capacity cannot be limited to government capacity (and intermediaries).

In our view, overcoming current ecologically harmful socio-economic and socio-technical practices (Laranja and Pinto, 2022) and breaking out of strong path dependencies and lock-in effects (Göpel, 2018) requires longer and complex societal transformation processes and the involvement of a large number of diverse stakeholders (and actors in general) in multiple sectors, including citizens.

3. TACKLING WICKED PROBLEMS: THE DYNAMIC PATTERNS AND CAPACITIES FOR TRANSFORMATIVE SYSTEM CHANGE

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Transformative capacity is needed for a system-level change that addresses the current complex and interdependent needs of social and environmental problems. Understanding the distributed agency functions performed by public and private sector actors, in conjunction with the underlying dynamic processes and mechanisms that drive long-term transformative system change, is fundamental. Models of these dynamic processes can be *awareness-based* or *process-based*. Awareness-based models focus on the need to change the internal conditions and mindsets of individual actors so that they learn to see system-level problems that they do not see, *i.e.*, models that help to change the way individuals think and interact with the system. Process models are prescriptive models of the dynamics of the change process.

In what follows, we review and synthesise the literature on consciousness and process-based models and frameworks to understand different types of 'capacities' associated with the dynamic patterns and mechanisms of system-level change. As mentioned in the introduction, this reflection acknowledges the differences in subject (who owns the capacity?) and functions (capacities for what?). While the authors are sensitive to ontological differences, *i.e.*, capacities at individual, group, organisational, and supra-organisational levels, their focus is on processes and capacities at the organisational level.

Transformative Social Innovation

While social innovation can be seen as changes in social relations, transformative social innovation (TSI) is understood as a process by which innovation changes the dominant societal values and behaviours, *i.e.*, changes with sufficient 'breadth and depth' to influence and sustainably change the broader institutional context (Avelino et al., 2019). Therefore, over time, social innovation initiatives with greater impact can collectively lead to structuration, *i.e.*, institutionalisation processes through which institutional changes emerge and become more widely embedded.

According to David Stroh (2015), when actors (social innovation agents) have a shared vision or aspiration for the future and a shared and deep understanding of where they are now and why, they establish a creative tension that moves them to change things in the desired direction. Using examples from social innovation, Stroh proposes a dynamic model of system change divided into 4 stages.

1. Build a foundation for change and affirm their readiness for change;
2. Clarify current reality at all levels of the iceberg and accept their respective responsibilities for creating it;
3. Make an explicit choice in favour of the aspiration they espouse;
4. Begin to bridge the gap by focusing on high-leverage interventions, engaging additional stakeholders, and learning from experience.

The first step is to lay the foundations for collective transformative action. This involves engaging key stakeholders in co-creating shared visions for the future and building capacity to work together. The second step is to build a shared understanding of what is happening in the system and why, and to accept people's responsibility for the current reality. This requires a change of mindset. The third stage is about helping people to make an explicit choice for what they really want, becoming aware of the costs and benefits of achieving their vision for the future. The fourth stage is about transformative action. It is about helping stakeholders bridge the gap between the future they want and where they are now. To do this, they need to identify leverage points and focus their efforts on those few coordinated actions with a high potential for transformative change and impact at the system level.

In an interesting social innovation research study conducted in partnership with the City of Onkaparinga (Australia), Zivkovic (2013) proposes a collaborative model using Complex Adaptive Systems theory - CAS and therefore focusing on 'emergent' behaviours (Holland, 2006). Complex Adaptive Systems (CAS) have three characteristics (Dooley, 1997): The first is that the system consists of semi-autonomous heterogeneous actors, and each makes decisions about how to behave. The second characteristic is that the actors interact with each other in an interdependent way to produce system-wide patterns. This interaction leads to the third characteristic - 'emergent behaviour'. CAS sees organisations and society as systems that adapt their behaviour to changes in the environment. This adaptive response

feeds back into the system and modifies it. As a result, organisations and society need to adapt again, generating further feedback. The key point in CAS is that it is impossible to understand the whole system by looking at its individual parts, and that the collective emergent patterns that characterise CAS are what drive transformation processes.

To facilitate "emergent behaviours" Zivkovic (2013) proposes different kinds of activities that help to create the conditions for the different behaviours to emerge - see Table 2.

Table 2. **Unlocking complex adaptive system dynamics for social innovation**

Focus Areas	Intervention Characteristics
Create a disequilibrium state	• Highlight the need to organise communities/ecosystems differently • Cultivate passion for action • Manage initial starting conditions´ • Specify goals in advance • Embrace uncertainty • Surface conflict • Create controversy
Amplify Action	• Enable safe fall experimentation • Enable rich interactions in relational spaces • Support collective action • Partition the system • Establish network linkages • Frame issues to match different perspectives
Encourage Self-Organisation	• Create correlation through language and symbols • Encourage individuals to accept position as role models for the change effort • Enable periodic information exchanges between portioned subsystems • Enable resources and capabilities to recombine
Stabilise feedback	• Integrate local constraints • Provide a multiple context perspective and system structure • Enable problem representations to anchor in the community • Enable emergent outcomes to be monitored
Enable Information Flows	• Assist system member to keep informed and knowledgeable of forces influencing their community system • Assist in the connection, dissemination and processing information • Enable connectivity between people who have different perspectives on community issues • Retain a reuse ideas knowledge and ideas generated through interaction

Source: Zivkovic (2013); Lichtenstein and Plowman (2009)

Beyond the dynamics of system change, social innovation studies also provide valuable insights into the different types of individual and organisational-level capacities needed to solve complex social problems. David Stroh (2015) suggests that identifying stakeholders and designing strategies to engage them individually and collectively is a key aspect. Establishing common ground or shared purpose by creating an initial shared vision of ideal outcomes, and an overview of what is not currently working, also helps. Another fundamental skill is the ability to work together. This involves developing skills in systems thinking, deep listening and having productive conversations about difficult issues. Skills such as taking responsibility for the current state, identifying positive feedback, calculating the costs of change, road mapping and continuous monitoring and learning have also been fundamental to social innovation (Stroh, 2015).

Building on recent Transformative Social Innovation (TSI) theory, Strasser et al. (2019) propose a conceptual framework to better understand transformative impact and transformative capacity. The authors broadly define transformative system-level capacity as the ability to translate transformative potential into transformative impact and define three dimensions of transformative capacity.

Firstly, diffusion capacity is defined as the extent to which ways of doing, organising, framing and knowing - DOFK - are influential across different geographical and cultural contexts or societal sub-sectors. Transformation can occur at different levels of scale or in different contexts. What may be transformative at one level of context (e.g., an individual or organisation) may not be transformative at another level (e.g., the economy as a whole).

Second, deepening capacity, defined as how ways of DOFK doing are embedded in formal structures such as policies, incentive mechanisms, legal codes, as well as in cultural values, mental models and worldviews. Social change can occur at different levels of depth, in terms of incremental, reformative or transformative change.

Third, sustainability is defined as the persistence with which ways of doing things are reproduced over long periods of time, while evolving to adapt to changing conditions. Some changes are temporary or easily reversed.

Finally, in their study case of the J.W. McConnell Family Foundation, Moore et al. (2015) suggest that one important capacity is accelerating and scaling promising initiatives to achieve positive social impact and systemic change. The authors suggest a range of scaling mechanisms for social innovations, including replicating and adapting social innovations in new settings, influencing cultural values, narratives and beliefs, and changing broader laws and policies.

Urban Studies

The urban studies literature sees urban transformation towards sustainability as a multi-actor process and cities as geographical and administrative entities within a multi-level governance system. Therefore, this literature refers to 'governance capacity' for transformation and 'distributed agency' and suggests specific types of capacities. For example, Hölscher et al. (2019) use four different types of capacities to categorise urban policy capacity for systemic change across scales and sectors:

- Stewarding capacity - the capacity to anticipate, protect and recover from uncertainty and risk;
- Unlocking capacity - identifying and dismantling unsustainable path dependencies;
- Transformative capacity - the capacity to enable, diffuse and embed radical innovation and;
- Orchestrating capacity - the ability to coordinate multi-actor governance processes.

Similarly, Wolfram (2016) proposed an integrated framework that maps ten interdependent key components of urban 'transformative capacity' and identifies requirements for their development - Table 3.

Table 3. **Interdependent components of urban transformative capacity**

C1	Inclusive and multi form urban governance
C2	Transformative leadership
C3	Empowering CoP
C4	Systems awareness
C5	Sustainability foresight
C6	CoP experiments

C7	Innovation embedding
C8	Learning and reflexivity
C9	Agency levels – individual, household, group, organization, institutions
C10	Site, neighbourhood, district, city, region, nation, transnational

Source: Wolfram (2016)

Social learning practices and methods (C8) are an essential component required to feed the outcomes of components (C4-7), which include the use of systems analysis to understand change dynamics and path dependencies. This learning feeds back into governance, leadership and community empowerment (C1-3), for example through collective reflexivity and monitoring of systems change. Most importantly, the urban transformative capacity framework proposed by Wolfram (2016) also considers the levels of scale (local to global-C9) and agency (individual, household, organisation, association-C10) associated with system change.

Resilience and Social-Ecological Systems Thinking

Resilience approaches draw on expertise in human ecology, ecological economics, complex systems, and political and social sciences to understand how human communities and their associated social-ecological systems respond and adapt to changes in their environment. Resilience is usually defined as the ability of a social-ecological system to return to equilibrium after an external perturbation (Berkes et al., 2003). Non-linearity in resilience studies is seen in threshold effects, while irreversibility means that the system has changed to such an extent that it cannot return to its original state.

The most common understandings of resilience are the ability of a system to maintain its structure in the face of external shocks and disturbances (resistance, without losing stability) and the ability to recover (recovery, returning to the previous equilibrium point). These two strands of resilience are essential for bouncing back, *i.e.*, for returning to "normality". But resilience can be more than this. It should also be understood as the ability to "adapt", to come up with new responses based on existing structures and capacities (adaptation and adaptability). And the generation of completely new ways of changing the structure itself (renewal of the system's strategy and capabilities). The last two types are crucial if you do not want to return to the previous "normal" - because "normal" is part of the problem. They are the sources of the leap forward, creating a "new normal" - transformation.

A resilient response requires different resilience capacities (Giovanni et al., 2020). The "bounce back" understanding can be particularly effective for minor perturbations, but in the face of deep shocks with strong impacts, which are deep systemic failures, a "bounce forward" transformation is needed.

In resilience studies, the concept of capacity is usually seen as an interplay between 'adaptation', 'adaptability' and 'transformability'. Adaptation can be understood as the ability to respond to an economic shock by returning, at least in the short term, to a preconceived development model that may have been successful before the shock. It reflects an inherent tendency of systems to follow the path that has been successful in the past. Adaptability arises from opportunities or decisions to abandon a path that may have been successful in the past in favour of a new, related or alternative trajectory or niche. This involves a number of substantive challenges in developing the capacity and tolerance to deal with the cognitive uncertainties, economic inefficiencies and political unpopularity of moving from an established to an alternative regional niche. It is the combination of these two types of capacity that gives rise to the resilience concept of "adaptive capacity" (Folke et al., 2003; Dietz et al., 2003). Transformability is the logical step forward, the ability to innovate and build a new type of resilience "when ecological, economic or social (including political) conditions make the existing system untenable" (Walker et al., 2004; Folke, 2016).

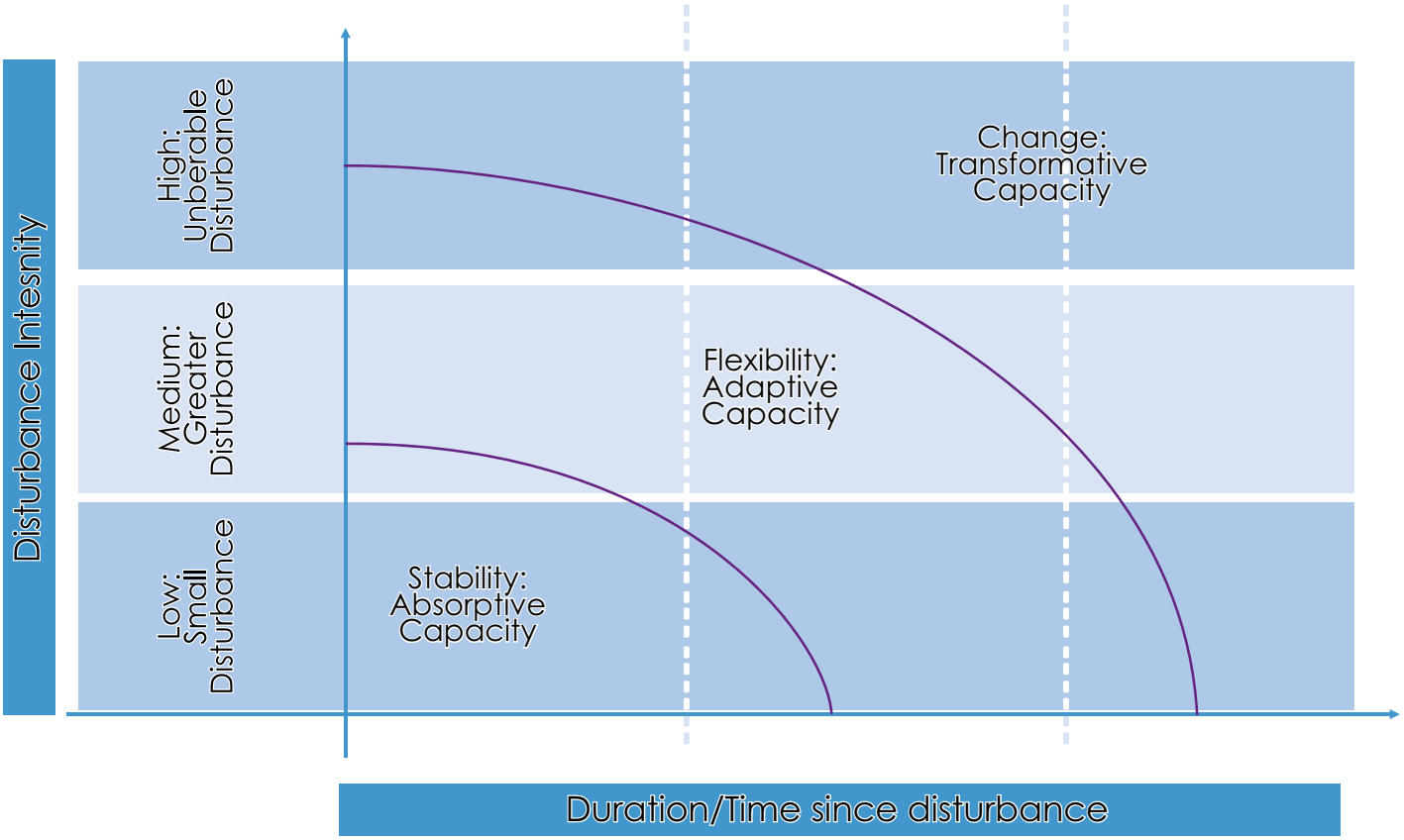

Figure 1. **Resilience capacities and disturbance intensities**

Source: Giovanni et al. (2020)

Following contributions based on Evolutionary Economic Geography (see Pinto, 2018), resilience is seen as a non-equilibrium adaptive capacity to undergo anticipatory or reactionary reorganisation to minimise the impact of destabilising shocks and create new growth pathways. Resilience is a characteristic of complex adaptive systems. This means that, although the mechanisms are still unclear, there is a relationship between resilience at different levels. The resilience of a country is not independent of the resilience of its regions, communities, organisations and individuals. And vice versa. It is therefore essential to think and act at different levels. Resilience is driven by two (opposing) forces. Innovation, as the exploration of new ways of doing things. And reproduction, as the set of self-reinforcing habits, routines and institutions based on existing economic activities and ways of doing things that enable adaptation to external shocks and create path dependencies and lock-in effects. It is a dynamic phenomenon. What can be seen as a sign of resilience, such as resistance or a quick recovery, may not have lasted long and may create serious vulnerabilities in the longer term or for the next shock.

Theory U

Theory U (Scharmer, 2016) is fundamentally an awareness-based model that can be understood in three ways: as a framework for systems thinking, as a method for leading change, and as a method for individuals to connect with their higher-self. Theory U is based on the idea that the quality of the outcomes created at any level of systems change is a function of the quality of awareness, attention or consciousness that the actors in the system have of themselves and of the system (Sharmer, 2016). In other words, the outcomes created are a function of the levels of consciousness from which the actors operate.

The U-Process - see Figure 2 - is based on the belief that individuals can gain insight into their most intractable problems, large and small, by cultivating individual capacities and the right conditions. Too often actors respond to challenges by replicating the solutions they are most familiar with, *i.e.*, 'reacting' or 'doing more of the same'. However, complex challenges require a more thoughtful approach, one that creates the conditions for insights to emerge and move from 'reacting' to ' generating'.

To create the conditions for systemic change, the U-Process outlines three 'phases'. Each of these phases - Sensing, Presenting and Realising - involves using specific spaces for reflection and tools to support specific types of learning.

- Sensing is about seeing the whole system in which actors are part of. Today's grand challenges are so complex and fast-moving that it's difficult to understand how they affect communities (or socio-economic systems). Without a picture of the whole system, stakeholders end up arguing from their specific positions of 'truth'. Sensing involves using our senses rather than relying only on evidences of the past or second-hand data and information. Sensing is also about suspending our judgments, opinions, assumptions and mental models and using our eyes, ears and bodies to sense into the context of the system.
- Presencing is the phase where participants find their own relationship to the whole system, opening up to the question of what the current situation demands and what roles each actor wants to play. Usually, actors tend to objectify problems as something separate and distinct from themselves. In doing so, they forget that they are an active part of the systems they're trying to change, and therefore it becomes difficult to understand systemic change without considering their own role in the process. This engagement is usually difficult to practice because actors involved in change processes tend to have their favourite theories, tools and ideas about what is needed, and resist moving into uncertain territory and surrendering to a new unknown system state that is about to emerge.
- Realizing begins when actors have an idea (a vision) of what role they want to play in the system change process and how they will contribute. All actors have a direction, and as the details of each specific contribution need to be developed, actors (alone and/or in collaboration) should build and test prototypes. The learning involved in this phase requires a 'fail often, fail early' approach. By making many small mistakes early in the process, rather than one catastrophic mistake later, actors should go through a repeated learning cycle. This cycle can go on for a long time, but eventually, new successful practices emerge and become institutionalised.

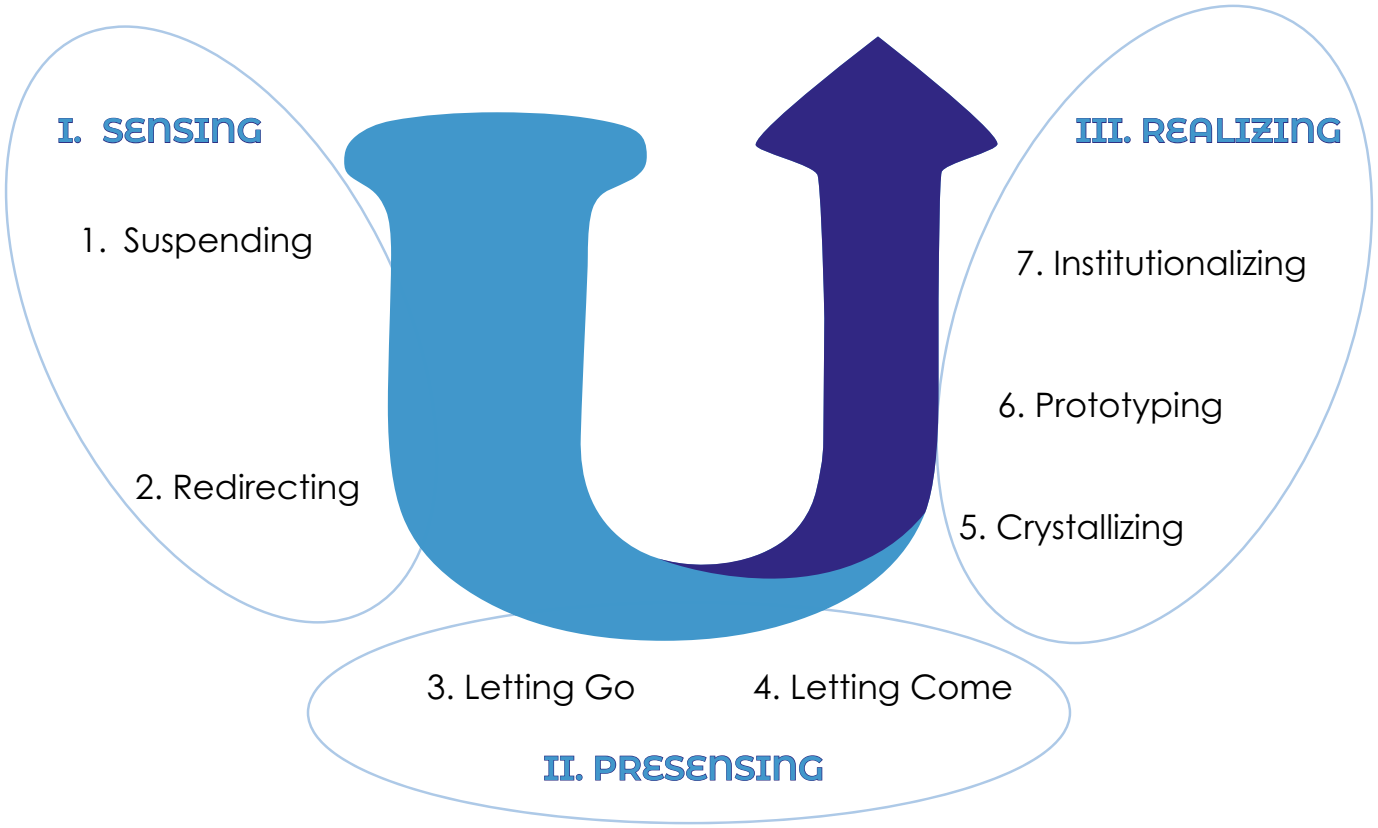

Figure 2. **The U-process**

Source: Scharmer (2016)

The U-process (sensing, presencing and realising) requires seven capacities, most commonly thought of as person-individual level capacities or group capacities (Sharmer, 2018).

Suspending judgements is required to be able to sense and 'uncover the current state of the system'. Often our judgements about things cloud our ability to see accurately. In practical terms, suspending judgement means being aware of your own personal lenses and biases, *i.e.*, being aware of how and when your mental models affect your perceptions. If actors can't suspend judgement, they will end up simply projecting their own stream of thoughts, ideas and concerns onto a situation rather than shedding light on it. Suspending judgement is a prerequisite for reorientation.

Redirecting is the ability to listen and see from different positions. Usually, actors listen and see from their own position. They need to learn to look at their own systems from the edge, rather than from where they are. The ability to redirect means expanding our sense of place and time.

Letting go is the ability to be open to new ideas. Actors often believe, sometimes unconsciously, that if others had adopted their positions or solutions, there would be no systemic problems. The practice of letting go requires overcoming the fear of the unknown while embracing whatever it is that wants to emerge.

Letting it come is a uniquely difficult skill because it represents a shift to action, and all action is a commitment of some kind. It, therefore, requires the capacity to generate new ideas and understandings of each actor's vocation and function in the system.

Crystalizing is the ability of each actor to clarify what they want to create, *i.e.*, to move from a general, imprecise idea to a more detailed action design. It is also a capacity to commit to the vision and outcomes of the change process.

Prototyping is the ability to learn iteratively by trial and error, making many small mistakes early on in a controlled space. It is the ability to try, evaluate and learn from an idea. By failing fast and failing often, actors learn more. Prototyping helps to avoid the paralysis of inaction - paralysis by analysis.

Institutionalisation is the ability to spread social innovation throughout society so that it becomes institutionalised. It is the ability to take a new practice from a small group of people to a common practice among millions. It is not just an individual capacity but a process of widespread adoption of new cultural and social practices and behaviours.

Sustainability Transitions

Drawing on evolutionary economics and sociology of innovation, scholars in this field argue that current social and environmental challenges cannot be addressed by incremental improvements and technological fixes but require radical shifts to new kinds of socio-technical systems that perform core societal functions of production, consumption and end-use (Steward, 2012; Grin et al., 2010). Socio-technical systems are complex systems of aligned technologies, knowledge, infrastructure, markets, governance and regulation, culture and industrial structures that interact, reinforce and co-evolve, e.g., energy systems, food, mobility, health or water.

Research on sustainability transitions focuses on how these socio-technical systems are organised and function (e.g., physical and economic infrastructures, institutions and individual behaviour) and how their process of change is shaped by institutional, technological and socio-cultural contexts in terms of identity, legitimacy, actor coalitions, power relations and resources. A well-known model for socio-technical system level transformation is the so called MLP – Multi-level Perspective model (Geels, 2002; Schot and Geels, 2008).

This multi-level perspective reflects that transformative change or transitions in specific sub-sectors (e.g., low-carbon energy transitions, mobility transitions) result from the evolution and interactions between three levels - see Figure 3. An important theme in this model is the struggle between emerging niche innovations and established regime systems, against the backdrop of exogenous "landscape" developments (Geels and Turheim, 2022). Furthermore, transitions are collective processes that span the entire production-consumption chain.

At the highest level, exogenous 'landscape' developments include globalisation, urbanisation, climate change, but also societal values, political ideologies, economic crises, pandemics, natural disasters, etc. At an intermediate level, change refers to how the dominant regime evolves, *i.e.*, how the institutions,

technologies, markets, rules, norms and routines that give a system its structure change over time. Socio-technical regimes tend to be stable and evolve gradually. However, global trends sometimes create tensions and destabilise dominant systems, opening windows of opportunity for deeper change. At the lower level there are new individual actors, their organisations and their product-market niches.

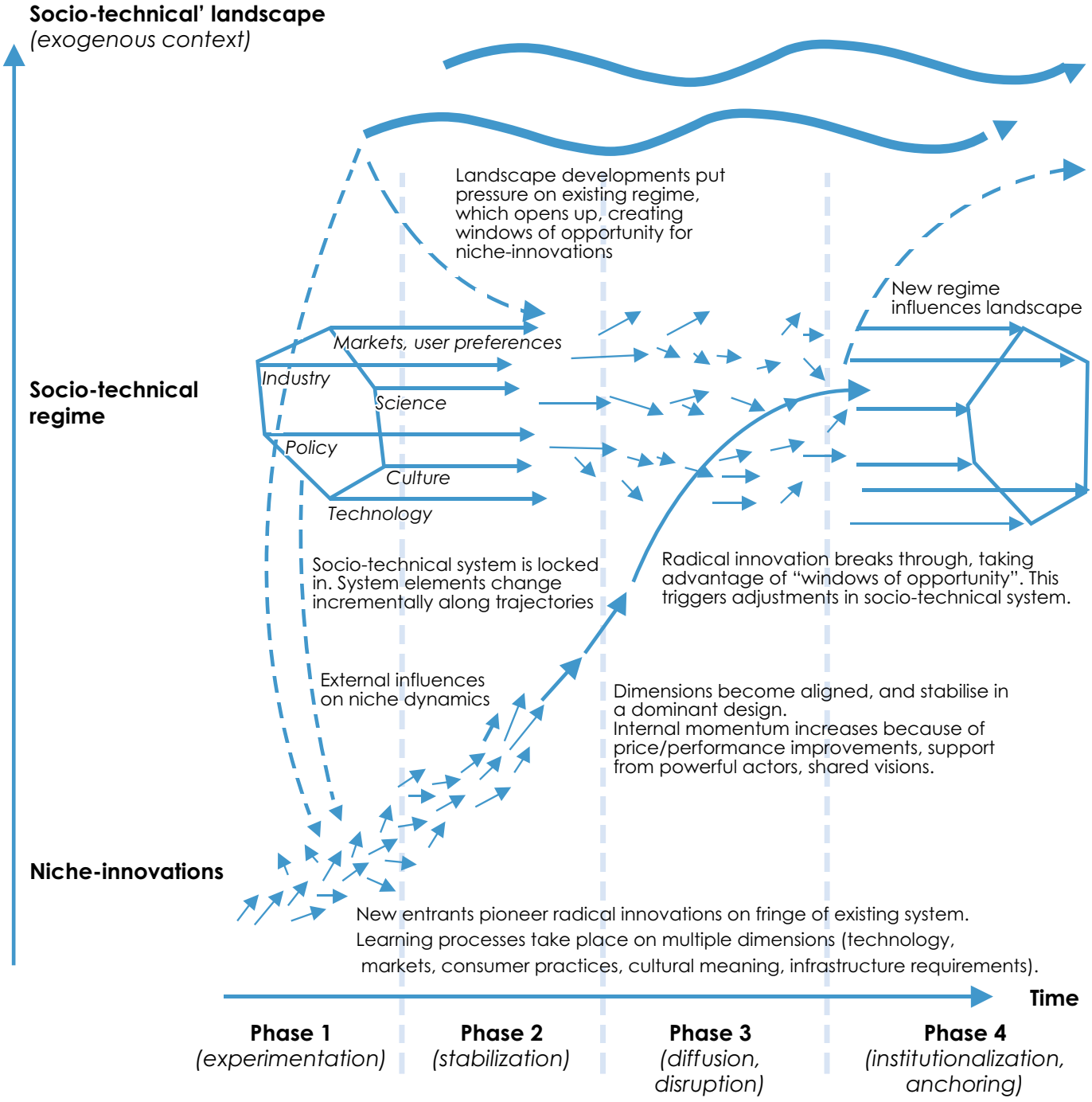

Figure 3. **Multi-level Perspective of Socio-Technical Transitions**

Source: Geels, 2002; Shot and Geels, 2008

According to the MLP model, socio-technical transitions unfold over time through four phases. The first phase involves discovery and experimentation, with the aim of generating radical innovations that emerge in small niches, promising viable alternative solutions that can contribute to the reconfiguration of the system. Examples in the energy system are energy co-operatives that establish collective

energy practices with solar energy, which can be scaled up and contribute to broader behavioural changes. This first stage can result from strong policy incentives and the definition of change directions that frame trial-and-error innovation experiments that lead to discoveries with transformative potential. In the second stage, these small niche innovations build internal momentum and face resistance from existing entrenched systems. In the third phase, the pressure exerted on the system by the newly discovered niche innovations can help to further destabilise the existing systems, thereby fuelling the transition process. Finally, in the fourth phase, broader diffusion of innovations will replace the existing system, triggering broad system reconfigurations that settle into a new status quo.

The multi-level perspective emphasises the interaction of niches with the socio-technical regime and the underlying dynamics of markets, industry, science, politics, technology and culture. However, although the model mentions the need to dismantle the current regime, it falls short of understanding the disruptive dynamics of system change, which often prove to be turbulent, chaotic and unstructured, and can therefore be complemented by the X-curve (Hebink et al., 2022) - see Figure 4 - or the two-loop model (Wheatley and Frieze, 2006) - see Figure 5.

The X-Curve

The X-curve depicts the dynamics of change as a combination of two interacting processes: the dynamics of build-up and the dynamics of breakdown. Too often, models of change processes are biased towards innovation and problem-solving and systematically overlook subtractive change (Loorbach, 2014; Hebinck et al. 2022), which involves processes of decline, regime breakdown and exit. Patterns of decline must occur in part because of exogenous pressures (such as climate change or digitalisation) but may need to be supported by specific policies to support gradual dismantling and to deal with social unrest and tensions within the targeted system, as well as resistance and emerging critiques of the need for change.

On the other hand, patterns of construction are about shaping alternative ways of thinking, working and organising. Such radical transformative innovations often emerge experimentally, but they are marginal and outside the social norm, so they may need to be protected by the existing regime through regulation, e.g., people switching to bicycles and using shared mobility platforms. Over time, however, such alternatives can scale up, become cheaper, more visible, better understood and organised, accelerating the diffusion process.

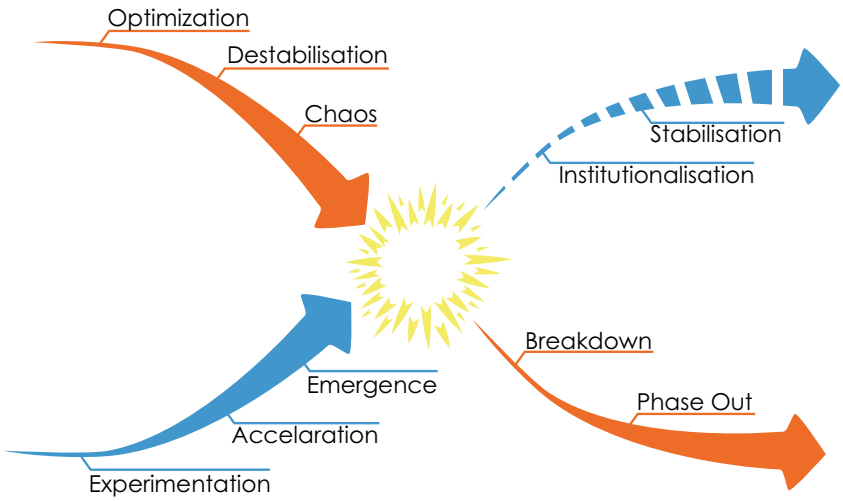

Figure 4. **The X curve**

Source: Silvestri, Diercks and Matti (2022)

The literature on sustainability transitions also provides valuable insights into the capacities required to trigger transition processes.

First, triggering transition processes requires the capacity to 'destabilise' the current regime (Turnheim and Geels, 2012; Geels, 2014). Technological, cognitive and institutional lock-in mechanisms contribute to stabilising existing systems, constraining incumbent actors and orienting their activities towards incremental rather than radical change, and therefore need to be dismantled (Geels and Turnheim, 2022).

Second, transition processes involve the co-creation of visions of future socio-technical systems (Kemp et al., 1998). Therefore, capacities are needed to facilitate the co-creation of these visions by many stakeholders (actors in general) in different sectors, including final consumers and citizens.

Third, collaboration (possibly formalised in partnerships) is needed not only to define visions and pathways for long-term change, but also to create the specific problem-solving spaces for radical entrepreneurial experimentation that are the seeds of transitions (Kemp et al., 1998; Loorbach, 2014).

Fourth, transitions involve the capacity to change regulations. Radical innovations (technical, grassroots and business model innovations) need to be protected from the selection pressures of mainstream markets so that they can grow and eventually replace existing solutions and, in the long term, contribute to broader changes in socio-technical systems. Diffusion often follows a pattern of "niche accumulation" (Geels, 2002), whereby an emerging radical innovation moves from small market niches or application domains into larger mainstream markets. Therefore, the up-scaling of new promising radical innovations often requires the ability to change regulations and/or the use of policy instruments such as capital grants, interest-free loans or procurement policies and information campaigns in a more intelligent and targeted way.

Finally, studies on sustainability transitions also point out that the dynamics of socio-technical system change require the development of specific governance capacities. For example, while Ehnert, et al. (2018) point out that efficient multi-level governance is crucial to steer sustainability transitions in desirable directions, integration and coordination of a wider range of different policy areas is also crucial to avoid fragmentation of promising initiatives (Weber and Rohracher, 2012; Turnheim et al., 2018). In addition, transition processes involve risks, unintended consequences and trade-offs between social, economic and environmental sustainability outcomes that require continuous monitoring and evaluation. There is therefore a need to develop decision-making capacity in situations of high risk and uncertainty using participatory approaches and adaptive governance (Chaffin et al., 2014) based on iterative cycles of policy design, implementation, evaluation and adjustment.

Public sector agencies and intermediaries can play a most important role in developing transformative capacities and practices in sustainability transitions. For example, their role is essential not only in facilitating the circulation of information, aggregating processes, mediating conflicts and balancing power shifts (Kivimaa, 2014), but also in promoting entrepreneurial discovery and experimentation. In addition, public sector institutions have a fundamental role in promoting coherence and consistency of policy goals and instruments (Rogge and Reichardt, 2016) and in promoting collective reflexivity based on monitoring systemic change (Kivimaa et al., 2017).

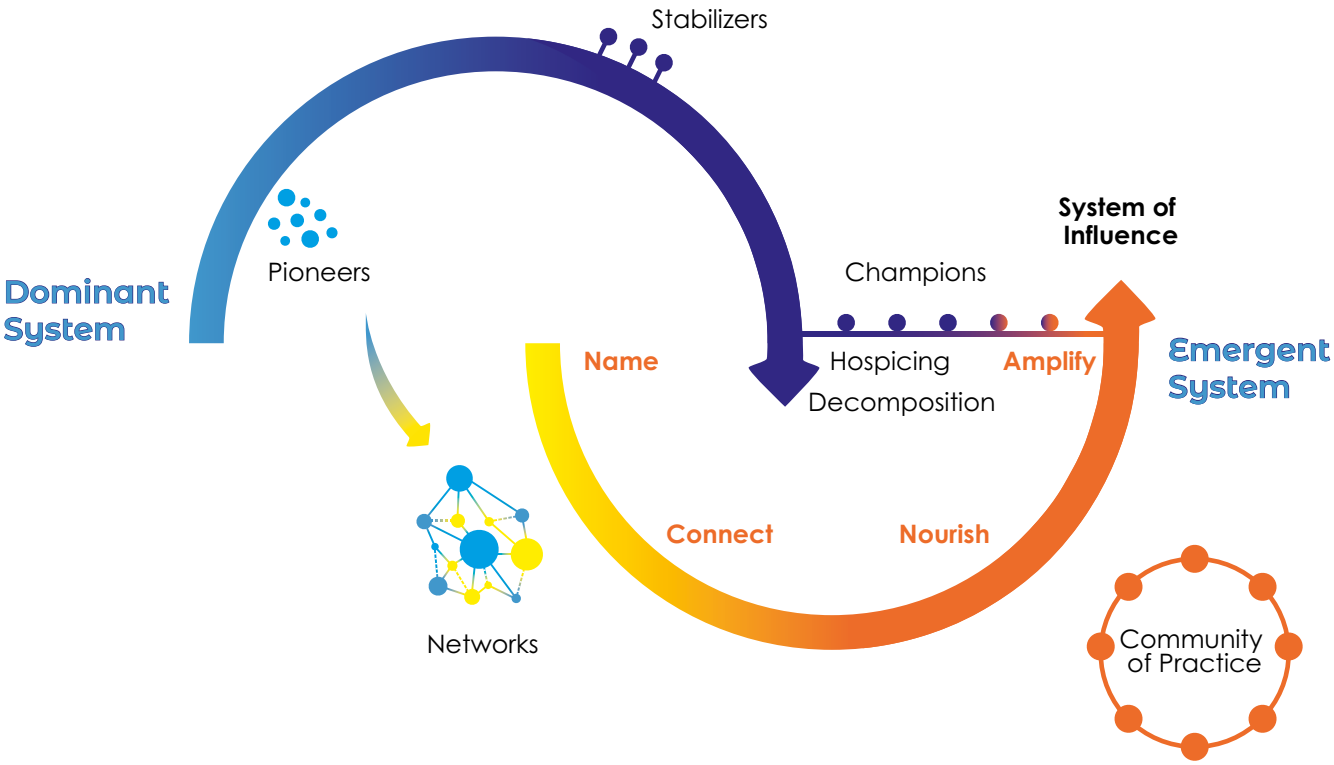

Figure 5. **The Two Loops model**

Source: Wheatley and Frieze (2006)

Transformative Innovation Policy

Transformative and Missions Oriented Innovation Policies literature (Shot and Steinmuller, 2018; Mazzucato, 2018) points to a gap in our understanding of the capacity for transformative innovation policy, and in particular a gap in understanding the role and capacity of government (and public intermediaries) and their ability to design and implement transformative missions and directional innovation, as well as their ability to manage challenge-driven programmes (Borrás, 2019; Borrás and Edler, 2020; Borrás et al., 2023).

For example, Breznitz et al. (2018) identified distinctive patterns of learning, adaptation and experimentation in innovation agencies around the world and proposed a typology of innovation agencies. Similarly, Maclaren and Kattel (2022, p. 6), in their study of UKRI (the main agency for public investment in science, research and innovation in the United Kingdom), defined three types of policy capabilities for organisations involved in promoting transformative innovation policies, namely: navigation and dynamic portfolio management; connection and coordination; and learning and reflexivity. In another study focusing on the UK's Government Digital Service (GDS), Kattel and Takala (2021) illustrate how dynamic capabilities emerge in public services and how they evolve over time.

However, Kattel and Mazzucato (2018) suggest that mission-oriented policies require public sector organisations to develop a set of specific dynamic capabilities. First, capabilities for building public-private partnerships that are not constrained by the prevailing notion that PPPs can only be used as market-fixing mechanisms. Second, capabilities for leadership and commitment. Because mandates can easily become either fashionable labels for business-as-usual practices or overly rigid top-down targeted R&D plans, there is a need to encourage bottom-up engagement as well as contestation and adaptability. Third, the ability to design and manage coherent policy mixes (instruments and funding) is a key capacity. Similarly, Edmondson et al. (2018) and Rogee and Reichart (2016) argue that the ability to understand the link between policy mixes and system change dynamics is a key aspect of transformative policy.

Based on the practices of its members the Transformative Innovation Policy Consortium – TIPC[1] has also identified three different types of capabilities: organisational capabilities; capabilities needed to enhance participation and engagement of all actors in the transformative change process, and personal-individual capabilities.

1 See https://tipresourcelab.net/

First, TIPC suggests that intermediaries or bridge-builders play a key role. They connect otherwise disconnected parts of the social system (community) and can harness, translate and find the appropriate partners for knowledge exchange and cooperative entrepreneurial experimentation. Hence, organisational learning capacity to create "relational spaces" (Shaw, 2022; Boni et al., 2022a), conditions for careful listening and cultivation of psychological safety are key aspects that allow actors to develop trust and feel empowered. This bridging or mediating capacity is often overlooked, but transformation processes require translating and co-creating knowledge and meanings across contexts and cultures.

Second, according to TIPC researchers, the capacity for participatory engagement (democratisation of the transformation process) is also fundamental (Boni and Velasco, 2020; Witte 2019). Transformative innovation processes require participants to have agency and influence throughout the process, that is, they require the participatory engagement of different types of actors. This includes giving voice not only to those who will be most affected by the change process, but also to those who have innovative ideas on how to drive and accelerate transitions and are willing to experiment and implement them. There are different levels of participation and engagement, and the quality of such engagement can be greatly enhanced by using specific types of participatory events and methods (Laranja et al., 2022).

Finally, personal individual capacities include the reflexive thinking, open-mindedness and commitment to continuous learning needed to deal with the uncertainties associated with the dynamics of transformative change processes (Boni et al., 2022). Being reflexive means being open to constantly revising our understanding of the world and our role in the system in relation to others, *i.e.*, being able to develop our self-identity as a product of our reflexive beliefs (Giddens, 1991). In addition, individual capacities include the ability to see and feel the system, *i.e.*, 'system awareness'. The capacity for system awareness includes systems thinking to map the system and its networks of actors (power relations) and to become more comfortable with complexity. The ability to have a neutral, objective, outside-in view of one's own system (getting off the island to see the island). Finally, the members of the TIP consortium propose to consider "imaginative capacities". At an individual level, this involves the ability to communicate using narratives to help navigate the complexities of the change process. Stories are crucial to transformative policy approaches because they help individual actors to see their communities and contexts. Storytelling can be used to define pathways and/or to imagine 'backcasting stories' from the future backward.

4. CONCEPTUALISING CAPACITIES FOR TRANSFORMATIVE SOCIAL AND INNOVATION SYSTEMS CHANGE: A DRAFT FRAMEWORK

4. CONCEPTUALISING CAPACITIES FOR TRANSFORMATIVE SOCIAL AND INNOVATION SYSTEMS CHANGE: A DRAFT FRAMEWORK

There are similarities and differences between the models and frameworks reviewed in the previous sections. For example, sustainability transitions and the MLP - Multi-level Perspective Model focus on overcoming unsustainable path dependencies by creating conditions for regime destabilisation (Kivimaa and Kern, 2016; Geels, 2014) and the emergence of disruptive innovations (Loorbach et al., 2015; Frantzeskaki et al., 2012). Transformative innovation policy also builds on the concept of transformation and transitions of socio-technical systems proposed by MLP. On the other hand, Theory U focuses on the conditions for the inner development of individual people (or groups), *i.e.*, capacitation through sensing, presencing and prototyping. Resilience research and urban studies, on the other hand, focus on governance to deal with perturbations in the system and to prevent the system from responding in undesirable directions.

In this section a first moment is dedicated on drawing on and extending elements of the various strands of literature that have been revised to conceptualise capacities for transformative system innovation - section 4.1.

Because this report states that the capacity to address broad societal challenges cannot be limited to the capacity of government organisations, the authors see their subject 'capacity' as spread across many different private, semi-public, and public actors at individual and organisational levels (poly-centric perspective). This 'collective capacity' or concerted agency is shaped by the roles, actions, interactions and context in which a diverse set of actors operate.

However, also based on the previous sections, namely the MLP, the X-curve, Theory U (Sensing, Presensing, Realising), the authors try to develop a more general model of the dynamics of transformative system change and to relate the defined capacities to this model - section 4.2. Using elements of TSI - Transformative Social Innovation, which uses Complex Adaptive Systems theory - CAS (Holland, 2006), stages of the change process are defined as a series of expected 'emergent behaviours'. In addition, based on TSI (Zivkovic, 2013; Lichtenstein and Plowman, 2009), activities that actors do to facilitate emergence (including leaders who facilitate the process) are also defined – being then linked to the defined capacities.

4.1. Capacities for transformative systems change: what are they for?

Based on the commonalities identified in the reviewed literature streams, two main groups of capacities were identified: capacities at the organisational and group level; capacities at the individual level - see Figure 6 and Table 4.

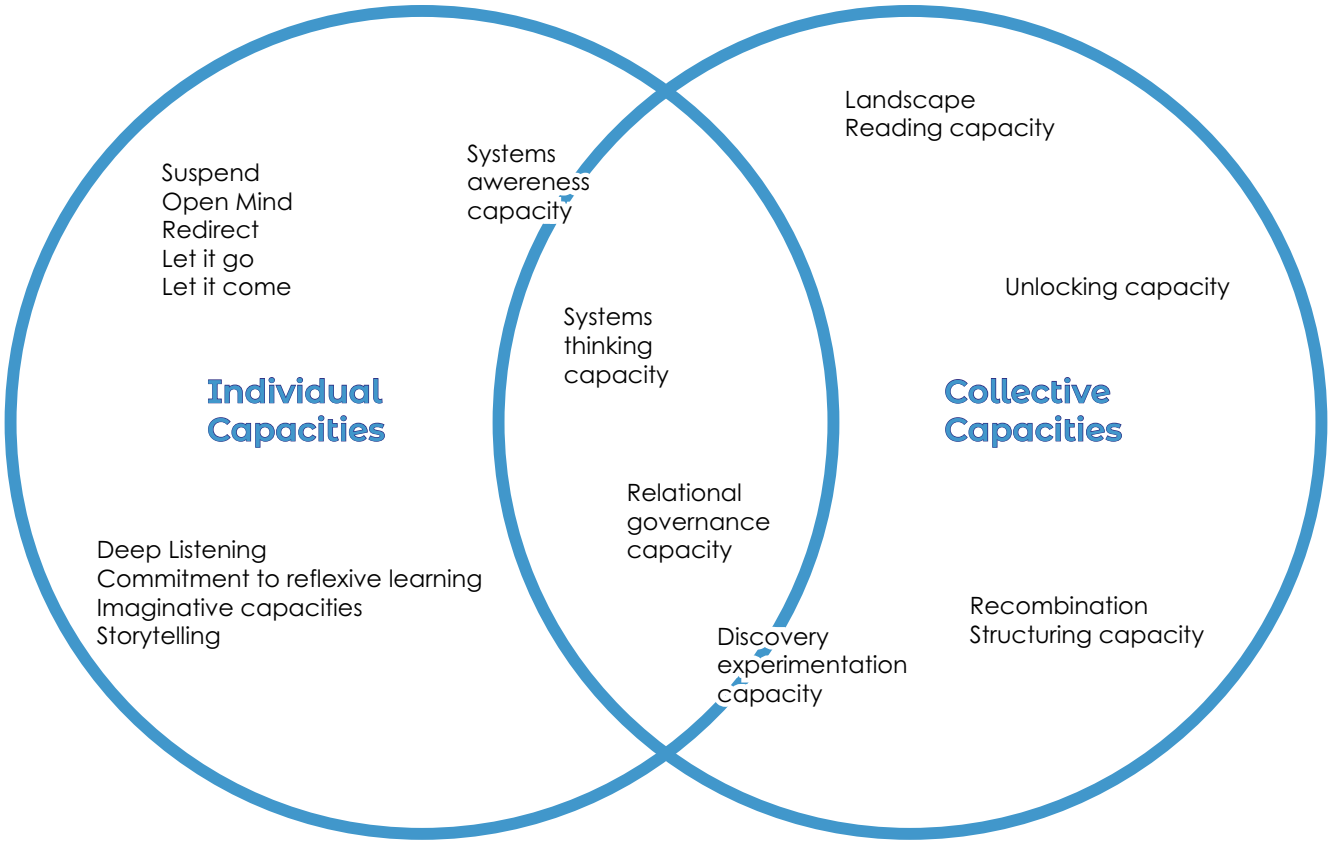

Figure 6. **Capacities**

Source: Own elaboration

Landscape Reading Capacity

The capacity to identify and interpret long-term trends is identified in various strands of literature, in particular in the MLP literature on sustainability transitions (Geels and Turheim, 2022), as an essential skill for actors involved in system-level change. This capacity seems to be linked to the need to be aware of the gaps that will emerge, or are already emerging, if predicted landscape impacts are not addressed. This capacity to anticipate and understand 'gap formation' is also key to inform the formulation of missions (Mazzucato, 2018) or the identification and choice of alternative development pathways (Schot and Steinmueller, 2018). Knowledge generation mechanisms such as foresight, roadmapping, etc. can help to identify and anticipate landscape impacts and to jointly develop visions of future socio-technical systems. In urban transformation studies, Hölscher et al. (2019) have also proposed 'stewarding capacity' as the ability to anticipate and respond to risk and uncertainty.

System Awareness Capacity

System awareness is the capacity to understand your system, how well it is connected, and in particular which actors dominate, what their interests and networks of power are (Wolfram, 2016). It involves sensing the system (not just understanding the system), which requires the ability to see and feel the system from an outside-in perspective, *i.e.*, from its boundaries (Sharmer, 2016).

System analysis, such as system mapping, helps to understand system boundaries, system networks and rules, and to identify system gaps, problems, dysfunctions or maladaptations. It also helps to identify institutions, technologies and behaviours that perpetuate malfunctions. This capacity is important because dominant structures, practices or regimes need to be strategically dismantled. This usually involves breaking their control and withdrawing or reducing existing public support. Note that system awareness is not only the capacity to perceive and understand the system and its systemic problems in the early stages of a transformation process, but also the capacity to perceive the system throughout the transformation process, *i.e.*, the capacity to perceive and respond to unforeseen effects of the ongoing change process in the system.

Table 4. **Capacities for transformative system change**

	Transformative Social Innovation	Urban Studies	Resilience and Socio ecological systems thinking	Theory U	Sustainability transitions	Transformative Innovation Policy
Landscape reading capacity		(Wolfram, 2016) "C5 - Sustainability foresight" (Hölscher et al., 2019) "Stewarding, anticipating and responding to risk and uncertainty"	(Folke et al., 2003) "anticipate and respond"		(Geels and Turheim, 2022) "capacity to interpret long term trends"	(Mazzucato, 2018) "anticipate and understand gaps formation"
Systems awareness capacity	(Stroh, 2015) "capacity to feel & take responsibility for the current system state" (Stroh, 2015) "system analysis"	(Wolfram, 2016) "C4 - system awareness"		(Sharmer, 2016) "Sensing"	(Kemp et al., 1998) "co-creation of visions regarding future socio-technical systems"	(Schot and Steinmueller, 2018) "making social choices over alternative pathways of development" (Mazzucato, 2018) "Missions' should be broad enough to engage the public and attract cross-sectoral investment"
Unlocking capacity	(Stroh, 2015) "establish common ground", "identify positive feedback", "identify investment deemed necessary" (Stresser at al., 2020) "Lengthening capacity"	(Hölscher et al., 2019) "unlocking, recognising and dismantling unsustainable path dependencies"	(Walker et al., 2004) (Folke, 2016) "transformability"		(Geels, 2014) "destabilization and decline" of current regimes (Turnheim and Geels 2012) (Wesley et al 2011) "regime destabilisation" (Geels and Turnheim, 2022) "dismantling technology, cognitive, institutional locked-in mechanisms"	
Discovery and experimentation capacity	(Stroh, 2015) "identify and scale what works" (Stroh, 2015) "organise implementation - roadmapping"	(Hölscher et al., 2019) "transformative capacity, creating and embedding novelties" (Wolfram, 2016) "C6 - CoP experiments, C7 innovation embedding"		(Sharmer, 2016) "crystalizing, prototyping"	(Loorbach, 2015) "niche formation through experimentation" (Kemp et al., 1998) "experimentation" (Kivimaa, 2014) "agencies role in promoting entrepreneurial discovery"	(Maclaren and Katel, 2022) "Navigation and Portfolio Management" (Schot and Steinmueller, 2018) "open-ended processes that encourages experimentation and diversity" (Shaw, 2022; Boni et al. 2022) "relational spaces"

Recombination and structuring capacity	(Moore et al., 2015) "scaling mechanisms for social innovation"			(Sharmer, 2016) "institutionalizing"	(Turnheim et al., 2018) "overcome the current fragmentation of initiatives" (Geels, 2002) "Capacity to change regulations" (Kivimaa, 2014) "role of agencies as intermediary actors in circulation and aggregation processes"	
Relational governance capacity	(Stroh, 2015) "capacity to collaborate and hold productive conversations" (Strasser et al., 2020) "widening" (Stroh, 2015) "gather projects implementation data, metrics, feedback" (Stroh, 2015) "monitoring & regular evaluation for revising the implementation" (Stroh, 2015) "organise and improve quality of information"	Wolfram, 2016) "C1 inclusive & multi form urban governance, C2 transformative leadership, C3 Empowering CoP, C8 learning and reflexivity" (Hölscher et al., 2019) "orchestrating, coordinating multi-actor processes	(Folke et al., 2003) "adaptability"		(Kemp et al., 1998) "should be developed collaboratively" (Rogge and Reichardt, 2016) "need for coherence and consistency in policy goals and instruments" (Ehnert, et al., 2018) "efficient MLG" (Chaffin et al., 2014, 2016) "adaptive governance" (Kivimaa, 2014) "role of agencies in circulating information, mediation, balancing changes of power" Kivimaa, 2017; Loorbach 2015) "agencies role in promotin reflexivity and monitoring systems change"	(Maclaren and Katel, 2022) "Connecting and Coordinating" (Katel and Mazzucato, 2018) "establish PPP", "leadership and engagement", "coherent policy mixes" (Edmonson, 2018) "coherent policy mixes" (White, 2019) "participatory engagement" (Boni et al 2022) "cultivate psychological safety" (Boni and Velasco, 2020) "giving voice to those most affected by the transformation" (Maclaren and Katel, 2022) "Learning and reflexivity" (Mollas-Gallart et al 2022) "monitoring as an input for reflexivity"
Systems thinking capacity	(Stroh, 2015) capacity to "use systems thinking" (Strasser et al., 2020) "Deepening"					
Personal - individual level capacity				Shcarmer, 2016) "Suspend, Redirect, let it go, let it come, crystalizing, prototyping, institutionalizing"		(Boni et al., 2022) "careful listening, open mind, commitment to reflexive learning, system awareness, imaginative capacities storytelling"

Source: Own elaboration

Unlocking Capacity

Unlocking capacity refers to the ability to destabilise, dismantle or phase out existing unsustainable regimes that create path-dependency 'traps', *i.e.*, lock-in situations involving technologies, social values, individual behaviours, vested interests and market incentives (Turnheim and Geels 2012; Westley et al., 2011). Unlocking capacity enables the recognition of the need to stop the unsustainable and to design policies for destabilisation.

Sustainability transition scholars theorise how existing regimes can be destabilised by pressuring incumbents, undermining vested interests and reducing existing incentive structures, effectively reducing their comparative advantage based on unsustainable business-as-usual practices (Kivimaa and Kern, 2016).

This involves openly challenging and questioning existing narratives and assumptions, withdrawing social and political support for business-as-usual (financial, regulatory, political, etc.) and even penalising unsustainable regime technologies, cultures and practices (Geels, 2014; Kivimaa and Kern, 2016). It is also necessary to consciously divest from current human and financial capital and dismantle the power networks that tend to favour the status quo of dominant actors and keep systems in their current traps. It is also necessary to support the creation of a critical mass of actors with a common understanding of the problems and a willingness to change.

However, the ability to confront social and cognitive fixations with counter-intuitive interventions that frame unsustainable technologies and practices as obsolete, while creating opportunities and awareness for alternatives, often requires formal mediation processes that are taken up by public authorities and agencies at regional and national levels (Turnheim and Geels, 2012).

The role of governments in brokering partnership formation, clustering niches and brokering information is, therefore, fundamental (Frantzeskaki et al., 2014). Furthermore, as the long-term focus of transformations is often at odds with how societies make short-term decisions (especially short-term low-cost needs) (Loorbach, 2009), public authorities also have an essential role in keeping the focus on longer-term goals.

Discovery and Experimentation Capacity

An important policy capacity component associated with 'unblocking' is the capacity to develop alternatives to the current unsustainable regime. This requires the capacity to search, discover and experiment with radical alternatives that offer new ways of doing, thinking, consuming and organising, as well as the capacity to drive rapid diffusion (scale up) through social, technological and governance innovations.

Discovery begins with the definition of new 'pathways', *i.e.*, new directions for transformative change. However, defining long-term goals and fruitful pathways for niche formation is done through intense collaboration and co-creation. It therefore requires the engagement and participation of a wider and more diverse set of actors.

Another aspect is the ability to provide ample resources for experimentation, prototyping and testing. These niche formation processes are supported by entrepreneurial front-runners who identify opportunities and provide leadership for change by championing new narratives and mobilising financial and social capital. However, for radical and promising innovations to lead to more enduring systemic change and be translated into new structures, cultures and practices, they need to be scaled up, gain traction and broader support from new networks and alliances that can connect more and more actors to ongoing processes and increase visibility and buy-in, further encouraging wider uptake.

Transition scholars highlight in this context the roles of intermediaries, knowledge brokers and boundary spanners who create mostly informal convening spaces for face-to-face contact and collaborative networks to initiate learning and discovery processes by collecting, processing, combining and distributing knowledge (Kivimaa, 2014). Beyond public authorities, these roles can be played by different types of actors. For example, private non-profit organisations, enterprises and cluster associations that provide and distribute information and services can help to articulate expectations and visions and build social networks (Kivimaa, 2014).

The role of public authorities is, therefore, often to facilitate this process, ensuring that all interests are heard, increasing ownership and safeguarding against conflicts of interest (Loorbach et al., 2015).

Public authorities can also, in some cases, provide a protected space (e.g., in terms of regulatory support, subsidies and research grants) that encourages safe-to-fail experimentation and thus critically facilitates the emergence of radical innovations.

Recombination and Structuring Capacity

Following from discovery and experimentation capacity, recombination and structuring is the capacity for promoting diffusion and replication of the most promising experiments. This involves, overcoming fragmentation of smaller discovery experiments, keep potential winners while simultaneously stop potential losers. It may also involve reframing the initial challenges and capacity to change regulations (Geels, 2002). Recombination involves diffusion and this may involve scaling and joining smaller initiatives into larger size coalitions. It also involves the capacity to consolidate the new network linkages between actors, promoting new structures and institutionalisation of a new regime. According to Kivimaa (2014), intermediary agencies have an important role in promoting information associated to aggregation processes.

Relational Governance Capacity

In all the streams of literature reviewed in section 3, there was frequent reference to some kind of distributed agency capacity - which we call 'relational governance capacity'. In our view, this capacity includes the ability to coordinate/steer multi-actor governance processes, promote synergies and trade-offs, and minimise conflict. As pointed out by Chaffin et al. (2016), without some form of formal or informal coordination that links system functions and promotes networks and the emergence of alternative ideas and solutions, transformation processes may stall or collapse. However, because socio-technical transformation is a non-linear, uncertain process, this agency capacity is best achieved through processes of facilitation, mediation and negotiation rather than through top-down hierarchical planning and control structures.

Thus, in situations where knowledge is incomplete, surprise is likely, and adaptation to unanticipated consequences is required, relational and communication skills are key to this governance capacity. The concepts of adaptive governance or 'tentative governance' (Kuhlmann et al., 2019) are useful to understand which type of governance is more appropriate for transformation processes.

These processes therefore require advanced communication and relationship-building skills. Identifying and communicating sources of uncertainty, investigating and communicating the impact of the transformation process on the needs and interests of stakeholders seems to be a key issue. On the other hand, effective communication is strongly linked to active listening skills (or so-called non-violent communication skills).

Linked to this relational governance and communication capacity is the need to monitor system change as the process unfolds. Monitoring (and evaluation) involves the ability to register the experiences and progress made with the system (collective memory of system evolution) and to use this learning to constantly revise the assumptions and objectives of the system change underway, *i.e.* monitoring is important as an input for reflexivity and learning, which allows objectives and practices to be adapted to changing situations in line with new information (Mollas-Gallart et al., 2021). However, this is not just about the usual ability to collect KPIs and multiple indicators, but also about participatory monitoring practices and exercises that seek to use collective social memory to link past experiences with what is known in the present and what is expected in the future.

Systems Thinking Capacity

Systems thinking capacity refers to the need to have knowledge of processes of 'system dynamics', *i.e.*, the dynamics of system change. This includes understanding systems theory, complex adaptive systems (see Holland, 2006) and the dynamics of system change across scales. David Stroh (2015) argues that the use of systems thinking is key to understanding societal problems and envisioning intended social innovations. On the other hand, Shot and Steinmuller (2018) argue that system-level change should be seen as a new policy rationale - the logic of state intervention needs to shift from measures to overcome market failures and promote economic growth to a broader focus on promoting system-level transformation.

Individual-Level Capacity

Individual-level capacity refers to the ability of individuals (participants in the change process) to engage in system-level change processes. System change initiatives are often driven by the sustained effort and commitment of key individuals, including 'system leaders'. An individual can change the direction of his or her organisation, catalyse the formation of a new network of relationships, or create the conditions for developing trust, focus and commitment.

By connecting to a network, individuals can contribute to and influence the evolution of the system, either alone or in their organisations. The potential for individuals to influence systems carries an empowering and inspiring message: that everyone can make a difference, regardless of their level of authority or role in a system. A common theme in discussions of systems change is the importance of the mindset that individual participants and leaders bring to the change process. Otto Scharmer's (2016, 2018) Theory U encourages individuals to 'open their mind, heart and will'. An open mind is essential for challenging assumptions, learning to truly listen to other perspectives (deep listening) and exploring new approaches ('let it go' and 'let it come'). Open heart is important for 'compassion' and 'empathy'. Open will is important for entrepreneurial action and prototyping.

Important skills and abilities at the individual level also appear to be system awareness, imagination, storytelling, the ability to reflect and to engage deeply with others to broaden and deepen a collective shared perspective (Boni et al., 2022). To a large extent, personal transformation is an essential accompaniment to system-level change (Sharmer, 2016).

4.2. Transformational Dynamics and Emergent Behaviours

Combining elements of MLP, X-Curve, Theory U process and Complex Adaptive Systems - CAS, this section attempts to define a more general model of transformative change dynamics - Figure 6. Using a stylised narrative of what could be a sequence of emergent collective behaviours that make up the transformative dynamics of the system, the authors describe the intended emergent behaviours below. This vision also links to actor-network formation (Latour, 2005) and the relevance given to forming a network of relationships between entities through translation. There are four overlapping stages proposed by actor-network theory. First, problematisation concerns the definition of the problem. Second, interest is the process of convincing other actors that the problem is relevant to them and involves the creation of shared views and consensus. Third, enrolment is the moment when roles are assigned to different actors, resulting in a system committed to a common goal. Finally, mobilisation is an advanced moment, where the network of actors is stabilised, with a translation enabler as spokesperson, surrounded by a relatively passive network of actors.

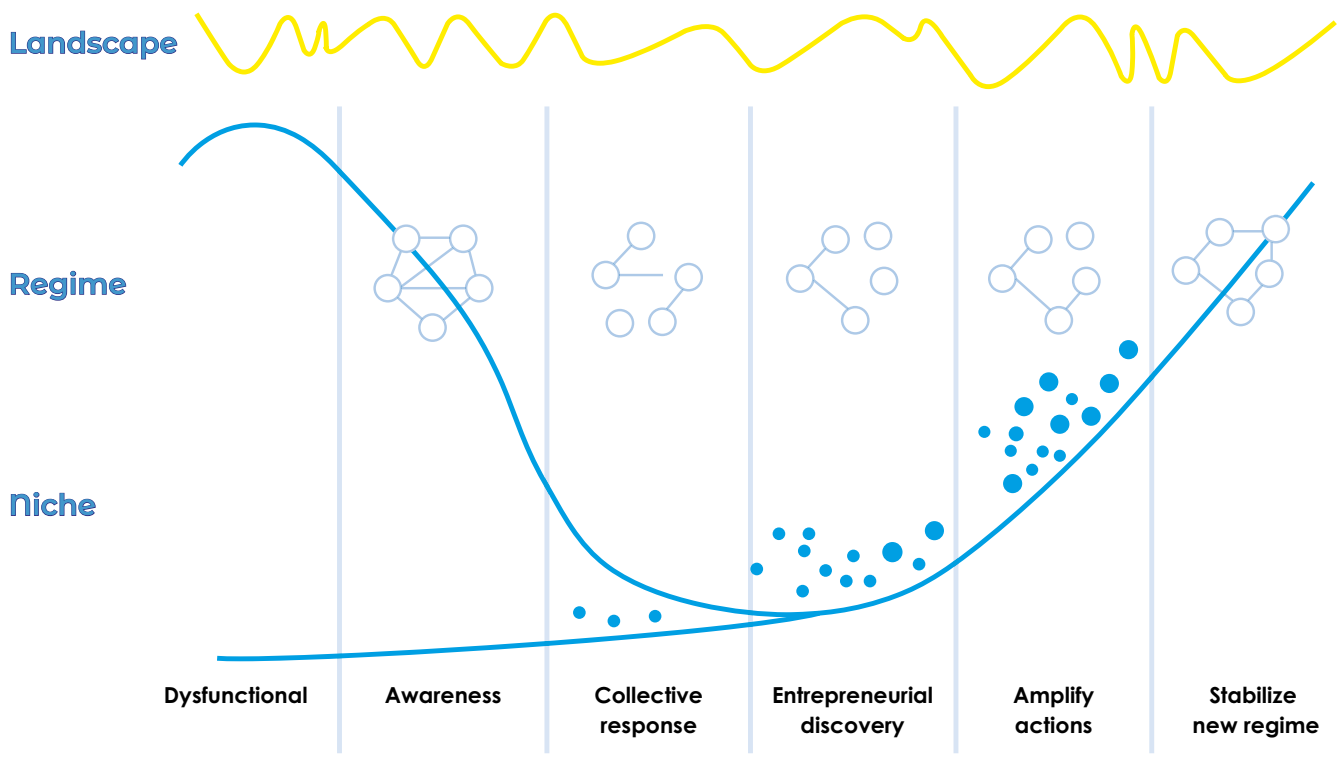

Figure 7. **Dynamics of transformative system change**

Source: Own elaboration

Table 5 intends to associate the capacities defined above to the activities actors and leaders do (using the capacities), and to the intended "emergent behaviours" that are addressed by these activities.

Dysfunctional

Transformative system change often begins in response to a serious problem or challenge within a complex system. Dysfunctional behaviour corresponds to a state where the system is out of balance. Using the MLP model, we could say that pressures from the landscape left unaddressed produced 'mal-adaptation's' or 'malfunctions' that create a mismatch between the regime structure and the landscape. These malfunctions trigger gap formation, which may lead to the recognition of a new challenge that needs to be addressed.

Awareness

As a result of the persistent increase in dysfunctions, actors in the system shift to higher levels of awareness and become motivated to understand and discuss what's happening. A shift to awareness behaviour depends on the scale of the dysfunctions and how they are perceived by the actors, *i.e.*, it depends on a threshold number of actors who are increasingly affected by the existing system dysfunctions. Leading actors (public, private or bridging actors) start to organise "shared perceptions". Underground cultures, arts and social innovation actions may already have their interpretations of the change signals and may already be communicating the existing dysfunctions to a wider audience. These dysfunctions may be perceived as "shared threats" or "shared opportunities". A strong "social capital", *i.e.*, the existence of individual capacities, trust, social networks, etc., enables the formation of a "common perspective". In addition, to change a complex system, stakeholders must first understand how the system is affected - *i.e.*, how changes affect the components, actors, dynamics and influences that together make up the system and its current outcomes. This requires learning and open-minded inquiry. Most actors have experienced and learned about the system from one point of view. To truly understand its many dimensions requires absorbing new information and learning from other viewpoints and perspectives. This means constant dialogue, underpinned by radical and empathetic listening, which enables each actor to have a deeper understanding of the multiple perspectives on a particular system.

Policy facilitators or bridge-builders have a role to play in promoting and contributing to awareness and in supporting the formation of 'common perspectives', *i.e.*, shared understandings, meanings and interpretations.

Table 5. **Capacities, activities and emergent behaviours they address**

Capacity	What is it for?	Are manifest in activities leaders do to create conditions enabling new behaviours to emerge?	Transformation Dynamics Emergent Behaviours
Landscape reading capacity	• reading of long term change • dealing with uncertainty and risks • leading gap formation • foreseeing possible landscape impacts • defining vision, missions and targets to provide long-term directionality • learn the sources of uncertainty and risk and how to deal with it	**Embrace uncertainty** • Learn to feel at home in a confusing and uncertain landscape • Link past with present and with the future	**Dysfunctional**
Systems awareness capacity	• understanding of your own system, ability to see and sense/feel the system • understanding current system boundaries and rules • recognising mal functions, mal adaptation • create a systemic view both in framing the initiative goals as contributing to broader system change • understanding and exploring the issue at hand as a complex system with multiple elements, dynamics and stakeholders.	**Raise awareness** • Enhance knowledge about the system, about different stakeholders or interest groups • Diagnostic mal functions, system problem-gaps, failures • Identify vested interests / dominant structures • Study how change will affect needs and interest groups • Highlight the need to re-organise communities/ecosystems differently	**Awareness**
Unlocking capacity	• dismantling unsustainable path-dependencies. • stop reduction of the unsustainable • deliberate phase out of existing technologies and practices • but at the same time • see and sense the longer term future	**Undermine vested interests** • fluctuation and create controversy • withdraw or diminish support to dominant structures, practices, regime • break dominant regime networks, dismantle control institutions • mediate conflict • destabilize the unsustainable; • free resources, trapped in the dominant regime, needed for the new regime to emerge	**Collective response**

Unlocking capacity		**Support the creation of a collective response** • promote willingness and awareness to change, • counteract on the resistance to change • help to co-define directions of search • encourage search and definition of new "pathways", directions for transformative change • provide inspirational visions, foresight, road mapping and planning • collective strategy design • encourage individual actors to accept position as role models for the change effort • catalysing and supporting engagement, co-design and collaboration • encourage stakeholder ownership and championship of the actions	
Discovery and experimentation capacity	• push or pull to enfold the system transformation process • niche formation • creating of novelties • broadening the problem and the solution spaces not just techno, org, also business model innovation • to shield novelties from the pressures of "installed regimes" • practical aspects of project portfolio management to support multiple initiative activities	**Promote Experimentation and Entrepreneurial Discovery** • cultivate passion for entrepreneurial action through "fail-fast" "fail safe" • provide "safe-space" for trial and error, testing, prototyping, experimenting with new practices, processes, products • support new entrants with radical proposals • encourage rich interactions in a "relational space" • adapting the initiative strategy in response to new insights, events or conditions.	**Entrepreneurial Discovery**

Recombination and structuring capacity	• scale transformation process • stimulate knowledge diffusion • practical aspects of project portfolio management	**Scale-up** • adapt and realign the strategy, resources, structures with the most promising experiments • feed promising experiments with more resources in order to scale up • keep potential winners, stop potential losers • supporting the new most promising initiatives, and; • (re)Frame issues to match different perspectives • enable resources and capabilities to recombine • invite different actions to join in larger size initiatives • help to establish new network linkages • enable emergent outcomes to be monitored	**Amplify actions**
		Creation of a new system organisation - install a new regime • developing internal capabilities and structures. • promote wide industry/-sector/cluster dialogue - participatory dialogic interactions • promote relations with actors and between actors • nurture actor's diversity • Stabilise feedback	**Stabilise new regime**

Relational governance capacity	• engagement in the change processes • steering participatory governance • gathering actors to work together • multi-actor coordination processes • support a group of actors to work towards a common goal. • horizontal and vertical multi-level governance and coordination of policies • orchestration • community building • dealing with responding to non-anticipated events • adaptive governance • monitoring and reflexive learning • monitoring progress on multiple dimensions • improve communication and information gathering	**Facilitate** • build alignment, secure commitment, troubleshooting, and supporting ongoing collaboration • creation of cross-scale links • facilitation of multi-stakeholder collaboration within the initiatives • organise workshops and other types of events in different formats, using participatory methods • negotiating, moderating, mediating, resolving conflicts, convincing, motivating, active listening • active listening **Promote collaboration** • enable connectivity between people who have different perspectives on the issues (problems, challenges, solutions) • coalition building and advocacy to develop alignment and mobilize action among stakeholders in the system, both within and between organizations • enable learning, trust-building and empowered action among stakeholders who share a common goal **Monitoring and Learning** • monitoring, evaluating and learning from the experience mobilizing, envisioning and encouraging actions and projects; • retain, diffuse, reuse knowledge and ideas generated through interaction **Enable and promote information flows** • assist system member to keep informed and knowledgeable of forces influencing the system • assist in the connection, dissemination and processing information.	**All**

Systems thinking capacity	• understanding of the complex systems shaping the challenges to be addressed • understanding of "systems dynamics" • understand dynamics of system change	• general knowledge about systems. Systems Theory, Systems Change, Innovation system, different frames of transformation such as TIP, Mission Policy. Knowledge about the process of system change we are trying to promote • integrating different forms of interdisciplinary knowledge • learning about different frames of transformation • systems thinking, systems change, frames, and tools • learning notions of adaptability, flexibility, agile	**All**
Personal - individual level capacity			**All**

Source: Own elaboration

Collective Response

Creating awareness among a critical number of actors triggers a willingness to respond. This willingness to respond often starts with the definition of "change paths", search directions or visions of a possible future. This emergent behaviour can be seen in increased interactions and/or bridging activities to aggregate different interpretations and visions.

However, the response depends on the engagement of active actors, which means that all actors need to be involved through a continuous process of convening, conversation and collaboration. This includes both individual and group discussions to build trust and share perspectives. It is essential to engage a broad, diverse array of actors and stakeholders – including critics and challengers. Exclusion of a major stakeholder group at the start of a new response can significantly undermine the ability to build widespread commitment and maintain momentum over the long term.

Entrepreneurial Discovery

A sufficient number of actors sharing comment intent and a need for action triggers a need for action. Build from the directions for search, multiple perspectives about the problem are transformed into a "focus for action". This action comes in the form of entrepreneurial experimentation, and it leads to diversity creation. Novelty through discovery and niche creation is the emergent behaviour at this stage. In large-scale system change initiatives, a wide range of actors across the system can act decentralised to pursue a common goal. Policymakers and intermediaries can stimulate and support decentralised, multi-stakeholder action that is self-directed but aligned with the shared vision and goal of the wider network. At the same time, they need to demonstrate early results and encourage mutual accountability for both individual actions and collective impact.

Amplify Actions

Conditioned by market and institutional forces, some of the proposed entrepreneurial experiments grow and eventually become a "dominant design". The presence of intermediaries and bridging agents may or may not influence which solutions diffuse and are adopted more quickly. However, at this stage, policymakers should protect against too early/too harsh selection, allowing for the amplification of emerging niches. For market-based interventions, strengthening business model innovation is key to enabling the scaling of new solutions. This can be done through new collaborations between projects or between companies. To enable the development of promising or viable business models, it is also important to have

access to new financing models and innovative forms of investment - including blended finance (public and private finance) - which can significantly impact catalysing and accelerating promising actions.

Stabilise New Regime

A new organisation of the system emerges when a common perspective on the new dominant solutions is diffused and widely accepted. A new organisation of the system is therefore triggered by a critical mass of actors who are interested in the new frame of solutions, *i.e.*, they converge on a new set of collective behaviours.

CONCLUSIONS AND OUTLOOK

5. Conclusions and Outlook

Based on an initial literature review, the authors asked what capacities are needed for Transformative Innovation Policies (TIPs), *i.e.*, policies that promote radical new innovations and their diffusion that induce broad social, environmental and technological change. Our (limited) efforts to assess relevant policy capacities suggest that there are theoretically a variety of different capacities needed for the generation and uptake of transformative innovations, and that these capacities are very different from existing capacities tailored to deal with older generation non-systemic innovation policies.

Policy capacity for transformation is different from simply knowing what to do. It means being able to act and behave in a given context, making sense of existing knowledge, being aware of different values, interests and perspectives at stake, and being able to manage relationships with all actors. Policy capacity for transformative innovation is therefore a combination of knowledge, skills and attitudes mobilised into action in each context.

While the framework is only a sketch of the capacities needed to manage transformative innovation and is therefore far from complete, we hope it can help identify the resources and capabilities governments and other stakeholders need to drive transformations that promote sustainability. However, we would like to emphasise that these capacities do not reside only in public organisations, innovation agencies or foundations, which usually act as policy intermediaries dealing with specific policy instruments, or in other types of policy intermediaries. They must be present in all other actors involved in transformation processes.

The proposed draft conceptual framework suggests that the different policy capacities needed for transformative social innovation are deeply interlinked and interact with each other. Moreover, policy capacities are dynamic, *i.e.*, they can be further developed with each new exercise, *i.e.*, from accumulated experience. One conclusion that can be drawn is that existing formal innovation policy education and training programmes are rarely designed to build transformative innovation policy capacity. Curricula have mostly been designed under traditional paradigms of problem-solving linear causality, discipline-based analysis and planning.

As a future research agenda, we propose an empirical mixed methods case study on innovation policy capacity at the regional level. The study will consist of operationalising the conceptual framework in a questionnaire addressed to public authorities, policy intermediaries and beneficiaries involved in innovation initiatives with transformative potential. The questionnaire will ask whether the policy capacities identified in the literature are present or would be needed, and whether other capacities can be found empirically. Finally, we will bring together the literature-based framework and the empirical parts to develop a more elaborated conceptual framework of policy capacities necessary for transformative innovation, with the aim of deriving recommendations for a more bottom-up style of governance for transitions.

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