The spatial and scalar implications of missions

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1 Introduction

In recent years, debates about innovation policy have highlighted a broader scope for action and a widening of the range of policy goals such policies are expected to (or might be expected to) address (Borrás, 2009; Flanagan et al., 2011). Scholars and analysts have both detected but also advocated a shift from generic and primarily R&D-based innovation support measures towards a new (or third) 'generation' of innovation policy - variously referred to as challenge-led, mission-orientated (Foray, 2018; Mazzucato, 2018b) or transformative innovation policies (Schot & Steinmueller, 2018). This new generation of innovation policy thinking is a response to major societal challenges such as climate change, migration, or food and energy security - the implication being that traditional innovation policies were either inadequate in response to or else uninterested in such challenges. A more targeted and challenge-oriented innovation policy should, it is argued, help to deliver *desired*, and not just *more*, innovations (Boon & Edler, 2018; Kuhlmann & Rip, 2018). This implies a more active role of the state in funding risk-taking activities and in creating - not just correcting - markets. This 'normative turn' in innovation policy has also been observed in the design and implementation of regional policies, with a greater emphasis on the socio-ecological dimension of innovation (Bugge et al., 2021a; Coenen & Morgan, 2020a; Uyarra et al., 2019), particularly in the context of the European Green Deal and the Innovation Strategies for Sustainability (S4) (Hassink et al., 2021; Morgan & Marques, 2019). Whilst there is much agreement that bolder, more customised and directional policies are needed to tackle the societal challenges of our time, there is less consensus about how such policies should be implemented in practice.

As mission-oriented approaches gain prominence, questions emerge about how missions are best defined, implemented and evaluated/studied. Mission-oriented innovation policies do not operate in a vacuum but within existing institutional and multi-level governance structures (Fisher et al., 2018). They will therefore vary according to context, including geographical context, yet the

spatial and scalar dimensions of transformative missions have been neglected. The territory is key, given that it is where the new responses to the great challenges of society are experienced. Local administrations usually have competencies in relevant areas and can generate and test new solutions that can later be replicated on a more global scale (Boschma et al., 2017). Debates about transformative missions are also surprisingly divorced from parallel efforts to support regional innovation and the increasing importance of 'missions' and challenges in such endeavours (McCann & Soete, 2020; Miedzinski et al., 2021; Pontikakis et al., 2022). Janssen et al (2021) thus argue that missions risk "becoming a default answer that is applied uncritically to address societal issues, ignoring the accumulated experience from pre-existing and analogous goal-oriented policies, and the complex social and political issues they bring to surface" (p.439).

This chapter seeks to address this shortcoming by discussing the spatial and scalar dimensions of mission-oriented policy frameworks. We draw from scholarly contributions in innovation policy studies, regional studies and economic geography, to suggest how scale and place-based qualities may shape and be shaped by problem-solution representations in relation to wicked societal challenges. In trying to capture differences in how problems and solutions may be framed geographically, we discuss four stylised opportunity spaces, including governance strategies and instruments aligned with the prevalent geographical problem-solution constellations.

The chapter is organised as follows. We first introduce the concepts of transformative missions and review previous attempts to advance the definition and articulation of mission-oriented policies. We then discuss the importance of adopting greater spatial sensibility in the implementation of missions. In section four, we articulate these by proposing a tentative map of policy opportunities for transformative missions. Section five concludes. In this chapter, we refer to the regional level to mean the subnational level of policy making (including administrative regions but also metropolitan areas) in contrast to the national or supranational level, and also discuss multi-level settings. While we acknowledge the diversity of regional settings in terms of industrial profile, institutional capacity and political competences, we do not discuss these in detail in the text.

2 Understanding transformative missions

'Third generation' innovation policy approaches emphasise societal problems as key drivers for intervention, and advocate a shift from generic innovation support measures - often based on R&D - towards policies that seek more transformative system changes through not just technical solutions but also social or behavioural changes (Wesseling & Meijerhof, 2021). System-wide transformation requires attention to directionality, experimentation, demand articulation, policy learning and coordination (Weber & Rohracher, 2012). In mission-oriented innovation policy these ambitions materialise through goals defined in an ambitious, actionable, measurable and time-bound way (Larrue, 2021; Mazzucato, 2018a).

Wanzenböck et al. (2020, p. 3) define mission-oriented innovation policy (MIP) as

> *"a directional policy that starts from the perspective of a societal problem, and focuses on the formulation and implementation of a goal-oriented strategy by acknowledging the degree of wickedness of the underlying challenge, and the active role of policy in ensuring coordinated action and legitimacy of both problems and innovative solutions across multiple actors."*

In attempts to classify and compare different mission policy approaches, the innovation policy literature has drawn on the distinction between societal challenge-oriented 'transformer' missions targeting transformative change, and 'accelerator' type moon-shot missions (Fisher et al., 2018; Larrue, 2021; Wittmann et al., 2021). According to Fisher et al (2018) accelerator missions are narrowly defined and aimed at a well-defined and generally scientific or technological goals, while transformer missions are aimed at addressing wicked societal problems requiring system transformation. They note however that both are ideal types and that most mission-oriented policies may consist of a mix between the two. In a similar vein, Edler et al. (2021) define 'transformative' missions as politically defined areas of search for solutions to societal problems, and differentiate them from other, more technocratic, types of missions that are more suitable in instances where "clear goals, targets and pathways can be defined but possibly less appropriate in areas of wicked transformative change" (p. 2).

Implicit to the idea of transformative missions is an acknowledgement that societal challenges are often 'wicked problems', and as such are contested, uncertain and highly complex (but also in principle *temporary*, in the sense that a challenge can be addressed). This challenge focus behind the new mission orientation is different from the top-down technological missions of the past (Nelson, 1977), which focused on achieving 'stretch' technological goals rather than on social innovation and on issues related to social acceptance, market conditions and alternative technological and non-technological solutions (Edler et al., 2021, Wanzenböck and Frenken, 2020). However, whilst the stretch technological goals of 'moon-shots' (if not the means of achieving them) are clear and understood by all participants, neither the understanding of a wicked societal problem (or possible means of addressing it), nor the legitimacy or likely impact of those means, can be taken for granted (Wanzenböck et al., 2020). An ever-present risk is that missions tackling such wicked problems are framed as accelerator missions, organised top-down and focused on technological or scientific solutions, rather than as more bottom-up transformative missions aimed at systemic change (Polt 2019; Wittmayer and Schäpke 2014).

Wanzenböck et al (2020) argue that the design of mission-oriented policies should start from a recognition of the heterogeneity of "underlying problem structures". Specifically, they suggest that mission design must consider the different 'wickedness' dimensions (contestation,

complexity and uncertainty) of both problems and solutions. Contestation or legitimacy may exist around the feasibility of a solution, or may arise because of conflicting claims, values and framings on the part of diverse actors. Complexity may relate to technological interrelatedness and the need to restructure the broader socio-technical system, but also to the multi-scalar and multi-dimensional nature of societal problems to be addressed by policy (which actors, at which levels of governance, are responsible for the problem, and who decides about possible solutions?). Uncertainty may stem from limited knowledge about the availability or feasibility of potential solutions, their potential side-effects or unintended consequences, or from limited or fragmented knowledge about the problem. Wanzenböck et al. (2020) identify a need for a greater understanding of geographical and institutional conditions or multi-level arrangements that may influence the alignment of problems and solutions, better insights into how legitimacy is built in policy processes, and more knowledge about the organisational capacity of public actors.

Mission-oriented policy crosses traditional public policy boundaries, addressing problems in areas that are normally situated in policy domains such as health, mobility, energy, or food and at multiple levels of governance. The articulation of missions will be a highly politicised matter because it involves prioritising some societal challenges over others and requires both sense-making and legitimacy-building processes (see e.g. Edler et al., 2021). Many problems compete for legitimacy and prioritisation, and there is the risk of capture by dominant groups (Wesseling and Meijerhof, 2021). Janssen et al. (2021) argue that missions tend to be situated at the interface of the socio-economic system relevant for the social domain related to the challenge in question (in terms of the infrastructure, technologies, behaviour and values for production and consumption), and the science, technology and innovation system that might be mobilised for solving the challenge. Missions are thus embedded in but also in tension with those two systems. Moreover, science, technology and innovation systems may often be only poorly aligned with the newly prioritised challenges (Cappellano et al., 2022; Janssen et al., 2021).

The complex and politicised nature of making and implementing mission-oriented innovation policies implies significant capacity on the part of state actors, and many governments may struggle to maintain directionality and ensure the funding, articulation, and evolution of the required instrument mix (Larrue, 2021). While for clear-cut ‘moonshot’ accelerator missions it is possible to envisage a top-down approach (for instance through the creation of a single agency to co-ordinate how the mission is addressed), transformative missions are more likely to require the mobilisation, alignment and coordination of a variety of distributed actors (Craens et al., 2021; Edler et al., 2021). Such processes of mobilisation, alignment or coordination will occur in more fluid networked arrangements that cut across different policy areas and levels of decision making.

The design of transformative missions is therefore very unlikely to be done on a tabula rasa but rather will be built on existing problem framings (Janssen et al., 2021) and institutional arrangements. Similarly, the development of new practices and technologies, and the phasing out

of the old ones, is likely to be shaped by existing innovation system structures, including knowledge bases and industrial specialisation (Bugge et al., 2021). New missions are defined and then implemented into a landscape of existing policy rationales and mixes, all with their own momentum, most of which will be institutionalised to a greater or lesser extent, with their own epistemic, stakeholder and 'client' communities (Laranja et al., 2008). Legacies of earlier policy approaches and system structures may enable, or may hamper, new mission approaches. Despite the stress on novelty, the existence of policy path dependencies and the need for missions to command widespread legitimacy and political alignment means that new generation policy approaches are likely to sit alongside existing policies, whether complementary or potentially in tension, rather than to displace them completely (Hassink et al., 2021; Janssen et al., 2023; Scordato et al., 2022). Transformative missions, in particular, have implications not just for the science, technology and innovation system but also for the infrastructure, knowledge, technologies, behaviour and values related to production and consumption that are relevant to the challenge in question (Janssen et al., 2021). Mission pursuit has the potential to mobilise or modify existing regional resources, actors or institutions, and, depending on the regional context, to shape (i.e. generate or constrain) new economic opportunities (Bugge et al., 2021).

Transformative mission approaches will therefore vary, not just according to the specific challenge or problem, but also according to the existing configuration of innovation systems and institutional and political structures - and may turn out to be in tension with existing policies, goals and framings, including those at other levels of governance. Yet these spatial and scalar dimensions of transformative missions are often overlooked. It is not clear from the literature how sub-national policy actors might best contribute to broader missions, or whether certain kinds of missions might be best pursued at the local or regional level. Equally unclear is the question of how different types of regions might use mission-oriented approaches to advance economic development goals. Finally, the unintended distributional effects of mission policies across geographies constitute a further blind spot in current debates.

3 Considering scale and place in mission-oriented innovation policy

The question of how to "organise, coordinate and implement challenge-oriented innovation policies across different levels" has been neglected in current policy debates (Wanzenböck and Frenken, 2020: p.51). It is often implicitly assumed that societal challenges are best or more efficiently dealt with at the national (or supranational) level, where the right levers, structures, resources and (technocratic) competences are assumed to be most likely to be found, where critical mass is assumed to be most likely to be achievable, and where, it is assumed, economies of scale may be best taken advantage of. This 'big science for big problems' approach not only devalues the importance of cities and regions in the implementation of innovation policy, often in a multi-level governance setting, but also *de facto* excludes a vast majority of people and places (Heslop et al., 2019), potentially creating a profound challenge to societal and democratic

legitimacy (Coenen & Morgan, 2020b; Wanzenböck & Frenken, 2020). Indeed, who chooses the mission and how, and how may inclusive and democratic processes for mission selection look like is not clear (Storper et al., 2022). Another likely outcome of lacking a place sensitive approach is greater regional inequality: The top-down technology-centred mission policies of the past had clear differential impacts on regions and cities, concentrating government and private R&D in a small number of locations (Sternberg, 1996) with potentially limited links to, and potential for spillovers to, other local economies.

There is an inherent geography to both societal challenges or problems and the knowledge associated with their solutions, and this is often left unacknowledged by mission-oriented approaches, which are therefore unable to "explain why solutions can be more successful in one place compared to another, and why some solutions spread beyond their place of origin and scale up, while others remain trapped by local context." (Coenen et al., 2015, p. 491). On the problem side, societal challenges are not only fuzzy and contested but are also local and situated. Wanzenböck and Frenken (2020) use the principle of subsidiarity to suggest that such societal issues should be addressed by those who are more likely to be affected by them, and argue that "challenges do not present themselves as the same for every region or nation, as underlying problems affect places in different ways and to different extents". Despite the very widespread use of terms such as 'grand' and 'global', they argue, "challenges remain contextual" (p.56). Place-dependent conditions and the contested nature of societal challenges mean that they are likely to be differently felt, understood and acted upon in different places. Moreover, problem representations will be shaped by what Rutten (2017) refers to as 'distance dynamics', that is, whether the definition of needs and problems are reflective of the specific economic, social and environmental conditions of one place, or conversely, whether they address needs and challenges that are common to many settings.

On the solution side, the know-how necessary to address societal challenges is partly tacit and situated, and interventions "require discovering the tacit elements of technology and adapting them to the local environment" (Hausmann & Rodrik, 2003). This helps explain why solutions and transformation pathways developed in some places and co-produced with local actors and communities are not always easily transferred to other places (Boschma et al., 2017). Knowledge is spatially embedded in people and organisations, and distributed among many actors – including users on the demand side. The solutions to societal challenges will be helped by geographical proximity given the unclear and contested nature of contemporary grand challenges and the need to involve large and diverse number of stakeholders (Coenen et al, 2015). Solutions will also be shaped by pre-existing innovation system structures, including the knowledge infrastructure of universities and research laboratories but also incumbent firms and patterns of industry specialisation (Bugge et al., 2021b). For instance, Tanner (2014) found that the fuel cell industry emerged in regions with competences in related technological fields. Thus, just as for problem representations, solution representations will be shaped by local place qualities (or

'place dynamics', Rutten, 2017), including the knowledge bases and expertise of firms and the knowledge community at large, as well as other characteristics of place such as culture and the demand sophistication of users. Some authors have begun to explore the place-based conditions that might enable or hinder transformative system change, considering features such as regional innovation systems, the variety of regional assets (natural, industrial and institutional), and firm- and system-level agency (Isaksen et al., 2018; Jakobsen et al., 2022; Trippl et al., 2020) able to mobilise (and transform) place-based, but also extra-regional, assets.

The geography of problems, then, can be different to the geography of solutions shaped by the distribution of knowledge and technological competences. Anchoring missions in local contexts may bring benefits not just in terms of local knowledge and new economic opportunities, but also through greater legitimacy for challenge-based policy action. Flanagan and Uyarra (2022, p. 544) note that "all regions have their own problems and challenges, some of which may provide a basis for legitimation, positioning, knowledge and market building" for new technologies. Orientating innovation policy missions according to place-based needs and problems, rather than technological strengths, may enhance the opportunities of less-favoured regions - which are often poorly equipped with knowledge assets (Flanagan et al. 2022). However, looking at regional innovation systems from the perspective of problems or challenges may require a broader understanding of innovation, and of relevant innovation actors, and is likely to require greater attention to the application and consumption side. The application side of innovation is important because, as Jeannerat and Crevoisier (2022, p. 5) point out, "economic value is increasingly created in places where new uses are invented and less in places where advanced technologies are produced".

Moreover, place is not just relevant to the orientation of missions but is also key to the effective implementation of mission-oriented innovation policies (Brown, 2020). Implicit in most discourse about innovation policy is the idealised assumption that there is a 'policy-maker' (Morgan and Marques 2019), downplaying the multi-level, multi-actor governance characteristic of messy, complex innovation policy mixes (Flanagan et al., 2011). Many societal challenges are addressed or shaped by (supra-)national policies, such as targets, standards and regulations concerning environmental issues, and much decision-making influencing economic development, education, industry, or finance remains at the national level (Capasso et al., 2019). However, regions and cities are key sites for policy action around societal problems. They are responsible for a large share of public spending and have a wide range of policy competencies in areas such as transport, built environment, housing or energy that are likely to be key to system transformation. Increasingly identified as 'agents on the ground', cities and regions are essential for experimenting with and implementing progressive policies providing the context for system innovations and new institutional arrangements to emerge (Bulkeley et al., 2010; Raven et al., 2019). This requires institutional capacity, which may be weak in some places (Morgan and Marques 2020). It also creates a profound challenge of multi-actor, multi-domain and multi-level

coordination. While the mission policy literature increasingly acknowledges that a 'bottom up' perspective is required (Mazzucato, 2018a), it is hard from the current literature to see how bottom-up and top-down approaches might combine effectively in various mission settings beyond some hand-waving references to the need for coordination.

In the end, even for top-down approaches, policies have to be implemented in real places, 'on the ground'. But regions can also be active sites of policy learning, experimentation, and testing of solutions - 'living labs'[1] for and demonstrators of new solutions to societal problems (Bulkeley et al., 2016; Voytenko et al., 2016). In this way they have the potential to become 'lead markets' for other places facing similar challenges (Losacker & Liefner, 2020). Small-scale (policy) programmes or experiments can turn into temporary local innovation systems that involve various actors to advance societal objectives and pursue regional industrial transformation (Frenken, 2017, Suiter et al. 2021).

Still, a key question is how place-based solutions can, or cannot, diffuse and contribute to system transformation more widely (Coenen et al., 2015; Uyarra et al., 2020). As shown by Bours et al. (2021) for the case of plastic pollution, more robust, systemic or multi-local dynamics do not necessarily emerge quickly out of local 'small wins'. They require institutional support and governance arrangements that facilitate coalition-building and networks at a wider geographical scale. The literature on experimentation in cities and regions (Fünfschilling et al. 2019; Sengers et al; 2021; Lam et al, 2020) has addressed the problem of local government actions within a system of translocal and multi-level governance (e.g. Bulkeley 2010, Lee 2014, Loorbach et al. 2020). In this view, national or supra-national entities provide incentives through broad goals, regulation, coordination and financial resources to address a shared problem such as sustainability. At the same time, cities or regions decide upon their actions and experiment with new solutions tailored to their local conditions, politics and values (Loorbach et al. 2020).

Experiences and practices with new solutions can travel through networks across scales (from lower to higher levels and vice versa) or horizontally between cities or regions through translocal networks. The connections between experts, solution providers, other stakeholders or policies offer structures to "diffuse contextualised solutions across territories and sectors" (Frenken, 2017, p. 45), leading to impacts beyond the individual experiments. There are different types of diffusion or scaling up processes distinguished in the literature: *Embedding* into local structures (e.g., institutional embedding), *translation* or replication in other spheres, institutional contexts or localities, and *scaling* in terms of incorporating more domains and practices, actors and/or resources) (e.g. von Wirth et al., 2019). Lam et al (2020) similarly discuss several amplification

[1] JPI Urban Europe defines living labs as 'a forum for innovating… [and] the development of new products, systems, services, and processes, employing working methods to integrate people into the entire development process as users and co-creators, to explore, examine, experiment, test and evaluate new ideas, scenarios, processes, systems, concepts and creative solutions in complex and real contexts' (cited in Voytenko et al., 2016, p.46).

processes seeking to a) accelerate the impact of individual initiatives (within amplification), b) extend the impact to more people or places, c) change institutional structures, values and mindsets beyond the initiative. Hence, it is not per se about diffusing concrete solutions, technologies or outcomes that emerged from a local innovation systems but more about diffusing the lessons and experiences with particular problem-solving activities. In fact, most solutions are likely to stay local given the embedding and context-dependent assembling of actors, networks, infrastructures, technologies and institutions. The difficulty for societal challenge-oriented innovation policy lies then in finding ways to extract and codify place-based practices and achievements, for instance in the form of new templates, artifacts or indicators, and to let these travel through horizontal and vertical governance arrangements.

Moreover, a number of scholars have started to consider place and scale as a strategic tool that can open up opportunities for transformative innovation policies. In this sense 'scale' is not fixed but rather a temporary structure that conditions actors and activities (Madsen, 2022). A constructivist understanding of policy scale follows the idea that narratives and framings about problems (and their solutions), as well as the resulting missions and policy targets, are the outcome of framing processes (Schön & Rein, 1994; Van Hulst & Yanow, 2016). Framings draw boundaries around a societal or political issue, define what counts and what does not, and become a guide to action for some while excluding others (Flanagan et al. 2022). This implies that policy designs building on specific problem and scale frames can be performative, influencing the innovation trajectories and search for solutions within and across regions.

Consequently, not only solutions but also problems can be scaled up and down, and deliberately used to disrupt system stability and help drive transformative change. Flanagan et al. (2022) note how problems can be scaled up to facilitate the embedding of local actors, networks and solutions into global market structures, shaping the likely solution space and the direction of innovation (Ansell & Torfing, 2015). Nonetheless, current mission-oriented approaches and frameworks generally do not consider the role of local problem and solution conditions, or the different place and distance dynamics intentionally or unintendedly engendered by these policies (Bugge et al., 2021; Uyarra et al., 2020).

4 A tentative map of the opportunity space for transformative missions

In previous sections, we have noted the spatial, scalar and place dimensions that can shape societal problem representations, how potential solutions are articulated, and how transformative innovation policies are governed. In this section, we link problem-solution views on mission policies (Wanzenböck et al. 2020; Bugge et al. 2021) with work on territorial knowledge dynamics and the aforementioned notions of place and distance dynamics (Binz & Truffer, 2017; Rutten, 2017; Uyarra et al., 2020). The aim is to derive a tentative map of the potential

opportunity space for transformative mission orientation that better takes into account place, scale and distance dynamics.

To recap, Wanzenböck et al. (2020) remind us that societal challenges are characterised by complexity, uncertainty and contestation. 'Wickedness' or divergence will be greater if, for instance, the division of responsibilities to tackle a problem across regions or countries in a multi-level governance system is not clear. It will also be higher in situations of institutional complexity, for instance, where state actors take multiple roles in transformations (Borrás & Edler, 2020), where many stakeholders are involved in policy formulation and implementation, and where actors simultaneously play roles as innovation producers, consumers, facilitators and regulators, for instance for digital solutions, in the built-environment or in the healthcare sector (Fisher et al., 2018). Moreover, even if there is some agreement or shared vision around the nature of a problem or challenge, the solution may still not exist or remain uncertain and contested (the case of a problem looking for a solution). Proponents may consider innovative solutions feasible, but these solutions lack broad-based societal legitimacy, address the problem only partially, or work better in certain (urban/rural) environments than others. These situations of misalignment may lead to mission stagnation, as the actor's problem and solution representations do not match, or the innovation system with the available actors, competencies, networks and institutions is not sufficiently aligned with a challenge or mission (Hekkert et al. 2020).

Shifting from a 'wicked' towards a more aligned problem-solution constellation can follow a 'problem-led', a 'solution-led' or a 'hybrid' pathway in which the issues of contestation, complexity or uncertainty are addressed on the problem and solution side (Wanzenböck et al. 2020). As we will argue in this section, scaling down or embedding a problem and/or solution locally, or alternatively bridging distance to frame a challenge in a broader or more global sense, can be strategies supporting problem-solution alignment and the activation of new innovation dynamics and mission progress. At its simplest, a societal problem may be framed locally or globally, depending on whether it is perceived as unique (that is relevant to one locality) or shared by many places. Similarly, solutions may be sought locally or globally, depending on the nature of the innovation (technological vs. non-technological), and the knowledge and expertise available or needed locally, or on local aspirations to build such innovation competences. The innovation dynamics and search for solutions may, in turn, be more 'place-based' (i.e. local) or more 'footloose' (i.e. global).

Note that we use the local/global distinction rather than impose strict administrative boundaries or levels. We aim to capture stylised differences in how problems and solutions may be framed geographically. The tentative map of policy opportunities for transformative missions below (Figure 1) is offered as a reflective tool to foreground spatial assumptions and consequences when scrutinising transformative mission thinking, on the one hand, and to stimulate thinking

about strategies for a more place- and context-sensitive mission governance, on the other. We discuss four stylised opportunity spaces, including governance strategies and instruments aligned with the prevalent geographical problem-solution constellations. We are aware that problem and solution representations are rarely isolated or independent considerations. Instead, they might be constructed simultaneously and unconsciously in practice: how problems are framed in geographical terms might determine the solutions that are sought, as well as the place(s) in which we search for these solutions. Hence, the geography of problems and the geography of solutions are highly interrelated. We are not proposing a fixed typology but rather a notional continuum of possibilities. It is also not intended to reflect or determine the transformative potential or nature of a specific governance structure, strategy or instrument. Specific governance strategies may not be intrinsically transformative, and the potential for transformative impacts will differ from situation to situation and context to context.

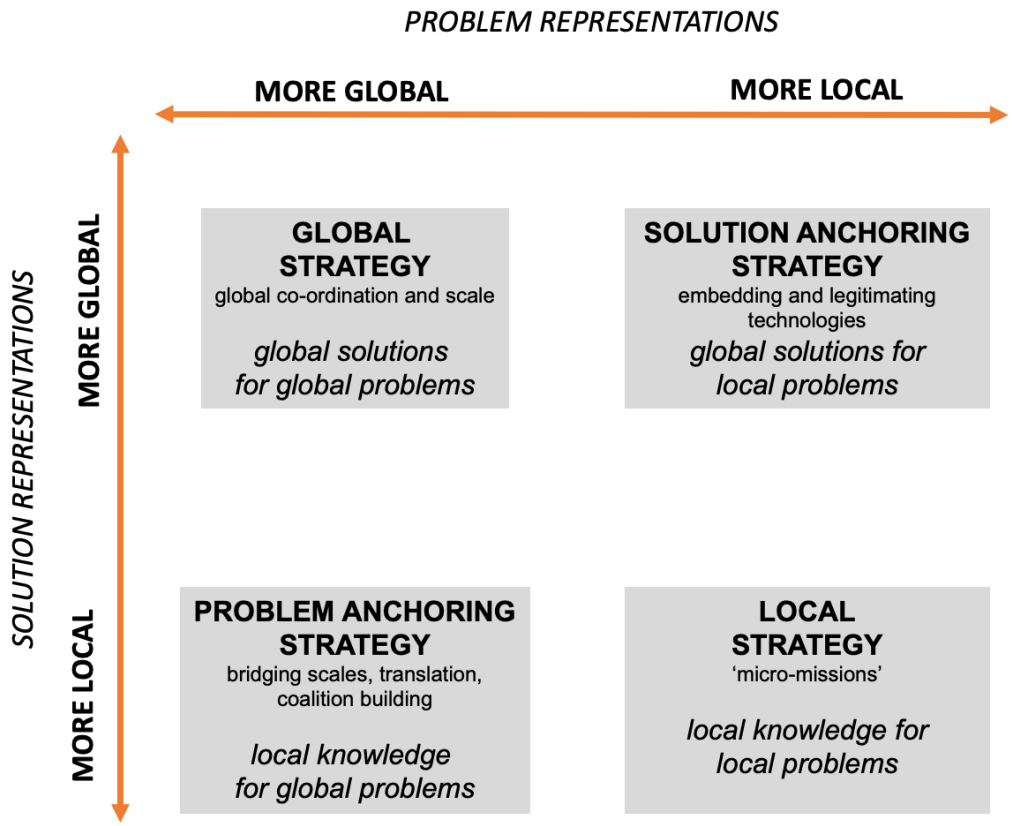

Figure 1: Policy opportunities for transformative missions

Local knowledge for local problems

Local problem/solution representations that are place-specific and with limited distance dynamics may relate to highly wicked issues or missions that are complex, contested or uncertain. In such situations, local networks and institutional and cultural embedding can facilitate the search for solutions. A 'local' strategy may be adequate to manage the complexity and contestation that arise in such situations, benefiting from both place-based knowledge of the problem and potential solutions. In this context, Henderson et al. (2023) discuss the advantage of smaller scale 'micro-missions', namely those addressing specific place-based issues at a sub-national scale, in terms of bringing together local actors, supporting legitimacy and balancing diverse interests and needs. Such approaches allow for an 'experimentation logic' in which there is simultaneous learning about the 'supply side' (knowledge and innovation development) and 'demand side' (legitimacy and implementation) of a solution to a localised problem.

Transformative and system-oriented initiatives involving social or institutional innovations are easier to establish and support at a smaller scale, or temporarily, without facing the boundaries and coordination challenges between established policy areas or levels (Weber and Rohracher 2012). Moreover, initiatives relevant to a mission may have emerged 'bottom-up' and self-organise their search for solutions. For instance, Bours et al. (2021) show for the national mission of 'plastic-free waterways' that a shared local embedding can help initiate a problem-based dialogue and connect 'on the ground' different initiatives, solution providers and stakeholders that are affected by or care about a common goal. Such local, system-oriented approaches can activate capacities to self-organise and undertake action – alone or in networks or cooperatives.

Over recent years several concepts and instruments were presented in the innovation and transition literature that can be related to a local experimentation strategy. These range from niche experiments (e.g. Kemp et al., 1998), over urban experiments and living labs (e.g. Voytenko et al., 2016) to regulatory or policy experiments aimed at influencing the place-based dynamics between 'top-down' regulatory or policy changes and the behaviour of businesses and society. An advantage of these approaches is that they "are geographically embedded in real places" (Voytenko et al., 2016, p. 47). Furthermore, local 'anchor' organisations such as universities and hospitals can play a role in supporting "problem framing, institutional setting, social interaction and learning" in the context of such urban experimentation and living labs (Evans et al., 2015, p. 2; see also Henderson et al., 2023). An example of regions adopting a 'living lab' approach to test, validate and refine complex solutions is the Network of Living Labs of Health of Galicia (LABSAÚDE)[2], which aims to to respond to the needs of the Galician health system through the creation and implementation of innovative projects in a real-world environment in which multiple agents (e.g. users, practitioners) interact.

[2] https://acis.sergas.gal/cartafol/LABSAUDE?idioma=es

However, local experimentation needs to be managed appropriately to avoid the downsides of 'localness', such as too narrow problem or solution framings, poor uptake of solutions, or lock-in. It is important to focus not only on local embedding but also to complement this with a translocal or global bridging strategy also to access extra-regional networks or enable broad-based solution uptake (Glückler, 2007).

System-based experimental approaches are increasingly discussed in an experimentalist governance logic (Sabel et al., 2012), as they attempt to combine interim goal-setting and contextual learning with monitoring and systematic comparisons of alternatives. Morgan (2018) argues that monitoring organised at higher governance levels such as the EU level can support local strategies by ensuring cross-regional (horizontal) learning and vertical coordination to diffuse solutions across contexts.

Global solutions for global problems

In a situation of broad understanding of, and consensus about, both technological priorities/possibilities and societal problems, and where place-based knowledge or needs are not critical to the societal challenge at hand, a global strategy involving bridging distance and making use of global knowledge creation dynamics can be appropriate (Wanzenböck and Frenken 2020). More akin to 'top-down' accelerator missions (Wittman et al. 2021) such a governance strategy consists of 'global' coordination and scale, that is seeking critical mass, to tackle problems with a relatively clear definition and objective ('mission') designed according to a scientific 'breakthrough logic'.

The focus here is on building specific knowledge, capacity and competences; geographical proximity is less relevant due to the ongoing innovation dynamics, codified search routines, and established connections of professionals over distance (Rutten 2017). Current examples can be found in large-scale vaccine development or the European mission to fight cancer, focusing on trans-national collaboration for scientific advancements. Limited value or attention to context-specific knowledge, local concerns, or serendipitous or accidental encounters can be a downside of a global amplification or scaling strategy focused on scientific and technological advancement. Local or 'mobile' brokers such as scientists, NGOs, consultants or firms engaged in both local and international knowledge communities are therefore needed to achieve regional engagement or local societal impact (Atta-Owusu & Fitjar, 2022; Glückler, 2007). Non-core regions without strong local knowledge clusters or organisations can be disadvantaged by such global mission designs.

Local knowledge for global problems

In other instances, problems may be framed as more general or global to simultaneously stimulate the local search for solutions in various places. The problem space may be well

understood or relatively uncontested in this situation. At the same time, the application and diffusion of solutions may still be hampered by uncertainty, ambiguous regulatory frameworks or weak decisions over technological choices. Broadening the geographical scale of the problem - e.g. by mobilising translocal networks, such as global networks of cities (Fastenrath and Coenen, 2021) - may help 'bridge scales' and widen the scope of a market, upscaling potential solutions to new places or fields of application (Dewald and Truffer, 2012; Uyarra et al., 2017). Thus a strategy could be based on translating and building local coalitions to tackle a challenge that, in its broad definition, is shared by many places, but where the creation and implementation of a solution is dominated by localised processes, routines or conditions.

A place-based approach for anchoring global problems is relevant to exploiting local qualities such as the knowledge bases and expertise of firms or other knowledge actors, or the demand sophistication of local users and citizens. Existing regional innovation system configurations may be mobilised to co-develop solutions to societal problems. This can, for instance, be a strategy for many societal issues related to public health (particularly around care), education, or mobility, where a problem may exist that is both local and global, and that requires complex solutions potentially combining technologies and knowledge from different sectors and industries to be implemented in a local context. Regions may use those opportunities to encourage interactions between diverse, potentially co-located networks of industries and knowledge bases (Glückler, 2007; Janssen & Frenken, 2019). Novelty and new path creation opportunities may emerge from the local bridging and recombination of unconnected actors and industries (Uyarra et al., 2020). The challenge here is to adequately articulate the problem in a local context, and to mobilise actors and networks around a common vision.

For multi-local problem-solving, collaborative platforms (Ansell & Gash, 2018) can be an instrument to bundle localized and ongoing projects, collaborations and networks. Such multi-local ambitions have been established in areas such as food[3], childhood obesity (Ansell & Gash, 2018; Borys et al., 2012) or sustainable mobility (van der Kam & Bekkers, 2020). In a mission context, these 'networks of networks' can have different governance purposes, for instance, together framing and creating broader commitment for a global problem; sharing and translating experiences with localised innovations; or promoting joint implementations, specific certification schemes or new standards to support multi-local solution diffusion.

An example of such collaborative platforms is the 'shared agendas' for sustainability and social change adopted in Cataluña (Spain), which aim to articulate, through a participatory governance model, the collective action of diverse actors to face a common societal challenge (usually related to the SDGs) in the territory and the problems that arise from it (Fernández & Romagosa, 2020). These projects are based on cross-sectoral collaboration and the generation of shared

[3] https://www.foodinnovationhubs.org/#global

knowledge between public administrations, academia, companies and civil society, to understand and manage complex problems from a holistic perspective and by taking into account long-term effects. The efforts seek to change the model of production and consumption in a territory towards a green and circular economy model, by responding to specific needs and problems of groups in that territory. The aim is to replicate or scale successful solutions by connecting them to more global strategies and agendas, such as the EU's research and innovation missions (Generalitat de Catalunya, 2020).

Global solutions for local problems

Finally, local problems may be mobilised to support the development of particular innovations or technologies. Innovations (technological or non-technological) that have the potential to tackle a certain societal problem may initially lack a local context. For instance, technological innovations might need to be accompanied by institutional or social innovations (Vale and Carvalho, 2013) to anchor technologies, embed them in the local institutional context, and increase their legitimacy and public acceptance. Anchoring thus implies "re-contextualizing and diffusing external knowledge in place" (Vale and Carvalho, 2013,1021) so that regional actors can access it and use it to transform regional structures (Binz et al., 2016).

Only if anchoring can be achieved, and legitimacy created at the local level, can such 'global solutions for local problems' be delivered. For instance, Uyarra and Flanagan (2021) discussed how the government of the Galicia region in Spain mobilised all regional departments to articulate problems and needs that could demonstrate the application of UAV (uncrewed aerial vehicles) based service solutions to public problems such as fire prevention, control of fisheries, and coastal surveillance and monitoring. Here, regional problems were leveraged to support external knowledge anchoring and legitimation for contested UAV technology.

As this example illustrates, peripheral places may make promising locations for contested innovations and test-beds for solutions that can then diffuse more widely across organisations and locations. This is particularly important for regions which may be less suited to lead in the development of new technologies, but which can instead take the lead in specific applications (Janssen & Frenken, 2019). The development of generic technologies may boost existing industries but also open up opportunities for diversification by driving convergence among the knowledge bases of unrelated industries (Corradini & De Propris, 2017; Montresor & Quatraro, 2017).

As noted by Losacker and Liefner (2020), regions may have demand or regulatory advantages for the testing of complex technologies, which makes them ideal regional (rather than national) lead markets. Lag or follower markets, they argue, "anticipate the benefits of the innovation designs first adopted in the lead market" (p.123). Demand advantages may arise from specific demand conditions, such as the risk of flooding or of forest fires as in the case of Galicia.

Looking at the case of waste management in Shanghai, Losacker and Liefner concluded that the large market and the legal conditions, and their interplay with a technological advantage, explained why Shanghai outperformed Shenzhen and Beijing as potential lead markets for waste-related technologies. Uyarra and Gee (2013) similarly identified the purposeful articulation of demand for waste management, active lobbying at multiple scales and technology legitimation as key mechanisims that helped the adoption of more sustainable technologies for waste management in the Greater Manchester area. Binz et al. (2016) studied the development of on-site water recycling technology in Chinese city regions and found that Beijing developed a sizeable industry (despite having the least favourable technological conditions) as a result of active mobilisation and anchoring processes of external resources through market formation, investment mobilisation, technology legitimation and knowledge creation.

In these kinds of instances the focus is not so much on developing new technical innovations, but instead on the social impacts of innovations, and how they can be stimulated and used to support challenges affecting specific places. A danger, however, is that discourse may be captured by special interests that intend to legitimise particular technologies with reference to its potential to solve societal challenges, but without sufficiently considering those challenges. This 'solutionist' bias may arise if too much emphasis is placed on promising solutions at the expense of more deeply understanding the problem, its causes and consequences (Montero, 2020).

5 Concluding remarks

In the last two decades there has been a lively debate about the need for more directional or mission-oriented innovation policies in order to address so-called wicked societal challenges, requiring not just technical solutions but also social or behavioural changes. In common with the debate about innovation policy more broadly, the debate about mission orientation has mostly focused on the definition and design of missions, rather than on their practical implementation in real political and local contexts. It remains unclear how MIPs will align in practice with multi-scalar governance, regional innovation systems and place-based problems and challenges. This lack of spatial sensitivity leads to a neglect of cities and regions as key loci for innovation and experimentation and as a key element in multi-scalar transformative innovation policy.

Clearly, the need for (societal) change driving a mission has not been 'out there' all along, nor is it identically manifested in all places; rather, it is contextual, socially constructed, follows various geographical dynamics and almost naturally involves different viewpoints and interests in relation to the kinds of innovation that might be needed. Given this fundamentally normative character, questions of how, where, at what point in time, and by whom problem discourses are created and societal needs articulated is highly relevant to attempts to make transformative mission-oriented innovation policy work in practice. Problem-driven innovation activities are, at least to some extent, directed by problem discourses and build on contextual narratives which specify the need for innovation and the nature of the change that is being sought. This means that

both problems and solutions need to be considered, and that there is both a geography of problems and a geography of solutions.

This chapter has sought to illuminate these issues by integrating a spatial and scalar dimension to how we think about transformative mission-oriented innovation policy. It brings together contributions from innovation policy studies, regional studies and economic geography, and argues that problem/solution representations in the context of mission-oriented policies not only have different degrees of 'wickedness' but will also be more or less geographically anchored. The latter is shaped by considerations of place qualities, and how these are framed in relation to a single location or in relation to multiple places. On this basis we propose a tentative mapping of the possible opportunity space for mission-oriented innovation policy, to illustrate how cities and regions might articulate 'missions' to advance societal challenges that considers not just their relevance to their territory and community but also the extent to which local (pre) conditions may support, or be supported by, the search for solutions. We use this to explore four specific idealised opportunity spaces that are relevant for different types of 'missions' but also different types of places, and that might be supported by diverse strategies and policy instruments. The aim is to foreground spatial and scalar implications and to encourage reflection on the potential for transformative mission-oriented policies. This is a first, tentative exploration of these implications and inevitably has limitations – most notably that we neglect the fact that societal challenges are not only contested and complex but also subject to transformation over time, and that the systems of innovation that emerge to solve them are not fixed but transient. The solution of one problem often leads to new and different problems (Metcalfe & Ramlogan, 2008). Since problems evolve, so do the content and the patterns of systemic interconnections between actors in the system.

The chapter has also reopened the question of what it means to be *transformative*. Transformative missions consider transformation in the sense of tackling a pressing societal challenge, but mission-oriented policies might also, directly or indirectly, transform places and communities. Top-down accelerator missions may be place-blind in theory, but no policy is spatially neutral in practice. Any MIP will inevitably influence the agglomeration of economic activity, potentially aggravating economic and societal disparities across territories. Thus place-blind transformative policies may exclude a large proportion of communities and places if not made more place sensitive. Equally 'localness' may lead to fragmentation and poor take-up of otherwise potentially transformative solutions. Missions may also suffer from 'solutionism', namely greater emphasis on promising solutions rather than the goals and values that the policy seeks to address. Considering place and scale could help ameliorate this risk by better fitting solutions to problems on the ground and by building legitimacy for those solutions according to the local context and the prevalent innovation dynamics.

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