Towards a Methodology for Co-Creating Transformative Policy Mixes

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Background

The extent to which modelled future pathways support effective challenge-led policy making has been questioned for a long time, with one major issue being the insufficient integration with the perspectives of policymakers and further stakeholders. It has been suggested to deal with this issue by designing facilitative dialogues between modelers and stakeholders to develop transformative policy mixes for system transformations (Rogge et al. 2020). The purpose of such dialogues is two-fold: First, to single out conflicts between model-generated future pathways and current innovation dynamics in order to identify transition bottlenecks; second, to co-create socio-technical storylines by scientists and stakeholders, exploring how these bottlenecks can be overcome (Geels et al. 2018).

While concrete methods of co-creation are currently tested in different projects, they are not yet analyzed and validated sufficiently regarding their contribution and function in participatory processes to co-create transformative policy mixes. In particular, there is a lack for an empirically-grounded way to clearly define different types of dialogues with respective different forms of participatory methods to address different levels of governance. One promising approach here seems to utilize the characteristics of the concerned transformation processes. However, the current state of research on the characterization of transformations is quite limited. In this context, a broad set of relevant dimensions was recently derived from various literature sources, empirical case studies and expert knowledge (Edler et al. 2020).

A novel methodological framework

In our speed talk, we will describe a novel methodology for designing co-creation workshops, which aims at providing a conceptual link between the transformation dimensions with the process of stakeholder integration when co-creating transformative policy mixes. In particular, the methodology addresses the following questions:

- *Which dimensions of a transformation are particularly relevant to the co-creation of transformative policy mixes?*
- *How should the processes of stakeholder mapping and dialogues aiming at the co-creation of transformative policy mixes reflect these dimensions?*

The methodological approach involves a systemic synthesis of the conceptual and methodological state of the art in three areas:

- Transformation dimensions: Starting from Edler et al. (2020) and Rogge et al. (2020), we identify relevant transformation dimensions by evaluating innovation system and transition analysis for three empirical case studies that differ in their sectoral and geographical focus (Koasidis et al. 2020; Nikas et al. 2020). These

are ordered based on their relevance for stakeholder selection, workshop inputs and workshop discussions.

- Stakeholder involvement: We extend classical approaches to stakeholder analysis with a prospective dimension by mapping the stakeholders who may be affected / and can affect the course of the transition not only in the present but also in the future depending on the pathway of the transition (latent/dormant stakeholders) and by recognizing different types of power across the transformation dimensions (Avelino 2017).
- Policy mix: To turn a modeled development pathway into a socio-technical narrative, we plan to organize workshops regarding key aspects of transformative "policy mixes" (e.g., Rogge et al., 2020). The workshops should then focus on developing those policy guardrails that appear particularly suitable to stakeholders to destabilize "non-sustainable" pathways, but also to strengthen political support for "sustainable" pathways at the same time.

Based on the discussion, a detailed methodological framework for co-creating transformative policy mixes will be provided, which will be applied to empirical case studies on climate mitigation pathways funded through the H2020 project PARIS REINFORCE.

Literature

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Session 16: Systems approaches for understanding and assessing the impact of directionality in challenge-led policy

Submission for speed talk

Title: Aligning directional policies with collective learning processes: developments in the Mobility of the Future programme since 2012

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Abstract

In light of today's grand challenges, a new generation of innovation policies is emerging which raises new demands on policymakers and administrators. In contrast to earlier generations, challenge-led innovation policies are addressing wicked problems directly rather than approaching them indirectly by stimulating economic growth and regulating externalities (Schot & Steinmueller, 2018). Our paper focuses on transformative mission-oriented innovation policies (MOIP), a specific type of challenge-led innovation policies. One of their constituent features is the provision of directionality in the problem-solution space (Mazzucato 2018; Wanzenböck et al., 2020). The provision of directionality requires a more active involvement of the state compared to other innovation policies to align stakeholders and coordinate collective efforts to accomplish the mission (Mazzucato, 2018; Hekkert et al., 2020). Therefore, modes of governance, learning processes and policy coordination need to be reassessed and adapted (Weber & Rohracher, 2012).

The theory building process for MOIPs is still at an early stage. However, first endeavours to systemise their essential characteristics all stress the importance of learning and reflexivity (Fisher et al., 2018; OECD, 2019; Janssen et al. 2020; Wesseling & Meijerhof 2020). The accomplishment of missions typically requires a multitude of technological and social innovations that interact with and build on each other. Furthermore, solutions are often uncertain and the understanding of the problem itself can change over time. Thus, learning processes need to be designed so that policies can be dynamically adapted. Lastly, the design of learning processes plays an important role in ensuring stakeholder involvement and legitimacy, which constitutes another key success factor of missions (Mazzucato, 2018).

In this paper, we present an analysis of the design and evolution of learning processes in a well-known MOIP: the "Mobility of the Future" (MdZ) programme in Austria (Biegelbauer et al., 2020). The analysis is still ongoing and will be finalised in May. This MOIP is particularly interesting for understanding the struggles of aligning directional policies with collective learning processes, having been designed as a learning programme from the beginning. Having been established already in 2012, the programme also constitutes a strong case for examining adaptations in the learning process and how these interacted with changes in directionality. The authors have followed the programme since its inception and conducted several studies connected to MdZ throughout the years, including an evaluation and the development of a tool for assessing the social impacts of this programme. Most recently, they have been commissioned to develop an impact assessment monitoring framework for the programme. In analysing the learning processes in this case, we follow Hekkert et al. (2020) as well as Wesseling and Meijerhof (2020) in combining a systems perspective on MOIP with a structural functional approach. We expand this approach by enriching it with insights from the social and transformative learning literature. Thereby, we aim to shed light on the concrete functions learning processes play in a

mission-oriented innovation system and how they have been adapted in response to changing definitions and interpretations of the mission. The paper will present preliminary findings from this analysis and discuss how MOIP can be reflexively designed and monitored to better align learning processes with the visions and goals of the MOIP.

Table 1: Comparison of two cultures of learning

	Transmissive learning	*Transformative learning*
Purpose and Scope	Understand defined cause and effect relationships	Organisational and individual transformation in contribution to systemic change
Process	Transfer of information from experts or peers	Action-oriented development process
Meaning	Predefined frames for learning content	Meaning is negotiated and constructed in diverse groups
Outcomes and Impacts	Efficient reproduction	Shared actionable knowledge, transformed perspectives, and environments
Assessment and Evaluation	Standardised monitoring and evaluation	Participatory-evaluation and critical support

Source: Adapted from König (2015)

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In recent years, various policy-making approaches have been put forward that are part of a 'normative turn' (Weber and Rohracher, 2012; Schot and Steinmüller, 2018) and are oriented towards an overarching 'directionality', aiming to effectively deal with so-called 'wicked problems' or 'grand societal challenges' (Mazzucato, 2013; Boon and Edler, 2018). These include, for example, 'demand-based' or 'challenge-led' policy approaches, 'mission-oriented' innovation policy as well as the notion of dedicated innovation systems (Haddad et al., 2020; Haddad and Bergek, 2020; Wesseling and Meijerhof, 2020; Mazzucato, 2016; Hekkert et al., 2020), and share the idea of one overarching goal, towards which various actors involved in sociotechnical systems change might subscribe to. Ideally, various actors from private, public and third sectors would engage in concerted efforts to induce systems change aligned with the normative orientation, e.g. to increasingly establish sustainable ways of production and consumption.

While featuring prominently in current policy discourses (e.g. EC, 2020; Mazzucato, 2018; ETC, 2019), it remains unclear under which conditions respective directionality-focused policy approaches might be effective in advancing sustainability-oriented sociotechnical systems transitions, and how to potentially assess respective impacts. Existing work on sociotechnical systems (e.g. TIS, transition management, MLP) highlights the role of actors and their agency, as well as their embeddedness in existing structures, and interrelated social practices, institutions, infrastructures, technological innovations, norms, rules, etc. that are inextricably interlinked and co-produced (Bergek et al., 2008; Jasanoff, 2005). Focusing on the element of directionality, several questions emerge including: What is the role of different actors in co-creating directionality in challenge-led policy, and how do different actors' degrees of alignment and/or engagement/implementation efforts affect the impact of challenge-led policies (Callon, 1986; Latour, 2004)? What is the role of existing framework conditions, i.e. institutional settings (Fünfschilling and Binz, 2020), existing policies (Rogge and Reichard, 2016), discursive threads, prevailing sociotechnical imaginaries (Jasanoff, 2004), and distinct actors' visions and vanguards (Hilgartner, 2015) in shaping the emerging directionality and what are the impacts of these dynamics on the effective development and implementation of challenge-led policy?

Building upon existing work on sociotechnical systems change and technical and global innovation systems, as well as by drawing on work on co-creation practices, the sociology of translation and the co-productionist idiom (Callon, 1986, Latour, 2004, Jasanoff, 2005), I develop and implement a theoretical framework to examine the role of directionality in advancing sustainability transitions in energy-intensive industries, and the conditions under which respective challenge-led policy might be effective. Focusing on decarbonisation processes in the cement industry, (a) I conduct a global mapping of actors and policies, as well as key outputs by non-policymaking entities that subscribe to the overarching directionality and may be – indirectly – influencing or influenced by challenge-led policy approaches; (b) I link this policy-mapping to decoupling outcomes (CO_2 emissions vs. cement production) in order to assess the impact of respective policies; and (c) conduct comparative case studies of 3 countries in order to examine the framework conditions under which directionality-oriented policy approaches might be effective. Finally, I draw policy recommendations.

Innovation Policy at the Plant Level: How Entrepreneurial Actors Capitalize on Policy Mixes to Realize Demonstration Projects

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Demonstration projects represent the bridge between research and development on one hand as well as up-scaling and commercialization on the other (Bossink, 2015; Hellsmark, Frishammar, Söderholm, & Ylinenpää, 2016). This stage of the innovation process (demonstration) is critical for proving the market-attractiveness of the new technologies. The innovation system literature emphasizes the importance of uncertainty reduction, and one of the main sources of uncertainty reduction is entrepreneurial experimentation, which implies probing into new technologies and applications (e.g., Bergek et al., 2008). Entrepreneurial actors depend on pilot and demonstration plants in making such experimentation possible. Demonstration plants address not only technical challenges, but also reduce the organizational-, market-, and institutional uncertainties that key stakeholders face in advancing new sustainable technologies (Hellsmark et al., 2016; Hendry et al., 2010).

Failure to support the demonstration and early deployment of the clean energy technologies would mean a waste of resources applied earlier in the innovation cycle for research and development (Åhman, Skjærseth, & Eikeland, 2018). Demonstrating a promising technology at large or full scale involves major costs and risks for technology developers if the technology should fail. Furthermore, knowledge generated through the learning at demonstrations has public-good characteristics, firms will often not appropriate all benefits from their investments. Hence, they are likely to underinvest in learning unless support is provided (e.g., through R&D subsidiaries and technology deployment schemes) (Åhman et al., 2018). This is particularly the case in developing clean energy technologies, where technological complexity and market uncertainty are high. Thus, public support and investment for demonstration plants are a focal point of governmental investments both on a regional, national and supranational-level for strengthening the competitiveness of industry and tackling the barriers that hold back private investment (Hellsmark et al., 2016). Policy action is also argued to be required to remedy various market and system failures (e.g., Edler & Fagerberg, 2017; Edmondson, Kern, & Rogge, 2018).

Few studies have assessed the outputs and effectiveness of public fund instruments for the construction and use of demonstration plants in the context of clean energy technologies (Åhman et al., 2018; Brown & Hendry, 2009; Frame, Hannon, Bell, & McArthur, 2018; Krahé, Heidug, Ward, & Smale, 2013). These studies concluded that public R&D and investment support are important, but as the technology matures, they need to be complemented with purposefully designed market creation incentives and systematic instruments (Åhman et al., 2018; Brown & Hendry, 2009; Hellsmark et al., 2016). Hellsmark et al. (2016) also argue that demonstration programs that reduce technical uncertainties need to be supplemented by policies that ensure that markets are formed. They conclude that relying solely on public subsidies to R&D and investments in a selection of demonstration plants will likely lead to a start–stop approach and will not promote the overall commercialization of energy technologies. This suggests that a mix of different policy instruments are needed for various types of demonstration plants, and policy actions should be matched with intended demonstration plants outcomes more effectively. It is argued that PDPs, particularly when the scale of the project is large and the technology is close to market readiness, are increasingly

complex and risky (Åhman et al., 2018; Frishammar, Söderholm, Bäckström, Hellsmark, & Ylinenpää, 2015). Policy mix refers to 'a set of different and complementary policy instruments to address the problems identified' in a national or regional innovation system (Borrás & Edquist, 2013: 1514). Thus, for public policy, the main challenge for demonstration and early deployment of the novel technologies then becomes providing the right incentives at the right time so that such a process can be facilitated (Hellsmark et al., 2016).

Bossink (2017) and Hellsmark et al. (2016) also argue that public policy for the demonstration plants cannot be understood at a single level of governance. According to Bossink (2017), next to a national level, there is also a need for coordination of public policies on an international level, for example in the European Union (EU), in order to stimulate the use and construction of demonstration projects for sustainable energy technologies. Hendry, Harborne, and Brown (2010) also contend that the EU needs a comprehensive and general coordination policy, in which all sustainable energy demonstration projects are integrated. In line with these studies, Edmondson et al. (2018) posit that further attention should be paid towards the vertical dimensions of public policy design, spanning multiple levels of government, including implementation of national-level policies at the local scale to reduce conflicts or even increase the synergies. Hence, appropriate policy instruments for the various demonstration plants reside not only within different governmental bodies but also at different levels (e.g., regional, national, supranational). In addition, these may operate under different institutional logics and with partly conflicting goals. Therefore, innovation policy on demonstration plants for clean energy technologies, in general, cannot be understood at a single level of governance (Bossink, 2017). In an effort to bridge the above research gap, it is required to place a central focus on the multilevel nature of existing policy mixes through the differentiation of policy elements and processes at multiple levels of governance (the supra-national, national, and regional levels) and examines their interactive dynamics for the construction and use of PDPs. Accordingly, the literature addresses the need for a more fine-grained insight into how policy mixes influence and facilitate the construction and use of PDPs (Bossink, 2017; Brown & Hendry, 2009; Hellsmark et al., 2016). This limitation also relates to the implications for how to design and implement public policy measures to support PDP activities for accelerating the commercialization of new energy technologies (Hellsmark et al., 2016).

On the other hand, Mavrot, Hadorn, and Sager (2019) argue that the focus on settings and target groups allows for a better understanding of the overall policy mix performance from a policy evaluation perspective. It is at these setting and target group levels that the policy mix concretely takes effect. They show that both the examination of the policy concept (i.e. policy design) and policy implementation are enriched through a better understanding of meso- and micro-level particularities that affect the policy process. The examination of the policy mix is demonstrably more meaningful if the moderating role that settings play between the policy mix as a whole and the ultimate target group is considered. According to Mavrot et al. (2019), within policy mixes a given measure may activate different mechanisms depending on what kind of measures it is combined with. Policy mixes thus provide different sets of opportunities for the target groups to react to. This approach highlights that it is the target group's reaction and behavior to the opportunities provided by the policy that triggers the change (…). Observations at a micro- to meso-level will then allow drawing conclusions for a more general level of policy design. In achieving this, we also aim to get a better understanding of the activities and strategies of key entrepreneurial actors, e.g., technology developers, to make use of different public policies and instruments. This is especially important for policymakers who want to support system builders, e.g., to facilitate the demonstration and early deployment of novel technologies. Accordingly, our main research question is:

How do entrepreneurial actors capitalize on policy mixes to realize demonstration projects?

In light of this background, by drawing insights from policy mix studies (Edquist, 2011; Flanagan, Uyarra, & Laranja, 2011; Rogge & Reichardt, 2016) and the policy feedback theory (PFT) (Edmondson, Kern, & Rogge, 2019; Pierson, 1993), our study provides a multilevel interpretation of the vertical interactions of existing policy mixes in the different governance levels and policy domains. The term 'policy mix' implies a focus on the interactions and interdependencies between different policies as they affect the extent to which intended policy outcomes are achieved (Flanagan et al., 2011). In the last three decades, policy feedback has emerged as a popular concept in policy analysis (Béland, 2010; Jordan & Matt, 2014). Jordan and Matt (2014) argue that since politics create policies, and policies also remake politics, we should make policies the starting points as well as the endpoints of our policies analysis. Feedback from previous and current policies is important in that it helps highlight what policy works and what may not (Edmondson et al., 2019; Kern & Rogge, 2018; Pierson, 1993). Accordingly, the focus of our paper has been on the challenges and implications of innovation policies on the construction and use of demonstration plants to facilitate the commercialization of technologies in the empirical context of advanced biofuel technologies. Three distinctive demonstration plants are studied. The aim is to identify the policy mix dynamics that are active in three cases, and by this, to identify patterns, mechanisms, or processes with analytical and external validity, and contribute to theoretical development in this area (Yin, 2009).

Our aim is to broaden the discussion within the technology and innovation studies literature about the importance of policy mixes and their interaction with the target group. In addition, it provides a point of departure for discussing the challenges of identifying and designing appropriate innovation policy in the PDP context. The main contribution of this study lies in the differentiation of policy mixes at multiple spatial scales (supra-national, national, and regional levels) and the uncovering of their dynamic interactions in realizing the demonstration plants. Furthermore, it helps to derive insights and learn from the policy mixes for further policymaking. In other words, this study contributes to the conceptualization of policy mixes for the construction and use of PDPs by highlighting the verticality of policy mixes, accounting for which configurations will facilitate a more nuanced design of policy mixes. Recognizing the nature of policy mixes in this context is also conducive to the design of more open-ended and reflexive innovation policies. Accordingly, the study provides new insights into the challenges of innovation policy in the demonstration plants context and shows how the development and commercialization of the novel technologies from a policy perspective can be improved.