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Article

The politics of directionality in innovation policy through the lens of policy process frameworks

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Different interpretations of "directionality" in innovation policy and sustainability transitions literature streams suggest the need for distinguishing between actors "giving direction" contributing to transformative change, and "systemic directionality" emerging through transformative change required to address societal challenges. As an initiation toward bridging these understandings, we emphasize the process-oriented and political nature of directionality and mobilize political theory to conceptualize the politics of directionality. The questions *who gives direction*, *where and how is direction given*, *which direction is given*, and *when and why does a direction change (or not)* are employed to explore the politics of directionality in an integrative literature review of five policy process frameworks: Multiple Streams Framework, Punctuated Equilibrium Theory, Policy Feedback Theory, Advocacy Coalition Framework, and the Narrative Policy Framework. We propose an integrated conceptual framework for the analysis of the politics of directionality involving giving direction and processes of systemic directionality.

Keywords: directionality; innovation; societal challenges; sustainability transitions; policy processes; politics.

1. Introduction

Following the "normative turn" in innovation policy in addressing urgent societal challenges (Schlaile et al. 2017; Uyarra, Ribeiro, and Dale-Clough 2019), "directionality" has become a key concept. The notion of "directionality" is employed in the innovation policy discourse and sustainability transitions research, which relates to the normative direction of transformative change processes in sociotechnical systems. While inherently related, the ways the concept of directionality is used in these two literature streams suggest a need for distinguishing between "systemic directionality" and "giving direction," as they seem to hold different meanings.

Conceptualizations stemming primarily from research on sustainability transitions range from (interacting) transitions in sociotechnical systems in a certain direction (Schot and Kanger 2018), to the direction of sociotechnical pathways in transitions (Stirling 2011; Rosenbloom 2017; Pel, Raven, and van Est 2020), or to normative visions of desirable futures guiding the direction of transformative change (Smith, Stirling, and Berkhout 2005; Kemp and Loorbach 2006). Accordingly, directionality is seen as a *feature of* systemic, evolutionary processes of transformative change, in which cumulative choices in a certain direction can limit or open up development pathways in which transitions unfold (Rosenbloom, Meadowcroft, and Cashore 2019; Pel 2024). Scholars increasingly regard emergent pathways in transitions as normative and political (Elzen et al. 2011; Kok and Klerkx 2023) and highlight the temporal, process-oriented nature of directionality (Pel, Raven, and van Est 2020).

Using the same term, directionality is considered crucial in innovation policies aimed at addressing societal challenges (Weber and Rohracher 2012; Schot and Steinmueller 2018; Diercks, Larsen, and Steward 2019). These changes focus on broad societal change processes in specific directions given by public policies and policy actors, who may guide, block, or accelerate innovation processes. For example, policy actors influence the selection environment and guide the search in innovation systems by formulating expectations (Bergek et al. 2008; Yap and Truffer 2019; Hekkert et al. 2020). Recent discussions on transformative innovation policy and mission-oriented innovation policy (MIP) highlight the role of directionality. MIP, in particular, seeks to "create directionality" by defining concrete goals and directing innovation activities toward a mission (Kattel and Mazzucato 2018; Mazzucato 2018). These expectations have sparked empirical investigation (Grillitsch et al. 2019; Parks 2022; Wardeberg et al. 2024) and criticisms (Cappellano et al. 2022; Sandström and Alm 2022) on the effectiveness of "directional policies." Key concerns include how societal demands, policy goals, sectors, and solutions are defined, and by whom (Boon and Edler 2018; Andersson and Hellsmark 2024), and which pathways are taken through the problem-solution space (Wanzenböck et al. 2020) to *contribute* to innovation policy to transformative change (Ghosh et al. 2021).

We argue giving direction and systemic directionality are inherently interrelated and interdependent. Systemic progression in a certain direction can manifest in a diversity of desirable futures and possible development pathways, which can, in turn, influence public policies and decision-making in different ways, such as through setting long-term goals and missions advocated by certain actors. Thus, specific directions in public policies (from the innovation policy perspective

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on directionality) may be nested within the systemic evolution of diverse possible societal development trajectories (related to the sustainability transitions field's perspective on directionality).

We propose an understanding of directionality that captures this nested, interdependent relationship between giving direction and systemic directionality, viewing it as *a political process of how emerging and materializing pathways in transitions influence and are influenced by the formation and negotiation of normative policy directions*. This definition highlights the complex and dynamic relationship between policy directions and the actual development of transition pathways, shaped by existing institutions, power structures, and values related to the past, present, and future (Stirling 2024). It also underscores that the politics of directionality unfold both in setting a course (giving direction) and in the response to how that course unfolds in practice (systemic directionality), which is crucial for innovation and transition processes and warrants more attention in these fields.

Building on prior work emphasizing the political and normative character of directionality (Hausknost and Haas 2019; Kok and Klerkx 2023; Stirling 2024; Wiarda, de Wildt, and Doorn 2024), its governance (Lindner et al. 2016; Könnölä et al. 2021), outcomes (Andersson, Hellsmark, and Sandén 2021; Ghosh et al. 2021), or how directionality is brought into policy practice (Parks 2022; Bergek, Hellsmark, and Karltorp 2023; Andersson and Hellsmark 2024), we deepen the focus on its political dimensions by engaging with questions and insights from political theory, which have been relatively underexplored in this context. Moreover, we align with a political–theoretical starting point of policy and policymaking in which the ontological distinction between policies and politics is challenged. Along this view, following Stirling (2024), we question current narratives that innovation policy is becoming "more directional," that is, to assume that they were nonpolitical before, and that direction is a property *of* innovation policy that can be "lacking," "weak," or "strong" (Weber and Rohracher 2012; Bulah et al. 2024). Instead, we argue that any policy is not to be seen as neutral but as a negotiated, political outcome influenced by different actors in different positions of power, in and beyond the public policy sphere (Majone 1989; Fischer et al. 1993; Durnova, Fischer, and Zittoun 2016). Particularly, those policy issues related to complex societal challenges tend to be politically contested, and policymaking around such issues rarely happens in a political vacuum (Wanzenböck et al. 2020). Consequently, a broad range of actors are affected by the resulting direction and can win or lose depending on which direction prevails. We, therefore, consider any policy direction taken as the outcome of a *political decision-making process* and prioritization.

Considering the relevance of viewing directionality through the lens of political policy processes, there has been surprisingly little attention paid to *policy process theory* to better understand directionality. To close these gaps in existing literature, we present the following research question: *how can the politics of directionality be conceptualized using policy process frameworks?* We employ an integrative literature review (Paré et al. 2015) to consolidate insights from different academic fields and generate new theoretical insights. By answering this question, the article provides a relevant contribution to understanding innovation policy as subject to political negotiations and decision-making processes: a view that has remained underdeveloped in the innovation policy field.

We start our investigation by introducing the questions *who gives direction*, *which direction is given, where and how is direction given*, *when and why does a direction change (or not)*, inspired by a commonly used definition of politics from Lasswell (1936), and "*who gets what, where, when, how and why*." We use the elements of this definition as an analytical structuring device to understand the politics of directionality. Through analyzing questions that relate to "giving direction," such as *how is a direction given?*, as well as questions relating to "systemic directionality," such as *when do directions change?*, our first aim is to contribute to bridging the gap in understanding of directionality between the innovation policy and sustainability transitions fields. We then draw on various prominent policy process frameworks from the policy studies field to harvest relevant conceptual contributions from policy studies and conceptualize the politics of directionality. As an outcome, we present an integrated conceptual framework for studying the politics of directionality, with important implications for the innovation policy field.

The remaining sections are organized as follows: Section 2 presents state-of-the-art insights on the political dimensions of directionality. Section 3 outlines the methodology, data collection, and analytical steps of the integrative literature review. Section 4 discusses contributions from the policy process frameworks in relation to existing literature. Section 5 summarizes findings within a conceptual framework and explores implications for innovation policy theory and practice. Finally, Section 6 concludes with a critical methodological reflection and an agenda for future research on the politics of directionality.

2. The politics of directionality

This paper aims to conceptualize the politics of directionality and contribute to a better understanding of the political nature of how directionality unfolds in processes of innovation and transformative change. To unpack this political nature, we draw on a classic and widely applied definition of politics by Lasswell (1936): "*who gets what, where, when, how, and why*." Within the innovation policy and sustainability transitions fields, these questions have been used explicitly (Köhler et al. 2019; Ehnert 2023), or implicitly (Meadowcroft 2011; van Oudheusden 2014), to understand various political questions. We employ Lasswell's questions as an analytical structuring device for our study, albeit with slight adaptation in the formulation and order of the questions, to fit our aim of critically analyzing and conceptualizing the politics of directionality. As such, the questions present an analytical tool inspired by, rather than following directly from, Lasswell (1936).

Specifically, we approach the questions from two perspectives: first, the perspective of giving direction (i.e. *who gives direction*, *how is direction given*, and *where is direction given*) and second, the perspective of how directions unfold and influence systemic directionality (i.e. *when do directions change* and *why do some directions prevail over others*). ["*When*" and "*why*" questions are formulated differently from the "*who*," "*where*," "*how*," and "*which*" questions. We have chosen not to discuss "*when is direction*

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given" and "*why direction is given*" as separate dimensions for the following reasons: first, "*when is direction given*" would suggest direction is only given at certain moments in time, obscuring the political nature of existing directions (Stirling 2024). Instead, we focus on *when* directions change or are reoriented. Second, we argue the question "*why is direction given*" would require us to review the psychological, behavioral, or emotional aspects of agency and decision-making. Such a micro-foundational focus extends beyond what our study of policy process frameworks can provide.] The question *which direction is given* alludes to giving direction and systemic directionality (for further detail, see Section 2.4). While discussed separately for analytical clarity, the questions and their insights need to be considered in relation to each other. For example, *who gives direction* has important implications for *which direction is given* and *why certain directions prevail* over others. Below, each of the six questions will be introduced and discussed considering existing literature from the fields of innovation policy and sustainability transitions. Our understanding of these analytical questions serves as an entry point for how to engage with a political understanding of directionality, highlighting current gaps that emerge when viewing directionality from a political perspective.

2.1 Who gives direction?

Who "directs" innovation policy and processes of transformative change points to the relevance of actors, their position of power, power relations vis-à-vis other actors, and participation and inclusion in decision-making processes (Stirling 2008; Parks 2022). Who gives direction has ramifications for which directions are recognized and reflected in policy goals, and whether short-term activities by actors giving direction will contribute to or hinder progress toward these goals. As the debate on "just sustainability transitions" highlights, these matters have important implications for the democratic legitimacy of policy (Swilling and Annecke 2012; Bennett et al. 2019), which is why, as Stirling argues, more attention should be paid to diversity in directionality (Stirling 2011). Similarly, broad inclusion is often advocated, such that societal engagement through for instance the involvement of nonstate actors (Kuhlmann and Rip 2018) and citizens (Trischler et al. 2022) is foundational for direction-setting.

However, despite the will and effort for democratic participation in processes of directionality, relevant decision-making might happen outside of open debate. Instead, having relevant resources, access to significant policy actors, interest and skills to influence policy formulation, or bring about new collaborations, such as policy entrepreneurs (Salas Gironés, van Est, and Verbong 2020), institutional entrepreneurs (Grillitsch et al. 2019), or regulatory agencies (te Kulve et al. 2018), may be crucial for providing directionality. This implies *who gives direction* is a matter of power, and power relations between actors with varying capacities to mobilize resources and institutions to achieve their goals, and who may win or lose as a consequence (Avelino 2017). Regarding *who gives direction*, more attention is yet to be paid to how these actors are embedded in broader networks of actors involved in decision-making processes, how their directing activities influence power (im)balances within those networks, and to which normative ends these activities are directed (Kok and Klerkx 2023; Stirling 2024).

2.2 Where is direction given?

Where direction is given points to the various sites of giving direction, such as the space where policy directions are formulated and negotiated or where innovation activities are directed. For instance, many of the models in innovation studies consider markets as the main and apolitical selection environment for innovation (Hausknost and Haas 2019).

From the perspective of policy formulation, the way goals, sectors, and solution directions are translated and defined forms the space in which directionality can unfold (Andersson and Hellsmark 2024), which can materialize differently across different geographical scales and policy domains (Grillitsch et al. 2019). Furthermore, demand-side, sector-specific, or challenge-oriented innovation policies provide relevant spaces in which societal needs and demands are articulated (Boon and Edler 2018). Lastly, the concept of an "arena" has been introduced to describe the space where actors come together to formulate and govern societal missions (Janssen et al. 2023; Wesseling, Meijerhof, and Delicado 2023), develop a shared problem perception, vision, and agenda among frontrunners in a transition (Loorbach 2010), or where institutions, technologies, visions, and practices come together in a cognitive space (Jørgensen and Sørensen 2002).

Considering these relevant contributions regarding *where direction is given*, more attention might be paid to the political nature of sites of giving direction. In our understanding, spaces of policy formulation, negotiation, decision-making, and broader political arenas are sites of giving direction, which are linked to transition dynamics (Normann 2015; Markard, Suter, and Ingold 2016; Edmondson, Kern, and Rogge 2019). In line with this view, Hausknost and Haas (2019) suggest (re)politicizing the space *where direction is given*, through shifting the boundaries of the selection environment in which solutions are sought, from markets to a space marked by broader societal concerns.

2.3 How is direction given?

In our understanding, *how direction is given* relates to the strategies, roles, actions, and governance approaches through which direction is given by policy actors. Directing strategies may involve asserting power, leveraging privilege, exercising authority, or mobilizing expertise (Stirling 2024). Furthermore, *how* policy goals or societal missions are defined (Mazzucato 2018), and which discourses and knowledge are mobilized to legitimize these ends (Pel 2024), matter for which directions and their associated cultural and political values are prioritized (Wiarda, de Wildt, and Doorn 2024).

Giving direction may also imply different governance approaches. Pluralistic, bottom-up approaches of experimentation and participatory governance are often advocated for to align the interests of broad stakeholder groups, create shared expectations, and facilitate coordinated action (Kuhlmann and Rip 2018; Schot and Steinmueller 2018; Grillitsch et al. 2019; Könnölä et al. 2021). In contrast, mission-driven governance has been connected to a more top-down approach, in which the mission dictates the direction of change, with a role for policy to tilt the playing field in favor of the mission and related actors (Kattel and Mazzucato 2018; Mazzucato 2018).

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Regardless of differing governance approaches, a large responsibility is often placed on the state and public policy actors to shape the direction of transformative change (Laatsit, Grillitsch, and Fünfschilling 2022; Bergek, Hellsmark, and Karltorp 2023). For example, policymakers are expected to stimulate innovation in societally desirable directions (Weber and Rohracher 2012; Könnölä et al. 2021), while also phasing out activities that hinder sustainability transitions (Røpke 2012; Kivimaa and Kern 2016; Ghosh et al. 2021). This requires finding a converging pathway through the problem-solution space (Wanzenböck et al. 2020), resolving conflicting actor interests, developing shared visions, developing new governance capabilities (Grillitsch et al. 2019), handling conflicting policy goals, identifying realistic pathways, and accessing intervention points (Bergek, Hellsmark, and Karltorp 2023). These are no easy tasks and may imply demands beyond the scope of innovation or sectoral policies (Boon and Edler 2018; Laatsit, Grillitsch, and Fünfschilling 2022). Importantly, Stirling (2024) notes directing innovation activities often reiterate existing, locally powerful directions, rather than challenging structures of power or pluralizing toward radically alternative directions. *How direction is given* thus matters for the prevailing direction, that is, the outcome (Andersson, Hellsmark, and Sandén 2021; Ghosh et al. 2021).

2.4 Which direction is given?

We understand *which direction is given* as relating to the normative orientation of (innovation) policies (i.e. policy direction) that result from political processes of giving direction, and which transition pathways emerge and prevail as a consequence. *Which direction is given* through policy has important ramifications for whether specific societal needs and challenges are adequately addressed (Boon and Edler 2018), and whether legitimate development pathways are consequently selected or reinforced (Rosenbloom, Meadowcroft and Cashore 2019). These issues matter for the transformative potential (Haddad and Bergek 2023) and outcomes of innovation policies (Ghosh et al. 2021) and sociotechnical change (Andersson, Hellsmark, and Sandén 2021).

Little attention has been given to the character of directions beyond technological dimensions, as recognized by Andersson, Hellsmark, and Sandén (2021), Hausknost and Haas (2019), and Wiarda, de Wildt, and Doorn (2024). However, choosing between two alternative technologies for decarbonizing the energy system connects to different pathways toward carbon neutrality, affects different sets of actors, and may prioritize different values. Therefore, Pel, Raven, and van Est (2020) suggest that directionality is characterized by a multiplicity of competing sociotechnical configurations, and diverse forms of normative appraisal and assumptions.

We view a policy direction as a discourse related to a particular policy solution, a related view about the problem this solution aims to solve, and political, ideological values that underly such problem frames and advocated solutions (Wiarda, de Wildt, and Doorn 2024). In policy formulation, this relates to how goals, sectors, and solution pathways are defined, demarcating which pathway directions can materialize (Andersson and Hellsmark 2024).

2.5 When do directions change?

The question *when do directions change* turns the analysis of the politics of directionality to temporality and the systemic emergence and evolution of directional development trajectories. We understand this question in relation to moments when directions (pathways) change, are stabilized, reoriented, or when particular pathways are favored over others. Such processes have been relatively well covered in existing literature, examining relevant positive and negative feedback mechanisms (Edmondson, Kern, and Rogge 2019), which create dynamics of openness for change in direction, and subsequent closing down and lock-in (Stirling 2008).

From a political point of view, an important aspect of when directions change is to gain insight into when, and by whom, moments of openness and closing are influenced. During moments of openness, political choices can impact the pace and direction of change. Critical moments are so-called "branching points," when political choices determine whether and in which direction the pathway is followed (Foxon et al. 2013; Rosenbloom, Haley, and Meadowcroft 2018).

At the same time, directionality is characterized by path dependency, meaning that early sequences of choices can set in motion self-reinforcing courses of development that limit the possibilities for change in direction (Stirling 2008; Rosenbloom, Meadowcroft, and Cashore 2019). While it is an accumulating sequence of choices that shape the outcomes of directionality, particular policy choices influence the ways in which self-reinforcing patterns of development can be enacted (Rosenbloom, Meadowcroft, and Cashore 2019) and how emergent processes of transformative change unfold (Pel 2024).

2.6 Why do some directions prevail over others?

We view *why some directions prevail over others* as another systemic, structural question of power and path dependence. Power in relation to directionality can be seen as a productive means to promote certain understandings, meanings, and values to a direction, implying that some directions are recognized and formalized, while others are excluded or marginalized (Stirling 2008). Because these power relations are subject to path-dependence (Schmidt 2011), we view directions related to dominant perspectives regarding societal challenges and their desired solutions as likely to prevail over those that are more divergent. As the diversity of possible directions closes down, a path dependency is formed for a particular transition pathway as a consequence of cumulative choices favoring a certain direction over others (Rosenbloom, Meadowcroft, and Cashore 2019).

Finally, why certain directions prevail over others can be seen as an outcome of the aforementioned aspects of directionality. For instance, temporal dynamics related to path dependency (*when*) can influence the composition of the group of actors involved in the negotiation and decision-making processes (*who*), and spaces where directionality takes place (*where*).

3. Review approach

This study employs an integrative literature review, which aims to assess, synthesize, and integrate literature on a topic from different fields, enabling new theoretical frameworks and perspectives to emerge (Torraco 2005; Paré et al. 2015). We use questions about the politics of directionality [*who gives direction*, *where and how is direction given*, *which direction is given*, and *when and why does a direction*

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Table 1. Data collection and sources used for analysis.

Type of source	Sources (total $N = 81$)
1. Foundational works ($n = 10$)	MSF: Kingdon (1984); PET: Baumgartner and Jones (1993); PFT: Pierson (1993), Pierson (2000) and Skocpol (1992); ACF: Sabatier (1988) and Sabatier and Jenkins-Smith (1993); and NPF: (Jones and McBeth, (2010), Jones, et al. 2014) and Shanahan, Jones, and McBeth (2011)
2. Chapters from *Theories of the Policy Process* (Sabatier and Weible 2018) ($n = 5$)	MSF: Herweg, Zahariadis, and Zohlnhöfer (2018); PET: Baumgartner, Jones, and Mortensen (2018); PFT: Mettler and Sorelle (2018); ACF: Jenkins-Smith et al. (2018); and NPF: Shanahan et al. (2018)
3. Sources covering at least two of the frameworks ($n = 9$)	Cairney (2013), (Heikkila, and Cairney, (2018), Howlett et al., (2016), Howlett et al. (2017), Kern and Rogge (2018), Nowlin (2011), Orach and Schlüter (2016), Petridou, (2014) and Sobeck (2003)
4. Additional sources based on snowballing and web search in Scopus and Web of Science ($n = 57$)	MSF: nine additional sources; PET: thirteen additional sources; PFT: thirteen additional sources; ACF: thirteen additional sources; and NPF: nine additional sources. See Supplementary Table 2A for references

change (or not)] as an analytical tool to review policy process frameworks. Our aim is not to present an all-encompassing overview of the policy process field but rather to translate their insights for the study of directionality in terms of a political process, providing relevant insights for the field of innovation policy.

3.1 Policy process literature

Within policy studies, this review focuses specifically on policy process frameworks. {Frameworks aim to provide a shared research platform that enables analysts to work together in describing, explaining, and, sometimes, predicting phenomena within and across contexts (Sabatier and Weible 2018). Hence, frameworks are broader than theories, which provide more precise conceptual and operational definitions in the form of testable and falsifiable hypotheses. We prefer the term "policy process frameworks" for this study, even though some frameworks are commonly referred to as theories (e.g. Punctuated Equilibrium Theory (PET) or Policy Feedback Theory (PFT)].} Policy process frameworks give a suitable starting point for analyzing the politics of directionality due to their theoretical focus on temporal mechanisms of policy stability and change. Literature on policy process frameworks is developed in active research communities, which continuously advance knowledge regarding these frameworks based on new insights, and critically discuss their advantages, limitations, and future research avenues while maintaining consistency in the interpretation of core concepts.

Among policy process frameworks, a specific selection was made based on predetermined selection and inclusion criteria (not in order of relevance). The framework:

- addresses complex policy dynamics of stability and change, offering insight into the policy process and complex dynamics beyond policy stage heuristics and short-term policy cycles;
- covers policy processes broadly, linking political negotiations in decision-making with broader political debates;
- is well-known and theoretically mature, having been applied empirically across diverse geographical, temporal, and (policy) field-specific contexts for over a decade; and
- has an active research community that continuously revises and enhances its theoretical foundations in recent contributions and publications.

As a second step, a screening took place within the field of policy process studies to identify and evaluate policy process frameworks ($n = 16$) against the evaluation criteria presented earlier (Supplementary Table 1A). The following policy process frameworks were selected after evaluation: Multiple Streams Framework (MSF), PET, PFT, Advocacy Coalition Framework (ACF), and the Narrative Policy Framework (NPF). Supplementary Tables 2A and 3A present an overview of the selected frameworks, their aims and scope, the theory of policy change, core concepts, and references to selected sources used for analysis.

3.2 Data collection and analysis

Different kinds of sources were collected for analysis through a process of expanding from seminal work and foundational papers of each framework (Table 1). Foundational works, selected chapters in Sabatier and Weible's (2018) theories of the policy process, and key publications provided core concepts. Comparative sources provided insights into the frameworks' strengths, weaknesses, and historical context. Additional sources, gathered through snowballing and database searches, included empirical reviews, theoretical contributions, and applications in innovation policy and sustainability transitions.

The data analysis of the five selected policy process frameworks was organized in three steps (Fig. 1): understanding core concepts and framework strengths/weaknesses (Step 1), analyzing political dimensions across frameworks (Step 2), and applying these insights to conceptualize the politics of directionality (Step 3). The coding process was iterative, in which first-order codes were generated deductively, based on codebooks containing core information about the frameworks (Step 1) and their political aspects (Step 2), with subcodes emerging during the coding process. The codebooks are presented in the Supplementary material (5–6).

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Step 1: Understanding core concepts of the frameworks

Coding for each framework:

* Core concepts
* Origins and development
* Aims
* Assumptions
* Scope and level of analysis
* Mechanisms of policy change
* Strengths, critiques, and future research

(See Codebook 1, Supplementary Material)

Step 2: Understanding the politics of policy process frameworks

Coding political dimensions for each framework:

* Who - actors
* Where - spaces of policy making and politics
* How - strategies, roles and governance
* What - outcomes
* When - temporal dynamics
* Why - underlying mechanisms

(see Codebook 2, Supplementary Material)

Step 3: Integrating insights to conceptualize the politics of directionality

Concepts (step 1) are integrated with political dimensions (step 2) for the analysis of the politics of directionality:

* Who gives direction?
* Where is direction given?
* How is direction given?
* Which direction is given?
* When do directions change?
* Why do some directions prevail over others?

Figure 1. Data analysis process.

4. The politics of directionality through the lens of policy process frameworks

This section contains insights from the previously introduced policy process frameworks, which are mobilized for conceptualizing the politics of directionality. This analysis builds on foundational discussions of the analytical questions related to the politics of directionality discussed in Section 2, by introducing relevant concepts from policy process frameworks.

An overview of the results is presented in Table 2.

4.1 Who gives direction?

Who gives direction points to the relevance of actor inclusion in processes of negotiation and decision-making in directionality, and the capacity to influence decision-making processes. Policy process frameworks can build on existing insights regarding *who gives direction* through the concepts of policy subsystems, policy monopolies, and policy entrepreneurs.

The policy process frameworks present the variety of actors involved in the policy process as a *policy subsystem* (PET, ACF,

Table 2. Overview of relevant concepts from policy process frameworks for the conceptualization of the politics of directionality.

Who gives direction?	Where is direction given?	How is direction given?	Which direction is given?	When do directions change?	Why do some directions prevail over others?
Policy subsystem (PET, ACF, and NPF) and policy community (MSF)	Policy subsystem (PET, ACF, and NPF)	Softening up (MSF)	Belief system (ACF and NPF)	Friction (PET)	Lock-in and path dependence (PET and PFT)
Policy monopoly (PET)	Macropolitical arena (PET)	Policy conflict (ACF, NPF)	Policy image (PET)	Policy change (MSF, PET, ACF, and NPF)	Problem recognition (MSF, PET, ACF, and NPF)
Policy entrepreneur (MSF)	Problem stream, policy stream, and political stream (MSF)	Coalition coordination strategies (ACF) and narrative strategies (NPF)		Windows of opportunity (MSF)	Resources as a source of power (MSF and ACF)
	Policyscape (PFT)	Open or closed political negotiation (PET and MSF)			
	Policy venue (PET, ACF, and NPF)				

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and NPF) or a *policy community* (MSF) (Herweg 2016). A policy subsystem or community is a network of actors that is issue-bound and particular to a geographical area, making it a useful concept for contextualizing *who gives direction*, as well as *where is direction given* (Section 4.2). A policy subsystem thus shows how actor involvement in giving direction goes beyond policy domains and across sectors to include any actor involved with a particular policy issue. Moreover, the policy subsystem concept includes actors from within and beyond the public policy sphere, such as policymakers at any level of government, private sector actors, and representatives from non-governmental organizations, media, and research organizations (ACF and NPF).

However, PET and MSF emphasize that important decisions in policy subsystems or policy communities are predominantly made by a limited group of actors, consisting, for example, of policy experts, political party advisors, academics, bureaucrats, and lobbyists (Green-Pedersen and Princen 2016; Herweg 2016). This implies the frameworks differ in how they see the level of influence policy actors have on decisions within a policy subsystem. PET suggests that policy subsystems can become *monopolies* (PET) of influential actors with a single interest, who may prevent groups outside the dominant policy subsystem from engaging in significant decision-making (Givel 2010; Baumgartner, Jones, and Mortensen 2018). Given that policy monopolies are supported by a strong policy image and institutional structure, those *who give direction* may be subject to path dependencies. For example, decision-making structures, state capacities, interest group formation, and broader membership in the political community are shaped by how policy processes have historically developed (PFT).

Consequently, most policy issues are treated outside of broader political debates and discussions (PET), indicating that the call for broadening participation in direction-setting related to societal challenges may prove more challenging than existing directionality literature suggests (Kuhlmann and Rip 2018; Schot and Steinmueller 2018). Importantly, deeper engagement with participation beyond open calls for broadening inclusion is crucial because of the political nature of directionality and the need for democratic legitimacy in direction-setting (Elzen et al. 2011; Boon and Edler 2018;).

Furthermore, *who gives direction* is also a matter of who has relevant resources, capabilities, power, and political support for initiating change. The MSF has introduced the concept of *policy entrepreneur* (MSF) (Kingdon 1984), and later notions of a problem broker (Knaggård 2015) and political entrepreneur (Herweg, Huß, and Zohlnhöfer 2015), as actors that can institute policy change. Attention is brought to specific problems by problem brokers, who frame conditions as public problems and work to make policymakers accept these frames. Policy entrepreneurs link problems with solutions and adapt them to gain support within the policy community. Once a problem and solution reach the agenda, political entrepreneurs in formal leadership roles work to secure a majority for the proposal. Salas Gironés, van Est, and Verbong (2020) applied the concept of policy entrepreneurs to innovation policy directionality, highlighting the importance of early-stage direction-setting by these actors.

4.2 Where is direction given?

Spaces of policymaking, decision-making, and political arenas may be seen as relevant sites for giving direction, about which policy process literature has additional insights to offer.

Policy process frameworks suggest that the negotiation of directions might occur within arenas of policymaking, such as *policy subsystems* (PET, ACF, and NPF), and in spaces of *macropolitics* (PET and PFT). Both are relevant for directionality, as problem frames and solution pathways may be discussed in broader political arenas and have ramifications for policy formulation. As such, there are inherent linkages between systemic dimensions in which directionality unfolds and the decision-making processes taking place within sites of political negotiation. Additionally, past policies may shape the *policyscape* (PFT) in which current policies are formulated in policy subsystems and debated in broader political spaces, shaping the context in which directionality is given (Mettler 2016).

Furthermore, the MSF distinguishes three main spaces of policymaking and politics. The *problem stream* (MSF) is where changes in societal indicators, feedback from previous policies, or focusing events are framed into problems (Kingdon 1984). As problem frames are an essential part of directions, the problem stream can be seen as a space where directions first emerge. In the *policy stream* (MSF), the policy community generates multiple policy solutions to the policy issues, which are gradually reduced through discussion, modification, and recombination of ideas. Here, directions are shaped further by identifying a diversity of policy solutions. In the *political stream* (MSF), negotiation processes around the legitimacy of directions occur and may be influenced by (changes in) national mood, the degree of interest group mobilization, and changes in ideological preferences related to political cycles (Herweg, Zahariadis, and Zohlnhöfer 2018). The MSF provides more specific insight into the spaces *where direction is given*, and *how* directions are negotiated through agenda-setting and decision-making processes.

Lastly, the concept of the *policy venue* (ACF and NPF) may be important as space for giving direction, as this is where (narrative) debates regarding specific policy issues between opposing coalitions of actors play out. Policy venues may take form in formal institutions, such as parliaments, or informal ones, such as (social) media platforms (NPF and PET). The concept of policy venues hereby provides a broader understanding of spaces *where direction is given*, beyond what innovation policy scholars might initially associate with spaces of negotiation and deliberation, such as mission arenas (Janssen et al. 2023; Wesseling, Meijerhof, and Delicado 2023).

4.3 How is direction given?

Giving direction involves various actor roles and governance strategies to balance promoting transformative innovations with phasing out undesirable activities amid societal transitions (Røpke 2012; Kivimaa and Kern 2016). Policy process literature offers insight into navigating policy conflict and negotiating different policy directions.

First, the concept of *softening up* (MSF) suggests that direction is given through discussing, altering, and recombining alternative solutions, filtering out policy alternatives along

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the way. In this way, many directions advocated by diverse actors may be "closed-down" during the policy process (Stirling 2008), highlighting the political negotiation of different directions beyond selecting technologies through market mechanisms (Hausknost and Haas 2019).

Furthermore, existing literature points to the various challenges related to the governance of directionality, for example, in bridging normative values between diverse stakeholders in seeking consensus (Grillitsch et al. 2019) or coordinating conflicting policy goals (Bergek, Hellsmark, and Karltorp 2023). The ACF and the NPF give relevant insight into the dynamics of *policy conflict*, indicating that the level of conflict (i.e. the extent to which actor coalitions perceive the objectives or actions of opponents as a threat) depends on which strategies they employ to influence the policy process. For instance, if actor coalitions perceive themselves as losing a policy debate, they are more inclined to use *narrative strategies* related to expanding conflict (NPF), exaggeration of maliciousness of the opponent, growing mistrust, and obstruction of policy solutions (ACF). Within advocacy coalitions, *coordination strategies* are used to align the behavior and beliefs between policy actors within the coalition to influence the policy process (Jenkins-Smith et al. 2018). Overcoming policy conflict is easier when coalitions converge on policy beliefs, or negotiated agreement is facilitated by mutual interaction, broad representation, commitment, and trust (ACF).

Lastly, how direction is given by different actors may vary over time and between spaces of policymaking and macropolitics (PET and MSF). In a policy subsystem with a dominant monopoly of actors and a widely accepted policy image, there may be lower levels of contestation and conflict compared to periods when a policy issue enters the macropolitical arena, and political mobilization and societal debate take place (PET). Likewise, in the policy stream, interaction is characterized by arguing and linking problem frames with proposed solutions, while in the political stream, bargaining and powering for political support dominate (MSF). These insights are relevant for understanding how directions may be differently negotiated through *closed politics of soliciting, or open societal debate* (PET and MSF).

4.4 Which direction is given?

Characterizing *which direction* results from negotiating different policy directions beyond technological dimensions has been a relevant gap in the literature (Hausknost and Haas 2019; Andersson, Hellsmark, and Sandén 2021; Wiarda, de Wildt and Doorn 2024). Policy process literature contains relevant concepts for understanding the normativity of directions that emerge beyond technological dimensions, relating to which values, norms, and ideas may be represented in policies and policy discourse.

The *belief system* (ACF and NPF), "*a set of basic values, causal assumptions and problem perceptions*," provides individuals with meaning and sensemaking (Sabatier and Jenkins-Smith 1993: 25). It consists of three layers: the deep core beliefs, related to fundamental normative values and political ideology; the policy core beliefs, containing empirical assessments of the causes of the problem, normative value priorities, and preferred solutions; and the secondary beliefs, regarding the seriousness of the problem, or the design of a specific policy instrument (Sabatier and Jenkins-Smith 1999). The different layers of the belief system provide a new way of understanding the political characteristics of directions beyond alternative technologies. Importantly, it also shows how directions are materialized in the form of public policies, as policies are considered as translations of a belief system manifested in goals, rules, incentives, taxes, and other policy instruments (ACF and NPF). Public policies are thereby never neutral but reflect the narratives, beliefs, political values, problem frames, and preferred solutions of the actor coalition that prevailed in the policy debate.

Additionally, the notion of a *policy image* (PET) can be helpful in understanding the stability of such policy belief systems. Policy images related to political values, emotive appeals, and empirical information can be used to reproduce a frame around a particular policy problem (Baumgartner and Jones 1993). As long as subsystem politics remain stable, the assumptions related to a particular policy problem are taken for granted, and the policy image hereby contributes to feedback processes reinforcing the stability of existing policy monopolies (Princen 2013).

4.5 When do directions change?

Existing literature on directionality has pointed to the relevance of feedback mechanisms and pathways with moments of openness related to when directions change (Stirling 2008; Foxon et al. 2013; Rosenbloom 2017). Policy process theory can be of additional value to understanding directional change through insights into *policy* dynamics and *-change* (MSF, PET, ACF, and NPF). While the PET emphasizes policy change as major policy punctuation, the ACF and NPF allow for minor, gradual policy change, such as through policy learning.

PET sees policy change as related to short lurches of potentially major deviations from past policies, stemming from disproportionate information processing of policymakers and building up *friction* (Baumgartner and Jones 1993). When pressures for change are sufficient, policy issues move from the policy subsystems onto the macropolitical and governmental agenda, potentially leading to significant policy change led by previously uninvolved political actors. A new equilibrium is established as new institutions are put in place by a new, or newly altered policy community, and public and political involvement recede.

The ACF identifies four conceptual avenues for *policy change*: (1) events external to the subsystem, such as crises, (2) internal events, such as policy failures or scandals, (3) policy learning through the gradual altering of concepts and assumptions of subsystem participants, or (4) negotiated agreement among previously warring coalitions (Jenkins-Smith et al. 2018: 145–146). Any path can contribute to major policy change, although they should be considered more as a necessary but not sufficient source of policy change. Furthermore, policy narratives also affect the likelihood of *policy change* (NPF) (Shanahan, Jones, and McBeth 2011; Shanahan et al. 2018). Stronger, more stable, and cohesive policy narratives are more likely to provide the "coalitional glue" needed to make a coalition successful in realizing their preferred policy outcomes. Lastly, the conditions for a *window of opportunity* (MSF) potentially leading to agenda change (Kingdon 1984) and subsequent decision-making (Herweg, Huß, and Zohlnhöfer 2015) include problem recognition by society, "coupling" of a solution to this problem, and political support from policymakers.

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The policy process frameworks thus emphasize that policy change can only occur under certain conditions (MSF, PET, ACF, and NPF), informing *when directions change* by specifying the circumstances in which and how a change in policy direction is more likely. For example, the MSF stresses that agenda change is rare and only happens when the conditions in each of the three streams allow them to be brought together.

4.6 Why do some directions prevail over others?

Explanations of why certain directions prevail over others can arguably be seen as a combination of path dependency on existing trajectories and the power to shape understandings, meanings, and values associated with a particular direction. First, policy process frameworks suggest that policy dynamics are driven by feedback mechanisms, characterizing policy processes mostly with *path dependence and lock-in effects* (PFT and PET) rather than dynamic policy change. Specifically, PFT suggests *self-reinforcing feedback mechanisms* (PFT), related to economic returns, expansion of state capacities in existing domains, and sociopolitical, fiscal, informational, and interpretive feedback (Mettler and Sorelle 2018). Consequently, path dependencies result in agenda-setting, offering frames for interpretation, imposing resource restrictions and commitments, configuring governing capacity, and institutionalizing standard operating procedures. Additionally, policy outcomes shape politics through shaping the social, economic, and political conditions in which individuals and groups take part in the policy process and the goals they pursue (Pierson 1993). Past policies are essential in shaping current policies and politics, making envisioned solutions to societal challenges more closely aligned with past directions and likely to prevail over more divergent ones.

Furthermore, policy process theory suggests that certain directions may prevail due to the *recognition* of specific *problems* over others (PET, MSF, and ACF). Limited time and serial processing of information affect the recognition and attention to particular problems and their related solutions over others (Jones and Baumgartner 2012). Additionally, problems have become more contested, implying that choosing between solutions is ever more difficult for policymakers, making them more receptive to lobbying and public opinion. As a result, policy processes are characterized by ambiguity (MSF) and nonlinearity (PET). Under these conditions, values, belief systems (ACF), and policy narratives (NPF) are central to sensemaking and legitimizing which directions are relevant.

Lastly, the legitimization of certain directions is related to power, as power legitimizes certain problem understandings, meanings, and values to a direction, while others are excluded or marginalized. Such power can stem from *resources* (MSF and ACF), like formal authority to make policy decisions, influence on public opinion, access to relevant information and networks, ability to mobilze support, time, financial resources, and skills related to leadership, negotiating, and persistency (Zohlnhöfer and Rüb 2016; Jenkins-Smith et al. 2018).

5. Discussion

Directionality is understood in the innovation policy literature mainly through actors "giving direction", *contributing to* transformative change, and in the sustainability transitions literature as "systemic directionality," a *feature of* transformative change needed in the face of urgent societal challenges. Regardless of these somewhat different meanings, both perspectives point to the relevance of a process-oriented and political understanding of directionality. We have therefore proposed a view of directionality as *a political process of how emerging and materializing pathways in transitions influence and are influenced by the formation and negotiation of normative policy directions*. Departing from a political understanding of directionality, we addressed the question of how the politics of directionality can be conceptualized using policy process theory.

5.1 Conceptualizing the politics of directionality

To address our research question, we propose a conceptual framework for analyzing the politics of directionality through the lens of policy process frameworks. This framework represents an initial effort to integrate policy studies insights into innovation policy and sustainability transitions literature, providing a foundation for further theoretical and empirical advancements. It can be expanded and adapted by incorporating specific elements from policy process theory and transition theory, with its application shaped by the particular empirical contexts involved. The purpose of this framework is three-fold. First, we aim to show how our analytical questions about giving direction and systemic directionality are nested, bridging the gap between the different understandings of directionality in innovation policy and sustainability transitions. Second, we point innovation policy scholars to relevant concepts, which can be used in future analyses to illuminate the political nature of the term directionality, policy direction, and directing actors and activities. Third, it poses reflective questions for innovation policy scholars and practitioners to help make sense of the meaning and implications of the political processes that make up policymaking in the context of emergent and unfolding transitions.

As illustrated in Fig. 2, our framework suggests a nested relationship between the political process of giving direction (in terms of *who, where, and how direction is given*), resulting in negotiated policy directions (*which*), and systemic directionality in terms of emerging and prevailing directions (*why*), as well as dynamics of stability or change in the direction of pathways (*when*). We summarize our conceptual understanding of each analytical question and list relevant key concepts derived from policy process frameworks to guide future studies on the politics of directionality.

At the top of Fig. 2, the questions *who gives direction*, *how is direction given*, and *where is direction given* are presented. These questions and their related insights from policy process frameworks represent political decision-making processes of giving direction related to actors who may steer, accelerate, or block policy directions. These questions are most relevant for understanding and engaging with policy subsystem politics and policy processes, and potentially speak most to the innovation policy community. They are inter-related in meaningful ways and have implications for *which* policy direction results as an outcome (Fig. 2).

For instance, policy process frameworks emphasize the need to critically examine actor involvement (*who*), as well as the democratization and legitimation processes of direction-setting. This is crucial because the spaces *where* key decisions

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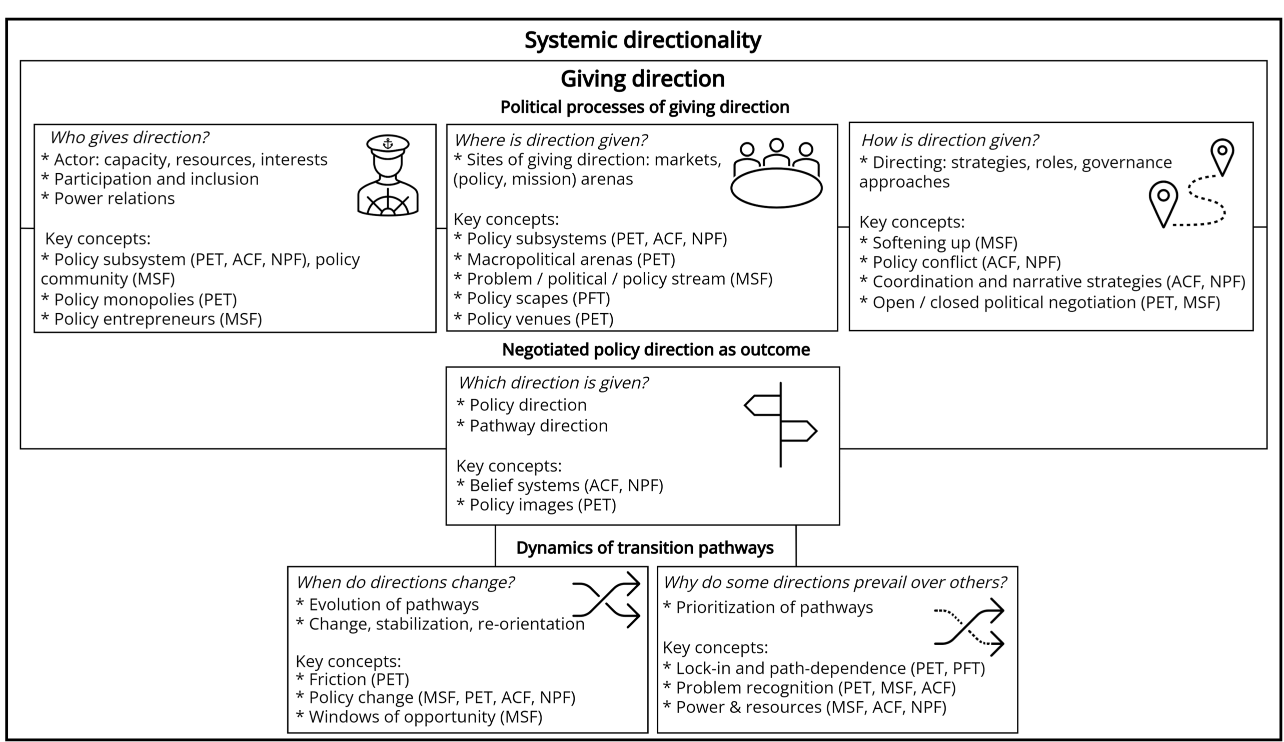

Figure 2. Conceptual framework.

on negotiating policy direction occur may be restricted, limiting influence from actors outside the dominant policy subsystem and closed to open public debate (Givel 2010). This may foreground significant challenges associated with calls from various authors for greater democratic engagement in processes of directionality (Kuhlmann and Rip 2018; Schot and Steinmueller 2018; Könnölä et al. 2021;).

Furthermore, it matters *how* policy problems and solutions are recognized and prioritized, or *how* policy conflict is addressed, for the resulting policy direction (*which*). Importantly, Grillitsch et al. (2019) suggest that the inability to resolve conflicting normative interests can result in vague policy formulation and a lack of direction needed in light of addressing societal challenges. Policy process literature indicates that in giving direction (*how*), there is a need to be reflexive about the underlying beliefs and values of actor coalitions trying to coordinate and find relevant policy solutions, and to foster conditions of trust and commitment between them. "*Belief systems*" and "*policy images*" (ACF and PET) may be helpful in this regard. Both concepts show that public policies are never neutral but reflect political values, problem frames, beliefs, and preferred solutions of actors who successfully influenced policy debates and reiterated dominant policy images. Policy process literature hereby affirms that policy directions (*which*) are political in nature, reflecting actors' beliefs and images around which problem–solution constellations compose "the right direction."

Additionally, *which direction is given* has relevant implications for *why some directions prevail over others* and *when directions change*. This question hereby connects giving direction and dynamics of transition pathways within Fig. 2. The *when and why* questions are relevant for analyzing directionality from a more long-term perspective of evolving societal development and emerging pathways (systemic directionality). Such questions are systemic and might therefore be more relevant among sustainability transition scholars. Hereby, policy process frameworks highlight that policy directions and politics are subject to structural dynamics of positive and negative feedback, comparable and relevant in transitions, which may create opportunities for change or lock-in of policy directions (PET and PFT). This is in line with existing contributions in the sustainability transitions literature, which have shown how policy mixes coevolve with sociotechnical systems (Edmondson, Kern, and Rogge 2019) and how cumulative choices in a certain direction guide systemic directionality of transitions over time (Rosenbloom, Haley, and Meadowcroft 2018). In particular, Rosenbloom, Meadowcroft, and Cashore (2019) have emphasized the need to view branching points, where directions change, as inherently political. Policy process literature offers valuable insights into this, drawing on various conceptualizations of policy change (MSF, PET, ACF, and NPF) and the concept of windows of opportunity (Kingdon 1984).

Finally, attempts to uncover the reasons *why some directions prevail over others* can be informed by insights from policy process literature on power and influence in problem recognition and agenda-setting (MSF, PET, and ACF), as well as the resources needed to legitimize problem frames and solutions and influence decision-making (MSF, ACF, and NPF). As argued by Pel (2024) and Stirling (2024), dominant problem frames in the innovation policy domain revolve around "lagging," or "catching up," prioritizing technological innovation over other solutions. This policy direction (*what*) prevails through structures of power and privilege (*why*) (Stirling 2024).

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5.2 Implications for innovation policy

The politics of directionality as conceptualized in this article have important implications for the innovation policy community. Arguably, in academic literature and policy practice, three policy directions have materialized, related to market failures, system failures, and transformative change paradigms (Weber and Rohracher 2012). Each of these rationales represents a distinct normative direction (*which*), involves specific actors (*who*), in a specific policy subsystem (*where*), and mobilizes specific strategies (*how*) to influence the policy discourse. The evolution of these discourses (*when*) can be described as layered because even though new paradigms have emerged, the frame "innovation for growth" has continued to prevail (*why*) (Schot and Steinmueller 2018; Diercks, Larsen, and Steward 2019). These policy directions now coexist in parallel, for example, through policy instruments related to growth-based research and development (R&D) incentives and university–industry–government relations, working alongside policies fostering experimentation and upscaling for transformative change. In light of our conceptual framework, three conclusions about present-day innovation policies can be drawn.

First, past innovation policies and instruments are not as "neutral" as the recent call for more "directionality" to innovation policy implicitly suggests (Stirling 2024). Even those science and R&D policies understood as generic policies to stimulate innovation "horizontally" instead of favoring particular technologies or industries have political consequences regarding the kinds of innovations, industries, and firms that benefit from such policies (Rodrik 2009). For example, R&D-intensive manufacturing industries and larger firms profit more from R&D subsidies compared to smaller firms and service industries (Frenken 2017). As shown by the policy process frameworks in this study, innovation policy, like any other type of policy, knows winners and losers, and is subject to ongoing struggles between actor groups for influence on decision-making, prioritization, and policy outcomes. Resulting policies and instruments can therefore be seen as translations of prevailing actors' beliefs and ideologies, challenging the assumptions that innovation policy has been "non-directional" before and now requires "more direction" (Stirling 2024).

Second, the policy directions for addressing market failures, system failures, and transformative change contain alternative political values. This has relevant ramifications for *which* direction is currently given through innovation policies. While economic growth and neoliberalism have historically underpinned market failure and system-oriented innovation policies, transformative approaches aim to support social and ecological sustainability transitions. The ideological values they represent (economic versus sustainability) have historically been at odds with one another, making their coexistence challenging, if not conflicting. Therefore, current innovation policy can give rise to policy conflict or political compromise inhibiting transformative action toward sustainability (Grillitsch et al. 2019). Contributing more to transformative change in the direction of sustainability transitions will require prioritizing values such as environmental sustainability, democracy, human rights, and social justice in innovation policy, while phasing out growth-aiming rationales. This involves being reflexive and explicit about the values underlying current innovation policy instruments, challenging existing power relations in relevant policy subsystems, overcoming policy conflict through converging policy beliefs, broad representation, and fostering commitment and trust among actors involved.

Third, all policy process frameworks included in this study emphasize that policymaking is a complex, messy, and continuous process of normative prioritization and negotiation, which comes with relevant challenges for innovation policy actors. For example, policymakers face time constraints, leaving relevant, complex issues unaddressed (Baumgartner and Jones 1993), and policy feedback processes lead to path dependencies in policymaking, limiting the possibilities for policy change (Pierson 1993). At the same time, innovation policy practitioners are called to take action in light of urgent societal challenges by implementing directional policies while leaving little space to reflect on policy solutions beyond prevalent directions. For bureaucrats, politicians, or other actors involved in directing transformative- or mission-oriented innovation policy, our conceptual framework can act as a guide to illuminate and navigate the difficult and confronting questions surrounding the politics of directionality.

6. Conclusion and future research

This paper has aimed to study the politics of directionality through the lens of policy process frameworks, harvesting important conceptual insights for understanding *who gives direction*, *where and how is direction given*, *which direction is given*, and *when and why does a direction change (or not)*. We approach the concept of directionality as a fundamentally political process, for which political theory has relevant insights. Based on this understanding, we conducted a thorough integrative review of policy process literature to illuminate the political nature of directionality. This review has resulted in an integrated conceptual framework that draws on relevant concepts from policy process frameworks, aiming to advance the conceptualization of the politics of directionality. For innovation policy scholars and practitioners, engaging meaningfully with the politics of current innovation policy rationales and their implications in the context of pressing societal challenges is essential. It implies that the call for "more directionality" may be challenged, as this rests on the flawed assumption that innovation policy has been neutral or "non-directional" before. From the perspective of policy processes, innovation policy rationales and instruments contain their own ideological values and should, therefore, be treated as political. Overcoming the differences between them will undoubtedly raise difficult questions of prioritization, require reflexivity, and challenge existing belief systems, policy images, practices, and power relations. Additionally, (policy) actors involved will face challenges of navigating new conflicts that come with the political and complex character of the problems challenge-oriented innovation policy aims to address.

6.1 Limitations and methodological discussion

The previous discussion shows that policy process literature has relevant insights to offer regarding the politics of directionality. However, the policy process frameworks were not

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written with this explicit purpose in mind, which implies that there are limitations to this study to consider.

First, no single framework offers a silver bullet for understanding the politics of directionality. For instance, PET and PFT have strong temporal characteristics, focusing on feedback mechanisms, policy change, and path dependency. As such, these frameworks are more relevant for understanding *when directions change* or *why* some are more persistent than others, compared to questions such as *who gives direction* or *how is direction given*. For the latter questions, the MSF, the ACF, and the NPF offer more relevant insights, for instance, around navigating policy conflict among different actor coalitions.

Second, the policy process frameworks studied in this article comprise large research communities and bodies of literature in and of themselves. Through the integrative review approach used in this article, much of their depth and nuance is lost in the need for a concise understanding of their core concepts and potential use for conceptualizing the politics of directionality. While it was not the purpose of this review to be all-encompassing in presenting the policy process frameworks, other methods would be more suitable when aiming for a complete picture of one or more policy process framework(s).

Lastly, as also discussed by Kern and Rogge (2018), policy process frameworks differ in their ontological and epistemological foundations and assumptions. Some have a more positivist history and application (e.g. the ACF), while others have more constructivist characteristics (e.g. MSF or NPF). One should be aware of such differences when applying the concepts and frameworks in new contexts such as innovation policy. Regarding the politics of directionality, a more interpretive and constructive understanding of policy reality seems fitting, as this involves a political view of policymaking characterized by sensemaking processes and argumentation, rather than a chain of causal mechanisms. Nonetheless, it would lack the necessary nuance to understand any of the frameworks as fully positivist or fully constructivist. A telling example is the NPF, which holds a constructivist ontology, while employing quantitative methods, traditionally related to a more positivist epistemology (Jones and Radaelli 2015).

6.2 Promising avenues for future research

This paper has proposed a conceptual distinction between "giving direction" and "systemic directionality" to clarify different understandings of directionality in the innovation policy and sustainability transitions communities. While this article has taken the first step toward bridging the gap between these different conceptual understandings, more explicit discussion and reflexivity around the intended meaning are necessary. Furthermore, this article has foregrounded the inherently political and temporal nature of directionality, through presenting and employing an understanding of directionality as a political process, with accompanying questions about the politics of directionality. Future research could develop an empirical knowledge base on the politics of directionality by mobilizing (parts of) the conceptual framework proposed in this article.

Such empirical analysis could first focus on historical processes of *when directions change* and *why certain directions prevail over others*. Important insights could be gained by identifying and analyzing periods of openness to directional change and moments where existing pathways were reinforced, through mobilizing branching points (Foxon et al. 2013; Rosenbloom, Haley, and Meadowcroft 2018) or windows of opportunity (Kingdon 1984). Policy change literature can uncover the conditions under which directions change and how they can be fostered in light of relevant societal challenges.

Second, we argue that an actor-centered approach would be relevant for studying directionality in an innovation policy context. It matters *who gives direction* and *how direction is given* for the legitimacy of the resulting decision or outcome. Furthermore, enriching current empirical insights into practical challenges—such as navigating diverging interests, identifying pathways, and stimulating coordinated action (Grillitsch et al. 2019; Bergek, Hellsmark, and Karltorp 2023)—will undoubtedly provide valuable learning opportunities for both innovation policy practitioners and academics. It would be interesting to explore sectoral and geographical differences to generate more territory and domain-specific insights on giving direction.

Lastly, empirical attention is needed to understand *which direction* is given through policy, as an outcome of political processes related to directionality. Such empirical investigation should centralize the normative political–ideological values underlying different directions and stimulate reflexive discussion on their desirability considering societal challenges, e.g. how they might align or create tensions with the pursuit of just sustainability transitions.

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Supplementary data

Supplementary data is available at *SCIPOL Journal* online.

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Data availability

The data underlying this article are available in the article and its online supplementary material.

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