Governance arrangements for the implementation of transformative innovation policy: Insights from a comparative case study

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There has been great interest in the rationales for transformative innovation policies (TIP), including those following a mission-oriented logic. However, few studies have investigated how public administration can effectively implement TIP. To study this, we first identify from existing literature four TIP governance tasks (creating legitimacy and leadership, coordination across levels/instruments/actors, reflexivity, resolving conflicts) and three distinct governance modes (administrative-, network-, system-oriented). In a comparative study, we then ask how the different governance modes shape the implementation of the TIP governance tasks, including the opportunities and boundaries related to a specific mode. Empirical insights are obtained from seven regional and national policy programmes across Europe with an ambition to promote system-wide transformation. Our analysis highlights similarities and differences between transformative policy designs, and identifies challenges related to implementing the TIP tasks within certain modes. The findings serve to inform and inspire the further uptake of transformative and mission-oriented innovation policies.

Key words: innovation policy; societal challenges; governance; public administration; transitions
JEL codes: O32, O33; O38

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1. Introduction

Transformative innovation policy (TIP) (Weber & Rohracher, 2012; Steward, 2012) asks for new ways of using science, technology, and innovation to address intransigent societal challenges more explicitly and more targeted than previous innovation policy framings or rationales (Schot & Steinmueller, 2018). Distinct for this new policy framing is the call to go beyond strengthening existing innovation systems, and instead pursue change and transformation in socio-technical systems that fulfil societal functions like mobility, health, food or housing (Diercks et al., 2019). Coherent policy programmes following the TIP frame aim at system innovation (Smits & Kuhlmann, 2004; Van Mierlo et al., 2010): the structural re-configuration of dominant actors, institutions, technologies, and infrastructures that define entire production and consumption systems.

Much has been written on the need for and rationales of more transformative innovation policies (Weber & Rohracher, 2012, Schot & Steinmueller, 2018). However, only a few studies focus on the implementation side of transformative programmes to understand what is required from public organisations and policy makers to engage in systemic change processes and become more 'transformational' (Borrás & Edler, 2020). Studies have started to look into different public sector roles (Borrás & Edler, 2020) or types of transition capacities (Hölscher et al. 2019) for governing system transformations. Previous works in the innovation policy field focus, for instance, on the need for policy learning and organisational capacities (Borrás, 2011), or on dynamic capabilities in the public sector in the context of mission-oriented innovation policies (Kattel & Mazzucato, 2018). Compared to hands-off neo-liberal policies, the implementation of transformative and mission-oriented policies likely requires governments to have extensive knowledge and the organisational capacity to operate in the system they are trying to change (Kattel & Mazzucato, 2018; Ghosh et al., 2021). However, as found by Braams et al. (2021) in a literature review of scholarly work on public administration traditions, most of these traditions seem unsuitable for transition tasks like 'giving direction' or 'destabilizing the unsustainable'.

So far, little attention has been given to the governance arrangements through which governments can execute the tasks needed for driving transformative change processes in society. We understand *governance arrangements* as the organisational structures, processes, and capabilities of public organisations through which the interactions between government and societal actors are organised and through which policy is being shaped and implemented. Being embedded in particular norms, traditions, networks and organisational structures, we

consider governance arrangements as the fundaments on which the implementation of policy instruments rest. Unfortunately, earlier research has only little to say about how public organisations and policy-makers adapt their organisational practices to pursue innovation policies that can realise transformative effects in society and the economy.

To examine the possibilities and difficulties in governing system change, we adopt the idea that governments perform according to distinct governance modes (Van der Steen et al., 2016) that are either administration-based (i.e. guided by hierarchy), network-based (i.e. in cooperation with societal actors), or society-based (i.e. led by societal actors). These governance modes define how and on what legitimacy basis public actors act and coordinate their activities (Bourgon, 2011), and translate to diverse ways of interaction within the public sector and between the government and societal stakeholders such as businesses, practitioners, community-based organisations, or civil society. In this study, we assume that the different governance modes under which policy-makers operate provide different conditions and challenges for adapting or introducing governance arrangements (and thus implementing TIP). Therefore, we pose the following research question: *"How do transformative innovation policy governance arrangements unfold in different governance modes, and what challenges typically arise for each arrangement?"* With this question, our aim is to develop a realistic and contextualized account of what becoming 'transformative' entails for public organisations.

At the heart of this article lies a comparative study of seven transformative policy programmes recently implemented at the regional or national level across Europe[1]. The programmes were selected based on their ambitions to address particular societal challenges by achieving system-wide transformation. Three of them explicitly focus on societal missions. Our analytical framework to study and compare these programmes consists of four TIP governance tasks (providing legitimacy and leadership; supporting coordination; facilitating policy learning; resolving conflicts) and three distinct governance modes (administration-, network- or society-based). Via document analysis and interviews with policy implementors and experts, we provide in-depth insights into how different TIP governance arrangements are put in place by public organisations. We also look into whether and how governments change their formal and informal structures and processes to meet their TIP ambitions. Since seven cases is far too limited to give a comprehensive account of possible ways to design governance arrangements,

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[1] This article is based on a larger study conducted for a JRC Science For Policy Report for the EU Commission (number JRC131490). The report entails more thorough elaborations on the theoretical framework as well as methodology used for the study.

the empirical analysis mainly serves to provide concrete illustrations, to demonstrate the use of the analytical framework, and to explore the type of insights that might be obtained when looking at TIP implementation through the lens of governance modes.

This study concurs with an emerging literature that deems the design of appropriate governance structures, processes, and practices essential to unleashing the transformative potential of missions and other types of directional innovation policies (Reale, 2021; Janssen et al., 2021; Bours et al., 2021). In this view, it is not primarily about finding the right policy instruments but also engaging in the right activities; to mobilize public and societal stakeholders, to explore and co-create new promising solutions, and to develop them further in support of system-wide change. We aim to open this policy implementation 'black box' around potential struggles emerging from the need to change organisation and practices in the public sector; a perspective often disregarded in the literature on transformative or mission-oriented innovation policy. Our study offers a basis for systematic analysis of governance arrangements used to fulfil transformative innovation policy tasks. Moreover, although the empirical analysis presented here is still explorative, some lessons can be drawn on the possibilities and constraints provided by the governance mode under which policy organisations have to operate.

2. Analytical framework

2.1 Transformative innovation policy governance arrangements

To systematically compare governance arrangements for TIP, we consider the principles or tasks that should, according to current literature, be followed by public organisations when creating and implementing transformative policies. Looking at almost a decade of transformative innovation policy literature (Weber & Rohracher, 2012; Steward, 2012; Schot & Steinmueller, 2018; Diercks et al., 2019; Grillitsch et al., 2019; Salas et al., 2019), several features have been, often implicitly, associated with public policies that aim at promoting transformative change in society. Undoubtedly, directionality is seen as one of the core principles of the new innovation policy frame (Schot & Steinmueller, 2018), in the sense that governments take on an active role in promoting and shaping the direction of innovation and societal change (Mazzucato, 2018; Diercks et al., 2019).

We look beyond directionality to create a better understanding of TIP governance in terms of structures, processes, and concrete activities public organisations adopt to pursue their

transformative aims. Following Braams et al. (2021), Table 1 presents an overview of the TIP governance tasks we identified from the relevant innovation and transition policy literature. We divide them into four generic categories: (1) creating legitimacy and leadership; (2) coordinating across multiple levels, actors, and instruments; (3) reflexivity, learning, and experimenting; (4) resolving conflicts. These task categories mainly serve as an analytical reference for our empirical study to explore and compare various concrete governance arrangements of actual TIP programmes.

Table 1: Four categories of TIP governance tasks.

Creating legitimacy and leadership	Coordinating across multiple levels, actors and instruments	Reflexivity, learning and experimenting	Resolving conflicts
Identifying and demonstrating transformative failures *(Weber & Rohracher, 2012)* Acknowledging and managing the normativity of innovation policies for societal challenges *(Uyarra et al., 2019; Schlaile et al., 2017)* Establishing accountability mechanisms *(Rogge & Reichardt, 2016)* Focusing on system-level impact *(Weber & Rohracher, 2012; Hekkert et al., 2020)*	Focus on vertical and horizontal policy coordination *(Weber & Rohracher, 2012; Larrue et al. 2021)* Focus on policy mix, pursue multi-instrumental policy approaches, *(Rogge & Reichardt, 2016)* Stimulate trans- and multi-disciplinarity beyond epistemological boundaries *(Cagnin et al., 2012)*	Reflexive, experimental and tentative governance approaches, continuous policy adaptation *(Kemp & Loorbach, 2006; Torrens & Schot, 2017; Kuhlmann et al., 2019; Janssen, 2019)* Process-orientation: policy learning, formative and system-oriented evaluation *(Borrás & Laatsit, 2019; Molas-Gallart et al., 2020; Wanzenböck et al., 2020)* Focus on social and organisational learning, second-order learning *(Grin et al., 2010; Van Mierlo & Beers, 2020)*	Destabilization: deliberate decline, exnovation and phasing out policies *(Rogge et al., 2020; Hekkert et al., 2020; Klerkx & Begemann, 2020)* Embracing contestation, complexity and uncertainty *(Schot & Steinmueller, 2018; Wanzenböck et al., 2020)* Charting actionable and acceptable development pathways *(Schot & Steinmueller, 2018)* Tilting the playing field *(Kattel & Mazzucato, 2018)*

2.2 Governance modes

The second pillar of our analytical framework to study governance arrangements for TIP consists of the governance modes that characterize how public organisations interact with society. In the policy studies literature, governance modes are referred to as the institutional structures and actor constellations involved in collective decision-making, denoting the various forms through which governance can be executed (e.g. Treib et al., 2007, Lange et al., 2013, Van der Steen et al., 2015). In a TIP context, governance modes may be viewed as the arenas where transformative agendas and concrete measures are negotiated and decided upon (Fink-Hafner, 1998; Jørgensen & Andersen, 2012). They define the legitimacy and boundaries of public and other societal stakeholders to initiate and navigate change processes by supporting

(or hampering) the emergence of new forms of coordination, learning, or a new culture of experimentation. They also co-determine the choice of policy instruments, such as how hierarchical 'steering' (e.g. in the form of regulation by public authorities) is combined with 'self-regulating' devices (e.g. voluntary agreements or market-based incentives) (Jordan et al. 2005).

In the following, we distinguish three archetypical governance modes: Administration-based, network-based, and society-based governance. We situate these governance modes on a spectrum between the two extremes 'hierarchy' and 'community', or as Kooiman (2003) stated, between hierarchical governance and co- or self-governance. These governance modes differ in (1) their degree of formality of institutions, (2) the relative importance of public and non-public actors or their membership flexibility, and (3) the extent to which they rely on (self-, co- or hierarchically-)organised processes to achieve societally desirable outcomes. We characterise the modes as follows:

- **Administration-based governance:** This governance mode follows the classical bureaucracy type of government which executes policy in the light of the societal goals determined in political processes (Van der Steen et al., 2018). Public authorities have a set of rules and resources at their disposal that creates stability when pursuing the priorities of the political system they represent. Based on existing laws, formal rules and procedures, it is in the hands of policy-makers to translate political decisions about what is societally desirable into concrete measures. Following an 'inside-out' logic, the government (and its agencies) is the central unit to effectively and efficiently produce desired results; other societal stakeholders like businesses, NGOs or citizens are subjected to 'receivers' or agents that help produce the desired results.

- **Network-based governance:** The network governance model is based on co-governance between public actors and societal parties that engage in collective action for a specific purpose (Rhodes, 1997). It is less centralistic than the administrative model, and may appear in various forms, from more flexible alliances to dedicated public-private partnerships with strategic agendas. Public organisations engage in these forms of co-organisation since societal actors (such as businesses or NGOs) possess knowledge and resources crucial for creating more effective policies and incentives to pursue a public goal. They act more like partners in this purpose- and result-oriented

model, with specific roles in organizing the collective processes and protecting process quality related to participation, transparency, and timing.

- **Society-based governance:** This last model draws on societal resilience, as found in societal stakeholders' willingness and capacities to self-organize and undertake action – alone or in networks and cooperatives (Van der Steen et al., 2018). In contrast to the other two types, it is not per se a government-created capacity. Following a societal self-governance logic, it is the most informal mode providing certain flexibility when coordinating various stakeholders (market and non-market actors, incl. citizens) and institutions (formal and informal) in the co-production of services for a community (Thompson et al., 1991). Society-based governance, therefore, often relates to more informal, local and participative governance approaches but does not exclude governance via market incentives. Like the network governance model, it follows an 'outside-in' logic but emphasizes organically emerging initiatives, stakeholders or change processes. Rather than negotiating common agendas in a top-down fashion, societal self-regulation follows a bottom-up governance or community logic related to more local and participative governance approaches. The governance role that goes with it centres on nurturing, coordinating, and propelling societal energy. From a transitions perspective, the challenge may not lie in enabling experimental activities but in coupling them to robust movements to change the system's functioning (Van den Bosch, 2010).

Table 2: Ideal-types of governance modes

	Formality of institutions	Membership flexibility & diversity	Governance of change processes
Administration-based governance	High	Low, public actors leading	Inside-out, hierarchical organisation
Network-based governance	Medium	Medium, Public and non-public actors	Co-governance, purposeful alliance
Society-based governance	Low	High, societal actors leading	Outside-in, self-regulated, community building

Table 2 summarizes the three archetypical governance modes. These modes are to be seen as ideal types, mainly serving as an analytical reference for studying varieties in governing system-wide change. We are aware that public organisations increasingly adhere to multiple perspectives at once (Stoker, 2006); in reality, only hybrid forms that entail elements of various

governance modes and are themselves subject to change may be observed empirically. Nevertheless, we rely on these ideal-types as an analytical reference. In this way, we expect to grasp the distinct realities in which public and non-public actors operate, related to the degree of formality, membership flexibility or diversity or the reliance on a certain governance logic to pursue transformation. This helps us to further our insights into the mode-specific opportunities and challenges in implementing transformative policies.

3. Methods

3.1 Case selection

To identify governance arrangements for TIP, we examine policy programmes that attempt to mobilize science, technology, and innovation (STI) to tackle societal challenges and drive system transformation. These strategies may appear in various forms, ranging from system-oriented R&D- and innovation programmes, over sectoral or domain-specific programmes such as in the transport or energy sector, to umbrella strategies related to a whole-government mission-oriented innovation approach. Based on key publications on transformative innovation policies and transformational system failures (Weber & Rohracher, 2012; Schot & Steinmueller, 2018), we consider a policy approach as fitting the TIP rationale if it meets the following broad criteria: (1) involve directionality (i.e. sets a direction for guiding innovation based on a shared vision and articulated objectives); (2) follows a societal agenda with ambitions beyond economic, industrial or technological goals; (3) integrates not only the supply- but also demand-side of innovation; (4) addresses a cross-cutting policy theme with need for (horizontal/vertical) coordination of policy action; (5) pays attention to stakeholder involvement and more open and diverse policy design and implementation processes.

We rely on purposive sampling to obtain our set of cases for comparing governance arrangements for performing TIP governance tasks. First, we screened sources including: several online tools, repositories, and observatories (STIP Compass tool, MIP tool, MIPO); reports like the JIIP (2018) publication discussing 'transformer missions' and "accelerator missions", OECD report on mission policies (Larrue, 2021), EC report on sustainability transitions (Kelemen, 2020); and conference websites (e.g. TIPC conferences; EEEN2020 Environmental Evaluation Supporting the Implementation of SDGs and Transformative Policymaking). With this search strategy, we ensured that the programme gained visibility

either because (a) policy makers consider the programme as potentially transformative due to its goals, objective, or governance approach; or because (b) the research community describes the programme as having transformative features in scientific articles, reports, or research projects. Given the exploratory nature of our study, the aim was not to achieve the most complete and representative set of cases. Instead, we sampled for prominent examples sufficiently different in their governance structure to gain in-depth insights into the variety of TIP programmes focusing on system-wide change. Our initial set contained about 30 programmes implemented at local, regional, or national scales.

Then, in a second step, we applied the following criteria to reduce our sample further: (1) the programme has relevance in the overall (innovation) policy landscape of a country/region/city; (2) the programme shows real commitment as, for instance, shown by some level of dedicated financial and/or human resources; (3) the programme is in a stage of development beyond the formulation of ambitions or individual experiments. Accordingly, we excluded programmes that are small-scale, fragmented or without a significant role of policy, and programmes that are too premature, in the planning phase or not yet well documented. At the same time, the criteria still allow for very different types of programmes, ranging, for instance, from resource-centred to coordination-centred programmes. Because some types of programmes are more likely to be associated with a particular governance mode (e.g. the society-based modes rely on collaborating rather than on providing financial incentives), the wide scoping ensures that the sample stretches over the full range of governance modes from which policy programmes can originate.

Our final set of seven cases and their core properties are shown in

Table 3. C1 and C4 are extended R&D or innovation funding programmes implemented in the STI domain but striving for more systemic change focused on sustainability. C2, C3 and C5 are multi-themed strategic or 'umbrella' programmes that prioritise specific sectors or challenges and are (at least partly) implemented in the STI policy domain; and C6 and C7 are domain-specific or thematic programmes that consider STI crucial to achieving their goals.

Table 3: Selected cases of TIP programmes.

#	Name	Geogr. scope	Country	Sector	Year est.	Strategy type	Mission-orientation
C1	Green solutions for the future	National	Denmark	Climate	2020	Extended R&D programme	Explicit
C2	German Hightech Strategy 2025	National	Germany	Broad	2018	Umbrella framework	Explicit
C3	Mission-oriented Topsector & Innovation Policy	National	Netherlands	Broad	2019	Umbrella framework	Explicit
C4	City of Tomorrow / Building of Tomorrow	National	Austria	Housing/ Energy	2013	Extended R&D programme	Implicit
C5	Catalunya 2020 / RIS3CAT	Regional	Spain	Climate	2012	Umbrella framework	No
C6	Amsterdam Circular Economy	City	Netherlands	Circular Ec.	2015	Domain programme	Implicit
C7	Circular Flanders (part of Vision 2050)	Regional	Belgium	Circular Ec.	2017	Domain programme	Implicit

3.2 Data collection and analysis

The in-depth examination of each programme is based on evidence from administrative documents, press releases, prior literature, and relevant studies, including evaluations if available. A total of 17 interviews with public officials in charge of designing and/or running the programmes and policy analysts knowledgeable about the respective policy landscape complements the desk research. The interviews were semi-structured, based on an interview protocol with questions related to the programme's transformative criteria, its TIP governance tasks (as discussed in section 2.1), and the experienced implementation achievements and challenges.

Based on desk research and interview data, we studied for each case the different formal and informal ways of incorporating transformative policy characteristics, what operational changes this required in the organisations implementing the policy, and what challenges it posed for those organisations. This research step relied on an axial coding approach following our focal transformative policy characteristics (i.e. the 'closed' dimensions around which we identified our codes and categories). For each case, any structure, activity, event, or organisational change that qualifies as a governance arrangement for fulfilling one of the four TIP governance tasks related to creating legitimacy and leadership; coordinating across levels, actors, and instruments; reflexivity, learning, and experimenting; resolving conflicts, as identified in Section 2.1, was highlighted in our research protocol. Key TIP observations were described and summarized in seven within-case analyses, and each case summary was validated with additional input where necessary by a key public official for the case in question.

Subsequently, in a cross-case analysis, we established the link between the observed TIP governance arrangements (and challenges) and our 'ideal type' governance modes. To do so, we assigned each TIP observation to a governance mode that is most representative of this specific activity, organisational practice, or event. Then, in a comparative analysis of observed

TIP characteristics and governance modes across all programmes, we could group similar governance arrangements into an overarching label.

The following section briefly describes how the seven cases reflect the properties of the three governance modes described in Section 2.2. As we will show, most of the selected policy programmes exhibit one dominant governance mode, but some combine elements of multiple governance modes.

4. Overview of policy programmes and their governance modes

4.1 Administration-based TIP governance

According to what can be derived from the literature on governance modes, TIP programmes organized around an administration-based governance logic would place the government in the lead to design and implement targeted policies in line with national priority areas. In this logic, the government, or a representative ministry, is responsible and accountable for TIP implementation and progress within the legislation period. Other parties within the public sector, such as other ministries, governmental agencies, or research funders, are not 'owners' of the strategy but are incentivized to contribute to the high-level priorities.

The cases most evidently following this way of operating are the Danish strategy for Green Solutions of the Future (C1), the Germany HTS2025 (C2), and the Dutch MTIP (C3). All three of them are examples of 'umbrella' frameworks, as they rely on a common governance structure and policy instruments for addressing diverse missions (Larrue, 2021). Another salient communality is that the cases in this category follow a whole-government mission approach (Larrue, 2021) by adhering to high-level policy strategies that are adapted versions of earlier R&I strategies to pursue societal missions. The Danish programme (C1) addresses four green missions, the German HTS2025 (C2) targets twelve missions in six focus areas, and in the Dutch case of Mission-oriented Innovation Policy (MTIP) comprises four central mission themes with a total of 25 concrete mission goals (C3).

One of the main goals of these administration-based approaches is to spur coordination within government. The strategies are led by ministries responsible for STI or economic agendas but seek to involve other ministries in developing more coherent policy mixes. Even though all three cases started from an R&D and innovation policy perspective, they now try to open up

and change towards holistic and system-based approaches, also by lining up demand-side policies around selected key priorities. For the Green Solutions and MTIP cases, this move has been driven by pressing climate goal commitments (imposed by their national Climate Acts). In the HTS2025 and the MTIP case, other societal challenges are also addressed by the TIP programme. One of the reasons is to link also to European policy priorities and funding schemes, including the Horizon Europe R&D framework programme.

According to our illustrative cases, programmes following administration- or 'inside-out'-oriented traditions- aim to transform 'within the government' to promote innovation for societal challenges. Instead of achieving a direct transformative impact in society or economy, the objective is to (re-)design policies that target the systemic nature of today's societal challenges. Therefore, emphasis is on finding new ways of working in established organisational structures, that is, between different departments or units (vertical coordination) or different levels (horizontal coordination) of the public sector. Following our cases, a key objective is to improve the coordination of existing policies, according to selected priorities, or across the established logic of task division and resource distribution in individual ministries, departments or sections.

4.2 Network-based TIP governance

TIP programmes following the network governance mode aim to mobilize the knowledge, capabilities and resources of stakeholders outside the policy sphere to design and implement policy initiatives. Following scientific literature, a central feature of a network governance approach is the appointment of dedicated agencies, centres, or teams with a mandate to design, manage or execute policy initiatives in line with the direction and goals set by the government. In contrast to the administrative-based governance model, stakeholders can be closer to policy-making and, for instance, involved in the thematic orientation of a programme or agenda.

Such features of network-based governance are best recognized in the Austrian City of Tomorrow (CoT) (C4) and the Catalonian RIS3CAT strategies (C5). While CoT has a predecessor in the form of an R&D programme targeted at technology development ('Building of Tomorrow'), the current strategy also includes programme lines that facilitate experimentation and co-creation (e.g. the three Innovation Laboratories). Besides stimulating close cooperation between municipalities, local communities, civil society and researchers, CoT also draws on non-public actors (e.g. businesses, industries, NGOs) to participate in policy formulation and priority setting. For RIS3CAT, Catalunya's Research and Innovation Strategy

for the Smart Specialisation, the network-based nature is manifested in practices that engage local stakeholders in defining challenges (for smart, sustainable, and inclusive growth) and possible solution directions. The development of agendas relies on a quadruple-helix model with substantial involvement of end-users. A major difference between the programmes is that they differ substantially concerning their mission-orientation. CoT adheres to timebound societal goals, thereby implicitly attempting to connect closer to European mission approaches. Catalunya's RIS3CAT (dating from 2012), on the other hand, pursues structural changes in production-consumption systems without linking that exclusively to a challenge-led rationale.

Note that also HTS2025 and MTIP, categorized as mainly administration-based, display elements in line with a network-based or co-governance approach. This concerns, for instance, the use of platforms to unite societal stakeholders and future discuss directions, such as the Hightech Forum for HTS2025 or the Topconsortia for Knowledge and Innovation for the MTIP, or the explicit focus on public-private partnership projects.

Our case examples suggest that governments or policy-makers can still play a key role in network-based governance, especially if they have the power to decide which partners participate in governance arrangements. In our cases, societal actors are represented by institutionalized actors from academia, business (e.g. industry associations), and civil society (e.g. NGOs, interest groups, city representatives) that are considered relevant for a specific theme. Following the quadruple helix idea, the appointment of these (societal) impact actors is considered a way to open up to academia, industry and civil society in programme design and operation.

Moreover, the studied initiatives, even though policy-led, aim to contribute to a stronger interconnectedness of the stakeholders themselves. In other words, they follow a network-based mode to engage with a broad set of actors, on the one hand, and because it helps to unite actors that can complement each other when working on desirable innovation paths, on the other hand. For all cases reflecting network-based governance characteristics, cultivating such relationships between policy and other stakeholders is regarded as a continuous, deliberate, and integral part of the programme. It does not only occur on an ad-hoc basis. Still, even though stakeholder input and management is essential to programme design, operation and further development, in our cases, the final decision-making (e.g. on thematic orientation) is mainly left in the hands of policy.

4.3 Society-based TIP governance

Society-based governance follows an 'inside-out' approach and relies mainly on the societal stakeholders' own and collectively organized initiatives to pursue shared goals. Amsterdam Circular (C6) and Circular Flanders (C7) are the programmes that best fit these defining properties of a society-based governance mode. While Amsterdam Circular is run by a team embedded in the government itself (the municipality of Amsterdam), Circular Flanders is carried by a team that is financed by but operates at some distance of Flemish policy departments. Both cases aim to catalyse innovative programmes in the field of Circular Economy (CE), without necessarily relying on R&D or knowledge-based novelty alone. Social innovation in the form of behavioural or institutional change is strongly emphasized to meet the prioritized CE goals. Characteristic is that the programmes evolved through a process that first identified the opportunities and challenges perceived by 'field actors' such as firms, citizens, and municipalities. This process then led the teams executing the programmes to select several key themes and action lines. While both programmes focus on circularity, we consider them representative of other strategies that rely on facilitating self-organisation and the connection of bottom-up societal initiatives. Rather than incentivizing such societal stakeholders to behave differently, the society-based governance programmes focus on responding to emerging systemic bottlenecks. Reaching out to a wide variety of policy actors and funding organisations is a substantial part of both programmes, if there is agreement that more formalized or strategic support is necessary to promote promising circular practices.

The case illustrations of what society-based TIP governance might look like point at the usefulness of establishing a dedicated organisation that is tasked with solving a particular problem. Such an independent entity, in the studied cases financed but not administered by a government department, allows for the closest form of collaboration with private actors around a societal topic or challenge. Compared to representative network arrangements, this organisation is in direct contact with a broader range of stakeholders directly involved in (or affected by) changes that are part of a transformation. This allows the team to better grasp potential opportunities but also challenges that the different stakeholders encounter when engaging with a particular problem or solution, be it as producers, users, or by being affected in any other way. In our cases, the public entities managing the programme carry labels like a "transition team" and are run by so-called transition managers. Part of their responsibilities is to infuse transition-thinking in other governments, and support them in designing policies in accordance with their field experiences and practices.

Both in the case of the Amsterdam Circular and the Circular Flanders policy programmes, the observed TIP governance arrangements aim to accelerate (new or existing) bottom-up activities initiated by societal stakeholders. This includes for-profit and non-profit activities, often still in an experimental stage of developing new products or services and their integration. As a result of this, the focus is less on technological developments but on exploring suitable business models and new institutional arrangements required for new solutions to work. Hence, in such society-based programmes, it is not up to policy to orchestrate the innovative and potentially transformative activities, or to fund individual activities that would not occur without government support. Instead, critical is catalysing the small initiatives that can transform socio-economic systems when applied in a greater number or at a larger scale. This implies a greater interest in experiments and projects that target the scaling or diffusion of innovations to challenge the functioning of the entire system around these innovations. Policy entities propelling the bottom-up initiatives attempt to make a difference by approaching and connecting stakeholders that hold the key (in terms of partners, information, funding, regulation, or otherwise) to a viable application of innovations in practice.

4.4 Overview of TIP governance modes

Drawing on governance literature and our case illustrations, Figure 1 visualizes the key characteristics of the three governance modes for conducting TIP governance tasks.
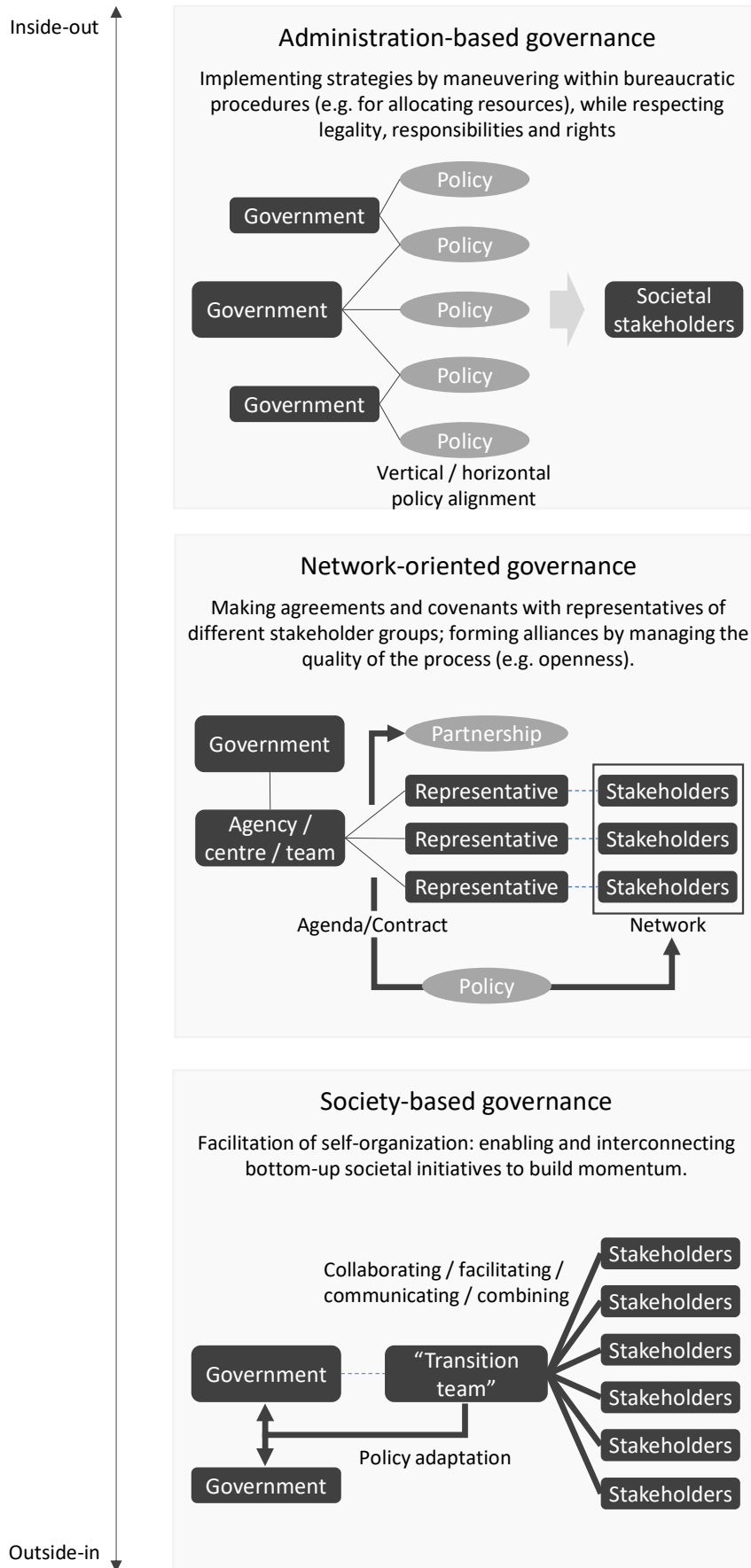
Administration-based governance

Implementing strategies by maneuvering within bureaucratic procedures (e.g. for allocating resources), while respecting legality, responsibilities and rights

Government — Policy

Policy

Government — Policy → Societal stakeholders

Policy

Government — Policy

Policy

Vertical / horizontal policy alignment

Network-oriented governance

Making agreements and covenants with representatives of different stakeholder groups; forming alliances by managing the quality of the process (e.g. openness).

Government

Partnership

Agency / centre / team — Representative ---- Stakeholders

Representative ---- Stakeholders

Representative ---- Stakeholders

Agenda/Contract   Network

Policy

Society-based governance

Facilitation of self-organization: enabling and interconnecting bottom-up societal initiatives to build momentum.

Collaborating / facilitating / communicating / combining

Stakeholders

Stakeholders

Government ---- "Transition team"   Stakeholders

Stakeholders

Policy adaptation   Stakeholders

Government   Stakeholders

Figure 1: Key characteristics of three governance modes for conducting TIP governance tasks.

5. Cross-case analysis: Governance arrangements and challenges

In this section, we abstract from the individual cases and present the most distinctive TIP governance arrangements per governance mode and governance task. Table 4 provides an overview of our key observations in this respect. Case-specific examples of the identified arrangements are included in the table in the appendix. In what follows, we discuss our findings in light of our three ideal-type governance modes and also address potential challenges public organisations might face when aiming to be transformational and promote system change.

Table 4: Overview of TIP governance arrangements according to ideal-type governance modes and TIP governance tasks.

Governance modes:	Transformative innovation policy governance task:			
	Creating legitimacy and leadership	*Coordinating across multiple levels, actors and instruments*	*Reflexivity, learning and experimenting*	*Resolving conflicts*
Administration-based governance	‣ Show commitment from high political levels ‣ Create an independent policy unit	‣ Change of innovation funding priorities ‣ Targeting multiple (existing) instruments, actors or policy fields at prioritized topics	‣ Policy mapping across different departments ‣ New monitoring and evaluation procedures beyond abstract inputs/outputs	-
Network-based governance	‣ Engage in partnerships based on shared leadership and collective agendas	‣ Involve representative key stakeholders in agenda-setting ‣ Shared ownership between policy partners	‣ Adapt policies based on network signals ‣ Evaluate formatively, with participative deliberation	‣ Community building and community management
Society-based governance	‣ Create a vision around perceived problem urgency ‣ Emphasize community-based problem-solving	‣ Establish a hub-like transition team outside government ‣ Reinforce bottom-up initiatives ‣ Inspire and instruct policy makers	‣ Learning-by-doing (stocktaking) ‣ Monitor project outcomes for initiative re-orientation	‣ Install a field-level working group

5.1 Governance arrangements and challenges in administration-based governance

Legitimacy and leadership: Developing new strategies or priorities within the public sector, and endorsing these at the highest political level, guarantees political legitimacy of new goals and objectives, at least for the legislation period of 4-5 years. However, as interviewees have pointed out, even within the policy organisations themselves, such a centralized approach and

form of leadership could be easily perceived as a too abstract and top-down view on moving forward, with little attention to various implementation hurdles. Opposition at lower hierarchy levels can result from limited recognition of established organisational cultures or working practices, undermining the ambitions for organisational change and slowing down the transformation processes within governments.

Policy administrations can attempt to stimulate new ways of working by acknowledging different organisational cultures, and by considering and facilitating necessary organisational changes within the administration when launching a new challenge-led strategy. An alternative way we observe to achieve novel cross-domain alignments is the creation of an independent policy unit ('face') for a theme, such as a societal challenge or mission outside existing departmental structures. Such independent units may reduce existing rivalry or competition between ministries and thus can execute leadership more effectively for the particular theme, based on broad-based legitimacy across the administration. Cultivating joint cross-departmental units across the organisation can help to disentangle priority areas for transformation from other (shorter term) political strategies, and establish organisation-internal structures and processes beyond priorities determined for a legislation period. Moreover, given the notoriously limited resources in the public sector, all cases show that organisational change or transformation 'within' administration is expected to be effective only if sufficient personnel and financial support is provided for the new themes and structures.

Coordination: The formulation of innovation challenges or missions supported at a high political level offers a shared objective or reference for new (innovation) priorities across public administration. As such, they can guide the modification of policy schemes (e.g. in terms of funding criteria) that can potentially contribute to these priorities. Our cases also show that linking to long-term and strategic government priorities as formulated, for instance, in European or national goals (e.g. climate agreements, energy plans), can provide a valuable reference and stimuli for change. It incentivises policy actors to commit to a whole government approach beyond research and innovation. Moreover, well-functioning cross-departmental coordination seems difficult (but necessary) to pursue a whole government approach. Administrative silos typically exist at both the strategic and operational levels. Also here, as our cases illustrate, coordination within the public administration can be facilitated by the formation of dedicated joint units (such as challenge or mission teams) composed of actors with different backgrounds who work together to develop their joint agenda. In contrast,

commitment to whole-government approaches seems not sufficiently encouraged if programmes are formulated too domain-specific (e.g. for research and innovation), or not matched with additional (human and financial) resources. As interviewees point out, providing more space and resources (particularly time), and the possibility for more informal coalitions across sections between dedicated staff members, could be the first step towards more cross-departmental coordination if formal coordination structures are lacking.

Reflexivity and learning: From an administration-based governance perspective, a systematic mapping of existing policies, including their strengths, weaknesses and interrelations, seems crucial before launching a new programme. This is confirmed by several interviewees and for the different cases. In the context of TIP this would entail the full range of support measures, or associated regulations, that may influence transformations on a societal issue. Fornational-level programme, the relevant policies appear distributed over departments concerned with science, education, or business and the respective policy domain itself, related to, for instance, health, or mobility). Obtaining a comprehensive view of the full policy mix would also require insight into supra- and subnational policies. However, policy officials admitted they did not have a clear overview of all the policies that can be mobilised to support a specific priority, challenge or mission. Comprehensive policy mapping would thus need to be a collective endeavour that is far more challenging than just listing the instruments on one policy department's budget.

When it comes to learning and experimenting in administration-based traditions, the room to do so might be limited if a policy strategy is coupled with a legislation period or traditional policy and evaluation cycles. Strict evaluation cycles and methodologies favour monitoring key performance indicators and individual programmes, but these are of decreasing relevance for programmes focusing on society-based change. input-/output-oriented evaluation culture, which is still prevalent in our cases, is increasingly considered at odds with aspirations to combine multiple innovation supply and demand-side measures. If the aim is to bundle policies more effectively, immediate (short-term) impact or causal relations are hard to assess. Instead, establishing continuous monitoring and evaluation procedures is considered fruitful to ensure outcomes to feedback in the policy process directly. Cases that experimented with such extensive monitoring approaches benefited from a more direct engagement with stakeholders; the establishment of independent expert panels; accompanying research support; or the

development of an in-house capacity to extract and channel learning lessons within public administration.

Challenges: While the administration-based governance model benefits from a high level of (political) legitimacy and leadership from the outset, we also observe substantial challenges in building up governance capacities geared towards transformative change. These challenges mostly relate to departmental thinking and rivalry for recognition and resources in public administration, which can obstruct ambitions of alignment and coordination. Committing other actors and departments beyond informal collaborations seems more difficult if the innovation priorities are not recognizable aspects of their activities or priorities. Moreover, relying on strict administrative and budgetary cycles can hamper flexibility, learning and experimenting with new policy designs. On the one hand, legislation periods provide opportunities to adapt high-level innovation priorities and strategies, but on the other hand, periodic changes in political leadership can also create inconsistencies or uncertainties in pursuing long-term goals and (transformative) impact.

5.2 Governance arrangements and challenges in network-based governance

Legitimacy and leadership: Network-based governance arrangements rely on shared leadership based on the collective agendas they generates. As we observe, programme lead and management is often shared between different (policy) actors such as between multiple ministries and/or agencies. Our cases illustrate thatsuch co-ownership or even co-funding arrangements generate legitimacy for an issue, fostering commitment to a joint agenda within the public sector. Next to actors from the public sector, the network-based programmes we studied have increasingly attempted to include relevant stakeholders - e.g. from industry, cities – more directly in programme co-creation, funding, and execution. These stakeholders are often considered key figures who can speak on behalf of larger communities (industry, science, SMEs, public actors, NGOs, etc.) but their influence depends on the platform the government is offering them. In policy-led network arrangements, we see that governments take a less dominant role within a delegated structure. Nevertheless, the network structures are typically positioned prominently as the vanguard of a specific policy domain.

Coordination: A representative model of stakeholder involvement is at the core of a network-based TIP governance arrangement. The programmes showing characteristics of this governance mode pay close attention to developing dedicated governance structures (e.g.

platforms, management boards), and engage in processes for direct and continuous stakeholder interaction beyond ad-hoc consultation or advisory tasks. Intensive collaboration often occurs with a limited set of key stakeholders, ranging from agenda-setting to programme execution. Within these arrangements, decisions about priorities and future agendas (e.g. new themes, solution directions) can be relatively informal, facilitated by the close relationships and interaction of the various (public and private) actors. The strategic decisions within a closed network are also used to build up a broader stakeholder community beyond those actors directly involved agenda (co-)creation. akeholder management and consultation often lie in the hands of an agency or centre. In our cases, such broader multi-actor arrangements follow more formalized settings, such as through the organisation of workshops (e.g. focus groups) with a targeted stakeholder group or larger public consultation process in the form of online surveys, open discussion meetings or open calls.

Besides creating strategic networks at the level of the policy programme, collaboration can also occur in public-private partnerships that directly take up a challenge, mission, or societal problem to create new solutions. Examples from our cases include innovation hubs or platforms involving various players to develop and experiment with sustainable solutions. These partnerships are organized through clear agreements or co-funding structures between the triple or quadruple helix representatives. In some cases, stakeholder involvement and partnerships stretch to lower-level authorities like cities and municipalities that can take the role of lead-users for systemic solutions at a smaller (local) level.

Reflexivity and learning: Reflexive governance and learning structures rest largely on the established stakeholder network. Through the involvement of 'field actors', the network provides a channel to the government or agency for signals to adapt policies with respect to new or changing problem fields or innovation directions. In a model based on delegation of tasks to network partners, the public sector is mostly responsible for organizing and managing interaction processes in the stakeholder network (e.g. mobilizing actors that may contribute to desirable goals). Understanding and changing how these interaction processes work out is more important for policy makers than assuming responsibility for how much of the desirable results is achieved. As interviewees confirm, a new monitoring and evaluation practices may be required, away from (summative) evaluation traditions at the end of policy cycles towards more (formative) evaluation procedures that also look at process and intermediate outcomes. In particular, they stresss that such evaluation processes, prioritizing learning and adaptation over

accountability, benefit from engaging different types of stakeholders in policy assessments (including theactors formulating and implementing policies). While opening up to stakeholder opinions generally leads evaluations to be subjective rather than objective, they interviewees see merit in examining how diverse actors understand policy rationales, policy objectives, and the strategy for meeting those objectives. Especially in a network-based governance model, in which stakeholders heavily rely on each other, identifying misalignment or resistance is crucial for assessing the likelihood that the chosen policy approach will work out favourably.

Resolving conflicts: In a network-based governance model, public actors attempt to avoid disputes about strong or top-down decisions by leaving the responsibility for agenda-setting, negotiation, and sometimes also final decision-making to the delegated networks. These networks, in turn, find agreement based on negotiations and the input of their members (key stakeholders or representatives). Moreover, the policy networks are active in community-building, such as organising networking events or interactive spaces. These activities are considered as means to create short ways and informal interaction possibilities between different actors, also between actors with potentially diverging interests and needs. Building direct relationships between innovation funders (e.g. agencies) and the (future, present or past) funding recipients is another distinct feature of a networked TIP governance arrangement we found in our cases, with the aim to strengthen the community between the public and private parties.

Challenges: The transformative potential of this governance mode is subjected to three challenges. First, there is the question how relevant 'stakeholders' are defined, which can be broad and open, but also narrow. Both have advantages and disadvantages in making speed, finding common grounds, and incorporating alternative ideas. In practice, network-based programmes tend to be based on triple, or quadruple, helix models around a select set of key representatives. Key representatives of demand or societal impact stakeholders are harder to find and incentivize to engage with the policy on a continuous (not ad-hoc) basis compared to representatives of supply or industry stakeholders. An additional concern is that a governance structure based on interacting with a few triple or quadruple helix representatives is sensitive to capture by vested interests.

Second, a clear challenge for the network-based model is that the government is not in the driver's seat but should still be able to respond to signals provided by the representatives it interacts with (e.g. concerning regulatory barriers or lack of lead markets). This requires the

ability of policy officials to not only build the networks but also to understand and address signals that surface from the field. Moreover, the multiple-helix centres or teams that are at the heart of network-based TIP governance arrangements, can only have an impact if they can ensure commitment from the community they represent. To be able to take responsibility for their part in the public-private collaboration (e.g. to develop a support infrastructure for new solutions), policy actors often require a high level of assurance that there is a need and demand for ambitious developments.

Third, as network-based TIP governance relies much on stakeholder knowledge and capacities, there is also a likely scenario that it will mainly be their particular interests that prevail when considering innovation directions. Exerting more guidance on part of the government might meet resistance in the network. This is especially expected if certain solution directions are unattractive for market players or contested by certain parties. Involving stakeholders in priority setting without providing (too) much directionality for solutions remains a challenge for the network-based governance.

5.3 Governance arrangements and challenges in society-based governance

Legitimacy and leadership: For outside-in governance arrangements, legitimacy stems from the purpose of the programme (i.e. is the cause recognized as important?), and from how societal stakeholder participation is managed. The focus is mostly on generating momentum and on interconnecting bottom-up initiatives. Therefore, the programmes consider it essential to create a vision around the importance and urgency of the problem to get stakeholders committed. Given that the funding streams for system- and societal-oriented programmes are typically relatively small, broad support from field-level stakeholders for their goals and vision is considered crucial for a successful operation. In our cases on CE, the programmes' and their visions' legitimacy was strengthened if built around known narratives or established concepts ('missions', 'donut economy', 'transitions management'). Moreover, society-based programmes strongly emphasize the community aspects of problem-solving. In that sense, transition managers focus more on the process than the trajectory (or directions) of transformations. The community is in the 'driver seat' of the transitions, with political support or public resources for this community to discover and negotiate the directions. The investigated cases used, for instance, their websites, newsletters, and evaluations to showcase not only the achievements of bottom-up activities but also their drivers and motivations.

Coordination: Society-based TIP programmes typically start small, as the organisations are established independently and are not in charge of running other policy programs. In our cases, the programmes' founding purpose has mostly been to engage intensively with the field and stakeholders around a particular societal issue. As the examples illustrate, starting collaborative relationships with societal stakeholders is about trust-building in form of listening to different views, needs and ambitions. An important task in supporting coordination is seen in bundling the 'societal energy' such as by organizing events and platforms to display ongoing practices and inspire. Then, to go beyond the first tier of dedicated and easy-to-engage actors, extensive communication and facilitation work is considered a critical task of the transition management team. Another difficulty in community building and management lies in reinforcing the linkages between very different parties, such as the winners and losers from a transition.

Moreover, transition managers see themselves as a hub between policy and non-policy partners. Creating circumstances favourable for new (bottom-up) solutions requires governance capacities in the form of abilities to inspire, instruct and mobilize a broad range of actors, including policy officials from different government departments. The objective would be to take policy along in internalizing the transition, so that they incorporate new practices while maintaining responsibility for their respective policies (including budgets and accountability).

Reflexivity and learning: Society-based TIP governance arrangements follow a learning-by-doing approach, typically accompanied by a deliberate learning process based on systematic stock-taking and learning about bottom-up activities. For our cases, this involved a continuous search for new promising initiatives, and at the same time, evaluating what does (not) work. It allowed for learning at two levels: the field level in terms of problem areas and existing solution types, as well as the level of the TIP programme in terms of the actual support efforts. Insights on both levels were used to recalibrate the activities of the transition team.

In our cases, society-based approaches to monitoring and evaluation resolved primarily around specific bottom-up initiatives to be supported, not so much around concrete policy interventions,strategies or measureable goals. Hence, monitoring and evaluation seems to have a different scope and purpose than in programmes following the other two TIP governance arrangements. Instead of focusing alone on costs (input) and effects (outcome) of support actions, monitoring zooms in on individual projects or activities and to demonstrate how they

contribute to the desired transition. The main purpose of monitoring project outcomes is not to evaluate or assess but to identify projects that deserve a spotlight or require additional attention.

Resolving conflicts: Our cases illustrate that the capacity to deal with tensions and resolve conflicts in society-based TIP governance can be strengthened by installing a steering committee in which stakeholders can work out differences. For the studied cases, such committee structures were beneficial for strategic decision-making about future actions and activities within the community. Activities in the form of organized events, such as discussion nights or workshop series, helped overcome differences, and create a better understanding of the sources and status of tensions.

Challenges: While society-based governance arrangements lend themselves well to designing and implementing the tasks and features of transformative innovation policy, they may also show their limitations. The biggest one might be the difficulty of building momentum. By not starting out with a clear programme, funding or action line for the initiatives, it can be hard to identify and convince enough initiatives to integrate into a broader, self-reinforcing movement. Catalysing bottom-up initiatives only works if enough problem-oriented activities are already happening on the ground or in society. Moreover, the absence of a standardized set of policy tools highlights the flexibility and self-regulatory character of society-based governance arrangements, but it can also hamper bold moves.

6. Discussion

Driving system-wide transformation is likely to demand unconventional interactions between government and societal stakeholders, both in the development and implementation of policies. This study aimed at identifying the variety of governance arrangements, i.e. the organisational structures, processes and capabilities, through which public organisations pursue their transformative policy ambitions. With a comparative analysis of seven transformative policy programmes, we aim to shed light on different implementation modes of TIP governance and their respective opportunities and challenges. The obtained results thereby inform the ongoing, primarily conceptual, debate with insights on how to apply transformative innovation policy frames or rationales in practice (e.g. Weber & Rohracher, 2012; Schot & Steinmueller, 2018; Borrás & Edler, 2020).

As a starting point, we identified three ideal types of governance modes based on which aspects and activities of transformative policy initiatives can be implemented. Our findings confirm that the three governance modes differ substantially in how they permit public organisations to deploy structures and processes in line with transformative ambitions or principles. For each mode, we encountered TIP governance arrangements that allow for new ways of providing legitimacy and leadership, supporting coordination, facilitating policy learning and resolving conflicts. While the transferability of specific governance arrangements and practices across modes might be limited, we can observe hybrid 'cases' or TIP programmes integrating features of various governance modes. Still, the underlying organisational (i.e. administrative, co- or self-governance) principles of a particular governance mode seem to be dominant or at least guide the design and implementation of the TIP initiatives we studied. .

A question immediately following from our analysis of governance arrangements is how and also from whom policy organisations should learn to develop their own programmes and strategies further. If more knowledge and experience on different governance arrangements and modes become available, what does that mean for e.g. public organisations mostly operating according to an administration-based governance mode (like the mission-oriented cases)? Almost by definition, governance modes themselves are not easily changed. However, the possibility of a 'gradual' evolution of governance modes might explain the observation that most of our cases do not strictly adhere to one mode, but harbour elements from various archetypes when governing change processes.

Such a 'governance mix' (Bugge et al. 2018) simultaneously following top-down and bottom-up principles is visible in, for instance, the cases of the HTS2025 and the MTIB, which show a steady 'opening-up' to move from administration-based towards more network- or society-based governance. While many of the routines and logics in those cases reflect that bureaucratic procedures and accountability-thinking still prevail, there are also signals that the public organisations in the lead are increasingly open to entering governance constellations in which (representatives of) societal stakeholders get a larger say in shaping policy instruments and allocating budgets. On the contrary, the initiatives already operating under a more society-based governance still show aspects of administration-based governance approach. This is illustrated by e.g. the case of Amsterdam Circular. Despite assigning large importance to different stakeholders' views on why and how to pursue circularity, such views still need to be incorporated into strategies that are formulated and adjusted according to formal budget cycles.

These observations also beg the question of what it takes for public organisations to change the legitimacy and space of possible actions. Based on our cases, it seems possible to 'escape' the boundaries of a dominant governance mode, either by following incremental steps (e.g. by altering some policy features with every new generation of a policy program) or by pursuing a more radical route (e.g. by establishing a transition team outside of a public organisation). Further research into governance changes within and across governance modes may want to recognize that such changes do not necessarily follow from elaborated plans. Instead, they might often rely on a 'small wins' approach based on step-by-step governance experimentation (Bours et al., 2021).

Another way of looking at the issue of evolving governance modes is to ask whether it is even recommendable or desirable for governmental organisations to move away from administration-oriented based governance. We found most of the society-based arrangements in sub-national (regional and local) initiatives, pointing to potential complementarities between top-down governance modes at the national level and more bottom-up and participatory governance approaches at lower levels of policy. This idea would be consistent with the subsidiarity perspective on innovation policy for addressing societal challenges, which states that national and local policy bodies can reinforce each other when setting top-down directions and accommodating bottom-up experimentation (Wanzenböck & Frenken, 2020). Local governments might be better positioned to steer and accelerate transformative initiatives, as societal problems, despite their often global prevalence, typically possess social, economic and institutional characteristics that vary from place to place (Coenen et al., 2015). Moreover, it is usually at the local level where one can find also the political institutions and problem urgency powerful enough to unite diverse actors around a shared goal (Wanzenböck & Frenken, 2020). In that sense, it is perhaps not necessarily problematic if national governments stick to an administration-based governance approach focused on improving the fit between policy instruments, as long as the resulting policies (subsidies, regulations) are suitable for supporting bottom-up initiatives. This view underlines the importance of not only looking at policy mixes in the sense of instrument mixes, but also of multi-level arrangements and 'governance mixes' tying top-down and bottom-up governance approaches together. Indeed, one of the potential mechanisms for doing so can be the use of missions as boundary objects for coordinating across different communities and governance levels (Janssen et al., 2023).

Finally, studying the materialization of transformative characteristics holds relevance for the emerging interest in mission-oriented innovation policies with transformative ambitions (Hekkert et al., 2020; Jütting, 2020; Haddad et al., 2022). Considering the contrasts between TIP programmes with and without an explicit mission-orientation, the examined strategies centred on missions fit best with the administration-based and network-based governance approach. This implies that in at least the mission-oriented TIPs we investigated, there is ample emphasis on cross-ministerial policy coordination and streamlining policy instruments. While this might give impetus to developing promising innovative solutions in line with a particular mission goal, it is less clear how the dominant governance modes can also support the diffusion and adoption part of pursuing a mission. One of the promises of missions is to engage a broad spectrum of societal stakeholders with interest in the problem and possible solutions (Janssen et al., 2021), but even in the network-based governance mode we only found engagement arrangements that are limited to the participation of primarily institutional representatives. Governance arrangements directly involving municipalities or citizens were more prominent for the society-based governance mode, which leaves unclear what the other two modes can accommodate in this respect. As there are only few empirical examples of fully fledged mission-oriented innovation policies, it is still too early to make statements on whether and how such policies can, or should, be orchestrated according to a society-based governance mode.

7. Conclusions

This article provides a comparative cross-case analysis of transformative policies across Europe. The seven investigated cases all aim to mobilize innovation capacities to drive system-wide transformations, but differ in the governance arrangements they deploy to steer and control innovation and diffusion processes. Documenting concrete structures and processes is a first step when trying to understand what works best in certain circumstances. Moreover, it might inspire policy makers and provide a basis for exchanging lessons and experiences.

Moving forward, it is important to be able to distinguish strategic and operational struggles (e.g. lacking capacities to get suitable governance arrangements in place) from political types of bottlenecks (insufficient willingness to transform). Weak or inconsistent political leadership is not uncommon in contested policy spaces, in which multiple societal interests collide, but

need to be addressed in ways that differ from merely capacity building. This article aims to open up research avenues on the latter account. Extending investigation of what governance arrangements to develop, and how to do so, is likely to be relevant in the face of emerging (innovation) policies with an explicit ambition to support the development of governance capacities, such as the S4 'Innovation for sustainability' policy framework succeeding S3 (McCann & Soete, 2020).

Our main contribution stems from developing an analytical framework that allows for cross-case comparisons. Doing so points at the importance of being sensitive to differences in the governance modes from which transformative policy emerges. When comparing abilities to bring about 'transformative outcomes', it seems fair to consider that governments may have very diverse starting points and possibilities. Building on the assumption that different types of policy systems require different ways of coping with implementation hurdles (Matland, 1995; Hudson et al. 2019), our focus on linking governance arrangements to governance models provides a basis for future empirical work to consider particular transformative policy types - rather than lumping them all together. Regarding mission-oriented innovation policies, the examined governance modes offer an alternative kind of contextualisation compared to e.g. types of missions (Wittmann et al., 2021) or types of mission-oriented innovation policy instruments (Janssen, 2022). As suggested by Borrás and Edler (2020), recognizing the differences between distinct modes of governance might also help to understand how socio-technical system changes come about. It is likely that governance arrangements fitting a administration-based governance mode are more suited for one type of transformation (e.g. hierarchical and state-driven) than for other transformation types (e.g. the ones based primarily on self-regulation).

In terms of policy implications, our study suggests that there is no clear recipe for becoming more transformative; not only because there are various ways of achieving the same, but also because (depending on the dominant governance mode) governmental organisations differ in the opportunities and challenges they face when converting to the transformative innovation paradigm. TIP programmes can be leading examples for other policies also sprouting from administration-based or network-based governance systems, while being less transformative than not particularly ambitious policies organized around a society-based governance logic.

To what extent developments in policy designs and governance capacities truly lead to transformative outcomes lies outside the scope of this conceptual and mostly descriptive study.

Further research can build on the presented findings by assessing the socio-economic and socio-technical changes set in motion, and linking them back to specificities of the encountered type of governance system, policy design, and governance capacities. Of particular interest would be the identification of patterns that reveal what combination of governance arrangements is best suited to deliver on different kinds of transformative ambitions (e.g. short- or long-term goals). The presented findings also give rise to further research on routes for policy bodies to become more transformative, and investigations of potentially complementary ways of organizing national government's top-down and local government's bottom-up governance styles. It thereby feeds into the ongoing discussion on the respective roles of niche activities versus incumbents and mainstream actors in driving change, which both might be needed to effectuate large-scale system transformation (Geels, 2021). To the extent that there is a link between governance modes and the types of change they can accommodate best (e.g. society-based governance is easily associated with mobilizing and coupling niche activities), there are also reasons to stretch comprehenisve TIP strategies over policy organisations operating according to different governance modes.

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Appendix: Case examples of governance arrangements per TIP governance task

Cases:	Transformative innovation policy governance task:			
	Creating legitimacy and leadership	**Coordinating across multiple levels, actors and instruments**	**Reflexivity, learning and experimenting**	**Resolving conflicts**
C1: Green solutions	Ministry of Higher Education and Science in a strong lead. Link with Climate Council of high-level representatives.	Policies launched with partners, e.g. Green Business Forum; Board of Business Development; and the business/finance ministry	Formal evaluations like international assessment of Innovation Fund. In-house mapping of policies and barriers.	(Not prominently present, due to focus on competitive research calls)
C2: HTS2025	BMBF strategy is endorsed at highest political level. Missions are formulated top-down and mostly focus on policy coordination; there is no separate budget.	BMBF strategy invites other ministries to implement missions, in collaboration with e.g. the Länder. Roundtable supports alignment. High-Tech Forum advices and engages stakeholders like citizens.	HTS2025 builds on evaluation of earlier HTS versions, new R&I landscape analyses, and ongoing process-based learning in current HTS.	Development of joint position papers and roadmaps for overcoming lacking financial commitment from ministries.
C3: MTIP	MTIP is initiated by Min. of Economic affairs & Climate Policy, but missions are owned by various ministries and kept away from politics.	Around 30 public organisations sign Knowledge & Innovation Covenant. Multi-annual mission programs are designed by triple helix platforms, checked by e.g. advisory boards.	MTIP is presented as evolving. Learning relies on (innovation) policy monitoring as well as on programme monitoring.	Intermediary-like mission teams mediate between innovation actors and problem-owning ministries.
C4: CoT	Strong focus on visionary ideas, comprising climate, energy, mobility, technology and innovation agendas. Leadership supported by Austria's lead in European JPI 'Urban Europe'.	Cross-cutting theme links policy silos via e.g. working groups. FFG aligns R&I funding schemes. CoT budget for trans-national initiatives like city partnerships. Network platform for knowledge and actor mgmt towards societal stakeholders.	Regular adjustments of focus areas in yearly calls, based on perceived stakeholder needs. Ongoing development of new 'system impact' assessment approaches.	Firmly established structures in the Austrian funding landscape ensures a gradual and smooth coordination process between core partners.
C5: RIS3CAT	EU origin of available funding provides legitimacy and helps to overcome local power games (due to vested interests in e.g. sectors).	Coordinating EU funds from non-sectoral ministry ensures neutrality. Diverse public and private actors participated in developing shared agendas and targeting funding calls.	A series of workshops served to update views on which development paths to pursue, and how to adjust funding calls.	Bottom-up approach brought municipalities on board, instead of imposing top-down policies on them.
C6: Amsterdam Circular	Team Circular developed strong vision 'Amsterdam Donut City' and is backed by Coalition Agreement. Broad political commitment allows policy officials to explore new ideas and approaches.	Multi-departmental composition of core team; extensive rounds of consultations and workshops with policy officials. Sustainability Council with firms and NGOs advices Team Circular. Online platform for community mgmt.	Learning-by-doing approach; strategies refined based on experimentation results. Use of living labs and prizes. Comprehensive monitoring frameworks.	Articulating vision (based on integrated perspective) allows stakeholders to see what circular means to them, and overcome short-term conflicts.
C7: Circular Flanders	The CF transition team is placed outside any individual ministry, and relies on a public-private steering committee of high-level societal representatives.	Various departments and regions partner with CF, while maintaining ownership over their own budgets and policies. Working agendas guide actions, e.g. the creation of one-stop-shop for funding.	Few static measures; responsive policy actions are based on continuous interactions with variegated field-level stakeholders.	Creating arenas in which stakeholders confront each other with their views, e.g. panel sessions during debate events.