



## JRC SCIENCE FOR POLICY REPORT

# Capacities for transformative innovation in public administrations and governance systems: Evidence from pioneering policy practice

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## **Abstract**

Despite mounting interest in transformative innovation policies, there are only few studies that provide insights with regards to their implementation. The present study asks which policy design features make a policy transformative and what capacities public administration and the broader governance system need in order to provide such transformative policies. The study is centred on a comparative and in-depth analysis of the development of 12 transformative policy initiatives selected on account of possessing characteristics that literature suggests can be transformative. The study includes a synthesis of findings on how transformative policies emerge, what governance capacities (and underlying practices) they typically involve, which features of transformative policies can be strengthened, and what difficulties policy makers might encounter. A key practical contribution of this study is the empirically-grounded identification of distinct possible pathways for transformative capacity development and deployment for the three stylised models of governance systems encountered at present across Europe: administration-based governance, network-based governance and society-based governance. The typical development sequences encountered in each of these stylised paths can provide inspiration to policy makers looking to develop legitimacy and capacities ahead of implementing transformative innovation policies.

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## Executive summary

Europe is faced with manifold and pressing demands for change, like the need to make our societies more sustainable within defined timeframes. These demands are severely testing the ability of existing governance frameworks to respond, as they require policy makers to design and implement policy initiatives suitable for transforming entire production-consumption systems. Innovation policy, as the only policy domain with a primary mission to create new solutions, is becoming increasingly relevant across policy domains. Despite mounting interest for transformative innovation policies and growing policy experimentation on the ground there are still only few conceptual or empirical studies that provide an understanding of how they can be implemented. In order to effectively adopt transformative policy approaches, a better understanding is needed of relevant prerequisites, facilitating factors, and constraints.

The present study asks which policy design features make a policy transformative, and what capacities public administrations (and the broader governance systems they are part of) need in order to provide such transformative policies. Governance capacities are understood as the collection of structures, processes and capabilities policy administrations need to design, implement and update their policy instruments. There are currently not enough evaluations to draw broadly generalisable conclusions about the extent to which the outcomes of these policies have been transformative. Therefore, the term 'transformative' in this study refers to features of policy design and implementation literature suggests can be transformative, not to transformative outcomes.

Based on a review of the literature, we propose a multi-layered view of transformative innovation policy features. According to this view, transformative innovation policy is not just a matter of designing one-off policies with the right strategic, operational and instrumental characteristics. The fundamental basis for transformative policy making is also having a reliable governance system in place. Drawing from a synthesis of recent literature on transformative innovation policy, we identify five key criteria distinguishing transformative innovation policies: *directionality*, *societal goal*, *cross-cutting policy field*, *mobilising the demand side*, *stakeholder involvement*. Using these criteria we performed a broad search for candidate policies emerging at the national, regional or local levels across Europe. We produce a longlist of 30 possible examples of transformative policy initiatives (TPIs) and select 12 of those on account of more closely resembling the design and implementation features that literature suggests can be transformative.

The study is centred on a comparative and in-depth analysis of the development of the 12 TPIs and of the governance systems within which they emerged. The analysis was performed between December 2020 and March 2021, drawing on desk research of policy documents and interviews held with public officials and policy analysts knowledgeable about the policy developments and policy landscape in a specific territory. Besides examining the features of each initiative, especially those literature suggests have the potential to drive transformations, the objective is to give an overview of how they are doing this and how they came about.

The study concludes with a synthesis of findings on how transformative policies emerge, what governance capacities (and underlying practices) they typically involve, which features of transformative policies can be strengthened, and what difficulties policy makers might encounter when aiming to make their policies more transformative. The aim of a synthesis in this form is to abstract from particular TPI examples, and instead draw lessons on the level and type of governance systems that also policy makers in other countries, regions and cities can relate to. A key practical contribution of this study is the empirically-grounded discussion of distinct possible paths for capacity development and deployment for the three stylised models of governance systems encountered at present across Europe: *administration-based governance*, *network-based governance* and *society-based governance*.

Key findings include:

- (1) Real-world examples show that there is actually extensive practitioner experimentation with policy features literature suggests can be transformative. Far from being just theoretical constructs, there are several attempts, at all territorial levels of governance, to introduce policies with *directionality, societal goal, cross-cutting policy field, mobilising the demand side, broad stakeholder involvement*. This finding is not especially surprising if one considers that the identification of these five features in academic literature has relied on observing and analysing actual policy practice. Pushing forward the frontier of theoretical and practical knowledge on transformative innovation requires continuing this dialectic between academic discourse and policy practice, which is now more relevant than ever.
- (2) Real-world examples show that in practice there is a variety of ways to design the five key features that literature anticipates can be transformative. However, none of the investigated cases seems to match fully all five features. TPIs emerge within very different administrative models of governance, i.e. *administration-based governance, network-based governance, and society-based governance*. For each of these models there are clearly distinct governance capacities (and underlying practices and principles) for improving the transformative potential of innovation policies. Our attempt at a synthesis of capacities relevant to each archetypal governance model as emerging from the cases, identifies the distinct bundles of capacities relevant to each model.
- (3) For *administration-based governance*, key collaboration and alignment capacities were the ability to link new policy objectives to long-term and strategic government priorities, to form dedicated joint units, and to frame the benefits of coordination so that they are obvious for all actors; key legitimacy and leadership capacities were endorsement at the highest political level, and the ability to facilitate process innovation and gradual organisational change within the administration; key learning and experimenting capacities included the ability to perform a systematic mapping of existing policies and instruments and establishing more continuous monitoring and evaluation procedures.
- (4) For *network-based governance*, key collaboration and alignment capacities were the ability to involve key stakeholders in agenda-setting and in some cases to set up partnerships with other levels of governance, including municipalities who are closer to the concerns of lead users; key legitimacy and leadership capacities include a readiness to share management between several policy actors, foster co-ownership and work effectively under a highly delegated structure; key learning and experimenting capacities include the ability to follow new monitoring and evaluation methodology (such as formative evaluation) and to engage in active and deliberate community building measures.
- (5) For *society-based governance*, key collaboration and alignment capacities include the ability to establish and maintain a problem-centred entity with sufficient autonomy to be responsive to the needs of the system, the ability to facilitate the work of key change agents in the system and communicate their successes, to organise community building and management, and to inspire, instruct and mobilise a broad range of policy makers beyond their immediate domain of control; key legitimacy and leadership capacities include the ability to create vision around the perceived importance and urgency of the problem and a capacity to root problem-solving efforts with communities of users who drive forward the solutions; key learning and experimenting capacities include the ability to take stock and learn from bottom-up experiments, and the ability to focus monitoring efforts on project outcomes, allowing a sharper focus on the parts of the policy mix that deserve the most attention.
- (6) There is no single recipe for becoming more transformative; not only because there are various ways of achieving the same, but also because governance systems really differ in the opportunities and challenges they face when converting to the transformative innovation paradigm. For this reason, an informed understanding of each system should precede attempts to introduce TPIs. Sensible ways to better understand each policy system and design tailored paths for governance capacity building and deployment may include policy intelligence and diagnostics, learning from international experiences and the valorisation of tacit system-level expertise of experienced public officials.
- (7) Some of the investigated cases suggest that the transition of policies to the transformative paradigm should not be regarded as irreversible but rather depends on the stability of the underlying policy system. This finding highlights the need for still missing policy heuristics to navigate around temporary setbacks and obstacles to the sustainability transition, which may have recently become more relevant.

# 1 Introduction

## 1.1 The era of transformative policy initiatives

Europe is faced with manifold and pressing demands for change, which are severely testing the ability of existing governance frameworks to respond. The COVID-19 pandemic has exposed shortcomings in the resilience of our economies which will require close attention. Technological change (most notably digitisation and labour-substituting automation), shifting demographics and above all, climate change - with all its political, production and consumption implications - are demanding far-reaching responses. In the absence of informed political leadership, there is no guarantee that the necessary transitions will happen at all or in time to avoid bleak scenarios. Adequate preparation can also help ensure that the challenges these external impulses represent are turned into opportunities for sustainable and equitable growth. Indeed, the European Green Deal (European Commission, 2019) sees a central role for innovation and anticipates future economic prosperity as passing through environmental and social sustainability. To address such challenges and opportunities, the new EU policy agenda embraces and seeks to promote the 'transformative innovation' approach<sup>1</sup> emerging from two major developments within the field of science, technology and innovation (STI) policies. One of these developments is the shift in goals for which STI policies are being deployed, and therefore the intervention rationales and roles governments may consider. Instead of only increasing the rate of R&D and the diffusion of knowledge, STI policy also provides a means to mobilise innovation capacities for addressing 'grand' societal challenges (Kuhlmann & Rip, 2018). This broader scope is often associated with an extended set of failures that legitimize government intervention, going beyond the typical market and system failures. So-called transformation failures (Weber & Rohracher, 2012) can also consist of e.g. a lack of directionality and reflexivity regarding the (support for) innovation trajectories that may help to address a particular societal problem. Addressing such failures requires a wide variety of responsive as well as proactive government roles, far beyond traditional hands-off funding allocation and the creation of beneficial framework conditions. Apart from building momentum by nurturing and shielding so-called niches, the success of desirable innovation trajectories also depends on efforts to alter the regime that conditions possibilities for innovative solutions to develop and diffuse (Kemp et al., 1998; Geels & Schot, 2007).

A second (and related) major development concerns the rise of a 'systemic' perspective on innovation processes (Edquist, 2006). In this perspective, it is the path-dependent interplay between various technological, economic and societal factors that determines how innovation trajectories unfold (Hekkert et al., 2007). Accordingly, supporting the creation and implementation of novelty is no longer believed to be a matter of pushing research activities to increasingly higher application stages, but rather of lining up factors like human capital, infrastructures, and market formation mechanisms conducive to a particular innovation trajectory (Smits & Kuhlmann, 2004). Moreover, building on insights from transition studies again, it is acknowledged that technological and socio-economic change are driven or limited by institutional factors (including regulations) that shape the socio-technical system in which innovation takes place (Wieczorek & Hekkert, 2012). Synergies between changes on all of these accounts allow for not just product and process innovations to take place, but for entire production-consumption systems to transform.

Currently, a new perspective on innovation policy is emerging right at the interface of the two aforementioned developments. The rise of transformative innovation policies (Weber & Rohracher, 2012; Steward, 2012; Janssen, 2019; Diercks et al., 2019) refers to policy that builds on rationales aimed at system-wide change and innovation in socio-technical systems, related to the fulfilment of a societal function or need such as mobility, food or housing. Indeed, this is in contrast to earlier innovation policy approaches, primarily aimed at optimising (but not transforming) the functioning of markets or innovation system (Laranja et al., 2008). A transformative innovation policy aims at fundamental and deep changes in socio-technical systems, so-called system innovation, as in the configurations of resources, institutions (incl. policy), industry structures, infrastructures, and technologies that define patterns of production and consumption in a society (Geels, 2004). It asks for new ways of using science, technology and innovation to meet societal needs, and of

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<sup>1</sup> The influence of this thinking is evident, for example, in the new EU Missions in Horizon Europe ([https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe\\_en](https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe_en)), in new indicators such as the Transitions Performance Index (European Commission, 2022) and in the experimental development of place-based frameworks for sustainable development including S3 for SDGs (Miedzinski et al., 2021) and the Partnerships for Regional Innovation (Pontikakis et al., 2022).



addressing issues of sustainable and inclusive societies more explicitly than previous innovation policy framings or rationales (Schot & Steinmueller, 2018).

## **1.2 Objectives of this study**

While much has been written on the rationales for transformative innovation policy, there are still few conceptual or empirical studies that provide an understanding of how they can be implemented (Schot et al., 2017; Borrás & Edler, 2020). This study asks which policy design features make a policy transformative, and what capacities public administrations (and the broader governance systems they are part of) need in order to provide such transformative policies.

At the heart of this study lies a comparative and in-depth account of twelve leading transformative policy initiatives, 'TPIs', from different European countries and regions. Besides assessing on what accounts (i.e. which policy features and public capacities) the initiatives have a potential for bringing about transformations, the objective is to give an overview of how they are doing this (e.g. which policy designs are associated with providing directionality?) and how they came about. Shedding light on actual policy designs and governance arrangements, and how they are configured with respect to each other, might inform the further uptake of transformative innovation policies.

To maximize learning opportunities, this report intentionally looks at twelve rather distinct policy initiatives; not just in terms of e.g. their sectoral focus or the extent they have emerged from traditional STI policies, but also in terms of the policy systems in which they are manifested. As will become clear over the next chapters, the twelve cases are to be regarded as 'pioneering' only when it comes to certain policy features, or in relation to the particular policy contexts in which they were developed. Yet, this does by no means imply they are excellent examples of how transformative innovation policies should look, or should be governed. The ambition of this report is merely to assess how in practice policy makers are responding to the call for transformative innovation policies – and to the challenges that go with it. Creating a better understanding of possibilities and constraints in this respect is, one could say, a small but crucial step in supporting the actual uptake of policy approaches with the potential to transform entire production-consumption systems.

## 2 Conceptualisation and identification of Transformative Policy Initiatives

### 2.1 Conceptualising Transformative Policy Initiatives (TPIs)

Although at this stage the literature on transformative innovation policy is not fully conclusive on the nature of TPIs, there are various attributes that re-occur consistently. To understand them well, we place the governance of a specific TPI in a multi-layered interpretation. This multi-layer perspective, suggested by Howlett (2009), allows us to characterise, analyse and compare the transformative features and governance capacities of TPI at different levels:

- **Strategic level** – the political level of governance at which decisions on the embedding and significance of the policy for the government strategy are made, and the overall direction and goals of a policy determined (directionality, intentionality, fundability, etc.).
- **Operational level** – the administrative level to design and implement a policy according to political priorities, and to coordinate it across policy fields, sectors and levels (horizontally and vertically).
- **Instrument level** – the level at which specific instruments (financial and non-financial) are designed and managed, in light of the political priorities, the policy mix and the available resources.

As shown in the figure below, the TPIs (with their three levels) are in turn nested in a broader policy landscape or governance system. The **system level** captures the dominant policy rationales and governance capacities found in the administrative bodies that are responsible for the TPI and many other policies (see section 2.2).

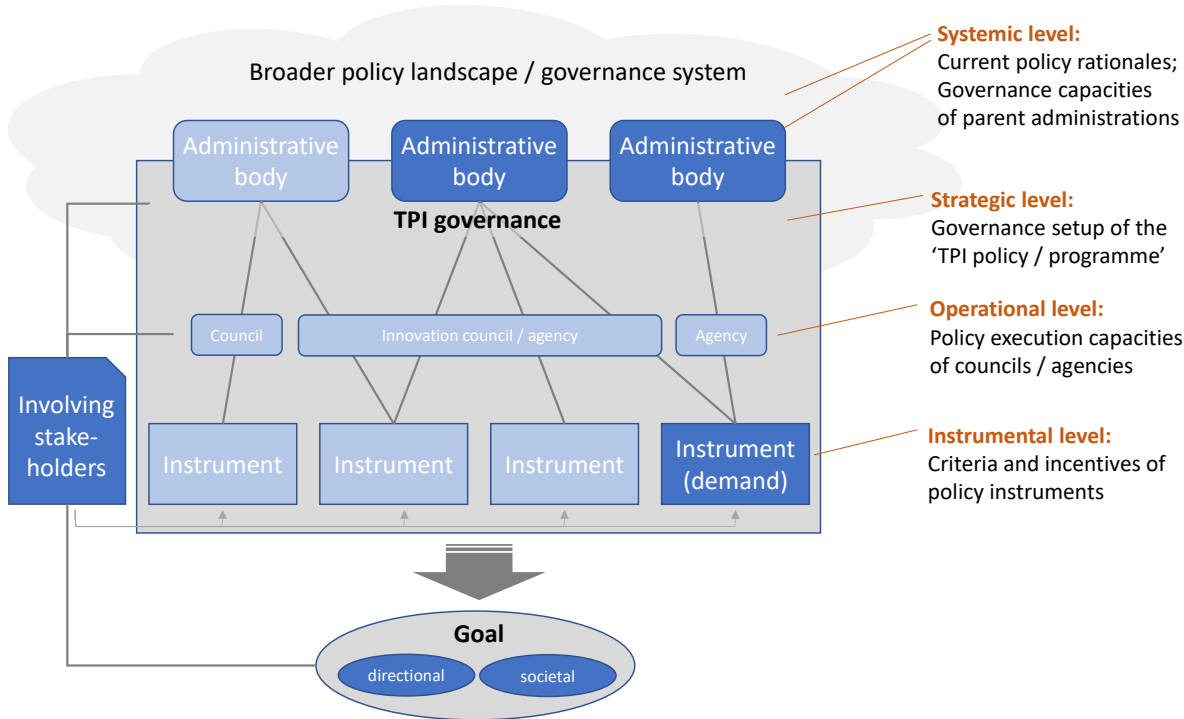


Figure 1: Multi-layered interpretation of core (dark blue) and non-core (light blue) structural and process features of transformative policy initiatives.

The dark blue coloured elements in Figure 1 highlight which features in the multi-layered perspective are deemed key / baseline characteristics of a TPI, according to a review and synthesis of recent literature on transformative innovation policy (see Box 1 for a summary). These are:

- A. **Directionality:** The initiative sets a conscious direction for guiding innovation activities (and supporting policy interventions), based on a *joint vision* and *articulated objectives* for the transformation process of a socio-technical system.
- B. **Societal goal:** The policy follows a societal agenda, *beyond an economic, industrial or technological rationale*, that is related to environmental or societal aspects of development (e.g. SDGs). Multiple forms of innovation (e.g. technological, institutional) are considered to contribute to achieving this goal, but innovation is not a goal in itself.
- C. **Cross-cutting policy field:** Innovation is considered as cross-cutting theme embedded in the societal agenda, with several context-specific policy domains, such as environment, energy, health or agriculture, being involved in implementing innovation support schemes. The aim is to move beyond policy silos, not only in terms of goals but also in coordination (horizontal and vertical) and implementation of concrete actions and initiatives.
- D. **Mobilising the demand side:** The initiative pays attention to supply- and demand-side policy instruments, stimulates interaction between innovation producers and consumers / users and promotes societal embedding of the innovation.
- E. **Stakeholder involvement:** There is an increasing role of public-private cooperation and interaction at different stages of the policy cycle. The government is considered as facilitator, (not leader) of new and more inclusive governance arrangements, steered towards achieving more open, transparent and diverse policy networks and policy processes.

**Box 1: Elaboration of five baseline characteristics according to scientific literature (summary)**

**A. Directionality**

- Identification of major societal problems, for which long-term solutions need to be developed (with the help of R&I) (Weber and Rohracher 2012). This involves building a shared vision regarding the goal and direction of the transformative process of a socio-technical system, to concentrate (innovation) efforts and enable cumulative knowledge generation and learning around specific solutions in support of this direction.
- For Grillitsch et al (2019) directionality involves 1) promote institutional entrepreneurs; 2) resolve conflicting interests due to skewed distribution of power and resources; 3) develop capabilities in new forms of governance, at the level of actors. At the network level, 1) connect and integrate directionality exercised by multiple types of actors, locally and globally; and at the level of institutions 1) develop shared vision among multiple actor groups; 2) set objectives that provide direction in a concrete and actionable way.
- Stirling (2009), in the new manifesto on innovation and sustainable development, applies a more narrow notion of directionality, referring to the need for more open academic and policy attention to the fact of there being alternative possible orientations for progress (pathways). This directionality notions refers to aspects of progress in general, not particular to policy.

**B. Societal aim, beyond economic or technological and innovation (STI) goals**

- Transformative innovation policy follows a broad societal policy agenda (Diercks et al. 2019), in its policy objects (beyond competitiveness, jobs and growth) towards societal challenges, related to climate, inequality, demography, resources, etc.
- It also goes beyond the economic policy agenda, in that it has less 'pro-innovation bias', recognising that not all innovations are good or valuable (Diercks et al. 2019). A societal policy agenda acknowledges this more nuanced understanding of innovation, taking both positive and negative outcomes into account, and making societal impacts of innovation (or policy) as parts of the assessment.

### **C. Cross-cutting policy field area**

- For Diercks et al. (2019) an transformative innovation policy is considered a horizontal/cross-cutting policy theme, as it follows a societal agenda. Not only economic or industrial policy informs the innovation agenda, but also policy domains, such as environment, energy, health or agriculture. As a result, innovation is supported in a variety of context-specific policy domains, with innovation being a so-called horizontal or cross-cutting theme.
- Weber & Rohracher (2012) refer to horizontal coordination (failure) between RTI-policy, and sectoral policies (e.g. transport, energy, health, industrial sector policies) or cross-cutting policies (e.g. tax policy, economic policy, regional policy).
- The aim is to “break down policy silos.”, *beyond directionality (as in A) and formulation of policy aims (as in B)* when it comes to coordination in implementing *concrete policy actions and initiatives*, and the need for coherent policy impulses from different policy areas and over time (sectoral and temporal dimension of the “policy mix”; Reinhardt & Rogge, 2016).
- Connecting separate projects and niches with similar goals (Salas et al. 2019).
- Working backwards from well-defined goals with all implicated decision makers, can influence the direction of growth and thus improve the coherence of strategic investments across many different sectors, induce cross-sectoral learning and increase macroeconomic stability. (Mazzucato et al., 2020).

### **D. Focus on mobilising the demand side**

- Demand articulation is a key systemic function for innovation (Hekkert et al., 2007; Bergek et al., 2008).
- Weber and Rohracher (2012) refer to demand articulation failures, as “insufficient spaces for anticipating and learning about user needs to enable the uptake of innovations by users. Absence of orienting and stimulating signals”. The line of reasoning around demand articulation has been taken up in the analysis of TIP initiatives of Grillitsch et al. (2019) and Salas et al. (2019).
- Policies to mobilize demand range from supporting joint learning processes involving producers and users in experimental approaches (‘living labs’), to more emphasis on user-led innovation, or the integration of users and producers in open innovation models.
- Another mechanisms is the promotion of other forms of (non-technological) innovation such as social innovation and institutional innovation, based on increasing consumer awareness or regulatory changes.
- Increasing emphasis is on public procurement and the building up of procurement competencies in public administration to support and demand novel solutions with potential to contribute to system innovation (Uyarra et al. 2020).

### **E. Stakeholder involvement**

- Stakeholder engagement makes private parties’ expertise available to the public domain, with an increasing role of public and private cooperation and interaction among relevant societal actors (e.g. in a policy domain).
- It changes the role of the government from a leading to a facilitating one (Borras and Edler 2020), and is a sign of reduced and fixed hierarchies in policy and decision making based on more inclusive governance arrangements.
- With increase stakeholder engagement, the scope and diversity of policy networks is widened (Grillitsch et al. 2019).
- Stakeholder involvement requires novel modes and decentralized mechanisms for public-private coordination and interaction (Salas et al. 2019; Borras and Edler 2020). These can range from inclusive forms of decision making involving representatives from public/private/knowledge organisation; e.g. state – economy – civil society (strongest form), over the organisation of stakeholder workshops, roundtables and scenario-development events, to public consultation processes to collect opinions/concerns with non-binding advice function (weakest form).
- Given that societal engagement should be a major source for direction-setting in transformative innovation policy (Schot and Steinmueller 2018), it requires open and transparent mechanisms to

deal with tensions, conflicts and diverging interests in collective vision building, agenda and programme objective formulation, etc.

- Stakeholder involvement can be important for legitimising policies (Salas et al. 2019).

Key characteristics A-D are features related to particular **structural** elements of the multi-layered interpretation, whereas characteristic E concerns a **process** feature that might occur at all of the three levels.<sup>2</sup>

## 2.2 Conceptualising governance capacities

In addition to the key TPI characteristics at the strategic, operational and instrumental level of a particular instrument, there are several possible **governance capacities** – at the governance system level – that are often associated with the transformative potential of (innovation) policies.

In this study, governance capacities are understood as the collection of structures, processes and capabilities policy administrations need to design, implement and update their policy instruments; see for instance also the work by Borrás (2011) on policy learning and organisational capacities for innovation policies, or Kattel & Mazzucato (2018) on the public sector's dynamic capabilities in relation to mission-oriented innovation policies. Being embedded in particular norms, traditions, networks and organisational structures, governance capacities are the largely tacit fundamentals on which policy instruments rest. Typically, the nature and strength of relevant governance capacities can only be revealed via in-depth and qualitative characterisation of the policies under study.

The capacities that have so far been addressed in the transformative innovation literature – often implicitly – further characterize *how* specific transformative ambitions of policy initiatives are reflected in the structures and processes from which the implemented TPI emerges. This relates, for instance, to *how* experimentation and a learning-by-doing culture are organized, *how* these are evaluated and feed back to the design and the transformative goals of the policy measure, or *how* coordination is aspired, particularly if a broad set of stakeholders with potentially diverging interests is involved.

Below we provide a list of governance capacities encountered in key references. They can be roughly divided according to three categories. Indeed, as the identified characteristics stem from different sources, they are not entirely mutually exclusive. Neither is the list to be regarded as exhaustive. The broad categories defined below merely serve as a starting point for obtaining a more detailed insight into the governance structures, processes and capabilities that underly the development of transformative policies. Potentially the empirical findings on these accounts serve as a basis for recategorising and/or extending the initial overview of governance capacities.

### **Coordination and alignment: Multi-level, multi-actor and multi-instrumental**

- Vertical and horizontal policy coordination (Weber & Rohracher, 2012; OECD 2020)
- Multi-instrumental policy approaches / Policy mix (Rogge & Reichardt, 2016)
- Focus on multi-disciplinarity beyond epistemological boundaries (Cagnin et al., 2012)

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<sup>2</sup> According to our current understanding, there are no key characteristics exclusively tied to the role of specifically the 'operational' level of innovation councils/agencies. The mandate of this layer differs strongly per country and policy domain, apart from the fact that transformative innovation policies could also stem from administrations like line ministries (not concerned with innovation per se, and therefore also not relying on innovation councils/agencies). Note, however, that a design feature like stakeholder involvement can in some cases be very much allocated at the council/agency level.

### **Creating legitimacy and leadership**

- 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)
- Accountability mechanisms (Rogge & Reichardt, 2016)

### **Learning and experimenting: Reflexivity in policy design and process:**

- Reflexive governance (Weber and Rohracher, 2012)
- Adaptability (Janssen, 2019)
- Experimental Governance (Torrens & Schot, 2017); Tentative governance (Kuhlmann & Rip, 2018)
- Formative evaluation (Molas-Gallart et al., 2020)
- Second-order learning (TIPc, 2017)
- Consideration of system-level impact (TIPc, 2017)

### **Managing conflicts**

- Destruction policies (Rogge et al., 2020); Deliberate decline / destabilisation (Hekkert et al., 2020); Exnovation / phasing out (Klerx & Begemann, 2020)
- Embracing contestation (Wanzenböck et al., 2020)
- “Conflict vs Consensus” (TIPc, 2017); anticipatory deliberation (Schot & Steinmueller, 2018)
- Establish corridors of acceptable development pathways (Schot & Steinmueller, 2018)
- Tilting the playing field (Kattel & Mazzucato, 2018)

## **2.3 Integrated conceptual framework**

Extending the conceptualisation shown in Figure 1, Figure 2 presents the integrated framework also containing the governance capacities. As will be explained in more detail in chapter 3, our selection of TPIs is based on cases that reflect – to some extent - TPI features A-E. Which governance capacities are represented in these cases, and how, is part of the explorative analysis itself. This implies that our analytical boundaries are not confined to capabilities in relation to the selected TPI only; if relevant we will also report on capacities that were already deployed as part of predecessors of the TPI (or parallel policies launched from the same policy system). What is not being considered, is how transformative the policies are in terms of their actual impacts.

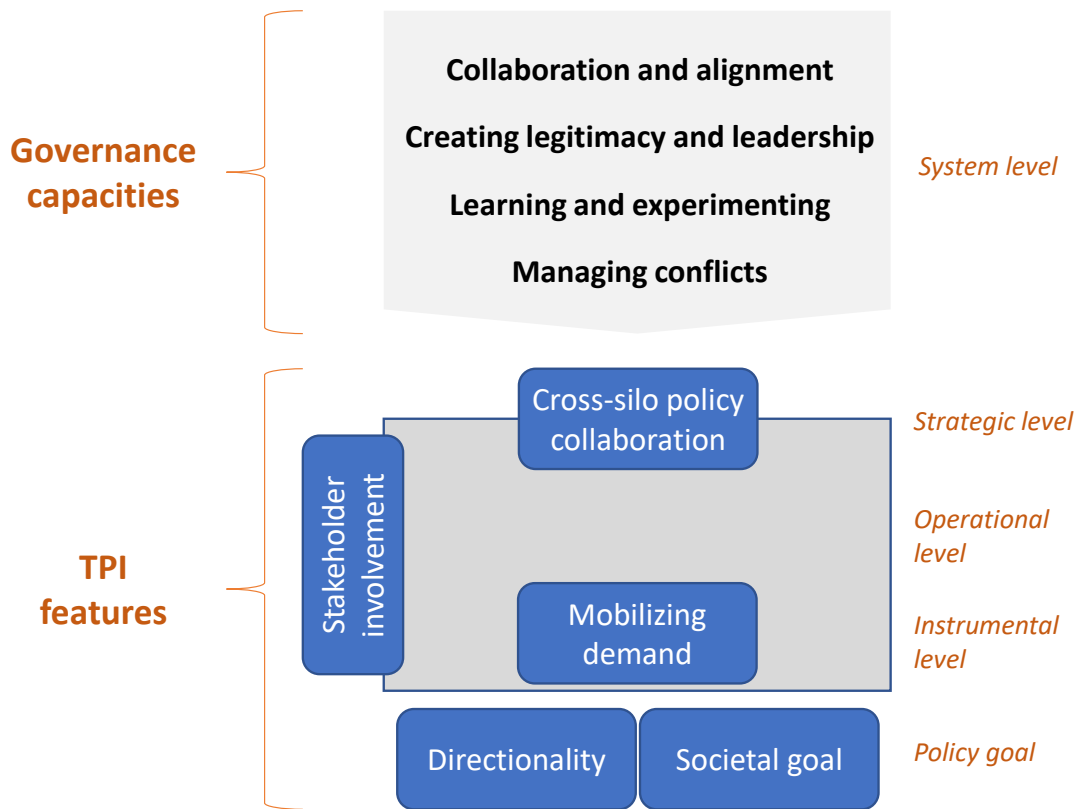


Figure 2: Relation between governance capacities and multi-layered interpretation of TPI features.

### 3 Identification, selection and analysis of policies

#### 3.1 Constructing a longlist of TPIs

Building on our conceptualisation, the construction of a longlist of TPI examples entails finding policies that meet the five key TPI characteristics as much as possible. Next to the five baseline characteristics, we considered the ‘researchability’ of a TPI initiative in terms of the underlying governance system and capacities as core characteristic for the construction of our longlist and the selection of our shortlist.

On this basis, we defined the following broad sampling criteria:

- 1) The initiative gained visibility either because (a) policy makers at the national, regional or local level describe the initiative as transformative, due to its goals, objective or governance approach; or because (b) the research community describes the initiative as having transformative features in scientific articles, reports or research projects.
- 2) The initiative is embedded in a broader national or regional policy strategy or programme, and it is significant enough to potentially contribute to system innovation.
- 3) The initiative has relevance in the overall (innovation) policy landscape of a country/region/city, and shows real commitment as for instance shown by resources (financial, human, etc.) dedicated to it.
- 4) The initiative is in a stage of development beyond the formulation of ambitions or the execution of individual but loosely embedded experiments.

Accordingly, we excluded initiatives at the supranational level (as the best practices to derive for countries or regions would be limited); initiatives that are small-scale, fragmented or without a significant role of policy (as the governance structure and requirements would be different); and initiatives that are too premature; i.e. in the planning phase or not yet well documented (as the evidence on governance capabilities would be limited).

Based on our key characteristics for TPI (section 2.1) and our four sampling criteria above, we screened several online tools, repositories and observatories ([STIP Compass tool](#), [MIP tool](#), [MIPPO](#)); reviewed reports (e.g. JIIP ‘transformer missions’, OECD report on missions, EC report on sustainability transitions); project descriptions (e.g. TRANSIT), and searched for cases on conference websites (TIPc; EEEN2020 Environmental Evaluation Supporting the Implementation of SDGs and Transformative Policymaking). Relying on these sources implies the cases are obtained via purposive sampling. As a result, no claims can be made regarding how complete the list is, nor whether they are truly the best available examples of transformative policies. For the purposes of this study it is primarily important to have a list of different challenge-oriented innovation policies that can be assessed on at least a couple of transformative attributes per case. In a next step we describe the procedure for selecting the ‘leading’ examples amongst the cases appearing on our longlist (see section 3.2).

Table 1 shows the set of 30 potentially transformative challenge-based policies, with information to further characterise the initiatives, such as main information source, the geographical scale, country, sector and implementation year. We further characterise the type of initiative, as **(R) extended R&D or innovation funding programme** mainly implemented in the STI policy domain; **(M) multi-themed strategic or umbrella programme**, partly implemented in the STI policy domain; or **(D) domain specific and thematic programme** that is sector based and involves STI elements. In reality the distinction between these categories is not always clear-cut, as for instance many umbrella programmes evolved from extended R&D funding programs. The labels have been assigned based on what current properties are most characteristic for the initiative.



Table 1: Longlist of 30 challenge-driven policy initiatives with transformative potential.

Source	Initiative	Geo. scope	Country	Sector	Year est.	Type
EC transitions (various)	Green Building Cluster of Lower Austria	Regional	Austria	Building	2001	D
JIIP	Mobility transition: Mobility-as-a-Service	National	Finland	Mobility	2010	D
OECD DSTI article	Energiewende	National	Germany	Energy	2010	D
Interview	Mobility of the Future	National	Austria	Mobility	2012	D
Interview	Automated Driving initiative	National	Netherlands	Mobility	2013	D
Interview	Amsterdam Circular Economy	City	Netherlands	Circular Economy	2015	D
Interview	One Sea: Autonomous Maritime Ecosystem	National	Finland	Maritime	2016	D
OECD toolkit	Circular Flanders (part of Vision 2050)	Regional	Belgium	Circular Economy	2017	D
OECD STIP	Action Plan for Circular Economy	National	Portugal	Circular Economy	2017	D
EC transitions	Environmental strategy 2030 (coal phase-out)	Regional	Slovakia	Climate	2017	D
OECD STIP	A new bioeconomy for a sustainable Italy	National	Italy	Climate	2019	D
OECD STIP	Strategic Energy and Climate Framework	National	Spain	Climate	2019	D
OECD DSTI	Vision-driven innovation milieus	National	Sweden	Health	2019	D
EC transitions	Bristol's One City Plan; carbon neutrality 2030	City	UK	Climate	2019	D
Interview (various)	Green solutions for the future	National	Denmark	Climate	2020	D
OECD DSTI	German High-Tech Strategy	National	Germany	Broad	2006	M
JRC UMIT	Challenge-Driven Innovation Programmes	National	Sweden	Broad	2011	M
(various)	Catalunya 2020 / RIS3CAT	Regional	Spain	Broad	2012	M
(various)	Strategic Innovation Programs	National	Sweden	Broad	2013	M
EC transitions	Copenhagen Climate Plan 2025	Regional	Denmark	Broad	2015	M
OECD DSTI	Pilot-E	National	Norway	Broad	2016	M
OECD STIP	Strategy for responsible development 2020	National	Poland	Climate	2017	M
JIIP	Mission-oriented Topsector & Innovation Policy	National	Netherlands	Broad	2019	M
Interview	Bio and Circular Finland	National	Finland	Circular Economy	2019	R
OECD DSTI	City of Tomorrow / Building of Tomorrow	National	Austria	Housing / Energy	2013	R
OECD DSTI	Grand Solutions Program	National	Denmark	Broad	2015	R
OECD DSTI	SFI Challenge Programmes	National	Ireland	Broad	2018	R
OECD DSTI	National Energy Research Strategy	National	France	Energy	2016	R
OECD DSTI	UK Industrial Strategy Challenge Fund (ISCF)	National	UK	Broad	2017	R
OECD DSTI	Flagship Programme	National	Finland	Broad	2018	R

### 3.2 Characterisation and selection of TPIs

Based on our longlist, we critically examined the individual initiatives again in light of our sampling criteria and the key TPI characteristics. Furthermore, to further assess the suitability for our case studies on the underlying governance system and capacities, we paid particular attention to the available knowledge and evidence base, the documentation of the TPI (website, reports, etc.) and the accessibility of information and interview partners.

To structure the initial assessment of the transformative potential of identified policies, we developed a pragmatic 'characterisation table' based on the five key characteristics introduced in section 1.1. Table 2 describes the ordered nomological scales that were used to type each characteristic. The main purpose of this exercise is to verify that the policies deemed most transformative (by design) are indeed useful for demonstrating policy practices at the higher end of the scale. Systematically conducting a quick-scan revealed that some seemingly interesting cases are probably not so transformative after all. While poor performance on the transformative criteria may be expected for extended R&D funding schemes, the policies not making

the shortlist also include well-known ‘modern’ STI programs like the Danish Grand Solutions Program or Finnish Flagship Program (due to little demand side mobilisation and stakeholder involvement).

Table 2: Characterisation table for quick-scan on ‘transformative potential’ of possible TPIs.

	Type = A	Type = B	Type = C	Type = D	Type = E
Directionality <sup>3</sup>	The initiative does not pre-define any prioritized themes or challenges	The strategy pre-defines very broad themes	The initiative sets clear goals, without selecting solution paths	The initiative sets clear goals and pre-defines (broad) solution paths	The initiative includes selective roadmaps for meeting goals
Societal Goal	Initiative focus on competitiveness / economic growth	Initiative focus on competitiveness in societal fields (e.g. clean-tech)	Equal priority for economic and broader societal goals	Initiative focus on solving challenges via innovations	Initiative focus on societal goals
Cross-silo policy collaboration	Initiative and instrument(s) run by one policy body	Initiative owned by one body and operated by another one (e.g. an agency or council)	Initiative owned by two related bodies (e.g. science + business)	Initiative relies on static set of instruments from various policy bodies	Initiative relies on dynamic set of (co-funded) instruments from various policy bodies
Mobilising demand side	No mentioning of implementation or demand-side concerns; solution ‘pushing’	Initiative acknowledges implementation; no dedicated measures or budget	Innovation funding complemented with pilot, demonstration and end-user support	Focus on market creation, additional instruments mobilized ad-hoc (e.g. innovation procurement, regulation)	Coherent use of multiple demand-side policies, financial and non-financial
Stakeholder involvement	Strategic planning by administrative entities only	Researchers or businesses involved in strategic planning	Strategic planning by triple-helix representatives	Diverse stakeholders involved occasionally or operationally	Continuous strategic involvement of diverse stakeholders

With respect to the characterisation table used for creating the shortlist of cases, some disclaimers apply. This first scan is ‘basic’ in several ways:

- The characterisation was done after reading policy descriptions and creating an overall impression of what it entails. It is not based on in-depth analysis, as the quick-scan serves merely to identify which TPIs merit extensive analysis.
- The characterisation table, building on the ordered nomological scale, relies on unsubstantiated simplifications; e.g. the equal distance between types A-B, B-C, etc. does not necessarily match with the ‘amount of difference’ in how transformative a certain policy feature is. It also ignores interactions between the characteristics.
- Looking at the categories defined for a TPI to be characterized with types at the higher end of the scale, the bar for an initiative to obtain the Type E is still rather low and unspecific. For the characteristic of stakeholder involvement, for instance, it is possible to define more precisely to what degree stakeholders had an advisory or decisive role in setting directions. However, applying the characterisation method revealed that presumed transformative initiatives sometimes don’t even make it up to the average of the scale.

<sup>3</sup> At this point there is no consensus on whether transformative policy initiatives require strong top-down guidance for evoking complementary investments, or rather the creativity and embeddedness of bottom-up experimentation. This appears to be a difference between two debates currently influencing the field of transformative innovation policy. In the literature on mission-oriented innovation policies one can find advocates of top-down approaches, while there is increasingly attention also for ‘top-down-bottom-up’ approaches in which clearly defined problems should give room to bottom-up experimentation. Contributions coming from the transitions literature, in turn, occasionally go much further in underlining the importance of bottom-up search processes.

- The governance capacities introduced in section 2.2 are not covered, while in the end some of them might perhaps be more important for the transformative potential of TPIs. This is up for the in-depth case studies to determine.
- The characterisation is primarily based on what policies pursue, not on what they really do or achieve. Table 3 gives an overview of the 12 TPIs making up the shortlist of cases that will be investigated in more depth in chapter 4, which will also touch upon the results of the characterisation method based on Table 2. Apart from containing 9 national policy frameworks, the list below also contains two regional initiatives and one city level initiative. With respect to the strategy type the shortlist has a more or less even distribution of multi-themed programmes typically covering a broad range of sectors and challenges, versus extended R&I funding schemes or especially domain programs with a more narrow focus.

Table 3: Shortlist of TPIs selected for detailed assessment.

Name	Geogr. scope	Country	Sector	Year est.	Strategy type
Amsterdam Circular Economy	City	Netherlands	Circular Ec.	2015	D
Circular Flanders (part of Vision 2050)	Regional	Belgium	Circular Ec.	2017	D
Bio and Circular Finland	National	Finland	Circular Ec.	2019	D
German High-Tech Strategy 2025	National	Germany	Broad	2006	M
Catalunya 2020 / RIS3CAT	Regional	Spain	Climate	2012	M
Strategic Innovation Programs	National	Sweden	Broad	2013	M
Pilot-E	National	Norway	Broad	2016	M
Mission-oriented Topsector & Innovation Policy	National	Netherlands	Broad	2019	M
Green solutions for the future	National	Denmark	Climate	2020	R
SFI Challenge Programmes	National	Ireland	Broad	2018	R
City of Tomorrow / Building of Tomorrow	National	Austria	Housing/building	2013	R
UK Industrial Strategy Challenge Fund (ISCF)	National	UK	Broad	2017	R

### 3.3 Examination procedure and reporting format

The objective of conducting detailed examinations of the selected TPIs is to provide an instructive account of how they are designed, as well as from what predecessor policies and underlying governance capacities they evolve. An account of their evolution is important as it affects the current shape of the policies and can be suggestive about the kinds of governance capacities required to design and implement them (The link between the examined TPIs and governance capacities is more fully explored section 5 of this report).

To put the more analytical observations in perspective, the case descriptions start with a factual description of a TPI's main properties. This is followed by an overview of how the TPIs developed in terms of the five key characteristics (i.e. directionality, societal coal, cross-silo policy, mobilising the demand side, stakeholder involvement) introduced in section 2.1. The analysis of those respective properties builds up to the analytically most interesting part of outlining how manifestations of policy learning, or other causes for policy change, relate to adaptations in the design of transformative policy characteristics. Taking a progress perspective on how the transformative characteristics evolved over time fits within a realistic view on how TPIs come about in a country or region; as often this might be a matter of gradual updates rather than radical modifications. A comparative and history-sensitive examination of international TPI examples allows for investigation of which characteristics are more likely to be put in place first, and why, in light of the respective administrative and governance traditions.

The examination of the TPIs is based on evidence from administrative documents, press releases, prior literature and relevant studies (including evaluations, if available). Key references for each of the cases can be found in Appendix I. To complement the information retrieved from the desk research, interviews were held with public officials (in charge of designing and/or running the initiatives) and policy analysts knowledgeable about policy developments in the broader policy landscape and over a substantial number of years. The semi-structured interviews are based on a 'light' protocol that addresses: (1) a validation of our impression of the policy origins of the TPI; (2) the presence and attributes of TPI characteristics that are hard to cover via just

desk research; and (3) an extensive discussion of additional transformative characteristics like the ones identified in section 2.1 or raised by the interviewees themselves. Instead of going through the characteristics one by one, the first and most significant part of the interview is devoted to understanding why there were policy changes; what have been the most important strategic and operational modifications in spurring and targeting innovation, and what were the reasons for altering existing approaches and/or coming up with a new one? Interviews were performed between January and March 2021. The interview protocol is included in Appendix II.

## 4 In-depth examination of twelve policies

Aiming to shed light on what transformative policy features entail in practice, and how they came about, this chapter delves into the twelve TPI cases as selected in section 3.2. Besides sketching the historical background and primary properties of the different policy strategies, also major developments in the key characteristics are discussed. To efficiently indicate on what accounts the transformative potential of a policy improved, the descriptions contain a graph providing a 'profile' of early versions of the policy as well as the current version of the policy. The characterisation table of Table 4 provides the basis for determining the 'initial profile' and the 'current profile'. The corresponding texts, explaining how transformative characteristics evolved over time, highlight the most distinctive attributes that were added or modified. Finally, for each case we report on what particular structures, processes and capabilities the four central governance capacities (see section 2.2) relied.

### 4.1 Amsterdam Circular

#### General description

As the name indicates, the objective of Amsterdam Circular consists of striving for a fully circular economy. This goal of the Dutch capital city is to be met by 2050, with a sub-goal of 50% reduction in new raw material use by 2030. Besides contributing to an environmentally sustainable city, the goals are also motivated by socio-economic ambitions related to inclusivity and job creation. Generally the strategy does not prioritize one goal over the other, but recognizes that pursuing all goals simultaneously is a balancing act. As of 2019 this is captured by the adoption of Kate Raworth's Doughnut Economy concept, stating that production and consumption systems should respect some minimal requirements (i.e. socio-economic fundamentals) and some upper limits (e.g. environmental constraints). Available strategy documents do not specify an explicit policy perspective on how to deal with trade-offs on these accounts. Instead, the positive view they exhibit suggests that the development and adoption of all sorts of circular practices provides a way to realize the envisaged circular economy and the overall ambition of a thriving city. To spur the uptake of such practices, the city assumed a facilitation role that principally focuses on Inspiring, Motivating, Directing, and Communicating. It also mobilizes its existing portfolio of policy instruments to realize the ambitions, for instance by introducing circular criteria in tenders for housing.

The Amsterdam Circular strategy goes back to 2015, and has since then evolved through different stages. It started with a hands-on approach, focused on backing a variety of circular projects initiated mostly by local firms and communities. The portfolio of projects stretches over physical developments in the city, research programmes, consortiums, policy interventions, assessment instruments and innovations of both a technological and non-technological nature. After a few years of supporting experimental activities, a stock-taking evaluation in 2018 suggested to focus more on certain directionalities (three focal value chains) as well as instrumentation (focus on procurement and knowledge activities). Still, following the 'learning by doing' motto, the core of the current Amsterdam Circular 2020-2025 Strategy remains to mobilize partners and facilitate bottom-up initiatives.

Activities outlined in the Innovation and Implementation Plans linked to the respective versions of the Amsterdam Circular strategy describe through which ways the City is reinforcing and eliciting local initiatives. In line with the aforementioned facilitation role, orchestration by the City of Amsterdam does not consist so much of laying out detailed roadmaps, but rather on ensuring broad stakeholder involvement from the seven city districts, local initiatives, market parties, knowledge institutions and residents. As the city stands close to its residents, it assigns a major role to their involvement: "Amsterdam challenges all of the city's residents, businesses and visitors to be aware of their impact and invites them to have a positive impact on people and nature". In other words, the city aims to build momentum around the activities that emerge from motivating and uniting local stakeholders. To maximize the strategy's impact it was decided to follow the advice of focusing on only three of the five value chains for which there are Transition Agendas at the national level.

These were selected because of their economic significance to the city, their impact on ecology and climate and the opportunities for Amsterdam to exert influence.

In a nutshell, the policy approach underlying the strategy entails a relatively open approach regarding the solution directions that are being explored, combined with a more articulated emphasis on demand-side support coming from public authorities themselves (through increasingly intensified PPI interventions and sustainable waste policies) as well as the Amsterdam residents. Moreover, the municipality provides the fundamentals for ensuring consistency between initiatives, for instance by commissioning overarching analyses and collecting information on the activities and outputs of the ±200 projects that have been associated with the strategy so far. A remarkable effort in this respect is the monitor that is being developed for tracking progress. With the help of especially applied research institutes, the City is collecting indicators on the “social and ecological impact of the transition. The Monitor charts the extent to which Amsterdam’s economy has become circular and identifies areas in which more needs to be done.”<sup>4</sup> In April 2020 Amsterdam published the first City Doughnut: a portrait of the impact of the city on the local as well as on the global level, looking at societal and ecological impacts. The portrait illustrates that Amsterdam’s responsibilities as a city do not end at the city border.

**Development of transformative policy characteristics**

The table below highlights the most remarkable changes in TPI characteristics over time:

Amsterdam Circular	
Directionality	The 2015 strategy started with a broad scope regarding how to achieve a circular economy. When emerging projects were grouped according to five value chains, three of them stood out as most promising. The 2020-2025 strategy articulates specific ambitions and courses of actions for those three value chains.
Societal goal	From the outset the goal has been to strive for an inclusive and sustainable circular economy, but not at the cost of jobs. With the launch of a new Coalition Agreement and the 2019 Amsterdam Donut strategy, the sustainability objective (to be realized through innovation and circular practices) gained some relative prominence.
Cross-silo policies	Throughout the policy evolution, the strategy has seen few developments regarding cross-silo policy collaboration. The City of Amsterdam has remained in charge of adjusting policies (e.g. procurement, waste) of both her own departments as well as of partners like the port of Amsterdam and the Metropole Region Amsterdam. With the 2020-2025 strategy the focus on engaging other authorities increased a little.
Mobilising demand-side	While the ‘learning by doing’ motto has always implied ample attention for implementation issues of projects, some of them not even necessarily being innovative, the evaluation of 2018 indicated that the City could improve it’s impact by enhancing market creation activities like innovation procurement, regulations regarding spatial

<sup>4</sup> <https://www.amsterdam.nl/en/policy/sustainability/circular-economy/>

	planning, and (inter)national lobbying for a level playing field. The activities were intensified with the launch of the 2020-2025 strategy and program.
Stakeholder involvement	By drawing upon bottom-up initiatives rather than top-down roadmap execution, the strategy has consistently relied on high degrees of stakeholder involvement. Besides firms and residents, this also includes public authorities and knowledge partners. Firms and residents are regularly invited to provide advice on the strategies (e.g. through extensive consultations), and actively approached for participating in the circular initiatives that are being launched. By focusing on inspiring, motivating and communicating, the City aims build a truly collective endeavour.

## Assessment of governance capacities

### Collaboration and alignment (strategic, operational, instrumental)

#### *Multi-sector policy processes*

Amsterdam Circular is not about designing a series of innovation support measures that might need to be aligned, with each other or with demand-side policies. To a large extent the strategy consists of making circular thinking part of everything the City does – i.e. in the physical (e.g. housing), social and facilitatory domains. This implies that policy mix alignment is in fact the primary focus of Team Circular’s activities. Being embedded principally in the department of Urban Planning and Sustainability, the team engages with the City’s other 55 policy departments as well as national and various municipal authorities to discover (and support) possibilities for making their policies ‘circular economy proof’. Moreover, apart from revising existing policies, the team aims to make circularity considerations part of all new policy making processes.

Helpful in this respect is the fact that the core team features policy makers from several directions, including R&D, Economic Affairs, the Chief Technology Office, and Waste management. Such a **multi-departmental composition** fits the objective to cut across departmental boundaries and administrative layers when spurring possibilities for adjusting policies.

Besides the fact that Amsterdam Circular **helps policy officials to understand** how their activities would need to change to enable a circular economy, collaboration within the City’s policy administration is also driven by the **coalition agreement** that simply demands policy departments to improve performance regarding circularity (see ‘Legitimacy and leadership’, below). As this context implies that at a strategic level Team Circular does not stand alone when aiming to convince fellow policy officials, more emphasis can be placed on the operational and instrumental challenges of ensuring circular policies.

Choosing which policies to make CE proof is not something the Circular Team itself decides. Already from the start Amsterdam Circular has drawn on **extensive rounds of consultations and workshops** with policy officials from many of the City’s departments. One series of interactions led to the building blocks for the 5 year strategy, centred around three value chains. With the support of policy officials Team Circular has translated the strategy into actual projects that could be implemented by the various policy departments, ranging from modifying regular policy practices to initiating new collaborations or regulations. The execution of all these activities is very much in the hands of policy officials operating throughout the City’s organisation. In sum, Team Circular is not operating from one policy silo and seeking for others to support their cause, but rather informs those others on why circular economy is important for them and what they can do about this. Policy alignment does not arise from top-down policy planning (and detailing specific directionalities), but from close cross-departmental interactions between policy officials aiming to improve a certain policy practice. The **cooperating departments themselves are responsible for those policy efforts**.

#### *Multi-actor stakeholder processes*

Apart from engaging officials from a broad range of policy departments, ample attention is paid to involving stakeholders like firms and residents. For the City of Amsterdam this is relatively easy as at the urban level the distance to such parties is small. Moreover, there are plenty of opportunities for arranging encounters, including workshops at municipality premises, discussion nights at debate venues, and even festivals. Some of the stakeholders, especially from the policy side, have been involved around the finalisation of the plans that were derived from the workshops. Additionally there is a **Sustainability Council** with amongst its members various firms and NGO's. They meet several times per year and provide advices to Team Circular.

Recognising that a 'system transition' is required to change all the behaviour patterns and system structures needed for a circular economy to function, Team Circular launched an **online platform for creating a broad community of local stakeholders**. The Amsterdam Donut Coalition<sup>5</sup> serves to engage volunteers that are willing to contribute to the transition (conform a '**coalition of the willing**'), which is believed to be crucial given the Amsterdam Circular objective of combining sustainability with growth and inclusivity. The latter requires that affected stakeholders have a say in how the desired outcome is achieved and what it looks like. The online platform on which the coalition operates facilitates '**self-organisation**' and **co-creation**, and is open for both organisations as well as individuals. A core team is in charge of managing and inspiring the community, e.g. via events like lectures and meetups. In terms of governance capacities, one take-away here is that Amsterdam Circular is not telling or requesting stakeholders to behave different: the tactic is to **let the stakeholders in a community inspire each other by showing what some members are achieving already**. In an interview published in a recent article on Amsterdam Circular, featuring in the February issue of TIME, a community manager states: "If you start something and you can make it visible, and prove that you or your neighbourhood is benefiting, then your city will wake up and say we need to support them."<sup>6</sup>

### **Legitimacy and leadership**

The Team Circular undertakes plenty of efforts to get other departments on board and change their policies, but apart from convincing them with a strong vision (Amsterdam Donut City) it is very much also the policy directions set by the **Coalition Agreement** that leads to cooperativity. In fact the coalition agreement dictates that circular economy policies are being adopted, and the Amsterdam Circular strategy helps policy makers to find ways for doing so. The **broad and consistent political commitment** for improving sustainability manifests itself also in **policy officials having possibilities (time, mandate) to follow trends and to explore new ideas and approaches** for moving forwards in the transition. The freedom to look around is in fact what led some key figures to encounter and connect the donut theory and the rising global interest for circular economy.

As for the vision, the abovementioned TIME article stresses that some policy makers and economists are wary of endorsing a strategy that seems to oppose capitalist principles underlying welfare creation. While this criticism is only partially justified, as the donut model fully acknowledges the necessity of resources for ensuring a social minimum, the donut theory indeed limits the prioritization of growth objectives. It is likely that this alternative view, embraced by the Amsterdam coalition and Team Circular, lends some legitimacy from the massive acclaim for Kate Raworth's work on the donut economy. Amsterdam did not invent the novel view, but was very eager **to adopt and translate the renowned theory to the local context** – in close collaboration with Kate Raworth herself (which is consistently emphasized in communication materials). According to the February 2021 TIME article, several other major cities are now following suit: "Copenhagen's city council majority decided to follow Amsterdam's example in June, as did the Brussels region and the small city of Dunedin, New Zealand, in September, and Nanaimo, British Columbia, in December".

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<sup>5</sup> <https://amsterdamdonutcoalitie.nl/>

<sup>6</sup> TIME (February 1, 2021). Amsterdam is embracing a radical new economic theory to help save the environment. Could it also replace capitalism? <https://time.com/5930093/amsterdam-doughnut-economics/>



## Learning and experimenting

As formulated in the strategy 'From Innovation to Impact' (2019): "Learning what works and what doesn't in practice is our first step towards creating a circular economy for Amsterdam". Since the beginning Amsterdam Circular has followed a **learning-by-doing approach**. Perhaps precisely because the City encourages and facilitates activities initiated by others (apart from striving for city-wide modifications in e.g. procurement standards and regulatory issues), a key feature of policy execution has been the analysis of activities that emerged and received some sort of support. To make sense of the relevance and impact of the wide set of projects associated with the circular economy strategy, the City engages in **collaborations with knowledge partners**. These include the Amsterdam Institute for Advanced Metropolitan Solutions (AMS) and the Amsterdam University of Applied Sciences. "These collaborations have resulted in a body of research that looks at the spatial implications of a circular economy and the impact of circular construction on building and investment costs." Moreover, inspiration for adapting the strategy or instruments also comes from **interacting with like-minded cities** around the world. Amsterdam is member of several international city networks, including C40, Euro Cities and the Striving Cities Initiative.

Learning goes beyond merely reporting the lessons of individual unconnected projects. Instead, there are ample deliberate efforts to set up measurement frameworks that actually offer an information basis for developing, implementing and adapting policies. Examples mentioned in the 2019 strategy include: "Urban Pulse, which explores the temporal dynamics of material use; REPAiR, a European project linking spatial development with raw material usage in an area; and Afvalketen in Beeld (The Waste Chain in Focus), which presents data on Amsterdam's waste production. These projects have given us our first insights into the scope, origins and use of materials in the city and in the functioning of the circular economy. Building on this knowledge, various partners are currently gaining experience of recording the materials used in buildings in the city through materials passports". Engaging in the development of **comprehensive monitoring frameworks** also led to the development and application of the Circular City Scan, which helps to assess opportunities for applying the concept of 'urban metabolism' to buildings and areas. Finally, the City is currently also developing its Circular Economy Monitor further by means of Doughnut workshops, data partnerships and the creation of a data platform. The Monitor is becoming increasingly important for tracking progress in Amsterdam Circular, and responding to it with policy adjustments.

Knowledge on what (innovative or non-innovative) circular practices work, and for what reasons, is the result of **experimentation**. Experimentation is of major importance both within Amsterdam's series of circular economy strategies, as well as across them. The initial strategy of 2016-2018 served to create a better understanding of the circular economy concept (including possible roles for the municipality), but also to get a first overview of the kind of projects and actors already contributing to a circular Amsterdam. It is explicitly acknowledged that the decision to immediately start nurturing initiatives, before even having an advanced strategy, was an experimental way of figuring out what types of projects and support measures would deserve more attention in follow-up policy plans. Moreover, the action-based approach also fitted the ambition to show that a circular economy is a realistic, cost-effective and inspiring alternative to the linear economy.

One very specific way of experimenting consists of **changing the criteria in tender procedures**. Opening up towards circular solutions is challenging as this often requires different specifications. Knowing how these should be formulated requires a deep level of understanding of the potentially interesting solutions that are emerging. Being too ambitious or too specific in the specifications can lead to a lack of (proper) applications, which can have severe consequences if the to be procured product/service is essential for providing public services. Every time tender criteria are changed, policy officials learn something about the current supply of possibly suitable market offerings.

Another way experimentation plays a role in the policy approach is the emphasis on projects of a very practical nature. While some projects require novelty and knowledge development, many of them rely on

actually trying out circular practices in real-life. Ways to accommodate this include the use of circular **‘living labs’** like De Ceuvel; a place for testing circular ideas. Exemplary is also Circular Buiksloterham, which started in 2015 from a covenant with very heterogeneous initiators.<sup>7</sup> In the Circular Buiksloterham environment new circular approaches can be tested and integrated at a relatively large scale, also thanks to collaborations with housing corporations. These housing corporations, and other stakeholders, have also been challenged through **prizes** awarded to parties solving a problem prioritized by Amsterdam Circular. For instance, in one case housing corporations had to team up with private parties (e.g. architects) to develop circular solutions for construction and maintenance.

### **Managing conflicts**

Amsterdam Circular is a risky policy endeavour as there are very different views on how to make trade-offs between short and long term ambitions regarding both economic goals and sustainability goals. To identify and resolve tensions, the City has **articulated its vision** by – as discussed – adopting the Donut Economy philosophy and translate this to the Amsterdam city-level context. Having this vision makes it easier for potential partners to see how some changes in their activities might contribute on the longer term and/or via so far neglected mechanisms to societally desirable outcomes. “It allows people to see the bigger picture”.

Helpful is also that the city contributed to the launch of a desk that gathered knowledge on, in this case, ‘Social Return’ (firms that have the City of Amsterdam as their client should engage in social initiatives related to e.g. poverty reduction, health support or education)<sup>8</sup>. Collecting and sharing relevant knowledge, and making visible what the various consequences of certain decisions would be, again made it easier for stakeholders (firms) to **take an integrated perspective** and balance interests. Team Circular is now considering to create another desk for Procurement issues.

## **4.2 Circular Flanders (Belgium)**

### **General description**

Circular Flanders is the Flemish strategic programme for transitioning towards a circular economy. The predecessor of the current programme was initiated when the Department of the Environment’s public waste agency, OVAM, recognized it would need to take on a very different role when striving for (and operating in) an ‘economy without waste’. Apart from being concerned with the technical and logistical aspects of managing materials, a new strategy would also have to address issues like skills, regulation, and consumer behaviour. This became all the more apparent when in 2011, the Flemish government launched its ‘Flanders in Action’ strategy focused on 13 societal challenges, one of them being sustainable materials management. At the time there was already a knowledge hub on circular economy issues, the SuMMa centre (active from 2012-2016, now replaced by the Circular Economy Policy Research Centre), as well as a ‘transition network’ closely linked to OVAM (PlanC, established in 2006 and turned into a non-profit think tank in 2012). SuMMa and PlanC, together with a public-private action plan on sustainable materials management, were united in the Flanders Materials Programme in 2012. From that moment onwards, responsibilities for the program were shared between the Department of the Environment and the Department of Economy, Science and Innovation. Managed by OVAM, the programme received Circular Awards in 2016. That same year, the new government of Flanders presented its long-term strategy ‘Vision 2050’, with moving towards a circular economy being one of the seven transition priorities. Circular Flanders in its present form was launched in 2017 as a continuation of the Flanders Materials Programme. As the mandate expires in 2021, preparations for the next phase are still ongoing.

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<sup>7</sup> <https://www.metabolic.nl/projects/circular-buiksloterham/>

<sup>8</sup> <https://www.amsterdam.nl/ondernemen/inkoop-aanbesteden/social-return/>

Circular Flanders can be described as the hub that inspires and aligns efforts geared towards realising a Flemish circular economy. It is essentially a partnership of governments, companies, civil society and knowledge institutes. Being embedded in OVAM, Circular Flanders has its own operational team of multi-disciplinary staff members that run the program. The team’s core activities consist of “building partnerships, co-creation and shared ownership; providing tailored (financial) support for pioneers and pragmatic go-getters; knowledge sharing and targeted policy-relevant research assignments; directive and supportive policy, alignment between administrations; fostering and accelerating innovation and entrepreneurship towards the circular economy by purposively committing the right tools; and upscaling and embedding principles and best practices in the area of the circular economy.”. A large part of the team’s efforts are devoted to connecting stakeholders, so that they will spot shared opportunities and address shared bottlenecks. Important in this respect is the presence of a broad public-private steering committee, consisting of high-level representatives from the ‘quintuple helix’ of knowledge institutes, businesses, governments, civil society and finance.

The steering committee, led by the CEO of a private firm, discusses and writes agendas on how to deal with current obstacles on the path towards a sustainable circular economy. The members are not only ambassadors for the circular economy (towards their own organisation), but they often are also in the position to make serious commitments. This structure allows the committee, with the help of the programme’s transition managers, to undertake activities that help to pave the way for circular practices. For instance, represented government departments or bank representatives can act upon signals expressed in committee meetings and start working on them with their own organisations and partners. Additionally, below the high-level steering committee there is a layer of project groups for deploying more structural activities around a certain theme, like circular purchasing or circular cities. At the operational level much of the work in project groups is coordinated by the roughly twelve staff members of the Circular Flanders team.

In terms of driving change, Circular Flanders relies only to a minor extent on providing funding. Engaging, connecting and collaborating with stakeholders, in order to change procedures and align interests, has a more prominent place in the strategy. The same holds for creating circumstances that allow circular activities to take-off. Circular Flanders runs campaigns that help firms and residents understand what role they could play in a circular economy. Moreover, Circular Flanders helped to promote circular procurement and make collective arrangements via e.g. the Green Deal on Circular Procurement (signed by >150 organisations) and the Green Deal on Circular Construction. Arrangements like these stand to open up market perspectives for a broad range of firms and solutions.

As the program moved from a focus on sustainable materials management to aiming for a circular economy, also the importance of the innovation and economic dimension of the transition grew. In the period 2017-2019, Circular Flanders launched three open calls for supporting circular economy projects. In total the budget assigned to the >130 projects amounted to about €11 million. Particular about these open calls is that also non-usual suspects like municipalities or citizen movements can obtain funding for their initiatives. When it comes to funding businesses, Circular Flanders aims again to act as a hub and portal that can leverage already present support measures. Through close collaboration with VLAIO, the policy execution agency of the Department of Economy, Science and Innovation, Circular Flanders advises firms on the policy instruments that might be interesting for them. In extension, the program created a FinMix activity in which financial experts discuss the funding possibilities a firm with circular ambitions could apply for. The latter has the benefit that those experts, often associated to banks or investors, obtain an overview of the portfolio of firms with circular activities (which is helpful when these firms move to a new round of obtaining capital).

**Development of transformative policy characteristics**

The table below highlights the most remarkable changes in TPI characteristics over time:

Circular Flanders
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Directionality	The 2017-2018 version of the Circular Flanders strategy already selected three focal pillars (circular purchasing, the circular city, and running circular businesses) and six action lines for driving changes in those pillars. Thanks to good experiences of having a diverse steering committee, it is gradually becoming possible to be more precise in what initiatives to prioritise. In their working agendas, stakeholders represented in the extensive governance structure systematically reflect on promising opportunities and key bottlenecks. Tactics for how to make progress are regularly revised, and support is geared towards the currently most obstructive system failures. Circular Flanders is now making the step towards annual 'compass-like' roadmaps that give a clear direction but may continuously be updated based on new insights.
Societal goal	As Circular Flanders is the continuation of initiatives coming from the waste management domain (rather than the innovation policy domain) it has been focusing on an inherently societal goal from the outset. Also in the current strategy innovation support is just one of many action lines to drive change.
Cross-silo policies	The roots of Circular Flanders go back to the Department of the Environment's public waste agency OVAM. The program it started on management of materials was coordinated principally from within OVAM itself. When the program transitioned into Circular Flanders, first as part of Flanders in Action and later of Vision 2050, also the Department of Economy, Science and Innovation joined as the second responsible high-level administration (with its business and innovation agency VLAIO becoming an important partner). Moreover, by adopting a transition management approach, the program intensified the partnerships with a broad range of additional policy authorities from both the Flemish government as well as regional governments (e.g. the association of cities and regions). 'Alignment between administrations' is one of the six key activities of the current strategy.
Mobilising demand-side	While OVAM itself was traditionally concerned with developing and demonstrating new techniques, e.g. for recycling, the Circular Flanders strategy is entirely oriented towards creating market and adoption opportunities for circular practices. This involves revising procurement standards (e.g. the Green Deal for Circular Procurement), engaging capital providers and regulators in the governance structure (e.g. steering committee or project groups), and pro-actively challenging stakeholders that obstruct an attractive playing field for circular processes.
Stakeholder involvement	A broad set of stakeholders was brought on board when Circular Flanders emerged from fusing PlanC, a transition network, with the knowledge hub SuMMa and OVAM's existing materials management strategy. High-level representation of e.g. NGOs was formalized by involving a broad range of stakeholders in the public-private steering group that regularly meets. Stakeholder involvement is now being intensified by putting it at the core of the governance setup that is currently under development, which is based on quintuple helix working groups. Each of the working groups is led by a balanced team of representatives from policy, science, industry, society and finance. The teams are decisive in coordinating and initiating change activities, that in turn often draw on involvement of municipalities, citizens, users, etcetera. Targeting firms and citizens by organising debates and via awareness campaigns has also been a consistent part of Circular Flanders' primary activities.

**Assessment of governance capacities**

**Collaboration and alignment (strategic, operational, instrumental)**

### *Multi-sector policy processes*

In the Circular Flanders strategy, emerging opportunities and challenges rather than a fixed set of policy instruments are leading when it comes to driving the circular economy. For the transition team to be so responsive, with respect to what support activities to deploy to tackle a certain obstacle on the way towards a circular economy, close collaboration amongst public authorities is of crucial importance.

Within the governance setup, policy administrations from various departments at the Flanders as well as the regional level are given the status of **partner** of Circular Flanders. This means that they maintain ownership over their own budgets and policies, but commit themselves to supporting the shared goal. Over the years the number of partners has been rising, as the strategy's focus shifted from conceptualising and understanding circular economy to making it work. One long-time partner is VLAIO, the policy execution agency of the Ministry of Education, Science and Innovation (EWI). Being part of Circular Flanders allows VLAIO to adapt some of their innovation support measures, so that they're better suited to firms working on circular economy propositions. VLAIO is now preparing the **working agenda** for the theme 'circular manufacturing', while the EWI ministry itself leads the working agenda on bio-economy. Interesting to note is that the EWI ministry is also responsible for producing **policy plans** (regarding Circular Economy), that ideally should be aligned with the working agendas. In the past the order was primarily that Circular Flanders would release the agenda first, so that EWI could respond with a policy plan. Thanks to the experiences of the past years, EWI is now able to produce policy plans even before the work agenda it should feed into was finalized. The intensified involvement of partners in preparing working agendas and policies (i.e. documents in which ambitions and actions are explicitly articulated) shows how strategic cross-silo policy collaboration has been advancing over time.

A remarkable practice for ensuring instrumental alignment is the 'FinMix' initiative mentioned earlier. This **one-stop-shop for obtaining finance** (or at least referral to relevant sources of finance) brings various funding parties to one table, so that they can have discussions on what support might be most relevant for a firm engaging with the Circular Flanders program/team. Instead of requiring those firms themselves to study the conditions of alternative funding opportunities, specialists from venture capital investors and account managers from banks will provide advise on where to apply best. An advantage of this setup is that the parties sitting at the table can also offer strategic or management advice, and keep track of the portfolio of projects that are reaching different stages of development. Evidently, the latter also holds importance for the issue of learning (see below).

### *Multi-actor stakeholder processes*

As discussed earlier in this section, much of the impulses coming from the Circular Flanders strategy build on mobilising a wide range of public and private stakeholders. Getting so many partners to collaborate is not only a result of giving them a proper place in the governance structure; it is probably also a straightforward consequence of Circular Flanders starting out from **merging three different initiatives – one of them actually being a transition network**. Compared to strategies initially focusing on funding research and innovation, and only later on involving societal partners, Circular Flanders did not face the challenge of how to identify and attract the latter (while allowing them to preserve their integrity in terms of what changes to prioritize). Making Circular Flanders a community driven strategy has been a fundament rather than an extension.

### **Legitimacy and leadership**

The **transition team** of Circular Flanders, **placed outside any individual ministry**, is the main catalyst for building momentum and creating synergies in the Flemish policy landscape – and beyond. It takes the lead in uniting public and private partners, and inspiring diverse administrations (at different policy levels) to reconsider their strategies and practices.

Circular Flanders' approach relies to a large extent on having a **public-private steering committee** in place, populated by **high-level representatives** from different parts of society. They act as ambassadors for the circular economy, and are requested to support desirable developments within respective networks. The committee is **chaired by the CEO of a large firm** (and not by a policy maker), ensuring that also within the committee itself there is a form of legitimate leadership that provides clarity on what actions to pursue.

### **Learning and experimenting**

Learning and experimentation are two core principles of Circular Flanders. The strategy is built on the idea that a successful transition cannot be planned in detail. Because there are always new opportunities and challenges when technological, institutional and socio-economic developments (originating from disparate bottom-up origins) proceed, continuous reflexivity is key. While some of the Flanders in Action challenges could be tackled through regular policy making, it was recognized (also in Vision 2050) that moving towards circularity requires a fundamentally different approach towards knowing where and how to intervene.

To **obtain operational intelligence from variegated 'field-level' stakeholders**, the chosen governance structure has a prominent place for a broad range of parties engaged in driving circularity. The stakeholders that are gathered in the Steering Committee, as well as in the quintuple helix working groups that are currently being developed, are asked to provide the Circular Flanders transition team timely and detailed information on how circularity initiatives are working out. Having ongoing interactions with these stakeholders allows the transition team to decide which particular opportunities or bottlenecks to target, and how. Instead of dealing with broad themes like 'regulation', the transition team learns about very particular barriers that currently stand in the way of building momentum and markets for circular initiatives. The type of experimentation that follows on obtaining such information can be as detailed as bringing a very specific set of organisations (e.g. municipalities, waste collectors, a bank) together to see how they can complement each other, possibly with some minor additional help from Circular Flanders to kick-start new initiatives or collaboration modes.

Circular Flanders also **seeks for external inspiration** of a more strategic and conceptual kind. The transition management philosophy it follows was partially based on insights provided by transition scholars of e.g. the Dutch Research Institute For Transitions (DRIFT). Another source of inspiration for what policy support to deploy were the Dutch Green Deals, like the Green Deal on Circular Procurement of 2013 (see the Amsterdam Circular Case). Circular Flanders has adopted a similar approach to launch the Green Deal on Circular Procurement and the Green Deal on Circular Construction.

Using the various types of obtained information allows Circular Flanders to make modifications in the policy approach. Apart from minor practical updates during the period for which the strategy has been set, there are also overhauls at the points when the mandate for OVAM's Circular Flanders strategy (and team) needs to be extended. This was the case in 2017, and now again in 2021. A current development is that Circular Flanders aims to go beyond retrieving and communicating signals, informing firms/residents and connecting partners; the next step is to move towards organising working groups responsible for initiating even more actual actions and support activities.

### **Managing conflicts**

Circular Flanders brings tensions to the surface by **creating arenas** in which various stakeholders can confront each other with their views, for instance in panel sessions during debate events. Doing so helps to create better mutual understanding of where a certain problem really lies. Sometimes the problem turns out to be not so fundamental after all, or it has already been tackled by recent developments. Creating a space for debate helps to create an accurate view of current resistances on the path towards a circular economy. It is believed that not all current conflicts can be resolved, but that having a conversation is helpful for allowing parties to move more towards each other over the longer term. Important in this respect is also that the

transition team **continuously communicates a message that stresses the long-term shared interests of parties** that on the short term might not be on the same page. By putting the circular economy in a bigger and shared perspective, Circular Flanders ensures that parties do not focus on current tensions but on routes for realising a sustainable future in which everyone has a role and a place.

### **4.3 Bio and Circular Finland (Finland)**

#### **General description**

Bio and Circular Finland is one of 17 programs created and run by Business Finland. Business Finland is Finland's innovation agency, whose main mandate it is to support Finnish companies with their innovation activities, internationalisation, investments, and tourism promotion. With the program Bio and Circular Finland, the agency wants to foster the development of internationally competitive circular and bio-based solutions and ecosystems that address global environmental challenges. At the heart of the program is the goal to increase the export of those solutions to international markets in order to increase revenue in Finland.

The program is planned to run for four years, between 2019-2022, with a budget of 150 million Euros. Packaging, textiles, plastics and construction are some of the core target sectors. The program is looking for bio-based solutions, circular manufacturing processes, new business models and the creation of new value chains that are climate-smart and carbon-balanced. Digital solutions for circular economy and the creation of ecosystems are also part of the program.

The program offers a variety of services, including funding, network creation (especially also global networks), identification of market opportunities, developing necessary capabilities and skills, scaling of businesses. The program has created five different funding pots, including grants and loans with varying amounts of co-funding (up to 50%). The amount of funding depends on the needs and resources of the companies, but there are also opportunities for large companies to get funding for R&D and ecosystem building. There is also funding available for co-creation, which is targeted at research organisations that want to collaborate with companies to co-innovate. Furthermore, there are opportunities for foreign firms to invest in Finland and get help with data collection and analysis, location management, networking, etc.

The funding for the program comes from the Ministry of Economic Affairs and Employment and the funding principles are defined by national law. The same holds for the indicators that they are evaluated against (e.g. jobs, turnover). Bio and Circular Finland can be seen as one of the responses to the national policy target of achieving Carbon Neutrality in 2035. Investing in circular and bio-based solutions has not been very contested. It is quite self-evident that it is valuable for Finland and that the program is remarkable. Business Finland cannot change the law that is governing their programs, but they can shape and tighten the criteria for directionality and impact as well as the target sectors in the different funding calls they release. When choosing overarching themes, the EU guidelines are important. There is a close collaboration with the EU. Business Finland tries to evaluate trends in the market, and work closely with companies, research centres and universities to identify where to invest. Big companies are seen as harder to change or work with, since they 'do what they do'. But if companies want help to transition towards more circular modes of operation, they are welcome to get support from Business Finland.

One particularity about the program is that it focuses on boosting export, which has gotten even more difficult during the COVID-19 pandemic. Circular solutions need systemic change, so there needs to be a willingness of the country to change many local regulations. There needs to be active involvement from the public and a lot of knowledge transfer to the destination country. Sometimes it is very tricky to find the problem owner in a certain place. Bio and circular Finland tries to make sure that the companies know that these processes are important. Maybe a more institutionalized way of working with these questions could be beneficial. Now it is a mix between people at Business Finland as well as the Ministry of Foreign Affairs that are helping with these issues.

## Development of transformative policy characteristics

The table below highlights the most remarkable changes in TPI characteristics over time:

Bio and Circular Finland	
Directionality	The directionality of the program is given in that it has a clear goal to develop a circular and bio-based economy globally, i.e. develop solutions to global challenges, and that there should be an international impact and export. Which types of solutions is left to the actors, but the identification of certain areas such as packaging, plastics, construction and textiles seems to favour certain applications over others. Over the course of the past years, the criteria for directionality and impact have been tightened a bit. Business Finland does not have the power to change the underlying laws, but they can steer some of the criteria through the different instruments. The substance or content of an initiative can be chosen, but not the overall funding principles.
Societal goal	There is clear societal goal involved, i.e. carbon neutrality and circular and bio-based materials and processes that are environmentally sustainable. However, the societal goals are seen as a vehicle to boost Finland's competitiveness and create a market outside the country for Finnish products and services. Since Finland has a rather small population, exports play a big role. Business Finland's role is also clearly linked to trade and investment promotion (in addition to innovation), which puts economic interests and the well-being of firms at the heart of the strategy.
Cross-silo policies	The money for the program comes from the ministry and there are some collaborations in the daily work with other ministries and the EU. However, the program itself is run by one public agency only, Business Finland.
Mobilising demand-side	There is a strong focus on international market creation and the implementation of solutions. The program, and Business Finland in general, offers a variety of specific tools and funds for this purpose, including support for foreign firms that want to invest. The program management has also realized that market creation in a foreign place requires a lot of knowledge exchange and local knowledge as well as willingness of the other country to accommodate change. They have been working together with the Ministry of Foreign Affairs on some of these issues.
Stakeholder involvement	Business Finland keeps close contact with research organizations, companies (including global manufacturers outside the country) as well as the EU in order to evaluate market trends, but there is no visible formalized or institutionalized way of stakeholder involvement for the program design. The program itself funds various co-creation projects that are targeted at the build-up of innovation ecosystems comprised of companies, research institutes, customers and municipalities that engage in joint research and innovation projects as well as the creation of suitable business environments that are in line with the overall goals of the program.



## **Assessment of governance capacities**

### **Collaboration and alignment (strategic, operational, instrumental)**

#### *Multi-sector policy processes*

Bio and Circular Finland is administered by one agency only, Business Finland. As such, there is no cross-silo activity necessary to run the initiative. However, one might note that Business Finland itself is a product of a rather recent **merger of two organisations**: Finpro, which offered services for internationalisation, investments and tourism promotion, and Tekes, which offered funding for innovation activities. The merger was completed in 2018 and has since then significantly re-shaped innovation policy orientation in Finland towards a more 'global growth' and internationalisation strategy.

During the administration of the activities of Bio and Circular Finland, there are of course several interactions between Business Finland and other ministries and agencies happening, especially in regard to export activities, where there is collaboration with the Ministry of Foreign Affairs.

#### *Multi-actor stakeholder processes*

The program interacts and consults on an informal basis with a variety of stakeholders, such as research organisations and companies as well as other governmental agencies and ministries. Research organisations seem to be important when it comes to the **identification of emerging and innovative activities**, while companies are consulted in order to **read market trends**. There is a particular interaction with export markets, i.e. organisations and companies in the target country, in order to stake out opportunities for Finnish companies.

Within the funding scheme, several instruments are set-up to facilitate stakeholder involvement and the co-creation of innovation ecosystems.

### **Legitimacy and leadership**

The focus on bio and circular economy seems to be very grounded in the Finnish economy, most likely also because of **favourable and attractive local resource endowments** (e.g. forest industry). In addition, Finland has a history of competence in the area as well as other favourable policies, which increases the legitimacy and popularity of circular and bio-based initiatives in general. Finland thus understands itself as a **leader in this area**, which helps with the legitimacy of the initiative within the organisation, but also nationally and internationally. This is important in order to attract companies and to create markets and new collaborations abroad.

### **Learning and experimenting**

The involved program manager and staff at Business Finland are constantly learning through **informal interactions** with a variety of stakeholders and other agencies. In addition, seven people are specifically tasked with the evaluation the policy, which is an **on-going internal learning process**. Due to the COVID-19 pandemic, many more problems with manufacturing have come up and Business Finland as a whole is trying to find solutions that can be implemented quickly. For export activities, like in the Bio and Circular Finland case, the pandemic has been especially difficult because it made travel impossible. The agency is currently looking into how they can help with these questions.

### **Managing conflicts**

No particular conflicts were mentioned.

## 4.4 High-Tech Strategy 2025 (Germany)

### General description

The German High-Tech Strategy (HTS) 2025 is a national umbrella framework and inter-ministerial research and innovation (R&I) strategy launched in 2018 to address a range of societal challenges. The current HTS2025 is the fourth edition of the HTS launched by the Federal Government. Generally speaking, each HTS should define the broad objectives and milestones of the research and innovation (R&I) policy of the next legislation period. The HTS2025 follows a 'whole-of-government approach' (Larrue 2021), building on commitment at the highest political level. It includes almost all federal ministries, with the major aim to improve coordination between the ministries on R&I-related topics, as well as increase coordination with higher education and research, industry and the private or civil sector.

Since 2006, the focus areas of the HTS have been gradually adapted, with more emphasis on concrete future needs, and from a technology-push to a societally-oriented understanding of challenges. Current objectives are (1) tackling grand challenges; (2) developing future competencies; and (3) establishing an open innovation and entrepreneurship culture. Although societal needs were already prominent in earlier versions (esp. HTS2010), the HTS2025 follows an explicit mission-oriented approach introduced in 2018. Given the general developments at the European level, and the increasing prominence of mission-oriented thinking in STI policy cycles, the idea was to give mission-orientation also more prominence in Germany.

To this purpose, 12 missions in 6 focus areas were identified in negotiation between different ministries to address major global challenges as well as technological, industrial and broader economic issues relevant for Germany. Hereby, STI activities are generally seen as enablers to contribute to solutions to these challenges. The concept of innovation was expanded, from technology (or high-tech) towards social innovation, behavioural change or regulatory aspects involved in innovation. In practice, the role of science and technology to advance a mission varies greatly across mission areas (Wittman et al. 2020). While some missions have a clearer technological or industrial application focus (accelerator missions), other mission types follow a socio-technical system perspective, and address the multi-dimensionality of problems with integrative approaches and different solution types (transformer missions). Hence, the German mission approach encompasses very different types of problems, challenges or mission goals (Wittmann et al. 2020).

A consequence of this heterogeneity in missions and challenge areas are differences in the governance and implementation of the HTS2025 at the operational level. The Federal Ministry of Education and Research (BMBF) is in the lead of managing the HTS2025 on behalf of the Federal Government, and in charge of the 'meta-governance' of the HTS2025 with its different missions. One department in the BMBF is in charge of e.g. managing cross-ministerial processes to achieve the coordination ambitions related to the HTS2025. There is no specific budget foreseen for the implementation. Instead, implementation in form of the individual missions is financed and administered by the respective ministries, mostly based on means for existing funding programmes.

The ministries are responsible for further developing and implementing 'their' mission(s), with concrete targets, milestones and instruments. Each mission should be further specified during the duration period of the HTS2025, and realized by improved coordination of actors and instrument at the level of national ministries. Also here, ambitions and activities taken to further develop (narrow down) the mission definition and to achieve a shared problem understanding varies between mission areas (Wittmann et al. 2020).

To enhance strategic coordination among the ministries, a 'Round Table of State Secretaries' from all ministries was installed with the HTS2025 to "to define, steer and shape innovation policy agendas along the HTS2025 priorities"<sup>9</sup>. With meetings twice a year, the round table is considered the central coordination

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<sup>9</sup> [https://www.bmbf.de/upload\\_filestore/pub/The\\_High\\_Tech\\_Strategy\\_2025.pdf](https://www.bmbf.de/upload_filestore/pub/The_High_Tech_Strategy_2025.pdf)

mechanism for strategic questions around the R&I activities of the federal government. The HTS2025 does not include specific structures or mechanisms to improve vertical (multi-level) coordination. Ministries in charge of a mission can coordinate their activities with the German Länder (regions) or other public bodies in accordance with their usual practice. Moreover, despite the aim of improved dialogue between science, industry and society, and more focus on scientific communication and participation, there are no governance structures in place that facilitate multi-level or multi-actor processes beyond public administration.

To support and further develop the German mission approach, the High-Tech Forum was installed as the central advisory body for the HTS2025. The Forum consists of an expert panel which delivers impulses for the further development of the HTS, but has no decision making power. Composed of experts from the national innovation system (academia, business and society) it provides advice for implementing and advancing the HTS2025. The different sub-groups can specify themselves the issues on which their advices will be needed (the 'consultation topics'). "Impulse papers", based on workshops or consultation processes, are its major communication device. In addition to the expert panel, a permanent branch of the High-Tech Forum is installed to support the management of the mission approach on behalf of the respective ministries.

To scientifically support the HTS2025 (and the advisory role of the High-tech Forum), the Fraunhofer ISI, an independent research institute, was put in charge to scientifically support the HTS2025 implementation. The goal of the accompanying research is to provide evidence-based policy consultation, for instance with socio-technical system mappings or new performance and effectiveness measures for missions, to stimulate learning and assess the progress of mission implementation. With the scientific support, the High-Tech Forum as well as public administration is in continuous exchange with international partners and the scientific communities about good practices in mission-oriented policy making (e.g. UK, NL, SE, OECD).

To date, the German government seems to be at the start of implementing a societal goal-oriented mission approach. As most missions are still broadly formulated, they would need to be further defined and embedded in both the policy (e.g. actors and instruments) and the broader socio-technical system to unfold their potential (Wittmann et al. 2020). Due to the duration of the HTS2025 until 2021, and the start a new legislation period, it is currently unclear how and to what extent the mission-orientation will continue.

**Development of transformative policy characteristics**

The table below highlights the most remarkable changes in TPI characteristics over time:

German High-Tech-Strategy	
Directionality	The HTS developed into a societal challenge-oriented programme, following an explicit mission approach including 12 missions in the current edition. Based on recommendations of advisory bodies, the formulation of mission statements in the defined missions areas got sharpened with various degrees of solution directionality depending on the mission field (accelerator vs. transformer missions). Clearer targets, milestones and monitoring devices were developed over the period of

	<p>the HTS2025, even though many missions are still broad without explicit targets. While visible steps have been made to increase the overall goal-orientation of the strategy, HT strategies in Germany are traditionally formulated for one legislation period (2018-2021), which creates some uncertainties about the continuation of the missions and mission approach.</p>
Societal goal	<p>Next to its traditional overarching target to increase German's R&amp;D activity, the HTS2025 follows the objective of tackling societal challenges with innovation. These societal goals are seen as opportunity to develop (technological) competencies and leadership beyond established industries in Germany. The societal dimension has been strengthened with the formulation of 12 missions at the level of ministries. While some missions focus on accelerating technological or industrial solutions, other areas follow a broader innovation understanding (including technological and non-technological) integrating social innovation, new business models and the interaction of solution. Limits to the transformative mission approach are given if focus is on the narrow set of STI funding with little emphasis on behavioural or societal changes to achieve missions.</p>
Cross-silo policies	<p>The HTS2025 follows a 'whole-of-government approach' (OECD 2020), and acts mainly as a policy coordination tool for R&amp;I-related policies at the level of ministries (horizontal coordination). While innovation was recognized as cross-cutting field in previous editions, the mission approach further strengthened the coordination function of the HTS2025. Missions should be a point of reference for administrative bodies, to achieve better insights into related strategies and instruments across ministerial boundaries. A roundtable of state secretaries was installed with HTS2025 to increase ongoing coordination, 'ownership' and the commitment of all ministries at high-level. The HTS2025 does not have a separate budget for funding and lacks dedicated resources, which limits coordination opportunities at operational level. Instead, each ministry is responsible for managing and financing their respective programmes in support of the missions. For most missions, no systemic mapping or further integration of instruments has been pursued yet.</p>
Mobilising demand-side	<p>With the High-Tech Forum, the HTS2025 is based on a continuous and strategic dialogue between the policy, science, industry and society, to analyze the evolving needs related to future technologies or societal development (demand articulation). Funding and (demand-side) instrument including regulations in support of the missions is organized decentral, in the responsibility of the respective ministries. No specific market or demand creation instruments were linked to the overall HTS2025.</p>
Stakeholder involvement	<p>While the broad missions have been defined at the level of ministries, the role of the High-Tech-Forum has been strengthened as service and advisory body with the HTS2025. As an expert panel (academia, industry and civil society), its role is to provide non-binding strategic recommendations and new impulses for implementation. Other stakeholder processes have not been institutionalized in the administrative culture. The level and variety of stakeholder involvement differs for each mission, as ministries are responsible and free to set up their own participation processes, or to coordinate with the German Länder (vertical coordination).</p>

## Assessment of governance capacities

### Collaboration and alignment (strategic, operational, instrumental)

#### *Multi-sector policy processes*

The HTS2025 was designed as coordination and orchestration tool to mobilize actors in- and outside the government. Considered as a **policy coordination tool** the HTS 2025 should ensure better horizontal coordination of R&I agendas at the ministry level, based on cross-cutting missions and focus areas. The main objectives was to achieve a common ground and understanding between ministries, and a better alignment of available instruments. Due to slow progress and lacking commitment of all ministries to R&I related issues as addressed in the HTS (EFI 2017), a committee or Roundtable of state secretaries has been installed with the HTS2025 to achieve better inter-departmental coordination and commitment at the highest level. A dedicated 'mission team' (e.g. roundtables across ministries for each mission) is considered as missing to achieve more coordination also at the operational level.

Instead, **the responsibility for mission implementation** (i.e. implementation of the HTS) remained at the level of individual ministries, which are according to their competences in a specific mission area responsible to work towards the mission goals. It seems that such forms of cross-ministerial cooperation have not been fully institutionalized in German administrative cultures. Cross-ministerial activities tend to cause problems of attribution of the measures taken. Ministries tend to follow the resort principle with strong division of labour between ministries, and limited boundary spanning activities in line with a mission.

A missing overall research budget for implementing the HTS2025 was recognized as drawback, as it undermines the sense of ownership and commitment to the goals of the HTS2025 (OECD 2020). This can provide little incentives for other field ministries to contribute to a STI policy strategy not fully belonging to their own domains. However, as pointed out in one of the support studies, without efforts for **strategic alignment** with other policies, there is a risk of overburdening the field of STI policy with regard to its transformative ambition and contribution (Wittmann et al. 2020).

Instead, the HTS2025 missions can be perceived as additional burden by certain actors, as they require **additional coordination costs** at the operational level, with little visible added-value from aligning their long-standing agendas and policies. So far, the potential benefits of a mission approach, but also the consequences for governance structures and processes, have not been fully recognized and utilized across ministries.

With respect to **vertical coordination**, each ministry remains responsible to set up stakeholder processes or to coordinate with the Länder (vertical coordination) or the European Union, if regarded desirable to achieve the mission. No specific means and instruments have been further specified for the HTS2025 to increase multi-level coordination.

#### *Multi-actor stakeholder processes*

Due to the top-down character of the HTS2025, no strategic and encompassing participatory processes were put in place before the launch of the HTS2025. External actors (public and private) should be involved and mobilized during mission implementation, for instance to develop long-term research strategies or roadmaps. As confirmed by interviews and scientific studies, **stakeholder mobilisation** around a particular mission appears easier (and occurs mostly) for **'organized' actors** such as in industry or research, while societal actors such as end users, environmental groups or local populations are hardly involved.

The role of the High-Tech Forum was strengthened as the **central advisory body for implementing and further developing** the mission approach. Its mandate is linked to the current legislation period. The Forum consists of a high-level **expert panel** of 21 members which should deliver impulses for the further

development of the HTS. The experts cover several aspects of the innovation system, and enjoy high recognition in their area (academia, business and society). The members have freedom on the specific issues of advice or recommendations, but have no decision making power. The High-tech-Forum uses several means to create legitimacy of the HTS2025 beyond the public sector. An example are so called 'Impulse papers' of the experts on selected topics, which are made open for debate to the public. Moreover, regular 'missiondialogs' are organized to involve a variety of representatives from public or private actors as well as field experts. Based on the discussion, the High-Tech Forum formulates advice for further implementation.

Moreover, the HTS2025 aimed to strengthen the **dialogue with citizens** through the organisation of participatory processes at regional level, diverse online platforms, or dialogue sessions for individual mission themes (e.g. circular economy). These are directly linked with the overall HTS2025 or the individual missions, and should ensure that input can effectively feed back to further developing the strategy. Another example is the Citizen Science Platform ("Bürger schaffen Wissen"), which run from 2014-2019 with the aim to engage stakeholders in the issue of citizen science.

### **Legitimacy and leadership**

As a strategy of the Federal Government, the HTS2025 is endorsed at **the highest political level**, which gives the strategy and the mission approach great relevance in Germany's R&I landscape. The BMBF was appointed to lead and coordinate its implementation at the operational level. Most missions were formulated **top-down**, as derived from existing national policies and cross-cutting themes. Legitimacy for each missions was achieved at a high level as given by the relevance of the challenge for Germany's future (e.g. climate change, public health, demographic change). Further actions to **specify the mission direction and goals** (joint problem or solution definition) or identify relevant actors (stakeholders) in the broader socio-technical system were taken in certain mission areas (e.g. combating cancer). In other areas the direction and goals (societal versus economic) were not clearly defined, or left open for interpretation, which seems to create a lack of accountability and hampers agency

Despite the support and backing at the highest level, the additional resources provided to effectively manage, coordinate and implement the strategy have been limited. The lack of a **separate budget** accompanying the strategy, and the **limited resources** (financial as well as human resources) for the operation, seem to limit the potential of effective stewardship to govern the missions and achieve better cross-actor coordination, alignment and learning. Ministries are typically more reluctant to contribute to the agenda of another ministry. Moreover, creating an independent 'face' for the each mission might be a way to reduce rivalry between ministries, and also increase the legitimacy of the new mission approach .

Moreover, the HTS is set only for one legislation period. This short term period (4 years) allows to adapt to evolving needs within the innovation system, and revisions can be made based on experiences, and the feedback of experts and stakeholders (High-Tech Forum, Fraunhofer ISI, EFI and input from civil society consultations). If necessary, adaptations to current technological or social developments can be made and new topics and missions proposed in the sense of an '**adaptive**' strategy. However, at the moment, there is considerable **uncertainty** to what extent the mission-oriented policy will continue, and if so, with how many and which missions. Despite the flexibility given by the relatively short time frame of legislation period, it can also substantially hamper progress in implementing the strategy.

### **Learning and experimenting**

The current strategy was the result of a **continuous development process** of the HTS that started in 2006, and was renewed with new objectives and policy targets every four years (legislation period) since then. In this way, the HTS is not fixed but designed as "a learning strategy" (OECD 2020) that can be adapted in light of recent scientific, technological or societal developments, and issues that are deemed of political importance (examples here are Digitisation or Industry 4.0). **External developments**, both at the European

level (European mission approach) and the re-gained prominence of mission orientation in the scientific STI literature further stimulated the decision to make mission orientation more prominent in Germany.

German's mission approach has been designed mainly as coordination tool for ministries and their individual strategies, with the idea to leverage public investment. The missions or mission areas have been defined in negotiation between the ministries in relatively short time, given the **tight policy cycle** to prepare the next edition of the HTS. Also here, the intention was to implement a mission approach that develops and learns over time, during the implementation phase. Limited time was devoted to facilitate a more systemic understanding of innovation and to identify a broader set of relevant stakeholders.

After the HTS2025 set the (political) scene for a challenge-orientation based on broadly defined missions, afterwards efforts was put into conceptualising different challenges and intervention logics to position the different missions in their respective socio-technical system (Wittmann et al. 2019; Wittmann et al. 2020). A more **strategic and systematic mapping** of the broader German R&I and policy landscape beforehand, to inform the selection and interplay of missions, might have facilitated the formulation of clearer targets (Wittmann et al. 2020). This lack of clear targets to **provide real directionality** was also criticised by the Commission of Experts for Research and Innovation (EFI) in its 2019 report. Several missions worked on narrowing down their mission definition with clearer goals and target (groups) over the years.

Moreover, several interviewees confirmed shortcomings in facilitating the implementation phase of HTS2025, to institutionalize learning and support organisational or cultural change. The importance of **process-based learning and evaluation**, including the resources necessary to bring actors on board and facilitate learning processes across actors and mission areas (e.g. regarding stakeholder involvement, coordinated best-practices, progress assessment) was underestimated at the beginning. This might have contributed to the yet limited legitimacy across ministries, and the relatively low practical impact of missions on public administration cultures or the German R&I system as a whole.

### **Managing conflicts**

A major problem coming with the HTS2025 and its whole-government or coordination approach without separate financial means is the commitment of other ministries. Even though set up as a strategy of the entire government, the BMBF is in the lead to coordinate the policy processes around it. **Limited willingness** of ministries **to invest own departmental resources (time, financial, human) for R&I agendas** can be a problem in this constellation. This type of resistance is partly the consequence of strong departmental thinking within ministries, regarding resources and recognition. Given that cultural shifts towards a broad mission-oriented did not take place yet, not all actors in the public sector see the benefits of a mission approach in the medium- to long-term. The **additional workload and coordination efforts** seem to currently hamper commitment of all actors to the missions. This limits the willingness of different departments and agents to seriously contribute to alignment efforts of existing policies, regulations or funding instruments. Finding a common ground at the early stage, for instance in form of a joint position paper, or clearer roadmaps and milestones, helped to overcome such type of resistances for certain missions.

## **4.5 RIS3CAT (Spain)**

### **General description**

The Research and Innovation Strategy for the Smart Specialisation of Catalonia (RIS3CAT) defines the framework within which the Catalan Government establishes their regional program for research and innovation (R&I) between 2014-2020. RIS3CAT is coordinated by the Directorate-General for Economic Promotion, Competition and Regulation of the Catalonian government. The strategy is embedded within the general Catalonia 2020 Strategy (ECAT 2020), which in turn is in line with the Europe 2020 Strategy for smart, sustainable and inclusive growth that builds on the idea of smart specialisation. ECAT 2020 has the

goal to foster smart, sustainable and inclusive growth through action in six policy areas: employment and training; social cohesion; innovation and knowledge; entrepreneurship; internationalisation; and green economy.

RIS3CAT stated four strategic objectives: 1) Enhance competitiveness of businesses in the region, 2) promote new economic activities through research, creativity and innovation, 3) consolidate Catalonia as a European knowledge hub, and 4) strengthen the Catalan innovation system in an international context. In order to reach these objectives, 12 different policy instruments were created, ranging from technology transfer, to public procurement, to knowledge generation and collaboration projects. Most of them function through competitive calls for projects with a variety of goals (R&D, formulation of action plans, collaboration, demonstration, etc.), but there are some other policy instruments involved, such as direct co-funding of demonstration plants. Overall, the estimated cost of projects is ca. 928m Euros (RIS3CAT Action Plan 2015-2020, 2018).

The 12 different policy instruments are managed by a range of different authorities, many of which are part of the Catalanian Government: Acció (public agency for the competitiveness of Catalan enterprise), Directorate-General for Local Government (Catalonia), Directorate-General for Research (Catalonia), Agency for Management of University and Research Grants, Directorate-General for Economic Promotion, Competition and Regulation (Catalonia), Barcelona City Council, Ministry of Economy, Industry and Competitiveness, Secretariat for Telecommunications, Cybersecurity and Digital Society (Catalonia), Directorate-General for Economic Promotion, Competition and Regulation (Catalonia).

In line with the EU Commission, RIS3CAT interprets smart specialisation as an R&I-driven agenda for economic transformation. The goal is that the local stakeholders of the innovation system define the challenges and competitive advantages in a bottom-up, collaborative processes (no top down policies). The overall strategy issued by the public administration should mobilize local knowledge in order to create new approaches and solutions to societal challenges. There is a strong emphasis on the facilitation of new and strategic collaborations and fostering the co-creation of knowledge, especially including civil society. Smart specialisation strategies are generally based on open innovation models that incorporate a quadruple-helix model that focuses on end users as the main beneficiaries. Co-design and co-creation of new solutions to societal challenges are at the centre of the strategy.

RIS3CAT defined four pillars for strategic action. Pillar one is targeted at the promotion of the leading sectors identified to be crucial for economic recovery that is smarter, more sustainable and more inclusive. These are food and drink; chemicals, energy and resources; industrial systems; design-based industries; industries related to sustainable mobility; health industries, and cultural and experience-based industries. Pillar two is about identifying and promoting emerging sectors around promising innovations. Pillar three is about supporting specific cross-cutting technologies that are seen as the main instrument for generating industrial change and new economic opportunities. Six such technologies have been identified: ICTs, nanotechnology, advanced materials, photonics, biotechnology and advanced manufacturing. Pillar four is committed to improving the innovation eco-system through public policies for entrepreneurship, eco-innovation, social innovation and training and skills.

The beneficiaries of the money are very diverse, including all kinds of public and private stakeholders in the research and innovation system, companies with operational bases in Catalonia, local organisations, not-for-profit organisations, universities and research centres, the Government of Catalonia, public sector and other public service providers or Digitalisation ecosystem players.



## Development of transformative policy characteristics

The table below highlights the most remarkable changes in TPI characteristics over time:

RIS3CAT	
Directionality	RIS3CAT is guided by overarching goals in EU policy, such as smart, sustainable and inclusive growth. In addition, specific regional priorities are identified in a bottom-up manner. For RIS3CAT, these were initially very broad: Development of Catalan industry, wellbeing of people, and green economy. Through various processes and in every project, these aims are specified for particular industries and local places. The freedom of local actors to interpret the general aims and to define their own challenges is quite large. However, over time, certain sectors and cross-cutting technologies have been identified and are thus promoted more: food and drink; chemicals, energy and resources; industrial systems; design-based industries; industries related to sustainable mobility; health industries, and cultural and experience-based industries. In respect to technologies, ICTs, nanotechnology, advanced materials, photonics, biotechnology and advanced manufacturing have been identified to be very important for the restructuring of the regional economy.
Societal goal	A variety of overarching goals are mentioned, but there is a tendency to view them in light of economic competence and regional competitiveness and growth. In general, smart, sustainable and inclusive growth are propagated, but there is no clear idea of what that entails or how it will be assessed. Green economy pops up in various documents as well as an idea of digital solutions as crucial to enable a transformation towards more sustainability.
Cross-silo policies	RIS3CAT is coordinated by the Directorate-General for Economic Promotion, Competition and Regulation of the Catalanian government. However, many different authorities are involved when it comes to the different policy instruments developed by the strategy. Several different governmental organisations and ministries from the Catalan Government are coordinating or managing the twelve different policy instruments, but only rarely are more than one or two collaborating within the same policy scheme. RIS3CAT is well embedded within the broader Catalan strategy as well as Europe 2020 strategy.
Mobilising demand-side	Smart specialisation strategies have a quadruple helix model that place end users and civil society centre stage. The mobilisation of these actors has, however, proven to be rather difficult. Therefore, the coordinators have introduced novel ways of creating joint visions by looking to new theoretical insights from Responsible Research and Innovation as well as Transformative Innovation Policy. They integrated a new requirement into some of the calls that encouraged the formulation of shared agendas for sustainability and social change. These bottom-up agendas were based on experimental and inclusive processes that are believed to have generated a more transformative discovery process, which in turn led to more transformative projects and interventions.
Stakeholder involvement	By drawing upon bottom-up initiatives rather than top-down roadmaps, the strategy has consistently relied on high degrees of stakeholder involvement from all societal sectors. One of the main changes that were introduced was to have municipalities leading some of the processes. Collaboration is the main

	<p>driver of the strategy overall, so stakeholders from all areas matter. However, the administration of EU funds is very challenging, resulting in a tendency to fund incumbent actors. The introduction of the 'shared agendas for sustainability and social change' has helped with co-creation and the inclusion of more actors from civil society.</p>
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**Assessment of governance capacities**

**Collaboration and alignment (strategic, operational, instrumental)**

*Multi-sector policy processes*

RIS3CAT is coordinated by the Directorate-General for Economic Promotion, Competition and Regulation of the Catalanian government. Smart specialisation strategies were adopted by all EU regions in the period 2014-2020. In Catalonia the strategy is coordinated by the unit responsible for managing ERDF. The coordination of the strategy by a unit with no sectoral competences and with an additional budget for research and innovation facilitated the introduction of new instruments to support transformative research and innovation beyond the traditional R&I stakeholders. Many different public agencies, municipalities and universities were involved to develop the calls within the strategy. Companies, as well as municipalities, were asked to identify challenges as well as collaborate with other actors in the process of defining and implementing innovative approaches and solutions to the challenges. It was reported to be quite challenging to change the way actors normally work.

*Multi-actor stakeholder processes*

Since the whole RIS3CAT strategy is based on collaboration for the identification of local challenges, stakeholder involvement is key. One of the more remarkable developments within the strategy is the introduction of the '**shared agendas** for sustainability and social change', which is a process based on insights from Responsible Research and Innovation as well as Transformative Innovation Policy that is about the creation of **inclusive and experimental spaces to co-create a joint vision and to explore collective roadmaps for transformative innovation**. Introducing this method into the calls seems to have made the involvement of civil society and other non-incumbent actors easier, and has therefore provided opportunities for the generation of more transformative projects and initiatives. In general, collaboration is perceived as a hard thing to enforce because actors like to have control and there seems to be a mental barrier for collaboration with non-traditional innovation actors.

**Legitimacy and leadership**

To have **EU money was critical** to not end up in local power games between the actors. The legitimacy from the EU (especially the fact that it is compulsory for all regions to design and implement smart specialisation strategies as an ex-ante conditionality for financing R& with ERDF), and the **coordination by the Ministry of Economy and Finance** were key factors that facilitated the introduction of new instruments and of new ways of working without generating conflicts.

**Learning and experimenting**

The monitoring of the strategy was seen as a learning experience. There was a lot of experimentation going on with new types of collaboration and the introduction of new methods, such as the shared agendas and monitoring tools. Moreover, many **workshops** were held and there was the opportunity to work directly with projects who wanted to be more transformative. Also being engaged in the international community on transformative/mission-oriented innovation policy as well as Responsible Research and Innovation and using the RIS3CAT as case study has contributed to a lot of learning. There was continuous adaptation and correction of the strategy throughout the years. Since a lot of the strategy was implemented through issuing

of calls, there was the opportunity to **change and modify new rounds of calls** in order to adapt to shortcomings identified in the previous rounds.

### **Managing conflicts**

In general, not many conflicts were mentioned. The overall impression is that actors are not necessarily against anything that is in the RIS3CAT per se, but that there is sometimes a **reluctance from people to have to put in the extra work necessary to change their way of doing things**. In particular, the involvement of municipalities as driving force for innovation activities in collaboration with universities and research and technological centres caused some tensions. In the previous period of EU funds (2007-2013) municipalities used the ERDF mainly for buildings and infrastructures. Within RIS3CAT, to receive ERDF money, they had to present transformative innovation projects in collaboration with R&I actors of the territory. There was a lot of uncertainty about what that entails and how one goes about this.

Smart specialisation strategies are an ex-ante conditionality for financing research and innovation with ERDF. However, it is a question whether or not ERDF is the most suitable vehicle when it comes to the financing of innovation activities, in particular due to the **very administrative and bureaucratic processes**. RIS3CAT tried to be much more **bottom-up** when it comes to the identification of challenges. But there is a danger of big companies taking over the process and selling old wine in new bottles just because they are the only ones that can handle the bureaucracy that comes with the money.

## **4.6 Strategic Innovation Programmes (Sweden)**

### **General description**

The Strategic Innovation Programmes (SIP) are a joint initiative by the Swedish Innovation Agency Vinnova, the Swedish Energy Agency, and the Swedish Research Council for Sustainable Development (Formas). The Strategic Innovation Programmes are public-private partnerships that are supposed to create preconditions for the development of sustainable solutions to global societal challenges while also increasing competitiveness in sectors considered of high relevance for the Swedish economy.

The SIPs are an outcome of a long policy process with a specific history. In 2008, the Swedish government developed a new instrument for research funding that was called 'strategic research areas' (strategiska forskningsområden; SFO). The aim was to enable broad research financing in the areas of medicine, technology and climate and it resulted in the financing of 24 research areas that were considered strategically important for Sweden. However, these 'strategic research areas' were criticized for being too academic, not enabling a good collaboration with industry or society. At the same time, they were increasingly embraced as strong prioritization mechanisms for strategic research, in particular as a way to ensure directionality towards addressing societal challenges. This challenge-driven STI policy perspective was gaining traction during the Swedish presidency of the EU, where Vinnova contributed to the development of the Lund declaration in 2009 with the explicit goal that European research must focus on the Grand Challenges of our time moving beyond current rigid thematic approaches. As a reaction, the government presented a new approach that they called 'strategic innovation areas'. The aim with those was to take up a more challenge-driven and bottom-up perspective and to focus on sustainable solutions for global societal challenges as well as increasing competitiveness of Swedish industry. Vinnova, Energy Agency and Formas were delegated the task to organize and coordinate these 'strategic innovation areas'. Between 2012 and 2015, these three public agencies issued calls to finance the development of 'strategic innovation agendas'. Various stakeholders within a diverse range of subjects and areas formulated common visions and goals and defined needs and strategies for the development of a 'strategic innovation area'. The goal was to avoid sector specific funding as it was common in previous instruments ('branschforskningsprogram'), but instead to mobilize actors from the whole innovation system. It was furthermore important that the actors themselves were involved in the definition of challenges and solutions and the set-up of a potential program. The agencies received 290 applications, 136 of which were granted funding to develop a 'strategic innovation

agenda'. It is these agendas that form the basis for the subsequent development of the strategic innovation programmes. During the development of the SIPS, there was an intensive dialogue between many actors from various agendas in order to merge interests and visions into bigger, more systematic, and fewer programs.

The three public agencies funded 17 strategic innovation programmes in four rounds of calls between 2013 and 2017. Each program can get funding between 20 and 40 million SEK per year for up to 12 years, conditional on a positive evaluation every three years. The programmes are quite diverse in terms of their set-up, actor constellation and overarching goals. In general, the programmes are in charge of formulating their needs and establish the program management, while the agencies are mainly responsible for their official duties. The main way the programmes use their budget is to organise calls for proposals to do R&I projects that involve programme actors. Some programmes developed a few complementary forms of intervention that are important for a more holistic approach to their subject area. Programmes should be characterised by openness and transparency in terms of which actors are collaborating and a cross-sectoral actor constellation is preferred. Actors need to be able to co-finance at least 50% of their activities.

Until now, there have been four evaluations that look at the impact of the SIPS after three years, and two evaluations that look at the impact of certain SIPS after six years of running time. In general, each evaluation represents a possibility for the SIPS to re-direct their focus, design new types of calls or organize different activities in order to meet their goals. The evaluations paint a very diverse picture of the transformative capacity of the different SIPS, since the programmes are organized very differently, contain a varied range of actors and operate in very diverse fields. As such, it is not just the funding instrument per se that impacts the working of the programmes, but also the respective programme management. While the SIPS as a whole get high praise when it comes to their additionality function in terms of generating competitiveness, they are often criticized for not having a clear directionality as well as a lack of impact when it comes to sustainable challenges as well as sustainability transitions. Often, this is seen as a result of the heavy bottom-up process when it comes to the identification of challenges by the industry itself.

**Development of transformative policy characteristics**

The table below highlights the most remarkable changes in TPI characteristics over time:

Strategic Innovation Programmes	
Directionality	The Strategic Innovation Programme itself does not define any particular challenges in itself. Instead, the identification of challenges is left to the programmes. The two broad directions that are given by the program are a focus on sustainable solutions for global societal challenges as well as economic competitiveness. Since the programmes have been funded based on previous agenda setting processes, the public agencies evaluated the significance of the identified challenges. There is also a continuous dialogue with the programmes and regular evaluations where the programmes are pushed to be as impactful as they can in relation to the overarching goals.
Societal goal	The initiative focuses on the bottom-up identification of societal challenges, but also puts economic competitiveness for Sweden centre stage. The funded programs have to show that they are relevant for Sweden’s economic competitiveness. After the first evaluations were pointing out that there is a lot of focus on competitiveness compared to any other societal goals, some

	of the programs have taken up a more pronounced focus on societal goals, such as SDGs. It also seems that the public agencies themselves are prioritising this higher than at the beginning of the initiative.
Cross-silo policies	The SIPs are governed by three public agencies (Vinnova, Energy Agency, Formas), with Vinnova seems to be taking the lead in many of the processes. The initiative is mainly providing funding for R&I and it is not coordinated or embedded with other types of funding instruments. However, in some instances there seems to be a link to the broader strategic innovation areas by the government and sometimes actors from the programme get additional funding through other vehicles as well.
Mobilising demand-side	While the SIP instrument itself does not provide any particular focus on implementation, it is up to each funded programme to organize and manage their activities. Therefore, some programmes can be seen to have more focus on implementation than others.
Stakeholder involvement	The SIPs are very much an outcome of bottom-up processes involving actors from several sectors. The agenda setting process was crucial as a way to make sure there is a broad representation when defining the SIPs at the end. While big firms and universities seem to be most common partners, there is a range of SMEs, public actors, institutes and other actors that are active in the different programmes. All programmes seem to have increased the number and diversity of actors over the years.

## Assessment of governance capacities

### Collaboration and alignment (strategic, operational, instrumental)

#### *Multi-sector policy processes*

For the Strategic Innovation Programmes (SIP), cross-silo collaboration was seen as essential. Not just for the governmental agencies, but also across industries and sectors. Vinnova had some history with working with other governmental agencies, including the energy agency, especially in the automotive sector. Vinnova was the driving force behind the collaboration for the SIPs and also sees itself as having taken leadership in the process. They adhere to a **trust-based philosophy** stating that if you start to get going with things, others will come and join.

#### *Multi-actor policy processes*

The SIP program itself is a quite classic R&I funding program hosted by three public agencies. However, the whole coordination process behind it is very much shaped by the stakeholders. For Vinnova, it was very clear from the start that in order to have systemic impact and be able to identify challenges, it is necessary to involve a range of actors. They should decide what the challenges are, since they are the experts. Not agencies, not politicians. However, it should not just be industry, because that has been the dominant way of working for Vinnova through the industry branch programs, where the government more or less shakes hands with an industry to enable their success. For the SIPs, the goal was to get a more open and transparent stakeholder involvement. Therefore, a **broad agenda-setting process** was started that yielded over 100 funded agendas. The main goal was to get actors started to think about a more challenge-driven approach and to get them involved. As for Vinnova it was clear that spreading out the funding will not have the desired effect, the decision was made to merge agendas into a few SIPs. This should also guarantee enough diversity in terms of actors.

### Legitimacy and leadership

Vinnova seems to have been the driving force behind the design of the Strategic Innovation Programs at the beginning and also provides a large part of the funding. The 17 programs, however, very much depend on the **leadership and management of the program actors** themselves. Quite big differences can be identified

in the set-up of the different programs. The programs are also divided between the agencies in terms of overall coordination.

The **open agenda-setting process** behind the creation of the SIPs has clearly contributed to their legitimacy amongst the stakeholders and the participating industries. Although there are some sceptical voices pointing to the fact that many SIPs are funding incumbent actors and the 'usual suspects', some of the program managements have tried to broaden the range of actors that they fund. In part, the funding of incumbent actors can be seen as a result of path-dependency of past policy making. Industry-based PPPs were (and still are) considerably more 'mature' or action-ready to form agendas and partnerships than other actors. Therefore, they were 'quicker to the ball' in the early phases and (for related reasons) probably less 'transformative' in the agendas than later partnerships. According to the external evaluation that was conducted, there is evidence of a more diverse range of actors getting funded through the newer generation SIPs, which could be seen as an increase in legitimacy due to a broader actor base.<sup>10</sup>

### **Learning and experimentation**

From a Swedish policy perspective, the SIPs have been considered very radical. They broke with every norm and routine the agencies used to work with. Their analysis was that the previously dominant industry programs were very path-dependent and only led to incremental innovation, in the system and also at the agency level. They were also seen as too closed and not willing to include a broader range of actors. Evaluations showed that quite clearly. Therefore, the idea of a challenge-driven approach came up.

Some people at Vinnova had long been thinking about that challenges should be the driving force of what they do and that there should be a broader societal ambition, beyond industry. A key point in time for that conclusion was in 2009, when Vinnova was involved in writing the **Lund Declaration** when Sweden had the presidency of the EU. The declaration stated that member states and EU institutions need to focus on the grand challenges of our times. The director general of Vinnova came to embrace that idea and many management discussions were held. They realized that they had nothing in their portfolio that was challenge driven. All the calls and programs were oriented towards competitiveness. As a result, Vinnova first launched the 'Challenge-driven innovation program', followed by the 'strategic innovation agenda' process that later led to the SIPs.

The SIPs themselves are **regularly evaluated** by external consultants (every three years), which allows for plenty of learning. Recently, they have also started to include a transformative perspective in these evaluations in order to see if the SIPs have transformative potential. However, at the moment, this is put into the appendix, because formally the SIPs were not set up to be a transformative instrument.

The regular three-year evaluation allows for several adjustments, at least in theory. However, in practice it seems to be a bit more difficult to gain steering authority once these programs are set up. Policy adaption is however considered crucial for a long-term instrument that can potentially run for 12 years.

### **Managing conflicts**

There have been a range of tensions throughout the set-up of the SIPs, in particular within the agency (Vinnova). It seems like there has been more internal conflicts rather than conflicts between the silos or between the funders and the recipients. Internally, there were a lot of **negotiations about responsibility**. The uncertainty involved with a new way of governing has caused frictions. At the same time, the reason for changing the governance mode was also caused by increasing tensions in the agency. Of course many people tend to cling to their respective programs, so phasing them out or replacing them is very political. Also the

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<sup>10</sup> [New evaluation of strategic innovation programs | Vinnova](#)

introduction of a new way of thinking (challenge-driven instead of competition) is difficult and time consuming and to this day an ongoing process.

## **4.7 Pilot-E (Norway)**

### **General description**

Pilot-E is a strategic, bottom-up collaboration between three Norwegian funding agencies: Research Council of Norway, Innovation Norway and Enova SF. Pilot-E is combining and aligning the functions of the three different funding agencies:

- To speed up the deployment of sustainable climate and energy solutions (Enova)
- To support Norwegian economy and businesses (Innovation Norway)
- To stimulate research-based innovation for the transition towards a more sustainable society (Research Council of Norway)

The combined aim of Pilot-E is to be a funding scheme targeting the Norwegian business sector with the aim of promoting a faster development and deployment of environmentally friendly energy technologies and services (and the corresponding companies). The scheme is offering a fast track 'one stop shop from concept to market' and promises to streamline and coordinate the policy instruments available from the three funding bodies. This should reduce the uncertainty for companies and give them a better basis for planning as well as support throughout the journey from invention to innovation (i.e. from idea to commercial deployment).

Pilot-E combines ca. 11 existing funding schemes into a larger toolbox. While the Research Council of Norway covers the basic research and some innovation, Innovation Norway has funding schemes that range from industrial research to demonstration as well as market introduction and Enova has funding for market introduction of new technologies as well as market change support schemes. A project application through Pilot-E receives one common decision from all three funding agencies who take the financial resources from their existing policy schemes. Pilot-E thus combines technology-push with market-pull thinking that is initiated by a mission.

The collaboration of the three agencies within PILOT-E is formalized in a separate agreement signed by the CEOs of all three agencies. The first agreement was signed in 2016. In January 2020, the collaboration agreement for PILOT-E was renewed for the period 2020 to 2023. The collaboration includes a joint assessment of topics for each year's call, a joint announcement of project funds and a joint assessment of the project applications. Pilot-E is governed by a steering group consisting of members from each agency's management. In addition, a program secretariat has been established that includes one person from each agency as well as an external coordinator/secretary. This secretariat is also referred to as the working group and has the operational responsibility for planning and implementing the announcements. The assessment and review of the applications is conducted through additional panels where a variety of case officers related to the multiple underlying instruments participate. External experts are invited as needed. Follow-up of the projects is done through the respective instruments the projects have received grants from, usually involving one or two caseworkers from the corresponding agency.

Pilot-E started in 2016 and regularly issues calls for proposals targeted towards specific societal challenges:

- 2016: Zero-emissions maritime transport (15 applications; 4 granted; 82m NOK)
- 2017: Zero-emissions land-based goods transport and The energy system of the digital age (25 applications; 9 granted; 149m NOK)
- 2018: Zero-emissions maritime transport 2.0 and Sustainable industrial processes for the future (11 applications; 6 granted; 107m NOK)
- 2019: A zero-emissions hydrogen value chain and Zero-emissions construction and facilities (12 applications; 4 granted; 92m NOK)

These calls are developed in very close collaboration with the industry and other stakeholders. The scheme is targeting larger consortia that address complex challenges and that have a plan in place that encompasses the whole pathway from research to full-scale demonstration under real operating conditions. Anticipated end-users or costumers need to be included into the project through the establishment of a steering group. Substantial co-funding is necessary and a plan needs to be submitted on how to contribute. Therefore, there is a tendency to fund large companies (or at least consortia that have the financial and human resources and skills).

### Development of transformative policy characteristics

The table below highlights the most remarkable changes in TPI characteristics over time:

Pilot-E	
Directionality	Pilot-E takes their overall missions from the broader Norwegian strategy. While it does define a clear direction and mission (new solutions in energy and transportation, zero emissions), the solutions are not predefined. Instead, it is the companies who suggest potential solutions and therefore shape the direction of innovation. Since the first call on zero-emissions maritime transport was perceived as a real success, and received good reviews by the industry, the funders were very happy to apply the same type of instrument to other areas. Subsequently, transport, energy, process industries, construction and hydrogen were picked as other areas for which similar calls were issued.
Societal goal	Pilot-E is bringing together three agencies with different purposes, but common ambitions. New green business development, changing the energy system, environmentally friendly transportation and reduction of greenhouse gas emissions are overarching goals. Pilot-E is inspired by the 'mission-oriented innovation policy' present in the EU, OECD as well as on national level in Norway. While the societal goals are ambitious and give a clear direction, it is still of high importance to strengthen the Norwegian business sector and make it competitive internationally.
Cross-silo policies	Pilot-E was the first initiative in Norway that tries to strategically combine several funding schemes from different governmental bodies into a 'one stop shop' for project applications. The goal is to ease uncertainty and bureaucracy and tailor the different funding schemes to the projects. One project application, one decision, several funding sources at once. While managing the collaboration of three agencies and their funding instruments, it needs to be pointed out that these are all governmental bodies that had at least some tradition of working together. Although they have different overarching purposes, they are still active in a similar field (knowledge and innovation funding).
Mobilising demand-side	Market creation and technology implementation are a clear goal of Pilot-E. End consumer and/or customers need to be involved in the project from the start, at least through a steering group. Enova, in particular, has schemes that help with market creation. Some end customers can qualify for investment aid from. The PILOT-E



	administration will provide clarification and guidance throughout the process.
Stakeholder involvement	Pilot-E develops their calls in close collaboration with the industry and different branch organisations. The secretariat and board of Pilot-E try to have an open dialogue. They invite industry to take part and develop the call text so that it matches their strategic position. They also try to get enough media attention and to invite very widely. The missions themselves are taken from the Norwegian national policy, they cannot be changed. But how to reach them is up to the industry. There does not seem to be much involvement of stakeholders outside of industry.

## Assessment of governance capacities

### Collaboration and alignment (strategic, operational, instrumental)

#### *Multi-sector policy processes*

Cross-silo collaboration was the main motivator and strategic goal behind the set-up of Pilot-E. They wanted to be able to meet societal challenges in a more strategic way and have a **'one stop shop'** for funding initiatives to ease the administrative burden for businesses. Normally, the ministries give the requirements on how to organize the funding, but in the case of Pilot-E it was more a bottom-up initiative by the three public agencies. The three funding bodies have some **history of collaboration**, especially in the field of green growth, where they met once or twice a year. It was in these interactions that the idea for a more strategic collaboration occurred. An important success factor that enabled the initiative to be built up in a smooth way, was to have a **program coordinator/secretary that was outside the three public agencies** and could help to coordinate in a more neutral and objective way. Also having a **steering committee** that contained one person from each agency was seen as important. Another acclaimed success factor for Pilot-E was to **clearly identify and acknowledge the role of each actor** and their different functions, and be very explicit about them. The program secretary also played an important role in facilitating the communication between the agencies through a lot of **visualisation and illustrations** (rather than only writing). It was also seen as an advantage for Pilot-E to be based on already existing funding sources instead of having to first secure new funding; the money was in place already. One thing that could be improved in the future is the reporting, since that is still done separately for all three agencies, which takes a lot of time and resources.

#### *Multi-actor stakeholder processes*

Industry and their respective associations played a large role in formulating the call and guide the solutions for the stated missions. Pilot-E is built around the assumption that the companies know best how to reach the overall missions. Some industry actors protested and said that what is asked by Pilot-E (e.g. zero emission transport) cannot be done, but these types of voices were ignored. The goal is to find the ones willing to make the changes and have a **good mix of new players (start-ups) as well as incumbents** with all their knowledge and capacities, also in regard to financial contributions (co-funding is required). In general, Pilot-E seems to be targeting industry before any other stakeholders.

### Legitimacy and leadership

The Pilot-E program received a lot of positive reviews, especially also from the industry itself. It developed a good reputation, so that the ministries and funding agencies were happy to prolong the initiative until 2023 and issue new calls on new topics. One of the most vital organisational features of Pilot-E, which made its administration run smoothly, was to set-up a program secretariat that contains a steering committee with representatives from all three agencies as well as an external program coordinator. Especially having an **external person for coordination** that is not associated with any of the three funding agencies is seen as vital for the success of Pilot-E.

## Learning and experimentation

The main learning has been achieved through the **interactions with the industry while developing the calls**. Since the calls change every year, it allows for constant adaptation and learning within the Pilot-E scheme, but also in the three associated agencies. The Pilot-E team is currently working on developing the scheme further, looking at more options to combine funding portfolios and coordinate proposals to ministries. In general, a growing collaboration between actors can be observed.

After five years of being operational, the first **external evaluation** has taken place (conducted by an external consultancy).<sup>11</sup> The general impression is that the scheme works well and it is very popular with the industry, which is also why it was expanded over the years for different topics. According to the evaluation report, there is a clear difference of popularity of the calls over the years, and therefore the question of whether or not industries might be ready enough to hand-in projects of the caliber needed for Pilot-E (or whether they need more time to develop these kinds of large-scale projects).

## Managing conflicts

Overall, Pilot-E has not experienced many tensions or conflicts. The alignment of the actors and their expectations reportedly worked very well. The **'coalition of the willing'** that came bottom-up from all three agencies was vital to develop the first idea and then **approach the ministries for approval**. After the success of the first call, the ministries were even more on board and asked to include further topical areas. The popularity of the scheme in the industry also helps to give it legitimacy and thus reduces conflict. Furthermore, all involved people are on good terms and have known each other for a long time. The **personal and organisational skills** of the program secretary also helps to enable a smooth collaboration.

## 4.8 Mission-oriented Topsector and Innovation Policy (Netherlands)

### General description

The Dutch Mission-oriented Topsector and Innovation Policy (MTIP) is the successor of the Topsector Policy that was introduced by the ministry of Economic Affairs and ministry of Education, Culture and Science in 2012. The original Topsector policy was primarily designed to strengthen the Dutch innovation system by establishing triple-helix coordination structures. In each of the nine Topsectors that were appointed, and that are still active today, a Topteam involving science, industry and policy representatives (also from line ministries relevant to a particular Topsector domain) develops joint agendas and draws roadmaps for future research and innovation activities. While such agendas also target issues like human capital, financial capital, regulation, exports and societal acceptance of innovations, initially much emphasis was placed on research and development (R&D). As one of the Topsector approach's main goals was to increase business investments in public-private research, also the available policy support was largely geared towards facilitating collaborative R&D. Through their Topconsortia for Knowledge and Innovation (TKIs, small agencies that support the sector), the Topsectors organize events and fund R&D activities in line with the Knowledge and Innovation Agendas (KIAs) they drew up and update every two to four years. Involving business is supported through, inter alia, the Public Private Research Allowance for public-private R&D projects, as well as the MIT measure for engaging SMEs (SME innovation stimulation Region and Top Sectors grant). Over time the ambition of intensifying the magnitude of collaborative R&D was complemented with a preference for encouraging novel rather than (only) existing collaboration patterns.<sup>12</sup>

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<sup>11</sup> [PILOT-E has been evaluated – the scheme creates added value for society and exploits synergies in policy instruments \(forskningsradet.no\)](#)

<sup>12</sup> Janssen (2015). Cross-specialization and structural holes: the case of the Dutch Topsectors. *Papers in Evolutionary Economic Geography* 15(19).

Inspired by modern industrial policy thinking, the Topsector approach that emerged can be considered as a transformative policy approach in several ways. Instead of backing existing sectors, as the somewhat misleading name might suggest, the objective for the government was (1) to learn from science and industry about promising collective development directions and (2) to provide the public inputs necessary for exploring and exploiting new paths. The evaluation conducted in 2016 concluded that the implemented governance structures and instruments were suitable for policy makers to retrieve and respond to information regarding shared innovation ambitions and associated barriers. On the other hand, the policy setup was less suitable for e.g. stimulating lead markets for the innovations resulting from executing the KIAs and their roadmaps.<sup>13</sup>

Following an early announcement from summer 2018, the Dutch government began to re-orient the Topsector Policy in 2019. With the triple-helix coordination structures and their ecosystems in place, it became possible to respond to national and international pressures to direct innovation activities more towards addressing societal challenges. The Mission-oriented Topsector and Innovation Policy, operational as of 2020, focuses on 25 missions (each with specific and time-bound ambition levels) belonging to four societal ‘themes’. The missions have been proposed by line ministries with responsibility for the social domain a given mission relates to, like health, security, or mobility. To a certain extent the new strategy still relies on the wide set of policies that were designed or mobilized as part of the Topsector approach. Additionally, various line ministries have started to develop their own policy initiatives for picking up and scaling up promising innovative solutions. The Topteams spearheading the governance structure are now complemented with Mission Teams that carry responsibility over developing and executing Multi-annual Mission-oriented Innovation Plans (MMIPs). The MMIPs specify how innovation development and deployment will deliver contributions to the mission goals that have been prioritized. Many of the MMIPs involve developing key (enabling) technologies such as nanotech, life sciences, engineering tech, photonics. In this way, the current policy brings together three angles: the societal missions (‘energizers’ that are recognised around the globe), the key technologies (‘enablers’ for advances in science and technology) and the topsectors (the ‘drivers’ for progress).

The table below highlights the most remarkable changes in TPI characteristics over time:

The Dutch Mission-oriented Topsector and Innovation Policy	
Directionality	The original Topsector Policy aimed to spur R&D&I collaboration in nine Topsector domains. The domains themselves were very broad and roughly defined, as in practice it was up to the Topteams and their TKIs to initiate networking events and draw up the KIAs and roadmaps. With the shift to the MTIP, the missions became the common point of reference for steering innovation activities. While proposed by line ministries, the goals were often formulated only after extensive consultation rounds with diverse stakeholders (also from outside the innovation system). In the translation from mission goals to MMIPs, the various stakeholders involved in the renewed governance structure had a large say in narrowing the scope of innovation activities targeted at completing the mission. The current impression is that this helped to build more coherent roadmaps, while the total number of innovation topics has not always been

<sup>13</sup> Janssen, M. (2019). What bangs for your buck? Assessing the design and impact of Dutch transformative policy. *Technological Forecasting and Social Change*, 138, 78-94.

	clearly reduced (yet).
Societal goal	Already when the Topsector policy was running for several years, there were increasing pressures to target the collective innovation efforts more specifically on societal challenges. Highly influential was not just the international debate on missions, but also the demands from line ministries (participating in the original Topsector policy) to exert more control over the direction of innovation. In the KIAs from 2018 the Topsectors already stated explicitly to which challenges they were contributing, while from 2020 the missions became formally dominant for all collective innovation efforts. For the ministry of EZK this is a matter of focusing their policies on promising innovative solutions, whereas especially the line ministries responsible for the missions also look into non-innovation solutions.
Cross-silo policies	The Topsector Policy was a first step to involve line ministries better in innovation dynamics, as it was believed that their regulations, support measures, procurement etc. could be decisive for many innovation trajectories. Initially the line ministries were represented through their (often small) innovation units. As the MTIP was put in place, however, these evolved into a configuration in which the line ministries committed themselves to ambitious goals at the core of their policy domains. Thereby their involvement intensified substantially, putting them effectively in the lead of guiding the transformations (especially those ministries that invest part of their own resources in innovation).
Mobilising demand-side	The Topsector Policy started out from a triple-helix 'supply push' logic, which was also reflected in the available policy mix. As pointed out in the 2016 evaluation, policies for supporting the uptake of innovations were mostly limited to demonstration subsidies and export promotion. The government was believed to have more potential for creating markets (herself), which played into the decision to move the command over innovation coordination to the line ministries. In the new MTIP there are already examples of ministries lining up an extensive range of subsidies, platforms and regulations for ensuring an attractive playing field for novel solutions.
Stakeholder involvement	The Topsector policy is inherently a coordination approach, with a crucial role for networking and collaboration activities. Technically the funding earmarked for the Topsector policy is primarily targeted at efforts for strengthen interaction between science, industry, policy and societal sectors. In the first years of the Topsectors, much of the energy and resources were devoted to spurring collaboration between research institutes and the innovation frontrunners from industry. Gradually, the attention shifted to intensifying the involvement of SMEs, NGOs and citizen organisations in R&D and innovation. Moreover, the ministries responsible for a mission appear to be more inclined to start with citizens, social organisations and non-innovative firms as primary target groups for their activities (e.g. they launch platforms for eliciting needs and disseminating innovative practices with relevance for a mission goal).

## Assessment of governance capacities

### Collaboration and alignment (strategic, operational, instrumental)

#### *Multi-sector policy processes*

At a strategic and operational level, collaboration and policy alignment in the MTIP are achieved through the **Knowledge and Innovation Contracts/Covenant (KICs)** signed every four year by an increasing range of knowledge and funding partners – including various ministries, regional authorities, the national science foundation, and research organisations. By putting their signatures on the KIC, these parties commit themselves to dedicate a substantial share of their resources to the Knowledge and Innovation Agendas (KIAs) proposed by the Topteams and now Mission Teams. A measure of success for the policy strategy is the willingness of all those parties not to deploy KIA-relevant activities on an individual basis, which might then not add up, but to truly pool resources and streamline policies in order for desirable innovations to reach the stage of application (and vice versa, for bottlenecks in the innovation deployment stage to influence research activities). This alignment is pursued through a **layered structure of coordination**, consisting of a hierarchy

of theme teams (deciding on major funding issues), topteam/mission teams (deciding on strategic directions and allocation of available funding), and TKIs and other operational support entities.

Instrumental alignment is at this point still a major issue. Because the MTIP approach is an ‘umbrella strategy’ covering different missions in societal sectors with very dissimilar institutional layouts and policy landscapes, it is associated with a patchwork of instruments from the various partners. One merit of such a patchwork is that it helps to mediate the risk of pursuing dead-end solutions: investing substantial public and private resources in too limited a set of solutions for societal challenges. Projects need to qualify again and again as they move from fundamental research to applied research and implementation. This creates a **natural stage-gate approach** with moments to reconsider research and innovation trajectories, which ensures some objectivity in choosing promising solution directions. However, this mechanism is also criticized as it stands in the way of making bold moves. Projects can not smoothly develop when they have to pass many administrative hurdles.

#### *Multi-actor stakeholder processes*

Being inspired by Rodrik’s ‘industrial policy for the 21<sup>st</sup> century’<sup>14</sup>, the original Topsector approach was regarded a network approach for interacting with the innovation frontrunners in nine economic domains. These interactions serve to retrieve information on collective (rather than firm-specific) innovation opportunities and challenges, in order to formulate appropriate policy responses. The information retrieval is to a large part **delegated** to the governance structure composed of Topteams and TKIs, which has recently been extended with the Mission Teams. The governance structure itself already comprises a broad range of multi-stakeholder advisory boards. Additionally, there are programme managers and a wide range of networking events and roadmap writing initiatives that also aim to collect and process insights on promising innovation trajectories.

Adhering to delegation does not imply the MTIP is a hands-off approach, allowing responsible policy makers to shift all responsibilities to the established networks. Instead, it constitutes an **arms-length** tactic. The Ministry of EZK still maintains a substantial staff of policy officials specialized in distinct Topsectors. These staff members maintain close connections with the various parties united in the extensive governance structures, in order to learn about research and innovation developments in relation to policy support (covering topics like investments, regulation, fiscal issues, human capital, etcetera). Additional governance capacity comes from the liaisons from the innovation policy execution agency RVO.nl (focusing on support through grant schemes), as well as the policy officials of line ministries involved in particular Topsectors.

All in all, the chosen design appears to be a way for the ministries to get in touch with representatives from across different innovation systems and sectors, while **gradually increasing the influence they exert on strategic directions**. The networks or ‘ecosystems’ that have been established through the original Topsector approach are now being leveraged for providing knowledge and innovations in response to ministries’ missions. This highlights how new stakeholders merge into structures that were developed over time. In interviews it is frequently noted that before the Topsector approach many line ministries had still very little knowledge about innovation processes, and were therefore not capable nor in the position to steer the search for novel solutions for societal problems. Now that line ministries take part in the innovation ecosystems, they become increasingly able to understand whom to address, what’s brewing in science and technology, how much novelty they could ask for and how to facilitate the solutions that emerge.

There are various other explanations for what allows the Ministry of EZK to rely so much on triple/quadruple helix structures, but particularly interesting in this respect is also the role of funding. The Ministry of EZK provides a relatively stable amount of funding for the TKIs to organize themselves and run their networking

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<sup>14</sup> Rodrik, D. (2004). Industrial Policy for the Twenty-First Century. No. 4767. CEPR Discussion Papers, 2004.

activities. One of the few earmarked policy instruments is the **allowance for public-private R&D projects**. By design, the allowance increases when business contribute more to these projects. This provides an incentive for the TKIs to go out and sense for which research and innovation topics firms are willing to make investments in. These firm often don't receive any of the funding, but can be triggered by the perspective of becoming part of a collective research project in which also other parties contribute to generating knowledge of shared interest. The amount of funding provided through this channel is relatively modest (around €150mln/year), especially in comparison to the resources available at e.g. the National Science Foundation, other ministries, and regional authorities. A major reason for all sorts of stakeholders to interact with the Topsectors is the expectation that setting directions and being part of the network also helps them to benefit from other forms of policy support. In some cases this involves a high degree of **trust**. Both within the original Topsector approach as well as in the MTIP there have been signals that parties kept participating in coordination activities, believing that at some point this would pay off. For SMEs this sometimes turned out to be disappointing, which is an ongoing concern (although there is also a separate policy instrument specifically for them). At a more strategic level, it now seems that there also forms of stakeholder participation that **anticipate** policy support which has not been committed yet. This holds especially for initiatives to develop programs lined up with the missions set by line ministries. Only a handful ministries have already announced funding. In other cases, stakeholders trust that once they have collectively delivered a vision on how to contribute to a mission, the responsible line ministry will step up and provide resources for realising the vision. The latter was the case for e.g. the Ministry of Infrastructure and Water Management, which recently freed up €40mln for supporting the Circular Economy transition agenda that resulted from several years of stakeholder interactions.<sup>15</sup>

### **Legitimacy and leadership**

A big change in the shift from Topsector policy to the MTIP has been that line ministries are not any longer represented as just one of the stakeholders in all sorts of boards in the governance structure; they are now the ones formulating the mission and being responsible for completing it. As such, they are the new **champions** of the policy, while the ministry of EZK is moving to the background. This constellation seems to fit with the idea that a strategy like the MTIP, pursuing also the actual uptake of (innovative) solutions, needs to be **led by a 'challenge-owning' ministry** that has a legitimate role in managing the focal societal challenge. For EZK it would be increasingly difficult to spearhead a strategy mainly requiring policy support beyond its own sphere of influence. Now that the responsibility for completing the missions has been passed on, it is up to the line ministries to show the way forward. In none of the mission areas does this seem to involve a very visible role for ministers, signalling that the missions are **kept away from politics**. Leadership mainly has the form of having the highest level of policy officials (director and secretary generals) participating in the theme teams, mission team and topteam. Because the MTIP concerns a delegated approach, as described above, the leadership is also in the hands of the science and industry captains operating in these boards. For the success of the strategy it is crucial that these captains are able to vouch for their words (on behalf of the stakeholders they represent), as that is essential for achieving convergence in the innovation investments and efforts from a broad range of parties.

### **Learning and Experimenting**

Just like in 2010, when the original Topsector approach was relatively novel, also the current MTIP is new and experimental. So far there are only few countries that have made missions truly leading for their non-generic innovation strategies. The Dutch MTIP is **not presented as having its definitive form**; many stakeholders in fact perceive that the first operational year only marked a transition towards a new policy approach for societal missions that is still not fully developed. The following policy elements are in a state of flux:

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<sup>15</sup> <https://www.rijksoverheid.nl/actueel/nieuws/2020/09/15/prinsjesdag-extra-investeringen-in-onderhoud-aan-wegen-en-spoor>

- the governance setup. EZK offered the overall architecture, but within each mission there was freedom for engaged stakeholders to operationalize it according to their own preferences.
- the funding. The Knowledge and innovation covenant is listing voluntary commitments but does not bind the signatories. This seems to be a well-working balance. Signatories such as the provinces, the regional development agencies and the universities of applied science value being part of the national drive towards societal missions and step up their involvement in the covenant.
- the policy instruments. There is no single policy mix exclusively tied to the MTIP; it is up to the partners to see which policy measures they apply. They show a growing appetite to discuss how their instruments would fit best together to help researchers and innovators on their trajectory from science to application.
- the monitoring frameworks. These are currently in development, in an effort to start early with keeping track of the status of innovative solutions. One key struggle arising from the policy shift is to go beyond mapping research, innovation and experimentation projects, and link them also to deployment of solutions and actual needs.

To facilitate R&D, experimentation and occasionally demonstration, the Ministry of EZK offers a set of innovation support schemes. During the Topsector period, policy adaptations mostly concerned budgets and criteria within these schemes. In response to needs observed by the teams responsible for new missions, the Ministry also **launched a new measure** particularly fitted for the climate-related missions; the research, development and innovation scheme 'MOOI'<sup>16</sup>. This scheme provides subsidies for substantially larger projects that are required also to include the demand side (both the firms finally offering the innovative solutions, as well as the users and other affected stakeholders). Even more responsive are some of the policy initiatives undertaken as part of the COVID-related recovery policies; by having the Topsector and Mission structures in place, the government was able to identify particular needs for innovation support that would be essential for maintaining search activities for innovative solution. Having close ties to business, science and society led for instance to a innovation support scheme for the mobility sector, as it became clear that due to the crisis they couldn't sustain their attempts to experiment with clean alternatives.

Important to stress again is that the MTIP is more than an umbrella for lining up innovation supply and demand policies. It is regarded to be a network approach, designed to buy in and align stakeholders. EZK itself is not steering in terms of setting directions or designing instruments; it is increasingly steering by **organising processes** that help others (incl. other policy makers) to change their activities. Indeed this shares some similarities with the Circular Flanders and Amsterdam Circular approaches.

### **Managing conflicts**

The MTIP is built on an extensive governance setup with different types of **advisory boards**. The mission teams formed over the year 2020 are positioned at the centre of these structures. Situated at the interface of various systems, they collect information from the secretaries working on the Multi-annual Mission-driven Innovation Programs and the line ministries occupied with addressing the prioritized societal challenge. Formally the **intermediary-like mission teams** should discuss conflicting perspectives and interests and propose a direction for moving forward. The theme board then decides. Effectively this means that the ministry of EZK nor the line ministries themselves have to cut knots and set directions, but leave this to the multi-stakeholder mission teams.

The shift from Topsector policy to MTIP implied an important change in how effectively the ministry of EZK can bend innovation activities more towards societal challenges. Before innovation-minded representatives of other policy departments would be part of the 'EZK's Topsectors', while now these other policy departments

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<sup>16</sup> <https://www.rvo.nl/subsidie-en-financieringswijzer/mooi>

are in the lead of bringing about changes. This implies that their own innovation units suddenly are becoming essential for achieving the department's objectives. In other words, these units are now less regarded as innovation frontrunners only playing around at the periphery of the department's core activities. EZK is not trying to push itself as the place to go for innovation policies, but aims to position the innovation units they have already been partnering with as the champions that can get their departments on board of innovation and transition journeys.

A bottleneck in this strategy is that different ministries have different objectives. Although this is becoming aligned, and there is more and more capacity to find synergies, issues can arise because of e.g. **different accountability regimes**. Other departments need to report on their own policies, and might therefore be hesitant to blend their resources with the innovation support resources provided by the Ministry of EZK.

## 4.9 Green solutions of the future (Denmark)

### General description

The Danish Ministry of Higher Education and Science announced the Green solutions of the future strategy in September 2020. According to the corresponding policy document it "will promote coherent green research efforts ranging all the way from basic research to commercialisation of new solutions across public and private research-financed funds and programmes as well as education and research institutions, taking the research and innovation needs of the business community into consideration. The strategy will contribute to strengthening the interplay between knowledge institutions, companies, innovation players, and public authorities, so that research results are converted to new green solutions creating jobs in Denmark and being of the largest possible benefit to society." (Ministry of Higher Education and Science, 2020, p.4).

Two major developments leading up to this strategy where the national Climate Act, passed in 2019, and an expert panel's peer review of the Danish R&I system, also stemming from 2019.

- The first provided a reason to reconsider Danish R&D policies, as well as the means to do so. That is, the Climate Act defines legally binding targets obliging Denmark to reduce its total greenhouse gas emissions with 70% (compared to the 1990 level) and with 100% by 2050. To meet these goals, the Minister for Climate, Energy and Utilities presented its Climate Plan in September 2020. Two different tracks form the core of the long-term strategy: an implementation track focused on short-term solutions and policy measures, and a development track that pays off in the longer term. In relation to the latter, the Danish government decided to reserve resources for investing in, amongst others, carbon capture, energy hubs and green fuels ('Power-to-X').
- The peer review, in turn, provided answers regarding what strategies and tactics to follow when pursuing innovation-based growth in particular priority domains. The peer review was overseen by the policy support facility of the European Commission's DG for Research and Innovation, on the request by the Danish Ministry of Higher Education and Science itself. The review concluded that "there is no sufficiently clear, deliberate, overarching strategic direction of the Danish innovation system" (p.12). Following upon this observation, it offered suggestions for designing research and innovation strategies that draw on available financial means and that can contribute to both growth objectives as well as environmental goals.

Together, those two developments provided a window of opportunity and some strategic clues for the Ministry of Higher Education and Science to update its approach to allocating research funding. The Green solutions strategy it presented entails a relatively comprehensive R&D programme. Unlike its predecessors, it extends the range of supported funding stages all the way to the phase of testing and demonstrating solutions emerging from research projects. At the same time, it still remains very much a supply-driven policy approach. The societal challenge of reducing emissions has formed a key starting point, but primarily for identifying promising green technology domains.



Remarkable in light of the above is that the green solutions strategy does not just provide an overview of green research topics eligible for funding; it also appoints four green missions.<sup>17</sup> The mission-driven effort is explicitly focused on accelerating the development of new solutions. While at the moment it is increasingly acknowledged that missions may also play a role in diffusing such solutions (or even driving the uptake of solutions not based on novel knowledge), the Danish take on missions till thus far is more in line with the more traditional approach, i.e. of using them as a lens for steering and combining investments in scientific activities. This holds especially for the missions on ‘carbon capture, utilisation and storage’ and ‘green fuels’, which are essentially technology domains rather than societal challenges. The missions on ‘climate and eco-friendly agriculture and food production’ and ‘recycling and reduction of plastic waste’ concern societal problems relying less evidently on science as the main source of solutions, but are nevertheless addressed with the same research-focused policy approach.

This mission-driven part of the green solutions research approach consists in the first place of earmarking DKK 750 million out of the total of DKK 2.7 billion ‘green’ research budget particularly for public investments in those four domains (2021 figures). Additionally, the government is introducing “innovation partnerships that will gather knowledge institutions, businesses, public parties and innovation actors around a common research and innovation effort targeting the accomplishment of a specific mission” (Climate Plan 2020, p. 72). “The partnerships must, to the greatest extent possible, forge a strong bond between partnership activities, public subsidy schemes such as the demonstration programmes and the Innovation Fund and Denmark’s Green Future Fund and private investor environments” (p. 73). The Innovation Fund and the newly established Green Future Fund are two of the major funding instruments. Both of them rely on public tender procedures. The Innovation Fund obtains DKK 1.17 billion of the 2021 budget for green research and innovation, which also includes the aforementioned DKK 750 as it is responsible for managing the mission-driven green research and associated innovation partnerships support. Other programs administered by Innovation Fund Denmark include, for instance, the Grand Solutions Program for investing in collaborative “research and innovation projects with the potential to create knowledge, growth and employment in Denmark”.<sup>18</sup>

As pointed out in a recent publication by the Danish thinktank DEA, the proposed green solutions strategy is an important but still small step towards running a transformative policy approach. Positive is that “unlike the strategic research policy of the past, mission-driven research and innovation policy is characterised by linking research and innovation policy to clear objectives, related to complex societal challenges”.<sup>19</sup> Yet, this only involves to a limited extent a mechanism for coordinating a balanced range of policy initiatives suited to elicit and accelerate complementary innovation activities – in order to ultimately achieve the Climate Act targets. Denmark does have a Climate Council of high-level representatives that provide advice on the government’s annual climate plans. However, while the Council is a structure overseeing a broad range of policy initiatives, it is not in the position to enrich the green research strategy or align it with other policies targeted at spurring ‘green’ developments. As the green solutions research strategy sits within the Higher Education and Science ministry, it remains largely unconnected to e.g. legal reforms by the Ministry of Climate, Energy and Utilities, or to sustainable procurement possibilities promoted by the Ministry of the Environment.<sup>20</sup> In sum, within the green solution research strategy itself, there is no central role for societal demands when it comes to adjusting research and innovation efforts in response to particular necessities experienced by actors working on the implementation of promising solutions. Neither does the strategy contain arrangements that allow for extensive stakeholder involvement, or for policy mix alignments beyond the instruments of the Higher Education and Science Ministry. At the same time, it should be noted that The Innovation Fund Denmark

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<sup>17</sup> The Green solutions for the future strategy (2020) lists topics and research needs that “form the basis for potentially identifying further missions in the coming years” (p. 24), covering areas like ‘Nature and biodiversity’ and ‘sustainable behaviour and societal consequences’.

<sup>18</sup> <https://innovationsfonden.dk/en/programmes/grand-solutions>

<sup>19</sup> DEA (21-01-2021). How can ‘missions’ set the direction for the green transition? (in Danish). See: <https://dea.nu/i-farver/publikationer/hvordan-kan-missioner-saette-retning-for-den-gronne-omstilling>

<sup>20</sup> See: <https://enq.mst.dk/sustainability/sustainable-consumption-and-production/sustainable-procurement/>

meets regularly with a group of ministries including the Ministry of Higher Education and Science, the Ministry of Climate and the Ministry of Industry, Business and Financial Affairs in order to discuss the implementation of the green research and innovations partnership and in order to at least align it with other policies. The Minister of Higher Education and Science also discusses green research policy and the specific missions within the Green Business Forum.<sup>21</sup>

To be sure, the more critical observations above are not necessarily to be interpreted as weaknesses, but merely point out that the green solutions strategy's ambitions and corresponding policy provisions are very different from e.g. urban-level transition experiments. Moreover, compared to traditional funding schemes and its own predecessors, the new strategy does come with some notable changes in the direction of transformative innovation policy.

### Development of transformative policy characteristics

The table below highlights the most remarkable changes in TPI characteristics over time:

Green solutions of the future	
Directionality	At this moment Denmark's green solutions strategy regards the green areas, prioritized in the government's climate plans, merely as domains that lend themselves for R&D policy with a 'strategic direction' (cf. the advice of the peer-review report). Instead of adhering to the traditionally technology-neutral approach, the green areas provide a basis for a more selective R&D funding strategy. While there is ample justification of why the selected areas are both relevant for the climate goals and promising for growth opportunities, they do not come with specific roadmaps on how to advance these areas. This is left to the innovation partnerships.
Societal goal	Targeting green topics and research needs implies a more prominent role for societal goals than found in generic research strategies. At the same time, the link to the Climate Act is rather loose. The green solutions strategy is oriented towards supporting research in green technology domains in which Denmark can excel, thereby paving the way for export success. Illustrative is the following quote: "the green transition goes hand in hand with the effort to create Danish jobs and strengthen the competitiveness in accordance with the Climate Act's consideration of sustainable business development" (Climate Plan 2020, p. 72).
Cross-silo policies	The green solutions strategy has been developed by the Ministry of Higher Education and Science, while much of the policy implementation is controlled by the entity running one of the Ministry's main funding schemes (i.e. Innovation Fund Denmark). This is not different from how other research policy strategies are administrated. Some of the strategy's policy initiatives are launched in collaboration with partners, e.g. the Green Business Forum (for coordination of green research), the Danish Board of Business Development (for cluster development), and the Ministry of Industry, Business and Financial Affairs (see below).

<sup>21</sup> See: <https://stateofgreen.com/en/partners/state-of-green/news/13-climate-partnerships-will-support-the-danish-government-in-reaching-the-green-targets/>

Mobilising demand-side	Compared to other policy programs executed via entities like the Innovation Fund, the green solutions strategy is slightly more concerned with the stage in which resulting innovations will be implemented. Still following a technology-push approach, the green strategy extends its research and innovation support all the way from basic research to commercialisation. This mostly entails intensifying university-industry collaborations, so that the business community can exploit opportunities arising from research success. The Ministry of Industry, Business and Financial Affairs is involved in launching a framework for strengthening cooperation between knowledge institutions and companies in the field of innovation.
Stakeholder involvement	As stated in the Green Solutions Strategy (p.28): "The implementation of the government's green research strategy will be discussed annually with the Green Business Forum, including progress in research and innovation efforts and possible future prioritisation. The government will work to strengthen dialogue and cooperation between the players in the green field, including the research-financed funds, education and research institutions, and the business community." At the level of the Climate Plan 2020 (to which the Green Solutions Strategy is loosely connected) stakeholders are also involved via Climate Partnerships with private sector associations, as well as a Climate Assembly consisting of 99 randomly chosen citizens.

## Assessment of governance capacities

### Collaboration and alignment (strategic, operational, instrumental)

#### *Multi-sector policy processes*

Most of the collaboration and coordination around the Green Solutions strategy seems to concern the **inter-ministerial dialogues on how to meet the 70% goal** set by the Climate Law and Climate Agreements. Led by the new 'Green Committee' appointed by the Ministry of Climate, discussions were held on prioritisation of bottlenecks, the required type of changes, and suitable support measures. Recognising that existing practices were insufficient for meeting the goal, the discussions also covered R&D and innovation. Apart from having this committee in place as a permanent structure, the ministry of HES also initiated a study to analyse in more depth on what accounts research policy could best contribute. Again, policy officials of various ministries engaged in such explorations.

In practice the above meant that there were parallel tracks of investigations and negotiations. The various activities complemented each other, as at some point the Ministry of Climate released **projections** on how to realize emission reductions; other ministries (including HES, Finance, and in social sectors like transport and agriculture) used this as a **guidance for assessing suitable policy changes**. The study by HES, in collaboration with other ministries, revealed for the various social sectors the stage of development of various technologies relevant for meeting the projected goals. The results formed a basis for deciding in what domains research capacity would need to be increased. Moreover, considering differences in the research and innovation system per domain, policy officials also reflected on alternative approaches for spurring research in those domains.

Translating these policy design choices to the instrumental level currently stretches over research support measures only, notably HES' five major funding organisations. Alignment of policies complementing such research support efforts is not explicitly embedded in a governance structure associated with the Green Solution Strategy itself, nor with the policy administration that is responsible for executing the strategy. The Climate Council does have oversight regarding green innovation efforts across the entire government, but advises on rather than develops policies. Generally the emphasis of the government's policy approach and governance capacities lies on **centrally identifying topics** and domains in need of intensified research

investments, which then **guides decentral activities** like the R&D support provided through HES' Green Solutions strategy.

#### *Multi-actor stakeholder processes*

Governance capacities for promoting stakeholder participation comprise several different settings. In addition to the abovementioned cross-ministerial deliberations regarding the prioritisation of green research topics, HSE also engages academic experts in its decision making. As the ministry is used to engage with such communities, it did not require many new capabilities to get those scholars' views on technological opportunities for meeting the emission goal. However, to structure interactions and information retrieval, HSE put together a **group of representatives** from different universities. Earlier it was already mentioned that annual feedback (on the green research strategy) is collected also from the Green Business Forum.

Also at the level of individual projects, there have been changes regarding stakeholder involvement. Instead of awarding projects to individual companies or research institutes, there is now an ambition to **support broader multi-stakeholder consortia**. Providing larger research grants is one of the ways to enable the formation of partnerships focusing on both the development and testing of green technologies.

#### **Legitimacy and leadership**

The Green Solutions Strategy was championed by a small team from the HES ministry, using the Climate Act as an opportunity for following up on recommendations provided in the expert panel's review of the Danish R&I system. Legitimacy for the directionalities in the new strategy is mainly derived from the **technical analysis** showing which technologies are promising for meeting the projections of the Ministry of Climate. The missions part of the new strategy provides some more clarity on the goals innovations should contribute to, but these goals are admitted to be still rather open. However, missions are also believed to be more political than just (the other) research topics. At the moment there is an ongoing debate regarding how much leadership is expected from the government. Strong parliamentary views and commitment on how to pursue the missions might be decisive for their success, but such a degree of steering is controversial.

#### **Learning and Experimenting**

When it comes to governance capabilities for learning, one important event is the ministries of HES' invitation for the **international expert panel** (with support of the JRC) to make **a review** of the Danish innovation system. The panel identified a need for a comprehensive national strategy and general targets for Danish research and innovation. It concluded that there is excellent research in Denmark, yet a lacking ability to convert this into innovation and concrete solutions. The panel also pointed out that there is a potential for enhancing the strategic implementation of funds in the Danish research and innovation system and that Denmark should develop new strategic instruments in the field of innovation (HES, 'Green solutions of the future', p. 11/12). These recommendations have been of evident influence on the ministry of HES latest research strategy.

Like in many governance systems, also **formal evaluations** play a major role. A key recommendation of the **international assessment of Innovation Fund Denmark** from March 2019 was to turn strategic research into research that creates foundations, has a long-term perspective, is coherent, and builds capacity.

Partially in response to these findings, the ministry of HES embarked upon its **analysis** of which particular topics to fund when also considering the emission goal of the Climate Law. According to the Green solutions strategy (p. 18), "The mapping was conducted in a number of consultations involving ministries, higher educational institutions, government-approved research and technology organisations (GTS institutes), innovation networks and clusters, public and private funds, business and interest organisations, NGOs, and professional organisations, and the recommendations of the climate partnerships." Having usually more generic scope, the ministries of HES earlier strategies normally didn't draw on such an extensive effort to set

directions. Apart from analytical competences for studying e.g. funding streams, research capacities and publication outputs, this also required competences for organising the interactions with stakeholders engaging in the aforementioned mapping. These competences need to be sustained, as the scope of the green solutions strategy is likely to be revised over the coming years. Parts of the strategy that might be adapted include the prioritized research topics (some of them potentially being promoted to missions), and the scope of open calls for which the mission-driven partnerships can apply.

### Managing conflicts

Resolving conflicts is not a prominent part of the strategy, as it primarily relies on appointing green topics for **competitive research calls**. Funding is allocated via public tenders, rather than via processes leading many stakeholders to agree on prioritized solution directions (like in specific roadmaps or budgeting exercises).

## 4.10 SFI Challenge Programmes (Ireland)

### General description

Since 2018 Ireland has implemented five challenge-based funding programmes under the lead of Science Foundation Ireland (SFI), the national science and engineering funding agency. Challenge funding aims to accelerate the development of transformative and potentially disruptive Science, technology, engineering, and mathematics (STEM)-led solutions to address significant national and global societal challenges. Important features of this **solution-oriented funding scheme** are a focus on *interdisciplinary* and diverse research teams. These teams *compete* in four stages with strict timelines for application/project launch, concept and seed phase, and the overall final prize. Stakeholder engagement and *co-creation* with beneficiaries and end-users is considered as a requirement in all phases, to ensure optimal translation of the challenge and societal impact of the solutions.<sup>22</sup>

The programmes are organized around different challenges for which € 3-5M are reserved per challenge. The SFI Future Innovator Prize was the first challenge-based scheme established in 2018 and with prizes awarded in 2020. The **current portfolio includes four active SFI Challenge Programmes** on Artificial Intelligence (AI) for Societal Good Challenge and The Zero Emissions Challenge (both launched in 2020), and a Plastics Challenge and Food Challenge (both launched in 2021)<sup>23</sup>. Within each programme, **specific challenges and solutions are defined bottom-up** by the applicants. Their definition and scope can vary considerably. Some challenges have a narrow focus with clear objectives and solutions (often defined in technological terms), while others have a broader focus to better address the problem complexity. Next to the main prize, a bonus prize may be awarded for teams demonstrating potential transformational impact.

Each challenge builds on a **stage-gated process** with fixed time schedules and budget allocations: After a short application phase, teams receive a small amount of funding for 3 months to form the team and concept, validate it with end-users and develop an impact pathway for the solution. In the seed phase (9 months), focus is on prototyping solutions and to develop a solution deployment plan together with stakeholders. In the final prize phase (12-24 months), the best team receives the prize award to deliver solution and advance deployment. Each team consists of team lead and co-lead (e.g. from academia) as well as a **societal impact champion** from the public sector or civil society (e.g. policy maker, NGO, expert, social entrepreneur, charity). With this shared team leadership, impact should not be an add-on to the research. The impact champion should assist teams to navigate non-technical issues, such as stakeholder engagement, societal barrier identification or non-technical skill development for innovation.

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<sup>22</sup> SFI (2020) SFI Challenge Based Funding Overview. August 2020

<sup>23</sup> <https://www.sfi.ie/challenges/>

Before the implementation of the SFI Future Innovator Prize, SFI’s funding portfolio and the Irish RD&I system in general was characterized by traditional R&D funding. The development into challenge-oriented funding was **gradual and a process in small steps**. First ideas to strengthen the relevance of more thematic challenge- or mission-oriented funding Ireland arose already with the involvement of Ireland in the European Joint Programming Initiatives (JPI) in the seventh Framework Programme (FP7). European research funds are of strategic importance for Ireland. With the **European discourse around mission and challenge-orientation**, and the observation of a changing European research funding landscapes, internal debates evolved around the question of how to **prepare Ireland’s science and research landscape** best for this new development in research funding.

At the national level, challenge-based funding was first mentioned as a strategic action in the National science and innovation strategy Innovation 2020 launched in 2015 by the Irish Government<sup>24</sup>. Here, the aim was to explore the potential for competitive funding mechanisms to accelerate solution-driven research and collaboration for grand societal challenges. In addition, several other strategies calling for transformational change and innovation started in parallel, such as the Government’s climate action plan or the National Development Plan Project Ireland 2040 (2018-2027). With these strategies, challenge-based funding receives increasing legitimacy as a way for research outcomes to flow more directly into society and economy. Despite recognising the strategic importance of challenge-oriented funding directed at societal problems, no specific budget or additional funds have yet been made available to implement initiatives on a broad national scale.

Inspired by international experiences, SFI started to develop its own challenge-based initiative for the specific field of STEM-related research, and this motivated the agency to **start experimenting with its own award scheme**, and to run the Future Innovator prize as pilot on a rather small scale. SFI funds interdisciplinary teams led by researchers from the areas of science, technology, engineering and mathematics (STEM) domains, but which may also include researchers from the Humanities, Behavioural and Social Sciences. The methodology, experiences and lessons learned from the Future Innovator Prize and its successor programmes could then be used as input for other agencies, to implement challenge-based funding on a broader scope. SFI considers its challenge programmes still as a form of pilot with small budgets and covering a rather narrow small range of actors and fields. Based on the learnings with its own programme, the organisation aims to significantly scale up by involving various domain specific departments (health, environment, etc) and acting as coordinator and facilitator for challenge-driven funding in Ireland.

**Development of transformative policy characteristics**

The table below highlights the most remarkable changes in TPI characteristics over time:

SFI Challenge Programmes	
Directionality	SFI’s challenge programmes combine thematic funding with a bottom-up approach to challenge- and solution-driven funding. While the Future Innovator Prize (2018) started as open programme for disruptive STEM-related research, follow-up challenge programmes become more focused

<sup>24</sup> National science and innovation strategy of Ireland: Innovation 2020. <https://enterprise.gov.ie/en/Publications/Innovation-2020.html>

	<p>on specific societal problems. This ensures problem directionality at the outset. The identified challenges and solutions should be visionary and unconventional, at the same time achievable and with transformative potential. Each challenge is validated against the addressed problem and envisioned solution, and its technological and non-technological aspects. The funder collaborates closely with the research team, its stakeholders, beneficiaries and end-users, from application to award, to develop impact pathways and deployment plans. The competitive step-wise process should ensure problem and solution directionality, legitimacy and impact at the same time.</p>
Societal goal	<p>Emphasis is on developing new and disruptive STEM approaches to address global or national challenges, in line with 'grand challenges' or the SDGs. Even though (STEM)-solution driven, societal impact and potential transformation in societal problem areas are central to the funding approach. For this reasons, new models of partnerships between science, government, enterprise, society and citizens are fostered. There are great ambitions to develop from a STEM-centred approach towards a broader challenge-oriented strategy, involving humanities, economics and social sciences, as well as other field-specific departments and funding schemes (as in health, environment, agriculture, etc.).</p>
Cross-silo policies	<p>The challenge programmes are run by SFI and financed by the Department of Further and Higher Education, Research, Innovation and Science. As part of its activities, SFI engages in formal partnerships (co-funded initiatives) with other departments such as Foreign Affairs (DFA) for solution diffusion. The small size of Ireland's public sector ensures informal coordination and interaction, for instance with other research funders, across SFI domains (economic and social sciences research) and government departments. In its new organisational strategy, SFI expresses the ambition to become the national agency for challenge-based funding. The aim is to coordinate challenge-based funding activities across different departments and funding agencies. A new national innovation strategy, with action points for such a broader-based challenge-orientation is currently under development.</p>
Mobilising demand-side	<p>SFI challenges programme is a solution-based programme. Co-creation with (commercial and non-commercial) end-users are cornerstones to ensure solutions are meaningful for beneficiaries and create value in society and economy. The interplay between the societal problem, the identified challenges and beneficiaries/end-users is validated from the application phase onwards, throughout the funding cycle. As a research funder, SFI works closely with the research teams to train their entrepreneurial skill set, facilitate market transfer, or identify potential economic, regulator or behavioural barriers early on. Other (demand-side) policies or policy strategies are not linked to the different challenges or overall programme.</p>
Stakeholder involvement	<p>SFI as an organisation uses stakeholder consultations to develop their organisational strategies. With the shift to challenge-based funding, stakeholders were extensively involved to provide input for programme design and operation. Given the character as 'learning programmes', continuous stakeholder input and feedback was important to gradually improve the organisational structure and processes around the programme. Stakeholder engagement ensured organisational learning, and sharpened the understanding of what is needed to best support both academic research and solution deployment in society. The programme's small scale facilitates trust-based relationships with different actors (academic community, business, society). SFI takes over stakeholder management at the programme level, by organising workshops, network events and 'societal impact' trainings for the teams. Moreover, each project develops its own stakeholder engagement plans. The societal impact champion (e.g. from the public sector, NGO, expert, social entrepreneur, charity) of each project/team is responsible for non-technical leadership, to navigate the research and guarantee solution validation, deployment and societal impact.</p>

## **Assessment of governance capacities**

### **Collaboration and alignment (strategic, operational, instrumental)**

#### *Multi-sector policy processes*

As a national agency for R&D, SFI funds oriented basic and applied research in the areas of science, technology, engineering and mathematics (STEM). Its current parent department (Department of Further and Higher Education, Research, Innovation and Science (DFHERIS) was established only in 2021. It now unites higher education and science agendas (formerly Department of Education) and research policy agendas (formerly department of Enterprise, Trade and Employment). This **organisational re-structuring is seen as an opportunity** to bring the research communities in universities closer to policy and society, **to broaden the mandate of SFI** away from economic competitiveness to societal benefits such as health, environment culture and ecological concerns.

Moreover, current government strategies (e.g. national R&I strategy, development strategy, climate action plan) **create impetus at a high-level** to broaden the focus on system innovation and transformative change. However, concrete resources to enable upscaling of the challenge programmes have not been secured yet. SFI's ambition is to support innovations for societal challenges on a more systemic level, using its experiences gained over the past years to facilitate cross-departmental coordination. The rather small **size of the country seem to favour openness and connections across departments**. However, up to now interaction with other domain-specific research funders (e.g. in health or agri-food) occurs in a more informal way. **Barriers to co-funding across departments** might be one of the major bottlenecks to set up real cross-domain 'challenge partnerships' and to achieve broader collaborations across the public sector. The joint initiative established with Foreign Affairs (DFA) to support solution diffusion across countries can serve as an example.

#### *Multi-actor stakeholder processes*

SFI as the bigger organisation holds close relationships to the research communities in universities and companies to develop its organisational strategies. Stakeholders are **consulted on strategic questions** related to for instance the future direction of its funding lines. Here, methods range from large-scale consultations about key topics, to targeted workshops using co-creation and ideation techniques for programme development.

At the programme level, the SFI programme managers work closely with its research teams throughout the stages of the funding programme. SFI also manages stakeholder engagement at the programme level, by organising workshops, network and demonstration events and 'societal impact' trainings for the teams. This should facilitate **co-creation on the programme side as well as on the research (project) side** to develop impactful solutions. Working in a small team and narrow field facilitates interactions and trust between the different research communities in Ireland.

Moreover, each team is responsible to develop its own stakeholder engagement plans and procedures. The **societal impact champion** (e.g. from the public sector, NGO, expert, social entrepreneur, charity) has a key role to play in establishing stakeholder relationships and collaborations, to direct the research to beneficiaries and guarantee solution validation, deployment and societal impact.

### **Legitimacy and leadership**

Inspired by a greater European trend in mission- or challenge-oriented STI funding, SFI started to develop a vision for implementing a challenge-oriented research programme in Ireland. Targeted research funding towards societal problems such as environmental or health issues was mentioned as strategic action point in



the national strategy for research and innovation (2015-2020). The strategy provided reasonable ground for the funding agency to further develop its ideas, even though with limited budget and a narrower focus as initially envisioned.

The fact that national resources for research and innovation were generally scarce and broader support for new funding practices limited contributed to the decision to do a pilot, learn as an organisation along the way and based on own experiences. A **dedicated team within the organisation** was made responsible for designing a programme structure that can combine the benefits of interdisciplinary team research, bottom-up competition on the best solutions and societal value generation.

After the launch of the Future Innovator Prize and four succeeding challenge programmes, SFI now prepares itself for leading the coordination of a cross-domain programme. The experiences with the challenge programmes showed that new types of research funding programmes require **changes in the 'modus operandi' of the organisation itself**, including **capacity building, on the job training and skill development of employees**. This led to a cultural shift in the perception and operation of the organisation as a research funder: If funders expect the research communities to be agile and adaptive to changing challenges and environments, **the organisation needs to be agile and adaptive to support research**. By now, there seems to be awareness in the wider public sector that the move towards challenge-based funding needs to go hand in hand with a broader cultural shift. This would require not only additional resources but also clear responsibilities to facilitate change processes and stimulate cross-departmental collaboration.

Hence, the SFI Future Innovator Prize follows the idea of **a learning programme**. In the first development phase of the programme, much emphasis was on organisational and process innovations to support the innovation at the programme or instrument level. Now when preparing the growth phase, more **resources and capacities** would be necessary for the programme management to be able **to coordinate joint initiatives with other departments and new partners** (e.g. SSH communities).

### **Learning and experimenting**

Before starting its own programmes, SFI **learned 'from outside' by observing others and collecting inspirations** from international examples, such as the challenge programmes of the Gates foundation or the EU missions. The participation in international conferences and workshops of policy practitioners showed that organising large-scale challenge or award programmes seems to be a challenge in itself. One way to move forward, despite a success recipe that is immediately applicable for the Irish situation, was to start small and with narrow focus, develop an own methodology and learn as much as possible along the way.

The **shift towards challenges forced the organisation to develop**, and 'learn from inside' by creating own best practices. Starting from a culture of traditional research funding, **changes in funding requirements and application procedures** (e.g. stage-based funding with shorter proposal, stricter timelines) were necessary to implement a funding approach that combines bottom-up directionality and immediate and transformative impact. Moreover, the programme managers engage with teams and meets them regularly, to act as a 'sounding board' for the teams to society, navigate them if necessary, or coach the 'societal impact skills' (i.e. networking and stakeholder engagement. This required a **shift in the understanding of the role of a research funder and programme manager**. Major investments (training, workshops, etc.) and time of the programme management need to flow into the process of research funding, facilitating, networking and coaching the research teams. The close and trust-based relationships to the challenge teams were important to generate learnings within a new programme, and receive immediate feedback on the benefits of the processes. Learning was rather easy at small scale, but additional capacities would be necessary to fulfil these roles also in a growing challenge programme.

Each team is responsible for the societal validation and impact assessment of its solution. At the programme level SFI aims to **move from an indicator-based to a qualitative or a framework-based approach** aims for impact assessment to follow the programme logic and understand its part in the system. This qualitative approach is currently pursued through stakeholder engagement, to **develop case-studies and narratives about real impacts**.

### **Managing conflicts**

Societal challenges were mentioned as an objective for research funding in the national R&I strategy, but initially there was **insufficient budget available to establish a large-scale and national-wide programme**. The solution was to establish a pilot project and experiments within a small team and in the rather narrow area of STEM-based research. In the current growth phase, available resources for challenge-based funding are still an issue, even though awareness about benefits of challenge-based funding increased significantly in the public sector. Major questions concern the affordability of big mission-or challenge-based programmes, either on top of or by replacing existing project-based schemes. These strategic questions influence not only the resources but also the capacities for effective programme management and coordination.

At the operational level, **expectation management** was crucial when working with new funding logics to explain the aims of a challenge-based model and give the research community a direction on what to expect. The fact that solution-oriented research is not (only) about commercialisation, but aims at a broader perspective on impact and societal value generation, requires training and awareness raising. Here, **early stakeholder engagement and co-creation** aspects of the programme helped to build up relationships and trust of stakeholders and partners.

## **4.11 City of Tomorrow (Austria)**

### **General description**

City of Tomorrow (CoT) was established as a research and technology funding programme, focusing on new energy solutions and their integration with services in future climate-neutral cities. The programme in its current form was installed in 2013, building on the experiences and results of the predecessor initiative 'Building of Tomorrow' (BoT; 1999 -2013)<sup>25</sup>. BoT was aiming to demonstrate the first passive house in Austria, following the demonstration of the first Plus-Energy-building within both aspects renovation and new construction. BoT was one of the outcomes of a comprehensive visioning process called "Austrian Programme on Technologies for Sustainable Development" (at:sd) organized in the late 1990s<sup>26</sup>.

Moving away from the strong technological orientation (e.g. related to the building of passive houses or building complexes) of its predecessor, CoT developed over the years into a programme with an integrative or systemic view on solutions for urban (energy) systems. CoT aims to develop scalable and multipliable prototypical model solutions for integrated urban energy systems to accelerate Austria's decarbonisation until 2040 and achieve the national climate and energy plan (NKEP). Next to technological feasibility, this includes challenges related to regulatory, economic and societal (behavioural) changes necessary at the building-, district- or city-level. The portfolio of operational objectives ranges from 1) the support of resilient cities and districts with high resource and energy efficiency, increased use of renewable energy production and high quality of life; over 2) optimising and adapting urban infrastructures in light of ongoing urbanisation and the associated increase in resources and energy; to 3) developing and securing both the technological leadership and the international competitiveness of Austrian companies and research institutions.

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<sup>25</sup> Biegelbauer et al. (2020): Mission-Oriented Innovation Policies in Austria – a case study for the OECD. Case 4, pp. 51-58;

<sup>26</sup> <https://nachhaltigwirtschaften.at/de/sdz/>

Austria's research landscape traditionally shows a high level of technology- and industry-oriented funding. As most R&D programmes in Austria, CoT is financed by the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK; before 2020 Ministry for Transport, Innovation and Technology BMVIT). Programme management and operation is shared in a consortium of partners, which work well together and guarantee a smooth process at the operational level. Next the BMK, this management team involves the Austrian Research Promotion Agency (FFG; responsible for preparing and executing calls; proposal assessment and pre-proposal consulting and support), the Austrian Promotional Bank (aws – Austria Wirtschaftsservice; accompanies projects to facilitate market transfer of new solutions); and the Austrian Society for Environment and Technology (ÖGUT; responsible for public relations, the organisation of workshops, networking events, or community building measures to connect CoT with different research communities. While the partners jointly decide about high-level issues and strategic direction of the programme on a yearly basis, the management team meets and regularly interacts to further develop and implement the programme.

Currently, the programme includes three parts or funding lines: (1) Application-oriented technological development; (2) integration of new technologies into existing systems; and (3) demonstration or transformation projects including technological, regulatory, societal or economic aspects of contemporary urban solutions. Since its implementation, CoT launches project calls every year with changing topics and focus areas. The program's overall budget is defined for each call and year, with resources depending on current political priorities. For instance, the government decided to provide additional funding due to its current focus on climate-related issues. The aim is also to support climate neutral districts as contribution to the EU Horizon Europe mission "100-climate-neutral-cities" as well as the green deal with new technologies and solutions to accelerate national renovation.

The recent calls and thematic focus areas place more emphasis on system integration or urban transformation aspects. In addition to these project-based funding lines, CoT funds three Innovation Laboratories (related to nature-based solutions; digitalisation of the construction sector; solar energy usage and optimisation) to provide a permanent space for experimentation and co-creation beyond the duration of conventional research projects. These laboratories aim to learn about the variety of challenges that may emerge over time, and act as national competence centres and thematic agents for the CoT programme when it comes to handover from research to the market or in questions of standardization and regulation. CoT also supports 'model regions' for intelligent energy solutions, focusing on scalability and transferability to other areas.

Stakeholder management and involvement is key for the programme. Major target groups in CoT are next to the traditional applied R&D actors (e.g. in industry or technical universities), cities with its different actors (e.g. local authorities, city planners, citizens/users) or city-industry partnerships. Particularly within the integration- or demonstration-oriented programme lines, CoT stimulates close cooperation between municipalities, local communities, civil society and research (esp. social scientists). Directly involving cities and local authorities, not only as partners but also as leaders of projects, became increasingly important for CoT. The programme is hosting several "focus groups" for specific topics and representatives of the quadruple helix (city administration, construction industry, energy intensive industry, architects and real estate developers). This group is splitted into organizations as participants of research projects and organizations as target group for research outcome.

A noticeable aspect is that CoT integrates a national and a trans-national programme line within one initiative. The trans-national line is closely related to the European initiative JPI Urban Europe (run and managed in Austria), and a share of CoT's budget is dedicated to trans-national initiatives and knowledge exchange (city partnerships, etc.). At the national level, the RTD and energy focus of City of Tomorrow is complementary to other funding programmes, such as Smart City Demo (with even more focus on municipalities, partnerships and demonstration projects for Smart Cities) or Energy Model Region (Modelregion Energy; with an emphasis

on change and transition processes of regions/districts), also run by BMK in cooperation with the Climate and Energy Fund (KLIEN).

### Development of transformative policy characteristics

The table below highlights the most remarkable changes in TPI characteristics over time:

City of Tomorrow	
Directionality	<p>Ambitious, middle-range challenges were implemented in the various editions of Building of Tomorrow (BoT; 1999-2013). These challenges grew gradually given the positive results with the programme (e.g. building a passive house; creating energy producing houses; zero energy districts or cities). In CoT, the goals shifted from initially technological goals, to a systemic perspective formulated as ‘scalable and multipliable prototypical model solutions for integrated urban energy systems’. CoT is acting in support of the National Energy and Climate Plan to accelerate the decarbonisation of Austria until 2040, with broadly defined operational aims (e.g. support resilient climate-neutral cities, optimize urban infrastructure). Within these programme aims, project funding is still more technologically-oriented but with emphasis on system integration, demonstration and transformation. The focus areas are defined in yearly calls by the management team based on stakeholder consultation. Next to traditional project funding, the programme currently (co-)funds three challenge- and solution-driven ‘innovation laboratories’ on a permanent basis, beyond project duration.</p>
Societal goal	<p>Building of Tomorrow was initially a technology funding program, with limited consideration of societal aspects (e.g. in form of accompanying social research to study user behaviour). Initially designed as a R&amp;D programme, the technology orientation of CoT is still visible. Over the years, more and more system aspects (including regulatory, societal or economic challenges in cities) were built into the programme to approach the topic of climate neutral and energy efficient cities from a broader perspective. This contributed to a shift in focus areas and instruments, with growing importance of system integration and demonstration projects at the district or city level.</p>
Cross-silo policies	<p>The programme is run by BMK, a Ministry integrating Climate, Energy, Environment, Technology and Innovation agendas. Austria’s administration system is still characterized by a culture of departmental thinking (with own budgets and strategies for different sections). Different support programmes are established and run independently from each other (e.g. mobility, energy, ICT), all having connections to urban environments. These administrative ‘silos’ are partly broken up at the operational level, where alignment can take place between programme coordinators and management teams (e.g. working groups, alignment meetings). The responsibilities of the FFG in operating several programmes contributes to cross-domain coordination of all relevant R&amp;I instruments. At the instrument level, there is increasing recognition of the complementarities between programmes, and the need to coordinate due to similar aims and target groups (cities). The European ‘urban mission’. as recently implemented at EU level, create a further push to enhance also the strategic (cross-field) coordination around urban topics within the BMK, and to prepare Austrian cities and research communities for European funding. Moreover, CoT integrates a national and a trans-national programme line with dedicated budgets. As the</p>

	latter is linked to the European initiative JPI Urban Europe (managed by Austria/BMK), multi-level interaction (city - European) and knowledge exchange (city partnerships, etc.) is facilitated.
Mobilising demand-side	A market or application-orientation was already part of Building of Tomorrow, for instance with the funding of lead projects. The involvement of aws (Austrian Promotion Bank) in the management team since BoT has ensured the support of companies (SMEs) in transferring research results to marketable product early on, already during the project. An important feature of the new CoT is to involve (public) users such as city planners and local authorities in the definition of focus areas for the calls. These (public) actors should then also be in the lead of projects to ensure commitment, a project set-up according to their needs and awareness about potential regulatory changes (at the city or region level) to deploy new solutions. Specific support schemes have been put in place to further incentivize these 'lead users' and facilitate proposal preparation for local civil society or public actors (e.g. change eligibility criteria for cities; experiment with non-competitive funding; networking; training).
Stakeholder involvement	CoT pursues stakeholder involvement with an active 'knowledge and actor management', established during the past five years. Key representatives ("key agents") with high embedding and trust in the respective communities (e.g. industry associations, city planning, research) are identified to create short ways to different stakeholder groups. In this way, CoT attempts to integrate key stakeholders early on in the thematic orientation and design of its programme lines. A key element of this stakeholder management is a networking platform, with the function to connect different target groups (technology suppliers such as industry with demanders at the building or city level), and to support coalitions and partnerships across larger cities. For programme managers, the platform serves as a knowledge source about stakeholder needs, regarding new themes or emerging research question, to be integrated in future calls. Members are requested to hand in their ideas on a regular (yearly) basis. At the project level, various stakeholders need to be addressed to be eligible for funding.

## Assessment of governance capacities

### Collaboration and alignment (strategic, operational, instrumental)

#### *Multi-sector policy processes*

City of Tomorrow (CoT) is a programme run by BMK, a Ministry integrating Climate, Energy, Environment, Technology and Innovation agendas. Despite this broad portfolio of agendas within one ministry, Austria's administration system is still characterized by a culture of departmental thinking, with own budgets and strategies for the different sections. This contributed to the emergence of several support programmes, running independently from each other in different fields (e.g. mobility, energy, ICT), with some connections to future cities. Strategically, the development of European 'urban mission' as part of Horizon Europe, might create a push for more strategic and cross-field coordination across the different BMK sections. Here, major opportunities are seen in better positioning Austrian cities and research communities in the European funding landscape.

The existing department '**silos**' are partly broken up at the operational and instrument level, as alignment and coordination can take place in the programme execution, for instance through more informal ways such as regular working groups, meetings and knowledge exchange between colleagues, etc. At the instrument level, there is increasing recognition of complementarities between funding instruments (such as between CoT and Smart City Demo or the 'Modelregion' initiative) and the need to coordinate due to similar target groups (e.g. cities) or the interlinkages of programme aims. The responsibilities of the FFG in operating several R&I programmes contributes to a better **cross-domain coordination**, the **alignment of R&I funding schemes**, and more targeted briefing of stakeholders and (potential) applicants for the different

programmes. Moreover, CoT integrates a national and a trans-national programme line already since the foundation of the programme in CoT, with the latter being linked to the European initiative JPI Urban Europe (managed by Austria/BMK). This ensures **multi-level interaction** (city, national, European) and knowledge exchange. Parts of the CoT budget is reserved for **trans-national initiatives** such as city partnerships.

#### *Multi-actor stakeholder processes*

So-called **actor management** and close contact to various stakeholders in cities plays a central role in CoT. While in BoT stakeholders (e.g. end-users, citizens, building environment) were mainly involved at a project level, CoT established a form of more strategic stakeholder involvement over the past years with the so-called 'knowledge and actor management'. This is in line with the objectives of the programme, namely to establish an 'urban' community, and develop competences also on part of end-users (cities, citizens or consumers) to implement innovative solutions. Core of this is a networking platform which was established in 2018 and involves representatives of all actor or stakeholder groups with a specific interest in the programme (e.g. from industry associations, built environment, social and technical research, planners and coordinators in cities). The functioning of the **networking platform** is to connect different target groups of the programme (initiators of projects and demanders of project outcomes) to exchange knowledge, learn from each other and establish short ways and partnerships. The platform enables to source research needs and relevant research questions directly from the CoT community, based on which future calls can be designed. This allows to further develop, adapt and target the programme more to user needs.

To these aims, **key agents**, that is individual representatives embedded and acknowledged by their respective communities, are identified to actively participate in and provide input for the networking platform based on their (communities) views and standpoints. Good experiences have been made with both the networking platform and the key agent model, leading to new ideas of how to expand the scale and scope of the platform (e.g. more cities or smaller cities) or replicate it in other fields (e.g. real estate sector). Currently citizens are considered mainly via their city or district coordinators, or via social researchers bringing in their expertise and knowledge from previous projects, but are not equally involved at the programme level (i.e. beyond individual projects).

**Input for the thematic orientation** of CoT and **new call topics** is mainly **provided by the community** itself. While earlier calls (2013 and 2015) were based on a broad public consultation process, the platform members (particularly the key agents), and the leaders of the innovation laboratories have now a stronger role, and are consulted on a regular basis. Decision on new topics, focus areas or instruments are then taken within the management team.

Generally, the **responsibilities for stakeholder involvement activities are shared** between the **management team**. BMK as the lead ministry is responsible for strategic questions and the functioning of the knowledge and actor management to ensure that input gained can effectively feed back to the policy process. The FFG is involved in the thematic consultation and training of project applicants in line with the programme goals and supports stakeholder activities at the project level; the aws (Austrian Promotional Bank) covers all market-related aspects to assist companies in the marketisation of new solutions; and ÖGUT which is responsible for the operational assistance of networking activities, including community building measures (workshops, conferences, etc.) and public relations. Moreover, to make programme and project outcomes visible to the public, CoT is embedded in the initiative 'Nachhaltig Wirtschaften' (Sustainable Development), an online information portal for all RTD Programs in the area of Renewable Energy and Environmental Technologies. The aim here is to make the project activities and achievements, such as immediate outcomes and (potential) societal impact more tangible for the research community as well as the broader public. Through the range of activities, **stakeholder contact is ensured for the different stages of programme design and implementation** (planning, project and project outcome implementation and community building).

## Legitimacy and leadership

The **role of leadership combined, with visionary ideas and significant influence**, became visible in the development of the programme. After the (technological) successes achieved with BoT, and inspired by early experiences in other countries or at European level, there was a strong ambition for establishing a national research community with a dedicated funding scheme focusing on the topic of future cities. **Austria's lead in the European Joint Programming Initiative (JPI) Urban Europe** established in 2008 have not only propelled the developments but also justified the direction taken for a national programme on urban environments. With CoT, such an "urban programme" was established in the energy domain, with a systemic view on urban transformation and strong linkages to trans-national structures (JPI Urban Europe). The aspiration for a new and more systemic orientation in funding urban topics received another **push by the general trend in STI policy around new mission orientation**.

The aims of the programmes (BoT and CoT) and their editions followed a **gradual development** path, with several stages defined on the basis of 'medium-range' challenges and successes: Starting from building the first passive house (a one-dimensional technology mission), which grew further due to positive achievements during the programme duration into the goal to build an active house (producing energy), or a network of energy-efficient buildings as in energy-efficient districts (Energy Plus quarters). Particularly with the latter, a broader focus was already integrated considering the interrelations between energy efficient technologies, regulations in the built environment and citizens behaviour.

Moreover, the rather **broad goals and aims for the strategic direction** of the programme, **secured enough space and freedom for the programme management** to combine their field knowledge with new ideas in the programme implementation. In this way the focus of the program could be gradually shifted, from a mainly technology-driven to a more systemic or integrative perspective on urban futures. This also resulted in the development of new funding instruments (e.g. innovation laboratories) and new forms of interaction with society and stakeholders (e.g. networking platform) that should over time play together in the support of system innovation.

Despite its holistic focus on urban system, the **system barrier** for City of Tomorrow which resulted from the energy-related programme Building of tomorrow were also set around the energy domain in support of climate-neutral urban environments. This division is mainly seen as a result of the structure of Austria's funding landscape, and similar programmes were established in other related fields (future mobility, ICT of the future).

The fact that climate, energy, mobility, technology and innovation agendas are bundled in BMK, all technology and innovation programmes are organized within one section, and consortium partners of CoT are also involved in the management team of other programmes, facilitates the streamlining of the innovation policy mix, at least what concerns R&I instruments. Next to the strategic coordination, tasks are divided with regular coordination meetings (e.g. working groups) and communication structures in place that should guarantee also a smooth process and R&I policy alignment at the operational level.

## Learning and Experimenting

*Learning and experiments from insights at the project level:*

The insight that urban topics require a broader view, away from industrial or technological impact towards system and societal impact lead to a greater emphasis in funding activities related to "system integration" and "demonstration" projects. The shift in focus also led to great awareness that the **resources (time and financial), capacities or skills of public or societal actors** (e.g. local authorities, planning bureau) **to take a more active role, prepare funded projects or write proposals are limited**. But also for 'traditional' applicants, or well-established actors in the community, a **different skill set was required** (e.g.

to find partner, manage multi-actor partnerships). Therefore, special emphasis was put on the consortium building phase, in preparation for a call, to provide **targeted training and consultation** and to **incentivize a broader set of actors to take over the project lead**.

In light of the systemic and transformative programme goals of CoT, there increasing awareness that Technology Readiness Levels (TRL), as common in assessing and monitoring technology-oriented funding programmes, is neither adequate nor far-reaching enough. Therefore, more emphasis has been put on project integration and potential **systemic impacts in project assessment (proposal and outcome)**. Regarding assessment, this has been done on a more ad-hoc basis so far, for instance, by extending the scope of the assessor panel with regard to different aspects (technological and social) and by briefing the members accordingly. A **new methodology to better assess the 'system readiness'**, for instance related to the functioning of mechanisms and impact channels at the system level, and the contribution of funded projects to these, is desired and under development, but has not been fully implemented yet. Hence, much effort is currently put into finding a more systematic assessment and evaluation method, also in trans-national cooperation with other R&I funders.

*Learning and experimenting from insights at the programme level:*

**Regular adjustments of focus areas** can principally be made within yearly calls (key topics, alignment with other programmes and funds, etc.), which gives **some flexibility and responsiveness to the needs of stakeholders** (in particular cities) and the research community. While some topics remain essential over several funding rounds, others can be terminated based on the feedback from members of the network platforms. In the meanwhile, all calls include indicative budgets for demonstration projects and demand-driven strategic topics to separate those from common excellence driven paper research projects .

Moreover, with the stronger emphasis on demonstration and piloting in CoT, a new instrument has been created to allow for longer learning cycles and the **collection of experience from experimentation beyond the usual (short-term) project duration**. The innovation laboratories are established as co-funded instruments to address future needs and challenges in four different fields (e.g. Digital built environment, nature-based solution). To ensure consistency and embedding of the laboratories in the overall CoT programme, project applicants need to connect their project to the laboratory already during the proposal phase, if thematically relevant.

By shifting from individual technology support towards more transformative project funding, several **challenges to equally cover the 'application side' in projects** arose. At the beginning it proved to be difficult to provide **the same conditions for public actors** (e.g. municipalities) **to apply for research funding**. Legal measures and changes in the terms and conditions had to be taken to make these 'users' eligible for project-based research funding, but also to make participation in research projects more attractive. Often, the limited duration and uncertain outcome of projects goes against the organisational culture and structures in the public sector. Moreover, public or civic actors often do not have the necessary experience but also not the resources to take a leading role in proposal development.

Furthermore, to **reduce uncertainties** for cities to participate in competitive funding calls, CoT started to experiment with different ways to involve these key users or stakeholders early on in the programme design and development (co-creation) and the preparation of calls. Most importantly, a new form of **non-competitive funding** for city consortia was created with the help of indicative budgets. If a proposal meets the criteria for funding (i.e. is assessed below the required threshold) project acceptance and funding is guaranteed. This measure should allow that cities are not in competition with each other, but **create a community and actively engage in knowledge exchange and joint learning**.

So far, there has been no comprehensive **evaluation or impact assessment at the program level** for CoT after the programme evaluation for BoT in 2016. All funded projects are monitored and project outcomes



checked for their quality and impact. At the level of projects the system readiness levels are central, and should be applied more systematically after development. However, there are no 'in-built' evaluation mechanisms to assess success/opportunities/challenges related to new programme elements. The development of new evaluation and impact assessment tools or indicators for a systemic programme as CoT is not (yet) envisaged. Despite the ambition to learn and experiment also at the programme levels (new instruments, new programme elements or new project assessment procedures), less emphasis has been put on monitoring and evaluating the steps made or the impact of the measures taken so far.

### **Managing conflicts**

As already mentioned, the emergence of CoT is characterized by a **gradual evolution** from Building of Tomorrow. Also, the firmly established structures in the Austrian funding (technology) landscape with different partners ensures a gradual and smooth coordination process between core partners and actors. Partly due to this 'gradualist' culture in Austria's R&I funding system and administration, no radical changes or fundamentally new approaches can be observed in the development or management of CoT. This reduced the potential for major conflicts.

At the same time, the broad definition of programme aims and orientation enabled a **more continuous experimentation** and learning from the new approaches and instruments that have been implemented at a smaller scale first. Based on positive experiences, new ideas and experiments gained legitimacy within the public sector, could be continued or even extended with additional funding (e.g. expanding the actor platform, launching new innovation laboratories).

## **4.12 Industrial Strategy Challenge Fund (UK)**

### **General description**

In 2017 the Ministry for Business, Energy and Industrial Strategy - BEIS - formulated the **UK's Industrial Strategy**. It had the status of a white paper, which was also endorsed by the British Parliament. Initially, £4,7 billion were foreseen for the period 2017-2024 for its implementation (OECD 2020). Designed as a supply-side policy for a successful and prosperous economy, the aim was to strengthen UK's industry and to become a world leader in research and innovation in four Grand Challenge fields (Artificial intelligence and data; Clean growth; Future of mobility; Ageing society). Progress on these challenges should be achieved by targeted government and private investments and new forms of public-private partnerships in the problem or challenge areas. Stimulating regions to develop their own Local Industrial Strategies was another core goal, with priorities targeted to local strengths and aligned with the national challenges.

The industrial strategy was designed as a mission-oriented policy framework overarching the UK's government. In May 2018, Teresa May (former Prime Minister) announced the first mission in each of the four Grand Challenge areas, with clear objectives, milestones and timeframes in order to focus the efforts of industry, researchers and government. The Economy and Industrial Strategy Cabinet Committee, chaired by the Prime Minister, was set up to deliver the strategy and its missions across government. This ensured support of the strategy at the highest political level under the previous government. In addition, to monitor and assess the progress and impact of the strategy, the Industrial Strategy Council was installed as main advisory body, involving key figures from business, academia and civil society. The task of the Council was to provide expert evaluations of the government's progress and recommendations for delivering the aims of the Industrial Strategy.

With the new government elected in 2019, the industrial strategy lost relevance at the highest political level. In March 2021, the Industrial Strategy with its missions was rebranded as a new 'Plan for Growth' (Build Back

Better: our plan for growth) incorporating three broad growth pillars (infrastructure, skills and innovation)<sup>27</sup>. Next to general goals for growth, the plan specifically refers to the recent challenges in tackling the Covid-19 crisis, and commits itself to UK's net zero emission target by 2050 as passed by the British Parliament in 2019. Given the broad focus of the plan and its growth pillars, the Industrial Strategy Council identified in its Annual report 2021 around 180 policies and commitments in different policy, that are relevant to deliver the plan for growth<sup>28</sup>. Emphasis on place-based strategies and multi-level interactions to support national challenges is less pronounced in the new plan, which has a stronger and more general focus on 'Levelling Up' falling behind places in the UK. However, it remains unclear how interactions between government and regions as well as cross-regional partnerships are facilitated.

The new government direction emphasizes R&D and technological frontier research, but puts relatively less emphasis on system or whole-government approaches as pursued with the Industrial Strategy challenges or missions<sup>29</sup>. The broader mission based framework is currently subject to review. While some missions were put on hold (Ageing society), environmental missions and goals (Clean Growth) have been incorporated in new strategies around the UK's ambitious net zero emission target. Several advisory bodies recently called for more system or whole-of-government approaches in supporting the net-zero transitions<sup>30</sup>, including the creation of clear leadership structures across central government, more multi-disciplinary operational units bringing together different administration departments, and the alignment of public sector funders for research and innovation in support of the net zero target.

One of the most important funding mechanisms for delivering research and innovation on UK's Grand Challenges is the **Industrial Strategy Challenge Fund (ISCF)**. It was initially developed to support the aims of UK's Industrial strategy in 2017 by means of challenge-based research (e.g. related to clean tech, clean growth), and still provides significant funding to UK's research and innovation landscape. UK Research and innovation (UKRI), a non-departmental public body managed by the Department for Business, Energy and Industrial Strategy (BEIS), is responsible for the implementation of ISCF. UKRI was created in 2018 as an umbrella organisation to bring the UK's science and innovation funding landscape closer together.

The OECD (2020) considers the ISCF as a challenge or mission-oriented agency programme. It provides research funding based on a multi-disciplinary approach (integrating social and technological research), with own challenges in line with the four priority areas outlined in the 2017 Industrial Strategy: Artificial intelligence and data; Clean growth; Future of mobility; Ageing society. So far, 23 'ISCF challenges' have been identified and launched within three waves (2017, 2018 and 2019).

Overall, the ISCF has been equipped with £2.6 billion of public money, with £3 billion in matched funding from the private sector (industry). Each ISCF challenge has a dedicated budget to conduct its activities during a three to four years duration, conditional to the commitment and funds provided by (industry) partners. Next to individual finances, each ISCF challenge also has its own governance structure consisting of a Programme Board, a challenge Advisory group and a Challenge Director (or 'Champion'), which are collectively responsible for developing the research and innovation agenda for the challenge duration. The challenge director (a Business Champion) has a central role in each challenge, as they can act and decide independently on concrete problem or solution directions taken during the challenge period.

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<sup>27</sup> HM Treasury (2021) Build Back Better: our plan for growth <https://www.gov.uk/government/publications/build-back-better-our-plan-for-growth>

<sup>28</sup> Industrial Strategy Council (2021) Annual Report 2021, <https://industrialstrategy.org/sites/default/files/attachments/ISC%20Annual%20Report%202021.pdf>

<sup>29</sup> UCL IPPP (2019): A Mission-Oriented UK Industrial Strategy. UCL Commission for Mission-Oriented.

<sup>30</sup> Council for science and technology (2020) Achieving net zero through a whole systems approach <https://www.gov.uk/government/publications/achieving-net-zero-carbon-emissions-through-a-whole-systems-approach>; Industrial Strategy Council (2021) Annual Report 2021 <https://industrialstrategy.org/sites/default/files/attachments/ISC%20Annual%20Report%202021.pdf>

## Development of transformative policy characteristics

The following discussion on TPI characteristics and governance capacities will focus mainly on the Industrial Challenge Fund, taking into consideration the broader developments in the UK innovation governance system. The table below highlights the most remarkable changes in TPI characteristics over time:

Industrial Strategy Challenge Fund (UK)	
Directionality	ISCF followed the challenge definition as outlined in UK's industrial strategy in 2017. These were addressed with 23 ISCF challenges, selected on the basis of government priorities and the expertise about research and industry needs within UKRI (1 <sup>st</sup> and 2 <sup>nd</sup> wave), or more wide-ranging and bottom-up stakeholder engagement (3 <sup>rd</sup> wave). The challenges/problems are broadly defined for each ISCF challenge from the start, while the partners contributing to solving it define their own agenda for the duration of the challenge (three to four years), with clear objectives or milestones. These goals can be updated along the way but need to contribute to the general challenge or objective set at the beginning.
Societal goal	ISCF is a R&D programme or technology fund with strong societal or user elements at the project level. Following the idea of challenge-oriented research funding, the major target group are actors of the UK's industry and research landscape to develop solutions to the Industrial Strategy's challenge areas. A key aspect of the ISCF is to provide funding for multidisciplinary research, to enhance interplay of all scientific fields relevant to deliver solutions. The aim is to create new ways of working between industry and academia, and across different disciplines, in line with a challenge. The fund explicitly focuses on integrating social sciences to understand all aspects of a challenge (societal impact of innovation, behavioural change, economic growth, global markets or supply chains, etc.) to support the provision and societal application of solutions.
Cross-silo policies	ISCF is run by UK Research and Innovation (UKRI), a non-departmental public body sponsored by the Department for Business, Energy and Industrial Strategy (BEIS) created in 2018. The organisation brings together seven disciplinary research councils, Research England, and the UK's innovation agency Innovate UK. A goal of the establishment of UKRI was a stronger coordination of science and innovation agendas. ISCF was established as one of the first research funding programmes under this umbrella with equal participation and cooperation in challenge definition and challenge selection of both sides. The funding for ISCF is based on public funding, matched with funding from the private sector (industry).
Mobilising demand-side	Demand-side considerations (i.e. related to potential markets or users) as well as the applicability of technological or industrial solutions are major aims of each challenge. Regulatory or broader societal aspects are therefore considered in the selection and development of innovations. The objective is to create a 'business case' for an effective solution to a challenge. Responsibility for demand-side activities and for creating a favourable 'business environment' for solutions is the hands of the individual challenge managers (business champions), and part of the solution development process. No further demand-side instruments or activities are specifically linked to the ISCF at a broader scale. .
Stakeholder involvement	The ISCF challenges are industry-led challenges which are supported by (academic) research. The first and the second wave of challenges were mostly defined based on in-house expertise, or the mobilisation of own networks for more informal or ad-hoc stakeholder (industry) consultations. For the third wave of challenges, in contrast, UK

	<p>industry actors were mobilised through the organisation of a bottom-up process. Stakeholders (particularly industry) could bring in ideas for future direction, based on main challenges UK faces. With the industry-led focus of the entire research program, direct involvement of citizens and the role of other societal actors is limited. A societal perspective on e.g. user behaviour or behavioural change is incorporated in each challenge, due to multi-disciplinary research teams including social, economic and behavioural sciences.</p>
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## Assessment of governance capacities

### Collaboration and alignment (strategic, operational, instrumental)

#### *Multi-sector policy processes*

The ISCF was established as one of the first research funding programmes within UKRI following a mission-oriented funding approach. Equipped with substantial public money, the main goal of ISCF was to support and deliver innovative solutions to the Grand challenges as outlined in the government strategy. UKRI works in partnerships with business and the public sector, as the challenge programme is based on **co-financing and the matching of public and industry money**.

The main goal of establishing UKRI as a non-departmental funding body was to better align the science and innovation agendas across the UK's research and innovation landscape. The new challenge-oriented government strategy as well as the **common interest in the challenges on the science side and the innovation side** limited potential competition regarding, for instance, the distribution of funding or resources for science mostly in academia and industrial innovation. Recognition of common benefits and joints aims prevailed in setting up a new funding programme in line with national aims and priority areas of the government.

#### *Multi-actor stakeholder processes*

The 23 ISCF challenges were identified and selected by combining government priorities with in-house expertise as well as the consultation of external experts and stakeholders in industry and research. For the first and the second wave of challenges, launched in 2017 and 2018 respectively, ISCF identified the challenges 'top-down', based on more informal consultation and checks with stakeholders in the agency's own network. Especially for the first wave, there was time pressure to launch the call. The ISCF drew mostly on in-house expertise, knowledge and networks to make a selection.

Along the way and in preparation of the second challenge wave, the agency conducted stakeholder workshops and engaged in direct consultation of industry and academia. After a longlist of challenge options, industry and academic could identify missing topics and ideas. The shortlist of challenges was then assessed in form of a strength and weaknesses analysis, and approved at the ministerial level. This **stakeholder-supported 'top-down' process ensured that policy priorities are to a high extent reflected** in the formulated challenges.

For the third challenge wave (2019), major efforts were taken to mobilise actors across the UK's industry and innovation landscape bottom-up through the organisation of an **open process to identify the next ISCF challenges**. Core to this bottom-up process for ISCF challenge identification was an **Expression of Interests (Eoi) by industry-led consortia**, involving also partner organisations from business, research, the public sector or charity. The aim was to identify major challenges UK's industry and society faces, also to understand the level of demand for innovation funding in order to address them. To this aim, applicants needed to provide evidence of industry demand for funding, a strong market analysis, but also explain what is currently preventing the challenge from being solved without policy support (additionality of funding). Despite the fact the Eoi process was not directly related to funding, but rather a way for industry to articulate their

main challenges, more than 200 applications proposed challenges to be taken up by ISCF. On this basis, UKRI selected a shortlist of challenges, for which funding was granted.

### **Legitimacy and leadership**

The ISCF is **underpinned by the UK Industrial Strategy at the highest political level**. As a White Paper the strategy has been endorsed by the UK Prime Minister in 2017 and launched by the Secretary of State for Business, Energy and Industrial Strategy (BEIS). The ISCF was designed as the principal tool to achieve the objectives of the Industry Strategy via challenge-based research funding and the bundling of public and private funds. Through the coupling to national Grand Challenge areas, also the identified ISCF challenges enjoyed high-level political legitimacy.

Another novelty was that each ISCF challenge is **led by a Challenge Director**, which is a key representative from 'outside' (mainly industry) and enjoying legitimacy in the respective field. These experienced industry leaders are hired on a fixed-term appointment, which allows them to act independently in designing and implementing their research and innovation agendas to tackle the challenge, explore market opportunities and develop a business case for their solution. The challenge directors are also **responsible and accountable for achieving progress** within the challenge period (three to four years).

### **Learning and experimenting**

The ISCF can be considered a learning programme as it is the first relatively open, large-scale but still targeted mission- or challenge-oriented research and innovation funding programme in the UK. Based on experiences with predecessor programmes such as Innovation Platforms, ideas for targeted innovation funding at greater scale developed already earlier within Innovative UK. The Industrial Strategy provided opportunities to realize a more focused and challenge-based approach to innovation support. The approach and lessons learned with the ISCF might serve as a template for other funding programmes too.

The ISCF was designed on the basis of experiences made with other targeted funding programmes (e.g. innovation platform). It was set up in a relatively short amount of time, given the timing to launch the first challenges. Especially the formulation of challenges, or how to define a bold and inspiring challenge for business, with tangible benefits of solving it for UK's economy and society, was perceived as not easy at the beginning. The leading principle of ISCF was that **"each challenge should be easily understood by everyone in the street"**. Practical experiences and examples from around the world were already available at the time of implementation.

Regarding monitoring and evaluation, the Industrial Strategy Council has been in charge of the overall progress monitoring and evaluation at the level of the Industrial Strategy. As an advisory body it can formulate recommendations and propose necessary changes in form of Strategy monitoring and progress reports. Specific focus are the development of success measures to monitor progress and evaluate implementation of the strategy (e.g. its contribution to UK growth, productivity or the use of data across the government)

The UK has a **strong tradition in using evidence from monitoring and evaluation** (e.g. based on rigorous programme evaluations, quantitative indicators/metrics and control group or counterfactual approaches, case studies) to justify and improve the funding system and its instrument. Also within UKRI, new indicators and measures have been developed to monitor progress towards achieving the challenges. For each challenge, responsibility for progress and success monitoring was initially with the challenge director. Over time, more experts were consulted in addition, to improve the level and provide extra guidance and expertise. Also, the outcome of each project (challenge) is subject to more rigorous evaluations, compared to 'normal' R&D projects.

## 5 Synthesis: Governance models and pathways for capacity development

### 5.1 Variety in policy approaches

This study looks into twelve policy initiatives, each of them relying (to some extent) on transformative innovation for addressing pressing societal challenges. The investigated cases share the ambition of not just accelerating independent innovative solutions; instead, they aim to drive a series of complementary changes that together bring about structural changes in production-consumption systems. Despite the apparent similarities in ambitions, however, there are significant differences in how public administrations design and govern their policies.

Viewing the twelve cases side by side, there are remarkable differences on dimensions like their geographic scope (national, regional, city level); the type of population(s) they target (science, industry, public authorities, societal stakeholders); the type of strategy they adhere to (domain programs, extended R&I funding, multi-themed umbrella programmes); their theoretical perspective on driving change (e.g. smart specialisation, mission-oriented policy, transitions policy); and what exactly is the object of coordination efforts (i.e. aligning innovation agencies, policies, or actors).

One of the most discriminatory dimensions, regarding how policy administrations deal with TPI policies, is the 'governance model' they work with. According to the literatures on public administration, governance, and political science, governance models express the role of governments in society - including the interplay with other governments as well as citizens (Van der Steen et al., 2015). Governance models are based on a coherent set of perspectives on different aspects of public organisation, including the position and interaction modes of policy makers vis-à-vis society (e.g. via law, a principal-agent relation or alliances), the legitimisation of government interventions (their input, output, throughput or outcome), what the policy makers are accountable for (processes or results), and the policy role that is assigned to other stakeholders (from passive to actively engaged).

Following the work by policy scientist like Van der Steen et al. (2015; 2018), we distinguish three archetypical governance models<sup>31</sup>:

- **Administration-based governance:** This model focuses on the bureaucratic machinery that produces policies on the basis of legality considerations. It highlights the government's roles of making and executing laws, and of being in the position to effectively and efficiently produce public services. The dominant notion is that public organisations have rules and resources at their disposal, in order to pursue the priorities of the political system they are representing. Within this 'inside-out' logic, stakeholders like firms and citizens are subjected to these rules or act as the agents that help to produce the desired results. Governments can strive for changes by strategically allocating funding, e.g. via tenders, as long as this happens according to sound procedures respecting the rights and values in relation to for instance state-aid and equal treatment.

- **Network-based governance:** The network-based governance model takes a less centralistic approach, as it regards collaboration between government organisations and societal actors as its cornerstone. The assumption behind this perspective is that societal actors possess information and resources that are crucial for creating appropriate policies, i.e. policies that provide the right incentives and conditions for pursuing a societal goal. Government and social actors need each other for prioritising, understanding and solving societal problems. To respond to these problems, public organisations therefore support alliances with and between societal actors. A major part of the government's role in this result-oriented model consists of

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<sup>31</sup> Van der Steen et al. (2015; 2018) distinguish between a bureaucratic model (following a traditional public administration approach) and a competitive model (following a new public management approach). As the difference between these two 'inside-out' models is of little relevance for the current study, we combine them in what we labelled the 'administration-oriented' governance model.

organising and possibly redirecting collaboration processes, while protecting process quality aspects like broad participation and transparency.

- **Society-based governance:** This last model draws on societal resilience, as found in societal stakeholder’s willingness and capacities to self-organize and undertake action – alone or in networks and cooperatives. Just like in the network governance models this implies a perspective that is primarily ‘outside-in’, but this time there is substantially more emphasis on supporting desirable bottom-up initiatives stakeholders engage in for their own reasons (rather than demanding concessions when negotiating towards common agendas). The government role that goes with it thus centres on nurturing and especially facilitating societal energy. From a transitions perspective the challenge is to not only enable experimental activities throughout the system, but to also aggregate them to movements with enough force to change the system’s functioning.

Figure 3, below, summarizes the three archetypical governance models. The case assessments discussed in chapter 4 implicitly suggest that these models help to capture highly distinct realities regarding opportunities and challenges for developing transformative innovation policies. In the next section we therefore use them as a basis for discussing findings on how transformative policies emerge, what governance capacities (and underlying practices) this typically involves, which TPI features this strengthens, and what difficulties policy makers might encounter when aiming to become more transformative. The aim of a synthesis in this form is to abstract from particular TPI examples, and instead draw lessons on the level and type of governance systems also policy makers in other countries, regions and cities can relate to.

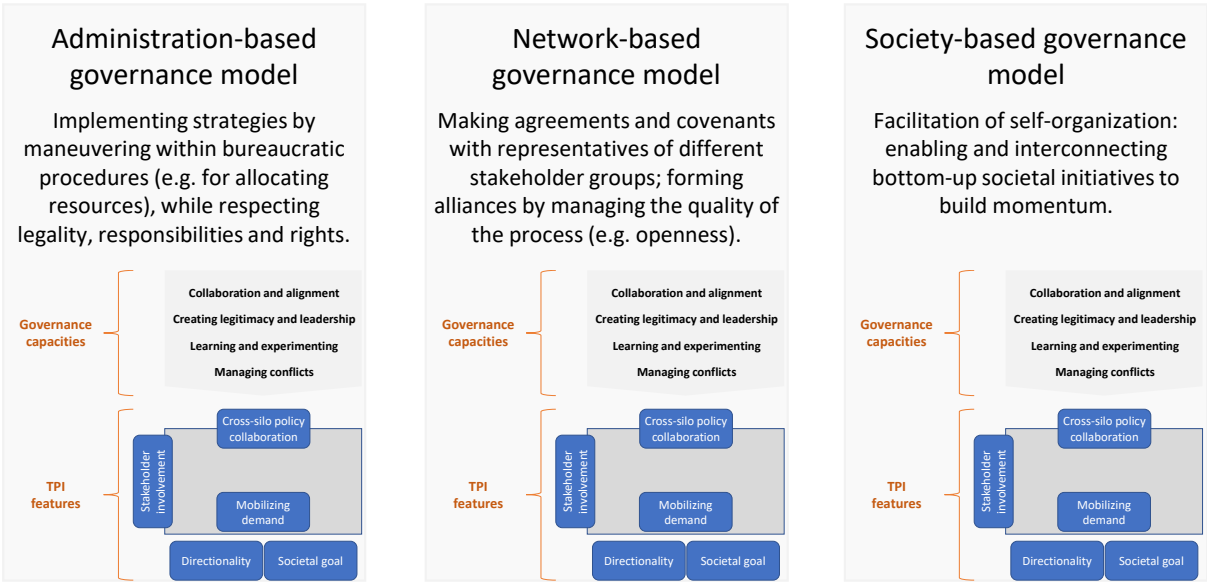


Figure 3: Three governance models conditioning the opportunities and challenges for developing TPIs.

**5.2 TPI features, capacities and challenges per governance model**

This section provides for each of the governance models a description of how becoming more transformative may look in practice. The descriptions are intentionally stylised, highlighting recurring or highly distinctive governance capacities, TPI features, and challenges. We do so in the hope that the stylised descriptions can be at least suggestive about promising pathways to capacity development in other countries/regions with similar governance models

Drawing on the identification of such typical properties, section 5.3 will follow up with a detailed overview of how much each case fits in these archetypical routes towards designing and implementing transformative innovation policies.

**Administration-based TPI governance**

TPI’s organized around an administration-based governance logic place the government in the lead to design and implement targeted policies in line with national priority areas. Often, this is done in combination with a whole-of-government strategy to guarantee legitimacy at the highest political level. Within its legislation period, the entire government (or a representative key ministry) can be held responsible and accountable for strategy implementation and progress. Other parties within the public sector, such as other ministries or research funders, are not ‘owners’ of the strategy but incentivized to contribute to the high-level goals and priorities.

Administration-based initiatives typically aim at transformation within the government in governing innovation for societal challenges. Instead of achieving direct transformative impact in society or economy, the aim is to (re-)design policies to better target the systemic nature of today’s societal challenges. Emphasis is therefore put on finding new modes of working together between established governance structures, that is between different units (vertical coordination) or different levels (horizontal coordination) of the public sector. A key objective of the administration-based model, is to improve coordination of existing policies in line with changing innovation priorities, and across established logics of resource division and distribution within individual ministries, departments or sections.

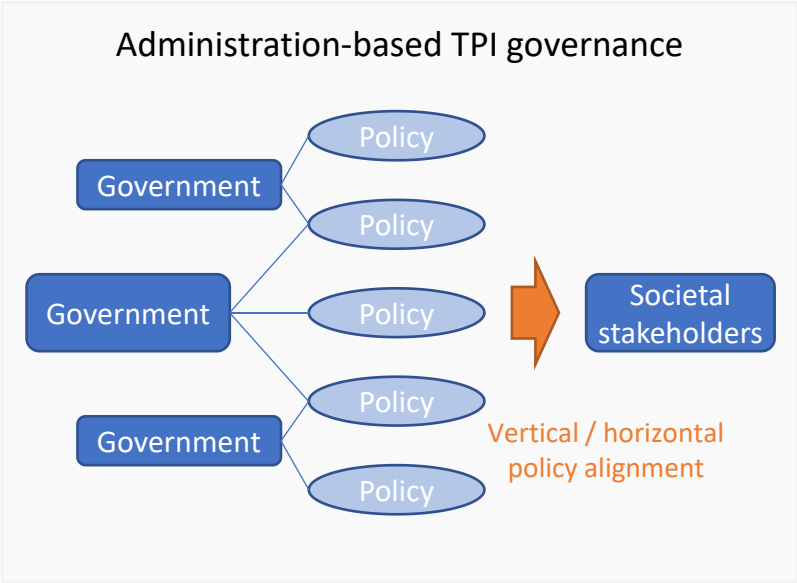


Figure 4: Core setup of transformative innovation policy according to an administration-based governance model.

**Transformative policy initiative (TPI) features**

In a governance system with this type of governance model, the following TPI features stand out:

A central characteristic of a government-led ‘inside-out’ approach is its aspiration to provide **directionality** in light of new research and innovation policy priorities. High-level European or national goals, such as included in climate agreements or emission targets, can provide the legitimacy for necessary (policy) changes within the public sector, towards more targeted innovation policies and funding instruments focused on national or global societal challenges. Then, directionality is understood mainly in terms of alignment of the (innovation) policy mix, starting from either the problem-side related to distinct challenges to better coordinate the



innovation with domain specific agendas such in health, energy or climate, or the solution-side related to specific innovations to accelerate their creation and broader deployment in economy and society.

**Demand-side mobilisation** is mainly understood in terms of increasing recognition and usage of more demand-side policy instrument to support innovations. Within the range of classical 'bureaucratic policy instruments', we observe increasing emphasis on linking innovation supply and demand in the design of funding schemes (e.g. more emphasis on piloting or experimentation), or the increasing use of regulation and public procurement. Also, funding schemes aim to involve a wider range of stakeholders at the project level next to the usual actors from the research and innovation landscape. At the strategic or initiative level, **stakeholder participation** is mostly organized around experts or key representatives from academia, civil society or industry, which are consulted to support the government or monitor the initiative's implementation. More direct forms or decision-making power of a wider range of stakeholders (including citizens or civil society) appears limited.

Despite the formulation of a common department-overarching strategy, our cases show that most often one key department or ministry is responsible for its execution at the operational level. This raises questions of ownership and accountability, hence commitment, in other departments, ministries or sections. Real strategic coordination, for instance in form of inter-departmental 'challenge' or 'mission' teams, that act independently of existing structures and are equipped with substantial own financial and human resources, are more often requested than actually observed. Also the establishment of cross-unit agendas or activities aiming at **overcoming administrative 'silos'** (between ministries, research funders, etc.) at the operational level seem to be a crucial coordination tool. If such formal governance structures are not provided, public administrations need to rely on the functioning of informal coordination processes within established structured, such informal knowledge exchange, working groups, etc. among employees.

#### **Core governance capacities to facilitate administration-based governance:**

Looking at how different cases have used the administration-based governance model to pursue transformative innovation, the following governance capacities (and underlying practices) stand out:

##### *Collaboration and alignment*

The formulation of innovation challenges or missions supported at high political level offers a shared objective or reference for new (innovation) priorities across public administration, around which multiple policy efforts are to be aligned. **Linking new policy objectives 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 for a whole government approach, incentivising the commitment of actors beyond research and innovation agendas.

Well-functioning cross-departmental coordination structures seem to be difficult but necessary to pursue a whole government system approach. Administrative silos typically exist at both the strategic as well as the operational level. The **formation of dedicated joint units** (such as challenge or mission teams), composed of actors with different backgrounds that work together in developing their joint agenda can facilitate coordination towards a common goal.

If initiatives are formulated top-down and too domain specific (e.g. for research and innovation), and/or are not matched with additional human and financial resources, the commitment of actor across public sector may not be sufficiently encouraged. The **benefits of coordination need to be obvious for all actors involved**. Establishing space, additional resources (e.g. time) and the possibility for more informal coalitions between willing and dedicated actors can be a way to replace a lack of formal coordination structures in more gradual transformation processes.

##### *Legitimacy and leadership*

In 'inside-out' governance traditions, new strategies or priorities are typically developed within the public sectors and endorsed at the highest political level. This **guarantees political legitimacy** of new goals and objectives in administrative traditions, at least for the legislation period of 4-5 years. At the same it can be perceived as top-down and one-sided view on how to move forward. Opposition at lower hierarchy levels, due to limited recognition of established organisational cultures or working practices, can undermine the high-level ambitions for policy change and slow down the transformation process. When implementing a new overarching strategy or programme, it seems important to not only acknowledge different organisational cultures, but also to **facilitate process innovation and gradual organisational change within the administration**.

A more 'radical' way to achieve cross-domain alignment around a societal issues, is to create an **independent unit or 'face' for the topic, challenge or mission**, outside existing departmental structures. Independent units may be able to reduce existing rivalry or competition between ministries, to execute more effective leadership and to achieve broad-based legitimacy across administration. However, to avoid conflicts about the notoriously limited resources, it also requires additional finances and more flexibility of existing budgetary boundaries and processes. Moreover, cultivating such **joint cross-departmental units** across the organisation can help to further disentangle societal transformation priority areas from current political strategies, to establish organisation-internal structures and processes beyond the priorities determined with each legislation periods.

#### *Learning and Experimenting*

For an administration-based governance model, a **systematic mapping of existing policies and instruments**, and their strength, weaknesses and interrelations before launching a new initiative seems crucial to determine its added-value and fine tune its design. The time needed for learning during the policy design process might often go against rather rigid administrative cycles and pressures to make new policies or changing in old policies visible. Relabelling existing policies, due to limited capacities, resources and recognition of the need for learning in the design and formulation of new policy priorities, is a substantial risk.

Moreover, the room for learning and experimenting appears limited if a strategy or an initiative is coupled to a legislation period of governments, and/or characterized by the traditional policy and evaluation cycles. Moreover, the input/output-oriented evaluation cultures seem to be at odds with aspirations to combine multiple innovation supply and demand-side measures. If the aim is to bundle measures more effectively, immediate (short-term) impact or causal relations are hard to assess. **Establishing more continuous monitoring and evaluation procedures**, away from summative evaluation traditions at the end of policy cycles, ensure outcomes to feed back more directly. Experimenting with new learning approaches, involving a more direct engagement and consultation of stakeholders in the policy process, the establishment of independent expert panels, accompanying research support, or building up in-house capacity to extract and channel learning lessons effectively within public administration.

#### *Sequential deployment of the capacities (and underlying actions)*

A government or administration-based government model often starts from the idea and ambition to broaden the basis for innovation funding, from R&D and technology push towards system approaches considering the societal aspects of innovation. Inspiration and ideas for policy change often come from outside the own organisation or even region or country, such as from new developments in STI policy thinking, from international practitioner workshops or broader trends in the European funding landscape. To follow these broader movements in accordance with existing activities or own priorities, a new strategy or programme is created within the established organisational and operational structures, as for instance within one policy department or a dedicated (innovation) agency.

To ensure legitimacy for the altered course of action, new initiatives are backed by high-level policy document or overarching strategies. New means and forms of experts advice (panels, advisory boards, etc.) are installed to support implementation and monitor progress. Such high-level commitments provide directionality and

clear signals for the different (public and private) innovation actors. More importantly from an administrative point of view, however, might be their function as common reference and goal to reach out to other departments or funding agencies, to find new ways for instrument alignment, or to interlock policies for instance across various stages from knowledge creation to innovation or solution deployment.

Administration-based governance models focus mainly on exploiting the complementarities between various (existing) policy instruments. Here, a first step seems to be establishing cross-agency or cross-departmental working groups to oversee the interlinkage, consistency or potential conflicts between policy efforts in addressing system innovation, spanning from classical R&D or innovation support, to domain-specific regulatory areas or the incentivisation of socio-technical change processes. Providing additional resources (financial, employees or time) to value, manage and monitor these coordination efforts seem to be crucial. Then, if several actors or organisations are committed to the joint efforts, resources can be pooled more easily, or new joint instruments developed, to pursue a system innovation approach beyond technology or innovation push.

**Challenges**

While the administration-based governance model benefits from a high level of (political) legitimacy and leadership from the outset, it can also involve substantial challenges in building up governance capacities geared towards transformative change. Departmental thinking and rivalry for recognition and resources may obstruct alignment ambitions and the coordination efforts necessary to support system innovation top-down. Committing other actors beyond informal collaborations seems more difficult if the innovation priorities are not recognizable aspects of their activities. Moreover, the reliance on strict administrative and budgetary cycles can hamper flexibility, learning and experimenting with new policy design. While legislation periods provide opportunities to adapt high-level innovation priorities and strategies, periodic changes in political leadership can also create inconsistencies or uncertainties in pursuing long-term goals and (transformative) impact.

**Network-based TPI governance**

When following a network governance perspective, TPIs aim to mobilize the knowledge, capabilities and resources of societal stakeholders when pursuing a policy goal. As figure 5 shows, this often involves interacting with institutionalized representatives in order to agree on collective agendas regarding how to move forward (including which solution directionalities to prioritize).

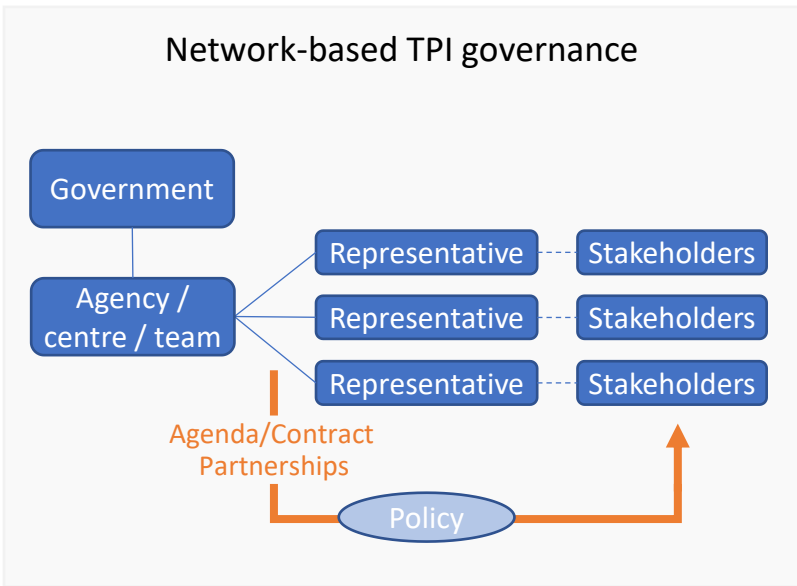


Figure 5: Core setup of transformative innovation policy according to a network-based governance model.

The network-based governance model builds on public and private collaboration and partnerships in policy design and implementation. A central feature of a network governance approach is the appointment of agencies, centres or teams to design, manage and execute policy initiatives in line with the broad direction and selection of priorities set by the government. Leadership is typically shared among different public or private actors, involving shared ownership or co-funding structures between partners.

In contrast to the administration-based governance, stakeholders are closer to policy making and, for instance, involved in decisions on the thematic orientation of a programme or agenda. The form of multi-actor involvement can lead from broad public consultation processes (e.g. online surveys, open calls) to more targeted consultation of key representatives or institutionalized stakeholders on selected topics (e.g. focus groups, informal consultations). Despite being based on a representative model of stakeholder involvement, transformative initiatives typically involve stakeholder groups that go beyond business or academia (triple helix). Following the quadruple helix idea, the appointment of societal (impact) actors can be considered as a way to open up to civil society and the consideration of citizens and societal aspects in programme design and operation. Moreover, the organisation of networking or matching events, stakeholder workshops, or building closer relationships between funder and (future, present or past) funding recipients is another distinct feature of a network governance model, to strengthen community building between public and private parties. Such policy-led initiatives aim to contribute in the end also to a stronger interconnectedness of the stakeholders themselves.

In a network-based governance, cultivating stakeholder relationships between policy and other public or private actors is regarded as continuous, deliberate and integral part of the initiative, and does not only occur on an ad-hoc basis. Even though stakeholder input and management is considered as essential to programme design, operation and further development, final decision-making (e.g. strategic questions on thematic orientation) is often left in the hands of policy.

### **Transformative policy initiative (TPI) features**

A characteristic element of network-based governance is the high degree of **stakeholder involvement**. Often this is organized at the level of institutionalized representation with clear presence in the field (e.g. a sector) or in the policy funding landscape (e.g. as direct beneficiaries of financial innovation support measures). While initiatives following the network-based approach engage actively in community building, the definition of stakeholders is often closely linked to the direct target group of the measure or funding programme. It often distinguishes itself from a system- or bottom-up oriented model as approaching stakeholders from the supply-side (e.g. innovation producers, solution suppliers or facilitators), but not necessarily from the demand or societal impact-side (e.g. innovation users or solution beneficiaries such as citizens). Even though being open to quadruple helix models, the identification of key representatives and real engagement of civil society remains often a challenge for initiatives organized on the basis of a network model. A narrow form of stakeholder participation allows for close and trust-based relationships between policy and private partners, facilitating informal involvement, consultation and engagement in policy formulation and/or adaptations according to stakeholder needs and demands. Even though being policy-led, network governance strongly builds on the idea of building public-private partnerships to galvanize commitment, potentially also investment, in achieving shared priorities and goals.

Openness to signals from outside the public sectors allows for a **high degree of directionality**, and to direct innovation policy measures to field-specific needs and demands. Related to strong stakeholder involvement is the fact that distinct actors can gain a substantial say and influence in agenda-setting processes, to shape the thematic orientation of the programme according to their needs, in order to provide or facilitate solutions for a distinct problem. In this way, directionality is performed mainly on the problem side (e.g. in the form of overall priorities and thematic orientation of specific calls), with solutions kept widely open. However, particularly for governance models relying heavily on institutionalized representatives (e.g. in a distinct field or

sector) the definition of problems or priorities can have substantial influence on solutions directions, implicitly favoring a certain set of solutions over others (e.g. technological vs. non-technological solutions).

If network-based governance models involve a set of public or policy actors at both the strategic and operational level, it can facilitate **cross-silo policy making**. Representatives from different domains (e.g. ministries) or agencies involved in various funding programmes facilitate coordination of policy measures, contribute to better alignment of policy instruments with similar goals or target groups, and stimulate knowledge exchange across administrative boundaries. Commitment to societal impactful innovation and alignment across domains (e.g. innovation and sectoral domains) is further incentivized by creating co-ownership structures between policy partners.

### **Core governance capacities to facilitate network-based governance:**

Looking at how different cases have used the network-based governance model to pursue transformative innovation, the following governance capacities (and underlying practices) stand out:

#### *Collaboration and alignment*

Ensuring collaboration and alignment revolves to a large extent on **involving key stakeholders in agenda-setting**. This can happen on an informal basis facilitated by close relationships and continuous interaction, or in formal settings via organized workshops or consultation processes to decide on priority areas. Key stakeholders can be highly heterogeneous, especially if they do not just include scientists (from different disciplines), firms (from different sectors) and governments (from different administrative layers and public domains), but also societal stakeholders like organizations and citizens that are in some way affected by current or foreseen economic activities. The various stakeholders likely differ in their ability to engage in agenda-setting processes, which points at the need for capacities to involve also the stakeholders that are less well-positioned to engage and represent their interests.

In this governance model public-private partnerships are organized through **clear agreements** with representatives of the triple/quadruple helix. In some cases, stakeholder involvement and partnerships stretch to lower-level authorities like cities and municipalities, e.g. in the role of **lead-users** with particularly strong demands. Recognizing and addressing such demands can provide the window-of-opportunity for experimenting with novel solutions, which later (when the solutions have been developed further) might also be applied in contexts facing similar but less strongly pronounced demands.

#### *Legitimacy and leadership*

Network-based governance relies on a **model of shared leadership**. One way to implement this is to share programme lead and management between different policy actors (between ministries, or between ministries and agencies/funders). **Co-ownership and co-funding** facilitates commitment on multiple sides. Another - not mutually exclusive - way is to directly include stakeholders (e.g. from industry, cities) in programme co-creation, funding and execution. This model, with the stakeholders having a clear and visible mandate, can be both more efficient and more effective compared to a model in which policy makers only consult stakeholders while remaining in full control themselves. People sitting in the boards of teams (business champions, societal champions, etc.) should be key representatives, with the ability to speak on behalf of large communities: they are supposed to be real **'captains'** (of industry, science, SMEs, public actors, NGOs, etc.). The latter is dependent on the platform that they are being offered by the government (policy-led networking). Although the government itself might have a minor role within the largely **delegated structure**, it is key that this structure is positioned very prominently as the vanguard of a certain domain.

#### *Learning and Experimenting*

In this type of governance model, it is likely that new monitoring and evaluation methodologies are required. When decisions on selecting key priorities (and how to address them) are delegated to field actors, the government itself is no longer the sole responsible actor for how policies are working out. Instead, it limits

itself to organising coordination processes, which should ideally lead to strengthening or transforming production-consumption systems. The link with achieving desirable societal results is very indirect in that case, as it relies on the interplay of a plurality of incentives that are not only influenced by different stakeholders but also impact upon different 'users'. This makes it hard to apply standard monitoring and evaluation practices that aim to track how a treated group of actors performs compared to a non-treated group. When attribution of effects is difficult and changes unfold non-linearly (e.g. first slow, and rapid when all the right system conditions are in place), it becomes important to focus on more **formative evaluation** that reveal what can be changed. Obtaining lessons on the quality of the governance structure allows for adaptation, and is possibly more useful than trying to measure the effects of policies that are co-constructed and try to hit a moving target (an evolving transition). Such formative evaluations could also serve to capture the views of the stakeholder network, in order to adapt policies to what is deemed necessary and what is deemed legitimate.

#### *Managing conflicts*

In the network-based governance model the government itself can avoid conflicts by leaving agenda-setting process and negotiations to the delegated teams or centres. The challenge in that case is to ensure that representatives in the teams really work out differences, and not just program their priorities entirely in parallel of each other (resulting in agendas that are hardly selective). One crucial capacity in that respect is to engage in **active and deliberate community-building measures**. Examples would be networking events and the creation of platforms that facilitate interactions and provide short ways between different actors, with potentially different interests and needs.

### **Challenges**

A network-based governance model that revolves around agreements between key representatives is depending on the definition of 'stakeholder', which can be broad and open, but also narrow. Both have advantages and disadvantages. Key representatives of demand- or societal impact stakeholders are typically not only being harder to find, but also harder to incentivize to engage with the policy on a continuous (not ad-hoc) basis. Governance structures based on quadruple helix representatives are sensitive to capture by vested interests, as organisations with vested interests often have the means and channels to ensure their participation. Another challenge is that by delegating control, the government is not in the driver seat. At the same time, it should still be able to respond to signals provided by the delegated teams (e.g. in relation to regulatory barriers or lack of lead markets) and not leave all actions to others and just operate as a process manager. For the teams themselves it is important to recognize that they can only have an impact if captains in the board can bring commitment from the community they represent. Otherwise a lot of talking might again lead to very little action. Finally, gradually enhancing the role of the government might meet resistance, especially if it leads to prioritisation of solution directions that are unattractive for market players, or contested by other (excluded) parties. Involving stakeholders in priority setting without providing (too) much directionality for solutions thus remains a challenge.

### **Society-based TPI governance**

For governance systems operating according to a society-based governance model, moving towards transformative innovation policy typically involves setting up a dedicated organisation tasked with solving a particular problem. Such a separate entity, financed by but not administered from within a government department, allows for close collaboration with societal actors actively engaged with the problem. Instead of merely releasing policy instruments upon these actors, or asking representatives to draw up agendas, the entity is in direct contact with a broad range of stakeholders that might contribute to the desired outcome. This allows the team to create an in-depth understanding of the opportunities and challenges encountered by actors already working on potential solutions – or affected by the actions of others.

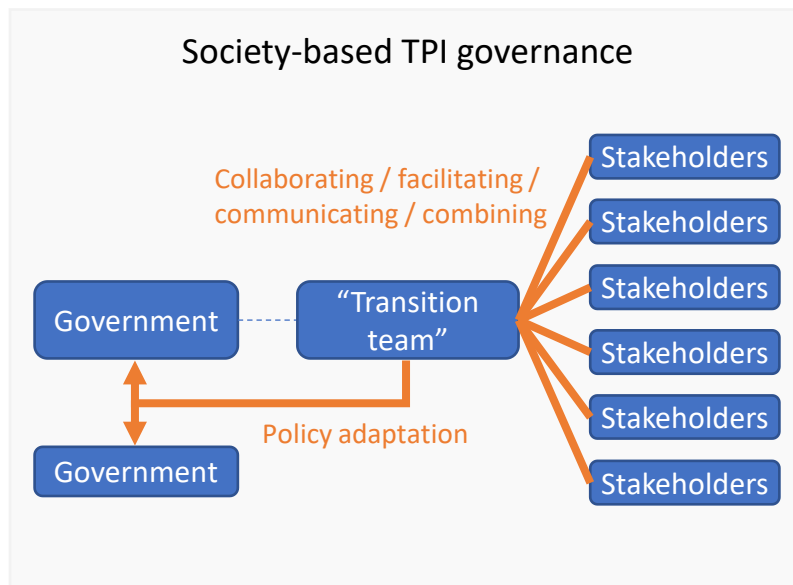


Figure 6: Core setup of transformative innovation policy according to a society-based governance model.

A key aspect in this governance model is the acceleration of bottom-up activities initiated by societal stakeholders themselves. In the case of innovations for societal challenges, this may concern for-profit or not-for-profit organisations' experiments with the application and integration of new products, processes, and services. Besides validating technical knowledge, testing combinations of solutions in a practical setting also helps to explore suitable business models and institutional arrangements required for new solutions to work. In this governance model it is not up to the government's problem-oriented entity to orchestrate such activities, or to simply fund the ones that wouldn't exist without government support (due to e.g. market failures related to externalities). Critical is the potential to catalyse small initiatives that, when applied in a greater number or at a larger scale, contribute to transforming socio-economic systems. This implies an interest for not just the abovementioned type of experiments with innovations reaching the deployment stage (like the ones resulting from policy support provided by the other two governance models), but also with activities that challenge the functioning of these systems. Examples would be projects addressing the willingness of stakeholders to change ways of organising, funding and adopting sustainable or safe behaviours. Such activities, creating favourable conditions for new practices, only have an impact when there are indeed novel practices that would benefit from these conditions. Or reasoned the other way around, the entity propelling bottom-up initiatives can make a difference by taking these initiatives to the stakeholders that hold the key (in terms of partners, information, funding, regulation, or otherwise) to a viable application in practice. Driving change and having a societal impact is therefore largely a matter of making the right connections at the right moment. Hence, in Figure 6, the public entity managing alignment is labelled as a "transition team" run by transition managers. Part of their responsibilities is also to infuse transition-thinking in other governments, and support them in designing policies accommodating desirable practices.

### Transformative policy initiative (TPI) features

In a governance system with this type of governance model, it is possible to develop all TPI features up to the highest standards captures by the scales of Table 4.

As facilitating and accelerating are the fundament of the society-based governance model, **directionality** does not have the form of imposing goals or pre-selecting a couple of main solution directions societal stakeholders should conform to. Rather, directionality emerges from the type of bottom-up initiatives that are being supported and promoted. This entails a somewhat responsive take on directionality. However, it is still possible to increase the momentum of such initiatives by appointing a few focus areas in which bottom-up initiatives will be spurred and interlinked. A particularly high level of directionality emerges when the transition team starts to actively act upon some common opportunities or bottlenecks as encountered in the

portfolio of bottom-up initiatives. Once such shared issues have been identified it becomes possible to target transformation efforts at very detailed needs for e.g. regulatory or funding adaptation. Normally the transition team entity itself is not in the position to adapt policies and institutions. It will therefore articulate the specific problems and solutions societal stakeholders are facing, and stress the responsibility and capacity of other actors (including public authorities) to make particular contributions for a transition to take off. Pointing out to others what they can do, and why precisely them, goes far beyond flagging broadly defined problem/solution areas.

Characteristic for policies fitting this governance model is that they can be truly centred on a **societal goal**, which might be deeply embedded in the mandate of the transition team entity. Its main objective is to reinforce desirable societal initiatives, which does not necessarily impose a trade-off with economic goals. As a matter of fact, various cases underscore the observation that after starting from a 'purely' societal objective it is often necessary to bring in an economic dimension precisely to build momentum. Many bottom-up initiatives exhibit a new way of operating, conform the structures and initiatives associated with a transformed socio-economic system, but to get traction and achieve scale it often is essential to bring business on board that are willing to adopt this way of operating (and see how they can make it work commercially). For instance, certain circular economy innovations or practices only succeed if there are firms that can provide supplementary logistics or recycling solutions. Apart from that these will need to be developed, some minimum level of scale might be required for a new technology or way of organising circular practices to be feasible (also in the envisaged new socio-economic system). Spurring the missing complementary activities is part of the abovementioned refined directionality, leading the transition manager to engage firms after concluding that this can catalyse a promising bottom-up initiative. Thus, the order of things is in that case not a shift from a competitiveness focus to solving a societal challenge, but the other way around.

At first, this governance model might perhaps not be associated with **cross-silo policy collaboration**. After all, one key pillar is to establish a separate entity at arms-length of the government department ultimately concerned with a certain societal goal. Much of this entity's focus will be on what stakeholders want and can do in that respect. However, when that picture becomes clear, getting more policy organisations on board might be precisely what can really help to pave the way for bottom-up initiatives to evolve into stronger movements. An advantage of this governance model is that the transition team entity has a relatively neutral position when it is only funded but not administered by a particular policy department. The latter will have to refrain from claiming the team's victories, or leaving a clear signature in any other way. The more the team is regarded as neutral and genuinely problem-oriented, the easier it will be to engage other policy organisations - without them immediately questioning why they are being involved. In the cases analysed for this report, the transition teams made a point of not telling departments from other policy silos what to do, but instead involving them in a joint reflection on what they could contribute. Importantly, in all cases these other departments remained fully responsible for their own policies. Unlike in the other two governance models there were few examples of uniting resources or co-developing instruments; the transition teams merely seek to motivate policy makers to make policy (making) adaptations or undertake new initiatives on behalf of their own stake in a common goal.

Closely related to the previous TPI feature is the issue of **mobilising demand-side** forces. Generally this forms a large part of why the transition team would endeavour to engage distinct policy departments. Although this can also be done to arrange extra resources for the development of new solutions (like in the examples in which transition teams secured some demonstration funding or business support services), much of the cross-silo policy collaboration will likely be focused on enhancing the opportunities for real-life testing and integrating new practices. Policy organisations can contribute by adapting tender criteria, leveraging their own procurement capacities, revising regulations, etcetera. As noted, such adaptations would not necessarily concern changes across the board, but precisely the bottlenecks that keep the current system in place by disadvantaging the alternatives surfacing in bottom-up initiatives.



**Stakeholder involvement**, to conclude with, is part and parcel of this governance mode. Reinforcing bottom-up initiatives starts with observing the available creativity and appetite regarding addressing a pressing societal problem. Additional forms of involvement concerns working out differences between stakeholders (see ‘resolving conflicts’, below), as well as widely communicating successful practices in order to engage even more stakeholders – either as developers or adopters of new practices.

### **Core governance capacities to facilitate society-based TPI governance**

Looking at how different cases have used their society-based governance model to pursue transformative innovation, the following governance capacities (and underlying practices) stand out:

#### *Collaboration and alignment*

To be as responsive and ‘outside-in’ as possible, one key practice - or rather structure - is **establishing and maintaining the problem-centred entity** financed but not administered by the overarching policy department. This may start out small, as the entity is not in charge of running high-level policy programs. Instead, it should be brought into the position of engaging the stakeholders most deeply involved in understanding and solving the societal challenge a government wishes to address. At least initially, collaborating with such stakeholders primarily consists of listening to their views and ambitions. Organising brainstorming and showcasing events around a shared societal goal might be a suitable practice for simultaneously engaging ‘societal energy’ and inspiring others; such events can serve as platforms for championing promising on-going practices and displaying them for an audience of parties already having an interest in the transition (or problem). Later on, the entity will need to rely on more extensive **facilitation and communication capacities** to strengthen the success of bottom-up initiatives, and make them reach also beyond the first tier of easy to engage stakeholders.

Simply bolstering and spreading individual success stories is unlikely to be enough to get those bottom-up initiatives in touch with the kind of partners that can help to remove barriers. Accelerating mutually reinforcing linkages across different parties, that may gain or lose from the transition, also requires a capacity (and resources) to **organize community building and management**. By actively driving actors towards each other, in order to unleash synergies, self-organisation and co-creation efforts stand to gain more perspective. Additionally, challenging existing systems and undertaking change-oriented actions also benefits from levelling the playing field or even shielding such actions for a while. This requires capacities in the form of abilities to **inspire, instruct and mobilize a broad range of policy makers** from different government departments. The objective would be to take them along in internalising the transition, so that they incorporate good practices while maintaining responsibility over their policies (incl. budgets and accountability).

#### *Legitimacy and leadership*

For outside-in governance perspectives, legitimacy stems mostly from how societal initiatives and stakeholder participation are managed, and for what purpose (i.e. is the cause recognized as important?). Accounting for public expenditures in relation to realized results is less of an issue, especially if the funding streams are modest anyway. However, in order for TPIs based on society-based governance models to achieve an impact, it is all the more crucial that there is broad societal support for their means and their ends. Without any significant resources to offer, driving a transition comes down to generating momentum by reinforcing and interconnecting bottom-up initiatives. **Creating a vision around the perceived urgency and importance of the problem** is therefore an essential basis to get more and more stakeholders committed to the shared goal. As noted before, it helps if the vision does not have a clear top-down origin, but results from close interactions with field-level stakeholders actually working on system-challenging initiatives. In some of the investigated cases, legitimacy of the vision - and in extension, the TPI itself - was strengthened by relying on certain concepts or narratives (‘missions’, ‘donut economy theory’, ‘transitions management’). Still, it appears recommendable to always mix such a basis with inputs from a broad range of stakeholders. The vision is

more powerful if it not only stresses why something is a problem, but also why it affects the collective and why ultimately it will impact on the activities of actors that currently benefit from the status quo.

Stepping from the problem to possible solutions, again it seems crucial to have a capacity for **emphasising the community-based nature of problem-solving efforts**. In the investigated cases the vision served to inspire and activate stakeholders, but without dictating how they should contribute. While this might lead to seemingly unspecific views on how to reach a desired societal outcome, it is merely the process rather than the trajectories that are being managed in this model. This probably works best if it is clear that the community itself is driving the transitions, with political support and resources only calling for action (without taking the lead) and creating the conditions for this community to discover and negotiate solution directions. The capacity for keeping the community in the driver seat therefore relies on process and abilities to demonstrate consistently who has been undertaking what, without necessarily emphasising the government's role. Various cases investigated in this report used websites, newsletters and evaluation reports to showcase not just what bottom-up initiatives achieved, but also what motivated them in the first place. To ensure some convergence and synergies among the possibly very wide spectrum of bottom-up initiatives, it obviously can be helpful to cluster them around some major solution areas. Still, to avoid this being seen as the government taking over the process, it is helpful if the clustering and possibly prioritising can be traced back to signals from the societal stakeholders or the steering committee in which they are represented (see also below).

#### *Learning and Experimenting*

A recurrent maxim in cases based on society-based governance is the learning-by-doing mantra. This does by no means refer to 'just doing things that seem right'. Instead, there usually is a deliberate learning process behind it, based on systematically **taking stock of the nature of bottom-up experiments**. Initiatives societal actors embark upon autonomously point at capabilities and interests that can be leveraged when shaping a transition. While the investigated cases fitting this governance model consistently look for promising initiatives, via all sorts of ongoing interactions, they also had processes in place for taking a step back and making a balance of what works and what not. This allows for learning at two levels: the level of problem (sub-)areas and solution types, as well as the level of actual support efforts. Indeed, in the investigated cases this led to occasional recalibrations of what initiatives and support efforts to focus on.

Given that this model revolves not around policies and strategies, but primarily around bottom-up initiatives, monitoring and evaluation have a different scope in comparison to the other two governance models. Just like for legitimacy, there is no emphasis on what is being supported, against what costs, and what results that generates. Attributing this to government intervention would be inherently difficult, as much of the policy support consists of facilitating initiatives stakeholders undertake at their own behest. Therefore, the focus of monitoring efforts can skip the first parts of the regular 'intervention logic framework' (input, throughput, output) and directly zoom in on how much these initiatives are contributing to the desired outcomes. **Monitoring project outcomes** provides insights in how much actual progress is being achieved, and which (type of) initiatives are contributing how much. This does not allow so much for major adjustments in policy mechanisms, but rather for refocusing the kind of initiatives that deserve a spotlight (e.g. featuring prominently in communication campaigns) or require additional attention.

#### *Managing conflicts*

One common way to deal with tensions between stakeholders is to **install a steering committee** in which they themselves can work out differences. Such a structure is particularly helpful when it comes to strategic decision on which efforts to intensify or discard. The clout of the committee is larger when committee members can speak on behalf of sub-communities, and even make strong commitments. Still, this might not be enough as long as different members and their sub-communities are not on the same page. The capacity to resolve conflict scan therefore also benefit from practices like **organising debates** (e.g. through discussion nights and workshop series), to overcome differences, or at least to create a better mutual understanding of the source and status of tensions.

### *Sequential deployment of the capacities (and underlying actions)*

In terms of sequence, the action of establishing a 'transition team' outside of government marks the most radical move in the governance trajectory. Once the team is in place, many of the other (more incremental) actions may in principle be undertaken in different orders. In fact, the investigated cases with relevance for this governance model point at an iterative process. Forming a vision might be one of the first steps to take before reaching out to stakeholders to facilitate and unite their initiatives, but the repeatedly encountered preference for 'learning by doing' also highlights the possibility of refining such a vision only once having a better overview of bottom-up activities. A detailed understanding of the transformation potential and directions of societal stakeholders allows for creating a more targeted and inspiring vision for, in turn, mobilising additional stakeholder involvement. Actions like community management and engaging policy makers, however, probably require that the transition team already has some experience and a portfolio of initiatives ready for acceleration. After all, a bigger and more convincing portfolio will imply a greater pressure for those other policy makers to team up and collaborate.

### **Challenges**

While the system-based governance model lends itself well for designing and implementing transformative innovation policy features, it also has its limitations. The biggest one might be the difficulty to build momentum. By not starting out with a program funding clear action lines and initiatives, it can be hard to find enough initiatives that can be integrated into a broader, self-reinforcing movement. Catalyzing bottom-up initiatives only works if there are enough problem-oriented activities happening to begin with. At some level the limitations of an intrinsically responsive (rather than steering) governance model also hold when looking at actual policy support efforts. The absence of a standardized set of policy tools highlights flexibility, but it can also hamper bold moves.

## **5.3 Mapping TPI examples on governance models**

Now that the most distinctive properties of each governance model have been extracted, it is possible to revisit the twelve case studies and give a comprehensive overview of how they relate to the archetypical descriptions of section 5.2. Making this connection explicit serves multiple purposes: First, it provides directions regarding which particular cases to study (and on what precise accounts) when having an interest for one of the three governance models. After all, these models should be regarded as the conditions that define the boundaries within which policy makers will have to operate. Second, noticing how the network- and especially the society-based governance model typically exhibit more elaborated transformative policy features, a mapping also supports investigations into the possibility of combining properties from multiple governance models.

When looking at the practices and principles constituting the governance capacities for each governance model, the twelve cases can be mapped as shown in Table 4.

*Table 4: Overview of how the twelve TPI cases relate to the practices underlying governance model specific governance capacities*

C = Collaboration and alignment; L = Legitimacy and leadership; P = Policy learning, R = Resolving conflicts. Entries in brackets indicate that only some instances of a TPI exhibit a certain practice.

	Green solutions	HTS 2025	Pilot-E	RIS 3C AT	SIP	SFI	MTIP	CoT	UK ISCF	Bio Finland	Amsterdam Circular	Circular Flanders
<b>Administration-based TPI governance</b>												
L: Legitimacy at high political level		X					X	X	X		X	
C: Change of innovation funding priorities	X	X		X	X		X	X		X		
C: Targeting multiple (existing) instruments, actors or policy fields at prioritized topics	X		X	X			X					
P: New monitoring and evaluation procedures beyond input/output		X				X			X			
<b>Network-based TPI governance</b>												
C: Involve key stakeholders in agenda-setting				X	X	X	X	X	X			
C: Shared ownership between policy partners			X	X	X		X			X		
L: Engage in partnerships based on shared agendas				X			X					
P: Adapt policies based on network signals						X	X	X		X	X	X
C/R: Community management						X	X	X	X		X	X
<b>Society-based TPI governance</b>												
C: Establish a transition team							X				X	X
C: Reinforce bottom-up initiatives						X		X	X		X	X
C: Inspire/instruct policy makers						X	X	X			X	X
L: Create a vision around perceived problem urgency	X						X	X			X	X
L: Emphasize community-based problem-solving											X	X
P: Learning-by-doing (stocktaking)											X	X
P: Monitor project outcomes for initiative re-orientation						X			X		X	X
R: Install a field-level working group		X	X									X

The impression arising from this overview is that many of the investigated cases, in the sample of twelve, have a rather clear 'governance model' profile when it comes to practices and principles they deploy. While it seems common to also make use of practices associated with another governance model, there are only few cases that cannot clearly be linked to one archetypical model.

The most remarkable example is probably City of Tomorrow, which displays a wide variety of (ways to enact) governance capacities. As this strategy has a relatively long history, it had the chance to move from a technology-focused R&D programme (based on an administration-based logic) to a more society-based approach.

To a lesser extent such a shift is also visible for the SFI and the MTIP. The latter has made a clear pivot when evolving from the network-based Topsector approach to a more challenge-driven policy approach. Still, as the table suggests, this pivot has only partially resulted in a revision of the governance model and capacities; only some of the typical practices have been adopted, while much of the administration- and network-based governance model has remained in place.

The lesson here is nevertheless that there appears to be some room for development. Even when mostly constrained by the limitations of the administration- and network-based governance model, TPIs emerging from such models can be enriched – and thus potentially become more transformative – by building capacities typical for the society-based governance model. However, there is need to be cautious when aiming to cover large 'distances' in the model. Looking at the empirical evidence so far, there are few cases that truly combine the administration-based governance capacities with society-based practices.

## 6 Conclusions

In light of non-negotiable deadlines related to e.g. climate change agreements and resilience funds milestones, there is an urgent need for policy makers to design and implement policy initiatives suitable for transforming entire production-consumption systems (and even the socio-economic and socio-technical systems they are part of). However, in order to effectively adopt transformative policy approaches, a better understanding is needed of relevant prerequisites, facilitating factors, and constraints.

Based on a review of the literature, we proposed a multi-layered view on transformative innovation policy features. According to this view, running TPIs is not just a matter of designing one-off policies with the right strategic, operational and instrumental characteristics. The fundament for being able to do so is having a reliable governance system in place; one that is able to develop governance capacities for 'managing' TPI characteristics like a clear policy directionality, prioritisation of a societal goal, cross-silo policy coordination, mobilisation of demand-side forces, and broad stakeholder involvement. As the literature is not yet convergent regarding which precise governance capacities this would require, the current study has sought to obtain detailed empirical insights from twelve studies from across Europe.

Looking at how far the investigated cases have come in terms of implementing TPI features, two immediate observations stand out. One of them is that the concrete cases show a variety of ways to design the five key TPI features distilled from fragmented transformative innovation policy literature. Real-life examples of how directionality etc. are embedded in actual policies is a first basis for learning to take place. Second, none of the investigated cases seems 'fully' transformative in terms of how strongly their policies match with the TPI features. Some cases are actually only to a very limited extent transformative, despite their bold ambitions. As the evidence has shown, however, the cases also have very different starting points. Helpful for understanding this is the distinction between the governance models that describe the policy making context, i.e. administration-based governance, network governance, and society-based governance. For each of these models there are clearly distinct governance capacities (and underlying practices and principles) for improving the transformative potential of innovation policies.

What the case comparison suggests, is that there is no clear recipe for becoming more transformative; not only because there are various ways of achieving the same, but also because governance systems differ in the opportunities and challenges they face when converting to the transformative innovation paradigm. TPIs 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 organised around a society-based governance logic. Interestingly, the case analyses indicate that TPIs do not appear to be fundamentally bound to one logic; in several instances policies evolved significantly and incorporated governance capacities belonging to the more bottom-up and inclusive governance perspectives. Also most of the other cases show progress, albeit sometimes very minor, when it comes to deploying policies with (potentially) transformative characteristics.

Variety in governance models and, consequently, in the pre-requisites for introducing transformative policies highlight the value of a detailed and up-to-date understanding of each policy system. Sensible ways to better understand each policy system and design tailored paths for governance capacity building and deployment may include policy intelligence and diagnostics (e.g. policy reviews), learning from international experiences and the valorisation of tacit system-level expertise of experienced public officials. For example, the JRC has developed a new kind of policy review exercise under a transformative framing that combines interviews of public officials with other evidence on the structure and capabilities of the policy and of the attendant production/consumption systems<sup>32</sup> (Pontikakis et al., 2020). Moreover, as part of the OECD process "Systems

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<sup>32</sup> POINT reviews conducted in Greece (Janssen et al., 2021) and Bulgaria (Stefanov et al., 2021) and in Daejeon, Korea (Kim et al., 2022) have resulted in rich accounts of the implicated governance system and have included tailored suggestions for the introduction of transformative policies and associated governance reforms.

Innovation for Net Zero”, the OECD is pioneering a new type of policy review that evaluates the transformative potential of individual policies in a framework that draws inspiration from system dynamics, with a first application to the case of Ireland’s transition to sustainable transport (see OECD, 2022). Other diagnostic tools relevant for understanding the transformative potential of particular aspects of a governance system are included in the recently published Partnerships for Regional Innovation Playbook<sup>33</sup>.

Unfortunately, some of the investigated cases suggest that observed policy developments should not be regarded as irreversible. In relatively stable policy systems, in which political fluctuations hardly affect policy administrations, it would be possible that subsequent policy strategies are increasingly transformative – even if progress on this account is slow. For somewhat less stable policy systems, the journey towards transformative policies and capacities might look very different. In such contexts new governments can in principle make bold moves and replace existing policy approaches for substantially more transformative ones, at least to an extent that these do not require strong multi-stakeholder networks and preceding or ongoing trust-building. However, the question would then be how long these new approaches remain in place. This question is particularly pressing in light of the claim that transformative policies based on an ambitious goal, as in missions, require both long-term as well as high-level political commitment. When such high-level political commitment can easily come and go, the transformative potential of policies gets vulnerable to sudden changes or discontinuation. Kivimaa and Schwaag Serger (2023) reflect on what approaches may allow transformative directions for policy development to continue even during times of tensions and setbacks. Based on an analysis of present-day challenges to transformative narratives they argue for supporting for broad and deep networks, support for multiple competing alternatives, multi-technology and multi-regime interactions and broad engagement with concerned stakeholders.

The current study has been limited to examining policy designs and governance capacities; to what extent these effectively contribute to bringing about transformative outcomes is to be studied in follow-up research. Such additional research can draw on recent scholarly work on the evaluation of systemic and transformative innovation policies<sup>34</sup>, which suggests to combine a formative assessment perspective (e.g. do coordination structures meet relevant policy design principles?) with a summative assessment perspective (e.g. is there evidence that new or adapted policies are associated with structural changes in e.g. production and/or consumption?). Each of those assessment perspectives can provide only a partial impression of how transformative policy strategies are. Hence, insights and evidence will be stronger when there is information for various parts of the long causal chain between legitimizing policy intervention, organising and implementing it, changing systems, and eventually addressing societal challenges. The more coherent these parts and pieces, the better it will be possible to judge the influence of policy strategies and their transformative outcomes.

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<sup>33</sup> <https://s3platform.jrc.ec.europa.eu/pri-playbook>

<sup>34</sup> Janssen, M., Bergek, A., Wesseling, J. (2022). Evaluating systemic innovation and transition programmes: Towards a culture of learning. *PLoS Sustainability and Transformation* 1(3): e0000008.

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## List of abbreviations and definitions

AI	Artificial Intelligence
BMBF	Federal Ministry of Education and Research (Germany)
BMK	Federal Ministry of Climate Action and Energy (Austria)
CEO	Chief Executive Officer
CoT	City of Tomorrow (Austria)
DG	Directorate-General
DKK	Danish Krone
EC	European Commission
Eoi	Expression of Interest
ERDF	European Regional Development Fund
EWI	Ministry of Education, Science and Innovation (Flanders, Belgium)
EZK	Ministry of Economic Affairs (Netherlands)
EU	European Union
FORMAS	Swedish Research Council for Sustainable Development
FFG	Austrian Research Promotion Agency
HES	Danish Ministry of Higher Education and Science (Denmark)
HTS	High-Tech Strategy (Germany)
ISCF	Industrial Strategy Challenge Fund (United Kingdom)
JRC	Joint Research Centre
JPI	Joint Programming Initiative
KIAs	Knowledge and Innovation Agendas (Netherlands)
KICs	Knowledge and Innovation Contracts/Covenant (Netherlands)
MIT	SME innovation stimulation Region and Top Sectors grant (Netherlands)
MIPO	Mission-oriented Innovation Policy Observatory
MTIP	Mission-oriented Topsector and Innovation Policy (Netherlands)
NGO	Non-governmental organisation
NOK	Norwegian Krone
OECD	Organisation for Economic Cooperation and Development
OVAM	Department of the Environment's public waste agency (Flanders, Belgium)
PRI	Partnerships for Regional Innovation
RIS3CAT	Research and Innovation Strategy for the Smart Specialisation of Catalonia (Catalonia, Spain)
R&D	Research and Development
R&I	Research and Innovation
RTI	Research, Technology and Innovation
SFI	Science Foundation Ireland
SIP	Strategic Innovation Programmes (Sweden)
SME	Small and Medium-sized Enterprise

STI	Science, Technology and Innovation
STIP	Science, Technology and Innovation Policy
STEM	Science, Technology, Engineering and Mathematics
TPI	Transformative Policy Initiative
TIPc	Transformative Innovation Policy Consortium
UKRI	UK Research and Innovation (United Kingdom)
VLAIO	policy execution agency of the Department of Economy, Science and Innovation (Flanders, Belgium)
VINNOVA	Swedish Innovation Agency

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## Appendix I: Key documents per case

This appendix provides an overview of important documents (and some of the key figures they contain) for each of the 12 cases discussed in the main text.

### Amsterdam Circular

- [Amsterdam Circular: Evaluation and Action Perspectives](#) (2018)
- Building blocks for a new Strategy Amsterdam Circular 2020-2025 (29-05-2019)
- Strategy Amsterdam Circular 2020-2025 (2020)
  - See also: <https://www.amsterdam.nl/en/policy/sustainability/circular-economy/>
- Strategy Amsterdam Circular 2020-2025 – Summary (2020)
- [Innovatie- en uitvoeringsprogramma 2020 – 2021](#) (2020)
- Amsterdam Circular Monitor (2020)
  
- [Amsterdam stippelt route uit naar circulaire stad](#)
- [Evaluating 70+ projects that are accelerating Amsterdam's circular economy](#)
- In a [recent interview](#) (published 31-12-2020) Mariana Mazzucato praises the Circular Economy ambitions of Amsterdam.
- [Amsterdam Donut-stad](#)
- [Roadmap Circular Land Allocation](#)
- [Amsterdam Climate Neutral 2050 Roadmap](#)
- [Development plan Circular Economy MRA 2018-2020](#)



Visual overview of the relationship between the strategy, the implementation programme, the monitor and the city doughnut.

Figure 7: Visual overview of the main elements in the Amsterdam Circular Strategy 2020-2025.

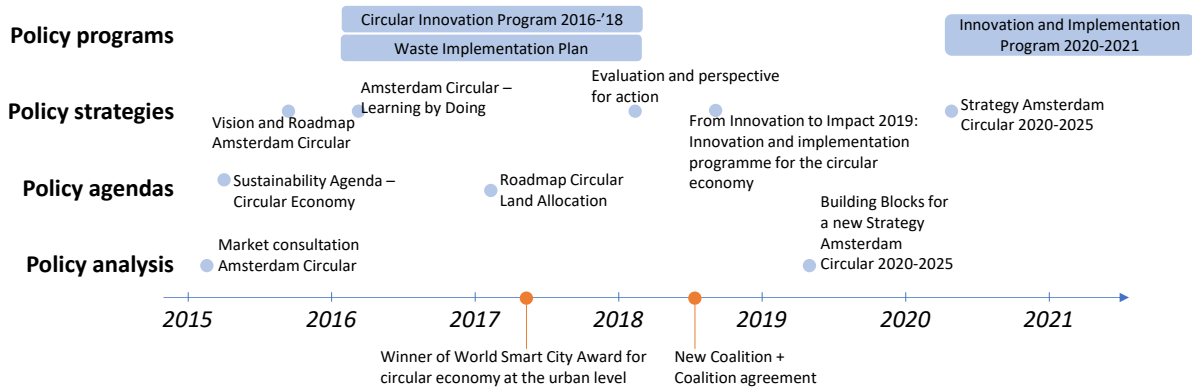




Figure 8: Timeline with key events leading up towards 'Amsterdam Circular Economy 2020-2025'.

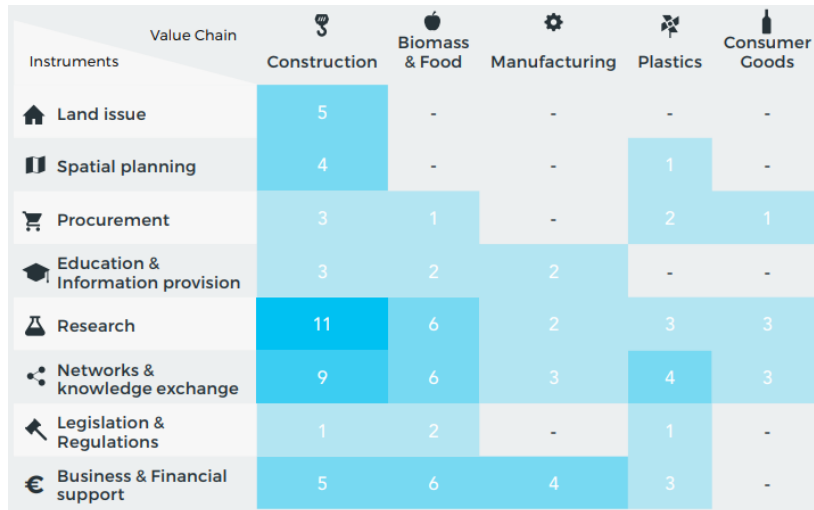


Figure 9: Instruments and project distribution of the Circular Innovation Programme 2016-2018<sup>35</sup>.

Regulatory & Legislative Instruments	Regulations	Strategy & objectives Spatial planning Environmental assessment & permits Monitoring & enforcement	Economic Instruments	Fiscal frameworks	Positive financial incentives Negative financial incentives	Soft instruments	Knowledge, advice & information	Research activities Educational programmes Information campaign Capacity building
	Legislation	Prohibitory provisions Performance standards Technical standards Labels Other legislation		Direct financial support	Subsidies Circular procurement & infrastructure Debt financing		Collaboration platforms & infrastructure	Data and information exchange platforms Matchmaking platforms Participation platforms Living labs
				Economic frameworks	Tradable permits Strong producer responsibility Public-private partnership		Governance	Institutional design Public-private partnerships Voluntary agreements Lobbying

Figure 10: Instruments available for Amsterdam Circular 2020-2025.

## Circular Flanders

- Government of Flanders (dec. 2018). [Vision 2050. A long-term strategy for Flanders](#) (Summary).
- Government of Flanders (dec. 2018). [Vision 2050. A long-term strategy for Flanders](#).
- Circular Flanders (2017). [Kick-off Statement](#).
- Circular Flanders (2019-2020). [Retrospective Report 2017-2019](#).

<sup>35</sup> Amsterdam Circular: Evaluation and Action Perspectives (2018).

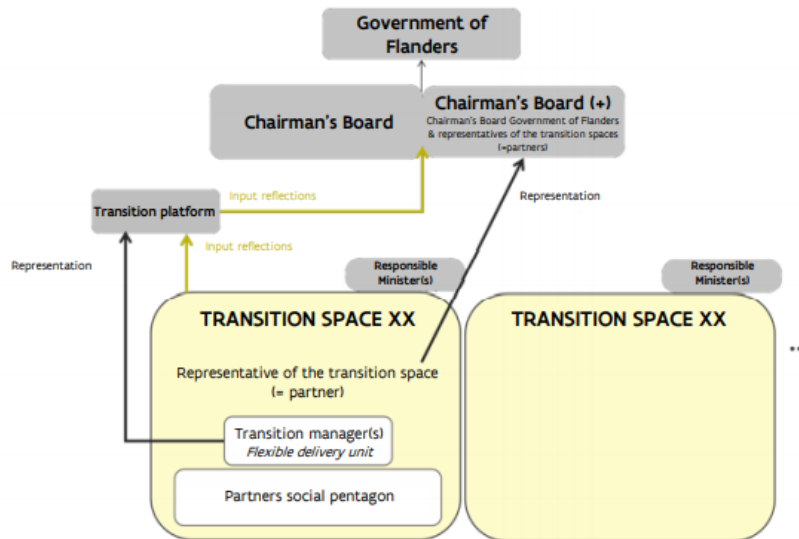


Figure 11: Organisational chart of Vision 2050 governance (Government of Flanders, 2018, p. 93)

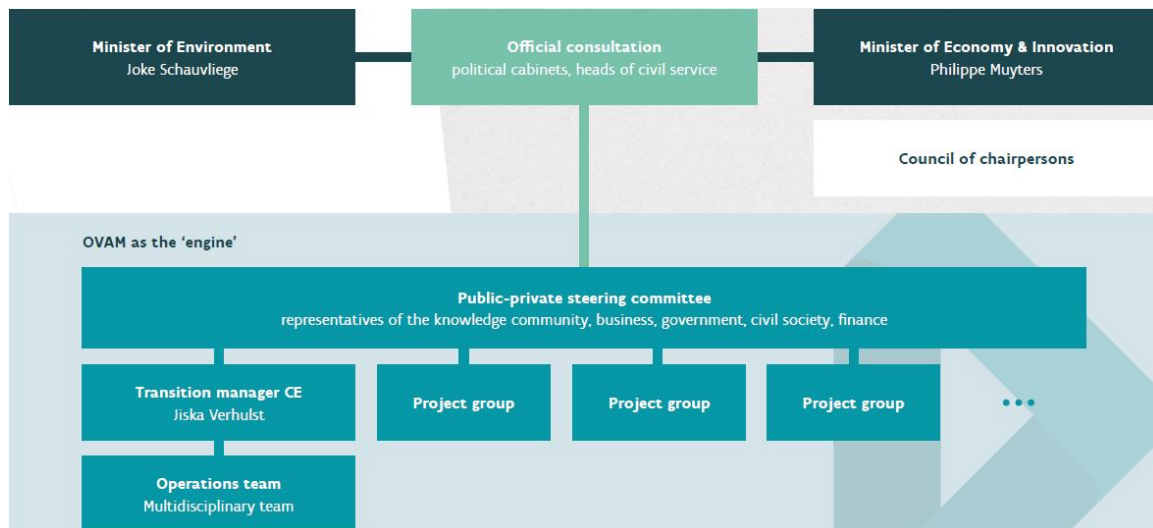


Figure 12: Organisational chart of Circular Flanders governance (Retrospective Report, 2019, p. 21)

### German High-Tech Strategy 2025

- OECD STIP/MOIP Case Germany: [STIP Compass \(oecd.org\)](https://www.oecd.org/stip/compass/)
- [The HT Strategy 2025 Progress report: https://www.bmbf.de/upload\\_filestore/pub/The\\_High\\_Tech\\_Strategy\\_2025.pdf](https://www.bmbf.de/upload_filestore/pub/The_High_Tech_Strategy_2025.pdf)
- EFI Reports. <https://www.e-fi.de/1/gutachten-und-studien/gutachten/>



Figure: Structure of the HTS2025 (Source: OECD 2020)

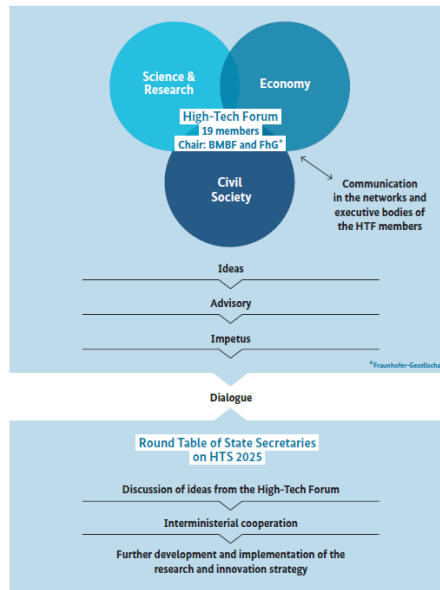


Figure: Governance Structure of the HTS2025 (Source: OECD)

### The Dutch Mission-oriented Topsector and Innovation Policy (MTIP)

- Ministry of EZK (13-07-2018). Kamerbrief over innovatiebeleid en de bevordering van innovatie: naar missiegedreven innovatiebeleid met impact
- Ministry of EZK (26-04-2019). Missies voor het topsectoren- en innovatiebeleid.
- Ministry of EZK (26-04-2019). Dutch missions for grand challenges: Mission-driven Top Sector and Innovation Policy.
- Ministry of EZK (2019). Governance of the KIA and Innovation agendas of the societal theme 'Energy transition and Sustainability', version 085.
- Ministry of EZK (12-11-2019). Kennis- en Innovatieconvenant 2020-2023.
- OECD STIP/MOIP: [Mission Driven Top-Sector Policy | STIP Compass \(oecd.org\)](#)
- Janssen M. (2020), [Post-commencement analysis of the Dutch 'Mission-oriented Topsector and Innovation Policy'](#). December 2020.

4 Themes x 5-8 Missions	KIAs	Ministries	Topsectors
Energy transition & Sustainability	(I)KIA	<b>EZK</b> I&W - BZK	Energy, Chemistry, Water, Creative industries, Horticulture, Agri-Food, High tech Systems & Materials, Logistics
Agriculture, Water and Food	KIA	<b>LNV</b> I&W - VWS	Agri-Food & Horticulture, HTSM/ICT, Life Sciences & Health, Chemistry, Energy, Water, Logistics, Creative Industries
Health and Health care	KIA	<b>VWS</b> LNV - OCV - SZW	Life Sciences & Health, Agri-Food, Horticulture, HTSM/ICT, Chemistry, Energy, Water, Logistics, Creative Ind.
Security	KIA	<b>DEF - J&amp;V - I&amp;W</b> <b>EZK - BZK - OCV</b>	Hightech Systems & Materials, Water, Logistics, Creative Industries
KIA: Key enabling technologies/methods		<b>EZK +</b>	Hightech Systems and Materials & all topsectors
KIA: Public earning capacity		<b>EZK +</b>	Creative Industries & all topsectors

Figure 13: Overview of Themes/Missions, KIAs, and the associated ministries and Topsectors (Janssen, 2020)

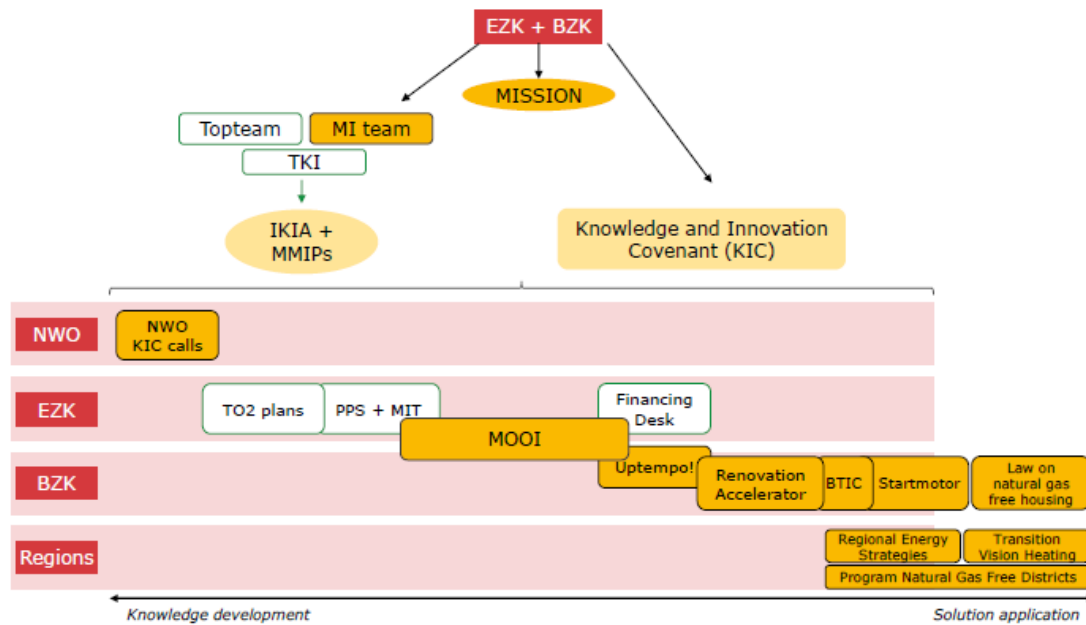


Figure 14: Relevant policy support measures for the Built Environment mission (Janssen, 2020).

### Denmark's Green Solutions of the future

- Ministry of Higher Education and Science (September 2020): ['Green solutions of the future: Strategy for investments in green research, technology, and innovation'](#)
- December 2020 (original September 2020): [Climate Programme 2020 Denmark's Mid-century, Long-term Low Greenhouse Gas Emission Development Strategy](#).
- [Peer Review of the Danish R&I System – Ten steps, and a leap forward: taking Danish innovation to the next level](#)
- [Green energy islands, renovated buildings and climate-neutral waste: Danish government has a new climate action plan](#)
- [Denmark's Green Future Fund to boost green solutions](#)

### New Initiatives

- An ambitious green research and innovation effort
- Green research and innovation partnerships
- Enhanced green focus for Innovation Fund Denmark
- Better coordination of green research
- Better framework for cooperation between knowledge institutions and the business community
- Strong Danish participation in international cooperation
- Monitoring and impact assessments of green research
- National Centre of Climate Research
- Green study programmes

### Initiatives launched

- Denmark's Green Future Fund
- New technologies for a greener Danish business community
- New cluster organisations
- Roadmap for research-based public sector consultancy
- Green perspectives in space
- National robotics strategy
- Roadmap for research infrastructure 2020
- ESS Strategy 2.0

Figure 15: New initiatives and initiatives launched in the Green solutions of the future strategy (MHES, 2020).

### Science Foundation Ireland’s Future Innovator Prize’ Programme

- SFI (2020) SFI Challenge Based Funding Overview. August 2020
- <https://www.sfi.ie/challenges/>
- National science and innovation strategy of Ireland: [Innovation 2020](#)
- SFI’s organisational strategy: [Shaping Our Future](#)
- 

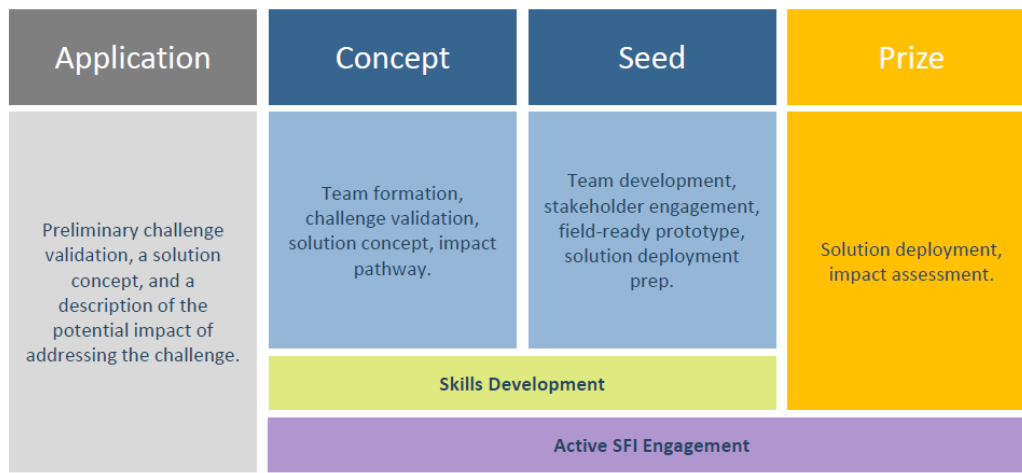
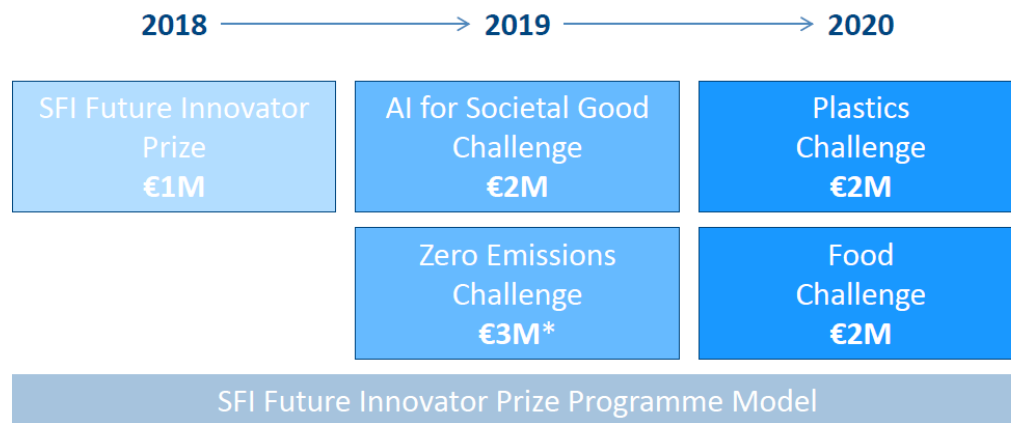


Figure 16: Funding and design of Science Foundation Ireland’s Future Innovator Prize’ Programme (SFI, 2020).

### City of Tomorrow

- OECD STIP/MOIP Case Austria: [STIP Compass \(oecd.org\)](#)
- Biegelbauer et al. (2020): Mission-Oriented Innovation Policies in Austria – a case study for the OECD. Case 4, pp. 51-58
- Lefenda, Johann and Pöchlhammer-Tröscher, Gerlinde (2016) Programmevaluierung Haus der Zukunft 1999 – 2013. Project Report. Wien
- Website of the programme: <https://nachhaltigwirtschaften.at/de/sdz/>
- 
- 
-

## UK Industrial Strategy Challenge Fund

Innovative UK – Delivery Plan 2019 <https://www.ukri.org/wp-content/uploads/2020/09/INUK-250920-DeliveryPlan2019.pdf>

OECD STIP/MOIP:

- UK Industrial Strategy <https://stip-pp.oecd.org/stip/moip/case-studies/14>
- UK ISCF <https://stip-pp.oecd.org/stip/moip/case-studies/12>
- UCL IIPP (2019): A Mission-Oriented UK Industrial Strategy. UCL Commission for Mission-Oriented Innovation and Industrial Strategy (MOIIS). Report, May 2019
- CST letter (2020) A systems approach to delivering net zero: recommendations from the prime minister's council for science and technology; January 2020
- Annual Report Industrial Strategy Council 2021
  - <https://industrialstrategycouncil.org/sites/default/files/attachments/ISC%20Annual%20Report%202021.pdf>

### 4.3 Bio and Circular Finland (Finland)

- Business Finland website: <https://www.businessfinland.fi/en/for-finnish-customers/services/programs/bio-and-circular-finland>
- Business Finland pp-presentation on program: <https://mediabank.businessfinland.fi//LVJksjBb9KXF>



### RIS3CAT (Catalonia/Spain)

- Several reports and action plans available from the governments website: <http://catalunya2020.gencat.cat/en/inici/index.html>

### Box 1. RIS3CAT: schematic diagram

Pillar 1	Pillar 2	Pillar 3	Pillar 4
Leading sectors	Emerging activities	Cross-cutting enabling technologies	Environment for innovation
<ul style="list-style-type: none"> <li>▪ Food and drink</li> <li>▪ Chemicals, energy and resources</li> <li>▪ Industrial systems</li> <li>▪ Design-based industries</li> <li>▪ Industries related to sustainable mobility</li> <li>▪ Health industries</li> <li>▪ Cultural and experience-based industries</li> </ul>	<p>These will be identified in the smart specialisation process</p>	<ul style="list-style-type: none"> <li>▪ ICTs</li> <li>▪ Nanotechnology</li> <li>▪ Advanced materials</li> <li>▪ Photonics</li> <li>▪ Biotechnology</li> <li>▪ Advanced manufacturing</li> </ul>	<p><b>Public policies</b></p> <ul style="list-style-type: none"> <li>▪ Digital agenda</li> <li>▪ Entrepreneurism</li> <li>▪ Eco-innovation (green economy)</li> <li>▪ Non-technological innovation</li> <li>▪ Training and talent</li> </ul>
<p><b>RIS3CAT Action Plan measures</b></p> <ul style="list-style-type: none"> <li>▪ RIS3CAT communities</li> <li>▪ Specialisation and Territorial Competitiveness Projects (PECT)</li> <li>▪ Emerging technologies</li> <li>▪ R&amp;D cooperation projects</li> <li>▪ Public-private partnerships in R&amp;D&amp;I</li> <li>▪ Industry of Knowledge</li> <li>▪ Technology transfer</li> <li>▪ Public procurement of innovation</li> <li>▪ Strengthening the technological capabilities of research and innovation infrastructures</li> <li>▪ International cooperation</li> <li>▪ CatLabs</li> <li>▪ Advanced digital technologies</li> <li>▪ Development of RIS3CAT in Barcelona</li> </ul>			

Source: DG Economic Promotion, Competition and Regulation.

### **Strategic Innovation Programs (Sweden)**

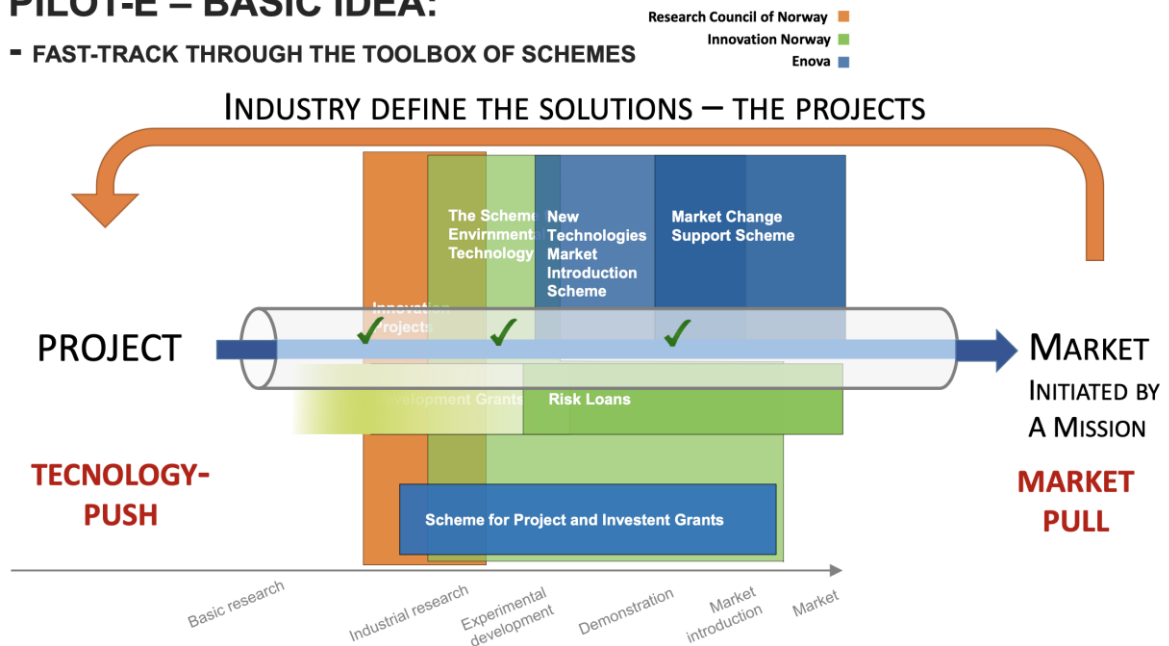
- Vinnova website and SIP documentation: <https://www.vinnova.se/en/m/strategic-innovation-programmes/>
- Technopolis' meta-evaluation of the second round of strategic innovation programs after six years: <https://www.vinnova.se/en/publikationer/meta-evaluation-of-the-second-round-of-strategic-innovation-programs-after-six-years/>
- Technopolis' meta-evaluation of the first round of strategic innovation programs after six years: <https://www.vinnova.se/en/publikationer/metautvardering-av-forsta-omgangen-strategiska-innovationsprogram-efter-sex-ar/>
- Report on innovation agendas: [https://www.vinnova.se/contentassets/689146a8bd274c52b3f177a8a125827a/swecos-kartlaggning-av-strategiska-innovationsagendor\\_20170601.pdf](https://www.vinnova.se/contentassets/689146a8bd274c52b3f177a8a125827a/swecos-kartlaggning-av-strategiska-innovationsagendor_20170601.pdf)

### **Pilot-E (Norway)**

- Pilot-E website, including several reports: <https://www.enova.no/pilot-e/>
- Evaluation report: <https://www.forskningsradet.no/nyheter/2021/pilot-e-er-evaluert/>
- Presentation of evaluation of Pilot-E: [https://www.enova.no/download?objectPath=/upload\\_images/88B5F468142D4EA6A20105DF16E76494.pdf](https://www.enova.no/download?objectPath=/upload_images/88B5F468142D4EA6A20105DF16E76494.pdf)
- Presentation by program manager Trond Moengen (personal communication)

## PILOT-E – BASIC IDEA:

- FAST-TRACK THROUGH THE TOOLBOX OF SCHEMES





## Appendix II: Interview protocol

*The instructions below serve to guide the interviews. Some parts of it might be communicated already beforehand by mail, once an interviewee has committed to participate in the study.*

### Introduction:

The study we conduct focuses on contemporary innovation policies for addressing societal challenges. Our research project serves to create an understanding of how such policies are emerging, and how they might mark a change with respect to earlier policy approaches. We compare policy initiatives from 12 countries and regions. Based on desk research we have collected evidence on how policy strategy @@@ came into being, and what strategies and policies were preceding it.

Through this interview we like to learn more about how exactly the current strategy evolved, where the ideas for the strategy originate from, and which changes in the public sector were necessary (if any) to implement it. We are also interested in what is *different/special* about the current strategy, and what does it take from government administrations to run it? Towards the end of the interview I would like to discuss a few particular policy characteristics we are comparing across cases.

### Topics for discussion:

*Origins of the policy [timeline picture may be shown here]*

- To what extent is this policy **unusual/special**? Does it mark a **shift from earlier policies**?
  - Strategically: the scope, scale, ambitions, role of the responsible administration(s)
  - Operationally: how it is implemented/managed, how other stakeholders are involved
  - Instrumentally: the resources/incentives that are being provided, and to whom
- What have been the main reasons for those changes or unusual features?
  - Political: e.g. different cabinets/ministers, different high-level policy priorities
  - Organisational: e.g. restructuring of departments
  - Tactical: e.g. new views on how policies can be effective (broader trend in STI thinking, and/or concrete evaluation results)
- To what extent is the current policy design the result of **deliberate learning and analysis**?
  - ... regarding experiences with your own (earlier or parallel) policies?
  - ... regarding experiences with other policy initiatives/programs?
- What is the overall **order** of changes; which changes in policy administration took place *before* the focal strategy was launched, and which ones followed *after*?
  - Did you have to make changes or terminate any other policies before being able to implement the focal program?

*Governance capacities: Did you have to change the way that you are working within the organisation in order to launch the focal initiative?*

- Has the way **learning** takes place (in the responsible administration) changed? Were there e.g. novel ways of gathering information and input for designing the policy? If so, are these still in place when running the policy?
  - Use of stakeholder and expert input
  - Monitoring and evaluation mechanisms
  - Trainings for public officials
- To what extent does the policy rely on **experimentation** (in the approach/instruments)?
  - To what extent is this policy itself an experiment in your view? In which respects?
  - What is the most novel/innovative element of the policy?
- To what extent did the **policy process and administrative cycle** change for the strategy? (e.g. monitoring and evaluation periods; the running period of policy; the budgeting)
- To what extent are potential **adaptations** of the policy (e.g. main themes/topics, budgets) possible over time? Is it possible to make changes to the policy over time and if so, what kind of process is in place for that?
  - How does this look for changes in the solutions (directions) that are being pursued?
  - How does this look for the instruments that have been put in place?

- Were there major **tensions** or disagreement in how the policy was designed?  
Are there tensions in the execution of the policy? If so, how were they **resolved**?
  - Were there certain structures or processes for managing conflicting interests?
  - What were major points of conflicts? Between whom were these conflicts visible?
  - Were there attempts to build coalitions and overcome differences?
- Can the emergence / expansion / impact of the policy be attributed to the **stewardship / leadership of specific 'agents'** (policy entrepreneurs); who's championing the policy?
- **Multi-actor stakeholder collaboration:** How were stakeholder involved in the development / implementation of the strategy and the prioritisation of problems/solutions?
  - (only) through broad consultation
  - through deliberations with representatives (e.g. roundtables)
  - certain stakeholders (which?) have influence/decision power in policy design and implementation?
- **Multi-sector policy collaboration:** Did the way of how departments collaborate within the administration change? What is the relative role of different administrative entities for running the policy? Are all partners equally important?
  - Are there new/stronger linkages between domains or across geographical levels? To what extent does coordination or collaboration with local communities / national government, or at the EU level, play a role in running the policy?
  - Do actors commit their own resources to shared policies? Is there true integration?
- **Policy mix:** To what extent does the policy integrate other innovation funding schemes?
  - How does the policy link to other policies running in the field(x) of X,... ? How is the policy mix being streamlined?
  - Were there adaptations or alignments of these other policies necessary?
- 

*Transformative characteristics of the instruments [focus on causes and changes over time]*

- **Directionality:** What considerations led the formulation of specific ambitions/goals, and possibly the solution directions that have been selected?
  - How 'selective' is the guidance that is being provided? Does it exclude a lot? Does it help to identify connections (complementarities) between the innovation efforts of different stakeholders?
- **Societal goal:** What is the relative importance of societal challenges and social or environmental considerations?
  - Do the actual policy efforts and the contributions of engaged stakeholders match this position of societal concerns?
- **Mobilising the demand side:** How much emphasis is placed on ensuring that there are markets for new innovative solutions?
  - In what way are various demand-side policies linked to each other and to supply-side policies; are there structures for safeguarding consistency?
- To what extent is it an explicit goal to **transform** and spur 'unusual' innovations or collaborations?  
E.g. by:
  - driving **multi-disciplinary** solutions
  - opening up to **challengers**; actors that radically change instead of only improve ways of doing business
  - **breaking away** from existing 'systems' of production or consumption

*Transformative impact*

- What **changes** do you expect the policy to induce? Which **effects** follow directly from what the strategy really does?
  - How do various changes add up (towards impacting upon the ultimate goal)?

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