How foresight on transition scenarios shapes policy. Experiences with the preparations for the 9th European framework programme for research and innovation

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Abstract

Transformative change has become an important issue in academic research, as well as in policy making in recent years. With the current re-orientation of R&I policy towards societal challenges in general, and mission-orientation in particular, there is an opportunity to foster the role of transition thinking as guiding framework from policy design to policy implementation. Whether this opportunity can be seized, will depend on the ability to overcome important barriers to transition governance.

In addressing such barriers, this paper focuses on the early phases of the policy cycle, and on barriers related to the organizational context for policy preparation. It argues first of all that foresight activities, drawing on a combination of intra- and extra-organisational networks and processes, are promising instruments to help overcome cognitive, organisational and institutional barriers to policy coordination, covering the full range of policies from the supply side of research to the demand side of sectoral framework conditions and regulation. Second, beyond this government-internal function, foresight processes also provide a point of reference for other actors, stakeholders and public debates, by opening up dialogue about transitions with actors and stakeholders external to public bodies. In other words, by drawing on various types of participatory methods, both intra- and extra-organisational networks can be mobilized for purposes of shaping specific R&I policies and programmes in an instrumental sense, but in a strategic sense they also have repercussions on the wider innovation ecosystems. Third, the relative importance of the intra- and extra-organisational networks differs depending on the phase of a foresight process.

In the context of a foresight project in support of the preparation of the EU's next framework programme (BOHEMIA – Beyond the Horizon: Foresight in Support of the EU's Future R&I Policy), a foresight methodology has been piloted, aiming to develop joint orientations for future policy across different areas, including both R&I policy and a range of sectoral policies, but also involving external actors and stakeholders. This process was guided by a conceptual framework inspired from transitions thinking in order to develop possible future policy "targeted scenarios" for tackling societal challenges. Policy mixes and agendas were formulated based on targeted scenarios in nineteen different areas of major significance for Europe at a time horizon of 2040.

The process was conducted in close cooperation with the EC's foresight correspondents' network, i.e. a network of civil servants from different DGs, covering "supply side" R&I policy as well as "demand side" sectoral policies. The foresight work with this intra-EC network (within and across DGs) was complemented by external online (Delphi) consultations involving experts and stakeholders.

The experience of the foresight project in support of the EC's future R&I policy confirmed the potential of foresight as an intra- and extra-organisational instrument of policy coordination in support of the formulation of transformative policies. Agreement was achieved on a range of candidate priority areas and associated targeted scenarios, but also on R&I agendas and requirements for sectoral policies necessary to make the scenarios happen. It was backed by inputs and expertise from consultations with a wider external network of experts and stakeholders. While the final decision on policies remains to be taken as part of the formal decision making of the EU institutions, the proposal for the next framework programme and related sectoral policies provides a basis for transition policies in Europe.

1. Introduction

Transition thinking has become quite popular in academic circles since the turn of the millenium, and there is growing recognition of its potential relevance to guide policy making, as reflected in recent work by the OECD (2015) and the EEA (2015). Moreover, there are some examples of policies that are explicitly based on transition thinking, among which the Dutch Energy Transition, the German Energiewende are just the most prominent ones. However, in spite of these success examples, it is fair to say that the influence of transition thinking on policy making has been comparatively modest so far, in particular as compared to the various variations of systems thinking.

With the current re-orientation of R&I policy towards societal challenges in general, and mission-orientation in particular, there is an opportunity to foster the role of transition thinking as guiding framework for policy design and implementation. Whether this opportunity can be seized, will depend on the ability to overcome important barriers to the realisation of transition policies.

The strategic and normative turn in R&I policy and beyond, which is closely tied to rise of societal challenges as guiding rationale underpinning not only R&I policy, has major implications for R&I governance in general (Weber 2012; Daimer et al. 2012), and for the use of foresight in support of reflexive governance in particular. First of all, given the longer-term time horizon, it requires a forward-looking and future-oriented approach to policy development and implementation. Second, while traditional R&I programmes may help build niche applications, the transformative ambitions requires re-shaping the wider innovation, production and consumption ecosystems, giving much more prominence also to social and organizational innovation.[1] Foresight can be used in an instrumental sense to inform programming, but also in a strategic sense to help shape the innovation ecosystem, addressing actors and stakeholders on the demand and diffusion side of innovation (i.e. industry, CSOs, (local) government). Third, there is a growing need for policy coordination and alignment between R&I-related policies and sectoral/thematic policies, if the ambition is to move beyond research and innovation and aim at triggering transformative change, which requires coherent impulses also from downstream sectoral policies. Foresight processes can help support this process of alignment. Participatory approaches, which are a characteristic features of foresight, are key to enabling such a process of alignment. The formation of shared visions, for instance, is one element that can help overcome potentially conflicting rationales between policy areas and thus facilitate policy alignment around common and coherent agendas. In fact, foresight processes have a range of potential impacts on policy making and policy governance systems, including intra- and extra-organisational learning, leading to coherent agenda-setting and policy mixes, and also in the context of transformations (Havas and Weber 2018)

These general governance requirements of a strategically and normatively oriented R&I policy are pretty well known, as are the possibilities of making use of foresight for supporting governance with a transformative ambition. However, what is less well understood are the cognitive and organizational pre-conditions for enabling the formation of transition policies in governmental organisations. There are several challenges to embedding transitions thinking in

[1] See the extensive overview of social innovation for social change, which was conducted in the context of the EU-funded project SI-DRIVE (Social Innovation. Driving Force of Social Change), which may use a different conceptual vocabulary than the one common to the transitions community, but which nevertheless conveys similar guiding ideas.

governmental bodies; it requires opening up to new ideas, overcoming established silo thinking, facilitating coherence in thinking about future policy challenges, and thus an embedding of futures and transitions literacay in policy-making processes and organisations, not to speak of all the organizational barriers to implementing transition policies at the level of programmes and agencies.

In this paper, I argue that properly designed foresight processes can help achieve a better alignment of policy making for instrumental (i.e. programme development) as well as for strategic purposes. (i.e. mobilizing ecosystems). The mechanisms through which foresight processes achieve this effect operate both at individual and organizational level.

The paper focuses on the early phases of the policy cycle, and on barriers related to the organizational context for policy preparation. It argues first of all that foresight activities, drawing on a combination of intra- and extra-organisational networks and processes, are promising instruments to help overcome cognitive, organisational and institutional barriers to policy coordination (e.g. in terms of shaping common long-term agendas, and establish a common orientation for transformative policies), covering the full range of policies from the supply side of research to the demand side of sectoral framework conditions and regulation. Ultimately, this shall help improve the coherence between policies from different fields and levels, as a pre-condition for triggering transitions. Second, beyond this government-internal function, foresight processes also provide a point of reference for other actors, stakeholders and public debates, by opening up dialogue about transitions with actors and stakeholders external to public bodies. Next to the formation of intra-organisational networks, foresight can feed extra-organisational networks, which contribute to enhancing coherence of vision and action among those actors and stakeholders whose decisions ultimately shape future transition paths. In other words, by drawing on various types of participatory methods, both intra- and extra-organisational networks can be mobilized for purposes of shaping specific R&I policies and programmes in an instrumental sense, but in a strategic sense they also have repercussions on the wider innovation ecosystems. Third, the relative importance of the intra- and extra-organisational networks differs depending on the phase of a foresight process.

The next section points briefly to some of the theoretical underpinnings of how foresight processes relate to processes to policy learning and organizational learning, ranging from individual learning to group learning and systemic learning along the policy cycle. Section 3 provides some empirical underpinnings to our argument, by revisiting recent experiences made with a two-year foresight process supporting the preparation of the next and ninth European framework programmes for research and innovation, which is likely to be called Horizon Europe. Then next section (Section 4) extract the main findings with regard to our initial arguments. The final section concludes.

2. Conceptual framework

In recent years, our knowledge of the potential role and impact of foresight has improved, and we better understand the main enabling factors, depending on the type of impacts we want to achieve (da Costa et al. 2008; Havas et al. 2010; Jarmai 2015). Havas and Weber (2017a), for instance, distinguish different types of forward-looking activities, depending on their focus (S&T/thematic prioritisation vs. systemic), their level of participation (expert-based vs. participatory), and their level of visibility (high vs. low). The benefits and impact that can be expected from a forward-looking activity depends on the respective combination of features and its "fit" with the policy governance systems in which it is embedded.

However, for the purposes of our guiding argument on the role of foresight in intra- and extra-organisational networks, we need to take a more differentiated look at processes of **policy learning.** Basically, policy learning can be defined as "change of policy relevant knowledge, skills or attitudes, which are the result of new information or the assessment of past, present or possible future policies" (Biegelbauer 2013: 50). Starting from this basic definition three levels of policy change can occur (Hall 1993): First-order change involving adjustments to the settings of basic instruments of policy (e.g. minimum lending rate, budget sizes); second-order change involving changes of policy instruments (e.g. the introduction of a new system of monetary control); and third-order change involving shifts in policy goals (e.g. from Keynesian tomonetarist macro-economic policy).

In relation to transition concepts, policy learning and change at all three levels would be required, and it would need to start at the third level of policy goals. Transitions thinking implies a shift in very fundamental beliefs in what the rationales and goals of government policy intervention are, as well as in the instruments, their design and implementation, not to forget the governance aspects, for instance in terms of who needs to be involved and how much coordination between policy areas is needed. Against this backdrop, it is of little surprise that transitions thinking is meeting major barriers to uptake in government policy, in spite of its apparent relevance to the strategic turn in R&I policy alluded to before. Important reasons for the limited success of transitions thinking in policy making must be seen in cognitive, organisational and institutional barriers, in silo-thinking and competing policy approaches of different ministries/DGs, which prevent policy coordination, and which ultimately lead to a lack of coherence between policies from different fields and levels.

In light of these considerations, how can foresight help trigger a wider uptake of transitions thinking? While the so-called process output of foresight activities in form of learning and networking has become an established element of the rationales underpinning foresight, the learning and networking processes within organisations participating to foresight remain underexplored in the literature. Jarmai (2015) has developed a framework to connect foresight processes to impact, and conducted qualitative empirical research on the basis of that framework, demonstrating some of the effects on **learning at the level of the individual and at the level of a group** (i.e. those actors involved in a foresight activity, thus making part of a "foresight system"), and what **wider systemic impacts** these learning processes generate beyond the group, i.e. in an organization and in a research and innovation system (common understanding, collective action, new actor constellations, reduction of uncertainty).

This theoretical perspective on foresight impact in organisations and systems through various types of learning can be applied also to foresight in the context of supporting transition policies. In calls for dedicated learning mechanisms to facilitate **learning across policy areas** (but still within an organization like the European Commission!), as a means to enable policy coordination. In relation to this kind of policy learning and policy coordination, I speak of **intra-organisational networks** as a key mechanisms through which foresight generates impact, because it takes place within a large organization, albeit with quire autonomous sub-entities.

Beyond policy learning and policy coordination within a large organization, transition policies also require the engagement of other actors and stakeholder, ranging from other policy levels, to industry, academia and civil society organisations. In contrast to intra-organisational networks, I speak of **extra-organisational networking** as mechanisms through which a foresight activity affects other than government actors. As will be explained later on, this

distinction between intra- and extra-organisational networks is crucial to understand how foresight can support a fundamental shift towards transition-inspired governance.

Finally, it is important to distinguish the **phase in the policy making cycle** to which a foresight activity is primarily dedicated. Taken a simple four-phase model as a starting point (strategic intelligence, sense-making, decision-making, policy implementation), the most crucial benefit of foresight arises in the sense-making phase that precedes decision making and implementation.[2]

These theoretical building blocks – types of foresight, different levels of learning, intra- and extra-organisational networks, policy cycle – form the ingredients on the basis of which the role and contribution of a specific foresight project shall be analysed in terms of its actual and potential future effects on policy making, tied to the ambition of triggering transition policies to materialize.

3. The BOHEMIA project and methodology

In the context of a foresight project in support of the preparation of the EU's next framework programme (BOHEMIA – Beyond the Horizon: Foresight in Support of the EU's Future R&I Policy), a methodology has been piloted, aiming to develop joint orientations for future policy across different areas, including both R&I policy and a range of sectoral policies, but also involving external actors and stakeholders. The project aims to support ongoing debates about future European R&I policy by providing a long-term view on the requirements and opportunities for research and innovation in Europe, and for the next framework programme in particular (Weber et al. 2018). It complements other preparatory activities, in particular the interim evaluation of Horizon 2020 (EC 2017a) and the modelling efforts to demonstrate the economic impact of R&I, and has fed into the so-called Lamy Report (EC 2017b), outlining some basic principles for the next framework programme. The main contribution of BOHEMIA is explore future potential areas of research and innovation on which Europe could concentrate its efforts, but set within a wider context of meta-scenarios and transitions.

This project was thus guided by a conceptual framework inspired from transitions thinking in order to develop possible future policy "targeted scenarios" for tackling societal challenges. Policy mixes and agendas were formulated based on targeted scenarios in nineteen different areas of major significance for Europe at a time horizon of 2040.

In organisational terms, the project was conducted in close cooperation with the EC's foresight correspondents' network, i.e. a network of civil servants from different DGs, covering "supply side" R&I policy as well as "demand side" sectoral policies. The foresight work with this intra-organisational network (within and across DGs) was complemented by two external online consultations involving experts and stakeholders from what can be called an extra-organisational network.

The basic rationale behind the project can be summarized as follows: It usually takes five, ten or even more years for research results to diffuse widely and achieve their full impact in society and economy. While lead-times are getting shorter, especially in some sectors, they are still a

[2] This approach was developed in the work of EFFLA (European Forum on Forward-Looking Activities), see EFFLA (2011)

significant factor in planning of R&I policies and activities. Pursuing relevance across a wide range of fields and policies, BOHEMIA started from socio-economic and global challenges at a time horizon of 2035 to 2040. What will the world look like by then? Will the needs, aspirations and challenges be similar to today's or rather look substantially different? Providing orientation with regard to these questions is essential for guiding research and innovation activities that respond to future requirements, and its requires both exploratory thinking and normative thinking in order to provide orientation for strategic action.

These requirements translate more specifically into the following three objectives, which are addressed respectively in the three phases of the BOHEMIA project:

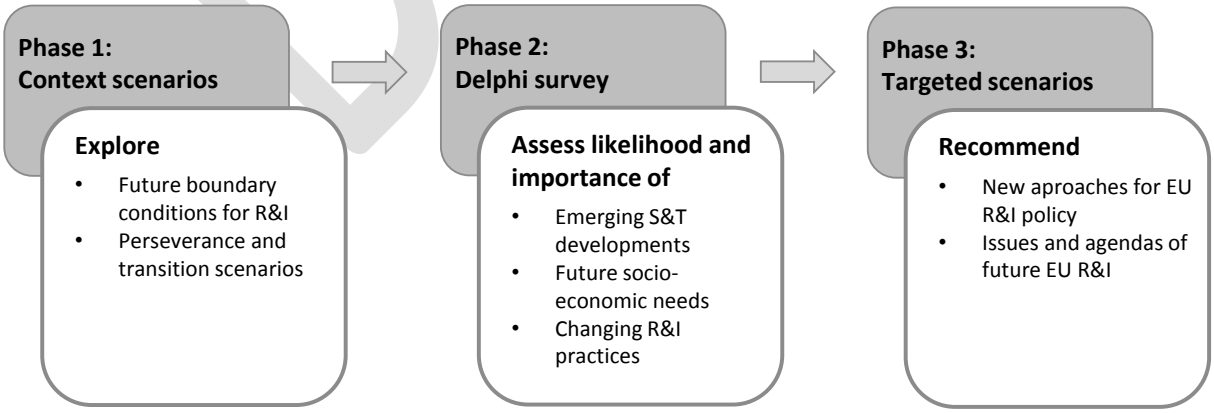
- Explore possible alternative futures in terms of societal, economic and political conditions and boundaries for EU R&I policy;
- Assess the likelihood and importance of the possible future evolution of socio-economic as well as of scientific and technological challenges, needs and opportunities;
- Recommend potential priority areas and policy approaches for addressing them.

In the context of the BOHEMIA project, a foresight methodology was piloted, aiming to develop joint orientations for future policy across different areas, including both R&I policy and a range of sectoral policies. This process was guided by a transition framework in order to formulate future policy "missions" for tackling societal challenges. Policy mixes and agendas were formulated based on transition scenarios in nineteen areas of major significance for Europe at a time horizon of 2035.

The three phases of BOHEMIA

Project BOHEMIA addresses developments both in the context of R&I and in the field of R&I to devise new possible approaches and issues for EU R&I policy. Figure 1 below presents the three phases of the BOHEMIA project and how each of them contributes to the project's objectives.

Figure 1: Objectives and corresponding phases of the BOHEMIA project



Phase 1: Context scenarios

R&I policy does not take place in a vacuum, but is embedded in a wider socio-political and economic context. In order to explore boundary conditions set by this context, BOHEMIA has developed two contrasting types of context scenarios for each of the following seven domains (Ricci et al. 2017): global political and socio-economic context, climate and energy, environment and ecosystem resources and services, health, security and resilience, accelerating innovation, and towards a world of cities.

In each of the seven domains, a pair of context scenarios was developed, in order to capture the variability of the future in a simple and clear-cut manner. The pair included a 'perseverance scenario' and a 'transition scenario' (see Box 1).

Box 1: BOHEMIA Context scenarios

Transition scenarios represent ambitious structural and institutional change process, which in many cases will alter of the 'rules of the game' in the seven domains. As such, they focus on areas where major changes are necessary and/or likely. They define the requirements and opportunities for future R&I, but also point to important implications for other policy areas and strategies of stakeholders.

However, transition scenarios cannot be taken for granted. Overcoming historically grown path-dependencies and switching to a different trajectory is very difficult. Therefore, it is necessary to be also prepared for **perseverance scenarios,** in which the fundamental structural and institutional conditions persist by and large as they are today.

The transition scenarios would enable the EU to meet both sets of ambitions simultaneously: to maintain or even strengthen its global role, at least in selected areas, and at the same time contribute to the fulfilment of the SDGs.

These transitions cannot be achieved by R&I alone, but require complementary actions in other policy areas and by other actors and stakeholders if the ambitious agendas are to be realised. To manage longer-term transitions there is a need for new forms of governance, and in particular enhanced coordination between different policy areas.

In the BOHEMIA context scenarios report (Ricci et al. 2017), we argue that, in spite of the fundamental openness of the future as reflected in the pairs of perseverance and transition scenarios,[3] the transition scenarios represent the future Europe should aim for. The scenarios are selective, covering only parts of the future space, composed of four major domains of change.[4] The domain of social needs, for instance, was represented by the scenario pairs on 'Security and Resilience' and on 'Health', while other social needs, such as food supply or inequality, were addressed only indirectly, as part of other scenario pairs. Moreover, the seven scenarios spaces are not independent but inter-penetrate each other. This is probably most

[3] The seven pairs were addressing the following areas: 1) Security and Resilience, 2) Health, 3) Climate and Energy, 4) Environment and Ecosystem Resources and Services, 5) Towards a World of Cities, 6) Accelerating Innovation: People and Tech Convergence, 7) Global Political and Social Context.

[4] In the scenario space, the four domains were called 1) Social Needs, 2) Biosphere, 3) Drivers of Change, and 4) Governance. As the delimitation of these domains has evolved in the course of the BOHEMIA project, they have been re-named as four transitions: 1) Social Needs: Providing for the Needs of People, 2) The Biosphere: Safeguarding a Hospitable Planet, 3) Innovation: Harnessing the Forces of Change, and 4) Governance: Joining Forces for a Better World.

pronounced in the scenario pair on 'Towards a World of Cities'. Cities represent the spaces where most of the scenarios interact. In spite of the overlaps and inter-relations, the four main domains, to which the scenarios were assigned, showed a degree of coherence and distinctness. This inspired us to re-frame them as key transition goals.

In the very end, the seven transition scenarios from the context scenarios report were condensed into four guiding transitions, which the EC should take as orientating frame for its future R&I related policies, because they would allow reconcile its two main political ambitions, i.e. the achievement of the SDGs and the strengthening of Europe's position in the world. Of course, these transitions are drawn from a European perspective, i.e. the transitions sketch pathways that would allow the EU to maintain and possibly strengthen its global role, while at the same time moving towards the Sustainable Development Goals, but taken together the four inter-connected transitions – while having different focuses – have a similar coverage as the second 'deep transition' suggested by Schot and Kanger (2018).

Phase 2: Delphi process

Emerging developments in science, technology and innovation (including social innovation!) are essential forces that could help realise the transition scenarios, or pose barriers and risks for the transition processes. The second phase of BOHEMIA examined the likelihood and significance of certain emerging trends in science, society, the economy and policy, and in R&I practices (Gheorghiu et al. 2017).

Box 2: The BOHEMIA Delphi survey

Delphi is a survey technique for collecting expert and stakeholder opinions on statements about the future. Delphi surveys typically build on a process of participants' revisiting their assessments in light of interim survey results. In the past Delphi questionnaires were circulated in multiple 'rounds'; today online questionnaires allow revisiting interim results in real time. The BOHEMIA Delphi survey was a real-time online survey, in which participants were able to revisit their initial assessments - the second assessment could be made under the influence of own and other judgements, which were provided in a visualised form.

Moreover, BOHEMIA employed a Dynamic Argumentative Delphi (DAD) technique, asking participants to also propose and rate arguments underpinning their responses to the Delphi statements. The goal of DAD is to enable inter-active online Delphi consultations with a large number of participants (in the hundreds or more), while adding an 'argumentative' (i.e., justification-based) dimension to it. This argumentative dimension allows understanding the reasons behind the assessments made.

The BOHEMIA Delphi survey contained 147 statements; concerning future states of affairs with presumed relevance for R&I policy in Europe. The statements were formulated in a precise and concise way, based on a combination of sources: interviews, scanning of internet sources scientific literature and foresight studies, the BOHEMIA context scenarios, a media analysis, a project team workshop, and a scoping workshop with the EC Foresight Correspondents' Network. As a result, the final set of statements is well balanced and its

scope is wide ranging, although, of course, there is no such thing as a perfectly balanced and fully exhaustive set.

The survey was implemented between 5 May 2017 and 18 June 2017. Invitations were sent to approximately 15,500 individuals, with reminders dispatched up to three times. Eventually, the number of registered participants (~ 1500) exceeded initial expectations by a substantial margin. About half of the participants went through the entire survey for one or more fields of knowledge, and ca. 18% of these also revisited their initial assessments and arguments. More than 10% of the participants originated from a country outside the EU, and the participation from EU member countries was reasonably balanced, though – as expected – with a comparatively strong participation from the home countries of consortium partners (Austria, Germany, Italy, and Romania)

Phase 3: Targeted scenarios

The results of the Delphi survey were analysed as to the degree of expert consensus on their likelihood within the timeframe addressed in the study and on their significance for EU R&I policy. Starting from likely to materialize statements, the results were synthesized into 19 targeted scenarios. The process involved clustering of Delphi results into draft targeted scenarios, a workshop with the foresight correspondents' network and an online consultation with a wider audience of stakeholders.

With the growing significance that the notion of 'missions' has acquired recently in the context of both European and national R&I policy, BOHEMIA has strived to generate results that are at a comparable level of granularity, thus serving as a source of inspiration for upcoming political debates about priorities for the next European framework programme (see Box 3).

Box 3: Making sense out of Delphi results with the help of targeted scenarios

The Delphi results provided the foundation for the formulation of more targeted scenarios, which in turn suggest possible orientations for future EU R&I policy. Based on the assessment of the Delphi statements in terms of likelihood and significance, a first set of targeted scenarios was developed following a clustering exercise of related statements. The targeted scenarios varied in terms of level of abstraction, but followed a common template:

- A **summary** of the essence of the targeted scenario
- A brief description of the actual scenario, formulated as a **visionary outlook** on ambitions and challenges with a time horizon of 2035 to 2040
- A set of arguments addressing the **relevance** of the targeted scenario at global level (i.e., their contribution to tackling SDGs) and at European level (i.e., why is it important for the EU)
- A section on **implications for EU policy** areas adjacent to R&I policy, in order to point to framework conditions and demand-side policy issues that will need to be addressed if the targeted scenarios are, or need to be, realized.
- A specific section on the **EU R&I policy implications** of the targeted scenarios, distinguishing between understanding-oriented research, regulatory science and

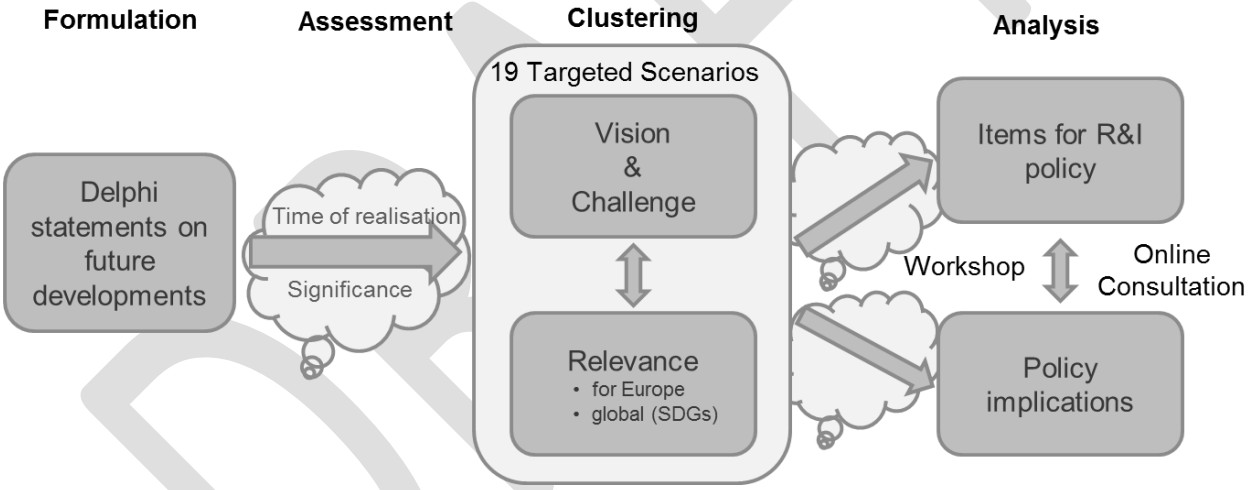
policy-knowledge, solutions-oriented research, and scaling-up experiments, demonstration and social innovation.

The targeted scenarios were validated and refined in a workshop with the EC Foresight Correspondents' Network, and subsequently were placed to a final online consultation, which centred on their importance for EU R&I policy and on their implications for future EU R&I policy directions. In total, about 1250 participants registered for the consultation, and finally almost 750 finished responding to at least one field of knowledge.

The consultation delivered an overall assessment of the perceived relevance of the targeted scenarios for EU R&I policy, and an amended and ranked list of possible future directions for EU R&I policy perceived as priorities within each of the targeted scenarios.

These results were further refined by a process of shortlisting key R&I directions, taking into account the total number of votes received as well as their share, and aggregating duplicates into clusters. Finally, the resulting clusters were slightly rephrased in order to better reflect the essence of the prioritised key R&I directions. Figure 2 below illustrates the process of sense-making from the formulation of Delphi statements to the analysis of targeted scenarios.

Figure 2: From the Delphi statements to future directions for EU R&I policy



The interactions with EC-internal and EC-external networks

Alongside the three phases, the BOHEMIA project was conducted in close cooperation with the EC's foresight correspondents network (FCN). Coordinated by DG RTD, FCN is a formal network of civil servants from different Directorates General of the EC, engaged in forward-looking and strategic activities in their respective environments. The DGs involved in the FCN cover "supply side" R&I policy as well as "demand side" sectoral policies. Many of these DGs play a role in European framework programmes, e.g. by running certain thematic programmes (e.g DG CONNECT), while others may not play an active role, but nevertheless matter by addressing policy issues of a cross-cutting nature (e.g. DG ECFIN). In total, the FCN comprises a group of about 60 to 70 individuals from the vast majority of DGs.

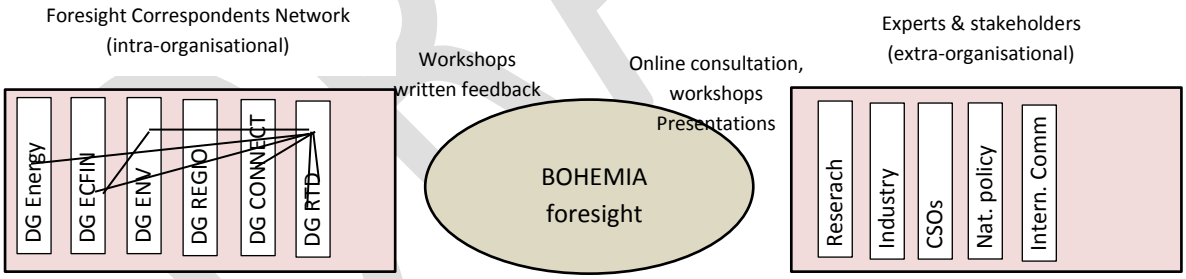
FCN played a crucial role with regard to the BOHEMIA project, by being not only regularly informed about the progress of the work but by also contributing actively to it. Through a series of workshops with the FCN as well as written consultations, the formulation of context scenarios, Delphi statements, targeted scenarios and associated reports was adjusted. It is fair to argue that this kind of "co-creation"

process led also to a kind of co-ownership of results. The close interaction with FCN also allowed adapting to the constantly changing debates about FP 9 almost in real time. For instance, by developing targeted scenarios at an appropriate level of granularity, it was possible to connect with the debates about "missions" as possible structuring element of FP 9. In fact, targeted scenarios can be regarded as candidate areas for such future missions.

The work with this intra-organisational network (i.e. within DG RTD and across other DGs) was complemented by external online consultations involving experts and stakeholders, as well as an extensive number of presentations and discussions in national fora. The two most extensive forms of interaction with the extra-organisational network of experts and stakeholders took place through two online consultations; first, the Delphi survey and later on the consultation on the draft targeted scenarios. The specific format of a real-time, online and argumentative survey, which allowed collecting assessments as well as arguments underpinning these assessment, provided a very rich picture of the future expectations (Delphi survey) and future requirements (targeted scenarios). It is difficult to assess to what extent the extra-organisational network developed some kind of "ownership" of results, but the qualitative feedback collected indicates a great deal of appreciation for this specific form of involving the community in a systematic fashion in the early phase of designing the next framework programme.

As sketched in Figure 3, the BOHEMIA project served as an interface between the intra-organisational foresight correspondents network and the extra-organisational network of actors and stakeholders in the wider R&I and policy community. By iteratively addressing the one or the other of these two networks, a process of mutual adjustment and validation of foresight results was conducted.

Figure 3: Intra- and extra-organisational foresight networks tied to BOHEMIA



4. Findings

The BOHEMIA project delivered a range of **substantive results** ("product benefits"), which feed into the process of preparing and designing the next framework programme. In instrumental terms, they help identify candidate thematic priorities for FP 9, but in strategic terms they also deliver an exploratory and a normative framework underpinning policy development well beyond the realm of R&I policy, and in line with long-term transformative ambitions. More specifically, the following main types of results were produced:

- Seven pairs of **context scenarios** as exploratory analysis of future contexts for R&I and related policies, which defines the major challenges to be addressed, and the scope of uncertainties to be prepared for.

- A set of four **transitions** regarded as essential for moving into a direction that would allow reconciling the main political ambitions associated with the European framework progarmmes, namely to further the achievement of SDGs and to strengthen Europe's position in the world. These transitions serve as normative frame for the subsequent work on targeted scenarios, which can be interpreted as candidate priorities of a future framework programme. In other words, the four transitions specify "the future we want", but at the same time take into account the variability of future contexts ahead. They are underpinned by discussion with the FCN as well as by inputs from the online consultations about the normative directions to take.

  The four domains of key transitions are:

  - **Social needs: Providing for the needs of people**, to ensure a better life for all;
  - **The biosphere: Safeguarding a hospitable planet**, to ensure the survival of the species;
  - **Innovation: Harnessing the forces of change,** to improve change and the mechanisms that bring change;
  - **Governance: Joining forces for a better world**, to establish the conditions for successfully managing transitions.

- 19 **targeted scenarios** that populate the future space as defined by the four transitions with more specific, sometimes experimental initiatives, which exploit the innovation opportunities ahead but embed them into pathways that help ensure they contribute to the envisaged transitions. These targeted scenarios point to combinations of social and technological innovation opportunities ahead, which may help realise the four transitions. A part from sketching the visions associated with these targeted scenarios, the scenario descriptions also specify
  - The relevance of the scenario for European policy goals, in terms of their contribution to strengthening Europe's position in the world.
  - Their relevance to the achievement of SDGs
  - The implications of the scenarios for non-R&I European (but also national level) policies, which affects in particular "downstream" sectoral policies with their respective investment and regulatory priorities
  - Future directions of R&I, which could be priorities for a future framework programme

- **Priorities for future R&I directions** as resulting from the online consultation; they serve as a first indication where EU-level R&I funding is regarded as crucial for realizing the targeted scenarios. Interestingly enough, the resulting priorities represent a combination of four quite different types of R&I needs: i) understanding-oriented research, ii) solutions-oriented research, iii) regulatory science (e.g. impact assessment), iv) social and organizational innovations for scale-up and uptake.

These substantive results may be interested in themselves, but the key question from the perspective of this paper is about the **process benefits**, i.e. whether and how these results

become “performative” (van Lente 2012) in the organization of the European Commission) and beyond. It is of course too early make a comprehensive assessment, and the subsequent observations may be speculative, but first indications point to the following outcomes:

- Through the close involvement of the foresight correspondents network, the BOHEMIA interim results became a **common reference point** for the different Commission services involved. As such they provided a shared focal point of debate across the boundaries of different directorates and DGs.

- The approach of developing and specifying targeted scenarios in the way done by BOHEMIA introduces a **quality standard** in terms of how candidate priorities for FP 9 need to be justified. A plausible scenario and R&D priorities are complemented by considerations on the expected benefits with regard to a normative reference framework and by requirements with regard to other policy areas, which need to be met in order to enable the realization of the scenario. This implies that right from the start, R&I priorities are not defined in isolation but with reference to other policy areas. Policy coordination needs are part of the development process of FP 9 right from the start.

- The embedding of the targeted scenarios into the wider transition framework obliged both the foresight correspondents and the respondents to the online consultation to **think well beyond the confines of S&T research**. As a consequence, considerations regarding research in support of regulation, or social and organizational innovations essential for upscaling and wider impact emerged as important priorities on the R&I agendas.

- Although intra-organisational and extra-organisational networks of contributors to BOHEMIA did not interact directly, the project served as an interface to collect inputs from both sides. In the different phases of the foresight process, the **relative importance of intra- and extra-networks changed**, depending on the tasks at hand. To back up normative considerations, intra-organisational networks were give a stronger role, whereas validation of future-oriented statements (Delphi) or the validation of targeted scenarios relied largely on expert and stakeholder knowledge from the extra-organisational network.

Overall, the experience of the BOHEMIA project in support of the EC’s future R&I policy confirmed the potential of foresight as an intra- and extra-organisational instrument of policy coordination in support of the formulation of transition policies. Common views across different DGs were achieved on overarching ambitions in terms of transitions, on a range of candidate priority areas, but also on R&I agendas (“supply side”) and requirements in sectoral policies (“demand side”). While the final decision on policies remains to be taken as part of the formal decision making machinery of the European institutions, the proposal for the next framework programme and related sectoral policies provides a substantive basis for transition-oriented policies in Europe, and process-wise it has contributed to promoting at least some degree of cognitive and thematic coherence and coordination across policy areas.

5. Conclusions

Overall, the experience of the BOHEMIA project in support of the EC's future R&I policy confirmed the potential of foresight as an intra- and extra-organisational instrument of policy coordination in support of the formulation of transition policies. Common views across different DGs were achieved on overarching ambitions in terms of transitions, on a range of candidate priority areas, but also on R&I agendas ("supply side") and requirements in sectoral policies ("demand side"). While the final decision on policies remains to be taken as part of the formal decision making machinery of the European institutions, the proposal for the next framework programme and related sectoral policies provides a substantive basis for transition-oriented policies in Europe, and process-wise it has contributed to promoting at least some degree of cognitive and thematic coherence and coordination across policy areas. Whether better policy coordination will ultimately be achieved will of course also depend on the implementation modalities for the next framework programme.

Complementary to the EC-internal benefits, the interactions with the extra-organisational network was valuable to deepen and validate the work conducted in cooperation between the project team and the FCN. Currently, it is still hard to say whether the foresight process also managed to trigger new ideas in the extra-organisational network, i.e. whether it had some influence the wider innovation ecosystem. The online-consultations and the various presentations may have stimulated the thinking about FP 9 in expert, stakeholder and policy-making communities beyond the EC, but it will require a dedicated study to demonstrate this. The future structure and content of FP 9 may show whether some elements of the BOHEMIA foresight found their way into the next programme (and even this is not a causal proof).

However, by drawing on networks both external and internal to the organization in which the insights from the foresight process shall be embedded, we would argue that a strengthening of the credibility and the potential impact of the foresight process could be achieved. A well-tuned sequence of knowledge flows from both networks, depending on the phases of the process, mutually reinforced the quality of results.

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