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DEALING WITH UNCERTAINTY: FORESIGHT FOR POLICYMAKING**

A new political science is needed for a world itself quite new.
Alexis de Tocqueville (1835)

Abstract: In a time when the world is facing the simultaneous rise of unprecedented challenges, there is an increasing need for evidence and forward-looking mindsets in policymaking. The role of the JRC is to provide evidence for policymaking, something it has done successfully for the last few decades. However, as the future does not exist, no evidence can be provided on it. Therefore, anticipatory thinking, able to provide intelligence about the future, is essential to deal with a volatile, uncertain, complex and ambiguous world.

The various Knowledge Centres, Competence Centres and Units of the JRC, and especially the EU Policy Lab, enable policymakers to explore and address these new challenges through future-oriented frames and methods such as foresight and horizon scanning.

As an example, the foresight and water modelling teams of the JRC collaborated on a foresight exercise concerning possible emerging issues, associated threats and opportunities for the Danube river basin. The project developed qualitative foresight scenarios taking a time horizon of 2040 accompanied by quantitative hydrological models of the Danube River Basin. This combined participatory approach, harnessing the knowledge of a group of policy-makers, academics and business representatives, made it possible to explore the implications of possible societal, political and economic developments in the region. Ultimately, the project was able to draw recommendations to support decision-making at the regional, national and EU levels.

Key words: *foresight for policy-making, foresight scenarios, Competence Centre on Foresight, water management, Danube River Basin*

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** The order of papers is one which was at the Conference.

1. INTRODUCTION

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In a time when the world is facing the simultaneous rise of many unprecedented challenges and the explosion of information, while large swathes of the world population reject facts, the need for evidence in policymaking about the past, present and future has never been so large. To resolve this conundrum, we need a new model for the way in which scientific knowledge is produced, communicated, understood and used in policy making. We need new ways of harnessing the enormous and increasing knowledge that we have about our planet, our economy and ourselves.

For more than 60 years now, the European Commission's Directorate General Joint Research Centre (JRC) has been acting as a science provider and knowledge broker at the service of the EU project. It contributes to generating and providing European policymakers with scientific evidence in their daily policy practice. Besides in-house research, the JRC (especially through its Knowledge Centres) is capturing and processing vast amounts of information from several sources such as research partners and collaborators, universities, industry, individual experts, etc.

As we know, both the worlds of science and policy are changing very quickly. Policy-makers are facing an astonishing pace of change and increasingly complex societal challenges. The JRC, while keeping a high awareness on such change, has updated its working methods, adopted interdisciplinary approaches drawing on multiple scientific disciplines and methods to better answer current and future policy challenges. Since 2016, the EU Policy Lab of the JRC supports innovation in policy-making through experimentation, methods and approaches foresight, behavioural insights, design for policy and, more recently, modelling.

In this context, the EU Policy Lab is also a safe space where scientist and policy-makers collaborate to ensure that the scientific advice and the policy need are aligned and purposeful. A good scientist can provide sound evidence for policy making, but in itself this is not enough to ensure that this evidence will actually be used for policy making. Often, specific people (scientists or other) are involved in the process of making the link between science and policy. These people have to understand the policy making process and act as bridges between science and policy. Of course, in that context, it is also very useful for policy makers to be ready to engage with science. In response to this need, the EU Policy Lab under its wide portfolio of projects is not only facilitating, but generating policy relevant knowledge in

co-creation with among policy-makers, scientists, business representatives, civil society and any relevant stakeholders.

How can the JRC enhance policy preparedness, and better equip policy-makers to deal with the VUCA (Volatile, Uncertain, Complex, Ambiguous) challenges of our world?

2. UNDERSTANDING THE FUTURE — THE KEY ROLE OF FORESIGHT

Foresight, is an action-oriented transdisciplinary approach that seeks to improve the ability to anticipate, create, and manage change. It can be applied to most domains (scientific, technological, environmental, economic, cultural, and societal), on a variety of scales (personal, organizational, societal, local, national, and global) and through a variety of methods. Indeed, future-oriented thinking, is an indispensable instrument for public policy, particularly in the context of rapid socioeconomic and technological changes [1]. Professional foresight does not (and cannot) attempt to predict the future.

The key question is: how to provide evidence about the future when the future does not exist? Strictly speaking, 'evidence' is only about the past. While the future can neither be measured nor predicted, a surprising amount of intelligence can be created about it by applying the tools of foresight. Addressing this issue requires us to adopt anticipatory thinking.

A good foresight process combines different tools in a tailor made approach to achieve the desired outcomes. It provides a space to different stakeholders and experts for systemic thinking and the development knowledge about the future. Furthermore, it frequently combines quantitative and qualitative methods. In the analysis of plausible future developments and challenges, foresight supports stakeholders putting forward strategies and actions that can help them deliver their shared future vision. [2]

Foresight does not seek to predict the future, rather it enhances future thinking through the application of structured methods and by gathering intelligence from a wide range of knowledge sources in a systematic and participatory way. It then applies this intelligence to understand the possible future evolution of systems of interest. Foresight structures the analyses to ensure the emergence of collective intelligence derived beyond established pathways. It builds plausible rationales of possible future developments and links them to today's decision making. It creates robustness in the knowledge that it generates by being inclusive and interdisciplinary and by identifying, analysing and understanding the consequences of the drivers of change that it identifies in a 360° perspective. To that end, it often applies the STEEP (Societal, Technological, Environmental, Economic

and Political) framework or one of its variations to help people take a truly 360° perspective.

In that context, one of the roles of the JRC is to establish anticipatory thinking and a reflective handling of uncertainty, something ever present in the activities of the EU institutions. As noted in the literature, the adoption of foresight and of other more experimental and participatory methods requires fundamental changes in the culture and set-up of organisations, as well as, in their processes of communication [3].

3. FORESIGHT FOR POLICY-MAKING

As we have seen, the role of foresight is to equip policy-makers with more awareness and tools, as their policy-practice can largely impact the future. In particular, foresight enables policy-makers to enrich strategic understanding before taking action, to develop systemic understanding and help understand incremental and disruptive change. It also helps overcome 'tunnel thinking' and limited data by relying on multiple perspectives and diversity of knowledge.

Foremost among these methods is the scenario building methodology [4, 5]. In the words of the JRC's online FOR-LEARNplatform, *"a scenario is a "story" illustrating visions of possible futures or aspects of possible futures [6].*

Categories of foresight methods

Criteria	Methods
1. Methods based on eliciting expert knowledge to develop long term strategies	– Delphi method – Experts panels – Brainstorming – Mindmapping – Scenario analysis workshops – SWOT analysis
2. Quantitative methods that make use of statistics and other data	– Trend extrapolation – Simulation modelling – Cross impact analysis – System dynamics
3. Methods to identify key points of action to determine planning strategies	– Critical/ key technologies – Relevance trees – Morphological analysis

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Fig. 1. Some of the best known foresight methodologies

Scenarios are not predictions about the future but rather similar to simulations of some possible futures. They are used both as an exploratory method or a tool for decision-making, mainly to highlight the discontinuities from the present and to reveal the choices available and their potential consequences." Scenarios are particularly well suited to address the VUCA concerns by pooling the explicit and implicit knowledge of the participants and allowing diverging interpretations to take shape and be weaved into plausible and coherent narratives, a key aspect of preparedness building. This delivers a shared result, fruit of a specific context and framing. As such it does not pretend to be universal but can provide a fairly broad space for useful reflections.

While it requires the mobilisation of a broad range of participants, the scenario method has a number of advantages. First of all, by working with relatively large and diverse groups of participants, it creates collective intelligence, something often recognised as delivering understanding which is superior to what one can achieve when relying on single experts [7, 8]. It also develops a systemic approach to the issue as it explores the "drivers of change" of the system in study taking a 360° perspective. One classic way to ensure this panoramic view is to apply the STEEP framework (looking at all factors coming from societal, technological, environmental, economic and political perspectives) [9]. This phase ensures an approach which is as broad and systemic as possible while remaining closely linked to the object of study.

The method uses this structured approach and combines it with techniques to stimulate the creativity of the participants to construct plausible future worlds. By developing various scenarios along consistent uncertainties, it also makes it possible to develop an analytical approach and to compare and contrast whole scenarios (i. e. future worlds) or specific aspects of interest within the scenarios. By doing so, it can help understand sensitivities to specific factors and identify key parameters, strengths, vulnerabilities or leverage points that can be very useful for decision making. More importantly, building and analysing scenarios stimulates the understanding of the non-linearity of change. Last but not least, by providing a diversity of frames coupled with an analytical view of the system being studied, scenarios help deal with uncertainty.

4. HOW TO USE SCENARIOS — AN EXAMPLE

The JRC Competence Centre on Foresight applies anticipatory thinking to EU policy-making. In this task, the JRC relies on a broad range of tools and capabilities and on tailored methods for each project and policy need. As a result, the scenarios developed in different studies can be very

diverse and put to many uses. In this section, we will take one example in which quantitative modelling approaches have been combined with qualitative scenario building.

Two years ago, the JRC worked on a project which explored water management issues for the sustainable development of the Danube River Basin (*Water management in the Danube River basin — Future challenges and policy preparedness)* [10]. This work was part of the JRC *Danube Water Nexus (DWN) flagship cluster*[1] which covers projects dealing with various water-related issues such as water availability, water quality, water-related risks and the preservation and restoration of ecosystems and biodiversity. The cluster also analyses the interdependencies between different water-intensive economic sectors such as agriculture and energy. The aim of this cluster is to provide input to decision-makers and managers in the region about sustainable futures of water resources use, also by putting water in the agenda of development in the Region in a pervasive way. One of the expected outcomes of the Danube Water Nexus activities was an "*analysis of scenarios of socio-economic impacts of alternative water allocation measures across competing water-using sectors (agriculture, energy, industry, human consumption, environment, transport) for the years 2030–2050*".

For that purpose The Competence Centre on Foresight, together with colleagues from the JRC Water and Marine Resources Unit, developed foresight scenarios of the Danube river basin to engage with policy-makers and various stakeholders from industry and academia.

The fields of expertise that were represented in the workshop ranged from flood protection, hydrological modelling, renewable energy resources and environmental law to civil and chemical engineering, agriculture, forestry, economics, etc. In total, 31 experts from 10 countries and 4 international organizations working in the Danube region and 5 JRC experts participated in the workshop.

In this work, the scenarios were used together with participatory techniques in a workshop. This approach offered a 360 degree review of future-related questions in an engaging way. This helped tackle the many sources of uncertainty water managers have to face when preparing for long-term sustainable development in as vast and complex a region as the Danube river basin.

[1] https://ec.europa.eu/jrc/sites/jrcsh/files/jrc-scientific-support-danube-strategy-concept-paper.pdf

https://ec.europa.eu/jrc/en/research/crosscutting-activities/danube-strategy

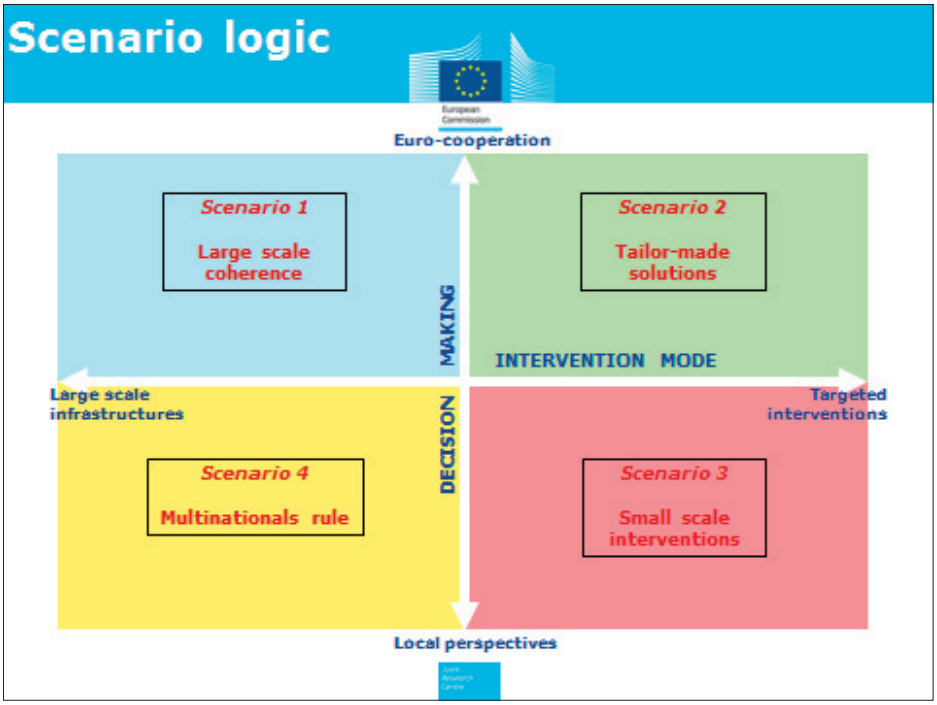

Fig. 2. The four scenarios* that had been developed for the workshop: *Water management in the Danube River basin — Future challenges and policy preparedness.* (*The scenarios were initially developed in the context of the MSc thesis of Augustin Gallot-Lavallee, The use of scenarios in water futures planning applied to the Danube River Basin, Centre for Environmental Policy, Faculty of Natural Sciences, Imperial College London, 2016.)

The participatory workshop developed for this project offered a rich and critical systemic overview of the issue to participants. It allowed them to immerse themselves in each of the four scenarios that had been developed (see Figure 2). The format allowed a focused interactive discussion around potential major directions of long-term change and to generate inputs for general long-term planning in policy. This type of workshops can be easily adapted to address specific policy topics or questions in a participatory way.

In this particular case, the purpose of the workshop was to identify actions to be taken by all relevant stakeholders, which ensured a high level of water protection and security while stimulating the economy. In order to achieve the stated objectives, the JRC team developed contrasting future scenarios, prepared illustrative modelling outputs, defined a meaningful palette of expertise and recruited accordingly participants with a diversity

of perspectives and a good geographic coverage of a system as complex as the Danube River Basin.

The two main aims of the workshop were:

1) To identify the key issues of water management in the Danube river basin in a perspective of sustainable development; and

2) To put forward a set of concrete actions for the various stakeholders to address those issues, beyond general policy recommendations.

The workshop also made it possible to generate useful output such as the identification of opportunities and threats for water quality, aquatic ecosystems, human water security and the economy under different scenarios. It also offered the opportunity to discuss trade-offs between economic development and environmental resources protection and to draw recommendations for win-win development options in the Danube region (ensuring a high level of water protection and security while stimulating the economy).

5. THE WORKSHOP PROCESS

Icebreaker

Most of the workshop participants did not know each other before. This is why they were given the opportunity to meet in pairs quickly and informally. After introducing, they presented their partners to the others. Very often, they spoke of the personal interests of the people they presented, not of their professional subjects. This has contributed to creating a very good ambiance.

Modelling

After the ice breaker exercise, and as there was a desire to build on a strong evidence base, an expert from the JRC presented how the JRC's work on water modelling for the Danube river basin can be used to illustrate outcomes for diverse parameters under various possible conditions that could be encountered realistically under various scenarios. This in-depth presentation gave a clear sense of the sophistication of the models, of the dynamics at play in the surface water systems and of the many aspects of water management that they can illustrate.

Introducing the scenarios

Following this reality check, the qualitative scenarios, developed around two structural axes: governance level (*Euro-cooperation* vs *Local perspectives*) and scale of preferred investment (*Large scale infrastructures* vs *Targeted*

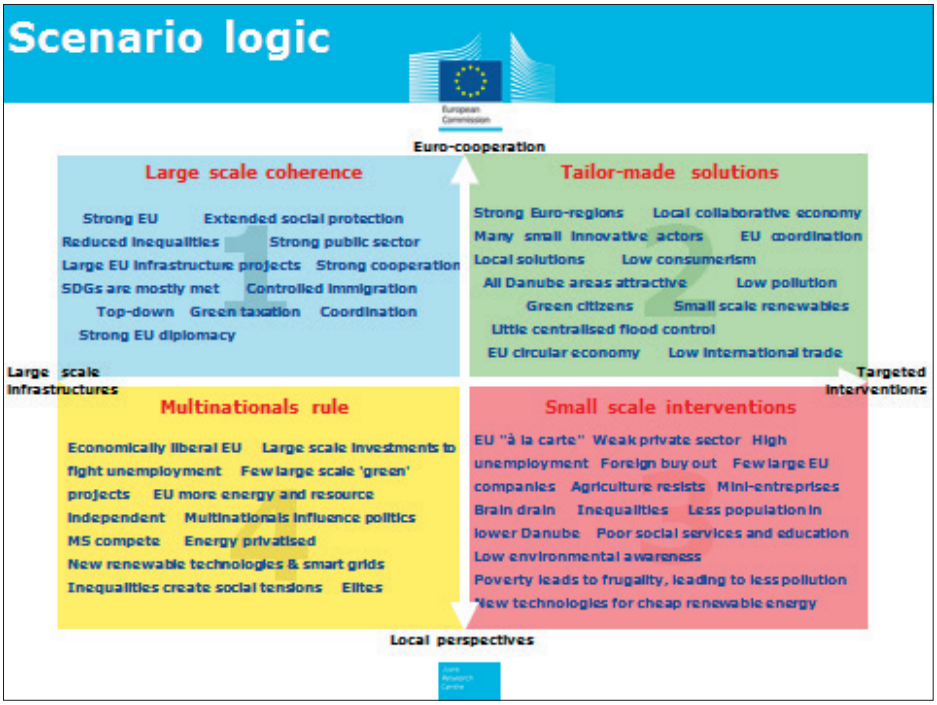

Fig. 3. A summary of the description of the four scenarios

interventions) (see Figure 2) were presented. This created a logical space that had been filled with numerous details about how each of the four worlds would plausibly operate, covering aspects in many dimensions (the STEEP dimensions — societal, technological, environmental, economic and political). Figure 3. provides a summary of the description of the four scenarios.

Four colleagues presented one scenario each, describing how, under each scenario, the STEEP dimensions would be affecting the agriculture, industry, energy and water sectors in the Danube river basin. Participants had the opportunity to ask questions on all scenarios and to suggest points to refine the narratives and render the scenarios more robust. The session ended with a general discussion to come to grips with the details and overall coherence of all scenarios. A few adjustments were made.

Identifying opportunities and challenges

At that point, participants had a good understanding of the four scenarios. They were then split into in four groups to identify the opportunities and challenges created by each scenario for water management in the Danube River Basin. The work was organized so that each group was discussing

two opposite scenarios (located along the diagonal of the scenario matrix) for 50 minutes. Conversation topics of the first and second groups are entered on the template.

For each sector, the results were structured according to opportunities and challenges in each sector in relation to the economy, society or the environment. Participants then reported on all four scenarios at the plenary session.

How to seize the opportunities

In the last session of the day, the participants were asked to define what could be done to seize the opportunities identified previously under each scenario for building a more sustainable Danube River Basin in the future. This time, the process was static, meaning that each group took time to reflect on one scenario only. The discussions resulted in a list of ideas and their rationale that were shown to all for a last discussion of the day.

Who should do what?

The second day started with a recollection of what was achieved the previous day and with a reflection on what could be done in each scenario to make the Danube River Basin more sustainable.

The goal of the session was to make recommendations as concrete as possible. Participants were again divided into four groups which analysed two scenarios each. Participants were asked to propose "who", "what" and "how" things should be done and what instruments could be used. The proposals were put on template to guide the discussions and structure the collection of information.

Based on a large amount of concrete and constructive results that can guide recommendations for each scenario, all scenarios were analysed and compared. Particular attention was paid to whether some of the proposals are applicable to any possible future that has been explored. If such a proposal exists, it would be an indication of what actions should be taken regardless of any uncertainty about the future — the so-called 'no-regret' options.

Closing

During the final session, the participants had the opportunity to comment or make remarks about the processes and the contents that were generated during the workshop. This discussion, as well as the whole workshop, went through in a prevailing constructive atmosphere, confirming the value of the participatory process.

6. CONCLUSION

The foresight project described above built on both a qualitative and a quantitative methods[2] looking at possible futures of the Danube river basin in the broader context of European and global trends.

As experienced in other foresight processes for policy-making, this foresight project shows the suitability of scenario building and participatory techniques to enhance long-term strategic thinking and shared understanding among diverse groups of stakeholders. It also delivered concrete recommendations for action.

The collective intelligence thus generated enabled people to overcome some of the doubts, fears and disagreements often generated by uncertainty. This was the result of generating shared understanding of a very complex system in a way in which all participants felt that they could contribute, that their input was duly taken into account and in which they all learned from each other, while discovering perspectives they might not have been aware of previously. In this respect, one can say that there was collective learning that all participants could bring back to where they came from.

This small experience is a good illustration of the value of applying foresight, especially to issues that are complex, uncertain and require taking a long-term perspective. The time spent in such processes to develop collective intelligence also gives space to discussions that helps address uncertainty and ambiguity.

The final lesson from this experience is to show the importance of developing an inclusive anticipatory culture for management and policy-making, particularly when dealing with complex systems. This combined participatory approach, harnessing the knowledge of a group of policy-makers, academics and business representatives, made it possible to explore the implications of possible societal, political and economic developments in the region in a timely and time-efficient way.

This type of approaches is also amenable to constant adaptation and experimentation to best fit the needs specific circumstances, actors and issues.

[2] Hydrological and water quality models enabling the simulation of water resources in the region, qualitative foresight scenarios and participatory methods.

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