Technological Forecasting & Social Change 115 (2017) 313–326

Contents lists available at ScienceDirect

Technological Forecasting & Social Change

Evaluating foresight in transnational research programming

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ARTICLE INFO

Article history:
Received 13 October 2015
Received in revised form 4 July 2016
Accepted 8 July 2016
Available online 4 August 2016

Keywords:
Transnational research programming
Foresight evaluation
Coordination of innovation policy

ABSTRACT

Global societal challenges require global efforts to address them. Research and innovation are increasingly expected to support such efforts, with limited resources. In this context of high expectations towards R&I, collaboration across borders, both in performing and in programming, is commonly seen as a way to get more results with the same or even less resources. Such collaboration across borders at a European or even global scale faces many challenges. The role of foresight as a supporting tool for transnational research programming has been analysed in a number of cases, but evaluation of its added value has to date largely been unexplored. Building on earlier work how to embed foresight in transnational research programming (TRP), this paper therefore aims to look at how the use of foresight in TRP can be evaluated, and what lessons can be drawn for its future use in support of TRP. Starting from the existing knowledge base on foresight evaluation, an evaluation framework for foresight in TRP is proposed, and tested against the foresight exercise that supported EU Russia S&T collaboration under the FP7 project ERA.Net RUS. The findings have implications for the role foresight can play in tackling societal challenges and increasing competitiveness at European and global level.

1. Introduction

In the context of recent years in which research is increasingly seen as a way to address (global) societal challenges, transnational cooperation in research programming is high on the agenda. In the EU, as part of the Europe2020 growth strategy, research and innovation are expected to support economic growth, increase competitiveness and job creation and to address societal challenges (EC, 2010). In a context where resources for R&I are scattered among many public and private actors (Member States, the European Commission, regions, universities and public research centres, private companies and private research centres, etc.), such expectations are not obvious to fulfill. Collaboration across borders in setting priorities for R&I is commonly seen as a way to get more results with the same or even less resources.

Such transnational collaboration also has a clear cost in the form of the need of overcoming a wide set of barriers. Typically, barriers to transnational research programming (TRP) exist in relation to five dimensions of coordination: systemic, horizontal, vertical, temporal and multilateral co-ordination (Haegeman et al., 2015; Könnölä and Haegeman, 2012). Such barriers may be alleviated through the use of foresight. Foresight also holds the promise of facilitating the implementation of different functions of transnational research programming way beyond the identification of emerging issues, priority areas and relevant stakeholders. In particular, the role of a supporting tool like foresight for engaging and mobilising the innovation communities can be crucial for understanding (and enhancing) the capacities and capabilities of different countries to participate in joint research and innovation (R&I) programmes. Foresight can offer a structured and responsive process that efficiently mobilises stakeholders and informs decision-making. It orients efforts towards understanding diverse interests and shared visions on future developments, thus contributing to better decision-making in a cost-effective way (Könnölä and Haegeman, 2012).

Another argument for engaging in foresight for TRP is the long-term nature of societal challenges which programme collaboration aims to address. Longer-term collaborations may need different foresight rounds or ongoing foresight. In such multi-faceted context foresight evaluation can offer reflective learning opportunities for improving foresight engagements, if the evaluation results are used as input for new foresight design (Georghiou, 2003). Finally, as with foresight studies in other contexts, also the need for effectiveness and efficiency are clear arguments for evaluating foresight efforts in programme collaboration.

However, the use of foresight in research programme cooperation is still rather limited. Analysis of European Research Area Networks (ERA-NETs) under the EU's Framework Programmes for Research

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[1] The views expressed are purely those of the author and may not in any circumstances be regarded as stating an official position of the European Commission.

http://dx.doi.org/10.1016/j.techfore.2016.07.017

(FP6 2002-06, FP7 2007-13, and Horizon 2020 2014-20) suggests that cooperation networks which continue over a long period of time (such as Woodwisdom, evolving from an FP6 ERA-NET over an FP7 ERA-NET to an FP7 ERA-NET + lasting until 2017) tend to use foresight more often than networks that do not continue. Evaluating foresight in such collaborative settings can shed better light on the advantages of its use and thus increase the understanding of the added value of foresight among stakeholders involved in such collaborations.

This paper therefore aims to look at how the use of foresight in TRP can be evaluated, and what lessons can be drawn for its future use in support of TRP. The paper can be considered as an empirically-based theory building. We start from the existing knowledge base on foresight evaluation, which we relate to our experiences attained in a foresight exercise in order to develop an evaluation framework for foresight in transnational research programming (Section 2). We test the framework[2] against the foresight exercise that supported EU Russia S&T collaboration under the FP7 project ERA.Net RUS (Section 3). We draw wider lessons from the case for evaluating foresight in TRP in general (Section 4), and finally conclude with key messages for research and policy (Section 5). The paper follows up on earlier work on 'Embedding foresight in transnational research programming', published in Science and Public Policy (Könnölä and Haegeman, 2012). It also recommended to read this paper together with the complementary paper 'FTA supporting effective priority setting in multi-lateral research programme cooperation: the case of EU-Russia S&T cooperation' in Technological Forecasting and Social Change (Haegeman et al., 2015).

2. Evaluating foresight in transnational research programming

2.1. Introduction

With an evaluation we assess a project, programme or policy against its objectives and implementation. The evaluation serves to determine the (short term) outcome and (longer term) impact of an intervention. Indicators are usually specified and applied to measure achievement and effects of the intervention (OECD, 2002). Evaluation has become over the years ever more important in the field of research and innovation. At national level substantial efforts have been made to better understand characteristics, quality, usefulness, consequences and dimensions of evaluations regarding R&I policies in a systematic way (see e.g. Edler et al., 2012). Particular attention has been paid to the notion of behavioural additionality in innovation, i.e. how innovation policy can change behaviour of actors in order to improve innovation capabilities and outcomes (Gök and Edler, 2012; OECD, 2006). Regarding transnational R&I cooperation the EU framework programmes for research and technology development (FPs) are an example of a multinational research programme that undergoes regularly evaluations to check its impact. Ex-ante impact assessments, monitoring of programme implementation and ex-post evaluation of impact are being applied. A portfolio of methods, including quantitative and qualitative analysis, case studies, interviews, bibliometrics, etc. is used to this end.[3] In our case the ERA.Net RUS foresight study, implemented in the years 2010-2014, has finished relatively recently. While we will try to also identify longer term impacts, it should be considered that most effects are short and medium term outcomes.

To develop a framework for evaluating foresight in transnational programming we address first the programming context that creates the preconditions for the foresight and where the impacts of foresight are also observed. Then we consider how the preconditions form the rationales for foresight that are articulated subsequently in the foresight objectives, design and implementation. Subsequently, we explore earlier work on foresight evaluation and - in particular - on foresight evaluation within the context of TRP. Thereafter we propose an overall framework for foresight evaluation in TRP.

2.2. Transnational research programming (TRP) in society

When considering societal issues at stake, the first thing that comes to the mind are the wide sets of interlinked societal challenges to be addressed through programming, such as climate change, demographic and healthcare challenges along with the challenge of economic development and competitiveness. When considering reasons for using foresight in support of TRP the most obvious one is probably if and how foresight enhances the TRP and its impact in society.

More specifically, the different types of foresight contributions include outcomes, policy impacts and societal impacts.

- Outcomes are understood as the short and medium term effects of the foresight outputs
- Policy impact is considered as any (medium and longer-term) impact the foresight activities have on policy decisions made in relation to the topic of the TRP (See e.g. Da Costa et al., 2008)
- Societal impact is understood as a change in society which can (partially) be related back to the foresight activities, or to the policy decisions on which foresight had a policy-impact. This is obviously a more long-term impact (see e.g. Amanatidou, 2011).

In our analysis these impacts relate specifically to the use of foresight in TRP and how this has impacted on TRP, policies and on society. However, in this paper we do not mean to evaluate the impact of TRP as a whole.

2.3. Use of foresight in TRP

We look at practices of the use of foresight in TRP both in Europe, and in the rest of the world. Subsequently we consider roles and objectives of foresight in a TRP context, and challenges related to large scale transnational foresight exercises.

2.3.1. Experiences in Europe

Collaboration between European countries on research programming takes place through various instruments and processes. ERA-NETs introduced with the FP6 in 2002, have a tradition in applying foresight in support of programme collaboration. Uses range from the identification of trends to joint priority setting and the networking of research and innovation communities across borders. However there seems to be a gap between those ERA-NETs that have 'discovered' the added value of foresight and those that have not. Analysis of programme collaborations reveals that longstanding ERA-NETs apply more often foresight of any form (be it before the start of the network or while the network is ongoing) than networks that last only for three years, suggesting a correlation between the duration of the network collaboration and the use of foresight (Sources: NETWATCH and own analysis).[4] In practice this foresight can for instance take the shape of a dedicated foresight and programming unit to support a long-term structural foresight to develop, maintain and update a strategic research agenda (see EMIDA ERA-NET[5]/ANIHWA ERA-NET[6]). But the networks applying foresight still represent a minority of the total number of ERA-NETs.

[2] The framework can be used both for self-evaluation and for external evaluation. In our case it is used for self-evaluation, considering that each author was somehow involved in the foresight design or implementation.

[3] See for example E. Arnold et al. (2011), Understanding the Long Term Impact of the Framework Programme.

[4] NETWATCH has been integrated in the ERA-LEARN platform in 2015, see: https://www.era-learn.eu/.

[5] Coordination of European Research on Emerging and Major Infectious Diseases of Livestock (www.emida-era.net).

[6] Animal Health and Welfare ERA-NET (www.anihwa.eu).

Table 1
Roles of foresight in Joint Programming Initiatives[a].
(Sources: Netwatch, 2013; reports of individual JPIs).

Joint programming initiative (JPI)	Roles of foresight	Type of foresight
JPI climate change	- Participation of international foresight experts in the Transdisciplinary Advisory Board	Engagement of foresight experts as stakeholder
JPI more years better lives	- Mapping of relevant national foresight studies - Identify potential for joint activities	Use of existing foresight reports
JPI oceans	- Strategic debate about the future strategic orientation of research - Programmatic approach seeking solutions and joint actions	Shared vision
JPI neurodegenerative diseases	- No specific role	–
JPI FACCE	- Identification of joint programming opportunities and initiatives through mapping	Use of existing foresight reports
JPI HDHL	- Identification of main trends and drivers of change for future development - Identify key future challenges and explore possibilities to reach shared visions by developing research questions - Adjust and update the current Strategic Research Agenda	Use of existing foresight reports Shared vision
JPI cultural heritage	- Analysis of trends and drivers - Anticipated changes to the CH research environment - Futures Literacy Scenarios	Use of existing foresight reports
JPI urban Europe	- Determine specific research needs and roadmaps, short- and long-term policy measures, business opportunities and needs for new co-operation structures - Support identification of break- through innovations on functions of cities in future (2020–50)	Long-term ongoing foresight
JPI water	- Identification of trends and drivers of research and innovation (foreseen) (SRIA, pp.10)	Use of existing foresight reports
JPI AMR	- Identify and characterise scientific challenges and their potential impact on society	Use of existing foresight reports

[a] See: http://ec.europa.eu/research/era/joint-programming-initiatives_en.htm.

This is quite different for the European Joint Programming Initiatives (JPIs). Most JPIs are applying foresight to some extent or are planning to do so. This may have to do with the fact that foresight (or forward-looking activities) has been identified as one of the framework conditions for joint programming (EC, 2008; EC, 2011). Interestingly, at the start of joint programming back in 2008 foresight was commonly seen as a way to identify societal challenges for which a JPI should be established (E.g. the foresight exercises as part of the Standing Committee on Agricultural Research – SCAR have led to the identification (and subsequent creation) of several JPI topics). Nowadays, its use goes far beyond this initiating role. Table 1 shows an overview of roles foresight currently plays in each of the 10 JPIs currently running in the EU. Big differences exist among JPIs in the way foresight is being used. Most JPIs make use of existing foresight knowledge (through analysis of foresight reports or engagement of foresight experts as stakeholders), focusing mainly on supporting the preparation or update of their strategic research agenda. Few JPIs actually apply foresight for creating a shared vision (JPI Oceans, JPI HDHL) or by focusing also on longer-term issues beyond 2020, e.g. through supporting the identification of breakthrough innovations by 2050 (JPI Urban Europe). Interestingly, JPI Urban Europe also seems to be the only JPI that plans to apply ongoing foresight over the longer term in order to keep updating the strategy of the JPI. The above findings on the use of foresight resonate well with the aim of the paper to offer a clearer view on the potential added value of foresight in collaborative programming contexts through evaluating the efforts of past exercises. An increased understanding of the roles and potential impact of foresight may contribute to an increase in the use of foresight beyond using existing foresight knowledge.

2.3.2. Experiences in the rest of the world

Several examples exist on joint foresight projects supporting international S&T cooperation between the EU and other regions of the world, in particular with Asia. The foresight study of New INDIGO on future S&T cooperation between India and Europe involved scientists, science policy-makers and programme owners from Europe and India (Blasy et al., 2012). KORANET (Dall et al., 2013) developed recommendations for European-Korean R&D cooperation by involving ministries and agencies from more than 15 countries in an interactive foresight process involving a vision of a very optimistic European-Korean R&D cooperation scenario, "back-casting" with the actions needed to reach this desired cooperation status, and a roadmap with possible time horizon of implementation, feasibility and importance for each action. SEA-EU-NET (Degelsegger and Gruber, 2011) included a foresight exercise on determinants of future scientific and technological (S&T) cooperation between Southeast Asia and Europe, based on a driver-identification scenario workshop in Indonesia with policy-makers from both regions and on a survey of scientists'opinions using open email consultations and Delphi method. The results of the exercise are a reliable and comprehensive set of drivers perceived by key stakeholders as influencing the 2020 future of S&T cooperation between Southeast Asia and Europe. The International Council for Science (ICSU)[7] conducted a global study on the future of international science, focusing on the key drivers influencing international science in the next 20 years and on ways to support international science collaboration to the benefit of society. One of the purposes was to support ICSU members and partners in their development of long-term visions and strategic thinking with regard to international science (ICSU, 2011). Finally, a unique example of global collaboration in research programming supported by (ongoing) foresight is the case of STAR-IDAZ.[8] Funded under FP7, it brings together animal disease research programming networks in 4 world regions (EU, the Americas, Asia and Australasia, and Africa and the Middle-East). The cooperation builds on a longstanding European history in transnational programming (through EMIDA ERA-NET and its follow-up ANIHWA ERA-NET, and has been addressing a prominent role to foresight. The Foresight and Programming Unit (FPU) of the European projects now also functions as FPU for the global project and aims to bring together 4 regional foresights in support of developing a global outlook on animal disease research. The FPU is an interesting example of how ongoing foresight[9] can be embedded into global research programme cooperation.

[7] The International Council for Science (ICSU) is a non-governmental organisation grouping national scientific bodies (representing around 140 countries) and international scientific unions (30 Members). The ICSU coordinates interdisciplinary research to address major issues of relevance to both science and society.

[8] www.star-idaz.net.

[9] Also with the integration of four regional foresights the work does not stop. e.g. the final report of one of the foresight studies (FORE-Med) states that the process "cannot be considered as completely ended, nor it would be after the delivery of the Strategic Research Agenda. It should be considered a continuous process. The identified research areas and priorities should be, in fact, updated regularly, since the foresight predictive capacity decreases while time passes by, in particular if, in the meanwhile, different actions are made instead of those suggested or foreseen." (Bagni et al., 2014, p40).

2.3.3. Roles and objectives of foresight

The roles and objectives of foresight have been widely described in literature. Building upon the work of Barré and Keenan (2008) and Van der Meulen et al. (2003), Salo et al. (2004) coined three interdependent foresight objectives: (i) improved systems understanding, (ii) enhanced networking and (iii) strengthened innovation activities. From these objectives and the premises of knowledge creation, Dufva et al. (2015) can derive three general dimensions of foresight contributions named facets of foresight:

- Knowledge: The production of new knowledge and insights about possible future developments and the consequences of present actions that help stakeholders to (re-) position themselves in the innovation system
- Relations: The creation of new connections between different stakeholders[10] and across sectors, and the restructuring and enhancing of existing networks
- Capabilities: The learning of new capabilities that contribute to the future orientation of an organisation and the system at large.

We use these dimensions of foresight contributions for application in a TRP context, as proposed in Fig. 1 (Section 2.5).

2.3.4. Challenges in implementing transnational foresight projects

Typical challenges related to large scale foresight exercises include the involvement of a large variety of participants from different backgrounds who may not all be used to thinking in transnational terms, the wide geographical spread of participants, varying and changing expectations from stakeholders (Brummer et al., 2011), ownership of the exercise becoming more complex and more difficult to achieve, different understandings of foresight as a concept across countries, diverging national innovation systems and framework conditions hampering the development of common goals, unclear role for national project managers (Veie, 2007). Könnölä et al. (2011) propose some design principles for large scale transnational foresight exercises in order to address barriers as described above: scalability, modularity and flexibility. Scalability[11] is understood as the ability to process contributions vertically from stakeholders who are accustomed to different levels of abstraction when considering regional, sectorial, national or European priorities. Modularity refers to a process design where analogous sub-processes – or modules – can be enacted relatively independently from the other sub-processes. Flexibility refers to flexibility in the design and management of the foresight process in order to accommodate different national interests, capabilities and culture in transnational programming.

2.4. Foresight evaluation in transnational research programming

A review by the FORSOCIETY project (Klüver and Hoff, 2007) of 18 national foresight exercises (out of which 11 included some form of evaluation) suggests that common evaluation schemes should link process and effects, that time between evaluations should not be too long (which tends to happen for e.g. large programme evaluations) and that evaluations need a systematic approach, because adapting evaluations too much over time hampers comparability. Over the last decade, a number of frameworks have been developed that aim at offering such a systematic approach. Table 2 summarises some of those efforts.

In terms of evaluation criteria commonly used sets of criteria include efficiency, effectiveness, appropriateness, and behavioural additionality[12] (See e.g. Georghiou and Keenan, 2004; For-Learn, 2008; Amanatidou, 2011; Harper, 2013). Some contributions focus on scientific quality, stressing the need for transparency and replicability (Peperhove and Luoto, 2013) and for quality in knowledge flows (Guimarães Pereira et al., 2007). Other authors stress the importance of complex stakeholder interrelations (Miles, 2012), different foresight stages (Sokolova, 2015), the quality of embeddedness of foresight in the innovation system (Havas et al., 2010) or the sociology of expectations and self-fulfilling prophecies (Van Lente, 2012). Many authors also distinguish between process versus result/impact evaluation. Regarding impact assessment distinction is made between immediate, intermediate and ultimate impacts, and between impacts on policy-making (See e.g. Da Costa et al., 2008) and societal impact (Amanatidou, 2011).

In the context of research focused on addressing long-term global challenges the above mentioned long-term sustainability and embeddedness of foresight in transnational research programming becomes paramount. In order for such ongoing foresight to be self-learning, foresight evaluation and feedback into future foresight design is essential. Surprisingly, close to no examples of evaluation of foresight in support of transnational research programming exist. One case that comes somehow close to a foresight evaluation is the brief assessment of strengths and weaknesses in the FORE-Med study, conducted by the Mediterranean node of the STAR-IDAZ project mentioned earlier. The assessment of the transnational foresight exercise draws lessons for future exercises and argues for a dedicated budget for foresight (Bagni et al., 2014, p36), opening up the question of long-term sustainability. For STAR-IDAZ as a whole, the FPU is currently mainly financed by the ANIHWA project and partially by STAR-IDAZ, and the Executive Committee of the FPU is currently devising a business plan for securing the long-term sustainability of the FPU,[13] providing a unique case of long-term sustainability and embeddedness of foresight in global research programming.

This paper aims to make a start with filling this gap by proposing a foresight evaluation framework for transnational research programming and by testing it for the case of EU-Russia S&T collaboration and the related foresight exercise in the context of the FP7 project ERA.Net RUS.

2.5. A framework for evaluating foresight in transnational research programming

Following an intervention logic as used in theory of change (Connell and Kubisch, 1998) a framework for foresight evaluation is proposed, linking societal issues at stake to possible impacts that transnational research programming can achieve, and the role of foresight in this. This logic chart is presented in Fig. 1, illustrating the relations between three consideration levels: i) the TRP in society, ii) the implementation of foresight in TRP and iii) the evaluation of the foresight.

Issues on TRP and society provide the basis for evaluating the relevance of foresight objectives and the utility, sustainability and appropriateness of the foresight and generated impacts. The foresight objectives addressing functions of TRP are considered to evaluate effectiveness of the foresight and generated outcomes. The analysis of the implementation and outputs, in turn, leads to the evaluation of efficiency of the foresight management and implementation.

Hence, the commonly applied evaluation criteria from the literature review in Table 2 can be related to the foresight in TRP and defined as follows:

- Relevance: The relevance of the TRP foresight is measured based on how well the foresight objectives address the issues of the TRP in society, namely societal challenges, coordination challenges, tensions and functions of TRP.
- Efficiency: For assessing how inputs turn to outputs we consider the efficiency and quality of management of a foresight exercise. In the context of TRP we can measure the efficiency of foresight through

[10] In some cases foresight might even contribute to the creation of new organisations (as actors).

[11] One can consider input scalability, geographical scalability and administrative scalability. We refer to Könnölä et al. (2011) for more details.

[12] Amanatidou (2011) also makes reference to the importance of cognitive capacity additionality, especially in a context of research addressing societal challenges.

[13] For a historical overview of the establishment and evolution of the FPU, see: http://www.scar-cwg-ahw.org/index.php/subgroups/infrastructure-and-foresight/.

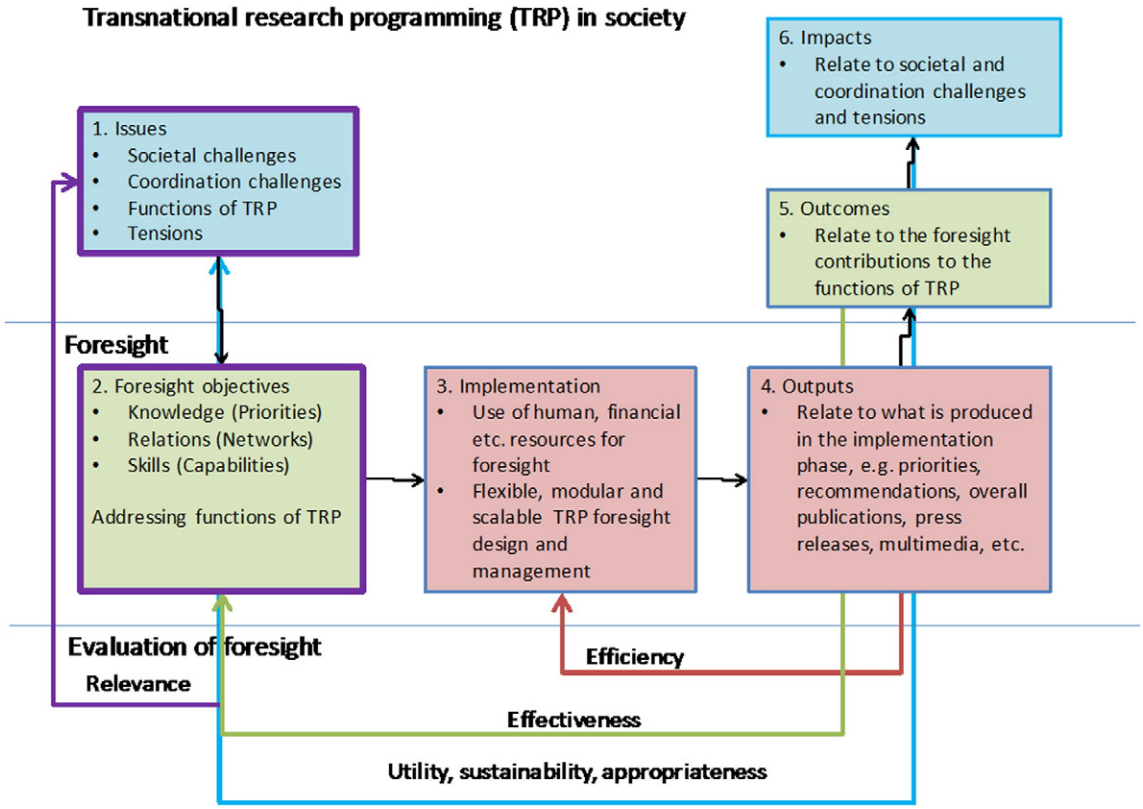


Fig. 1. Logic chart for transnational research programming and the role of foresight evaluation.

assessing the foresight against the specific design principles (Könnölä et al., 2011) for such foresight projects (scalability, modularity and flexibility) (see Section 2.3.4).

- Effectiveness: Effectiveness looks at the relation between the objectives and the project outcomes. Effectiveness evaluation focuses on 'the attainment of both the initial objectives and the objectives possibly refined during the project' (For-Learn, 2008). The foresight outcomes can be also related to each of the three facets of foresight: knowledge, relations, capacities.
- Utility, appropriateness and sustainability: Foresight objectives are related to final impacts in society to be achieved. We consider each criterion separately:
  - Appropriateness looks at whether the objectives were appropriately addressed in the project. It looks at foresight impacts on policy decisions in relation to TRP and impacts in society (directly related back to the foresight activities, or to the policy decisions on which foresight had a policy impact). In the case of TRP we can also relate appropriateness in particular to the degree to which foresight helps address barriers related to TRP. Such barriers exist in a number of coordination challenges (Haegeman et al., 2015; Könnölä and Haegeman, 2012): Systemic coordination (alignment of structural and systemic differences in national research systems); vertical coordination (between local, regional and (inter-) national levels); horizontal coordination (between research, innovation and other policy areas, such as competition, regional, financial, employment and education policies); temporal coordination (ensuring that policies continue to be effective over time and that short-term decisions do not contradict longer-term commitments); multilateral coordination (between two or more non-hierarchically structured policy levels). Additionally, appropriateness can be related to the degree to which foresight addresses tensions in setting joint S&T priorities in international S&T cooperation. For an overview of such tensions, see Haegeman et al. (2015; Table 1).
  - Herein, utility considers how well the project serves the information needs of intended users.
  - Sustainability refers to the continuation of benefits from an intervention after support of the intervention has been completed, the probability of continued long-term benefits and the resilience to risks related to net benefit flows over time (slightly modified from OECD). Herein, the behavioural additionality may often come up as a relevant aspect (See e.g. Amanatidou, 2011; For-Learn, 2008; Georghiou and Keenan, 2004; Gök and Edler, 2012; Harper, 2013; OECD, 2006). Sustainability aspects open also the question on possible future foresight needs and the role of foresight embedded in policy cycles and even further implications on the system and its resilience to cope with future shocks or gradual transformations. When considering a wider view[14] on sustainability, foresight in TRP should also contribute to the efforts of good governance that relates in particular with participatory, transparent and accountable practices, as well as effectiveness and equity. Such processes promote the rule of law and "ensure that political, social and economic priorities are based on a broad consensus in society and that the voices of the excluded, poorest and most vulnerable are heard in decision-making." (UNDP, 2005)

3. Testing the framework: the case of the ERA.Net RUS structural and thematic foresight exercise

3.1. Case description

3.1.1. The ERA.Net RUS network

European Research Area Networks (ERA-NETs) have been introduced by the European Commission to bring Research, Development and Innovation (RDI) funding organisations together, for coordinated research programming and funding initiatives in a transnational setting. ERA-NETs can be either thematically oriented, have a horizontal focus

[14] i.e. when considering sustainability in terms of inclusive social development, inclusive economic development, environmental sustainability, peace and security (UN, 2012).

Table 2
Overview of frameworks for foresight evaluation.

Foresight evaluation frameworks	Main characteristics
Typology for evaluating foresight (Georghiou and Keenan, 2004, 2008)	Evaluation criteria include: efficiency of implementation; impact and effectiveness; appropriateness
Eight-step framework for evaluation (For-Learn, 2008)	The eight steps include: 1. Setting up the evaluation; 2. Defining the scope and approach; 3. Choosing and defining evaluation items for effectiveness; 4. Evaluating the effectiveness; 5. Choosing and defining evaluation items for efficiency; 6. Evaluating the efficiency; 7. Choosing and defining evaluation items for appropriateness; 8. Evaluating the appropriateness/relevance of foresight
Impact of foresight on policy-making (Da Costa et al., 2008)	The six functions include: 1. Informing policy; 2. Facilitating policy implementation; 3. Embedding participation in policy-making; 4. Supporting policy definition; 5. Reconfiguring the policy system; 6. Symbolic function.
Doing Foresight,[a] web-based foresight self-evaluation tool (Klüver and Hoff, 2007)	Tool for self-evaluation before, during and after a foresight activity, in order to design, adapt and learn from the activity.
Foresight knowledge quality assessment (Guimarães Pereira et al., 2007)	Checklist for quality assurance of knowledge flows in the foresight process, using the foresight base activities of futuring, planning and networking.
Framework to classify the impacts of various types of prospective analyses (Havas et al., 2010)	Linking effectiveness of foresight for innovation policy to its neat embeddedness in the innovation system and the wider policy context, using four dimensions of 'contextualisation' (governance culture, policy attention, socio-economic dynamics, and resource availability) and outlining its implications for foresight functions (policy-informing, policy advisory, policy facilitating).
A foresight evaluation framework in dealing with grand challenges (Amanatidou, 2011)	Rationales, functions, impacts and grand challenge needs are combined in a cycle supported by specific internal and external conditions (or foresight principles) for dealing with grand challenges.
Dynamic foresight evaluation (Miles, 2012)	Foresight seen as a service activity between foresight practitioners, sponsors, and other stakeholders stresses the need to be aware of the complex interactive nature of foresight when conducting foresight evaluations.
Foresight and the sociology of expectations (Van Lente, 2012)	Lessons are drawn from the sociology of expectations for the objectives of foresight. These lessons therefore also affect the evaluation of foresight.
Impact of foresight on innovation performance (Harper, 2013)	Immediate, intermediate and ultimate/end impacts; evaluation criteria changing over time; advisory or strategic role versus instrumental role of foresight
An integrated approach for foresight evaluation (Sokolova, 2015)	Evaluation methodology focusing on three stages: 1. The preparatory phase; 2. Direct and comparative evaluation; 3. Synthesis and results.
Scientific criteria for evaluation of foresight studies (Peperhove and Luoto, 2013)	Assessment of scientific quality of foresight centred on two criteria: 1. Transparency as a precondition for duplicability[b] and 2. The selection of the experts.

[a] www.doingforesight.org.
[b] While some authors consider duplicability or replicability as such also as a relevant criterion to assess foresight processes, this view is not taken in this paper. Such criterion would support a view that foresight is a scientific project (to be assessed accordingly) instead of a decision-preparatory tool (which of course relies, among several other types of inputs, on the available results of scientific projects, and which also applies several methods that are also used in scientific projects).

(e.g. on SMEs), or a regional focus. Our case, the ERA.Net RUS[15] has had a regional focus on RDI cooperation of the EU Member States (MS) and Associated Countries (AC) to the EU's 7th Framework Programme (FP7) with Russia. The ERA.Net RUS project aimed at: 1. developing options and scenarios for the coordination of joint S&T programmes of funding institutions in EU MS and AC with Russian programme owners; 2. implementing and evaluating a pilot joint call; 3. proposing a concept for a sustainable joint programme. The network managed to successfully pool resources of funding agencies from 12 countries, including 7 EU Member States (MS), 4 countries associated to FP7 (AC), and Russia. Two pilot joint calls were implemented, one for funding of 'Collaborative S&T Projects', and one for 'Innovation Projects'. With a total budget of €10.3 million, a total number of 42 joint projects were funded under the two calls in 2011. The collaboration continued under an ERA-NET Plus (2013–2018), which has launched a joint call in 2014 for a total budget of €20 million (for 63 funded projects). In this collaborative context a foresight exercise has been implemented which resulted in a vision paper and action plan for future S&T cooperation (Spiesberger et al., 2013), as well as a thematic priority setting for the 2014 joint call launched under the ERA.Net RUS Plus project.

3.1.2. The foresight project

The foresight project as part of the ERA.Net Rus project, had the objective to conduct both a structural and a thematic foresight over the years 2010–2014 in support of developing a sustainable S&T cooperation between EU MS, AC and Russia, with a concrete vision paper and action plan up to 2020 (see Fig. 2). The structural foresight refers to institutional solutions and instruments (e.g. funding programmes) for the cooperation, whereas the thematic foresight refers to relevant thematic priorities of interest both for the EU and Russia.

In the structural foresight strand four different cooperation scenarios were elaborated in detail and validated in workshops. One positive scenario outlined an increasing and intensified RDI cooperation between the EU and Russia and was entitled "R&D policy paradise". One negative scenario ("Same problems, reORIENTation") highlighted disintegrating and decreasing trends, and two scenarios described a stagnation or continuation of the status quo of cooperation (see Fig. 3 for the positive scenario poster). Each scenario is composed of a snapshot of what S&T cooperation between the EU MS and AC and Russia could look like in 2020, as well as a roadmap explaining the events and milestones that could take place for the snapshot to materialise. In the Delphi survey,[16] these scenarios were tested for their probability and desirability. The survey population consisted mostly of researchers from the EU MS & AC and from Russia, involved in active scientific cooperation, as well as of policy makers.

The thematic foresight[17] strand was initiated with a meta-analysis of foresight exercises for identifying key thematic priorities for EU–Russia RDI cooperation. The analysis was backed-up with expert interviews. A second Delphi survey round was based on the results of the first round and focused in addition on thematic areas for research and innovation co-operation. On the basis of a first prioritisation by the ERA.Net RUS Group of Funding Parties (a selected group of RDI funding organisations from the EU Member States, Associated Countries to FP7 and Russia), thematic roadmapping workshops with scientific experts were organised in the four broad fields of nanotechnologies, health, social sciences and humanities, and environment and climate change. The thematic priorities as a

[15] The project was implemented in the period 2009–2014; detailed information on it is accessible at: http://www.eranet-rus.eu/en/198.php.

[16] A Delphi survey was implemented which typically involves two rounds. Results of the first round were communicated back to the survey participants in the second round, in which also additional elements were included for assessing thematic areas. For details on the Delphi survey and an analysis of its results we refer to the ERA.Net RUS foresight report (Spiesberger et al., 2014).

[17] For a detailed description of the thematic foresight strand, see Haegeman et al. (2015).

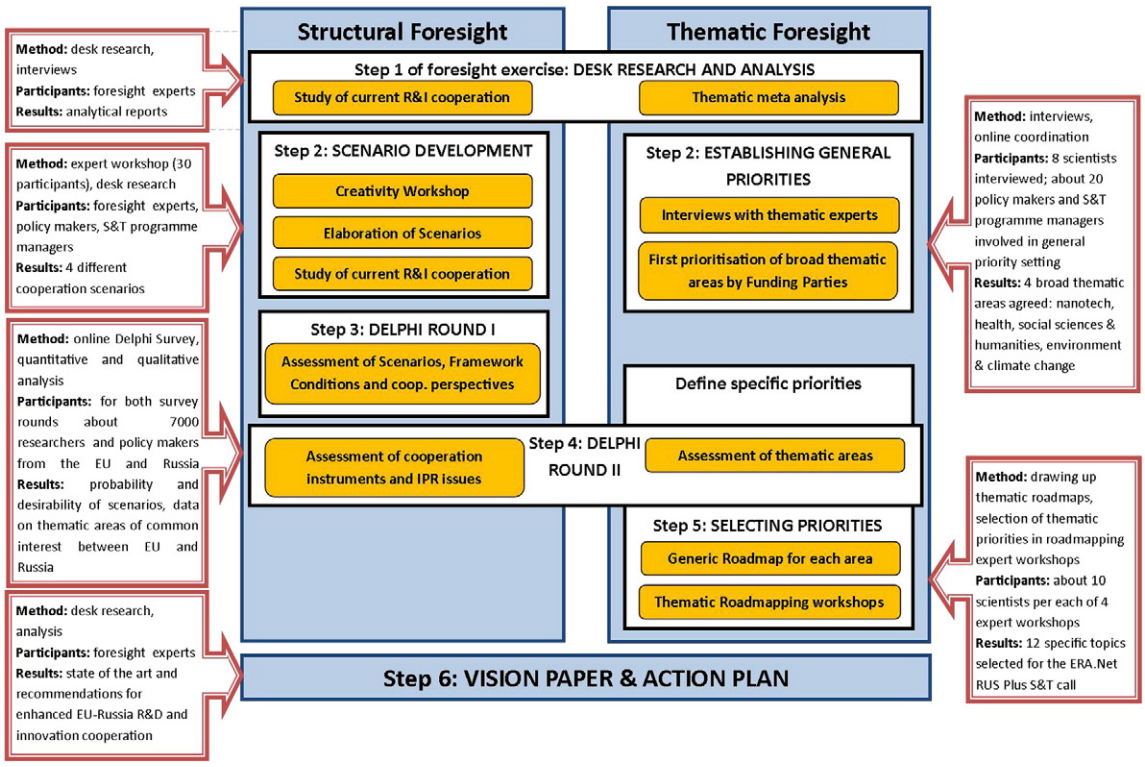


Fig. 2. Structural and thematic foresight process of the ERA-NET.RUS project (Source: Haegeman et al., 2015).

result of those workshops were used later on in the ERA.Net RUS Plus call for S&T projects.

The stakeholder groups involved in the foresight process for ERA.Net RUS can be divided into 3 categories: researchers (EU, Russian, other), actors involved in programming the research (funding agencies, ministries, etc.), and policy-makers. These three stakeholder groups are also reflected in the three levels at which the vision paper and action plan which are based on the foresight project propose instruments and measures: researcher level, institutional level and policy level (see Fig. 4). The same documents also build on creating three main axes (creating a sustainable framework, developing joint competences, and enhancing collaborative approaches/a true partnership) in line with the three objectives of ERA.Net RUS.

3.2. Evaluation

To assess the preliminary impacts of the foresight, we used a self-evaluation approach. Relevant foresight documents and data of the follow-up call for research and innovation projects in the ERA.Net RUS Plus project were analysed by the authors. Input to the evaluation of the foresight was gathered through qualitative expert interviews. In total, 10 interviews were conducted in two waves, the first one in autumn 2014, about 10 months after the end of the exercise, and the second one in spring 2015. Questions included which foresight outputs the interviewees could identify, how they were used, and whether the foresight was discussed at the national level by key stakeholders and policy makers. The interviewees participated in the foresight but were not in the position of managing or coordinating it.[18] Furthermore, in autumn and winter 2015 a survey for monitoring the ERA.Net RUS Plus call was conducted among funding parties involved in the call, as well as among successful and non-successful applicants for projects (from 288 individuals receiving the invitation 122 (or 42%) answered to the survey). In the following sections we evaluate the foresight exercise applying the framework presented in chapter two.

3.2.1. Relevance

As relevance of the TRP foresight looks at how well the foresight objectives have addressed the issues of the TRP in society, we consider the concrete outcomes, policy impact and societal impact of the foresight exercise. The foresight objectives to conduct both a structural and a thematic foresight over the years 2010–2014 in support of developing a sustainable S&T cooperation between EU MS, AC and Russia positioned the exercise to be potentially highly relevant for addressing the issues of TRP in society, in particular its contribution to the development of the concrete vision paper and the action plan up to 2020. The functions of the TRP were also set to be addressed especially through the structural foresight that referred to institutional solutions and instruments (e.g. funding programmes) for the cooperation. The thematic foresight objectives referred to relevant thematic priorities of interest both for the EU and Russia, hence with potentially important implications on addressing societal challenges and the society at large.

3.2.2. Efficiency

One of the ways to assess the efficiency of ERA.Net RUS foresight is to check whether specific design principles have been applied that help overcome challenges related to large scale foresight exercises. Table 3 presents the ways in which the principles of scalability, modularity and flexibility have been applied in the foresight project. An example of (input) scalability is the possibility for stakeholders in the Delphi survey to vote for societal challenges and research areas at three different levels of abstraction at the same time. The parallel development of a thematic and a structural foresight with key points of interaction is an example of modularity. Flexibility was built in the exercise, e.g. through a flexible design of the thematic workshops.

[18] Interviews were performed with key stakeholders, including advisors to the Russian Ministry of Education and Science, the ERA.Net RUS and ERA.Net RUS Plus call secretariats, representatives of funding organisations from the EU Member States, Associated Countries to Horizon 2020 and Russia, and European Commission officials.

Scenario: R&D policy paradise

The year 2020 is coming to an end in a few days, and we look back at a decade of prosperous cooperation in Research, Development and Innovation (RDI) between the EU and Russia. Russia's participation as an associated country in the EU's Horizon 2020 programme has proven an unexpected huge success. The presidents, both of the EU and Russia have gathered in Moscow to celebrate the achievements and sign the association agreements for the next programming period, to the EU's new funding tool, Innovation for the Future 2030.

Framework conditions

- Political will on both sides to strengthen cooperation has been translated into enhanced framework conditions for RDI cooperation and joint stimulation instruments
- Russia is member of the WTO & OECD

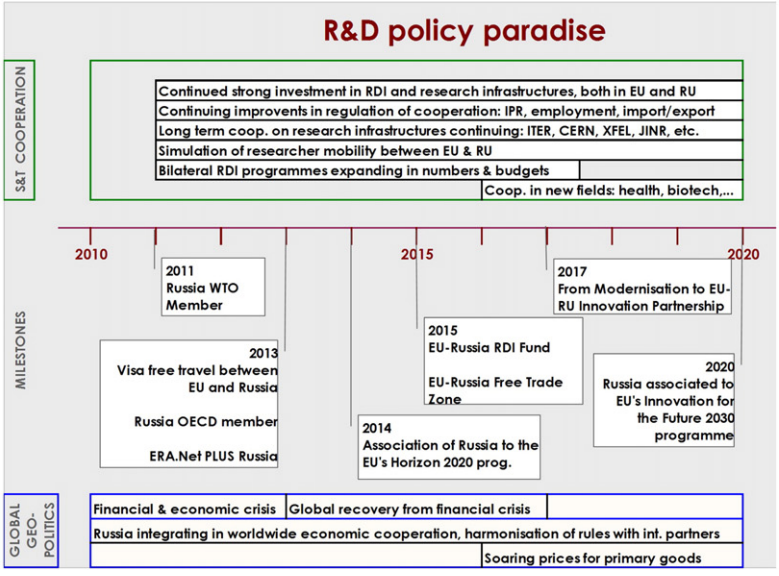
Governance and institutional solutions

- Free-trade Zone with EU agreed and implemented
- Modernisation partnership evolves into innovation partnership with related funding instruments and/or cooperation among funding bodies
- Joint management committees in place to provide good regulation for the cooperation and to manage the day to day work

Impact Variables (+ vs -)	Scores
1. S&T policy integration	+
2. R&D Investment (high vs low)	+
3. Performance (high vs low)	+
4. Private involvement	+
5. Transparent governance (advanced + vs old fashioned -)	+
6. Economic development	+/-
7. Cultural proximity	+
8. Thematic diversity (wide + vs narrow -)	+
9. S&T cooperation instruments (innovative + vs traditional -)	+
10. Qualified Human Resources	+
11. Regulatory framework	+
12. Research infrastructure/equipment	+

S&T cooperation instruments

- Horizon 2020/FP9 association and participation in other EU funding programmes for R&D and innovation will take place, support network for Horizon 2020 participation in RU established, RU participation in JTI's and JP
- Russian R&D and innovation funding instruments open to EU participation and funding allocation simplified (e.g. public procurement abolished for R&D and innovation funding)
- Joint EU-Russian RDI Fund established and operational



Public versus private actors in S&T

- Public-Private Partnerships in selected areas (aeronautics, gas transportation, etc.)
- A reasonable number of R&D intensive companies in Russia are performing R&D and compete with EU companies
- The Russian S&T system in a transformation phase from publicly dominated to a more significant role of the private sector
- Significantly higher investment in R&D and innovation by Russian companies

Fig. 3. The positive scenario (snapshot and roadmap) of the ERA.Net RUS foresight project: 'R&D policy paradise'.

3.2.3. Effectiveness

Effectiveness looks at the relation between the objectives and the project outcomes. The main contributions of foresight to the ERA.Net RUS outcomes emerged from the translation of the foresight report with its scenarios for future S&T cooperation, related barriers and thematic priorities into a vision paper and action plan, into a thematic single joint call, and into concrete proposals for a sustainable joint programme.

Regarding outcomes related to ERA.Net RUS objective 1 (options and scenarios for the coordination of joint S&T programmes) the structural and thematic foresight delivered a comprehensive foresight report with scenarios, barriers to cooperation and thematic priorities for future

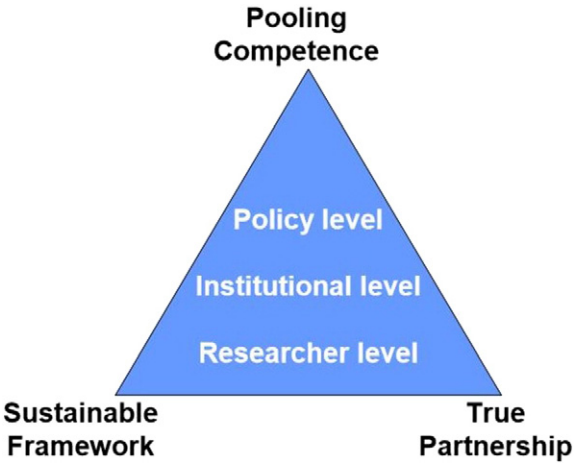


Fig. 4. Key dimensions of vision and action plan at three different levels.

cooperation. ERA.Net RUS objective 2 entailed the implementation of a joint call. In this, the thematic areas (and subareas) for the single joint call were based on the results of the thematic foresight exercise (and a second joint call using additional topics from the thematic foresight is under preparation in 2016, this time without co-funding from the European Commission). Also, the budget for the single call doubled compared to the pilot call. An additional Russian funding party joint because of the transparent way in which the thematic priorities were set. Outcomes related to ERA.Net RUS objective 3 entailed a concept for a sustainable joint programme. A joint vision and action plan, largely based on the foresight project, have been adopted by the Group of Funding Parties and presented at the high-level opening of the EU-Russia Year of Science 2014 in Moscow (officially launched in November 2013). Measures proposed include both a deepening of existing cooperation (e.g. towards an Art. 185 collaboration) and the widening to new types of cooperation (e.g. a joint thematic research institute).

The foresight outcomes can also be related to each of the three facets of foresight: knowledge, relations, capacities. To this end, Table 4 presents effectiveness of the ERA.Net RUS foresight by main stakeholder group that was involved in the exercise (see Section 3.1). For instance, funding agencies have acquired commonly agreed sets of thematic priorities for each thematic area, which were used to launch a joint international call (*knowledge*). Researchers learned about framework conditions for S&T collaboration and about possible future scenarios through their Delphi participation. Policy-makers were offered many suggestions related to both research policy (thematic and non-thematic policies) and wider policies (education policies, standardisation issues, IPR, migration policy, etc.). In terms of *relations*, the thematic workshops in which priorities were identified created trust among representatives of funding organisations from different countries and allowed them to better defend selected priorities at home because of the transparent approach. Finally, the joint discussion and decision among Funding Parties on thematic priorities was considered a novel experience, and spill-overs were reported to other ERA-NETs interested in using a similar approach (*capacity building*). It also created a better understanding of the importance of transparent and participatory decision-making. Especially the fact that this approach was an argument for the Russian Ministry of Education and Science to join the ERA.Net RUS Plus S&T call was surprising and illustrates this well.

3.2.4. Utility, appropriateness and sustainability

3.2.4.1. Appropriateness. Regarding policy impact and societal impact (Table 5): Concerning policy impact, several measures from the vision paper which was based on the foresight have already been implemented. Also, it was easier for national policy-makers to accept the thematic priorities because of the transparent way in which there were selected (compared to the pilot call for which the topics were decided by e-mail between representatives of funding agencies involved). Societal impact of the foresight exercise is reflected in 63 concrete projects with societal relevance in the areas proposed in the thematic foresight, the funding gap that was filled with the joint call thanks to a well-chosen level of granularity of call topics, and the growing size of the funding consortium, serving as a flagship and example initiative in joint S&T cooperation.

Regarding the degree to which foresight helps address barriers related to TRP: Table 6 presents an ex-post assessment of the foresight process against the 5 coordination dimensions referred to above under this criterion. The assessment checks first in what ways the foresight project has supported coordination under each of the five dimensions of coordination that are typical to a TRP (middle column). Secondly, the assessment also looks at additional ways the foresight could have supported each coordination dimension, but did not do (for a variety of reasons, e.g. lack of budget, option not considered, etc.) (last column). For instance, in support of vertical coordination, the foresight project brought together experts from MS/AC and from EC in the thematic workshops, used Horizon 2020 nomenclature as a basis for priority setting of national R&D budgets, etc. but did not involve regional level actors in the foresight in a systemic way (mainly because of budgetary constraints). In supporting horizontal coordination the foresight project focused on wide sets of issues beyond

Table 3
Application of foresight design principles in the TRP foresight in the ERA.Net RUS (Source: Haegeman et al., 2015).

Foresight design principle	Application of foresight design principles to the ERA.Net RUS case
Scalability	• In the Delphi researchers could vote at three different levels of abstraction at the same time (both for societal challenges and for research areas). Also in designing the thematic roadmaps different levels of abstraction were used (Input scalability). • A two round voting was organised in each workshop, both for general and for specific priority areas, with each round being independent from the other round. Topics only receiving votes from Russia or only from EU MS/AC were eliminated (multiple votes for the same topic were not allowed). In the specification of the most relevant topics, the rankings resulting from the two voting rounds were taken as first orientation point (input and administrative scalability) • Topics and challenges, which overlapped were merged into thematic clusters. The final topics were formulated in consensus among the participating scientific experts, under the guidance of the foresight moderators (administrative scalability) • Experts from varying countries/regions (geographical scalability), backgrounds and sectors • Open questions in structural Delphi delivered information from very different levels of granularity, that was merged and regrouped into key messages
Modularity	• Structural and thematic foresight ran in parallel but with key interaction points, e.g., structural scenarios include a thematic future dimension • Generic roadmap development ran in parallel with Delphi round 2 which were both brought together in the thematic workshops • An English and a Russian questionnaires were used that ran separately and in parallel
Flexibility	• Flexibility, especially during the thematic workshops was crucial for adapting the foresight design and management to decisions taken on the spot about certain tensions in setting joint research priorities • Due to the fact that thematic interviews did not prove to be a sufficiently productive methodological approach to specify relevant thematic areas for the cooperation, the focus of the second round Delphi was partially shifted to assessing the importance of societal challenges and thematic fields which became a main part of our second Delphi survey round.

Table 4
Effectiveness of ERA.Net RUS foresight along three facets (knowledge, relations, capacities), considered by stakeholder group involved in the exercise.

Actors	Knowledge	Relations	Capacities
Researchers (EU, Russian, other)	• Better insights in EU-Russia cooperation • Become aware of joint calls of the ERA.Net RUS (Plus) • Better picture of the framework conditions, the possible scenarios for collaboration, etc. through the Delphi survey (survey as communication tool)	• Getting to know potential new partners and funding opportunities • Network opportunity allowing researchers to have a say in shaping research priorities (both thematic and structural) and related framework conditions	• Better preparedness for participation in future joint calls • More prepared/resilient for 'unexpected' scenarios for EU-Russia collaboration, thanks to wide dissemination of scenarios through the Delphi survey (the survey results were communicated back to researchers)
Actors involved in programming the research (Funding agencies, ministries, etc.)	• Commonly agreed set of thematic priorities was considered major foresight outcome • Joint call used the thematic priorities from the foresight and mobilised substantial funding (€20 million) • Selected priorities were disseminated to EC to also feed into Horizon 2020	• Support in transnational community building: thematic workshops created trust among representatives of funding organisations from different countries • Bottom-up approach allowed to better defend selected priorities at home • Attract new participants to calls, thanks to wide Delphi participation	• Bottom-up discussion and joint decision among Funding Parties on thematic priorities was considered a novel experience • Spill-overs to other ERA-NETs: The approach was considered a good practice[a] • Foresight and vision document foster a multi-disciplinary approach, looking at R&I in a more integrated way
Policy-makers	Supporting research objectives: • Thematic workshop discussions focused on filling research gaps • Foresight provided suggestions to improve the national research system(s), esp. in Russia (with regard to mobility, infrastructure, etc) Other policy objectives: • Foresight provided suggestions to improve policies beyond research: innovation policies (esp. IPR and standardisation issues), migration policies (visa regulations), education policies (esp. Proposals for improvement), ageing, general policy issues (red tape, corruption, etc.).	• Thematic roadmaps combined Russian classification of research areas with EU classification (H2020) of societal challenges, increasing mutual understanding (also through in-depth discussions among participants)[b] • The improved scientific cooperation can promote the lessening of political and societal tensions and may have spill-over effects to other policy areas in stimulating dialogue and cooperation.	• Better understanding of the research priority setting process (implicit and explicit decisions on priority setting)[c] • Capacity for increased understanding of policy-makers of what is likely to happen.[d] • Better understanding of the advantages of transparent and participatory decision-making • Understanding the big overlap in common challenges to be addressed reinforces the willingness to collaborate, even when general politics go in opposite directions.[e] Willingness from both sides to collaborate in a difficult political environment (cooperation niche with a very successful joint call)

[a] The spill-over refers to other ERA-NETs also managed by the same organisation (DLR) as the ERA.Net RUS Plus call manager, as reported by this organisation. Colleagues from other ERA-NETs were all enthusiastic how this topic selection was done in ERA.Net RUS, and asked the call manager for advice how to implement it in their ERA-NETs.
[b] For a full description of the four step approach of the thematic roadmapping workshops, see Haegeman et al. (2015), Fig. 4.
[c] For more details, see Haegeman et al. (2015), Table 5.
[d] The realities of politics in the wake of the conflict in Ukraine and the mutual sanctions between EU and Russia in 2014 have not yet led to strong negative repercussions on RDI cooperation.
[e] For a detailed analysis of how the foresight project can facilitate the EU-Russian Scientific and Societal Engagement, see Sokolov et al. (2014).

R&I, departed from interdisciplinary societal challenges and involved experts from various scientific fields, but could e.g. also have involved national ministries beyond R&I in the foresight design to increase their ownership and participation. In brief the degree to which the foresight supports each coordination dimension gives an idea of the degree to which the foresight takes away a set of barriers that are typically related to each dimension[19] by supporting increased coordination. From the table it can be concluded that the foresight project contributed to a big extent to increasing coordination along all dimensions, and that there are some areas for improvement if the exercise is to be repeated in the future.

For understanding appropriateness in how foresight addresses tensions in setting joint S&T priorities in international S&T cooperation, we refer to Haegeman et al. (2015; Table 5) for a detailed assessment.

3.2.4.2. Utility. Utility considers how well the project serves the information needs of intended users. Illustrations of the usefulness of information collected through the foresight include the following:

- The bottom-up selection of thematic research areas, involving researchers, programmers and policy-makers, has led to better results for funding agencies in terms of funding partners (21) and countries (14) involved (compared to 18 and 11 in the pilot call), available budget (from € 7 to € 13,5 million) and projects funded (from 31 to 45) for the (two-step) joint S&T call (there was also an innovation call). With a nearly identical number of proposals evaluated (around 180), the call success rate increased from 17% to 24%. This rate is of course dependent on the available financial means, but the thematic focusing provided by the foresight contributed to a more effective procedure, in that more project proposals of high quality could be funded.
- Also when comparing participants in the ERA.Net RUS foresight Delphi survey with those participating in project proposals to the ERA.Net RUS Plus calls (Innovation and S&T funding lines), 65 participants from the Delphi could be identified that also acted as team leader of submitted project proposals (representing 65 of the 1090 teams that participated in 284 project proposals). As such the Delphi survey seems to have had an informing and mobilising role among the research community.
- Further use of the available foresight results are under consideration in the ongoing ERA.Net RUS Plus cooperation. Due to the highly successful implementation of the call, possible follow-up activities are being discussed. This concerns, in particular, another round of calls in the existing framework, which lasts as an EU funded activity until 2018. The thematic foresight could provide here another input for calls. In the already implemented call only a part of thematic priorities for EU-Russia RDI cooperation identified in the foresight was used. The remaining topics have recently been suggested by the foresight team to the call secretariat as possible thematic basis for another S&T call.

3.2.4.3. Sustainability. Sustainability refers to the continuation of benefits from an intervention after support of the intervention has been completed, the probability of continued long-term benefits and the resilience to risks related to net benefit flows over time. Here we address implications on longer-term cooperation, behavioural additionality and good governance.

A key objective of the network was to start developing a sustainable S&T cooperation (through a concept for a sustainable programme and action plan, and monitoring of its implementation), and the foresight

[19] For an overview of barriers related to coordination dimensions, see Könnölä and Haegeman (2012), Haegeman et al. (2014) and Haegeman et al. (2015).

Table 5
Impacts of foresight to TRP in society for the ERA.Net RUS case.

Type of impact	Contribution of foresight
Policy impact	• Several measures in the vision paper and the Action Plan have already been implemented meanwhile, e.g.: ○ The EU-Russia S&T agreement has been prolonged at the beginning of 2014. ○ The EU council group Strategic Forum on International S&T Cooperation (SFIC) established a Working Group on Russia, at which the foresight and the vision & action plan were presented twice and shared as an input for drawing up a Strategic Research Agenda (SRA) on EU RDI cooperation with Russia. ○ The unit for S&T cooperation with Russia within the German Ministry of Education and Research made use of the Working Document in preparation of the SFIC Working Group Russia that started in spring 2014. Elements of the document were used and integrated in the draft Strategic Research Agenda draft. • National policy-makers accepted more easily the selected thematic priorities because of the transparent bottom-up approach applied in the thematic foresight workshops. • The scenarios development and their testing in the Delphi increased understanding of alternative futures that could materialise. The realities of politics in the wake of the conflict in Ukraine and the mutual sanctions between EU and Russia in 2014 (reflecting the negative scenario) have not yet led to strong negative repercussions on RDI cooperation. • Understanding the big overlap in common challenges to be addressed reinforces the willingness to collaborate, even when general politics go in opposite directions. The improved scientific cooperation can promote the lessening of political and societal tensions and may have spill-over effects to other policy areas in stimulating dialogue and cooperation.
Societal impact	• Competitiveness: Joint call has led to 18 funded projects for 'Innovation' and 45 funded projects for 'Science & Technology' among nearly 300 project proposals. S&T projects based on foresight topics are focused on long term impact and involve mainly research organisations; only 2 out of a total of 168 organisations involved in funded projects (or 1.2%) are companies • Societal challenges: All projects funded are related to societal challenges of common interest to EU MS & AC and Russia. Looking at specific topics of funded proposals relevant societal impact can be expected in fields such as virology, cancer therapies, effects of climate change (on storminess, lakes, agriculture, etc.), energy efficiency improvements (through nanotechnologies), transport (hydrogen, fuel cells). • The ERA.Net RUS Plus has become the largest geographical ERA.NET, and a flagship and leading initiative in the EU-Russia science cooperation. Through its size and novel approach the ERA.Net RUS Plus initiative also has potential to enhance the importance of the EU-Russian partnership and reach a new strategic cooperation level. • Elaboration and formulation of call topics in thematic foresight workshops were sufficiently narrow, so they could be tackled with research projects of low to midsize research budgets. This way the joint call filled a funding gap and projects got funded that would otherwise not be, and which would be too small for H2020 (joint call as a step up towards H2020 participation)

project aimed to contribute to this sustainable S&T cooperation. The Vision Paper and Action Plan (Spiesberger et al., 2013) propose a sustainable framework for longer-term collaboration through widening and deepening collaboration up until 2020. Foresight was also able to devise alternative futures with realistic possible development trends, which were presented and disseminated in a suitable form. Fig. 5 relates the scenarios developed in the project to political reality. Developments over the years have shown that the foresight results have contributed indirectly to enhancing the cooperation (thus enhancing resilience).

Behavioural additionality, being understood as change of behaviour of actors in order to improve innovation capabilities and outcomes, is reflected in the intention of Funding Parties to sustain the transparent approach to priority setting, to launch an additional call using outcomes of the thematic foresight, and the intention of other ERA-NETs to apply a similar approach to priority setting and topic selection as was done within ERA.Net RUS Plus.

Considering the relation of the foresight exercise to good governance, mainly the aspect of *transparency* in priority setting for research funding showed impact, especially in a Russian context with rather limited historic experience in transparent decision-making (with a Russian ministry deciding to join the joint call because of the transparent way of decision-making). In this sense the exercise can be an entry point to support the wider application of transparency in other policy areas. *Participatory* governance is reflected in the wide support among policy-makers, funding agencies and researchers for the vision paper and action plan, mainly thanks to involvement of large numbers of stakeholders during the process. Aspects of *accountable, effective* and *equitable* governance are less reflected in the case.

4. Discussion

4.1. Moving forward the framework

Based on the application of the framework, it appears that it provides an invaluable structure for conducting an evaluation exercise in such a complex setting. However, despite the value of guiding the evaluation process to connect different dimensions of the foresight exercise with the evaluation criteria, at its present state it comes short of considering how to integrate diverse perspectives of stakeholders in the evaluation process. Herein, the authors have applied different tools in the case evaluation, for instance by differentiating the viewpoints of different stakeholders, but this aspect could be further developed. We also recognise the opportunities in further structuring the relative importance of different criteria perceived by different stakeholders. For instance, how to capture the diverse perspectives on weighting the evaluation criteria and present the results in a format that provides reasonable basis to consider if and when the foresight is actually successful or not, also taking into account the budget available.[20] Moving the approach a step further, individual stakeholders could be asked to give different relative importance to different evaluation criteria. Then relative importance can be combined with scores on each criterion, thus mapping a three-dimensional evaluation of the foresight (Dimensions: different stakeholder groups, relative importance of each criterion, scores on each criterion). In addition, the qualitative findings can be complemented by quantitative analysis, e.g. using indicators for measurement of impact. In connection with such attempts, for instance robust portfolio modelling has been applied in earlier TRP foresight exercises that could also be suitable for the evaluation purposes (Brummer et al., 2008).

4.2. Implications to policy and research

The approach proposed and tested for the case of EU-Russia S&T collaboration offers a structured approach to evaluating foresight in a context of TRP. The paper attempts to initiate a wider discussion on the role and impact of foresight in transnational research programming, by showing the variety of possible benefits foresight can bring to such environment, and thus rationalising the debate on the use of foresight in TRP. Within Europe, the approach can help advancing the understanding and use of foresight especially in the context of Joint Programming, a programme cooperation process between Member States in which foresight has been recognised as a key framework condition. In this context foresight evaluation is still underdeveloped, partially because of the early stage in which many Joint Programming Initiatives still are. Mutual

[20] For the ERA.Net RUS case the available Project Budget for the foresight was around €400K.

Table 6
Ex-post assessment of the foresight process against the 5 coordination dimensions typical to TRP (Source: Haegeman et al., 2015).

Coordination dimension	Elements in the foresight in the ERA.Net RUS case reflecting each dimension	Ex-post assessment of foresight exercise regarding each dimension
Systemic coordination	• Mapping of the current national R&I systems and their differences, current thematic priorities, etc. • Structural foresight including elements related to (current and future) national R&I systems and how this affects cooperation (SWOT analysis includes the national R&I systems; questions in Delphi include national obstacles and framework conditions for cooperation; scenarios include evolution in national R&I systems and their effect on cooperation)	• Differences in systemic issues at national level between EU Member States and Associated Countries could be included. • Regional level systemic issues not integrated • Some delphi respondents suggested to include more questions on the overall state and prospects of Russian education, science and innovation spheres.
Vertical coordination	• Mapping of ongoing and recent cooperation activities at different levels • European nomenclature for societal challenges (Horizon 2020) are used for priority setting of national R&D budgets. • Involvement of thematic experts from European Commission in thematic roadmapping workshops between MS/AC and Russia • Foresight project linked to important international event (2014 EU Russia Year of Science)	• Regional level was not systematically integrated in the foresight design.
Horizontal coordination	• Structural foresight focusing on wider issues than just R&I (such as education systems, business environment, migration policy, cultural issues, regulatory framework, etc.) • Thematic foresight departs from interdisciplinary societal challenges. • Experts from a wide variety of scientific fields involved in scenario workshops, delphi and thematic workshops. • Thematic workshops were coordinated by non-thematic experts.	• Involvement of relevant other ministries/departments at national level was not structurally part of the foresight design. • User involvement was limited to researchers and did not include end--users/citizens/interest groups. • Delphi to some extent biased towards basic research due to sample selection
Temporal coordination	• Structural foresight focusing on medium and long term (e.g. EU-Russia S&T cooperation scenarios up to the year 2020), thematic foresight focusing on short and medium term (e.g. via selecting topics for an imminent call for research projects) • Structural foresight addresses the issue of sustainability over time of the S&T cooperation. • Vision paper and action plan address short and long term. • Structural scenarios include structural roadmaps with milestones up to 2020. • Differences in policy cycles addressed in the vision paper	• Mapping of duration of current national programmes in selected thematic areas could have been relevant.
Multilateral coordination	• Mapping of ongoing and recent bilateral and multilateral cooperation activities at varying levels (regional, national, transnational) • Bilingual delphi questionnaires[a] and attention to semantic differences • Multilateral and multilevel voting: In the two voting rounds in each thematic workshop topics are only taken into account when EU MS/AC and Russian partners assign substantial votes (applying single voting: one vote maximum from each organisation for the same topic) • Action plan addresses actions from multilevel and multilateral actors.	• More variable geometry thematic cooperation alternatives between different non-hierarchical governance levels could be interesting to explore (e.g. a MS, a region of an AC, and Russia).

[a] Both questionnaires were not completely independent from each other. The EU MS/AC target group included a limited number of Russian experts, who reside permanently or temporarily in the EU MS/AC. The same goes for the Russian target group.

learning on foresight evaluation efforts involving different types of TRP initiatives and instruments can help advance the understanding of the use and evaluation of foresight in TRP – for instance, by codifying the learnings from the Knowledge and Innovation Communities (KICs) of the European Institute of Innovation and Technology.

Beyond Europe further collaboration is needed to enhance the understanding and use of foresight in global collaborative programming to address global challenges. The STAR-IDAZ project mentioned above groups research programming in different world regions for developing joint research agendas, supported by a long established foresight and programming unit (Bagni et al., 2015). This type of continuous foresight offers an invaluable example of a longer term impact of the foresight efforts, and suggests that foresight may play an important role in TRP in the future in order to adequately address global challenges. If global challenges get more and more global answers in terms of global TRPs, evaluation of foresight efforts and benefits in TRP can proof to become of high added value for addressing such challenges in a more effective way and increase global competitiveness.

5. Conclusions

While there is a growing literature on the evaluation of foresight projects, there exist few contributions on foresight evaluation in TRP. Based on earlier work on embedding foresight in transnational research programming (TRP) and on a review of literature on foresight evaluation and on transnational research programming, a structured approach was developed for evaluating foresight activities in collaborative programming. The framework was tested against the case of TRP between EU Member States and Associated Countries and Russia. Lessons are drawn for the use and evaluation of foresight in programme cooperation in general, for Europe and for global programme cooperation. Both from the theoretical underpinnings as well as from the empirical evaluation the question of what it means to run a 'successful foresight' seems to emerge to the centre of attention. This leads us to turn also to foresight stakeholders to define individually what a successful foresight is and how they perceive the foresight exercise in which they were involved in this regard. The paper identifies a clear need a) for further codification of existing evaluation efforts of foresight in TRP and b) for the further experimentation both in the design and management as well as the evaluation of foresight in TRP.

Acknowledgements

Work on this article was supported by the European Union's Seventh Framework Programme for Research, Technological Development, and Demonstration under the project ERA.Net RUS, grant agreement no. 226164, and by the Insight Foresight Institute based in Madrid, Spain. The authors thank the reviewers for their very helpful comments as well as the participants of the 5th Conference on Future-oriented Technology Analysis (Brussels, November 2014) for the fruitful discussions that helped refining this paper. The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

Fig. 5. EU-Russia cooperation scenarios and longer-term benefits.

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