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# Priorities for future innovation: Russian S&T Foresight 2030☆

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ABSTRACT

Under the transition to a market economy Russian science, technology and innovation (STI) has changed dramatically. After the crisis of late 1990s, the government declared science and technology (S&T) as one of national priorities and started increasingly investing in this sector but it has not led to the tangible output like a bigger volume of high-tech exports or a higher share of international publications. A number of policy instruments have been introduced to increase the efficiency of STI policies. One of them is S&T Foresight.

The activities aimed at identification of national S&T priorities and series of Foresight studies have helped to understand which areas are most promising for sustaining existing competitive advantages and building new ones via gradual shift from the resource-based economy towards the technology-oriented one.

The paper presents the design and organisation of a large-scale Russian S&T Foresight exercise as a fully-fledged instrument of the national STI policy and discusses the achieved results and their use for policies at different levels.



## 1. Introduction

The first attempts of systematic Foresight of long-term S&T development go back to the 1950s.[1] Since then, hundreds of projects aimed at estimating the future of S&T have been carried out in different countries; the scale of these activities has been rapidly growing in the last 10–15 years. Foresight studies have evolved from an instrument for choosing priorities for basic research towards a complex set of methodologies used for designing various sets of policy tools like large scale national and international S&T and innovation development programmes, identification of strategic goals for technological development for certain sectors of the economy, and corporate plans for technological modernisation.

Within S&T Foresight studies, a number of important trends are witnessed, which reflect both a progress in the methodology of such exercises and a deeper understanding of the dynamics of innovation development, as well as a significant complication of the science, technology and innovation (STI) policy mechanisms. Foresight scope has been widening from pure information supply for policy makers towards a fully-fledged activity covering a variety of socio-economic problems and integrated in policy design and implementation (see the generations of Foresight in Georghiou, Cassingena Harper, Keenan, Miles & Popper, 2008).

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[1] One of the most well-known players in this area at that time was the RAND Corporation where, among others, Delphi (see Dalkey & Helmer-Hirschberg, 1962) and scenario methods (see deLeon, 1973) were developed.

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The emergence of new, more complex policy instruments, which take into consideration interests of different stakeholders, and the transformation of the nature of innovation itself, due to the increasing role of non technological innovations, the expansion of the open innovation model etc., puts on the agenda of Foresight studies such issues as the identification of special characteristics and limitations of individual policy instruments and the evaluation of their potential impact on STI, economy and society.[2] Therefore, Foresight is called upon to provide decision makers with the information regarding possible scenarios and future design of the National Innovation System (NIS). On the other hand, STI policies face significant challenges in the mid- to long-term prospects, such as the development of S&T human resources, nurturing the entrepreneurship culture, fostering innovation activities as well as transfer and practical exploitation of knowledge (OECD, 2010, pp. 215–216).

With the complication of the Foresight tasks, it is addressing problems, which at first glance fall far beyond the scope of the narrow understanding of S&T. It is reflected in an integration of the S&T Foresight into a broader area of Forward Looking Activities (FLA, see European Commission, 2010), which nowadays becomes a standard practice for the process of policy formulation in the European Commission.[3] A great significance is given, in this regard, to the Foresight as an instrument of working out long-term visions of the future, identification of probable disruptive events[4] and assessment of the anticipated effects of the implementation of STI policies.

Well known Foresight methods (such as priority setting, and constructing visions of the future) have been lately complemented with a number of relatively new approaches, that have been borrowed from other strategic-oriented disciplines (such as weak signals (Ansoff, 1975)) and wild cards (Popper, 2011)). Another important trend is the integration of quantitative and expert judgment-based methods (see Haegeman, Marinelli, Scapolo, Ricci & Sokolov, 2013). An important factor of such integration is the rapid progress of the information and communication technologies, which provides powerful instruments of "smart" search as well as quantitative and qualitative analysis of publicly accessible expert data. At the same time, the use of expert knowledge on the dynamics of S&T allows raising the credibility of conventional forecasting models and bringing them closer to reality.

A special place in the Foresight study agenda is taken by the identification and analysis of Grand Challenges—far reaching and very complicated problems already encountered by the humankind, the influence of which in the medium to long-term prospects is expected to strengthen.[5] An interdisciplinary nature of Grand Challenges requires a coordination of actions taken by various authorities at all levels—from international to individual regions. The role of Foresight in this regard amounts to not only and not even mostly identifying these Grand Challenges, but to look for Grand Responses, meaning the necessary instruments and policies, which will contribute to resolving these problems in the most effective way. Taking under consideration the complexity of the issues addressed, a systemic understanding of S&T development priorities has been outlined. While in earlier days, it dealt with primarily thematically separate realms of science and technology, which were to get the advantage when allocating the relevant resources, nowadays Foresight studies also address political, economic and social issues at the macro level (external to the area of S&T), which define, in a broader perspective, the necessity to develop the NIS institutions; and the S&T priorities themselves.

The integration of Foresight into the process of formulation of STI policies provides a basis for elevating its contribution to the efficiency of the NIS. More specifically, Foresight can act as an instrument of "strategic intelligence" (Calof, 2008) anticipating the emergence of new research areas at the intersection of established fields of science. It also contributes to the creation of new knowledge and its "diffusion" by means of discussions with a wide circle of stakeholders, who, due to this, can be better equipped for their decision making. Cagnin, Amanatidou & Keenan (2012) emphasise in particular the role of Foresight in the identification of new markets (through articulation of relevant technological prerequisites), and in forming new combinations of interactions between the NIS actors and their mobilisation to the reallocation of resources invested in S&T and innovation.

The key research question studied in the paper is how addressing Grand Challenges and identification of technologies with a great potential to respond those challenges can help in formulation and implementation of S&T and innovation policies in Russia with respect to the county-specific limitations.

## 2. International landscape of Foresight in science, technology and innovation

First STI Foresight studies at the national level refer to 1970s when Japan started its Delphi surveys which then were repeated every 5 years. The Japanese Foresight has been further developed towards a broader coverage of research areas and using a more sophisticated toolkit of Foresight methods like scenario analysis (see NISTEP, 2010). The Japanese studies were

[2] The Organisation for Economic Co-operation and Development (OECD) plays a major role, in that sense, by actively "promoting" conceptions of consolidating governmental efforts (whole-of-government policy framework) and integrating various policy instruments (policy-mix) (see OECD, 2010).

[3] For broader discussion of changing Foresight role in decision-making process see Policy Briefs, produced by European Forum on Forward Looking Activities (EFFLA) http://ec.europa.eu/research/era/effla_en.htm.

[4] Christensen (1997) discusses different kinds of disruptive innovations—technological, organisational and others, which gives a room for a broader intervention of S&T Foresight to policy making.

[5] Much attention to this issue was given by the European Commission when forming the systems of Foresight projects, which are carried out according to the 7th EU Framework Programme. See more about the role of the analysis of grand challenges in Foresight in Amanatidou (2011) and Cagnin et al. (2012); this issue was also addressed in a number of relevant events (see, for example, https://ec.europa.eu/jrc/en/event/conference/engage-today-shape-tomorrow or https://futuresconference2015.wordpress.com/).