Bulgaria – Evaluation and monitoring procedure

1. Ex-ante Impact Assessment

1.1. Methodology and procedures conducted (if applicable)

The first National Roadmap for Research Infrastructure (NRRI) of the Republic of Bulgaria was adopted in 2010 by Council of Ministers' Decision No.692 and it defined the national needs in the field of research infrastructure (RI). The Roadmap, which is linked to the ESFRI priorities, derived from the priorities of the European Strategy for RI of the EU member states.

With Council of Ministers' Decision No.569 on 31 July 2014 the NRRI was updated by reviewing and evaluating existing and new RI, as well as identifying those that are in line with the European priorities and outlining priorities for modernization and/or construction of new scientific facilities.

For the new roadmap in 2017, a Diagnostic Review of RI and Equipment in Bulgaria was planned and concluded in April 2017. Four broad research areas fell in the scope of the report, namely: (i) Physics, Material Sciences and Engineering; (ii) Medical and Agro-Bio Sciences; (iii) Social and Humanitarian Science; (iv) E-infrastructure for multidisciplinary research. These areas cover well the entire spectrum of research areas in which the Bulgarian science has traditional strengths and, at the same time, new R&D research could serve as a strong basis for the development of knowledge-based competitive economy.

The available research labs and equipment in these fields in the respective universities and research institutes were studied, as well as the human capacity and the financial resource. SWOT analysis was added to the full picture of the assessment, and in addition to that a regional analysis for specialization in the four mentioned research areas was presented.

The most important findings coming from the Diagnostic Review were:

- There were 12 existing infrastructures with European significance (7%), 84 with national (52%) and 65 with regional significance (40%)
- Insufficient modern infrastructures, which must meet the current requirements for RI
- Inadequate management of existing research facilities, inefficient workload and maintenance
- Irregular territorial and thematic distribution of the RI
- Inadequately qualified staff to support research equipment
- Financial instability and inadequate engagement of the private sector
- Some potential, but also regional gaps, to support Bulgaria's smart specialisation strategy

The Diagnostic Review concluded that there is uneven regional distribution of research equipment and scientific potential. The strategy is aimed at supporting the most developed infrastructures with potential in the thematic areas of IS3 at national and regional levels. The above mentioned regional analysis and the conclusions will be taken into consideration when preparing future calls for funding under ESIF.

The Diagnostic Review supports the planning of the next stages of RI development in Bulgaria. Scientific research in the country requires building and effective use of modern and sustainably maintained research infrastructure. In addition, researchers should be given access to key unique RI abroad, which is not possible or is unsuitable to build in the country. The following principles are laid down:

- Avoid duplication of unique and expensive research equipment;
- Ensure high workload of the research infrastructure and access of interested users;
- Maintain the available infrastructure in a good working condition;
- Provide balanced allocation of RI by institutions and regions;

Ensure Pan-European RI integration.

InRoad has been funded by the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 730928.

2. Procedure for selection of the research infrastructures to be included in the roadmap

2.1. Objectives of the evaluation

Not applicable or no information presently available.

2.2. Eligibility conditions

Not applicable or no information presently available.

2.3. Evaluation criteria for the selection of the RI to be included in the RI national roadmap

The assessment criteria of the individual RI will include, overall, the following components:

- Demands and benefits of their scientific research
- Development, maintenance and usage of research apparatuses and equipment
- Scientific quality of the research and key beneficiaries of the research results (assessed through publications, patents, citations, number of consumers)
- Institutional capacity (composition of the scientists, who perform the scientific research; availability of habilitated staff; number of PhDs, age profile, etc.)
- Management of Programs for scientific research, financed on a competitive basis from national and international sources (number of current program and projects)
- Activity in attracting funding from different sources
- Social-economic benefits and relevance of the research results (availability of created product, technology, methodology, etc.)

Established partnerships – national, regional and European

2.4. Evaluation method and procedures conducted (organisation in charge, timing, selection of reviewers, configuration of panels, indicators, etc.) for the selection of the RI to be included in the RI national roadmap

Standing Committee for NRRI: Structure, competences, and decision making mechanism

The general implementation of the national roadmap and the development of the individual RI will be subject to regular national and international Monitoring & Evaluation (M&E). It will include a general review of the implementation of the NRRI policies at a national level, as well as corrective measures and possibilities for introduction of new instruments and schemes. The efficiency of the individual RI participation in the European roadmap and the implementation of their research and technological programs and activities will be monitored and evaluated.

For the overall monitoring of the implementation of the NRRI a new Standing Committee (SC) will be constituted as a consultative body to the Minister of Education and Science. The Standing Committee consists of:

- Deputy Minister (MES)
- Science Directorate at MES
- Representatives of nationally represented business Organisations
- Representatives of BAS
- Representatives of the Council of Rectors
- Representative of NSF
- Representative of Bulgaria in ESFRI
- Representatives of the Ministry of Economy
- Representative of General Directorate "Structural Funds and International Educational Programmes"
- Representative of National Innovation Fund
- Representative of General Directorate "European Funds for Competitiveness" at ME – managing authority of OP IC
- Independent experts

The main competences of the Standing Committee are:

- The implementation of NRRI (monitors, makes recommendations, prioritizes during conditions of financial resources shortage, and controls)
- Establishing a mechanism for financial resources allocation

InRoad has been funded by the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 730928.

InRoad synchronising research infrastructure roadmapping in Europe

- Assisting the Ministers in making decisions
- Reporting to the Minister the results of the annual assessment of the methodology
- Proposing certain decisions to the Minister, based on the report submitted by the NSF for the financial implementation of NRRI
- The preparation of an annual report on the NRRI
- Requiring (reviews) independent experts' opinions
- Reviewing and making decision related to the interim evaluation of NRRI, assigned by MES
- External evaluators from EB of NSF
- Reviews and acceptances of the report, prepared by the Science Directorate and the NSF on the self-assessments

The assessment of the RI in the national roadmap will be conducted in compliance with the methodology for review and assessment of the social and economic effects for the development of RI in the national roadmap (see below) at three stages:

1) Self-assessment, based on expert cards, developed by international evaluators;
2) Annual assessment about social and economic impacts of the RI by individual experts, hired by the Ministry of Education and Science, and
3) Scientific and financial peer review by independent and international evaluators, hired by the National Science Fund.

These peer reviews will be approved by the Executive Council of the National Science Fund and will be presented together with the Plan for financing to the Standing Committee of NRRI.

The same order, including a methodology for assessment as per ESFRI criteria (see below), will be imposed when new RI are included or existing RI are excluded from the National Roadmap. New national RI could be proposed for the national roadmap, based on regular international assessment or/and upgrade of the existing scientific complexes with national and European significance. The inclusion of new and/or upgraded consortiums will start with the development of a detailed project for construction and modernization of specific RI, when a new call is announced for new RI. Each new project will undergo an international expert assessment. Based on these assessments, one will be able to upgrade the existing research complexes with European and national significance, as well as to add new national RI.

The RI, which have been established under Strategic Goal 1 of the Operational Program for Science and Education for Smart Growth (Centres of Excellence and Centres of Competence), will be directly included in NRRI, as these projects would be approved by a high level of international evaluation procedure and prioritised for further national support. The same procedure will be applied for those Bulgarian research groups, participating in RI projects of Program Horizon 2020. The budget for implementation of the NRRI will be part of the budget for science of the Ministry of Education and Science, and it will be spent through the Annual Operational Program of the NSF. The Standing Committee will propose annually the financial distribution for the individual RI in NRRI.

Methodology for review and assessment of the socio-economic effect from development and maintenance of RI in the national roadmap

1. *Evaluation of the effect of:*
   - The scientific programme for the organisation itself
   - The scientific programme for the team
   - The plan and the exploitation of scientific results for the economy
   - The potential of scientific results on the market
   - The benefits for the related to these scientific results economic fields
   - Evaluation on the type of infrastructure regarding the group of the resources
     i. "concentrated" – concentrated at one place in one resource
     ii. "distributed" (organized as a network of resources)
     iii. "virtual" (the service is provided electronically)
2. *Measuring (qualitatively and quantitatively) the effect of:*

   2.1. Verifying and proving the relevance and practical accessibility of the selected target at the

InRoad has been funded by the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 730928.

specific internal and external conditions:

- Analysis of the internal environment (legal status of the organisation; available human and financial resources; strategic and plan documents; achieved results);
- Evaluation of the organisation's goals regarding the external macro-economic factors information and (PEST and SWOT analysis);
- Mission; strategic and specific goals of the sought improvement/expansion of the R&D infrastructure to achieve the set goal;
- Scientific programme of the organisation/team to achieve the set goal;
- Involved human resources to achieve the set goal (including a programme for encouraging the involvement of young scientists and researchers in R&D; attracted Bulgarian and foreign leading experts, involved in R&D);
- Motivation of the organisation's team to achieve the set goal.

2.2. Detailed description of the provisioned R&D for achieving the set goal/and (data base system):

- Plan-table of R&D events;
- Plan-table of the R&D process;
- Optimisation model, optimisation task and optimization of R&D infrastructure;
- Plan-table for accounts of the types of R&D products under the scientific programme by years for planning account;
- Tables for revenues, expenditures and gross profit by months and years of the planning horizon;
- Money flows by months and years of the planning horizon

2.3. Degree of coverage of the area/specialization of the services provided to us with the priority sectors, activities and profile of the potential beneficiaries, set out in:

- Innovation Strategy for Smart Specialization
- Operational Programme "Innovations and Competitiveness" (OPIC)
- Others …

3. *Justification of the necessary financial resource (construction, maintenance, creation of a network/s, participation in international R&D) according to the potential of scientific results, sought by:*

3.1. the market (by economic sectors) and the society (human resources, incl. education; security; public processes and attitudes; health care; ecology)

3.2. assessment of the value of the invested public funds – return (short-medium-long term)

4. *The influence of this infrastructure on different sectors to create new scientific knowledge in the field of:*
   - Promotion of the technology transfer and development of the natural, technical, social sciences, humanities, and innovations;
   - Solving important problems in the field of economy, education (ecology, human resources, security, defense and health (health care, education, public processes, economy, environment, agriculture, defense and security, ecology, cultural and historical heritage, etc.)
5. *Proving the anticipated socio-economic effect of the planned investments for this purpose:*

- *Report – assessment of the socio-economic efficiency of the investment (anticipated results for protection of the public interest), including, for example, the expected:*
  - Number of project groups/ number of projects;
  - Number of patent applications;
  - Number of patents;
  - An average number of anticipated users of R&D infrastructure;
  - Number of „spin-off" (newly emerged) companies;
  - Number of transferred technologies;
  - Participation in international research and added value to the state from this participation
  - Etc.

6. *Clearly defined criteria and indicators for evaluation of the implementation of the business plan for development of R&D infrastructure*

InRoad has been funded by the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 730928.

6.1. Conditions and ways to use the RI:

- Degree of defining / defined equipment and offered services
- Degree of defining the access policy by the basic research projects or programs.
- Availability of written and public rules/conditions for using the RI
- Availability of public authority/body/council and mechanism, used by it for evaluation and selection of projects, organisations and separate researchers for using the capabilities of RI
- Availability of research and description/definition of the scientific communities (customers) and their needs
- To what extent/Degree RI covers the needs of the scientific communities (customers) and their needs
- To what extent/ Degree RI is overlapping with the existing research organisations, entities, programs and projects

6.2. Uniqueness and compatibility of RI

- Degree of compatibility of RI and European research infrastructures
- Degree of duplication with other RI (as equipment, services, policies), included in the roadmap

7. *Marketing strategy for the promotion of the scientific results from the expansion of R&D infrastructure*
8. *Indicators for preliminary assessment of "pan-European significance" of the RI*

8.1. Key indicators for evaluation of the partners' involvement

- Number and share of national and international partner organisations (members), committed to shareholding in construction or during operations, related with RI
- Maturing/Internationalizing of RI and/or of its individual members
- Number of units of Distributed RI, the partner facilities
- Analysis of RI management
- Structure of commitments to the (a) construction and (b) exploitation of RI (in cash
- and/or in kind)
- Estimated value of the national centers, contributing to RI for (a) construction and (b) exploitation (cash and/or in kind)

8.2. Consumers strategy

- Percentage participation of potential consumers of RI (percent of scientists from the country in a certain field, geographical distribution of RI units); distribution of RI in different scientific fields, interdisciplinarity of the research in a certain RI, anticipated search (interest of users), initiatives for consumers, data base about the consumers in the field of research through periodic consultation with research and industrial communities
- Level of service delivery (anticipated number and consumers and annual hours of access)
- Efficiency of data management and of RI access (incl. centralized and distributed RI) (share of the estimated investment in infrastructure, that gives opportunity for adaptation of data to the international standards in that field)

1.3 Creating research network

- Number of consumers (consortiums) ready/planned to load/engage/involve their own sources in the use of RI
- Anticipated share of non-European consumers (an indicator for the internationalization of the project)
- Expressed/Declared/Reported interest to use RI by different scientific communities (multidisciplinary)
- Excellence in a certain research field (Science Excellence)
- Attractiveness of the RI for researchers outside of the country

1.4 Knowledge Transfer

- Doctoral programs working with universities (anticipated number defended PhD theses, made in RI or citing results, obtained in RI.
- Accessibility of RI for consumers from the industry with the purpose to implement projects, resulting profit from the use of RI, which profit is shared between the company and the RI

Methodology for evaluation of the entry of RI in the national roadmap as per ESFRI

InRoad has been funded by the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 730928.

criteria (year 2014)

An international peer review panel with reputed and skilled scientists was organized in order to evaluate RI to be integrated in the roadmap. More concretely, the panel was formed by the following scientists:

1. Prof. Jan Hrusak, Member of Czech Academy of Sciences and of the Executive Board of the ESFRI (material science);
2. Prof. Jacques Demotes, General Director of the European Network for Clinical Research (medicine and biology)
3. Prof. Giorgio Rossi, Director of an experiment on peak researches on photo emission, National laboratory TASC-INFM, Vice-Chair of ESFRI (natural sciences and physics).
4. Prof. Jacque Dubucs, Chair of the ESFRI Strategy Working Group on Cultural and Social Innovation (social sciences).

Then, the main criteria being evaluated by the panel were:

A) Scientific and technological excellence of the RI (50% weight of the assessment):

- The significance of the RI for the specific research fields (Relevance of the
- scientific objectives of the RI to facilitate and promote top-level science in Bulgaria; Capacity of providing potential for world class research and scientific breakthrough; Expected benefits for the national scientific and technological system for conducting cutting edge research at an international level, namely to increase the participation in international collaborative research projects, such as, those of the Horizon 2020)
- Adequate identification of the RI's strengths, weaknesses, opportunities and threats (SWOT analysis)
- Degree of internationalization, including the integration in international RI initiatives, namely those of the ESFRI roadmap
- Degree of inter-disciplinarily, including the effect of the RI on strengthening interdisciplinary research in Bulgaria
- Quality of the proposed training of researchers

B) Governance capacity and implementation feasibility (25%)

- Degree of adequacy of the management structure and governance of the RI to the proposed scientific aims
- Adequate management and action plan implementation (Leadership; Distribution of responsibilities; Experience and capacity; Identification of RI's strengths, weaknesses, opportunities and threats-SWOT analysis)
- Competence and complementarities of the nodes and added value of the national RI at the regional, national and international levels, including contribution to increase access to knowledge resources and scientific capacity in the field of operation of the RI
- Adequate equipment and relevance of improvements to the existing and/or acquisition of new equipment, considering the scientific aims of the RI
- Quality of the access policy and data management plan (Transparent policy for access to the infrastructure, including international access activities, conditions for provision of access, addressing remote access needs in relation to availability of e-infrastructures and data management issues; Access policy for industry (addressing IP rights - if applicable - fees and confidentiality issues)
- Operational readiness: maturity of the RI and appropriate relations between partners of the infrastructure and, if relevant, of the integration in an international RI

C) Budget and Sustainability (25 %)

Includes technical feasibility, human resource costs and cost-effectiveness of the proposed infrastructure (based on adequacy of requested funding and envisaged sources of funds, multi-annual budget plan with funding sources information and long-term sustainability plan of the investment).

2.5. Proposals evaluated and selected (available statistics)

Not applicable or no information presently available.

InRoad has been funded by the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 730928.

3. Update / Monitoring and ex-post Evaluation of RI Roadmap 3.1. Objective of the monitoring of the RI national roadmap as a whole
Not applicable or no information presently available.
3.2. Periodicity of the RI national roadmap monitoring actions (if applicable)
NSF will organize an independent external evaluation of the research activity of the national infrastructure complexes every two years, including the conduct of opinion polls and cost-benefit analysis for the regional and national economy.
3.3. Methodology and procedures conducted (timing, approach, indicators, etc.) for monitoring the RI national roadmap
Not applicable or no information presently available.
3.4. Methodology and procedures conducted (timing, approach, indicators, etc.) for monitoring the individual RI included in the RI national roadmap
Not applicable or no information presently available.

3.5. Methodology and procedures conducted in the case that an ex-post evaluation of the RI national roadmap is planned or has been implemented
Not applicable or no information presently available.

InRoad has been funded by the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 730928.