

Best practices and common trends of
national research infrastructure
roadmapping procedures, Monitoring
and Evaluation mechanisms including
recommendations
(InRoad deliverable D3.4)



BEST PRACTICES AND COMMON TRENDS OF NATIONAL RESEARCH INFRASTRUCTURE ROADMAPPING PROCEDURES MONITORING AND EVALUATION MECHANISMS INCLUDING RECOMMENDATIONS (D3.4)

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Authors:

Gerd Ruecker, Daniel Geyer, Claudia Ritter (DLR), authors of Finnish and Dutch Case Studies, cross-country analysis (5.2, 5.3)

Isabel Bolliger (UNIL), Alexandra Griffiths (SNSF), authors of Swedish and Czech Case Studies, cross-country analysis (5.1, 5.4, 5.5)

Joaquin Guinea (Innovatec), author of desk study on evaluation and monitoring, cross-country analysis (5.6, 5.7)

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Best practices and common trends of national research infrastructure roadmapping procedures, Monitoring and Evaluation mechanisms including recommendations (D3.4)

Executive summary

The [InRoad Consultation Report](#) and [InRoad Compendium](#) provide an overview of national RI roadmapping processes. The data collected revealed a great diversity of purposes and scopes of national RI roadmapping processes in Europe. These differences are the result of the specificities of each national context and Research and Innovation (R&I) system, as well as the varying intentions behind the introduction of national RI roadmapping processes. Considering the diversity of national RI roadmapping processes in Europe and the fact that they respond to the specific characteristics and needs of national R&I systems, one-size-fits-all solutions are not possible. Thus, the following D3.4 report puts forward an analysis of trends, a series of key elements to be included in national RI roadmapping processes and recommendations to align RI policies with national strategic priorities and funding plans, in order to successfully implement the national R&I strategy, support a predictable environment for future investments and achieve a greater societal impact. This report is supported by the Inroad Deliverable D3.3 on [‘Good practices and common trends of national research infrastructure roadmapping procedures and evaluation mechanisms’](#).

1. Introduction

[InRoad](#) is a two-year Horizon 2020 project looking at ways to foster a higher degree of coordination of priority setting, evaluation and funding mechanisms, as well as to ensure sustainable planning for Research Infrastructures (RIs) in Europe. To achieve this, the project conducted a broad consultation of national practices related to decision-making and funding for RIs, and engaged in a series of interviews, case studies and workshops with regional and national stakeholders (national authorities, funding organisations, RI host institutions and RI managers) across Europe. The analysis of the extensive data collected during the project activities allowed the project partners to identify common trends and best practices in national research infrastructure roadmapping procedures and evaluation in Europe.

The following recommendations are based on the extensive data collected during the project activities but more specifically on four in-depth case studies, which explored the entire decision-making process for one cycle of a national RI roadmapping process. The data was collected through expert interviews with different actors from each case. In order to identify good practices the case selection focused on countries with more experience with national RI roadmapping processes, according to the following criteria:

- include an assessment of the European and national research landscape;
- include a scientific and economic evaluation of new and existing projects;
- include a business plan as an eligibility criterion;
- are linked to funding commitments;
- are coordinated with roadmapping at EU level.

Based on these criteria and preconditions, the following four countries were selected: Sweden, Czech Republic, Netherlands and Finland. For more information about the development and evidence of the following section, please consult Deliverable D3.3 on ‘[Good practices and common trends of national research infrastructure roadmapping procedures and evaluation mechanisms](#)’. It discusses the elements provided in this report and detail all the necessary information about the methodology used to collect the data and identify best practices including detailed information such as the analysed national R&I systems from the case studies.

Other reports available on the project’s website (see especially the [InRoad Consultation Report](#), the [InRoad Compendium](#) and the [report on the series of regional workshops](#)) provide comprehensive background information.

2. Best practices and common trends of national research infrastructure roadmapping procedures, monitoring and evaluation mechanisms

2.1. Needs and trends in national RI roadmapping processes

In its [report](#) on roadmapping of large RIs, the Organisation for Economic Cooperation and Development (OECD) defined RI roadmaps as "*Strategic plans elaborated jointly by scientists and policymakers, under the aegis of the latter, with well-defined explicitly-stated contexts, goals, procedures and outcomes. (...) Typically, it involves the organisation of extensive 'bottom-up' consultations, leading to tough choices among competing projects.*"¹ Increasingly complex and expensive RI projects require careful planning and sound funding models. In that context, the RI roadmap is a tool to manage the existing RI portfolio and to plan future developments efficiently and transparently.

The [InRoad consultation](#) revealed that the current situation in Europe is far more diverse than the scope of the OECD definition. National RI roadmaps vary in scope, purpose and content. Nevertheless, a national RI roadmap is understood as an important tool to increase the transparency and accountability of public research funding used for RIs. The design of a national RI roadmap allows to bring together needs and priorities from different actors of the national R&I system, and to take into account both scientific excellence and societal impact. As such, national RI roadmaps are not only important for individual countries' R&I systems, but are also essential for the long-term sustainability of pan-European RIs. National RI roadmaps contribute to justifying long-term funding commitments effectively and efficiently. Finally, if a national RI roadmap has been elaborated in a transparent process, it brings legitimacy to the process and the decisions among all relevant stakeholders.

¹ OECD Global Science Forum (2008): Report on Roadmapping of Large Research Infrastructures.

Since the founding of the European Strategic Forum for Research Infrastructures (ESFRI) in 2002, national RI roadmapping processes have strongly evolved. Focusing solely on the ESFRI roadmapping processes, it is possible to identify the following phases:

- The main intention of the **1st phase** can be understood as incubation of projects, incl. the first three ESFRI Roadmaps (2006, 2008 and 2010), which are mainly lists of opportunities;
- The **2nd phase**, from 2010 to 2016, was triggered by the request of the Council of the EU for more prioritisation. Since then, the ESFRI Roadmap includes an assessment of the implementation of the projects and a prioritisation of RI projects. ESFRI Roadmaps are based on integrated landscape analyses that identify not only needs and gaps in different thematic fields, but also cross-disciplinary issues. In this phase, a High-Level Expert Group was formed by the European Commission (EC) to evaluate implementation status of projects on the ESFRI Roadmap. The [AEG report](#)² resulted in the introduction of new rules, such as a maximum period of 10 years for projects to be included the ESFRI Roadmap before upgrading to a landmark status or, if requirements are not fulfilled, being removed from the roadmap;
- The **3rd phase** of the ESFRI Roadmap for RI introduced an ecosystem approach. The ESFRI Roadmap 2016 includes a landscape analysis, the assessment RI project implementation and the scientific case. The 2018 ESFRI Roadmap 2018 encompasses the entire RI portfolio and additionally includes a periodic peer-review of the scientific status of four landmarks as a case study. The new guidelines provide precise definitions of RI, lifecycle and phases of the lifecycle;
- The **4th phase**, as currently envisaged, will be characterised by the challenges lying ahead, e.g. the need to refine the methodology for monitoring RI projects and for the periodic review of landmarks. Further consolidation of the European RI landscape is needed in order to guarantee long-term sustainability of European RIs and ESFRI needs to find its role in the global context.

ESFRI has been a key driver of national RI roadmapping processes. Hence, trends towards more sophisticated and complete RI roadmap processes can also be found at the national level, where the following approaches are increasingly being taken into account:

- **Top down approach** in order to elaborate long-term strategic priorities;
- **Bottom-up approach** in order to elaborate needs of the user communities;
- **Landscape analyses** in order to assess needs, strengths, gaps and accordingly priorities for RIs within the national ecosystem and increasingly also in Europe;
- **Evaluation / Monitoring methodologies** for the selection of RI proposal for the national roadmap and assessment of quality of existing RIs.

To guarantee the long-term sustainability of the European RI ecosystem, it is important to invest the available public funding for RIs as efficiently and effectively as possible. The growing popularity of the mentioned approaches already contributes to a higher degree of coordination between regional, national and European RI roadmapping processes. While national roadmaps feed their priorities into the ESFRI process, the priorities identified within ESFRI also rely on national funding commitments.

Diversity is a feature of the European R&I landscape, composed of countries with individual R&I systems. However, the diversity of roadmapping cycles makes coordination among the EU Member States (EU MS) and Associated Countries to Horizon 2020 (AC) more challenging, thus threatening the sustainability of the European RI ecosystem. However, as those differences lie

² European Commission (2013): Assessing the projects on the ESFRI roadmap: a high-level expert group report.

within national responsibility, it is neither desired nor feasible to align national RI roadmapping cycles. Thus, InRoad recommends **the development and common use of minimal elements for national RI roadmapping process and for RI monitoring and evaluation**, to allow for more effective coordination and to promote the long-term sustainability of the RI landscape.

2.2. Recommendations on national research infrastructure roadmapping procedures, monitoring and evaluation mechanisms

The recommendations, sub-recommendations, best practise, and further explanatory information here presented are the result of a cumulative process of development of policy insights for RI funding, which relates to one of the four different policy areas³ established by InRoad.

In total, 4 main policy insights have been developed by InRoad in its Final Report on national RI roadmapping, monitoring and evaluation, which cover clear messages highlighting the main conclusions of InRoad findings.

MINIMAL ELEMENTS FOR A NATIONAL RI ROADMAPING PROCESS

1

InRoad recommends that national RI roadmapping processes contain at least the following minimal key elements as a prerequisite for a higher degree of coordination for RI policies at national and EU level:

- **Regular updates of inventories of existing RIs and an identification of needs and gaps (i.e. through landscape analysis);**
 - **Long-term strategic priorities and a transparent prioritisation of national needs that take into account the European perspectives;**
 - **Evaluation of RI relevance according to scientific, managerial, strategic and societal dimensions and corresponding monitoring mechanisms, which consider national strategic priorities and scientific needs as well as lifecycle stages, types and missions of the RI;**
 - **Prioritisation of new and existing RIs in view of the available funding for RIs.**
-

Based on trends and needs listed above, the analysis of the InRoad consultation results completed by a desk review showed that there is considerable variation between countries in the way these elements are implemented within the roadmapping process. This was also confirmed

³ InRoad's final report tackles four different policy areas: #1 Coordination between national and European roadmapping processes; #2 Embedding RI roadmap processes in national research and innovation systems; #3 Higher degree of coordination between regional, national and European funding framework; and #4 Towards best practices and common standards for RI business planning.

by the analysis of the in-depth case studies. In general, transparent processes with well-defined steps, methodologies and goals are essential to create trust and legitimacy.

Considering the diversity of factors driving national RI roadmapping processes, the first step towards a higher degree of coordination would be the development of a common understanding of a minimal set of elements for RI roadmapping. InRoad therefore suggests identifying and sharing **minimal key features of a RI roadmapping process, which have been identified as prerequisites for a higher degree of coordination**. A shared understanding of those elements could act as a prerequisite for dialogue and exchanges of experience, thus leading to a higher degree of coordination of RI processes in Europe and a more sustainable European Research Area (ERA). On top of those minimal elements, InRoad recommends that national RI roadmaps have a clearly defined scope and purpose, i.e. in terms of political support for RIs, link to funding, as well as links to national and European policies and programmes. A clear definition of RI that is broadly understood and accepted by all actors involved in the process is also an essential prerequisite.

The following figure illustrates how these minimal elements of good practice can be implemented in a national RI roadmapping process. It shows in a dynamic way the different steps of the process and indicates when inputs from which actors are needed to support the prioritisation and evaluation of quality within the process. Furthermore, it is important to note that this is a periodic process – although the appropriate cycle depends on the context.

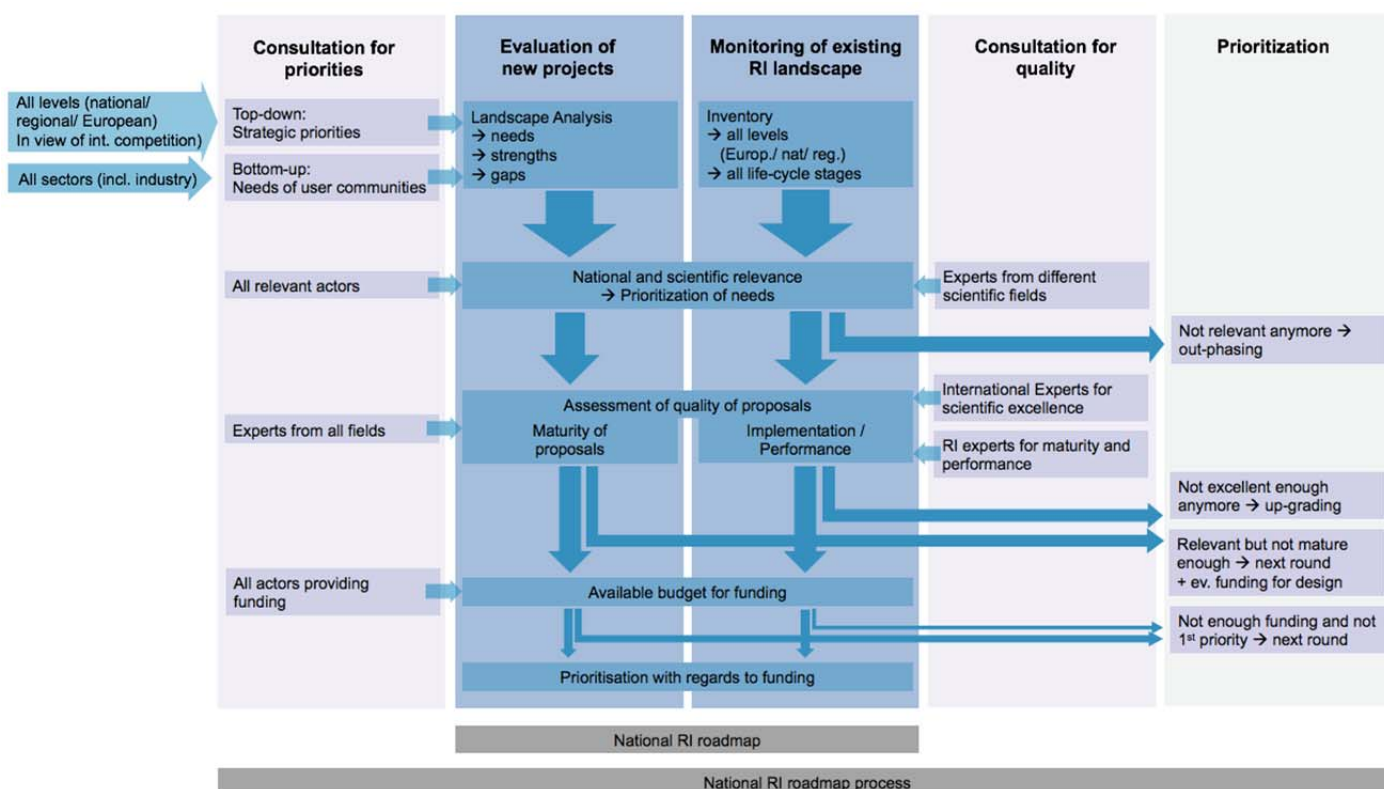


Figure 1: Minimal elements of good practice for national RI roadmapping processes.⁴

When deciding on the periodicity of roadmap updates, countries are advised to take into account the time and resources needed to organise prioritisation exercises, consultations, calls and

⁴ These elements of good practice of a national RI roadmapping process will be further elaborated within a PhD thesis of Isabel Bolliger on “National decision-making for prioritizing of funding of large-scale Research Infrastructures” (forthcoming).

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evaluations (when applicable), and to consider the timeline of the ESFRI process. Updates and regular evaluations are necessary, but they can represent a burden for the actors involved in the process. Therefore, InRoad encourages careful consideration regarding their timing.

REGULAR UPDATES OF INVENTORIES OF EXISTING RIS AND AN IDENTIFICATION OF NEEDS AND GAPS (I.E. THROUGH LANDSCAPE ANALYSIS)

In order to invest available public research funding for RIs in the most effective and sustainable way, it is important to be aware of the existing institutional, national, regional and European RI landscape. One way to achieve this is to establish **inventories, including RIs at all levels**, which are updated regularly. It is also possible to use existing databases (e.g. [MERIL](#)) as a source of information, to avoid duplication of work. As only 44% of the respondents to InRoad consultation see their RI roadmap process as an inventory of existing RIs, InRoad encourages an efficient use of such databases, and the development of incentives to maintain and regularly update them.

Another relevant element is a **regularly updated landscape analysis**. In the InRoad consultation, 74% of the participating countries indicated that landscape analyses should be part of roadmapping processes. In the countries analysed, they serve to identify strengths, gaps and/or needs in the national RI landscape. Their use could be strengthened with regard to highlighting the complementarity between RIs at European, national and regional levels. This helps to adequately position new and already established RIs in the landscape. Moreover, landscape analyses could be better related to national strategies and priorities, in complement to bottom-up identification of needs.

■ **Good practice 1: Up-to-date landscape analysis.** *The Czech RI roadmapping process includes a landscape analysis, carried out by expert working groups composed of national experts from each scientific field represented in the roadmap. This analysis identifies strengths and gaps in the national RI landscape, and supports the strategic vision of the Czech Ministry of Youth, Education and Sports (MEYS) and the prioritisation of RI projects.*

LONG-TERM STRATEGIC PRIORITIES AND A TRANSPARENT PRIORITISATION OF NATIONAL NEEDS THAT TAKE INTO ACCOUNT THE EUROPEAN PERSPECTIVES

The national RI roadmapping process is important to reflect on both national and European priorities, to assess the needs of the user community for RIs at all levels and to achieve a balance between funding commitments for national RIs and participation in European RIs. In most countries, it was found that there is scope for clearer priority-setting and increased transparency. Notably, linkages between strategy, roadmapping, evaluation and decision-making, e.g. funding decisions, are not always clear.

In view of prioritisation, it is important to have a **transparent, consultative process that includes all relevant actors**, including user communities, funders, RI managers and host institutions. To support such prioritisation processes, InRoad encourages the development of transparent procedures with clearly defined criteria and responsibilities (i.e. who makes the final decision to construct or fund a RI).

Good practice 2: Stakeholder engagement and institutional RI priorities. Universities, who are important funders of RIs in Sweden, are represented in the roadmapping process by a specific group (URFI). They contribute to defining strategic areas based on the inventory of needs and reviewing proposals from the call. The Research Infrastructure Council (RFI) also encouraged universities and research performing organisations (RPOs) to prioritise their own needs and develop institutional roadmaps, which some have started to do (e.g. Chalmers University, KTH Royal Institute of Technology (KTH)). This provides a solid foundation for institutions to justify and negotiate their needs and commitments for RIs.

Appropriate bottom-up identification of the long-term needs of the user community ensures that investments in RIs bring real added value for researchers and that RIs are used to their full extent. Conversely, top-down identification of strategic priorities of national relevance, as well as a description of how those priorities relate to the landscape analyses, are important in view of decision-making and prioritisation.

EVALUATION OF RI RELEVANCE ACCORDING TO SCIENTIFIC, MANAGERIAL, STRATEGIC AND SOCIETAL DIMENSIONS AND CORRESPONDING MONITORING MECHANISMS, WHICH CONSIDER NATIONAL STRATEGIC PRIORITIES AND SCIENTIFIC NEEDS AS WELL AS LIFECYCLE STAGES, TYPES AND MISSIONS OF THE RI

The evaluation of the scientific excellence of RIs and new proposals is a prerequisite for inclusion in the roadmap in 79% of the countries analysed by InRoad. However, methodologies and procedures vary significantly across them. An **independent and transparent peer-review process** to assess the excellence of RIs and their relevance with regards to identified scientific needs, uniqueness and added value is an important element of RI roadmapping processes at the national level. This also includes national relevance, societal value, maturity and potential impact of existing RIs and RI proposals. In turn, the results from this peer-review process are used to inform decision-makers and increase transparency and accountability within the process. To evaluate scientific excellence, 63% of the countries analysed use international expert panels, which is strongly recommended to limit risks of conflicts of interest and guarantee the required level of expertise.

Good practice 3: Identification of needs for new and existing RI at all levels. The Swedish Research Council calls for proposals include new and existing, as well as national and European RIs, which are evaluated through the same process. This ensures that only top-class and most relevant RIs are eligible. It also means that the process is streamlined, with clear common criteria for evaluation and there is a balance between long-term stability of existing RIs and necessary renewal of the landscape. Based on existing good practices, InRoad recommends a minimal set of evaluation criteria to ensure accountable, transparent and sustainable funding for RIs. A common understanding of these criteria between all relevant actors - decision-makers, evaluators, funders and applicants – is essential. The following minimal criteria are not to be seen as an exhaustive list, but as a common basis to develop methodologies and procedures that are adapted to each context.

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Based on a review of national RI roadmapping processes in Europe, criteria that are commonly used in evaluation procedures can be classified into four broad categories:

1. **Scientific dimension:** collaboration and degree of internationalisation; strong user base; scientific and technological excellence of the RI; etc.
2. **Management dimension:** mission and value proposition; governance and management; impact assessment and societal challenges; user strategy and access policy; data management plan; financial plan and funding framework; stakeholder engagement strategy; communication and outreach; implementation, monitoring and risk management; ethical and regulatory aspects; intellectual property rights management.
3. **Strategic dimension:** mission; visibility; identified priority areas; industrial relationships; innovation potential; etc.
4. **Societal dimension:** education and training; contribution to sustainable development goals; socio-economic impact; etc.

InRoad recommends that evaluation methodologies take into account those four categories – with priority to scientific and management aspects – and detail them into measurable indicators. As an example, the [ESFRI Roadmap Public Guide 2018](#) includes two annexes listing minimal requirements for both the scientific and implementation cases, which are used for its evaluation process⁵. These can be used as a starting point. It is important to note that different criteria may be needed for different targets, e.g. depending on the scientific domain of the RIs.

Good practice 4: Comprehensive and objective evaluation. *In the Czech Republic, all existing RIs and new proposals were evaluated in 2014 and 2017. The two-stage evaluation is carried out by international scientific panels. During the first stage of the evaluation process, proposals are assessed based on the definition of national RIs, as a prerequisite to pass on to the second stage. In the second stage, proposals are evaluated according to a more detailed set of criteria (e.g. socio-economic impact, uniqueness of technological facilities, etc.). The second stage also includes interviews with representatives of management of each RI, in order to address issues linked to operation and delivery of services to external users. Harmonisation of all panel results is carried out in a cross-panel session. All these elements contribute to an objective evaluation process.*

Another element to consider is the requirement of a business plan for RI roadmap and funding applications. Indeed, comprehensive business plans are essential when the roadmap evaluation is linked to funding decisions. In earlier stages of RI projects (e.g. design phase), presenting a *business case* instead of a full business plan may be sufficient, depending on the applicable procedures. Therefore, it is recommended that all applicants of national RI proposals submit a business plan to the national roadmap and funding application, whether they belong to a pan-European RI or not. This would allow national policy makers and funders to reflect on essential elements of the RI business plan (see recommendation 8).

⁵ ESFRI (2016a) Public Roadmap 2018 Guide, p. 22-23.

Good practice 5: Assessment of RI business plans. *The involvement of international expert panels is a practice already in place in some national RI evaluation procedures. These international experts are involved mainly in the assessment of the scientific dimension. For example, the Research Council of Norway (RCN) aims at having a balanced panel consisting of professionals with research and business expertise, for the evaluation of RI proposals at the initial stage of their roadmap procedure.*

Another important element of the RI roadmapping process is monitoring. Periodically monitoring the quality of RIs in relation to their mission, relevance and other jointly elaborated criteria can also allow for corrective measures to be taken when needed, in order to maintain the high standards expected from national and European RIs. This information can be used to support decision-making for individual RIs included in the roadmap, as well as the update of the roadmap itself.

There is limited information on the monitoring (follow-up) practices carried out in European countries in relation to RI roadmapping, thus no strong trends could be identified. Yet, monitoring is essential to adequately manage RI portfolios. Therefore, InRoad recommends developing and using a set of measurable, simple, relevant and reliable indicators, designed to facilitate the supervision of targets and achievements of all RIs included in the roadmap. In order to enhance mutual understanding, InRoad also recommends including visits to the facilities and interviews with RI managers, as well as giving the possibility for the applicants to react to the results of the processes.

In many evaluation and monitoring processes, RIs are assessed with the same methods and questions regardless of their lifecycle stage. This can lead to inadequate or redundant questions and limit the comparability of the results. Furthermore, since the societal impact varies across scientific fields and types of RIs, evaluation and monitoring are most accurate when considering the mission of the RI. When assessing scientific and societal impact, it has to be acknowledged that these impacts often only show in the long- or very long-term. Furthermore, the scope and type of impacts vary again across scientific domains and types of RIs. From our analysis, it appears that **existing evaluation and monitoring processes, including questionnaires, need to be better adapted to the lifecycle, type and mission of the different RIs.**

Good practice 6: Dynamic monitoring of RIs on the national roadmap. *In the [Finnish 2018 interim evaluation report on the Strategy and Roadmap for RIs 2014-2020](#), the Finnish Research Infrastructures Committee (FIRI-Committee) monitored and categorised all 32 RIs listed on their 2014 roadmap and classified them according to their level of maturity (lifecycle) and the fulfilment of predefined criteria into four different categories. Depending on their classification, the questions asked in future monitoring will be adjusted. RIs which were categorised as 'very advanced' and 'advanced' will be assessed more lightly for scientific advancement, as they were sufficiently advanced in the 2018 interim review to be considered reliable until the year 2020. Additionally, the development of RIs can be tracked through regular monitoring according to RI categorisation into the different maturity levels. The Finnish RI categorisation provided for more transparency, efficiency and supports.*

PRIORITISATION OF NEW AND EXISTING RIS IN VIEW OF THE AVAILABLE FUNDING FOR RIS

Prioritisation of RIs and projects is reported in 79% of countries analysed by InRoad. It is often a challenging task but it is increasingly necessary, as resources are limited and not all excellent RI proposals can be funded. Therefore, the final important element of a RI roadmapping process at national level is a prioritisation of RIs according to the available funding for the respective roadmap cycle. This step allows to choose the highest priorities among the RIs that passed the prioritisation of needs and were evaluated as excellent. As such, InRoad recommends to involve all key stakeholders in charge of providing funding for RIs in the national roadmapping process, e.g. ministries, research funding organisations or agencies, regional authorities, host institutions (universities and other) in order to increase commitment for national and international RIs, as well as to identify joint priorities.

BETTER INTEGRATION OF RI ROADMAPPING PROCESSES INTO R&I SYSTEMS

2

InRoad encourages better integration of RI roadmapping processes into the national research and innovation ecosystems and across other relevant national policies (education, health, etc.)

In many countries, there is scope for better integration of RI roadmaps into the national R&I system. Indeed, the importance of RIs and their services is not always well known or understood outside of user communities, funding agencies or other specific actors involved in the RI roadmapping process. For example, authorities in charge of industrial strategies or sectorial research programmes (e.g. health, agriculture, environment) could benefit from being better included into the roadmap process, and conversely, from connecting the national RI roadmap to their own strategies.

Good practice 7: Embedding the RI roadmap in a national R&I strategy. *In Finland, the national RI strategy and roadmap with implementation measures is a plan to contribute to a national R&I vision with clear targets and invites RI funders, hosts and users to align their strategies and capacities against this national plan. This creates coherence between different elements of the RI strategy: the long-term national plan, implementation and funding measures, RI roadmap and corresponding strategies, measures and roadmap elements at the host and user side.*

Moreover, regional authorities managing European Structural Investment Funds (ESIF) could play a key role in linking regional, national and European systems through the development of Smart Specialisation Strategies (RIS3). Efforts to better integrate RI roadmaps in that multilevel system could contribute to better linkages with other policies (e.g. energy and environment policies). In turn, **such integration would make the RI roadmaps and strategies at different levels (national and regional) more visible, more sustainable and less vulnerable to changing political cycles.**

Finally, there are opportunities to make better use of the RI roadmap to link the represented scientific fields with relevant policy areas, e.g. for instance with the [United Nations Sustainable Development Goals](#) or the [Paris Agreement](#) (2015). Addressing Sustainable Development Goals and global challenges requires international collaboration between RIs in different regions,

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efficient data sharing and user cooperation. To this end, policymakers, RI managers and users are encouraged to identify gaps and needs with regard to available data, research services and scientific insight in support of these global objectives. This integration of RI roadmaps and strategies would support both strategic planning and prioritisation, and contribute to the socio-economic impact of RIs.

Therefore, the success of priority-setting exercises for RIs appears to be dependent on the ability to set in motion national long-term perspectives and commitments, as well as on the linkages between RI roadmaps and different national and European policies.

Good practice 8: Coordinating national long-term RI strategies with relevant stakeholders. *The Netherlands and Finland each have introduced a RI committee, staffed with highly qualified professionals from various thematic disciplines and different R&I organisations which are tasked with designing, developing and coordinating long-term RI strategies and processes in interaction with their respective state governments. This way national RI decision-making processes, strategies, budget allocation and prioritisation are streamlined and shaped by an established group of experts.*

NATIONAL RI ROADMAPS AND LONG-TERM FUNDING

3

InRoad recommends connecting national RI roadmaps to long-term funding plans.

Investments in new RI projects or upgrades need to be carefully planned and linked to national, regional and European RI strategic priorities, taking a long-term perspective into consideration. Aligning investments with previously established strategic priorities contributes to the effectiveness and socio-economic impact of said investments.

In view of long-term sustainability, it is important that prioritised RIs receive funding from the national budget to be constructed, operated and upgraded, as well as terminated (when applicable). Only 24% of the countries studied by InRoad include funding commitments in the RI roadmap, while 59% use the roadmap as an input for funding (the remaining percentage are countries with no active roadmap, or where the roadmap has no clear link to funding). In cases where the national RI roadmap is primarily an input for funding decisions at a later stage (e.g. through a competitive funding call), or serves mainly to identify national scientific needs and existing gaps, there is a potential uncertainty for sustainable planning and coordination of RIs at European level. In general, more clarity in national RI roadmaps regarding available funding commitments would facilitate coordination.

This is particularly relevant for the adaptability to a pan-European roadmap (e.g. ESFRI). The existing diversity in the levels of engagement poses certain risks, such as making the funding of RI across Europe unpredictable and inefficient, especially for pan-European RIs. The European level must be taken into account in national roadmaps in order to better match existing and prioritised needs with available RI funding, and therefore to increase the long-term sustainability of the European RI landscape.

Thus, to ensure transparency and foster coordination between and across levels (regional, national, European), InRoad encourages the inclusion of long-term funding

plans in the national RI roadmap, even when it does not include direct funding commitments. For periodic evaluations, monitoring and socio-economic impact assessments, financial commitments and previous investments need to be continuously reviewed and related to the costs of RIs at different lifecycle stages.

Good practice 9: Long-term RI funding through collaboration in the RI-ecosystem. Finland follows a systematic, integrated and cross-ministerial approach for the development of their RI ecosystem and has developed an overall vision and roadmap for its research innovation system. Coherently, the 2014–2020 RI strategy specifies objectives and a program of interlinked short- as well as long-term measures for RIs. These measures are regularly monitored, discussed and adjusted if necessary. The longevity of infrastructure funding in Finland is achieved through collaboration. While the Academy of Finland provides funding primarily during the RI construction, the operating costs are paid by the RI host. To extend the RI funding, opportunities and principles for cooperation at the national level and between RI are pursued.

SUSTAINABLE COLLABORATION IN THEMATIC AREAS

4

InRoad encourages user communities to prioritise their needs with a long-term perspective in order to increase sustainable collaboration in the same and/or interdisciplinary thematic areas.

For user communities, **identifying and prioritising common areas of interest with a long-term perspective and finding opportunities for sustainable collaboration within the existing landscape is advisable.** Some communities have longstanding experience in collaborating across borders and advocating for their RI needs in a more unified way (e.g. the particle physics community). It would be beneficial for other communities to adopt such approaches and organise themselves into mono-disciplinary or interdisciplinary groups of common interest. This would enable researchers to exchange experience, share good practices, and identify common needs and priorities. In turn, this would help them form strong user communities and submit common RI projects at national or European level, thus using synergies and avoiding redundancies.

Good practice 10: Transparent prioritisation of needs. The Swedish RI roadmapping process includes extensive consultations for prioritisation of needs as well as in view of funding commitments. The RFI, responsible for the roadmapping process, is comprised of researchers from different scientific fields from different major research performing universities, as well as a representative from the innovation agency Vinnova and the industry sector. This council consults with the other scientific councils of the Swedish Research Council, the management of the 10 major research universities (through URFI), as well as four advisory groups, representing different scientific areas (incl. e-infrastructures). This ensures that user communities are involved in priority-setting.

To encourage user communities to organise, it is essential to recognise differences between user communities, such as differences in incentives and capacity to collaborate, or the specific needs of industrial users. For example, user needs are different when industry is involved in view of

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product development. The case of the synchrotron user community shows that cooperation on common projects and competition for scientific excellence can coexist.

For other communities, new ways of learning (e.g. by exchange of experiences between new and established communities, mono-disciplinary or interdisciplinary groups), adequate communication and leadership, as well as incentives to collaborate within and across communities would be needed. Such initiatives could be strengthened by policy instruments, as well as funding and award systems for user communities. For example, networking grants (e.g. COST) could assist newly formed communities.

3. Conclusion

The objective of this report was to describe common trends and best practices in national RI roadmapping processes, as well as evaluation and monitoring mechanisms for RIs, in Europe. For this, four country case studies (Finland, Netherlands, Czech Republic and Sweden), three country desk studies on evaluation and monitoring mechanisms (Czech Republic, Bulgaria and Ireland), a cross-country analysis (including 27 countries in Europe) and feedback from the InRoad validation workshop in 2018 were taken into account as part of deliverable 3.3 ‘Good practices and common trends of national research infrastructure roadmapping procedures and evaluation mechanisms’.

The trend analysis showed that there is a large diversity of national RI roadmapping processes. These processes have strongly evolved since the founding of the European Strategic Forum for Research Infrastructures (ESFRI) in 2002. ESFRI has been a key driver of national RI roadmapping processes. Hence, trends towards more sophisticated and complete RI roadmap processes can also be found at the national level, where certain roadmapping approaches are increasingly being taken into account.

Among this diversity of national research infrastructure roadmapping processes, best practices can be identified and opportunities for a higher degree of coordination of national RI roadmapping processes at EU-level become apparent. Based on the [deliverable D3.3](#), in total, 4 main recommendations are presented in this document: InRoad recommends that national RI roadmapping processes contain at least a set of minimal key elements as a prerequisite for a higher degree of coordination for RI policies at national and EU level. InRoad encourages better integration of RI roadmapping processes into the national research and innovation eco-systems and across other relevant national policies (education, health, etc.). InRoad recommends connecting national RI roadmaps to long-term funding plans. InRoad encourages user communities to prioritise their needs with a long-term perspective in order to increase sustainable collaboration in the same and/or interdisciplinary thematic areas.

The identified needs, best practices and trends in national research infrastructure roadmapping procedures, monitoring and evaluation contained in this document allowed InRoad to develop policy insights for a broad range of stakeholders such as European Union (EU) and national policymakers, as well as RI funders and managers. The deliverable D3.3 [‘Good practices and common trends of national research infrastructure roadmapping procedures and evaluation mechanisms’](#) provides additional evidence to support the recommendations. These insights were designed to contribute to a higher degree of coordination of RI policies in Europe. Therefore, InRoad hopes to contribute to the exchanges of experience going on between European stakeholders and within ESFRI in view of improving the long-term sustainability of the RI landscape.