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ARICE: Arctic Research Icebreaker Consortium:

**A strategy for meeting the needs for marine-based research
in the Arctic**

Deliverable 8.7. Set of indicators for the evaluation of
multiple impacts of ARICE

Submission of Deliverable

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Abstract

Evaluation is addressed mainly in terms of learning process and accountability of resources. The complexity of the interconnected activities involved in ARICE, and the intrinsic difficulty in measuring impacts in short-term timescales, has suggested to design a simplified structure to enable and structure a long-term evaluation of the outputs. It allows the diversity of activities to be framed in an evaluation framework through quantitative and qualitative indicators, avoiding the fragmentation of initiatives and paths which could evolve not coherently with the ultimate objectives of the project. The set of indicators are articulated within evaluation tables, built on well-know experiences in join European initiatives and adapted to ARICE specificities. It also aims at motivating the communities in embedding the evaluation concept from the beginning, avoiding the perception of burdening and at the same time catalyzing their diversity of their interests and capacities towards a true EU added value.

1. The general approach to evaluation and quality control

Research Infrastructures (RI) are framed in long-term strategic processes to address scientific advances and contribution to tackling societal challenges, which cannot successfully addressed by the research efforts of a single country.

ARICE will develop strategies and activities to ensure the optimal use of the existing polar research vessels at a European and international level, working towards an International Arctic Research Icebreaker Consortium which will share and jointly fund operational ship time on the available RIs.

Not a single set of rules nor any single instrument can fulfill the diverse needs and different typologies of activities which consist an inclusive and integrated approach to reach the ARICE objectives: the different typologies of joint actions can include cooperation, synergies and competition between participants at different levels (policy makers/funding organizations, operators, research groups, industry).

In this context, “evaluation” is aimed to maintain standards of quality of actions, improve their performance and provide credibility and accountability to the process itself.

Due to the complexity and diversity of activities which can be implemented, the granularity of any monitoring and evaluation has to be carefully designed and linked towards the overall objective, providing the success of ARICE as an “emergent property” from the details.

This being said, while “peer review” is a well-known process and meant as the process to support the selection of actions/projects, evaluation has to be considered as a wider concept and embedded as a cultural approach. The perspective is meta-evaluative, i.e. a procedure that set up the preconditions and the conditions to guarantee the feasibility, the impact of the entire process and its review.

The objective is to develop and strengthen the coordination of stakeholders through specific activities which can structure and/or enable solutions (which can be services, scientific advances, agreements etc.).

Some guiding principles need to be selected, preferably not addressing to rules (constraints factors).

Some essential (unavoidable) principles have to be usually endorsed:

- **Flexibility:** processes and procedures need to adapted and readjusted according to the case-by-case contexts.
- **Feasibility:** To increase evaluation effectiveness and efficiency, the responsibility of the committees and the actors involved (see accountability) should be clear.
- **Accountability:** The process of assigning actions along with the related responsibility to specific actors. The workflow is reported to the MB, which has the right to intervene.
- **Transparency:** Standards to assure an adequate documentation, clear statements in the process of governance, clear descriptions of the rules and procedures followed in the decisional processes, clear assumption of responsibility.
- **Effectiveness (timebound):** Evaluation should be addressed and developed within the right timescales to guarantee the efficiency and efficacy of the actions. Connect objectives to a timeline.

Furthermore, there is a sort of “intangible” principle that can be used also as an indicator (see below) deriving and embedded to the principles listed above, that of **Credibility**: it is related to the assumption of responsibility of the involved stakeholders and to the integrity of the process.

In this perspective, and based on the five principles mentioned above, the evaluation involves the entire process and takes into account a complete descriptions of actions, findings, limitations, and results. Evaluation should construct a judgment in a way that will also encourage committers to reinterpret or revise the process and their behaviour in case of failure or partial failure.

Evaluation procedures should be therefore practical and responsive to the way the all process operates. It is both a systematic measurement and a process of comparison with a standard, monitoring of the processes in order to prevent (as much as possible) errors.

From the first steps the "fit for purpose" is a guideline, the action should be suitable for the intended purpose, and this is a precondition.

Evaluation embeds "quality control" and reporting to the Governing Bodies, who makes the decision to reinforce or minimize the influence of collateral issues, it can intervene in the ex-post assessment for corrective actions and for a different assignment of responsibility. This stresses the fact that in the proposed model we are referring to a model implying a "continuous evaluation".

They are at least four aspects (mainly in the short term timescales) in order to measure the performances and to be able to reinforce or to correct the process (ex-post). These indicators should be directly linked to the specificity of the objectives, they can be used as pre-established criteria (ex-ante) and are underpinned in the monitoring activities during the on doing evaluation of the entire process:

- **Robustness:** the process should be immune (as much as possible) to uncertainty; all constituents should "look good" after the process is completed.
- **Reliability:** to perform all the required functions/steps under stated conditions and in the established period of time.
- **Credible process (consistency and completeness):** The evaluation process, both in planning and implementation, should be consistent with knowledge, values, and the goals stated. Documentation should adequately support the process sustaining the values of fairness and transparency.
- **Appropriateness:** appropriate measures should be guarantee to meet the goals and the needs of the planned actions, within the parameters of the framework prescribed in the policy and the information provided in the call.

Quality control and evaluation are therefore interconnected: the action progresses and results are assessed towards the stated objectives, the results (outcomes), the relation between costs and benefits and the impact.

2. A simplified fit-to-purpose evaluation framework

The evaluation of European infrastructures can be very challenging. There is a lot of experience and literature on such kind of evaluation but the complexity and diversity of the addressed issues, in terms of stakeholders, activities and objectives, suggests to simplify the evaluation framework in order to make it understandable, feasible and cost-effective, adapting also to the characteristics of the infrastructure itself and its aims. One of the main aspects of the evaluation which is hard to tackle is the attribution of impacts of the actions and their quantitative measurability: so, a transparent and

pragmatic approach has to be adopted, without introducing aspects or procedures which can defocus from the objectives and/or decrease the trust between the stakeholders.

ARICE is supporting the process towards an European infrastructure with some peculiar characteristics.

It addresses a distributed physical research infrastructure, but with only few providers of very expensive facilities. Indeed, it can provide a recognized pan-European and global added value in terms of advances in research and support to policy. In this regard, the role of ARICE as a science to policy interface is relevant for a) the **scientific results** in terms of knowledge of the dynamics of the Arctic area to **support decisions and interventions**, b) the presence of joint research activities in an area where there are some political tensions. These aspects makes ARICE a **unique “science in diplomacy” and “science for diplomacy” infrastructure** in the European scenario.

For these reasons, despite many complicated frameworks of evaluation can be adopted (see the list of references), an **understandable, consistent and applicable** scheme to structure the evaluation process as more **satisficing** (satisfying and sufficient) as possible, based on few issues, is suggested as follows.

What will be evaluated:

the **process** and the **products**, accordingly to the objectives and different target end-users, distinguishing between:

- Policy actions: concerned with achieving alignment and coordination between and within participating countries, issues of governance and partnership with a specific focus on the efficacy and effectiveness of the governing/implementing bodies of ARICE.
- Structuring actions: concerned with the activities for achieving the research addressed by ARICE, including also training and knowledge-based support to policy.

How will it be evaluated:

qualitatively, i.e. through the analysis of activities and events within a narrative, and **quantitatively**. Indicators can be identified for both the approaches.

Regarding the process which ARICE adopts (i.e. governance and partnership), the main issues may be summarized into three categories with associated key questions to identify the indicators:

- Representative efficiency: to which extent are the governance of ARICE and the taken decisions representative of the partner countries, their interests and objectives in the EU scenario?
- Administrative efficiency: to which extent are the ARICE’s management system and bodies efficient in implementing the decisions taken by the governing board?
- Relational efficiency: to which extent is ARICE efficient in relating its activities to other national, regional, European and international actions and activities, and thus positioning in

the global scenario and contributing in increasing critical mass, reducing duplication, avoiding overlaps?

3. From objectives to indicators

The first step in designing the evaluation framework is to analyze the **objectives** of ARICE and translate them in wording/aspects to facilitate the identification of **end-users** and associated **indicators**.

The objectives of ARICE identify some main aspects which can be considered as fundamentals for the evaluation scheme, as:

- The European added value: why together, international positioning, alignment of national levels and coordination, cost efficiency, standardization.
- The advances in Research and Innovation: results, structuring the cooperation between researchers and with industry, transforming the approach in the Arctic area.
- The Support to policy: as an enabling platform, in structuring the dialogue, for science diplomacy.

Assumed that the ultimate end-users of ARICE are the citizens and the environment, in an integrated objective of security of the Arctic region, “operational end-users” are identified in:

- Policy and decision makers, including public authorities and marine spatial managers.
- Funders, in public and private sectors.
- Providers/managers of the icebreakers.
- Research teams and providers of additional facilities (i.e. AUV, sensors etc.).
- Private sector.

Types of Indicators for Monitoring:

- Input indicators: should be able to provide information on the planned activities and measure the resources used for the implementation of the joint action, in terms of countries involved, institutions involved, human resources, funding (in cash and in kind), the used facilities, etc.

We would like to remind that there is often a misunderstanding between input and output indicators for some activities, which will then be used to identify outcomes and impacts. One example of such this possible confusion is the evaluation of the joint funding, which have to be clearly disentangled when claiming the success of an initiative. In fact, a huge joint investment can be an indicator of motivation and commitment, but cannot be addressed as an indicator of the impact on solutions

- Output indicators: direct and tangible outputs of joint action (e.g. calls, n° funded projects/activities, n° publications, patents, PhD Thesis, MoUs, reports, workshops, expert groups, networks, guidelines/recommendations, manuals, protocols, training course, etc.)

Types of Indicators for Evaluation:

- Output indicators: are results of the intervention that are usually less tangible (e.g. alignment of national research programmes, enhanced cooperation, access to services, etc.)

- Impact indicators: they measure the contribution to the wider long term effects of the ARICE

in relation to the goals and objectives and to those of the EU added-value (e.g. impact on EU and national policies, alignment of national programmes, reduced fragmentation, etc), strategic collaborations, sustainability of ARICE, long-term governance structure and widening.

4. The Evaluation Framework in practice

Any activity within ARICE can embrace different aspects which have to be associated to different indicators, as well as one indicator can be fed by the outputs from different activities.

For this reason, taking into account what mentioned above, the simplification of the evaluation process can be framed within two **Evaluation Tables (ET)**, each focused mainly on policy and structuring actions, whose aim is to facilitate the identification and monitoring of the activities and indicators, identifying “who does what for what”.

Evaluation Tables

<i>Alignment of national, European, International R&I programmes and infrastructures</i>			
Impact descriptors	Indicators (Input/Output, qualitative/quantitative)	Monitor and time-scale	End-user
Development, acceptance and implementation of common Agendas, in ARICE and at national levels; influence of ARICE in the national policies and strategies.	# of involved countries, semantic correlations.	Governing board of ARICE (1 year)	Policy makers
Harmonization/standardization of procedures, timing, peer-review and reporting processes.		Governing board of ARICE, researchers, providers (1 year)	Policy makers, Research infrastructure operators
Access to the Infrastructures: open, easy, transparent.	# of proposals/users accessing the infrastructures	Researchers, providers (case by case)	Policy makers, Research infrastructure operators, scientific community, industry
Avoid duplication of services, improved use of resources across Europe	Integration of international research cruises into national ship-time planning	National and EU institutions, providers (3 years)	Policy makers, Research infrastructure operators
Ability of the partnership to commit and mobilize the	Joint investments, glue money, widening	Governing board of ARICE, national and EU	Policy makers, providers

necessary resources/level of influence		institutions, providers (1 year)	
International positioning	Act at international events or fora, success stories at international level, dissemination at non-EU level.	Governing board of ARICE, researchers (1 year)	Policy makers

<i>Enhanced knowledge, research and innovation to tackle challenges</i>			
Activity	Indicators (Input/Output, qualitative/quantitative)	Monitor and time-scale	End-user
Integration of R&I communities		Governing board of ARICE (1 year)	Policy makers
Increase in science-driven international cooperation and cross disciplinary fertilizations	Cooperation index from submitted/funded proposals	Governing board of ARICE (3 years)	Policy makers
Outputs and outcomes of projects	# of scientific publications,	Governing board of ARICE, researchers, providers (1 year)	Policy makers, Research infrastructure operators
Increased integration and coordination of public and private knowledge, increased cross-sectoral involvement		Governing board of ARICE, researchers & companies, providers (3 years)	Policy makers, Research infrastructure operators, industry
Generate evidence to support policy-making	# reports, policy publications	Governing board of ARICE, researchers (1 year)	Policy makers
Communication, dissemination and visibility		Governing board of ARICE, researchers, providers (1 year)	Policy makers, Research infrastructure operators, scientific community, industry
Increase the global awareness of the challenges	News, journalists interviews	Governing board of ARICE, researchers, providers (3 years)	Policy makers, Research infrastructure operators, scientific community, industry
Standardization and increased human capacity building	# training courses, # of participants, school design, manuals	Governing board of ARICE, researchers, companies, providers (case by case)	Policy makers, Research infrastructure operators, scientific community, industry
Better management of the flow of data	Data management infrastructure developed by ARICE		Policy makers, Research infrastructure

			operators, scientific community, industry
Fostering innovation	# of workshops with industry representatives		Industry

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