

Integrating Activities for Advanced Communities



D1.13 - Innovation Monitoring Plan

Project No.871120– INTERACT

H2020-INFRAIA-2019-1

Start date of project: 2020/01/01

Duration: 48 months

Due date of deliverable: 2020/10/31 (M10)

Actual Submission date: 2020/10/26

Lead partner for deliverable: LINKPRO

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Dissemination Level		
PU	Public	
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Publishable Executive Summary

Innovation is a strong requirement in any funded EU project and every WP produces innovation in INTERACT III developing proper deliverables and milestones. Innovations should lead to improvement on processes, organizations, communities and stakeholders. To determine impacts and improvements of INTERACT III project, several metrics (i.e. system of measurement) have been developed to quantify innovation.

The innovation management (Task 1.3 – watch dog) will consist of a continuous evaluation throughout the project of the INTERACT Innovation Factors for each WP, measuring both internal (INTERACT Network Effects) and external (Stakeholders) potential impacts.

Proper indicators have been proposed and approved by WP leaders. To evaluate the innovation impacts from all parts of the project, KPIs (Key Performance Indicators) will be periodically collected and reported (deliverables D1.14 and D1.15)

The metrics implementation requires:

- to identify appropriate indicators to be used to monitor each Innovation Factor
- to set a data collection procedure and a clear calculation method for every indicator
- to apply periodically (e.g. quarterly or yearly) those procedures for metric estimation.

Due to activities multiplicity and complexity, two different categories of indicators have been determined:

- Key Performance Indicators (KPI):
exhibit improvement targets (efficiency, effectiveness, quality, ...).
- Key Activity Indicators (KAI):
measure the impact of an activity (people involved, stations engaged, document produced, audience reached, ...).

1. Introduction

1.1. What is Innovation

A lot has been written about innovation, and recently it became a confusing buzzword. Leaders from every sector agree that it is important, but nobody can easily identify a univocal definition. Even amongst innovation experts there is a huge variety of opinions.

In 1934, Schumpeter added a definition of innovation as *“new combination of new or existing knowledge, resources, equipment and other factors carried out within the economic sphere and with a commercial purpose”*. Thus, for Schumpeter, innovations are novel combinations of knowledge, resources, etc. through which new ideas are generated and put into commercial practice.

More recently, Gijs van Wulfen (a global authority and trusted advisor on innovation) defined innovation as *“a feasible relevant offering such as a product, service, process or experience with a viable business model that is perceived as new and is adopted by customers”*.

Even though our life is surrounded by new technologies, it is universally recognized that innovation does not correspond to new technology applications, that very often represent a means by which innovation can be achieved (*enabling technologies*). At the opposite, in the above definitions the following points are crucial to identify what innovation is:

- Innovation do not concern only new products or innovative services, but also processes and experiences evolution. A more efficient way to achieve a goal or an improved experience for customers and users could be considered as innovation.
- The customer adoption is the key to distinguish innovation from invention. Inside any organization internal and external customer are present, each one with different needs. Thus, even for not commercial organizations that do not operate in a competitive market, innovation could improve internal customers and stakeholders' experiences.
- Put a new idea into commercial practice as to be intended in a broad sense. Just as open a new market for a product could be considered innovation in a for-profit company, also increase knowledge dissemination involving new communities and organizations should be considered innovation in a non-profit company.

Moreover, metrics are important levers of innovation, for driving behaviors, as well as evaluating the results of specific initiatives.

How innovation should be measured? One of the reasons that only about 1/3 of all Fortune 1000 companies (annual list of the 1000 largest American companies) have formal innovation metrics is because this simple question does not have a simple answer. Because of its wide range of meanings and its critical requirement for virtually all organizations, leaders must establish a new breed of metrics for innovation:

- Fostering an organizational culture that supports and drives innovation.

- Evaluating innovation efforts to ensure both return of investment and supporting feedback loops of learning and improvement.
- Driving prosperity and growth.

1.2. Innovation in INTERACT III

As a funded project, INTERACT focus is not on return of investments, market share or revenue improvement. Neither INTERACT organization must fight with rivals in a competitive environment, quite the opposite, it promotes networking and participation.

However, INTERACT still have processes to be optimized, internal and external “customers” to be served (station managers, users and researchers) and stakeholders to be involved. Therefore, innovation should be addressed to enhance process efficiency, to improve service level, to develop new opportunities, to expand Arctic environment awareness, etc.

In INTERACT III several innovation factors have been identified, and 20 of them have been selected as the most important (see table 1). Some of them aim to foster people awareness on Arctic themes (e.g. IF.3, IF.7, IF.14-15-16, and IF.19), some others to improve process efficiency and service level to users (e.g. IF.5-6, IF.10), and some to involve as many new stakeholders as possible (e.g. IF.8, IF.20). Moreover, to grab new opportunities, innovative organization (IF.1-2), new procedures (IF.9, IF.17-18) and technological applications (IF.4, IF.11-12-13) will be pursued.

Every innovation factor could affect both INTERACT network processes (promoting for example new organization and protocols) and external entities (stakeholders, public, communities, ...). Furthermore, these factors could have a mixed impact on technical and scientific development as well as economic evolution, such as quality improvement, efficiency and societal challenges. Finally, impacts could be clustered in technology, process, social and educational evolution. Figure 1 shows the impacts distribution of innovation factors along the mentioned dimensions.

To measure impacts and improvements, WP leaders have been involved in metrics definition identifying one or more representative indicators for every Innovation Factors. The discussion that followed brought an important value to the project, promoting greater attention to impact measurement, process improvement and user (internal customer) satisfaction.

Metrics identification is sometimes challenging. In INTERACT III as well, some Innovation Factor require in-depth analysis to identify the real subject to monitor (e.g. Artificial Intelligence and Machine Learning application in Arctic Research or Protocols for screening of contaminants of emerging concern at INTERACT Stations), some other, due to the nature of activity, are not measurable (e.g. the “Report on Significance of the Agreement on Enhancing International Arctic Scientific Cooperation for Research in the Arctic” of WP5, or the consultancy role of Data Watch Dog). For that reason, metrics are not fully identified for all innovation factors at this stage of the project, waiting for further analysis.

I.F.	Task /Del	Title	I.F.	Task /Del	Title
1	T1.3-5	INTERACT “Watch Dogs”	11	T5.2	Exploring new communication technology possibilities for remote sensor
2	T1.7	INTERACT non-profit legal entity	12	T6.2	Exploring possible applications of machine-learning for data mining focusing on topics
3	D2.7-8 D2.11-13	Pocket Guides	13	D6.4	Report on future strategy and planning for the area of AI and ML to be applied in Arctic Research
4	D2.9	Repository with selected data from INTERACT stations integrated in INTERACT GIS	14	D7.1-4	Outreach films
5	M3.2	Access modality selection flow-chart	15	D7.5	Educational tool-kits
6	T3.4	VA Single-Entry Point	16	D7.6	Online lessons for secondary schools
7	T3.5	Synthesis Papers	17	D8.2	Protocols for (target and non-target) screening of contaminants of emerging concern at INTERACT stations
8	T4.2	Arctic Resident Observing Network (Nenets)	18	D8.4	Plan for development of screening monitoring networks and enhancing application of screening monitoring
9	T2.1, T4.4	Arctic weather predictions improvement	19	T9.1	Educating the tourists and tourist operators
10	D5.1	Report on Significance of the Agreement on Enhancing International Arctic Scientific Cooperation for Research in the Arctic	20	D9.2	Recommendations for improving tourist policies and regulations

Table 1 - From the many Innovation Factors (I.F) in INTERACT III, 20 have been selected for monitoring throughout the lifetime of the project

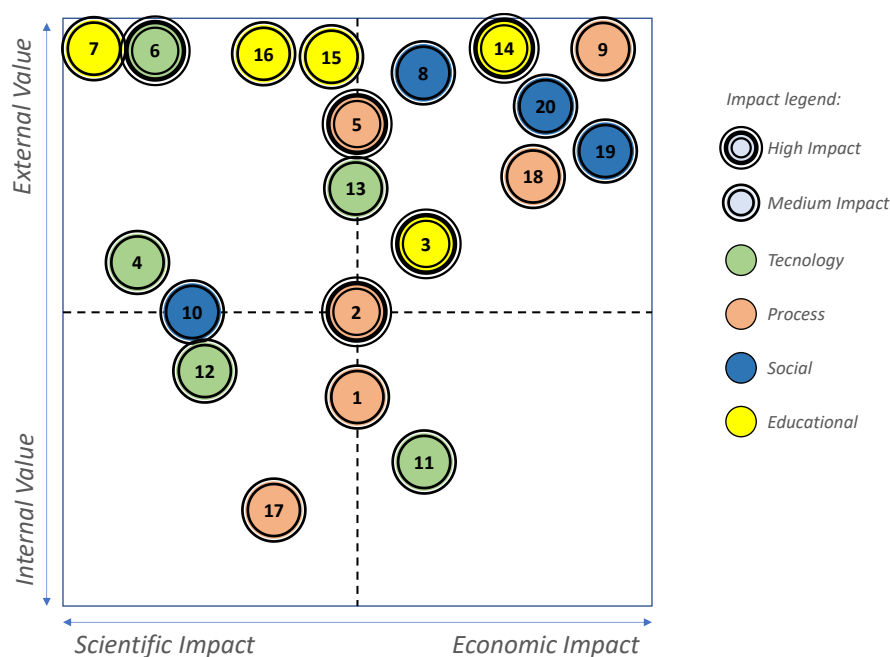


Figure 1 - The expected benefits of the 20 selected Innovation Factors

Metrics implementation does not end with indicator definition. It should include: raw data identification, necessary to calculate the indicator, specifying who is responsible for data gathering and quality; a clear calculation method to be applied at a given time; and, last but not least, a challenging and achievable target. In this Innovation Monitoring Plan, targets have rarely been set and this could be done later during the project, in order to encourage WP leaders to improve the outcomes of their work.

In general, indicators belong to two different categories:

- Key Performance Indicators (KPI)
- Key Activity Indicators (KAI).

KPI represents a result of project improvement, e.g. efficiency, effectiveness, quality, whereas KAI represents an impact measurement, or rather, the amount processed to achieve a purpose of project improvement. In INTERACT III, like any non-profit consortium, KPI are used to highlight internal process improvement or better service level to internal customer (e.g. the Transnational Access Service Level in WP3 for INTERACCES applicants). KAIs are the most utilized indicator category in INTERACT III because they show the degree of involvement of communities and stakeholders to achieve a specific result, e.g. organization involved to adopt recommendations for improving tourist policies and regulations in WP9, stations engaged to plan for development of screening monitoring networks and enhancing application for screening monitoring in WP8, document produced such as Pocket Guides edited in WP2, or audience reached for educational purpose.

2. Metrics

2.1. General Description

The following pages describe the proposed metrics for each INTERACT III Innovation Factor identified for every work package. A standard table will list definitions, features, procedures and organizations involved for each metrics. Below is a description of the different headings:

<i>Innovation Factor</i>	Element identified inside the project that will improve and innovate internal processes, experiences, awareness, ...
<i>Description</i>	An extended description of the Innovation Factor
<i>Impact</i>	Describes the expected impacts, internal and external, scientific and economic
<i>Proposed Metrics</i>	
<i>Indicator</i>	Indicator title
<i>Indicator type</i>	Key Performance Indicator (KPI) or Key Activity Indicator (KAI)
<i>Performance monitoring</i>	A description of performance or impact that the indicator monitors
<i>Procedure</i>	Illustrates data collection process and calculation model
<i>Report Frequency</i>	Defines monitoring frequency or specific due dates
<i>Responsible</i>	Who is responsible for indicator monitoring and data providing
<i>Partners involved</i>	Partners involved in data gathering
<i>Final Target</i>	Result expected for the indicator as a performance target

In some cases, metrics is not yet available because a preliminary survey or in-depth analysis is necessary to better focus area of interest and opportunities. In these cases, a brief description will state a preliminary proposed metrics and the expected next steps. The aim is to present missing metrics at the first release of Innovation Progress Report (Deliverable D 1.14).

2.2. WP1 Project Coordination

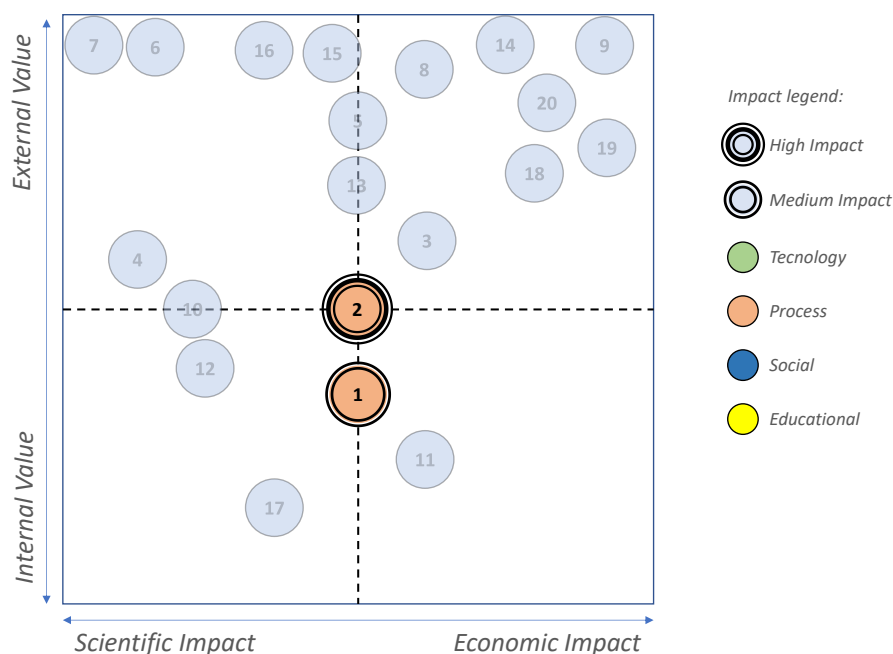
The main objectives of this work package are to facilitate and ensure:

- the smooth operation of the consortium
- the integration of various work packages to achieve synergy
- the successful and timely completion of the agreed tasks to yield the specified deliverables and reach the agreed milestones on time
- the achievement of significant advances in beyond state-of-the-art activities for ensuring innovation, data accessibility and education (through “watch dog” experts).

The following IFs have been selected for monitoring throughout the lifetime of the project:

- **INTERACT “Watch Dogs”** for monitoring and facilitating on innovation, data accessibility and educational topics (IF.1).
- **INTERACT non-profit legal entity** (INTERACT Association establishment) (IF.2).

The following figure shows the expected impact on innovation and improvement:



2.2.1. IF.1 – Watch Dogs

Innovation Factor	IF.1 – Watch Dogs
Description	Watch Dogs roles have been introduced in INTERACT III to keep watch on education, innovation and data management across the project
Impact	To achieve significant advances in beyond state-of-the-art activities for ensuring innovation, data accessibility and education
<i>Proposed Metrics</i>	
Indicator	Number of topics collected during the project as new educational resources
Indicator type	Key Performance Indicator (KPI)
Performance monitoring	New resources would be collected from all work packages for future educational application. In this sense this indicator measures a performance because the more, the better.
Procedure	At the end of the project a survey will be conducted to produce a list of new educational topics collected.
Report Frequency	At the final Innovation Progress Report (deliverable D1.15).
Responsible	Katharina Beckmann, ULUND
Partners involved	USFD

<i>Final Target</i>	NO
<i>Proposed Metrics</i>	
<i>Indicator</i>	Number of indicators monitored
<i>Indicator type</i>	Key Activity Indicator (KAI)
<i>Performance monitoring</i>	Due to the nature of some activity and the unknown progress, introducing a metrics to monitor innovation for all factors is challenging. That is why this indicator has been introduced, to monitor the real capacity of the project to monitor its own improvements.
<i>Procedure</i>	The Innovation Progress Reports that will be produced during the project will provide an immediate measure of indicators really monitored.
<i>Report Frequency</i>	At the Innovation Progress Report (deliverables D1.14 and D1.15)
<i>Responsible</i>	Giorgio Falsaperla, LINKPRO
<i>Partners involved</i>	LINKPRO
<i>Final Target</i>	20

Data Watch Dog has an advisory role inside the Project, ensuring data accessibility and interoperability across the work packages according to the most recent advances in data management approaches and policies. Thus, no significant indicator has been identified to monitor this task.

2.2.2. IF.2 – INTERACT non-profit legal entity

<i>Innovation Factor</i>	IF.2 – INTERACT non-profit legal entity
<i>Description</i>	Create an international non-profit association of stations members.
<i>Impact</i>	To secure a long-term economic sustainability of INTERACT and extend its activities, making INTERACT a true circum-arctic player
<i>Proposed Metrics</i>	
<i>Indicator</i>	Number of station members
<i>Indicator type</i>	Key Performance Indicator (KPI)
<i>Performance monitoring</i>	Number of terrestrial research stations registered as official member of INTERACT non-profit association
<i>Procedure</i>	A Membership campaign will be performed by INTERACT Non-profit association and all INTERACT Stations will be asked to join the Association as a Member. The INTERACT association Board (including DMG people) will constantly update Association Members List
<i>Report Frequency</i>	At all INTERACT General Assemblies and for the Innovation Progress Report (deliverables D1.14 and D1.15)
<i>Responsible</i>	Margareta Johansson, ULUND
<i>Partners involved</i>	ULUND, USFD, UCPH, UOULU, 4PM
<i>Final Target</i>	3 scenarios by the end of the project: Bronze: 23 stations Silver: 44 Stations Gold: 59 Stations

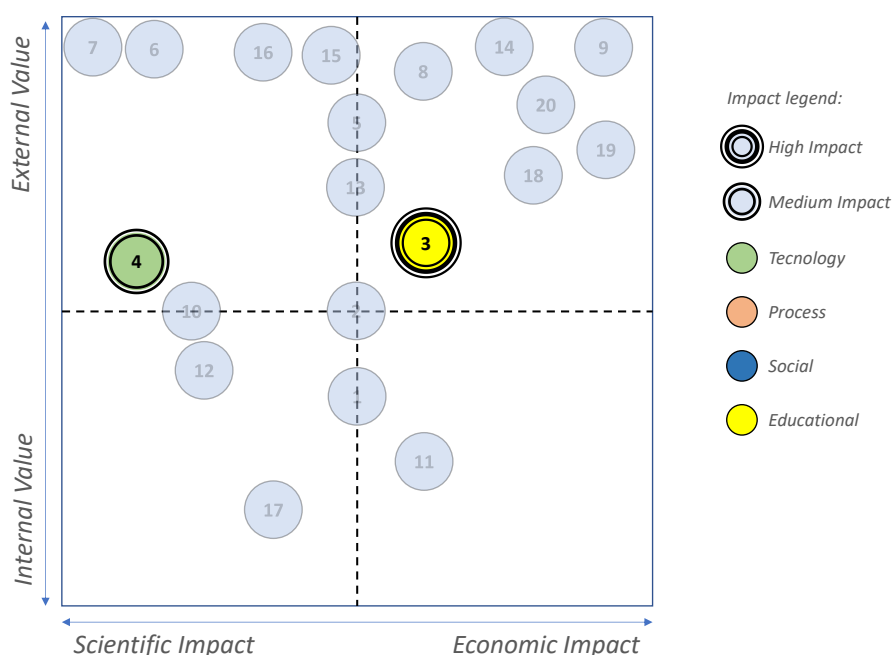
2.3. WP2 Station Manager Forum (SMF)

The aim of WP2 is to foster a culture of cooperation among research stations in an advanced infrastructure community, and between this advanced infrastructure community and scientific communities, industries, local communities, and infrastructures in other regions.

The following IFs have been selected for monitoring throughout the lifetime of the project:

- **Pocket Guides** realization, to increase data and information availability (IF.3).
- **Establish a repository** with selected key climate data from INTERACT stations to be integrated in INTERACT GIS (IF.4).

The following figure shows the expected impact on innovation and improvement:



2.3.1. IF.3 – Pocket Guides

Innovation Factor	IF.3 – Pocket Guides
Description	<p>Guides editing and distribution on:</p> <ul style="list-style-type: none"> • how to reduce CO₂ emissions in Arctic science • metadata standards for scientific networks • how to reduce plastic consumption and pollution

	<ul style="list-style-type: none"> • how to handle effects of tourism at research stations and in adjacent local communities • how tourists should behave around research station, including their study areas and local communities
<i>Impact</i>	<p>High impact on education, targeting potentially at all concerned people:</p> <ul style="list-style-type: none"> • The research community using the INTERACT stations, funding and services • Local communities near the INTERACT research stations • Arctic Council Working Groups • Projects, networks and organizations of relevance • Private companies of relevance • NGO's of relevance • Educational institutions in the Arctic and beyond • The general public in the Arctic and beyond
<i>Proposed Metrics</i>	
<i>Indicator</i>	Breadth of pocket guides distribution
<i>Indicator type</i>	Key Activity Indicator (KAI)
<i>Performance monitoring</i>	For each pocket guide, number of hard copies handed out, and number of downloading from different websites will be monitored.
<i>Procedure</i>	<p>Hard copies will be counted at handing out events.</p> <p>Administrators of websites containing pocket guides links (i.e. INTERACT, APECS, FARO) will provide relevant statistics.</p> <p>Monitoring starts at the pocket guide publishing deadline:</p> <ul style="list-style-type: none"> • M26 - Pocket guide on how to reduce CO2 emissions in Arctic science (D2.7) • M29 - Pocket guide on metadata standards for scientific networks (D2.8) • M40 - Pocket guide on how to reduce plastic consumption and pollution (D2.11) • M30 - Pocket guide on how to handle effects of tourism at research stations and in adjacent local communities (D2.12) • M30 - Pocket guide for tourist on how to behave around research station, incl. their study areas and local communities (D2.13)
<i>Report Frequency</i>	At the end of each year, after first guide publication: M37, M48
<i>Responsible</i>	Morten Rasch, UCPH
<i>Partners involved</i>	UCPH, AU, ULUND, AWI
<i>Final Target</i>	NO

2.3.2. IF.4 – Repository establishment

<i>Innovation Factor</i>	IF.4 – Repository establishment
<i>Description</i>	Repository with selected data from INTERACT stations integrated in INTERACT GIS
<i>Impact</i>	Scientific impact both internal and external use of the network.
<i>Proposed Metrics</i>	
<i>Indicator</i>	Repository degree of use
<i>Indicator type</i>	Key Activity Indicator (KAI)

<i>Performance monitoring</i>	Number of users visiting the repository will be monitored
<i>Procedure</i>	Umeå University will constantly monitor downloading from repository. The repository should be implemented at M44 (D2.9). In case of advanced implementation, the monitoring will be anticipated.
<i>Report Frequency</i>	At month M37 and M48
<i>Responsible</i>	Morten Rasch, UCPH
<i>Partners involved</i>	UmU
<i>Final Target</i>	NO

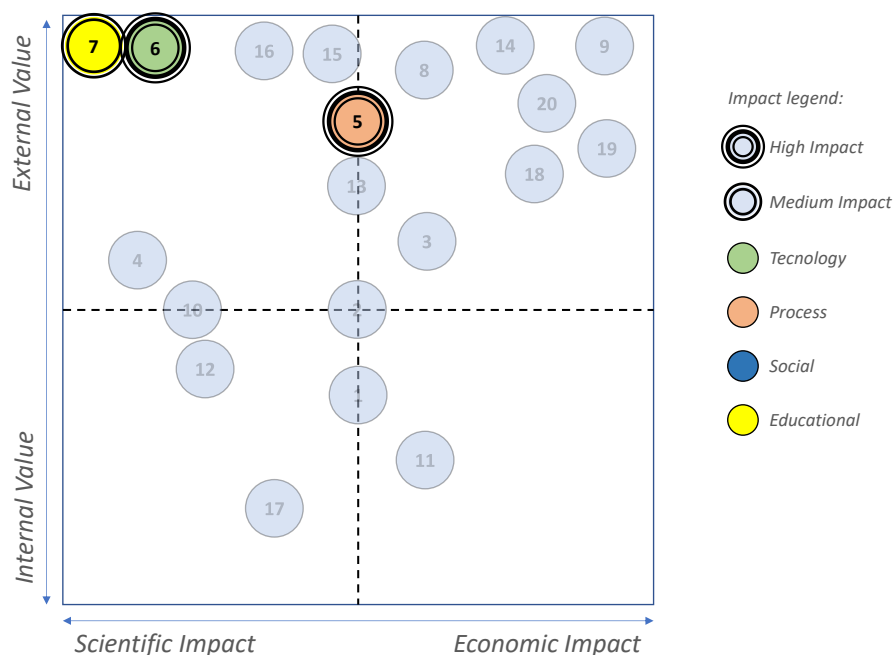
2.4. WP3 Giving Access to the Arctic

The main objective of WP3 is to manage free access to world class infrastructures in the Arctic and beyond for excellent science, providing tools (e.g. INTERACCESS) and procedures for the Trans-National (TA), Remote (RA), and Virtual Access (VA) to 53 state-of-the art terrestrial research and monitoring stations and large research field sites.

The selected IFs to be monitored during the project are:

- **Access modality selection flow-chart** to support selection of access modality (TA/RA/VA) for TA applicants (IF.5).
- **VA Single-Entry Point**, extension and improvement of the previous on-line INTERACT VA Single-Entry Point, to make available an easy and efficient way to access the metadata, data, and related data products, visualizations and services (IF.6).
- **Synthesis Papers** editing, as a multi-authored and multi-disciplinary new form of outcome (IF.7).

The following figure shows the expected impact on innovation and improvement:



2.4.1. IF.5 – Access modality selection flow-chart

Innovation Factor	IF.5 – Access modality selection flow-chart
Description	This tool will support selection of access modality (TA/RA/VA) for TA applicants. Thanks to this interactive tool, applicants will be addressed to the most appropriate access modality.
Impact	Part of a range of service tools, together with Station selection tool and TinderAct tool, it specifically promises to optimize the use of resources through costs saving adopting VA modality when data are already available online instead of TA/RA.
<i>Proposed Metrics</i>	
Indicator	TA/RA versus VA distribution
Indicator type	Key Performance Indicator (KPI)
Performance monitoring	Structured as a wizard, the tool can monitor the distribution of users addressed to TA/RA versus VA in percentage. Knowing this percentage helps to identify a distribution model of access modality (for example 60% TA/RA, 40% VA). In terms of ideal performance, the greater VA modality the better.
Procedure	The indicator will be automatically tracked by the online tool. At every flow-chart completion the counter of the suggested modality (TA/RA or VA) will be updated.
Report Frequency	Monthly or quarterly for internal use. For the Innovation Progress report (deliverables D1.14 and D1.15)
Responsible	Hannele Savela, UOULU
Partners involved	UOULU, INKODE
Final Target	NO

<i>Proposed Metrics</i>	
<i>Indicator</i>	TA Service Level
<i>Indicator type</i>	Key Performance Indicator (KPI)
<i>Performance monitoring</i>	<p>The scope of this indicator is to monitor the service level provided to TA applicants in terms of process efficiency. Several components contribute to its evaluation:</p> <ul style="list-style-type: none"> • Time from call closure to Evaluation (by TA Coordinator) • Time from TA Board meeting to access decisions (by TA Coordinator) • Time from access decision to announcement (by Coordinator) • Time from access visit to project report (by TA User) • Time from project report to reported publications (by TA User) • Time from access visit to reimbursement (by TA Station) • Time from recommendation to decision (by TA Station) <p>To summarize in one specific KPI, the overall improvement rate (e.g. average time reduction of all proposed time lapses together) over project life will be calculated. In addition, this indicator could be monitored for every station identifying best practices and solutions to be shared.</p>
<i>Procedure</i>	Every time interval will be automatically collected by INTERACCESS on-line application, evaluation and reporting system used by both TA Users, Stations and TA Coordination. To have a complete trend of this indicator, every component will be evaluated from the beginning of INTERACCESS tool (2017).
<i>Report Frequency</i>	At all INTERACT General Assemblies and for the Innovation Progress Report (deliverables D1.14 and D1.15).
<i>Responsible</i>	Hannele Savela, UOULU
<i>Partners involved</i>	UOULU, INKODE
<i>Final Target</i>	NO

2.4.2. IF.6 – VA Single-Entry Point

<i>Innovation Factor</i>	IF.6 – VA Single-Entry Point
<i>Description</i>	The online INTERACT VA Single-Entry Point will provide users an easy and efficient way to access metadata, data, and related data products, visualizations and services.
<i>Impact</i>	<p>Data availability will improve quality research giving access to a wide range of data and information and optimizing access costs: users could collect and use available data avoiding duplication of TA/RA costs.</p> <p>A large VA Single-Entry Point adoption should optimize resources without any limitation on knowledge dissemination.</p>
<i>Proposed Metrics</i>	
<i>Indicator</i>	Costs saving estimation for VA adoption
<i>Indicator type</i>	Key Performance Indicator (KPI)
<i>Performance monitoring</i>	To estimate savings related to VA adoption two scenarios should be considered: VA Single-Entry Point versus the absence of this utility. The main question is: what if we did not have VA Single-Entry Point? Most likely, the duplication of TA/RA to collect same or similar data already available could not be avoided.

	<p>Thus we can say that, for every use of VA Single-Entry Point platform, an equivalent TA/RA cost would be saved. This equivalence is comparable with the effort to create from scratch the same data or information: travel costs and labor costs, just to mention the main quantifiable efforts, other than risks and carbon footprint as a not easily quantifiable cost.</p> <p>Since number of downloads cannot be tracked, the only way to estimate that saving is to consider the real amount of TA granted proportionally to TA/RA and VA distribution (see previous IF.5 indicator TA/RA versus VA distribution).</p> <p>For example, with 4 M€ transnational access granted (TA_g) and 60% ($TA/RA_{\%}$) - 40% ($VA_{\%}$) distribution between TA/RA and VA, the estimated saving is:</p> $S_{VA} = \frac{TA_g \times VA_{\%}}{TA/RA_{\%}} = \frac{4 \times 0,4}{0,6} = 2,67 \text{ M€}$ <p>Actually, the TA granted is a limited budget value and likely part of total applicants not granted could take advantage of VA Single-Entry Point as well, so this value could be underestimated even though it is based on a statistical assumption.</p>
<i>Procedure</i>	IF.5's indicator evaluation and yearly granted transnational access amount are needed to be estimated
<i>Report Frequency</i>	At all INTERACT General Assemblies and for the Innovation Progress Report (deliverables D1.14 and D1.15).
<i>Responsible</i>	Hannele Savela, UOULU
<i>Partners involved</i>	UOULU
<i>Final Target</i>	NO
<i>Proposed Metrics</i>	
<i>Indicator</i>	Datasets value
<i>Indicator type</i>	Key Activity Indicator (KAI)
<i>Performance monitoring</i>	As mentioned before, the VA adoption will represent a very efficient way to access to data and information, avoiding TA/RA costs. Thus, datasets will acquire a real value that could be estimated comparing each of them with the equivalent effort to collect a dataset by TA.
<i>Procedure</i>	<p>The average estimated value of one dataset obtained by an equivalent TA is based on the length of a usual TA visit per user group (an average of 40 days) and the daily unit cost of the specific station, considering also the estimated cost of travel and logistics per user group to the station and back.</p> <p>Multiplying the number of available VA dataset with the average cost of a dataset will rapidly demonstrate the increasing value of the data provision as we more and more populate the new VA single-entry point.</p> <p>A report will be produced automatically by online tools.</p>
<i>Report Frequency</i>	<p>Monthly or quarterly for internal use.</p> <p>For the Innovation Progress Report (deliverables D1.14 and D1.15).</p>
<i>Responsible</i>	Hannele Savela, UOULU
<i>Partners involved</i>	UOULU, INKODE
<i>Final Target</i>	NO

2.4.3. IF.7 – Synthesis Papers

<i>Innovation Factor</i>	IF.7 – Synthesis Papers
<i>Description</i>	Utilizing the cross-fertilization of ideas and enhanced collaboration of scientists, multi-authored and multi-disciplinary Synthesis Papers will be published as a new form of outcome on contemporary topics.
<i>Impact</i>	The TA User Community consist of previous, current and potential TA Users and station representatives –involving nearly a thousand people annually- and facilitates networking and knowledge exchange to foster team-spirit, peer-support, communication, integration of inter-related projects, awareness among the scientific community of each other’s activities and collaboration in working on major and widespread issues.
<i>Proposed Metrics</i>	
<i>Indicator</i>	Number of papers
<i>Indicator type</i>	Key Activity Indicator (KAI)
<i>Performance monitoring</i>	At the end of the project will measure the success of this new form of outcome.
<i>Procedure</i>	Count the number of Synthesis Papers produced at the end of the project
<i>Report Frequency</i>	End of the project (for the final Innovation Progress report, deliverable D1.15).
<i>Responsible</i>	Hannele Savela, UOULU
<i>Partners involved</i>	UOULU
<i>Final Target</i>	NO

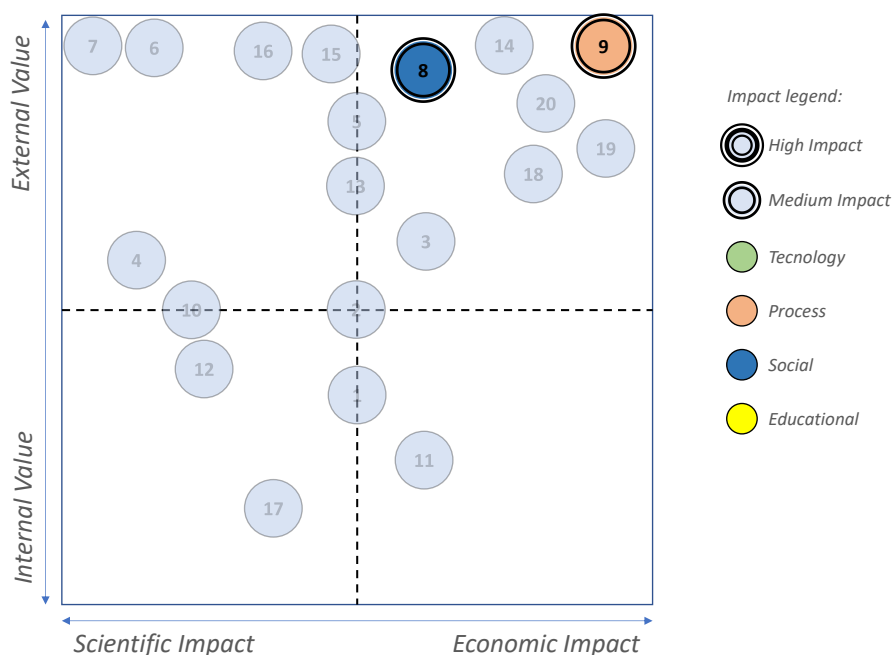
2.5. WP4 Unpredictable Arctic

The objective of this work package is to document and improve awareness of the many consequences of extreme weather events in the Arctic that are of importance to ecosystem services, local and global communities, so that appropriate timely responses can be made.

The following IFs have been selected for monitoring throughout the lifetime of the project:

- **Arctic Resident Observing Network** to work with a development of a new and innovative network led in conjunction with a health organization in the Nadym area of the Yamal-Nenets Autonomous District, Russia (IF.8).
- **Arctic weather predictions improvement** (IF.9).

The following figure shows the expected impact on innovation and improvement:



2.5.1. IF.8 – Arctic Resident Observing Network

A specific metrics for this innovation factor has not yet been identified. The hypothesis is to monitor the amount of data and information coming from local communities and organizations, to measure the effectiveness of observations. Contributions could be:

- Papers encouraged and facilitated to be written, including traditional knowledge of indigenous people, about the environment and how it is changing and how changes affect their lives as well as involving the wide local communities to contribute to the papers.
- Contacts with scientists, local authorities and institutes and organizations to gather information about the environmental processes and their societal consequences throughout Siberian territory, to make it included into INTERACT and make it available for INTERACTers and for all the world through INTERACT.
- Events where information obtained within the project could be presented.
- Contacts with local schools to involve them and to help teachers in their out-of-class work with kids.
- Pieces of information and research results that can be used to develop different types of educational materials and the number of information hubs (portals) where it can be made available then to the public.

A final proposal will be probably presented at the first Innovation Progress Report (deliverable D1.14).

2.5.2. IF.9 – Arctic weather predictions improvement

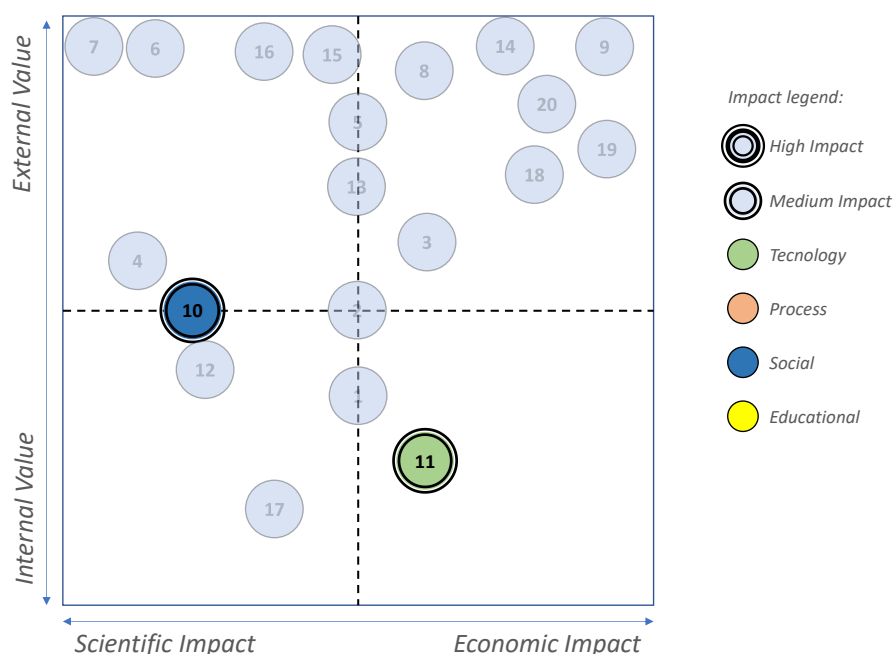
<i>Innovation Factor</i>	IF.9 – Arctic weather predictions improvement
<i>Description</i>	Arctic regions pose specific challenges to quality of weather forecasts related to processes which are historically difficult to model. This task would demonstrate the utility of data collected at the INTERACT stations for improving weather forecasts by using them to diagnose the sources of forecast errors.
<i>Impact</i>	To improve the skill of forecasts and their usability over time.
<i>Proposed Metrics</i>	
<i>Indicator</i>	Number and nature of issues detected
<i>Indicator type</i>	Key Activity Indicator (KAI)
<i>Performance monitoring</i>	An important step in making forecast improvements is identifying issues with it. The work proposed in Task 4.4 aims to do just that by confronting forecasts at four INTERACT stations with actual observations from those sites. The aim is to identify common forecast issues in the Arctic region. This could be a systematic or conditional error in a certain parameter.
<i>Procedure</i>	A list of classified issues by nature will be collected at the end of task 4.4 (M29)
<i>Report Frequency</i>	In progress report at M24, and final report at M29
<i>Responsible</i>	Jonathan Day, ECMWF
<i>Partners involved</i>	ECMWF
<i>Final Target</i>	NO
<i>Proposed Metrics</i>	
<i>Indicator</i>	Number of solutions adopted
<i>Indicator type</i>	Key Performance Indicator (KPI)
<i>Performance monitoring</i>	Any forecast issues identified will also be added to the ECMWF <i>Known IFS Forecast Issues</i> list, as appropriate. Where this analysis leads to a potential solution (to an existing or newly identified issue), for example changing a parameter in the model, this will also be counted as an innovation.
<i>Procedure</i>	A list of solution adopted will be produced at the end of task 4.4 (M29)
<i>Report Frequency</i>	At the final Innovation Progress Report (deliverable D1.15)
<i>Responsible</i>	Jonathan Day, ECMWF
<i>Partners involved</i>	ECMWF
<i>Final Target</i>	NO

2.6.WP5 Connecting the Arctic

This work package mainly aims to provide information to reduce barriers for exchange of people and scientific samples across national borders. WP5 will communicate to Arctic policymakers, an assessment and identification of bottlenecks for the free mobility of researchers, their samples and their data based on station managers' and TA users' perspectives.

The following IFs have been selected for WP5:

- **Information of researchers' free movement bottleneck** will produce a report that will be presented to Arctic policymakers and other stakeholders at a high-level policy briefing (IF.10).
- **New communication technology possibilities.** This IF aims to identify state-of-the-art communicational systems for researchers, stations and local Indigenous Communities, exploring new technology application opportunities for remote sensors (IF.11).



2.6.1. IF.10 – Information of researchers’ free movement bottleneck

Task 5.1 in WP5 related to this IF is to take the information on those barriers that WP2 collects, make a report, and present it to policy makers in 2 policy briefing.

Given that it is hard to find an indicator for this kind of activity, the original idea was to measure the impact of data collection measuring the number of scientists/stations involved on issues compilation and barriers description, to confirm that the analysis is sufficiently representative. Since task 5.1 does not include any data collection, this indicator would belong to Task 2.2 where the data collection will take place. To measure it we are trying to include APECS that oversees data collection. The finalization of this indicator is postponed to the first Innovation Progress Report (deliverable D1.14).

The WP leader of WP5 (EPB) will provide a list of participants after the briefing (names and affiliations) that will be a good measure of achieved result.

2.6.2. IF.11 – New communication technology opportunities

New technology adoption is certainly innovation. To explore the unknown, a preliminary assessment followed by a field guide would be necessary.

Innovation will most likely originate from IRIDIUM new satellite constellation that will provide new and upgraded services. The preliminary assessment will collect typical station needs, verifying how they are using IRIDIUM services, device application (phone, sensors, tracking equipment, third parts broad band),

collecting complaints and suggestions. The perception is that stations use a tiny part of features and opportunities available.

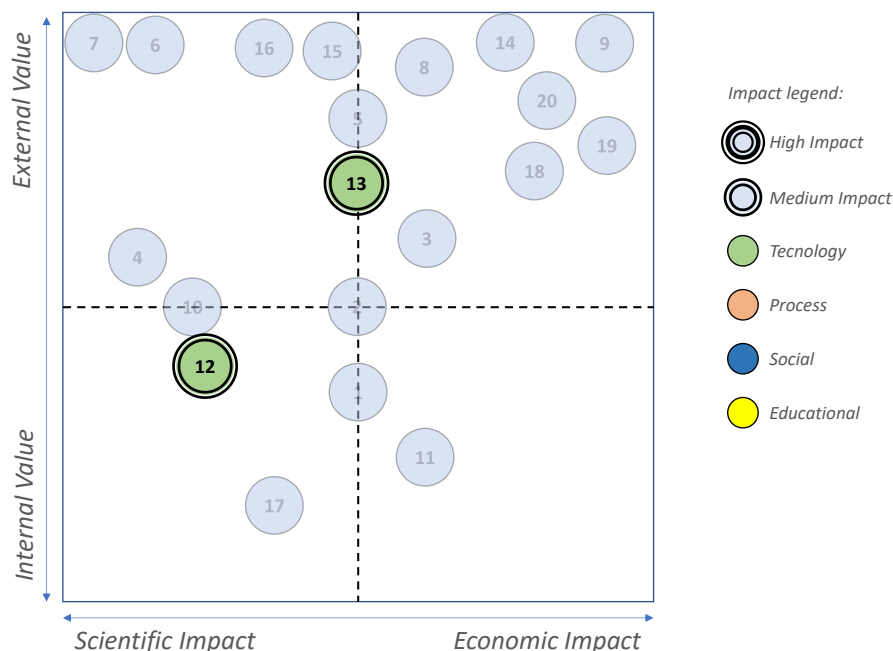
Finally, new services will be presented and tested in a pilot project to demonstrate real benefits. At this point it will be easy to identify innovation and measure it.

2.7. WP6 Climate Action

This work package will investigate new opportunities to apply Artificial Intelligence and Machine Learning to extend knowledge outside the boundaries of traditional data collection and management. A pilot model would be a best practice scheme for extensively use of emerging technology, ultimately, to cooperate with relevant manufacturers to develop new businesses, methods, products and solutions.

The following IFs have been selected for WP6:

- **ML applications opportunities**, exploring possible applications of machine learning for data mining, focusing on topics related to land-use, icescape, landscape, and ecosystems (IF.12).
- **AI and ML application in Arctic Research** to prepare a report of future strategy and planning for the area of AI and ML that can be applied in Arctic Research (IF.13).



2.7.1. IF.12/13 AI and ML application in Arctic Research

Cutting-edge applications of Artificial Intelligence and Machine Learning come true in the last years, especially in private companies, introducing new business models, improving process efficiency and quality,

supporting human activities. Even for-profit organizations encounter difficulties to identify and measure real benefits of this innovation due to the disruptive approach. Business leaders ask themselves how to predict the future returns for AI projects. The main question is: what are they looking to solve here? In business could be a problem of growth, a problem of inefficiency, or a problem of a better experience for consumers.

This WP is at the forefront, so it is difficult to know in advance what to expect. Inspiration could come from questions like:

- What do we expect to achieve?
- What benefits or improvements do we expect to introduce?
- Why should this approach be extended to all INTERACT stations?

For example, using AI and ML for data analysis and image recognition any answer could indicate a possible indicator:

- Should we validate a model comparing detected trends with real data? Effective correspondence could be monitored?
- Should we estimate previous trends when data and information were not available? How long back?
- Are we able to estimate the whole set of physical quantities currently evaluated or a subset of them (temperature, humidity, ...)? What other parameters? How many?

Right now, the WP leader is investigating opportunities and needs with a survey with station managers. Things will be clearer soon when a pilot project will be identified and launched (month 26). At that time, a suitable metrics will be implemented.

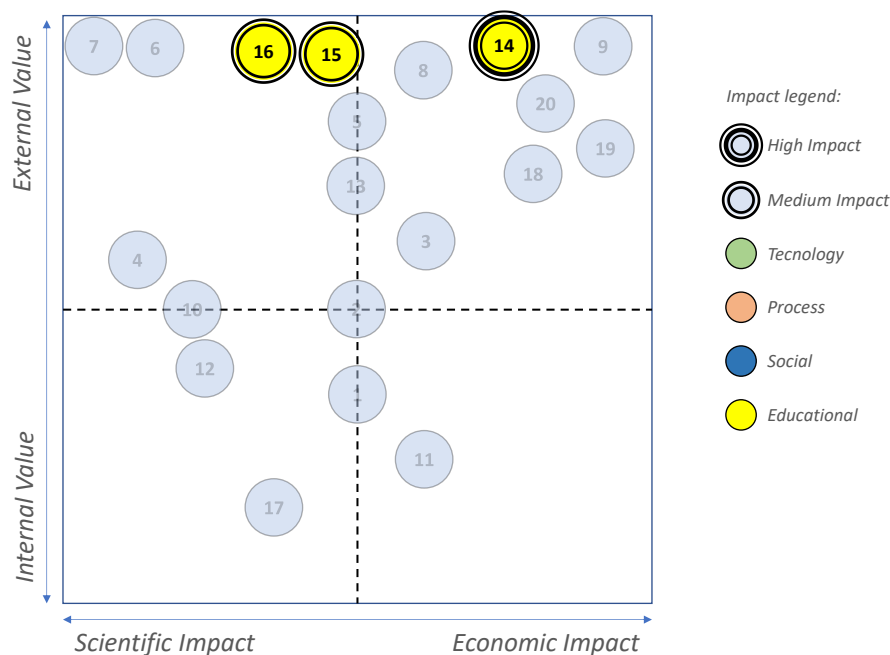
2.8. WP7 Preparing for a future world

The main objectives of this work package are:

- to develop and deliver educational resources at school and university level in response to needs identified by teachers across the world
- to increase awareness of the general public (including influential people) to Arctic environmental change and its global implications
- to establish a new generation of researchers capable of making high level assessments of environmental change in the Arctic and its global implications.

The following IFs have been selected for WP7:

- **Outreach films.** Awareness of climate impacts in the Arctic will be increased at a global level by producing high quality outreach videos made by a world leading organisation (IF.14).
- **Educational tool-kits,** to promote polar issues by providing educational resources to schools (IF.15).
- **Online lessons for secondary schools,** that aims to organise online lessons for secondary schools dedicated to polar issues and results of research conducted at the stations participating in the project (IF.16).



2.8.1. IF.14 –Outreach films

Innovation Factor	IF.14 – Outreach films
Description	Increase public awareness of Arctic environmental change and its global implications producing video clips freely available using the vast outreach sources of INTERACT.
Impact	To counteract public inertia on climate action and to influence policy, awareness of climate impacts in the Arctic and its widespread implications at a global level.
<i>Proposed Metrics</i>	
Indicator	Number of visualizations/downloads of each film
Indicator type	Key Performance Indicator (KPI)
Performance monitoring	Number of visualizations/downloads measure the level of diffusion of the message and, indirectly, the real impact on public opinion.
Procedure	For films uploaded on INTERACT's YouTube channel will be very easy to count number of views. Google analytics will be used for any different link provided on websites.
Report Frequency	At the Innovation Progress Report (deliverables D1.14 and D1.15).
Responsible	Katharina Beckmann, ULUND
Partners involved	USFD
Final Target	No

2.8.2. IF.15 – Educational tool-kits

<i>Innovation Factor</i>	IF.15 – Educational tool-kits
<i>Description</i>	Developing online educational resources in the form of tool-kits for schools
<i>Impact</i>	To empower younger generation with knowledge and tools to adapt to the most profound impacts of climate and environmental change.
<i>Proposed Metrics</i>	
<i>Indicator</i>	Number of students/teachers/secondary schools involved
<i>Indicator type</i>	Key Performance Indicator (KPI)
<i>Performance monitoring</i>	It is evident that this indicator will show the real impact of this educational program.
<i>Procedure</i>	Gradually, count students/teachers/schools involved.
<i>Report Frequency</i>	At the Innovation Progress Report (deliverables D1.14 and D1.15).
<i>Responsible</i>	Katharina Beckmann, ULUND
<i>Partners involved</i>	IGF-PAS
<i>Final Target</i>	No

2.8.3. IF.16 – Online lessons for secondary schools

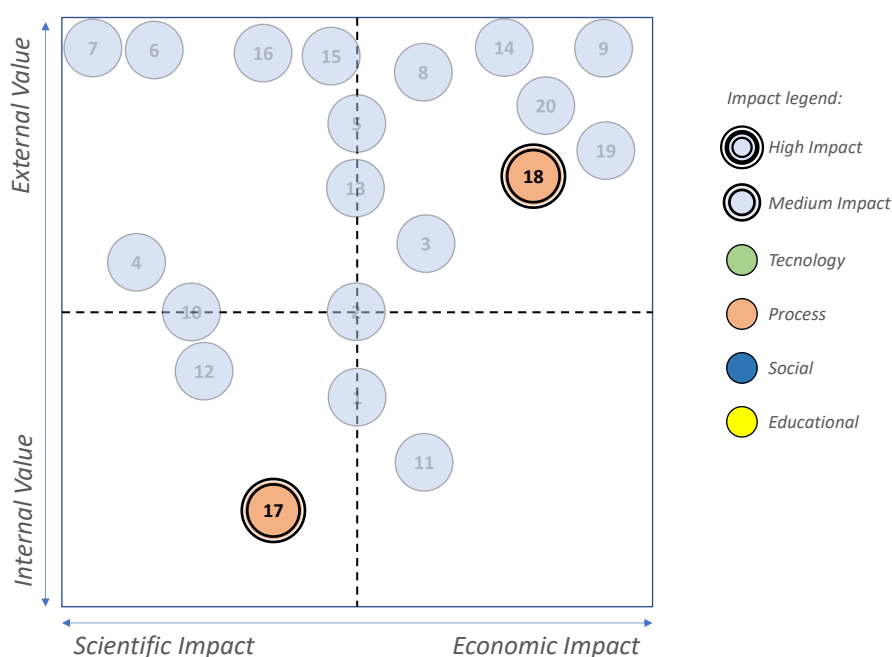
<i>Innovation Factor</i>	IF.16 – Online lessons for secondary schools
<i>Description</i>	Lessons will be offered to the network of teachers and educators participating in the EDU-ARCTIC educational programme (H2020 project). Thanks to this cooperation more than 1150 teachers and their students aged 13-19 from 58 countries will get the opportunity to become familiar with INTERACT stations and polar research.
<i>Impact</i>	Online lessons will be beneficial to both parties: scientists disseminating their research and schools participating in the webinars. They could serve also as a great promotion of each station.
<i>Proposed Metrics</i>	
<i>Indicator</i>	Number of online lessons produced
<i>Indicator type</i>	Key Performance Indicator (KPI)
<i>Performance monitoring</i>	This indicator will show the spread of this educational programme.
<i>Procedure</i>	Station managers will be involved at the end of the project with a simple survey to list the conducted online lessons.
<i>Report Frequency</i>	At the end of the project (final Innovation Progress Report deliverable D1.15).
<i>Responsible</i>	Katharina Beckmann, ULUND
<i>Partners involved</i>	IGF-PAS and all partners that own a research station
<i>Final Target</i>	60

2.9. WP8 Cleaner Arctic, cleaner world

Regarding pollutants impacts in the Arctic, considerable potential exists to use the INTERACT station network as both a core resource for looking into local sources of pollution and also ensuring that the station themselves are not contributing to this pollution.

The following IFs have been selected for this work package:

- **Contaminants screening**, to develop a protocol for screening monitoring at and close to selected INTERACT monitoring stations (IF.17).
- **Screening monitoring**, planning for development of screening monitoring networks and enhancing application for screening monitoring (IF.18).



2.9.1. IF.17/18 – Contaminants screening and Screening monitoring

A preliminary idea was to measure the number of most relevant chemicals concerns, at or around INTERACT research stations, expressed in terms of groups of chemicals identified by station managers or by local communities close to the stations. One problem may be that people will not be very familiar with the chemicals/chemical groups concerned – so would need to give this some thought.

On the other hand, to evaluate screening monitoring impacts, the number of labs capable of conducting relevant screening activities in the Arctic setting could be a good metrics.

Preliminary discussion revealed the opportunity to better understand actual procedures related to pollution issues at the station. For that reason, a survey will be sent to stations to gather information on their activities, concerns, and existing procedures relating to pollution issues, and also try to identify which

labs they work with. A proposed way forward to monitor this impact factor will be presented in the first Innovation Progress Report (deliverable D1.14).

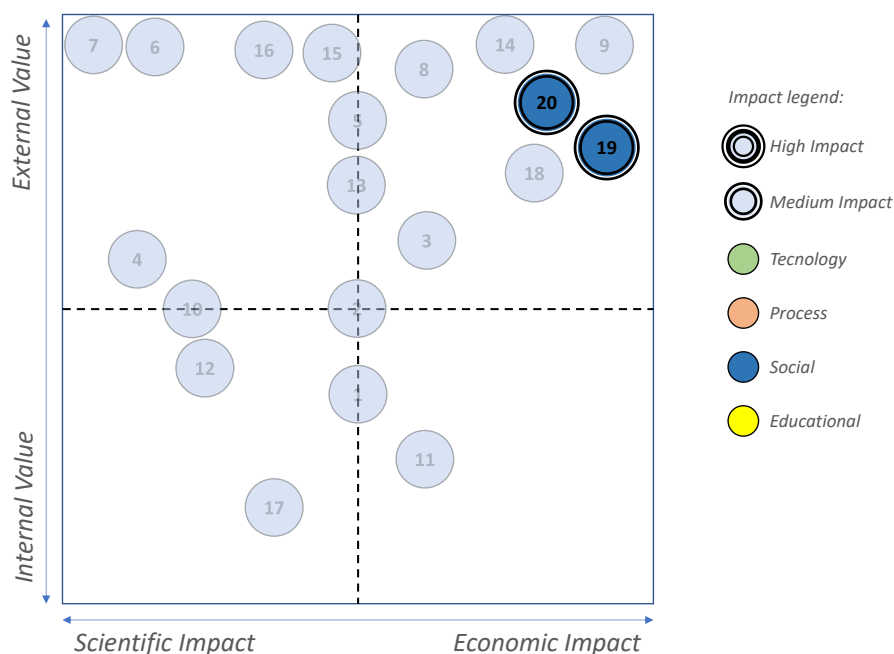
2.10. WP9 The Arctic Resort

The aim of WP9 is to support global communities to experience and value the Arctic and to educate tourists from around the world on Arctic issues, reducing their impact on the environment and local and Indigenous communities. Doing that, at the same time there is a need to maximize opportunities to local and Indigenous communities of sustainable tourism.

The selected IFs to be monitored during the project are:

- **Educating the tourists and tourist operators** developing guidelines for tourist visiting research stations (IF.19).
- **Recommendations for improving tourist policies and regulations.** Gather and summarize existing policies and regulations concerning arctic nature-based tourism, and suggest revisions based on the perspectives of local and Indigenous People (IF.20).

The following figure shows the expected impact on innovation and improvement:



2.10.1. IF.19 – Educating the tourists and tourist operators

Innovation Factor	IF.19 – Educating the tourists and tourist operators
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<i>Description</i>	The inherent innovation is on awareness improvement of the sensitivity of the Arctic to disturbance, giving value to this unique environment and ensuring sustainable tourism.
<i>Impact</i>	Tour operator's knowledge and processes could be affected by additional educational resources refining best practices for reducing impacts on the environment. Measures and tools used to ensure sustainable tourism to research activities in station management would be impacted as well.
<i>Proposed Metrics</i>	
<i>Indicator</i>	Number of Station Managers trained
<i>Indicator type</i>	Key Activity Indicator (KAI)
<i>Performance monitoring</i>	To build effective guidelines, Station Managers will be involved in a survey where results will be used to develop a template for station specific tourism guidelines to be realized during the project. Every station will be invited to use the template on a voluntary basis.
<i>Procedure</i>	The template, together with instructions on how to use it and two final pilot guidelines will be presented to all Station Managers who attend the Station Managers' Forum in Winter 2022 (SMF Meeting 3, month 25). Number of participants will set the indicator. In case of extra presentations at the following meeting (SMF Meeting 4, month 37), indicator will be updated.
<i>Report Frequency</i>	At the final Innovation Progress Report (deliverable D1.15).
<i>Responsible</i>	Melissa Nacke, AECO
<i>Partners involved</i>	AECO
<i>Final Target</i>	At least 50% of the total number of stations

2.10.2. IF.20 – Recommendations for improving tourist policies and regulations

<i>Innovation Factor</i>	IF.20 – Recommendations for improving tourist policies and regulations
<i>Description</i>	JNL will work together with local- and Indigenous communities in Scandinavia to identify the impacts that Arctic nature-based tourism activities have on local and Indigenous communities and their livelihoods, traditional resource management systems and/or perspectives on natural resource stewardship.
<i>Impact</i>	Policies and regulations are needed to prevent arctic tourism from becoming an industrial activity that has a negative impact on local- and Indigenous communities, their livelihoods and the natural environment. There are currently several projects aiming to develop guidelines for a more sensitive practice in Arctic tourism. However, there is little focus on nature-based tourism such as dog-sledging, small game hunting and sports fishing where the basis for the activity is natural resources.
<i>Proposed Metrics</i>	
<i>Indicator</i>	Number of existing policies and regulations analyzed, confirmed, and reviewed
<i>Indicator type</i>	Key Activity Indicator (KAI)

<i>Performance monitoring</i>	Considering that the aim of the activity is to summarize in an effective way a wide and fragmented range of policies and regulations, it would be significant for the quality of the analysis to consider as many policies and regulations as possible. Focus will be put on arctic nature-based tourism existing policies and regulations in Norway and Sweden. If simplification and standardization will be pursued, the amount of revisions would be considered a tangible innovation for local and Indigenous communities.
<i>Procedure</i>	Policies and regulations analyzed will be counted and respectively classified in confirmed and reviewed.
<i>Report Frequency</i>	At the final Innovation Progress Report (deliverable D1.15).
<i>Responsible</i>	Niklas Labba, JNL
<i>People involved</i>	JNL
<i>Final Target</i>	NO

2.11. Indicators Monitoring Plan

The timeline of indicators monitoring is as follow:

WP	Innovation Factor	Indicator	Months					
			13	20	25	29	37	48
WP1	IF.1 – Watch Dogs	Number of topics collected during the project as new educational resources						X
		Number of indicators monitored		X				X
	IF.2 – INTERACT non-profit legal entity	Number of station members	X	X	X		X	X
WP2	IF.3 – Pocket Guides	Breadth of pocket guides distribution					X	X
	IF.4 – Repository establishment	Repository degree of use					X	X
WP3	IF.5 – Access modality selection flow-chart	TA/RA versus VA distribution		X				X
		TA Service Level	X	X	X		X	X
	IF.6 – VA Single-Entry Point	Costs saving estimation for VA adoption		X	X		X	X
		Datasets value		X				X
	IF.7 – Synthesis Papers	Number of papers						X
WP4	IF.8 – Arctic Resident Observing Network	<i>tbd</i>						
	IF.9 – Arctic weather predictions improvement	Number and nature of issues detected			X	X		X
		Number of solutions adopted				X		X
WP5	IF.10 – Information of researchers' free movement bottleneck	<i>tbd</i>						
	IF.11 – New communication technology opportunities	<i>tbd</i>						
WP6	IF.12 – ML application opportunities	<i>tbd</i>						
	IF.13 – AI and ML application in Arctic Research	<i>tbd</i>						
WP7	IF.14 – Outreach films	Number of visualizations/downloads of each film		X				X
	IF.15 – Educational tool-kits	Number of students/teachers/secondary schools involved		X				X
	IF.16 – Online lessons for secondary schools	Number of online lessons produced						X
WP8	IF.17 – Contaminants screening	<i>tbd</i>						
	IF.18 – Screening monitoring	<i>tbd</i>						
WP9	IF.19 – Educating the tourists and tourist operators	Number of Station Managers trained						X
	IF.20 – Recommendations for improving tourist policies and regulations	Number of existing policies and regulations analyzed, confirmed, and reviewed						X
number of indicators to be monitored			2	8	4	2	5	17