



EUROPEAN COMMISSION
EXECUTIVE AGENCY FOR SMALL AND MEDIUM-SIZED ENTERPRISES

Director

Brussels,

REVIEW REPORT

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| Grant Agreement (GA) number: | 727890 |
| Project¹ Acronym: | INTAROS |
| Project title: | Integrated Arctic observation system |
| Type of Action: | RIA |
| Start date of the project: | 01/12/2016 |
| Duration of the project: | 60 |
| Name of the primary coordinator contact and organisation: | Stein SANDVEN (NERSC) |
| Period covered by the report: | from 01/12/2016 to 31/05/2018 |
| Periodic report: | 1st |
| Date of first submission of the periodic report (if applicable): | 31/07/2018 |
| Date of latest version of Annex 1 to the GA (Description of the Action - DoA) against which the assessment is performed | 13/06/2018 |
| Date of meeting with consortium (if applicable): | 19/09/2018 |
| Name(s) of monitors assisting in the project assessment (if applicable) | Mary Elisabeth MC CAMMON Vito VITALE |
| Name of Project Officer drafting the report: | Gaelle LE BOULER |

¹ The term ‘project’ used in this template equates to an ‘action’ in certain other Horizon 2020 documentation

1. Overall assessment

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| Overall assessment |
| Project has achieved most of its objectives and milestones for the period with relatively minor deviations. |
| Significant results linked to dissemination, exploitation and impact potential |
| <p>Project will likely provide results with significant immediate or potential impact in the next reporting period (even if not all objectives mentioned in the Annex 1 to the GA were achieved).</p> <p>The most significant exploitable results to date are:</p> <ol style="list-style-type: none">1) Increased collaborations and interactions with other programs/projects which will benefit the overall program and EU scientists. We understand that the “observing field” is a crowded one, and these interactions are time-consuming. However, we continue to believe that they will have increasingly greater impact.2) Surveys of existing observing assets and analysis of gaps. These are extremely valuable and will be even more so once input from external partners is included. INTAROS as well as other observing programs not included as part of it should find this extremely useful for assessing and prioritizing their needs and gaps. However, we note that all such inventories soon become obsolete, and it would be helpful to see these organized so that they reflect “sustained” systems, and not short-term “research” projects.3) Survey of best practices and lessons learned of Community Based Monitoring (CBM) programs and CBM toolkit. The results of this effort will be valuable for other CBM initiatives. The programs described were largely North America based, and it would have been helpful to have broader geographic distribution and an analysis of how CBM is approached in different parts of the Arctic. The toolkit should be made available on the INTAROS website. |
| General comments |
| <p>PROGRESS OF ACTIVITIES - Overall, the project is on track as of Month 18. All deliverables have been submitted on time and milestones have been met. The framework for implementing the remainder of the program is solidly in place, and there are no apparent delays or problems. Some minor refinements to several of the deliverables are recommended. We also include specific observations within the Work Packages and Deliverables for you to take into consideration as the project progresses which we believe would strengthen the project’s legacy.</p> <p>RESULTS - The main achievements are:</p> <ul style="list-style-type: none">• The beginning of a comprehensive observing assets assessment and gaps analysis, building on previous EU project results. The team made a wise decision to spend more resources on this effort, as it will be a primary outcome of the project. This will be a “work in progress”, with future refinements necessary to make these achievements useful on a larger scale than just the INTAROS consortium.• Development of new collaborations and partnerships as a result of the outreach and engagement efforts of the team. Of particular note are interactions with the Chinese Digital Belt and Road Program – High Mountain and Northern Cold Region, and with SAON’s Arctic Data Committee and Committee on Observing Networks, as well as contributions to the MOSAIC and YOPP field programs.• Exploitation and enhancements of existing observing systems and assets through the regional field activities and sensor enhancements, thereby increasing their capabilities and value, although results of the first year’s field work are not yet available.• Emphasis on community based observing systems and their value to overall understanding of Arctic change and current and future-decision making. <p>INNOVATION – The potential for technological achievements lies with new observing instruments, autonomous capabilities and multidisciplinary integration, especially in the central Arctic Ocean. This review is too early to assess these results.</p> <p>IMPACTS – The program will clearly have a positive impact on scientific understanding and observing capabilities in the Arctic. Potential impacts on society and on government and stakeholder decision-making are less clear. Stakeholder engagement has been limited to date, and we strongly recommend that it be expanded, but strategically, so as to increase its value.</p> <p>SCIENTIFIC/TECHNICAL QUALITY - This can only be assessed by the content of the deliverables. For the most part, quality is high, although there is always room for improvement.</p> <p>DISSEMINATION – With respect to the publication and outreach activities presented in WP7 deliverables, this appears to be good for this stage of the project.</p> |

Recommendations concerning the period covered by the report

We recommend that all deliverables clearly identify the lead author, co-authors, and internal reviewers.

In addition, we recommend that these deliverables be revised:

D1.2 Data Management Plan. Since this is intended to be a living document, and much work has been done on this since this version was submitted in M6, we recommend an updated version of the plan be formalized and submitted as a revised deliverable.

D4.1 Community Based Monitoring Programs. Since a new version of this document already has been prepared, we are rejecting the current deliverable so the team can submit the updated version.

D8.3 Terms of Reference for Advisory Panel. We recommend a revised version of the Terms of Reference be submitted to reflect the merger of two panels into one, and further details about membership and purpose and goals.

D8.4 Exploitation Plan. We recommend a second version of this deliverable be submitted that more clearly connects to the stakeholder engagement envisioned for INTAROS and included in D1.3 and D7.3 Dissemination Plan, to be updated in M36.

Recommendations concerning future work, if applicable

MAJOR RECOMMENDATIONS:

1) Significantly re-structure how you are addressing stakeholder engagement so that the roadmap for the future sustainable Arctic Observing System is designed to meet prioritized societal needs.

2) Continue to refine the observing system and asset inventories, especially to include non-members of the INTAROS consortium, and group the results to better link them to societal needs.

3) Continue work on the INTAROS web page to make it more usable by not-INTAROS users. Increase the transparency of the program by providing as much information and deliverables on the public site. Ensure that all portions of the site are functional.

4) Work to improve and better structure performance indicators for outreach and dissemination activities, as well as to implement solid methodologies/procedures for their evaluation. Organize a repository to collect the details on each action, so that future reviews can better assess their impact.

Recommendations for consideration by the project team are included in the reviews of individual deliverables. These should not be considered requirements for corrective actions, but rather, items for possible discussion. These range from expanding engagement with U.S. partners to broaden beyond U.S. AON and SEARCH, as these are largely NSF-funded and do not incorporate many of the operational agency observing programs to focusing more on pan-Arctic ocean circulation (and waves), and consequent impacts of ocean acidification, potential harmful algal blooms and invasive species and species range movement and distribution. The team should also consider the latest results of pilot tests of unmanned aircraft, as well as Sail Drones and wave gliders, and their future incorporation into an Arctic Observing System.

In addition, although the reviewers accept these deliverables without revision, the team should take into consideration for program implementation the recommendations and comments included for D1.3 Engagement Strategy and D7.3 Dissemination Plan.

2. Objectives and Workplan

| Is the progress reported in line with objectives and work plan as specified in the DoA? If there are significant deviations, please comment. | Yes |
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| <p>The project has met the objectives for the first 18 months and is making satisfactory progress in relation to its DoA. The Work Packages show adequate integration given the time period under review. However, more integration should be demonstrated in the coming years, with possible inclusion in future reports of a new section on WP integration. As noted above, stakeholder involvement from the scientific community appears to be strong, but engagement with the private and public sector should be increased.</p> <p>Comments on specific Work Packages follow:</p> <p>WP1 – requirements & strategy for a Pan-Arctic system.</p> <p>The objectives for this reporting period have largely been met. These deliverables have been submitted on time: D1.1 Initial Requirements Report, D1.3 Engagement Strategy, and D1.2 Data Management Plan V1. Extensive scientific coordination, collaboration and outreach has been underway, primarily by the Steering Committee and project leads. These efforts have resulted in new collaborations, new funding, and an increased understanding of INTAROS and the potential for an iAOS. The first INTAROS Stakeholder workshop was organized by EuroGOOS and is a step in developing a Roadmap for building and maintaining sustainable Arctic observing systems, although the actual stakeholder participation was limited to primarily scientific networks. There are major challenges in identifying the primary stakeholders and societal needs for iAOS. It is no easy task, and the landscape is crowded, so the INTAROS team must be very strategic and should work closely with the other H2020 projects in doing so. The cooperation with other H2020 projects such as Blue Action, Applicate, Nunataryuk or initiatives such as the Arctic Research Cluster should lead to concrete activities.</p> <p>The two deliverables: Initial Requirements Report and Data Management Plan V. 1 are high level documents that will provide an overall framework for further development of an iArctic Observing System.</p> <p>D1.2 Data Management Plan which was delivered at M6 needs to be revised in order to reflect the progress made by the project between M6 and M18. Indeed, several points remained open at M6 but now some aspects are clearer, such as the repositories to be used.</p> <p>D1.3 Engagement Strategy is accepted at this time, but reviewer comments need to be taken into consideration as the strategy becomes refined and implemented. In particular, the team needs to be more specific about which stakeholders and decision-makers will be engaged throughout this project, how they will be organized along thematic areas, and how the engagement strategy will feed into the D7.3 Dissemination Plan and D8.4 Exploitation Plan.</p> <p>.</p> <p>The team should be involved and contribute more to SAON and its implementation plan since that is the framework for Arctic Observing adopted by the Arctic Council.</p> <p>WP2 – Exploitation of existing observing systems.</p> <p>A major effort was devoted to designing and implementing an online survey to collect assessment and cataloguing information regarding existing Arctic observing systems, data collections. The survey capitalized on prior data assessment efforts and was organized in 3 teams: ocean and sea ice, atmosphere, land and cryosphere. The teams spent extensive efforts analysing present observing capacities, and these reports will be incredibly valuable to the entire observing community. As a result of this effort, the INTAROS Advisory Panel recommended the assessment include non-consortium institutions and be extended into the next reporting period. Thus far, the response from external groups has been low, but since this will greatly extend the value of the observing system database, greater efforts should be put towards this. It was noted that efforts are underway to ensure the surveys become a public database that is continually updated. The question of which systems are sustainable was done as a “self-assessment.” More specific criteria for that assessment would be helpful.</p> <p>The questionnaires were also used to develop the 3 reports on Exploitation of existing data towards improved data products. The synthesis of these efforts will begin in Month 19. 60% of the resources allocated to WP2 has been used, with the remainder slated to be used in the next period.</p> <p>The deliverables (D2.1, D2.2, D2.4, D2.5, D2.7 and D2.8) represent a good start for a long-term effort. The reviewers have included additional suggestions for improvement. These comments should be taken into account for the next deliverables to be submitted, especially D2.10 and D2.11. In order not to delay the work, the reviewers are not requesting the revision of the deliverables. However, if the partners would like to improve the content of some submitted deliverables, the deliverables can be re-opened.</p> <p>The Arctic Map project should be promoted as a positive aspect of the work being done by INTAROS and should be presented as a complementary project.</p> <p>WP3 – Enhancement of multidisciplinary in situ systems.</p> <p>The objectives were to develop and integrate autonomous & robust in situ systems for year-round measurements of key variables; deploy new sensors and in situ platforms in selected sites & extend existing infrastructures w/ multi-disciplinary measurements; plan & order new sensors & platforms to be deployed in 2018 for atmospheric,</p> | |

terrestrial and ocean/sea ice field work, and plan & prepare for field work campaigns starting in 2018. The results of these planning efforts are included in 5 Technical Development and System design reports for Greenland, North of Svalbard, Fram Strait, ocean & sea ice, and atmosphere & land. Planning and testing all appear to be on track. The deliverables (D3.1, D3.2, D3.3, D3.4 and D3.5) are all accepted, with some suggestions for future consideration as the projects progress, and within future “implementation” deliverables. It was noted that ideally, identification of WP 3 activities would have occurred following the final results of the WP2 surveys and gap analysis. However, since the 5-year time frame of the project precluded this and since a number of gaps were already identified, the team chose to focus on these and add value through this project.

For the work to come, please consider Intellectual Property Rights (IPR) issues.

WP4 – Enhance community based observing systems.

The team’s work toward attaining the overall objective of this package is proceeding largely as planned. Two workshops were organized and held to raise awareness on challenges and best practices (Alaska and Canada) with reports available on the INTAROS website. However, as the project team revises its website to be more useful to non-INTAROS users, these reports and other information should have more visibility. Two deliverables were developed and submitted on time: D4.1 “Community based monitoring programs in the Arctic: Capabilities, good practices and challenges” and D4.2 “Library for cross-fertilizing knowledge”, which describes the content of a web-based library of manuals and summaries of “what worked, what didn’t work, and why.” Access to the programs’ manuals and summaries should be provided on the INTAROS website. Planning and discussions have occurred for the 2 pilot CB observing projects in Svalbard and Greenland. The deliverables provide a valuable addition to the field of Arctic community-based monitoring. The goal is to keep updating D4.1 and through the Arctic Community Based Monitoring Atlas – both commendable.

We understand that a revised version of D4.1 is already available, so we propose to reject this deliverable so that the project can upload the new version.

On community based monitoring, the project should liaise with the other Blue Growth projects such as Nunataryuk, which has a set of activities in this field, as well as with the Arctic Research Projects Cluster, which has identified this field as a cross-cutting one.

The video which has been displayed is very interesting, but could be improved with the help of a communication specialist.

WP5 – Data integration & management.

One of the goals of iAOS is to provide seamless access to observations and derived parameters and products, more as a “federation” of data systems, than a single source. The first version of the requirements and architecture design was submitted as deliverable D5.1. Input were generated in preparation for the next release, which is due in November 2019. Work was also done for the Deliverable D5.2 “iAOS Platform and Tools” which is due in November 2018.

Work has also been done to provide a solid link between the observing systems and data identified in the observing assessments in WP2 and selecting “showcases” to be integrated into the iAOS to show the value of their use to INTAROS partners. Existing data repositories are being assessed for their technical readiness and maturity and potential for online integration into iAOS. Making available use of Cloud Platform tools and services will be of great value to INTAROS partners and should be encouraged. However, more extensive training will be required, and additional resources to do so will be needed. Planning is underway with WP6 teams so that their needs for data and processing services can be accommodated. Deliverable 5.1 is accepted. A stronger integration should be developed between WP5 and WP1 in order to demonstrate to not-INTAROS users and stakeholders the usefulness of developed services and data sharing and integration agreements.

INTAROS should develop cooperation with NEXT GEOSS where Terra Due is also participating and given that NEXT GEOSS has an ARCTIC pilot case.

Cooperation with the Polar TEP from ESA and with the COPERNICUS DIAS should be translated into concrete activities.

WP6 – Application of iAOS towards stakeholders. The main activities start in month 24, and there are no activities or deliverables to review in this period, although planning has been started under WP1 and WP2.

WP7 – Dissemination & outreach.

The main objective is to disseminate project results to raise awareness of Arctic challenges and to improve the understanding by key stakeholder and user communities of the state of the Arctic environment and processes. Another aim is to build capacity in using the new products and services developed under INTAROS. The team has developed a project visual identity and website, print materials, education materials, and dissemination plans. The program has been disseminated in numerous meetings and workshops, especially with the EU’s Arctic Cluster, and at the June 2018 Arctic Observing Summit. Student exchanges were planned for summer 2018. Developing climate change teaching packages for high school students and teachers was delayed to around M26 due to the resignation of the main high school contact, and an original start date that was premature. Experience-exchange workshops on community-based observing have been held in preparation for upcoming work in Svalbard and Greenland.

The project has benefitted greatly from strong cooperation with other EU dedicated initiatives (EDU-Arctic project for example) and cooperation with EU-Polarnet and Arctic Cluster, although that could be reinforced. The project

team needs to be clearer about the target audiences for the dissemination plan and engagement strategy. The target group such as the “decision-makers” are too broad. The measures to reach them should be tailor made. This needs to be clarified.

The work on early career scientists should be coordinated with what is being developed in AWI and in the Nunataryuk project.

The excellent presentations which have been prepared for the review meeting could be used to communicate on the progress of the project during this first 18 months.

WP8 – Project management.

All reports and deliverables have been submitted on time. The organizational structure is in place which includes the General Assembly, Steering Committee and Executive Board, and Advisory Panel. The Terms of References for the AP D8.3 appear to be for the first iteration of what was anticipated to be 2 advisory panels and needs to be revised to reference a single panel and to justify why this choice has been made. The terms of reference could also benefit from more detail on the makeup of the panel and the expectations for its advice. Their recommendations should be shared with the project adviser and the reviewers. D8.4 is very general and should be updated, incorporating more specific about stakeholder groups and their involvement.

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| Are the objectives of the project still scientifically and /or technologically relevant? | Yes |
| <p>The project continues to be scientifically relevant and has the potential to provide technological breakthroughs. However, the Arctic is warming even more rapidly than originally envisioned when this proposal was first submitted, with sea ice diminishing more rapidly at that time and the Arctic ocean warming more extensively. Therefore, the team needs to build into a future pan-Arctic Observing System the ability to continually assess and re-assess the changing Arctic environment, potential changes in stakeholder needs, and technological advancements. The team should consider how to collaborate with other programs that are responding to these changes. This will ensure that the scientific and technological targets planned by INTAROS will continue to be achievable within the time of the project.</p> <p>The very important event POLAR2018 event in Davos in June 2018, jointly organized by IASC and SCAR, in particular the Arctic Observing Summit meeting, deal with the problem of how to develop a sustainable observing system beneficial for society and sustainable development of Arctic region. The planned second Arctic Science Ministerial in Berlin and the Arctic Forum planned one day before, clearly demonstrate that the challenges facing the Arctic and polar regions are at the top of the political agendas of many countries.</p> | |
| Are the critical implementation risks and mitigation actions described in the DoA still relevant? | Yes |
| <p>At this point in the project, the biggest risks identified in the DoA were lack of interest among relevant stakeholders and the large degree of interdependency between WPs. They were both deemed low. There appears to be significant interest in the potential outcomes of the INTAROS project, although the team needs to work to ensure that stakeholder interests are actually addressed. The project management team seems to be effectively managing coordination among the various WPs.</p> | |
| Have the pilots/case studies started to showcase innovative results as described in the DoA? | Not applicable |
| <p>Too early in the project to assess any results.</p> | |
| Have the ethics related deliverables and/or requirements due for the current period been adequately addressed and approved? | Partially |
| <p>The Gender and Diversity Action plan has been submitted and implementation is underway. The team reports that all activities undertaken thus far have applied the ethical standards and guidelines of H2020 and the ethical principles and relevant legislation of the local country in which the activities were carried out. The team is also expected to explicitly refer to the ethic review report which has been sent on 18 June 2018 and to report on the following points:</p> <ul style="list-style-type: none"> - Confirmation is needed that local permissions to conduct the field piloting of community-based observing approaches in Svalbard (Norway) and Disco Bay (Greenland) have been obtained and are kept on file. - Confirmation is needed that ethics approvals for the conduct of the field piloting of community-based observing approaches from relevant ethics committees have been obtained and are kept on file. | |

- Insufficient information has been provided with regards to procedures for storage, protection, retention and destruction of personal data collected in the project in connection to the field piloting of community-based observing approaches.
- More detailed information is needed with regards to recruitment procedures and specifically whether personal data collected previously outside of the project would be used to identify and recruit participants.
- Confirmation is needed that all data used for this project are publicly available. If data are not publicly available, confirmation is needed that all proper authorizations to access and use the data have been obtained.

Have the comments and recommendations from previous assessments been taken into account?

Not applicable

This is the first review.

3. Impact

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| Does the work carried out contribute to the expected impacts detailed in the DoA? | Yes |
| <p>The major impacts to date have been increased collaborations with other programs/projects (Japanese ArCS program, SAON Board and committees, IPCC, Chinese DBAR HiMAC program) and funding for new projects (CAATEX project and planning for an Arctic GOOS, UAK project funded by Research Council of Norway). The survey of existing observing systems is a substantial contribution to SAON and will be helpful in developing an integrated Arctic Observing System. Some decision-makers are becoming aware of INTAROS and the potential use in policy development, but more strategic targeting of specific decision makers needs to occur in order to increase this impact.</p> | |
| Does the work carried out follow the plan detailed in the DoA to enhance innovation capacity, create new markets opportunities, strengthen competitiveness and growth of companies, address issues related to climate change or the environment, address industrial and/or societal needs at regional level or bring other important benefits for society? Give information on the relevant innovation activities carried out (prototypes, testing activities, standards, clinical trials) and/or new product, service, reference materials, process or method (to be) launched to the market, if any. | Not applicable |
| <p>It is too early to assess the innovation activities at this stage of the project, especially regarding new market opportunities and private sector competitiveness. During the first 18 months several technological activities were developed so that the experimental and testing phase in the field could begin in summer 2018. The project does have the potential to respond to private sector/industry and societal needs, but a more strategic targeting of these stakeholders would be beneficial.</p> | |
| Does the work carried out contribute towards European policy objectives and strategies and have an impact on policy making? | Partially |
| <p>Yes, the work carried out thus far is contributing towards European policy objectives and strategies, especially given that Innovation, Sustainability and Preservation represent the three pillars on which the EU strategy for the Arctic has been built since first EU declarations on the Arctic. EU investments in research continues to be significant – and sustained. The EU’s strategies for the Arctic emphasize the need to implement monitoring programs, as well as the necessary coordination infrastructure, to underpin sustainable development in the region. Developing an iAOS is crucial target in this scheme and will enable the EU to play an important role in international actions aiming to promote complete integration of pan-arctic observations. The Berlin Science Ministerial could be a turning point in accelerating such integration.</p> <p>The project’s connections with the SAON committees (Arctic Data and Observations), the Arctic Council working groups and committees, and the IPCC are commendable. The 3 observing assessment and gap analysis reports should impact future funding policies.</p> | |
| Does (or will) the work carried out have an impact on SMEs? | Not applicable |
| <p>We are not able to fully assess impacts at this stage of the project. However, the deliverables for WP 3 indicate that several SMEs have been involved in the technological developments (NORDECO and TERRADUE) and indicate the increase in their activities after the start of the project, although how much due to INTAROS is hard to ascertain. The project does not envisage launching any prototype on the market, but this could change over the length of the project.</p> | |
| Have the beneficiaries aimed at a gender balance at all levels of personnel assigned to the action? If beneficiaries could not achieve the balanced participation of women and men in their teams despite active recruitment efforts, have the reasons been explained in the periodic report? | Partially |
| <p>Gender balance appears to have been nearly reached at management levels and WP leads. It is difficult to assess gender balance at the individual WP task implementation level, although Section 9 of the periodic report indicates</p> | |

that of the total 109 people listed as involved in the project 77 (70.6%) are men and 31 (29.4%) are female. This reflects the need to improve gender balance within the overall research community.

4. Implementation

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| Has the project been efficiently and effectively managed? | Yes |
| <p>From a review of the report and the deliverables, the project seems to have been effectively managed to date. All deliverables were submitted on time. The project overall is under budget. The project management tool EMDESK chosen and implemented by INTAROS appears to efficiently secure operational management. It would be helpful to identify the lead authors, co-authors and internal/external reviewers of each deliverable as it is submitted. Overall scientific management/coordination could be improved, especially in terms of ensuring stakeholder engagement, and responsiveness of development of an iAOS to societal needs.</p> | |
| Is the management of the project in line with the obligations of beneficiaries (including ethics and security requirements, risk and innovation management if applicable)? | Yes |
| <p>Yes. Management of the project was able to produce work products without deviation from the time schedule and able to submit on time all expected deliverables. This is a remarkable accomplishment from a management perspective.</p> | |
| Is the contribution of each beneficiary in line with the work committed in the DoA? (applicable only to multibeneficiary projects) | Yes |
| <p>There have been some minor adjustments between a few of the beneficiaries, but nothing major, and nothing that has compromised project deliverables and milestones. This is to be expected with a project of this nature with so many partners.</p> | |
| Have the beneficiaries disseminated project results (foreground) in scientific publications as planned in the DoA, including the deposition of publications in open access repositories? Has the dissemination plan been updated? Do they include a reference to EU funding? | Partially |
| <p>33 publications (26 on journals, 3 book chapters) are listed in sub-section 6.1 of first periodic report. The report states that all listed publication have access through Green Open Access. The publications should acknowledge the EU funding. Not doing so can lead to a grant reduction.</p> | |
| Have the beneficiaries disseminated and communicated project activities and results by other means than scientific publications (social media, press-release, the project web site, video/film...) as planned in the DoA? Do they include a reference to EU funding? | Yes |
| <p>The primary means of dissemination and communication has been about the overall project through the project web site, posters at a variety of scientific conferences and meetings, dissemination of project brochures, etc. All beneficiaries appear to be making contributions to this effort. Project materials reflect EU funding. The project should be reminded that as specified in the EU Grant article 29.4 and 38.1.2, they should use the EU emblem and acknowledgement of the EU funding. The acknowledgement of the EU funding should also be done in the publications; not doing so might have a financial impact. We recommend developing future parameters and methodology for better monitoring/evaluating the impacts of these efforts. The project could benefit from additional expertise in the field of dissemination and communication.</p> | |
| Has the plan for exploitation of results, in particular as regards intellectual property rights, been appropriately planned and executed, as described in the DoA? | Not applicable |
| <p>An Exploitation Plan has been developed and presented in deliverable D8.4, but it has yet to be implemented. It reflects two main efforts: 1) securing exploitable results though the work in different WPs and 2) developing the stakeholder involvement process. Given our recommendation to greatly increase/revamp the stakeholder engagement process, we recommend that the Exploitation Plan be revised to reflect this.</p> | |
| Has the dissemination and exploitation plan been appropriately executed and updated? Give details if an update of the D&E plan is needed. | Partially |

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| See above, regarding exploitation plan, which we recommend be revised at this time. | |
| Has the Data Management Plan (DMP) been appropriately drafted and, if applicable, executed? Give details if an update of the DMP is needed. | Partially |
| Version 1 of the data management plan has been developed and submitted as deliverable D1.2. Planning is underway for the update but has not yet occurred since the due date is later. However, since much work has already been done to the plan and since it is envisioned as a “living document”, we recommend revising it as soon as possible. | |
| Have the proposed institutional changes been appropriately promoted? | Not applicable |
| Not applicable. | |

5. Resources

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| Were the resources used as described in the DoA and were they necessary to achieve its objectives? If there are deviations from planned budget, have they been satisfactorily explained? Have they been used in a manner consistent with the principle of sound financial management, in particular regarding economy, efficiency and effectiveness? | Yes |
| <p>Figure 13 of the first period report (page 81) provides a clear picture of all deviations with an explanation page 86. The main difference in planned versus actual resources is that WP1 spent more PMs than planned for the period because of the increase in coordination and collaboration activities. Tasks 2.1 and 2.2 were completed, but many of the assessed systems were not able to provide data into the iAOS, and thus resources have been transferred to Task 2.3. Overall, the project is a bit underspent due to delays in employment of personnel and purchase of some equipment, apparently with no effect on progress.</p> | |

Annex 1 - Expert's opinion on deliverables

| Del. no. | Deliverable name | Status | Comments |
|----------|-----------------------------|----------------------|---|
| D1.1 | Initial requirements report | Accepted | <p>This is a very high-level requirements report and depends largely on use of the design concept outlined in the “Framework for Ocean Observations” (UNESCO 2012), focusing on essential variables for each of the thematic areas, regardless of the observing platform. This has resulted in a report that is primarily scientific and appears to be a good start.</p> <p>However, the ambitious goal of the report is also to define the requirements based on identifying the major societal drivers of a sustained observing system, driven by a broader set of issues affecting the region. This has yet to be done.</p> <p>Stakeholder involvement was envisaged in the work plan through a first workshop (task 1.2). Unfortunately, participation in that workshop was quite limited, and mostly reflected the scientific community. In addition, the two advisory panels do not appear to have been involved, and subsequently, the two have been merged into one, with limited participation.</p> <p>Looking to the target of a revised requirement report (D1.9 due month 57), we would ask the team to consider the following observations/recommendations:</p> <ol style="list-style-type: none"> 1) Provide better documentation/references for sources of background information so the community can better assess the community consensus for particular requirements. 2) Make a deeper analysis of societal demands in the Arctic. The starting point could be the GEO societal benefit areas and UN sustainable development goals, as well as the results of AOS 2018. 3) Extend stakeholder participation in developing the revised requirements. In organizing the second and third planned workshops, the team should revisit ways to advertise the workshops and actively work to assure participation of society representatives. The project should take advantage of work developed by EU-polarnet and the Arctic cluster in identifying stakeholder categories and identifying useful contacts for them. |
| D1.2 | Data management plan V1 | Request for revision | <p>This is an appropriate high-level plan for addressing data management of new datasets and data products to be developed through INTAROS. It is very clear and well-written and follows the FAIR concepts. A revised version must be more detailed and include training in metadata generation for investigators. The team should not underestimate the time/resources required for this.</p> <p>The first version delivered at M6 left open several questions which the consortium is now able to answer. It has been agreed that the data management plan can therefore be improved with the new information now available at this stage of the project.</p> |
| D1.3 | Engagement strategy | Accepted | <p>This is a very preliminary, high level strategy. There are many entities and organizations not included here, especially from Russia and Alaska. We would like to see more emphasis on engagement with actual decision makers, as well as with the private sector and industry. As previously indicated, we recommend the project team prepare and submit in the next months a version 2 which would be more specific about the target stakeholders and decision-makers to be engaged throughout this project, and how they will be organized along the thematic areas.</p> <p>The Engagement Strategy should be well coordinated with the Dissemination Plan. All of these comments should be used to improve the Dissemination Plan.</p> |

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| D2.1 | Report on present observing capacities and gaps: ocean and sea ice | Accepted | <p>The initial draft report represents a very impressive amount of work and a lot of interesting results and information but is based exclusively on an assessment of consortium partners' capacities. The survey is now open to external partners' contributions, which will only increase the value of this assessment. The documentation included in this assessment is incredibly valuable – and should be promoted for use in other regions for planning and prioritization of funding observing assets.</p> <p>The reviewers offer these suggestions for consideration by the project team:</p> <ul style="list-style-type: none"> • Focus in this effort is on deep ocean, and not nearshore coastal regions, which are of more interest to more local/regional stakeholders and end users. Focus is also on sea ice and ocean variables, not on biological variables. Does not include waves, which is an increasingly important ocean variable as sea ice retreats. Also need to include toxic algae that lead to Harmful Algal Blooms. Need to include potential use of drones (aerial and Saildrones), wave gliders, etc. • What does this assessment tell us? The team should be assertive in soliciting additional input from external partners. Once that information is included, an overall assessment of key gaps needs to occur. The challenge will be in developing protocols for assessing which investments will provide the greatest long term value. • Should develop better explanation of the methodology for what gets included, and what becomes a gap. How are these assessed? • Pagination of the report is not well structured and does not help the reader. Legends are absent. • Should more clearly tie together assessment results and recommendations. • Should make a stronger connection with D1.1 the Requirements report. |
| D2.2 | Report on exploitation of existing data: ocean and sea ice | Accepted | <p>The deliverable presents in a compact but exhaustive way work developed for marine domain in the frame of task 2.2. Text is well written and consistent. The document presents a wide spectrum of reprocessed datasets as well as a few new, high -level products obtained from existing data. Most of the reprocessing aims to harmonize data series and sometimes ameliorate quality by introducing QA/QC procedures. In general procedures would be applied to make datasets more compliant with the general principles listed in the Data Management Plan (D1.2). This assumes that these will then be easily included in the IT infrastructures developed in WP5 and be ready to be used for examples and user cases in WP6. Each dataset is however treated independently. How all the protocols are harmonized, metadata standardized, and data incorporated into the processing chain and tools should be presented in deliverable D2.3.</p> <p>There continues to be ambiguity on which datasets of those described will become part of iAOS. No reference is made to the initial requirements of D1.1, nor is documentation of why each dataset should be sustained as part of an iAOS. This will become a crucial step in the last part of the project, with the results of WP6 becoming very important.</p> <p>Other observations: There is a huge amount of acoustic data being collected across the Arctic with little emphasis to date on how to synthesize, integrate and archive these data sets for future use.</p> <p>Also, have you considered incorporated of ocean acidification parameters into Global Ocean Acidification Observing Network's data portal?</p> <p>Please take these comments under consideration for future work.</p> |
| D2.4 | Report on present observing capacities: atmosphere | Accepted | <p>The initial draft is based on an assessment of consortium partners' capacities. It is now open to external partners' contributions, which will only increase the value of this assessment. The documentation included in this assessment is</p> |

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| | | | <p>incredibly valuable – and should be promoted for use in other regions for planning and prioritization of funding observing assets.</p> <p>The methodology applied is in large part the same used in D2.1 for ocean and sea-ice. However, in this deliverable OSCAR requirements are also used. In addition, a choice is made with respect to spatial and temporal coverage of observing systems. A broader analysis of survey results is provided in this report that were not included in D2.1 (such as the translation from 9 TRL levels to 6 maturity levels of technology).</p> <p>Recommendations /observations to be considered for strengthening this report:</p> <ul style="list-style-type: none"> - Do not rely on requirements recommended by a single (or two or three) researcher since that may reflect only an individual opinion and point of view (even if the requirement is still a sound one). Recommendations provided as individual opinions are really unusable. Try to base requirements on a broader sense of community. - For next steps, try to help the reader by taking better care of editing, in particular by harmonizing and standardizing tables. - Report on comments/recommendation of the advisory board as well as stakeholder panel(s). <p>Please take into account these comments for future work.</p> |
| D2.5 | Report on exploitation of existing data: atmosphere | Accepted | <p>This deliverable is quite short, presenting three datasets exploited to some extent by a couple of partners. Work to increase interoperability and apply the recommendations of D1.2 should be presented. with more details, together with recommendations and/or future work.</p> <p>Black Carbon is a high priority of the current Finnish chair of Arctic Council. Establishing pan-Arctic observing system for black carbon should gain traction in the coming year.</p> |
| D2.7 | Report on present observing capacities: land-cryosphere | Accepted | <p>We appreciate the recognition of gaps in permafrost (especially in discontinuous permafrost zones), soil carbon, and river discharge, as well as the recommendation to include more cover types under land cover (shrubs, mosses, grasses/ sedges).</p> |
| D2.8 | Report on exploitation of existing data: land-cryosphere | Accepted | <p>The deliverable presents in a compact but exhaustive way, work developed for land-cryosphere domains in the frame of task 2.2. Text is well written and consistent. The document represents mainly new high-level products obtained from existing datasets. As noted under deliverable 2.5, attention in this report is devoted to illustrating scientific motivations and basis for the work, as well analysis procedures, rather than focusing on increasing interoperability and applying the recommendations of the Data Management Plan in D1.2. Again, the report does not include any final section summarizing results through recommendations and/or indicating next steps.</p> <p>Please take into account these comments for future work.</p> |
| D3.1 | Tech development and syst design: Greenland | Accepted | <p>This document describes the technical development and system design phase of INTAROS WP3 (Task 3.1) for the Coastal Greenland reference site, which is identified as a key location for freshwater output from the Greenland ice sheet to the ocean.</p> <p>The majority of the actions reported here consist of improvements of monitoring system parameter coverage by adding existing sensors already available. A few actions report on actual technical improvement of sensors, like the VIRL ice-penetrating radar system of UPM, and technological development of GEUS for PROMICE network. Activities developed sometimes can produce little improvements, so that is under discussion if they have the highest priority.</p> |

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| | | | One reviewer notes that use of GNSS GPS devices is increasing. AOOS is piloting with US National Weather Service 2 projects with UNAVCO and ASTRA LLC for use in measuring ocean water levels from land. Recommend sharing of results during these projects. |
| D3.2 | Tech development and syst design: North Svalbard | Accepted | This document describes a design and integration of the INTAROS moored multidisciplinary observing system to be deployed during the first INTAROS field season north of Svalbard along 22°E. The INTAROS moored array builds on and significantly extends the existing infrastructure of the A-TWAIN oceanographic moorings. The number of moorings that will be installed, where and when, should be more clearly summarized. The Alaska reviewer recommends connecting with Dr. Seth Danielson, lead PI of Chukchi Ecosystem Observatory (https://www.uaf.edu/cfos/research/projects/ne-chukchi-sea-moored-eco/), for any lessons learned from his experiences in implementing ecosystem moorings. |
| D3.3 | Tech development and syst design: Fram Strait | Accepted | This document describes the progress of work anticipated to be carried out in INTAROS Task 3.3. The report is quite short, presenting as technological development only the arcFORCE activity. Limitations of existing pH sensors should be addressed and how new additions will respond to these. |
| D3.4 | Tech development and syst design: Ocean-sea ice | Accepted | The report is well written and edited, and appears adequate at this time. It describes autonomous Lagrangian components of the Arctic observing system for ocean and sea ice measurements that will be implemented under INTAROS. Instruments and platforms described in D3.4 drift freely on the sea ice or in the water column (ice tethered platforms, ice buoys and floats) or move along pre-programmed tracks (gliders). An autonomous sensor package (FerryBox) and drone-based sensors are used to collect observations from the ships of opportunity. All of these components are distributed and fairly independent of each other. But there is significant technological development proposed and the parameters are of great importance for the central arctic ocean observing system. |
| D3.5 | Tech development and syst design: atmosphere-land | Accepted | This document describes the current state of progress in INTAROS WP3, Task 3.5, focused on demonstrating the opportunities that arise from the use of new technology to fill spatial, temporal and methodological gaps in existing atmospheric and terrestrial observation networks in the Arctic. The document presents a wide variety of applications, and the technological content presented is of significant importance. Some activities (for example that of GFZ) would be better developed for task 2.2 and deliverable D2.5. |
| D4.1 | Survey of existing community-based observing programmes | Request for revision | The report presents an excellent review of the capabilities, good practices, opportunities and barriers of community-based environment monitoring programs in the Arctic, with a focus on decision-making for resource management in the key economic sectors of the Arctic. It is an extremely valuable achievement of INTAROS. The structure of the report is very clear and complete and is based on a large but still reasonable number of questions (50). It is very robust and suitable for future work aiming to update information by mainly enlarging the sample. The large starting base of CBMs, 170, secured a selection of the most relevant initiatives and also a good percentage of answers 30 on 45 (67%) to the questionnaire. In addition to the questionnaire, four workshops were organized in Canada, Alaska, Greenland and Russia. Some reports of the workshop achievements can be found on the INTAROS web page and are very informative. The answers provided the information necessary to perform an assessment through |

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| | | | an exhaustive analysis performed using standard statistical methods in section 2. At the same time, answers as well as information collected during workshop enabled the authors to deeply analyse many aspects related to CBM programs, from establishment to ensuring the quality of knowledge products, to documenting best practices as well as faced challenges. During the review meeting we were told that an updated version is ready to be submitted, therefore we are requesting revision of this deliverable. |
| D4.2 | Library with tools for cross-fertilizing knowledge | Accepted | As reported in the introduction, the report describes the contents of a web-based library of 'good practice' manuals in community based monitoring that could serve as tools for cross-fertilizing indigenous and local knowledge with scientific knowledge in the Arctic. The library was prepared by INTAROS together with the organizers of six CBM programs, yet it was not available on the INTAROS website as of the time of this review. The report describing the 6 CBM programs is well done. However, 5 are Alaska based (2 are joint with Canada), and 1 from Greenland. The report could have been strengthened by including at least 1 or 2 programs from Europe or Russia and assessing any differences/commonalities in their approaches. Under challenges, these challenges should be noted: the importance of local involvement/relationship building, difficulty in finding long-term funding, and low internet speed/bandwidth in many rural areas of the Arctic. |
| D5.1 | IAOS requirements and architectural design V1 | Accepted | This document reflects a clear, comprehensive design of the iAOS platform requirements and architecture, with the goal of integrating multidisciplinary and distributed data repositories and providing a set of tools for data analysis, transformation and visualization. The topics are treated with the necessary detail. The system will require sophisticated users and heavy internet bandwidth. Future consideration should be given for incorporating small applications for users with less internet bandwidth, and/or use on cell phones in remote areas. The document could benefit from inclusion of discussion about questions related to how IAOS will function as a whole entity in a very broad and complex context (i.e., issue and challenges arising from simultaneous access by a large number of users, huge amount of data repositories, relationship with data infrastructures of other large programs, etc.). |
| D7.1 | Project website | Accepted | Simple. Easy to navigate. Continue work on the INTAROS web page in order to: make it more usable by non-INTAROS users, increase the visibility of the main achieved results, highlight the survey develop in WP2, and attract more survey answers outside the Consortium. |
| D7.2 | Print materials V1 | Accepted | Recommend inclusion of more photos of stakeholders/end users in future materials. |
| D7.3 | Dissemination Plan V1 | Accepted | Appears to be appropriate level of detail at this point in project. The project should continue its close collaboration with other EU-Arctic Cluster projects in terms of dissemination. The next version should be better aligned with the Engagement strategy and take into account the recommendations made for deliverable D1.3. |
| D7.4 | Dissemination material V1 | Accepted | Do any of these materials need to be translated into indigenous languages? What are the templates for social media? |
| D8.1 | Project intranet tool | Accepted | Appears to be accomplishing its purpose. |
| D8.2 | Gender and Diversity Action Plan | Accepted | The EC should be congratulated for its transparent efforts to increase gender & diversity in its programs. But more work needs to be done, especially within individual research projects. |

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| D8.3 | Terms of reference Advisory panels | Request for revision | Although the 2 panels have been merged into 1, there is no revised terms of reference to reflect this nor to justify this choice. The membership and use of this panel is not adequately described. We recommend this deliverable be revised. |
| D8.4 | Exploitation Plan | Request for revision | <p>The list of exploitable results for the most part are “outputs” rather than “outcomes”, except for the results from WP6: Applications of IAOS towards stakeholders.</p> <p>The Exploitation Plan would benefit from an update – identifying clearly who and how the results can be exploited. This plan should guarantee the legacy of the project results after the EU funding. In such a complex project, it is normal that such a plan needs regular updates.</p> <p>According to the plan, “At the end of the project a Strategy for the Intellectual Property exploitation (WP8) will be drafted providing best practices in capturing and assessing the Intellectual Property and providing measures for exploitation after the end of the project.” This should be done earlier in the project, and not wait until its conclusion.</p> |
| D8.5 | Annual finance report - year 1 | Accepted | Details annual expenditures per partner. Expenditures on track. |

Annex 2 - Expert's opinion on milestones

| Miles. no. | Milestone title | Achieved | Comments |
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| MS1 | Firts workshop with partner and stakeholders | Yes | Workshop was held and results documented. More stakeholders could have been included. |
| MS2 | Initial requirement report | Yes | Report developed and delivered on time. |
| MS3 | Assessment and gap analysis of present observing systems | Yes | Very comprehensive assessment & gap analysis conducted. Required more resources than originally planned for, but worthwhile. Initial assessment only for INTAROS partners. Will be even more valuable once external partners are included. |
| MS4 | New sensors and platforms ready for deployment | Yes | According to the technical reports and the Period 1 report, these appear to be ready for deployment in summer 2018 and 2019. No apparent delays or problems. |