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**INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION**
(of UNESCO)

**INFORMATION DOCUMENT**

# DETAILS ON THE RESULTS FROM THE 2023 SURVEY TO GLOBAL OCEAN OBSERVING NETWORKS ON OCEAN OBSERVATIONS IN AREAS UNDER NATIONAL JURISDICTION

Summary. A survey was disseminated to the relevant GOOS global ocean observing networks regarding experiences related to undertaking sustained ocean observing in States' Exclusive Economic Zones (EEZs). The survey was focussed on the issues described in the OONJ Workshop Report (GOOS Report, 246) and descriptions of the specific issues were requested. Sixty-four anonymous responses from relevant networks were received.

Following the Decision EC-55/3.4 (June 2022) an 'IOC GOOS Network Survey' (https://forms.office.com/r/iC4fMXhb3X) with 20 questions was designed by GOOS Team and disseminated to relevant GOOS global ocean observing networks[1] to gain insight into the extent, type and specifics of the issues faced in taking observations in waters under national jurisdiction. The survey was based on the issues identified in the Ocean Observations in areas under National Jurisdiction (OONJ) Workshop Report (GOOS Report, 246). Survey respondents were requested to describe the issues without mention of specific states, parties or institutes, to identify the frequency and type of incident.

GOOS received 64 anonymous responses from the Argo, AniBOS, DBCP drifter, moored buoy and tsunami, GO-SHIP, OceanGliders, OceanSITES, and SOOP networks and 35 of them indicated that the operations had been impacted by issues associated with taking observations in states EEZs in the last five years. The survey received the most positive responses from Argo network, with a total of 21 responses (Fig.1). Argo is also the network that reported the most severe impact from the EEZ issues, with about 76% of the reported operation being impacted (Fig.2).

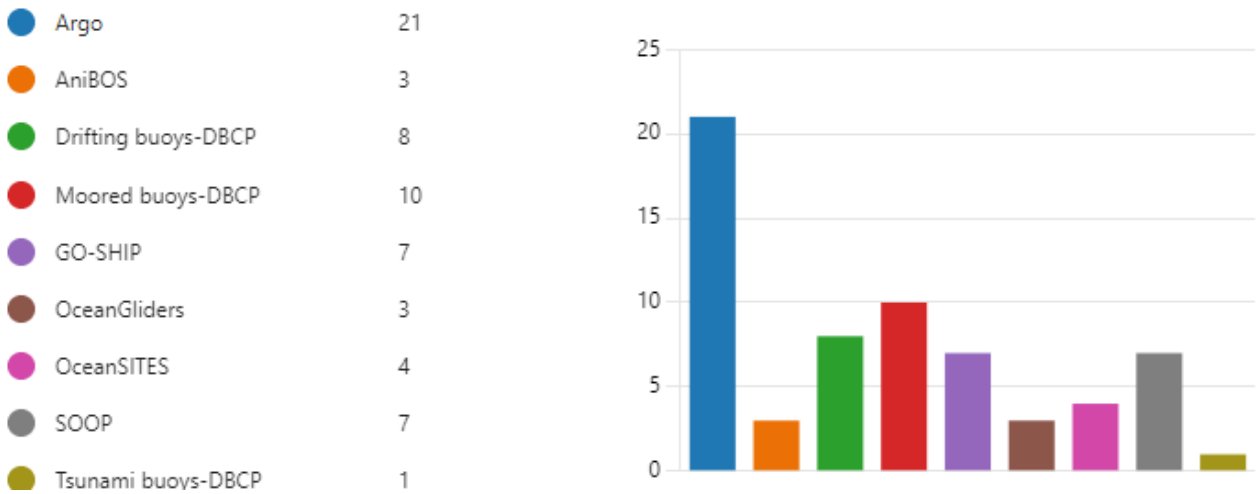


Figure 1. The bar chart of the networks who responded to the survey

[1] Relevant networks include Argo, AniBOS, DBCP drifter, moored buoy and tsunami, GO-SHIP, OceanGliders, OceanSITES, and SOOP networks. Other global networks were not included for the following reasons: VOS already has an international consensus on taking of measurements in national waters through the WMO Resolution 45 (Cg-18) (Ensuring adequate marine meteorological and oceanographic observations and data coverage for the safety of navigation and the protection of life and property in coastal and offshore areas). ASAP undertakes the collection of upper air profile data which is outside of UNCLOS, and GLOSS and HF Radar are implemented on land, and the focus of this survey is on issues in states EEZs.

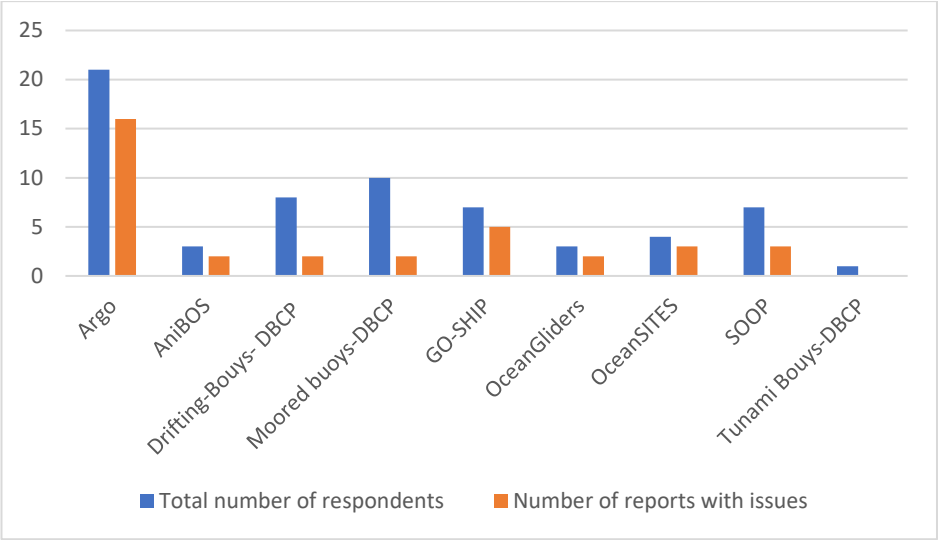


Figure 2. Statistics of the network respondents, in which blue bars are the total numbers of respondent from each network, and orange bars illustrate the number of respondents who reported EEZ issues.

The highest type of impact identified by the respondents was "mission/s halted/stopped/unable to go ahead", which accounts for 39% of the responses. This was followed by "mission/s required extra cost other burden" (25%), and "mission/s suffered delays" (21%) (Fig.3).

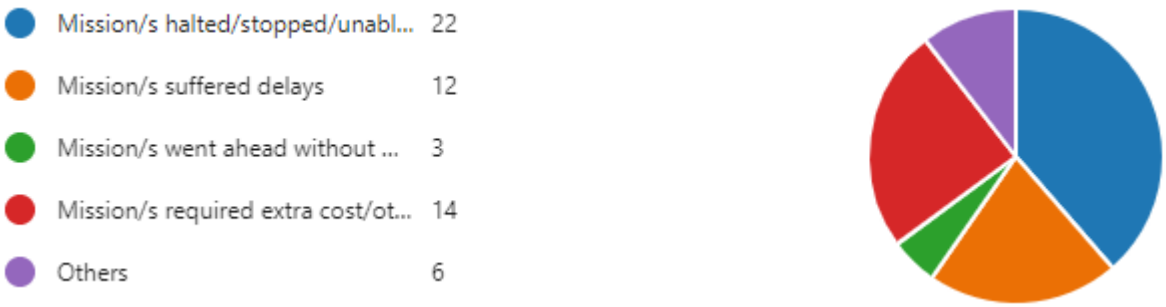


Figure 3. The main type of impact identified by the 35 respondents who reported the issues.

The survey called for detailed information across the 4 broad areas that were identified in the OONJ Workshop:

- Marine scientific research (MSR) process is incompatible with the operational reality of sustained ocean observing
- Advance notice is incompatible with operation of sustained ocean observing for some platforms
- MSR clearance is often impossible to obtain in zones where EEZs are disputed
- No national procedure for MSR clearance - new technology

Twenty seven out of the 35 respondents (76%) indicated that they have experienced the issues of *A) Marine scientific research (MSR) process is incompatible with the operational reality of sustained ocean observing*. Among the example problem identified by the GOOS Report No. 246, the issue of “opportunities to deploy instruments arise at short notice” was identified most frequently (Fig. 4).

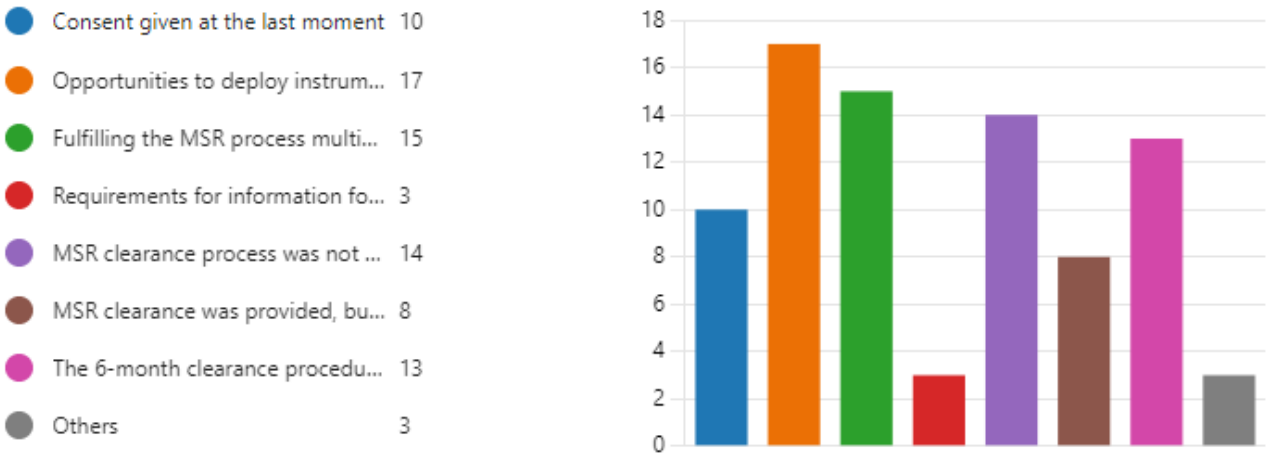


Figure 4. The statistics on the responses to incident(s)/problem(s) under A) identified in the OONJ Workshop

The examples are detailed below in Table 1. Some of the issues noted for Argo include that the coverage in some areas with extensive EEZs coverage is being compromised as the Argo Programme is often unable to easily request MSR clearance, several examples are provided below as to why, some could be tackled with more knowledge regarding process, however it seems that for Argo there are regular opportunities to deploy lost. Taking advantage of transiting cruises is noted several times, as is the issue of using commercial ships, in that transit cruises can be useful, but the MSR clearance procedure is a large burden to deploy one or a few Argo floats, and commercial ships change their routes and the request procedure in this case is not clear. For GO-SHIP clearance can arrive at the last minute, is sometimes not provided, states also request that observers are present which proved impossible with COVID restrictions. OceanSITES reports on a clearance requirement to give ownership of data to the coastal state, such that the data can only be shared with the coastal states' permission, which makes operations untenable.

Table 1. Detailed information on incident(s)/problem(s) under issue A[2]

| # | Network | Response |
|---|---|---|
| **1** | Ocean Gliders | The timelines for operational activities shift much faster than the MSR process. The process is also opaque making it difficult to know how it progresses and with whom to talk. |
| **2** | Argo | 1. A late opportunity to deploy floats on a research cruise with EEZ approval was declined because floats were not included in the clearance. 2. Deployment opportunities on research vessel transit cruises are difficult to obtain as it adds an extra burden to the operator that was not anticipated. |
| **3** | Argo | Nation X Argo programme generally avoids deploying in EEZs due to MSR process/administrative burden. This is sometimes has a detrimental effect on science and operational oceanography, for example there are cases when an EEZ region is of scientific interest and has low Argo float density, but it is too difficult to navigate the MSR process, so we don't try to deploy there |
| **4** | Argo | Cruise plans often shift closer to the cruise and does not allow a change for MSR clearance. This has happened several times and we had to choose to not deploy in those areas. |
| **5** | Argo | BGC Argo float deployment strategy for a BGC program, that is deploying 500 floats globally over 5 years; all data are publicly available in real-time through Argo. These floats are deployed opportunistically from research vessels. We have already passed up on multiple voyages in the western Pacific due to the nearly ubiquitous EEZ coverage. Yet the float data would greatly benefit the Pacific rim states. Currently it is OK for floats to drift into EEZs, but clearance is needed for deployment. |

[2] Note that for all the detailed responses listed in the table of this documents, some light editorial work was undertaken to focusing on the issues faced, by eliminating the names of States, parties or institutes.

| # | Network | Response |
|---|---|---|
| **6** | Argo | The main issues are on the application end. Because we are relying on volunteers for float deployments, asking them to mention Argo floats in their clearance requests is an additional burden that we are putting on them. |
| **7** | Argo | Clearance to deploy float was far too long and complicated to obtain. Change of mission due to scientific constraints was unable to match administrative requirements |
| **8** | Argo | Unless floats are being deployed from a research voyage, we don't even know how to apply for MSR. Institutions operating RVs have personnel who know how to apply of MSR clearance and have clear and strong links to national Departments. For deployments from commercial ships, leased vessels, etc., we do not have access to this expertise and it is not clear who should apply for MSR (which is ultimately a State to State process). This complexity and uncertainty means that we completely avoid deployments into EEZ which require MSR clearance, unless the deployments are part of a marine research voyage which is asking for MSR clearance for a bigger work plan. This means that there are large swaths of ocean where we do not deploy. With Iridium communications, float dispersion is lower, and so more permanent area of 'thin coverage' are becoming apparent around EEZs. This is of major concern and actually degrades ocean and weather/climate services for the nations who's EEZs are not well monitored. |
| **9** | Argo | Deployment opportunities missed because of delayed approval. Required alternative deployment, with additional cost. |
| **10** | Argo | The MSR process adds a significant burden and limits flexibility. Even repeated requests don't go smoothly- some blanket approval mechanism or the creation of precedents which can be referred to would help a lot. Even being a well-known programme (Argo) with local collaborators doesn't seem to streamline the process. |
| **11** | Argo | Information is requested that assumes vessel observation, including the exact date of the deployment, the date of drifting in, and the date of completion of the observation for EEZ clearance. Instead of providing clearance, a fee was requested. |
| **12** | Argo | Argo's mission to obtain global ocean coverage requires continual deployments in EEZs, which account for roughly 30% of the global ocean. Requests for Argo float deployments in EEZs are cumbersome and require substantial advance planning, limiting the ability to take advantage of last-minute deployment opportunities and adding substantially to the logistics of the cruise. Many cruises transit EEZs of multiple nations. EEZ issues affect many cruises, but here one example is highlighted. In 2021, chartered deployment cruise in the South Pacific deployed floats within 9 EEZs. The cruise track was defined to minimize the number of EEZ transits and consequently missed some opportunities to fill gaps in the Argo array. One country's EEZ had to be transited without any deployments due to late changes in ship logistics (COVID related) that did not provide appropriate lead time to receive MSR clearance in nearby EEZs. |
| **13** | Argo | Opportunities to deploy arrive at short notice. One solution would be to request MSR Clearance for every expedition, whether we have floats to deploy or not, but that would be a major overhead |
| **14** | Argo | MSR on research cruises is normally asked for PI with the 6 month leadtime. It is a logistical challenge to plan float deployments early enough to have these included on the PI request. Sometimes requests to the PI to include float deployments and/or more countries in his MSR were creating worries this could be dangering the principal work requested. Later on changes in an already granted or submitted MSR were often deemed to difficult |
| **15** | GO-SHIP | We wanted to carry out the XX-longitude section in the Atlantic Ocean and Nation-X did not give us permission to sample their waters. Nation-Y gave us one day before arriving their waters. |
| **16** | GO-SHIP | Some countries require participation from one or 2 designated nationals. In the context of the covid pandemic this became unfeasible. On other occasions there was not space available on board. Some countries take a long time to provide the clearance, more than 6 months. On disputed territories, two MSR are submitted, one country may grant clearance and the other may not arrive in time. Delays to cruise departure may affect already granted dates and there is not enough time to process a change in dates with the EEZ country. |

| # | Network | Response |
|---|---|---|
| **17** | GO-SHIP | GO-SHIP cruises almost always require clearances. Materials are submitted ahead of deadlines, but permission is frequently not received until just prior to a cruise, or even after the cruise has left and the station track has already been altered unfavorably for sustained observing. |
| **18** | AniBOS | 1. Standard tracking instruments considered spy-ware & not allowed. Collaboration suffered and resulted in no scientific output 2. Our approach to it has been just to keep our heads down, don't make a fuss and don't ask. |
| **19** | OceanSITES | A newly implemented permitting system requires individual researchers to enter a contract directly with the government issuing MSR clearance. It places liability on the PI and stipulates that the government solely retains the rights to the public distribution of all data collected. These conditions prevent researchers from signing, and subsequently from being able to conduct research. |
| **20** | OceanSITES | A certain coastal state now requires researchers to enter legal contracts with them regarding research in their waters. Stipulating, among other things, that a multi million dollar liability be personally placed on the permit requester, and that the data collected belongs to the coastal state, and may only be freely shared IF they allow it. This is untenable for the publicly funded research efforts that Agency XX supports. |

The survey also gives us new incidents/problems identified under A) which are not covered by example problem identified by the GOOS Report, 246. They are listed in Table 2.

Table 2: Other incidents/problems related to the MSR

| # | Network | Response |
|---|---|---|
| **1** | Argo | We generally do not plan to deploy floats in foreign EEZs because our timelines from float availability to deployment are too short and often very uncertain. |
| **2** | Argo | Our national department will not put in requests for clearances for Argo deployments on transits if Argo float deployments are the only thing mentioned in those requests. |
| **3** | Argo | We are hoping to set up regular deployments from commercial shipping companies. However, the EEZ issue is a major hurdle. Commercial ships often change routes quickly, and so float deployment plans must be nimble. It is impossible to get a general 'basin' MSR clearance or one that covers a long period of time, and so dealing with last minute changes is not easy. One crew mistakenly deployed into an EEZ when the vessel changed route. We reached out to the coastal state and apologized, and they were gracious, but it could have been a difficult situation. Thus, the present MSR situation definitely makes broad use of commercial shipping difficult, and definitely results in fewer deployments into EEZs. One example area suffering from the chill on deployments in EEZs is the western coast of South America where large and near permanent coverage gaps are being seen. |
| **4** | Argo | Approval required data embargoed for some time, incompatible with operational uptake. |
| **5** | Argo | The 'other' was the inability to modify plans at short notice. |
| **6** | GO-SHIP | In cases where permission has not been granted, the coast-to-coast observation requirement has been significantly compromised. |
| **7** | OceanSITES | A certain coastal state now requires fees be paid in advance of a permit being issued. These fees are based on the terminal degrees or rank of the individuals participating on the research cruise. |

There are 24 respondents indicated that they had experience the issue of *B) Advance notice is incompatible with operation of sustained ocean observing for some platforms*, accounting for the 68% of the 35 responses. "Opportunistic vessel use, e.g. commercial vessels that can support deployments at short notice, and often the timing of the deployment/transect is not under the direct control of the scientific mission" is the most identified issue (Fig.5).

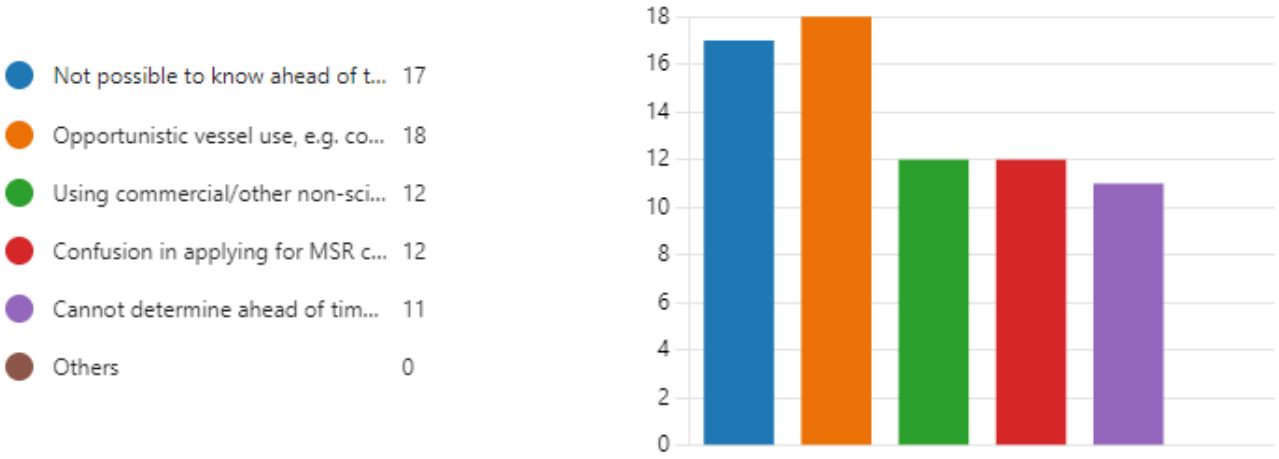


Figure 5. The statistics on the responses to incident(s)/problem(s) under B) identified in the OONJ Workshop

The detailed problems are described in Table 3. SOOP and OceanSITES both highlighted challenges in obtaining research clearance in foreign EEZs due to the time-consuming and uncertain nature of the application process. SOOP also mentions the impact of the COVID-19 pandemic on international cruises and scientific operations. OceanGliders and Argo both discuss difficulties in deploying instruments and floats from uncertain or changing platforms and vessels, as well as challenges in coordinating clearance processes between different organizations and countries. Argo also notes specific challenges related to the classification of Argo deployments as either MSR or operational oceanography, which can limit opportunities for opportunistic deployments.

Overall, these responses suggest that the MSR process can be incompatible with the operational realities of sustained ocean observing, and that there are a variety of practical and bureaucratic challenges that can limit the effectiveness of ocean observing networks in certain regions and contexts.

Table 3. Detailed information on incident(s)/problem(s) under issue B

| # | Network | Response |
|---|---|---|
| **1** | SOOP | These are systemic problems, ongoing and are already described above |
| **2** | SOOP | due to pandemic COVID, international cruises and scientific operations were restricted or delayed, also courtesy visits on board VOS fleet were suspended |
| **3** | OceanSITES | Trying to routinely operate multiple short cruises (1-to-2-day trips) in foreign EEZs, adjacent to the Nation X EEZ, is incompatible with a research clearance process that may take months. Historically we have solved for this by requesting and receiving "blanket" research clearance for these types of cruises. The blanket clearance would typically last 6-12 months. Today, (certain) coastal states are no longer allowing this. Often these short trips are scheduled with one-to-two-day notice based on scientific / weather conditions and vessel availability. It is impossible to accurately predict schedules like this, months in advance. |
| **4** | Ocean Gliders | Deploying instruments from uncertain platforms in open waters and the flying the gliders back into territorial waters. The shifting mission requirements and availability of platforms for deployment change the deployment locations and timing making the MSR application process challenging. |
| **5** | Argo | Deploying nation X floats from a nation Y research vessel in nation Y waters was not allowed. There appeared to be no mechanism in nation X (or Y) to address this. |
| **6** | Argo | Argo has a notification process for some countries. However, these are cumbersome and the majority of the countries requesting this do not have an up to date email, resulting in the emails being sent back. |
| **7** | Argo | See answer to #6[3]. I have simply been unable to plan deployments in a very large region of the western Pacific, and therefore float coverage will be very sparse. |

[3] Q6 is about briefly describe the incident(s)/problem(s) of A) Marine scientific research (MSR) process is incompatible with the operational reality of sustained ocean observing.

| # | Network | Response |
|---|---|---|
| **8** | Argo | Sometimes we learn of opportunities to deploy Argo floats from vessels after clearance requests have already been filed. |
| **9** | Argo | See above. [similar to the answer in Table 1] |
| **10** | Argo | Approvers chose to disallow deployment, because requirements were unclear. |
| **11** | Argo | The issues are well-described in 9). [well described by the example problems identified by the GOOS Report No. 246] |
| **12** | Argo | When the vessel and float ownership organizations differ (e.g., Agency XX and Agency YY), each organization performs the clearance, but each organization has different lines of procedure and significant effort to coordinate the application details. |
| **13** | Argo | One specific issue with the EEZ float deployment process derives from the international dichotomy whether Argo deployments are primarily MSR or primarily operational oceanography. In order to respect both community viewpoints, Nation X Argo does not generate EEZ/MSR clearance requests specifically for Argo deployments. This limits opportunistic use of some RVs and commercial vessels, including charters. Overall this is a substantial problem resulting in added costs and occasional lost deployment opportunities. |
| **14** | Argo | For opportunistic vessels such as sailing boats the lead times are to long to apply for MSR and it remains unclear who should ask for permit (owner of vessel vs. national focal point) and to whom |

The issue *C) MSR clearance is often impossible to obtain in zones where EEZs are disputed* had been indicated by 12 out of the 35 respondents, accounting for 34%. The detailed responses could be found in the Table 4.

The GO-SHIP network faces challenges where they are not allowed to enter the target area due to legal restrictions, which has resulted in choosing alternative locations for observations. Similarly, the Argo network avoids deployments into EEZs unless they have already received MSR clearance, resulting in the skewing of the density of the global Argo array. The lack of clarity around the approval process and poorly defined parameters often lead to missed opportunities for optimal deployments. Disputed EEZs pose significant challenges for observation networks, as deploying floats in such areas involves risks and uncertainties, resulting in abandoned opportunities. The issue is further complicated when the national authority refrains from submitting an application, not recognizing the parties involved in the dispute. GO-SHIP's approach to submit separate requests to both countries claiming the area is a possible workaround, while the Argo network refrains from deploying floats in areas where they do not know how to obtain approval. OceanSITES also faces issues. These incidents demonstrate the challenges and complexities of conducting oceanographic research in regions with disputed EEZs and highlight the need for standardization and simplification of the approval process to facilitate ocean observation in those disputed regions.

Table 4. Detailed information on incident(s)/problem(s) under issue C)

| # | Network | Response |
|---|---|---|
| **1** | GO-SHIP | The ship is not allowed to get int the target area. |
| **2** | GO-SHIP | Historically the long repeated ship-based hydrographic sections have been designed to avoid such regions of EEZ dispute. We have not attempted to receive permission, but instead have chosen a location that is not optimal. |
| **3** | OceanSITES | Eastern Mediterranean Sea |
| **4** | Argo | We avoid deployments into EEZs unless deployments are on RVs who are already asking for MSR clearance. RVs won't work in disputed EEZs so these regions will be avoided even more. |
| **5** | Argo | There are small areas in the Pacific which are disputed. We have refrained from deploying Argo floats in those regions because we do not know how to get approval. |
| **6** | Argo | As a party to a zone with a contested EEZ, we planned to deploy, but could not apply for clearance and could not deploy because of the risks involved. |
| **7** | Argo | Yes, we have had opportunities to deploy floats within regions with disputed EEZ status. Because of the uncertainty, these opportunities were abandoned. |

| # | Network | Response |
|---|---|---|
| **8** | GO-SHIP | The way we have dealt with it in the past is submitting separate (and duplicate) requests for the countries that claim the area, do the work once both countries provide clearance and report data to both countries afterwards. |
| **9** | Argo | If zones are disputed, it is common for our national authority to not even submit an application, because they do not wish to recognize the parties involved in the dispute. |

The issue of *D) No national procedure for MSR clearance - new technology*, was reported by 5 out of the 35 responses, accounting for 14%. The detailed valid information could be found in Table 5.

Table 5. Detailed information on incident(s)/problem(s) under issue D)

| # | Network | Response |
|---|---|---|
| **1** | Argo | Required extensive discussion to convince approvers that Argo floats are not a "marine vehicle". |
| **2** | OceanGliders | Data transmission through Iridium satellites. |

22 out of the 35 respondents provided the number of the missions run in the last 5 years and the % of mission impacted, see Table 6 for details. Here are some potential conclusions that could be drawn:

- Argo floats are the most widely deployed instruments for ocean observation, with multiple missions conducted in the past 5 years, ranging from 5 to over 150. The percentage of impacted missions varies, from 5% to 100%, many reporting 20-50% impacted.
- DBCP have conducted a moderate number of missions (70) with a relatively high percentage of impacted missions (50%).
- The percentage of impacted missions for OceanSITES and OceanGliders is generally lower than for Argo.
- GO-SHIP has conducted a relatively small number of missions (4-23) in the past 5 years, but the percentage of impacted missions is generally high (40-80%).
- AniBOS have conducted a moderate number of missions (35) with low percentages of impacted missions (2.8%).
- SOOP has conducted a small number of missions (3-25), with a relatively low percentage of impacted missions (5-10%).

Table 6. Numbers of mission impacted by incident(s)/problem(s) in the last five years

| # | Network | Number of the missions run in the last 5 years | % of mission impacted |
|---|---|---|---|
| **1** | Argo | We have deployed nearly 250 BGC-Argo floats in the past 5 years. | Perhaps 20% of our floats could have been deployed in EEZs, but are diverted to open ocean locations because of a lack of clearance. |
| **2** | Argo | 5 | 100% |
| **3** | Argo | Probably around 60 | About 30% |
| **4** | Argo | 50 | 20% |
| **5** | Argo | ~50-60 deployment voyages - a mix of RVs and commercial opportunities. Planning for everyone of these involves taking EEZs into consideration. Where floats are deployed is strong impacted by the bounds of the EEZs and | 100% |

| # | Network | Number of the missions run in the last 5 years | % of mission impacted |
|---|---|---|---|
| | | whether coastal states have given deployment concurrence. | |
| **6** | Argo | 10 | 5% |
| **7** | Argo | 10 | 5% |
| **8** | Argo | 13 | 80% |
| **9** | Argo | 150 | 40% |
| **10** | Argo | 23 | In some aspect: 100% |
| **11** | Argo | 30 | 10% |
| **12** | AniBOS | 35 | 2.8% (1/35) |
| **13** | Drifting buoys-DBCP | 70 | 50% |
| **14** | GO-SHIP | 4 | 40% |
| **15** | GO-SHIP | International GO-SHIP: 23. US GO-SHIP: 6 | 5% |
| **16** | GO-SHIP | 5 | 80% |
| **17** | GO-SHIP | For global GO-SHIP between 20 and 30 cruises in the last 5 years. | I don't have the exact number. the past 5 years are also anomalous because of added limitations from covid. It happens enough times that it is a known concern, particularly in certain lines. |
| **18** | OceanGliders | 20 | 25% |
| **19** | OceanSITES | 15 | 20% |
| **20** | OceanSITES | 38 | 58% |
| **21** | SOOP | 3 | 10% |
| **22** | SOOP | 20-25 | 5-7% |

Thirty-four responses were collected regarding the overall impact on the ocean observing network activities due to EEZ issues (see the Table 7 for details). It seems that the common issues across different networks are related to:

1. AniBOS has identified several issues, including operational delays, concerns related to data security and sharing, and the potential jeopardy of future projects, deployments, and observations. While the impact of these issues is currently minimal, the network emphasizes the need to address these challenges to ensure smooth operations and the continuity of their observing efforts.
2. Argo network faces many specific challenges related to EEZ issues. They encounter difficulties deploying floats in certain areas due to clearance problems. The complexity and additional requirements associated with deploying floats in foreign EEZs also pose obstacles. Furthermore, the timing and constraints of the MSR process often result in missed opportunities for deployment. These issues lead to persistent gaps in coverage, affecting the density and effectiveness of the global Argo array. The network highlights the importance of addressing these problems to ensure comprehensive and accurate ocean observations, particularly in coastal and EEZ areas, where human activities and impacts are significant.
3. Drifting buoys-DBCP: Many vessel operators and scientific personnel refuse to deploy drifters within EEZs for fear of retribution, impacting the ability to deploy drifters in coastal waters and utilize ocean currents/features effectively. They also pointed out that mission failures or delays lead to wrong and improper density of observations, as well as shortened instrument work periods.
4. GO-SHIP: Obtaining EEZ permissions is difficult or not allowed in certain regions, leading to the exclusion of crucial boundary current crossings and deletion of sections in GO-SHIP cruises. Marine surveys around neighboring countries are not allowed, preventing coast-to-coast surveys and leaving gaps in repeat sections.
5. OceanGliders: The overall impact is minimal, but it presents a nuisance and challenges in planning and operations. Failed field programs have been encountered due to EEZ issues.

6. OceanSITES: Nations' navy representatives are required on board for mooring deployment/recovery cruises, limiting the number of science crew members. Late-issued permissions make planning difficult, and research activities in EEZs have been stopped, impacting long-term monitoring programs and risking instrument loss. New requirements from coastal states prevent foreign-based research, negatively impacting critical research cruises and shipboard surveys.
7. SOOP: There has been a drastic reduction in SHIP reporting amounts in some regions. Lack of data contribution from critical regions reduces the value of the overall dataset for studying large-scale climatic processes. Difficulties arise in obtaining clearance for ocean observations in EEZs outside of the home country due to the absence of clear guidance or instructions.

In summary, the MSR issue is having a reasonably significant impact on several ocean observing networks, particularly those that rely on vessel-based observations and those that require research activities in EEZs. These responses highlight the difficulties faced, which lead to gaps in global coverage, limitations in data collection, additional cost and uncertainty, and challenges in establishing a comprehensive network.

Table 7. Detailed information on overall impact on ocean observing networks due to EEZ issues

| # | Network | Overall impact |
|---|---|---|
| **1** | AniBOS | Operational delays, data security/sharing concerns, jeopardy of future projects/deployments/observations |
| **2** | AniBOS | Minimal, to now, but as geopolitical tensions rise this will almost certainly change |
| **3** | Argo | We don't deploy floats which would help maintain nominal Argo coverage in many places because of EEZ clearance issues. |
| **4** | Argo | As a general rule, we do not plan to deploy floats in foreign EEZs because of the extra complexity. |
| **5** | Argo | It is a small but noticeable effect. Many of our deployment opportunity vessels operate in international waters, and therefore most of our deployments happen outside of EEZs. |
| **6** | Argo | We often have opportunities last minute and are unable to use them due to the MSR process. |
| **7** | Argo | As BGC Argo becomes global, there will be large regions with very inadequate coverage due to the large regions of contiguous EEZs of multiple states. |
| **8** | Argo | We very frequently forgo deploying Argo floats in other nations EEZs because the requests are too burdensome, the timing for advance notice doesn't work out. As a result, the Argo array has persistent gaps in coverage that we could have otherwise filled. A complete array benefits the entire international community, so it does seem a shame that these gaps persist |
| **9** | Argo | Time consuming and inability to sample certain parts of the ocean |
| **10** | Argo | Avoiding deployments into EEZs (except where concurrence has been given) remains a central consideration in all deployment planning. This is skewing the density of the global Argo array, particularly since floats have short surfaces times and float dispersion is weaker than for the first 10 years of Argo. This means that there is less ocean information near coasts and shelves where human activities and impacts are greatest, and this will detract from our ability to observe, understand, model and predict shelf and coastal processes. In addition, the state of the ocean near land-falling storms will be less well captured in weather and climate models, likely reducing skill in prediction of these extreme events. In a sense, the MSR issue is thinning out our observing power where we actually need it the most. |
| **11** | Argo | Additional approvals required, with poorly defined parameters, often resulting in alternative - simpler - but less optimal - and more expensive opportunities taken instead. |
| **12** | Argo | national Argo floats are most often deployed from research vessels for which PIs have to apply for diplomatic clearance. Logistics are getting more complicated and need long lead times if the PI has to be approached to agree to deploy floats in an EEZ and ask for additional clearances or add floats later on |
| **13** | Argo | The MSR process is time and resource consuming and inflexible. |

| # | Network | Overall impact |
|---|---|---|
| **14** | Argo | The existence of some ocean areas that are avoided for deployments due to a lack of human resources and to avoid diplomatic trouble makes it challenging to establish a genuinely global observation network. |
| **15** | Argo | The main impact is the lack of data in some coastal, EEZ areas. This is a brake to the knowledge of physical and biogeochimical processes in these areas. This has been detailed in the Recommendation n°2 of the deliverable D8.2 for the Euro-Argo RISE project (https://www.euro-argo.eu/content/download/163515/file/D8.2_VF_underEC_review.pdf, submitted, under reviewing process) Recommendation 2: EuroArgo to work with Portugal to find a solution for the persistent gap in the Azores region. The South Mediterranean Sea, East Black Sea are also important targets. |
| **16** | Argo | Overall, the inability to easily deploy in EEZs has been a significant hindrance to the Argo Program's ability to achieve its primary objective of maintaining full global coverage. Argo floats are primarily deployed off vessels of opportunity, and many deployment opportunities are lost due to incompatibility with the timeline and requirements of the current MSR process. |
| **17** | Argo | Some opportunities for sustained observing have been lost |
| **18** | Drifting buoys-DBCP | While it is acceptable, and encouraged by WMO, to deploy drifters throughout the worlds oceans (including EEZs), many vessel operators and scientific personnel refuse to deploy drifters within EEZs for fear of retribution. This "fear of retribution" impacts our ability to deploy drifters in coastal waters and unitize ocean currents/features to maximize spatial coverage (eg upwelling along the western coast of S. America). |
| **19** | Drifting buoys-DBCP | Serious as resulting missions failures or delays lead to wrong and improper density of observations and shorten instruments period of work due to initially not planned natural risks and degradation of power sources |
| **20** | Moored buoys-DBCP | not satisfactory |
| **21** | Moored buoys-DBCP | NTR |
| **22** | GO-SHIP | There are regions where we expect that EEZ permission will be nearly impossible to obtain, and therefore we have designed the international GO-SHIP program to avoid these regions. When newer EEZ issues arise, generally the crucial boundary current crossings are affected, and sometimes have to be deleted, which is catastrophic given that GO-SHIP cruises occur only once every 5 to 10 years. |
| **23** | GO-SHIP | no admission |
| **24** | GO-SHIP | Marine surveys around neighboring countries are always not allowed |
| **25** | GO-SHIP | I could not complete the coast-to-coast survey that is mandatory for GO-SHIP surveys. |
| **26** | GO-SHIP | In some cases it has prevented us from completing the coast-to-coast objectives of GO-SHIP lines. On other cases we have had to leave a gap in our repeat sections. |
| **27** | OceanGliders | Overall impact is minimal. |
| **28** | OceanGliders | At present more of a nuisance because we have partners in each of the countries involved but it makes planning and operations challenging and we have come very close to failed field programs. |
| **29** | OceanSITES | Nations navy representative (observers) are required on board for mooring deployment/recovery cruises and take away berth which in turn limit the number of science crew * often permissions are issued very late before cruise making planning difficult (e.g. berths for observers) |
| **30** | OceanSITES | All research activities in the EEZ have been stopped. This is impacting our long-term monitoring program and creates a risk of instrument loss. |
| **31** | OceanSITES | Due to the new requirements defined by (certain) coastal states to obtain foreign research clearance for work in their waters, NOAA researchers are unable to legally comply/meet these requirements. The result is negatively impacting all publicly funded academic and governmental foreign-based research within said coastal state's jurisdiction, and preventing from critical research cruises / shipboard surveys from taking place. |
| **32** | SOOP | drastic reduction of SHIP reporting amounts |

| # | Network | Overall impact |
|---|---|---|
| **33** | SOOP | Some regions critical to the study have no data to contribute, reducing the value of the overall dataset due to an incomplete picture of large regional and global climatic processes |
| **34** | SOOP | Without clear guidance or step-by-step instructions on how to get clearance (or be denied clearance), it is very difficult to pursue ocean observations in EEZs outside of the home country. |

The respondents also provided their thoughts and recommendations that are pertinent to the issues raised that they would like to bring to our attention. Table 8 presents the detailed information.

Table 8. Detailed responses on thoughts and recommendations that are pertinent to the EEZ issues

| # | Network | Responses |
|---|---|---|
| **1** | **Argo** | We greatly appreciate the IOC Decision IOC/EC-LI/4.8. It is enabling a transformative observing system. Extending similar capabilities to EEZs would be equally transformational. |
| **2** | **Argo** | The best solution for BGC Argo would be a decision by the member states to allow deployments, rather than in filing for deployments for each vessel for multiple countries. In regions where there are multiple contiguous EEZs, perhaps a regional consortium of states could provide deployment access. |
| **3** | **Argo** | I appreciate any efforts to address these issues. |
| **4** | **Argo** | To tackle the aforementioned difficulties, the existing art.247 could be used. OceanObs proposed an implementation of this article at the last General Assembly of the IOC in April 2022, but so far, it has not been implemented. To move forward, it has been recommended to have pilot zones to have bilateral agreements where the MSR clearance would not be needed anymore. This has been detailed in the Recommendation n°3 of the D8.2 Euro-Argo RISE project deliverable (https://www.euro-argo.eu/content/download/163515/file/D8.2_VF_underEC_review.pdf, submitted, under reviewing process): Recommendation 3: Pilot a regional implementation for art. 247 with support from an international organization, and/or its regional offices. (e.g. EuroArgo consolidated deployment planning in a region, which needs coverage improvement, such as in the Caribbean region). In addition, the recommendation n°4 is also important to render more accessible the MSR process. Until now, there is no harmonization among countries, and sometimes, forms are not available online: Recommendation 4: Encourage the harmonization of MSR clearance requests amongst EU members (e.g. standard forms, web-based submissions), shortening the 6-month delay, and use OceanOPS as a tool to facilitate this. |
| **5** | Argo | Indian Argo Programme has plans to deploy the floats outside the EEZ of India. |
| **6** | AniBOS | We appreciate the leadership GOOS OCG is taking to ensure seamless ocean observing |
| **7** | AniBOS | Improved network visibility and communication would likely aid/remedy some of the issues faced |
| **8** | Drifting buoys -DBCP | As an ancillary project aboard many scientific vessels, we're at the mercy of the mission and the primary studies to determine where drifters are deployed. Often times, even when we know about permitting requirements, the lengthy and time-consuming process deters chief scientists from requesting clearance for EEZ deployments. |
| **9** | GO-SHIP | If the survey become the go-ship transect · whether the application becomes easy |
| **10** | GO-SHIP | GO_SHIP very often acts as a platform for deployment of floats such as Argo and other drifters. We often submit our EEZ requests before we know where the floats will be deployed, so we can't include that in our request. This may limit where we are allowed to deploy instruments once underway. |
| **11** | Moored buoys-DBCP | To secure funding or donor support to deploy ocean monitoring devices in our marine areas |
| **12** | Moored buoys-DBCP | Our buoy has been out of service due to parts failure for over three years |

| # | Network | Responses |
|---|---|---|
| **13** | Moored buoys-DBCP | NTR |
| **14** | Moored buoys-DBCP | In my country, Comoros, there is no observation network but there was an observation station, a single moored buoy. Also, this buoy is currently out of service. Your assistance in this area is desired. |
| **15** | Moored buoys-DBCP | the safety of the buoys in open ocean, maintenance is expensive |
| **16** | OceanGliders | Lack of common and uncertain requirements between countries. |
| **17** | OceanSITES | To be clearer regarding questions 16 and 17. In the last 5 years, we have conducted 38 out of 66 planned missions (or 58%). This does not account for mission impacts due to COVID. It only reflects lost missions due to new requirements for research clearance permits from the coastal state; requirements which cannot be legally met by NOAA researchers at this time. |
| **18** | OceanSITES | I understand the survey is intended to collect answers from operators from the different networks, in other words, my answers are not intended to represent the situation of all OceanSITES operations just the one that I carried out |
| **19** | SOOP | NO. Los problemas son de vandalismo por grupos o personas al margen de la Ley. |
| **20** | SOOP | during 2022, Nation XXX Navy Weather Service developed a remote workshop in Nation YYY for GRASP (IOC) and RA II+III (WMO) members, on practical experience exchanges in the implementation of PMOs and VOS recruitment programs |
| **21** | SOOP | Although the SOOP XBT network has been operating in other countries' EEZs for many years, there are no formal agreements between countries in place and at any time, a country could insist the program ceases in their EEZs. A structured agreement for deployment of XBTs in EEZs would be ideal. |

Overall, the feedback received suggests that there are significant challenges associated with taking observations in waters under national jursidiction, and that these challenges can have a significant impact on the operations of the GOOS networks. The results of the survey could be used to inform future efforts to address these challenges and support the GOOS networks to effectively deliver information across climate, weather and hazard warnings, and ocean health areas, for global, regional and local benefit.