

Roadmap for Next-Level Development of the Integrated Global Water Cycle Observations (IGWCO) Community of Practice (CoP)

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Preamble

In 2019, the GEO Integrated Water Cycle Observation Community of Practice (IGWCO CoP) initiated a review of its activities and functions to determine what steps it could take to more effectively address the needs of its constituency. This roadmap is based on the initial IGWCO Review dated 25 July 2019 including the contributions of CoP members and the GEO Secretariat up to 27 February 2020. The conclusions of two teleconferences held 23 August and 5 December 2019 are also reflected in the document. The IGWCO Review and the minutes of the 2019 teleconference calls serve as supporting documents. Inputs from CoP members on the amended review sent to members in January 2020 and received up to mid-March 2020 are also reflected in the present document.

The baseline recommendation of the Review has been to maintain IGWCO-CoP as entity with revised goals and activities while retaining its integrity as a source of expertise on water for GEO. IGWCO also seeks to be recognized for its potential to support the GEO Secretariat through its coordination functions.

Current Mandate of the IGWCO

The GEO IGWCO Community of Practice has its roots in the former Integrated Global Observation Strategy Partnership (IGOS-P) and the community that implemented the IGOS-P water cycle theme. In 2008, this group officially became the Group on Earth Observations (GEO) IGWCO Community of Practice. In the GEO context, it also fosters the development of broader global and regional networks that deal with science and applications issues.

(<http://www.wmo.int/pages/prog/hwrp/chy/chy14/documents/ms/IGWCO.pdf>).

Strategic approach

To give a new thrust to IGWCO, its strategic approach is widened beyond its current activities as outlined below together with associated activities and initiatives. The unique strategic thrust of the IGWCO Community of Practice will enable it to serve as a principal partner in the strategic development of data services within GEO to the water community and facilitate the development of reproducible methods for using Earth Observations to address key policy issues, such as the SDGs, climate change, DRR and urban resilience. In this regard, the revised and adapted GEOSS Water Strategy serves as baseline.

This document provides the scope for IGWCO in its future development whereas actual implementation depends on opportunities, demand for services and resources in terms of cooperating CoP members, finances, and in-kind contributions from cooperating partners and institutions.

The clear and recognized affiliation of IGWCO with GEO is strategically indispensable. Although there is hesitation at present to recognize IGWCO as a GEO Community Activity, this needs to be re-considered through consultations between GEO and IGWCO on the basis of the past years of formal and informal cooperation. Presently, although the GEO strategic plan recognized the needs for CoPs, the work plan makes no mention of the role of CoPs (e.g. CoPs should be visible at http://earthobservations.org/geoss_wp.php).

IGWCO does have a responsibility to fill a broad strategic role, which includes familiarity and engagement with a large number of groups. The possibly best way to achieve an overview of active water groups is to solicit members of the target audience and implementation partners (described below) to report on activities of such groups where IGWCO as an entity would serve as an information-sharing hub. In addition to serving GEO's and the community's needs, relevant shared information could be used in the interest of IGWCO current and emerging activities and in the development of joint projects that could bring benefits to IGWCO and its partners.

Further, IGWCO's unique role is coordination; providing a think tank for new ideas and approaches and promoting ideas, projects and organizations that are moving to deliver on the products that support IGWCO plans (such as the GEOSS Water Strategy) as well as GEO Water Initiatives and Community Activities, IGWCO could also develop

new areas such as climate change support i.e. in the areas of extreme events such as floods and droughts and disaster risk reduction. These activities need close cooperation with implementation partners such as WCRP among others for the aforementioned examples

IGWCO continues to be a best-effort initiative with its main areas of activities geared towards Earth Observations, capacity building and in support of global and regional activities and programs through coordination, networking and provision of specific services. Here, IGWCO seeks for relevant gaps that are not covered by programs and initiatives of the UN Water Family, in particular WMO, UNESCO, UNEP, as well as other programs requiring water cycle observations including GCOS and related research programs such as WCRP-GEWEX.

In the water sector, IGWCO serves as a principal GEO partner through its function as incubator of ideas, programs, (pilot) projects and activities mainly in support of the GEO engagement priorities: Sustainable Development (SDGs), Disaster Risk Reduction and Resilience, and Climate Change. IGWCO also serves in coordination, and networking of water activities and as think tank in water issues related to existing and emerging GEO initiatives and activities and linking such initiatives and activities to other GEO areas where these have strong linkages with the water sector. With regard to GEOGLOWS, IGWCO strives to be complementary to GEOGLOWS and in support of on-going and planned GEOGLOWS activities.

Activities that make IGWCO unique amongst other water related programs and initiatives within GEO and beyond are:

- Providing revisions and updates to the water strategy as part of its function as incubator and in support of the strategic priorities of GEO and also serving generic interests of the IGWCO-CoP
- Fostering implementation of the tasks defined in the water strategy together with partners;
- Development and promotion of the revised GEO Water Strategy adapted to current GEO needs and requirements with recommendations for implementation of activities;
- Development and facilitation of the implementation of the water section as part of the overall GEO-Knowledge Hub,
- Providing support to and cooperation with GEOGLOWS in water cycle activities and areas where GEOGLOWS does not currently have activities,

- Providing a coherent overview of key groups, programs, initiatives, and research projects in the water sector that fall within the interests of GEO.

Through the engagement of its Community of Practice, IGWCO will continue to provide support to GEO and GEOGLOWS in those areas that are not covered by GEOGLOWS projects. This relates especially to coordination activities in the water sector with a large variety of groups, networking, and in its function as a think-tank. In addition, IGWCO will serve as a partner in clearing information for the water activities in GEO and seeks to significantly contribute to building up the water component of the GEO Knowledge Hub and to support GEO's SDG activities through contributions to SDG 6 – Water and other SDGs that have a strong dependency on water, its observational base, science-related issues, capacity building and regional as well as global implementation issues. IGWCO will report to its community, and the GEO Programme Board in consultation with the GEO Secretariat. IGWCO seeks close cooperation and support of GEOGLOWS and any other partners who wish to be stakeholders (e.g., UNESCO).

It is however warned not to overstretch the strategic approach if proposed initiatives cannot be underpinned with engaged CoP members and activities.

Main pillars of IGWCO-CoP

The “pillars” mentioned below reflect the scope of the IGWCO Community and its proven capability to deliver as a whole through its community members and collaborating organizations and scientific programs.

- **Global Water Cycle Observations**

Including methods of observations and facilitation of Application Ready Datasets, (ARD), fostering exchange of data and information, merging terrestrial and space-based observations, facilitation of the development of data and science-based applications. Improving collaboration with GCOS with regard to the definition of observation requirements of water-related Essential Climate Variables, GTN-H operating under auspices of GCOS and WMO as the main contributor of terrestrial water-related observations and CEOS with regard to space-based observations and products. Unless another partner comes forward, IGWCO plans to also

assist in finding a steward for the Community Activity “In-Situ Water”, as GEOGLOWS has indicated that it is not in a position to provide the lead for this activity. Same accounts for GTN-H that will continue to support this Community Activity. However, with its current available resources it is not possible to lead this activity.

- **Regional Activities**

Building on existing Regional GEOs (AmeriGEO, AfriGEO, EuroGEO and AOGEO) as entry points, the IGWCO will help to build a network for capacity building across the globe. IGWCO will assist in developing tailored plans, testbeds and pilot projects using the strategy that was used earlier with the collaborations developed in cooperation with AWCI, AfWCCI and Latin America Capacity Building initiatives. Expanding the regional scope beyond the present scope of GEOGLOWS would be an extended goal, focusing on specific needs of developing countries and countries in transition, building a global community of regional water experts and contributing to a global view of regional approaches to water-related issues in support of the global GEO vision. The development of regional knowledge hubs, geared to specific regional requirements should be envisaged as one solution. Since in particular the Global South lags of required in-situ observations the regional activities should also used to raise awareness for open data policies and should support the world water data centres federated in GTN-H.

- **Capacity Building**

Capacity building at regional (including AmeriGEO, AfriGEO and AOGEO) and global levels, outreach to the science and applications community including through GTN-H and CEOS, renewed cooperation with WCRP and WCRP-GEWEX (as mentioned below), and fostering the development of knowledge bases at regional and global levels in support of the development of the GEO Knowledge Hub. Other capacity building activities can be directed at strengthening observational systems and data services described below.

- **Overarching service functions**

IGWCO-CoP would act and communicate with its collaborators as a facilitator and with a role as coordinator providing oversight over water-

related activities (coordination and oversight meaning keeping abreast of activities, seeking harmonization, etc., not meant as an added hierarchical level). In that way, IGWCO-CoP would serve five main program activities of GEO, namely

- Contribution to the GEO Knowledge Hub (water)
- Supporting implementation aspects (including monitoring) of SDG-6 and water-related subjects concerning other SDGs, such as through active support of the Water – Energy – Food Nexus)
- Consolidation and coordination of overviews of water activities in GEO and harmonization with activities of UN’s Water Family.
- Coordination of GEOSS Water Strategies and policies in support of GEO strategic goals
- Facilitation of the implementation of appropriate recommendations in the GEOSS Water Strategy where appropriate and supported by the GEO Programme Board.

A strategically critical development will be the recognition of IGWCO as an important partner of water-related activities of GEO in close collaboration with the GEO Secretariat and GEOGLOWS. In this manner, IGWCO with its Chairperson and Co-Chair could seek to provide functional tasks to maintain oversight of water-related issues of relevance to GEO. Expanded efficiency can be achieved due to its Community of Practice in support of GEO interests in water and IGWCO specific activities and initiatives.

Requirements

Maintaining IGWCO as an entity and bringing it forward to a new level of overall recognition as outlined above and enhanced working efficiency, needs some basic requirements to be met including:

- Dedicated stewardship of IGWCO with effective communication with the Community of Practice and liaison with cooperation partners with a view to create added value for IGWCO.
- Basic Funding of coordination and communication activities. Although IGWCO has rarely received direct funding of its activities but rather relied on in-kind contributions and some funding from NASA and prior to 2015 by JAXA for coordination, it needs at the least some modest funds for overheads, limited travel and seed-funding of activities on the request of GEO members and the GEO Secretariat.

- IGWCO and the GEO Water initiatives should have access to policy advice and the high level linkages available through GEO to develop links to UN Water including its water quality activities.
- Institutional backstopping and in-kind contributions are necessary to have basic financial needs met including the time necessary to provide stewardship of IGWCO-CoP. Backstopping would also include the use of office space and communication facilities.
- Stable internal coordination and cooperation with GEO is needed because projects, tasks, initiatives, flagships, and community activities may come and go and change their direction with little advance notice being given.
- Formalized cooperation with GEOGLOWS on the basis of mutually agreed areas of priority of GEOGLOWS and mutual benefits.
- Active scouting for mid- and early career co-chairs of IGWCO.

As mentioned above, the formal recognition of IGWCO by GEO is a strategic requirement. It is recognized that there has been a formal process that led to the recognition of IGWCO in the GEO context in 2006. This recognition needs to be renewed and adapted to current development mainstreams of GEO as a whole.

Recognizing the expanded strategic orientation of IGWCO, involves an revision of the main pillars and activity areas and their perceived roles in future, IGWCO needs upgrades and clarifications in the following areas:

- Target audience;
- Funding;
- Implementation partners;
- Capacity building;
- Observations, Data Services and support to GEO Initiatives, Flagships and Community Activities
- Frequency and duration of meetings

Basic amendments are outlined in the following paragraphs.

Target Audience

As a Community of Practice (CoP), the main participants and partners have been those groups and individuals who generated information and products and those who actually used such information and products as

well as those who manage and/or coordinate those activities. In the past, mostly those who generated information and products also were the users. Looking forward, generating a larger target audience will make it necessary to reach out to practitioners and researchers in the realm of water management to make it attractive for them to become more actively involved, thus enlarging the CoP as a whole.

Enlarging the target group will involve providing services to those seeking information and also to attract active partners by demonstrating the benefits of participation and resource investments in terms of time, funding and persons.

To be responsive to information needs of other activities, IGWCO will develop a catalog of IGWCO-related services undertaken by groups and individuals that collaborate with IGWCO and support its interests. This will enhance IGWCO's capability to network information seekers with groups/individuals who can provide the desired information. This activity of IGWCO is linked to the development of the water component of the GEO Knowledge Hub and thus is of strategic importance for the water management community in the future.

IGWCO should focus on specific areas for outreach which target groups that can benefit from an affiliation with IGWCO will be those that IGWCO. Examples are:

- The World Climate Research Program and its water-related activities mainly towards the WCRP Grand Challenges, and applied research such as many projects in GEWEX;
- Community activities such as the EO4WEF (Earth Observations for the Water-Energy-Food Nexus) and the EO4SDGs (Earth observations for SDGs).
- Capacity building in existing and future regional programs where IGWCO is already involved or plans to be, and future activities in other regions.
- Other target audiences including those involved in terrestrial observations as well as space-based observations. These could be accessed through active collaboration with GCOS, GTN-H and CEOS to improve observational requirements and to avoid redundant work.
- Outreach areas of strategic importance including evolving communities around the development of the GEO Knowledge Hub. These groups and individuals are likely to be connected to capacity building, research and digital information management.

Funding

In the past, finding funding for IGWCO and its activities has not been greatly successful with a few exceptions. There are, however, funding opportunities which are summarized below:

- In emerging project proposals or those under advanced development, a specific IGWCO-related project component could be inserted;
- Offering support in projects under development that have areas that coincide with IGWCO competences and interests;
- Development of IGWCO projects that could be of interest for IGWCO-subgroups or in cooperation with GEOGLOWS. However, project-oriented funding should be sought for those areas that are complementary to GEOGLOWS but are not included in the GEOGLOWS portfolio;
- Proposition of new initiatives, especially in strategic areas. This could be done by aligning observations to water, SDGs, and actions to address other public policy activities such as SDGs or climate change;
- Development of funded activities/initiatives facilitating the implementation of recommendations from a revised and updated water strategy;
- Development of proposals to align observations or capacity building to water, SDGs and other public policy activities;
- Acquisition of national funding in activities which are of overall interest of national GEO initiatives such as standardization, quality management of observations, digital information and knowledge management as well as capacity-building activities;
- Support from the GEO-Secretariat in securing water-related funding through national sources. This could be in actual financial resources to allow the implementation of activities as well as in-kind support through *virtual* secondment of staff. In this manner, funding of coordination activities as well as specific workshops/meetings could be supported.

Implementation partners

Subsets of the Target Audience also serve as implementation partners. The membership of IGWCO-CoP has been always floating with a core

group and opportunity- and subject- based contributions by individuals and groups. In the future, the idea of project groups organized in IGWCO subgroups and funded through projects or related sources could expand the CoP's capabilities with a valuable additional group of implementation partners adding to the more traditional partners from the past.

IGWCO will continue to interact with GEOGLOWS, as well as with CEOS, GTN-H and other groups - including regional groups - responsible for responding to Water Strategy recommendations to determine which activities need to engage other groups in order to be fully implemented. An important implementation partner is WCRP, especially GEWEX and its water-related activities including the GEWEX Hydrology activities. Likewise, IGWCO has the potential to contribute to the WCRP Grand Challenges, including the extremes challenge.

New implementation partners are expected to emerge through future IGWCO activities related to support for the implementation of SDGs (especially SDG-6, Water), and possibly the UN-Water driven World Water Development Program, building of the GEO Knowledge Hub, capacity building, data services and research groups around GEWEX and related areas of interest to IGWCO. Other implementation partners can emerge through collaboration in areas such as the Water-Energy-Food Nexus.

Capacity building

Capacity building could again become a potential flagship activity of IGWCO. IGWCO should therefore connect with other GEO capacity building activities, using regional initiatives such as AmeriGEO, AfriGEO and AOGEO as entry points. To some extent this would be a continuation of the strategy that was implemented earlier in cooperation with AWCI, AfWCCI and Latin America Capacity Building that also involved JAXA and the University of Tokyo.

Capacity building tied to the GEO Knowledge Hub is a strategic opportunity for the IGWCO. IGWCO could provide a “water package” or “water interface” for the knowledge Hub by working with various GEO water-related initiatives and Community Activities. This would be done in collaboration with GEOGLOWS that already has linkages with the regional GEOSS projects. For further regional outreach in capacity

building activities, regional developments also need to be tracked. In all capacity building efforts, connection with UNESCO and its IHP-9 program (including related flagships initiatives such as FRIEND-water) as well as with WMO and GCOS would be essential.

Observations, Data Services and support to GEO Initiatives, Flagships and Community activities

Observations and associated data services are critical for IGWCO (sic: Integrated Global Water Cycle Observations!). Lead partners are GTN-H (and GRDC in particular), the Open Geospatial Consortium (OGC), CEOS and WMO as standardizing agency. There are a few existing activities and proposed actions that are summarized below. Observations and data services can also have a strong link to capacity building activities and in particular in building the (Water)-Knowledge Hub.

- With regard to the Essential Water Variables, while implementation rests within the realm of GEOGLOWS, linkages to GEOGLOWS, GCOS and WMO and other groups should be strengthened to coordinate and harmonize the different views amongst the groups on EWV definitions, standards, associated observations and user requirements. Because IGWCO authored the GEOSS Water Strategy where the concept was introduced it could take a lead in publicizing the EWVs and promoting their benefits and usage. The development, maintenance and monitoring of EWV is the lesson learned by GCOS' ECV and would need persistent funding.
- IGWCO could be advising GEO members and others on strategic directions for observational networks, new technologies, applications, and research. In this matter, linkages with WMOs Infrastructure Division and GCOS would be essential;
- IGWCO could play a role in promoting and developing specifications of requirements for continuity in existing and future satellite observing systems. In this regard, the IGWCO could review the status of existing research and operational satellite observing systems across water cycle components, especially those for which future continuity may be uncertain or under review.
- IGWCO could assess opportunities for using multi-sectoral and multi-disciplinary data from remote sensing platforms together with in-situ water data for integration that will provide cohesive end-user applications and decision-making services. To this end, a meeting or sub-group could be formed to develop

recommendations. Coordination with CEOS, particularly the CEOS Virtual Constellations, and discipline-specific groups, such as IPWG, would be beneficial.

- “In-situ Water” that is to be merged with GEOGLOWS serves the needs of users for water assessments and water models. However, these are two communities that are not coordinated at present and resources for this coordination are limited.
- IGWCO could support the coordination role of the WMO in standardization issues of data in cooperation with active partners including GRDC and OGC and close linkage with GTN-H and CEOS, where this applies.
- As a start, IGWCO could form a subgroup to look at the possibilities for discussing in-situ data in general and organize a meeting in particular and which could develop background information and provide recommendations for future action by IGWCO.
- IGWCO could play a role in promoting in-situ data. There is a proposal to organize a web conference in 2020 with high-level experts to discuss an approach and recommend actions. At the last GTN-H Panel meeting in 2019 GEO Sec agreed to support this important task. Other relevant partners are WMO’s World Water Data Initiative and UNESCO IHP.
- Observation systems would largely benefit from the satellite and in-situ communities joining forces. In that direction IGWCO could coordinate a meeting between satellite and in-situ communities:
- IGWCO’s role in strategy development for in situ and satellite observational networks, data applications and research should be linked to requirements of research and society, making further development and adaptation of observational networks a necessity;
- A workshop on the use of new technologies for digital water management is under development that could yield some opportunities for discussing in situ and satellite data services.
- IGWCO should explore Europe’s Horizons 2020 as a source for support for in-situ data projects (See www.twiga-h2020.eu for more information).
- Specifically in view of IGWCO’s support to GEO and using its expertise in observations and data services, IGWCO is in a position to support and facilitate the development of reproducible methods for using Earth Observations to address key policy issues, such as the SDGs, climate change, DRR and urban resilience.

Frequency and duration of meetings

Building on past experience, IGWCO teleconferences should continue to be organized on a quarterly basis. Plenary meetings could be convened every two years and additionally on shorter schedules, based on opportunities. IGWCO subgroups on specific activity areas should meet either in person and/or organize themselves by teleconferencing. This requires however that subgroups have a nominated group coordinator.

Depending on the nature of meetings, the duration would be from one day up to several days for the meetings organized every two years. Teleconferences should not exceed two hours and be undertaken on a well-defined agenda.

Next steps

Next steps summarized below should lead to the development of an implementation plan under the assumption that several – if not all - requirements listed above are either met or progress has been achieved. The implementation plan needs to follow the strategic outline of the IGWCO in its future development. Immediate next steps relate to those that should be accomplished by mid-2020 including:

- Adoption of the “Roadmap for Next – Level Development of IGWCO” with amendments as necessary by the IGWCO CoP
- Consultation with GEO Secretariat to formally clarify and define the relationship between IGWCO and GEO with regard to water-related Initiatives, Flagships, and Community Activities.
- Clarification of specific cooperation and interaction between IGWCO and GEOGLOWS;
- In order to develop capacity within the IGWCO, Points of Contact will be identified for specific tasks; likewise the formation of task groups (or subgroups) needs to be attempted to achieve progress in various areas addressed in the document above;
- The development of a simple webpage should be undertaken with largely static pages and additional News Items that publicize progress made in different areas and also publishing the edited minutes of teleconference calls and meeting outcomes. This could support soliciting new CoP members from the target audience;
- Finalization of the review of the Water Strategy and transmission to GEO Programme Board;
- Identification of relevant water issues in current GEO activities

- Development of an overview paper of IGWCO's potential contributions to the GEO Knowledge Hub;
- Provision of position papers to various areas of activities in a renewed/changed IGWCO program in cooperation with the IGWCO CoP, GEO-Secretariat, and GEOGLOWS as well as other appropriate partners;
- Organization of an outreach workshop or other event to publicize the renewed IGWCO-CoP initiative, its strategy and implementation thrust together with its partners (Probably end of 2020);
- Development of a first draft of the IGWCO implementation plan. It is acknowledged that that there will be implementation tracks of different speeds for different activities;
- Planning for meetings/workshops as mentioned above.

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