

# GEO Work Programme 2020-2022 Application

## GEO-Wetlands (Initiative)

### 1. Executive Summary

Wetlands are hot spots of biodiversity and provide a wide range of valuable ecosystem services, such as water purification, hydrological buffering against floods and droughts, coastal protection and climate regulation. Despite their disproportionate importance for people and nature, wetlands are one of the fastest declining ecosystem types worldwide. Information on wetland ecosystems and their services is often scattered, difficult to find, and hard to integrate into decision making.

To improve this situation, the Ramsar Convention on Wetlands has been supporting the conceptualization of a Global Wetlands Observing System (GWOS) since 2007. The GEO-Wetlands Initiative took over this task by the implementation of a GEO-Wetlands Community Portal that supports users with reporting on the status and trends of wetland ecosystems on different spatial scales. This directly serves countries with the monitoring and reporting regarding Sustainable Development Goal 6.6 Indicator 6.6.1 on Water-related ecosystems. These activities are coordinated with the two custodian agencies of this indicator, UN Environment and the Ramsar Convention.

One important result of these efforts has been the formation of a consortium and a successful EU Horizon 2020 proposal (“Satellite-based Wetland Observation Service” or SWOS) that aimed to implement GWOS on a continental (European) scale. Additionally, the ESA GlobWetland-Africa project, the Global Mangrove Watch and several others, provided initial funding to develop tools and infrastructure, to engage users and to provide the general momentum which allowed the launch of GEO-Wetlands as a substantive GEO Initiative within the 2017 to 2019 period.

Several important goals could be achieved in the first years of GEO-Wetlands and they provide the infrastructure, community and vision for its continuation from 2020-2022. Major expected outputs for this coming period are the operational use of GEO-Wetlands tools for national monitoring, and the establishment of the GEO-Wetlands knowledge-base and community portal as go-to address for information, products, data, guidelines, training materials and collaboration regarding the use of EO in wetland inventory, monitoring, mapping and assessment, and in wetland conservation and restoration. GEO-Wetlands activities directly contributed to the formulation of the methodological guidelines for SDG Indicator 6.6.1 as well as a Ramsar Technical Report on ‘The use of Earth Observation for wetland inventory, assessment and monitoring: An information source for the Ramsar Convention on Wetlands’. Long-term goal is to receive a direct policy mandate for maintaining these activities through major global stakeholders like the Ramsar Convention on Wetlands and UN Environment.

The GEO-Wetlands Initiative aims to ensure long-term sustainability by converting the ownership and governance structure from the current project and best-effort level to a more sustainable longer-term common governance structure using available project results to demonstrate the added value GEO-Wetlands provides to users on different levels.

The GEO-Wetlands Initiative is designed to directly support the Ramsar Convention on wetlands since it aims to provide Ramsar Contracting Parties with the necessary Earth Observation data, methods and tools to better fulfill their commitments and obligations towards the Ramsar Convention. It also contributes directly to the development and implementation of best monitoring practices for the UN

Sustainable Development Goals (SDGs) on Target 6.6 “By 2020 protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes”, supporting the development of methodological approaches and tools on the SDG indicator 6.6.1 “percentage of change in water-related ecosystems extent over time”. Furthermore, it provides tools that can be used by country governments to set quantitative targets for their wetland resources.

GEO-Wetlands strengthens the cross-cutting coordination of global wetland observation by involving key stakeholders on different levels, from different regions, and from all sectors (science, industry, policy) in a user-needs driven framework. This ensures that GEO-Wetlands’ activities are in line with the broad communities’ needs and carried out in an efficient and targeted approach to facilitate the user uptake. It also allows flexible and open involvement of the full user- and developer spectrum based on a co-design and co-creation approach with the major wetland stakeholders.

Since the first phase of GEO-Wetlands was almost fully dependent on project funding, one important goal for the second phase is the identification of a more substantial and long-term resourcing based on partnerships and stakeholder involvement.

Planned activities for the 2020-2022 period include to receive a formal mandate for the GEO-Wetlands initiative from the Ramsar Convention on Wetlands; to secure funding through research grants but also in the form of support for core activities like initiative and community management, portal and website maintenance etc.; improve and evolve research and applications in the fields of wetland EO; provide guidance and capacity building to support users with the application of tools and methods for EO-based wetland mapping, monitoring, inventorying and assessment.

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## 2. Purpose

The **GEO-Wetlands** Initiative is a collaborative and distributed effort, building on existing large-scale initiatives, activities and projects and using the momentum and availability of funding within the global wetlands community to move towards the establishment of a **Global Wetland Community of Practice (GEO-Wetlands CoP)** and a **Global Wetlands Observing System (GWOS)** as a contribution to the State of the World Wetlands and their services to people and the Global Wetland Outlook.

**The overarching vision of the GEO-Wetlands Initiative is to provide information from Earth Observation to support the conservation, management, restoration and wise use of wetlands worldwide, as a contribution towards global monitoring of the Sustainable Development Goals and the implementation of the SDGs at country level, the Ramsar Convention on Wetlands and other Multi-Lateral Environmental Agreements (MEAs).**

**GEO-Wetlands** is designed to act as a knowledge broker between the global Earth Observation community and wetland information users from the conservation, research, policy, practice and financing sectors. **GEO-Wetlands** will support users to make best use of EO-derived information on wetland location, extent and condition and hence their capacity to support biodiversity and provide ecosystem services to society.

Building on the use-cases developed in different contributing projects, **GEO-Wetlands** is addressing information needs from a broad range of sectors in a targeted way.

For example, the Ramsar Convention on Wetlands is supported by **GEO-Wetlands** through the implementation of a GWOS, providing Ramsar Contracting Parties (169 countries) with the necessary Earth Observation methods and tools to better fulfill their commitments and obligations towards the Ramsar Convention. Activities are aligned with the goals and targets of the fourth Ramsar Strategic Plan (2016-2024), including Target 8: “*National wetland inventories have been initiated, completed or updated and disseminated and used for promoting the conservation and effective management of all wetlands.*” or Target 14: “*Scientific and technical guidance at global and regional levels is developed on relevant topics.*” While GEO-Wetlands has not received any official mandate by the Ramsar Convention, or any other MEA, it works closely with the Ramsar Scientific and Technical Review Panel (STRP) and obtaining a formal mandate is one of the goals for the future of the initiative.

**GEO-Wetlands** is supporting the implementation of and benefit from the activities of the work plan of the Ramsar STRP, the reference entity in Ramsar in charge of providing scientific and technical guidance to the Convention. The STRP is a partner to the **GEO-Wetland** initiative (through the participation of STRP members in the core partnership) and had, as part of its 2016-2018 thematic work areas, the mandate to develop best practice methodologies/tools to monitor Ramsar Sites and wetlands, including surveying, mapping and inventorying. This activity was directly supported by GEO-Wetlands.

The infrastructure, tools, platforms and products which have been piloted in the first phase of **GEO-Wetlands** are providing additional input for the production and analysis of local, national and continental to global status, changes and trends of wetland ecosystems. This directly supports the requirements of the Ramsar Convention but also the achievement of the UN Sustainable Development Goals (SDGs) on Target 6.6 “*By 2020 protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes*”. It supports the development of methodological approaches and tools on the SDG indicator 6.6.1 “*percentage of change in water-related ecosystems extent over time*”. The SDG indicator 6.6.1 on water-related ecosystems is one of the multiple SDG indicators that have been proposed by the Inter-Agency and Expert Group on Sustainable Development Goal Indicators (IAEG-SDG) in the global indicator framework currently defined for the Goals and Targets of the 2030 Agenda for Sustainable Development, and that were adopted by the UN Statistical Commission (UNSC) at its 47th Session in March 2016. The GEO Wetlands initiative has been successful in helping UN Environment raise the tier level of the SDG 6.6.1 indicator from III to II, which means an SDG indicator that is conceptually clear, with an internationally established methodology and standards but for which data are not yet regularly produced by countries. This has been achieved through the inclusion of Earth Observation as a major source of information to be used by countries to monitor the extent of water-related ecosystems.

However, it is in the stages following this, where countries are required to set quantitative benchmarks or targets for the management of all natural resources, where the GEO-Wetlands tools will become relevant to every country. For example, each country will need to set a quantitative target for each of its wetland types at a scale that is useful for on-the-ground management, against which ongoing management will be assessed. Such targets must be set using a combination of scientific evidence and socio-political inputs to ensure that the targets are aligned with social requirements.

**GEO-Wetlands** is foreseen to also more substantially contribute to the production of the Global Wetland Outlook on the State of World’s Wetlands and their services to people, the flagship publication of

Ramsar STRP, which periodically reviews the state of wetlands worldwide, with a focus on the drivers of change and wetland loss, and the efficiency of response measures.

The expected outcomes for the GEO-Wetlands Initiative in the years 2020-2022 can be summarized as following:

- The GEO-Wetlands knowledge-base and community portal, that are operational but still under development, will reach a mature and fully operational stage where users can freely access and interact with both tools to find, access and use data, products, tools, guidelines, training materials, case studies, recommended practice documents and other relevant information sources.
- New research and innovation projects will be launched (subject to available funding) focusing on improving existing methods and tools as well as the underlying research and introducing new functionalities for the knowledge-base and community portal based on user feedback.
- Different pilot projects (e.g. national implementation projects) will demonstrate the capabilities of the available tools to support policy implementation (e.g. SDG monitoring) and support their further dissemination and visibility.
- A more permanent and substantial resource situation will be established for GEO-Wetlands through strengthened engagement with key stakeholders and in cooperation with members and participating organizations of GEO as well as with parties of the Ramsar Convention.
- Subject to the available funding, more substantial and permanent governance and management structures for GEO-Wetlands will be established to allow long-term planning, community management, infrastructure maintenance and working towards policy mandate for the initiative.
- Several working groups that reached a semi-operational stage during the 2017-2019 period (e.g. mangroves; capacity building; wetland inventory) will emerge into fully operational working groups with defined membership, objectives, work plans and outputs.

For a list of GEO-Wetlands tasks and expected deliverables see tables C and D in the Tables section at the end of the document.

GEO-Wetlands is in an intermediate period, as major contributing projects come to an end in 2019, and new projects as well as more permanent sources of funding will need to be secured for continuing the GEO-Wetlands effort and building on its first achievements. If these expected outcomes can be achieved until 2022, it will have major impacts on several levels:

- Demonstration and validation of developed tools and methods on a national scale in several pilot countries will lead to user uptake and acceptance and adoption of the GEO-Wetlands approach on a broader level. Based on these results, discussions with major stakeholders (Ramsar Convention, UN Environment) that already started in 2016 can lead to the development of standardized methods and tools for supporting national reporting towards global monitoring and indicator frameworks. Finally, this is expected to result in an official policy mandate for the GEO-Wetlands initiative and its recognition as community network through which best practices can be developed, defined and distributed.
- Continued availability, maintenance and development of the GEO-Wetlands infrastructure is expected to result in a growing user-community. This will very positively impact the outreach of GEO-Wetlands but also provide new opportunities with regards to development of business

models for providing different service lines to users of wetland data and products tailored to their specific needs.

- The overarching character of GEO-Wetlands in that it links the water and biodiversity & ecosystems Societal Benefit Areas of GEO and is also closely linked to several other areas (e.g. climate, food production) is expected to positively impact the collaboration between these areas within GEO, but also on a general level.

If GEO-Wetlands is successful in achieving these outcomes and impacts, it will reach a huge beneficiary group. As wetlands play an essential role globally through provision of invaluable ecosystem services to big proportions of human population, their strengthened conservation and sustainable use is expected to positively impact livelihoods of people on local level. Because of their central role in several global cycles (e.g. water, carbon, pollutants) they also play a major role for achieving the global sustainable development goals and potentially impact the whole global population. Their better understanding, monitoring and assessment through the use of EO data, tools and applications therefore benefits all people on Earth, but especially those who are directly dependent on functioning wetland ecosystems because they either live in wetland areas e.g. coastal cities and villages, as well as settlements in floodplains, along rivers or lakesides; or because they are economically dependent on wetlands e.g. through fisheries, tourism or agriculture.

### **3. Background and Previous Achievements**

In 2008, the Scientific and Technical Review Panel (STRP) of the Ramsar Convention on Wetlands initiated the establishment of a Global Wetlands Observation System (GWOS) to bring together available information on the status and values of wetlands and water in a way that can support policy processes and decision making at various geographic scales. It was expected to describe extent and condition as well as change and trends over time of a variety of wetland types. From 2011 onwards, the development of the GWOS has been one component of the GEO BON Work Plan and tightly linked to the activities of the GEO BON working group 4 “Freshwater ecosystem change”. During several meetings and two workshops the conceptualization of GWOS has evolved, coordinated by Wetlands International and the Ramsar Secretariat together with many other partners. The proposed GEO-Wetlands initiative strongly builds on these prior activities. It also draws from activities of the former GEO Societal Benefits Implementation Board that initiated a closer cooperation between the GEO Biodiversity and Water Tasks. In 2016, this cross-cutting cooperation, together with the successful acquisition of funding for projects directly supporting its goals, led to the establishment of the GEO-Wetlands initiative as part of the GEO Work Programme 2017-2019.

Since then, GEO-Wetlands reached several of the objectives set in its first implementation plan. The most important achievements being the establishment of a Community Portal and Knowledge-base for Earth Observation of wetlands. While both platforms are still under development, they already reached an operational level and will support the work of GEO-Wetlands over the coming years. The Community Portal is already publicly available since 2018. The GEO-Wetlands website and knowledge-base will be publicly launched in early 2019. The idea behind both infrastructures (which are also both linked to each other and to the GEOSS Common Infrastructure) is to support the wetland community through eased access to data, information products, tools, guidelines and case studies and through possibilities for connecting and collaborating on a community level.

In different projects, several important datasets, methods and toolboxes have been developed for the wetland community. Several of these projects already committed within their proposals to support GEO,

the development of a GWOS and GEO-Wetlands. Therefore, their results directly feed into the initiative and GEO-Wetlands on the other hand is aiming to ensure the long-term availability and further development of these contributions.

#### **4. Relationship to GEO Engagement Priorities and to other Work Programme Activities**

GEO-Wetlands has thematic links with all three GEO engagement strategies. The most direct is to the SDG framework and there specially to Goal 6.6. *“By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes”*. One of the overarching goals of GEO-Wetlands is to support, and strengthen the capabilities for, monitoring and reporting towards SDG Indicator 6.6.1. This is being approached on several levels from the development, standardization and improvement of methods; the development of user-oriented toolboxes and applications; the setup of user-friendly geo data and knowledge infrastructures; to the provision of capacity-building materials and training. Besides SDG 6.6 the activities of GEO-Wetlands are also very relevant for SDGs 6.3 and 6.5 as well as SDGs 15.1 – 15.4.

Wetland ecosystems play a very important role in global cycles and can function as carbon sinks as well as sources, depending on their status, use and management. Especially in their capacity to store huge amounts of carbon it's important to know their global extent and how it changes. This directly informs the national reporting and global stocktaking activities that are part of the Paris Agreement. Further, wetlands like e.g. coastal mangrove forests can help adapt to and mitigate to effects of climate change. Therefore, their better understanding through mapping, monitoring, inventorying and assessment directly contributes to several pillars of the Paris Agreement.

The links between GEO-Wetlands and the Sendai Framework for Disaster Risk Reduction are existing on a theoretical level, but there are currently no direct activities aimed towards that direction. In general, GEO-Wetlands supports the awareness raising regarding the important role of wetland ecosystems when it comes to disaster risk reduction especially regarding water related disasters like floods or droughts.

The three strategic objectives of GEO – advocate, engage, deliver – are all addressed by the GEO-Wetlands initiative with a specific focus on wetlands and the global wetland community. This is achieved through:

- advocating the importance of these fragile ecosystems' valuable and diverse ecosystem functions and the essential services they provide and the benefits of their sustainable use and conservation using improved information and knowledge products;
- advocating the use and importance of different EO datasets, products and techniques to improve our knowledge about and management of wetland ecosystems;
- engaging the broad wetland community from local (e.g. wetland managers) to global (e.g. Ramsar Convention on Wetlands, Convention on Biological Diversity) and involving them within a global community of practice;
- engaging with important stakeholders and policy makers like international conventions, UN organizations, donor and funding organizations, national agencies, space agencies and research institutions;
- delivering data, information and knowledge tailored to specific user needs and requirements, based on the state of the art and produced in a co-design and co-creation effort within the community of practice, according to GEO data-sharing and data-management principles;

- delivering the infrastructure to allow discovery, access and use of these data, information and knowledge and connect it via the GEOSS Common Infrastructure to a vast amount of additional relevant data, information and knowledge.

A unique characteristic of GEO-Wetlands is that it bridges several societal benefit areas (SBAs) of GEO and also several other GEO Community Activities and Initiatives. GEO-Wetlands especially connects the 'Water Resource Management' and the 'Biodiversity and Ecosystem Sustainability' SBAs. Further, it may support establishing thematic links between these SBAs and specific aspects of other SBAs like 'Disaster Resilience' (e.g. flood protection through wetlands), 'Food Security and Sustainable Agriculture' (e.g. conversion of wetlands to agricultural areas) or 'Energy and Mineral Resources Management' (e.g. hydropower and its impact on freshwater ecosystems). One of the main benefits of having a dedicated GEO-Wetlands Initiative in the GEO Work Programme is that all aspects of wetland observation can be governed under this framework instead of wetlands being spread throughout several initiatives, community activities and working groups without overarching coordination.

Wetlands are the interface between terrestrial and aquatic systems and cover also parts of the marine (coastal) environment. Further, wetland ecosystems are strongly connected to the water cycle and water quality and they are often centers of urban development and agriculture. The GEO-Wetlands initiative has links to many other activities and implementation mechanisms of the GEO Work Programme. This is especially true for the Biodiversity, Water and Ecosystems areas. Further, there exist additional links to other areas like agriculture (use of wetlands) or energy (hydropower) and climate (wetlands as component in the global carbon cycle). The GEO-Wetlands initiative has close links to all relevant GEO Community Activities, Initiatives and Flagships (e.g. GEO BON; GEOGLOWS; GEO AquaWatch;; GEO ECO) and also to regional GEO Initiatives.

GEO Wetlands is an essential part of the GEO engagement on the 2030 Agenda on Sustainable Development to promote the uptake of Earth Observations by countries to better achieve their SDG targets and report on the SDG indicators. In this context, GEO Wetlands directly supports the GEO initiative on SDGs (GEO EO4SDG) by coordinating the GEO activities on the SDG targets and indicators related to the sustainable use of wetlands such as the SDG target 6.6 on water related ecosystems.

Further, GEO-Wetlands is actively involved in the GEO foundational task GCI Operations for example through piloting developed portal widgets with its community portal. It has also close links to the GEO Capacity Building Coordination through its wetland community oriented training and capacity building activities.

### **5. Stakeholder Engagement and Capacity Building**

The GEO-Wetlands Initiative is planning its activities based on the needs of the user and stakeholder community, who through a co-design and co-creation approach is directly involved in its development. Therefore, the structure, organization and product development of the initiative are directly based on data- and information-needs of the wetlands community as already analyzed by projects like SWOS, GlobWetland 1 &2, GlobWetland-Africa, and others. The strong engagement with the Ramsar Convention on Wetlands and UN Environment ensures the tight links to the global wetland community and national stakeholders. Close links of GEO-Wetlands partners to the wider policy and decision-making communities regionally and nationally allow direct insights into the requirements on different levels (local to global) and offers possibilities for user-uptake of developments.

This co-design and co-creation approach has already brought together scientists (e.g. ecologists, remote sensing experts, other academics), data providers (e.g. space agencies, national agencies), product

developers (e.g. remote sensing and mapping companies, projects and institutions) and users (e.g. citizens, wetland managers, decision makers, NGOs and community organizations, governments, global conventions and initiatives) into a GEO-Wetlands Community of Practice (GEO-Wetlands CoP). This convening role of the GEO-Wetlands Initiative leads to improved communication and knowledge exchange between the different parties and will finally result in improved knowledge about the state, trends and sustainable management of the fragile and valuable wetland ecosystems worldwide. It will ensure the long-term sustainability of the GEO-Wetlands infrastructure based on a robust architecture, flexible enough to adapt to changing and additional user needs.

Users can directly benefit from having a centralized point of contact and information regarding any questions or information needs concerning wetland observation. On the other hand, GEO-Wetlands can function as an advocate of the users' needs on a global level and, in cooperation with other global initiatives and conventions like GEO, the Ramsar Convention on Wetlands, UN Environment and others, to ensure that relevant information and knowledge feeds into decision-making processes on different levels (local to global). This is particularly relevant in the context of the Sustainable Development Goals which the countries are incorporating in monitoring schemes and management strategies. GEO-Wetlands can provide the tools and information needed for improved SDG monitoring and fulfillment of the targets, e.g. target 6.1.

Based on this role, the GEO-Wetlands members and linked projects and initiatives, provide a large pool of capacity building opportunities. GEO-Wetlands will provide a structured overview of these opportunities (e.g. collection of training material, event calendar), and aims at creating specific capacity building material, tailored to the user needs at different levels and for different frameworks. This will concentrate on online tools for capacity building (e.g. MOOCs, webinars). A preliminary study of the capacity building needs will be undertaken to ensure that the offer fits the demand as best as possible.

Supported by the Ramsar Convention on Wetlands, Wetlands International, UNEP-WCMC and other involved stakeholders and projects like SWOS and GlobWetland-Africa, several existing user communities and networks have been linked to GEO-Wetlands and were directly involved in the further developments through the GEO Wetlands CoP. While many of these activities were made possible through contributing projects, the next phase of GEO-Wetlands will ensure that these user networks and the Community of Practice are maintained as permanent communication and collaboration platforms.

The target scale of the GEO-Wetlands initiative and the developed tools, infrastructures and products is global. Due to the project-based nature of the first phase of GEO-Wetlands many of the current partners are based in Europe. During the second phase it is therefore planned to widen the partnership and to more directly involve partners from the Americas, Africa and Asia-Oceania. While GEO-Wetlands is in contact and exchange with several institutions in these regions, no substantial cooperation or joint projects or other forms of formal collaboration could be realized in the first three-year period. This is therefore a strong aim for the second phase.

Knowledge conveyance, capacity building and network facilitation and other essential activities are all possible through international, regional, national and local networks of GEO-Wetlands partners. The GEO-Wetlands initiative will be actively supporting stakeholders in the uptake and use of GEO-Wetlands related products, tools, infrastructure, and developments. While in the initial phase this has already begun, it is all the more important to build upon these efforts in the second phase to ensure long-term continuation and sustainability.

## 6. Governance

GEO-Wetlands currently is based on a rather loose, bottom-up governance and management structure. There is a core team of partners (University of Bonn, Wetlands International, ESA, University of Jena) who take care of most management, communication and maintenance related activities as well as all the reporting and coordination towards GEO and other major stakeholders.

In addition to this core group there is a broad community involved in the initiative through different projects or as participants in working groups. This network is open and inclusive, with the goal to establish a global community of practice. A list of all organizations (and points of contact) involved in the core team and this broader community can be found in table A of the Tables section at the end of the document. Currently, several working groups exist in a semi-operational to operational stage e.g. on Mangroves, Peatlands, the GEO-Wetlands Infrastructure and Capacity Building. Other groups are currently planned or existing loosely as community efforts, e.g. on Wetland Inventories. Working Groups are generally intended to develop into long-term bodies of the initiative that develop a specific work plan with set outcomes and deliverables supported through necessary funding. The permanent establishment of these groups is a continuous effort that will migrate from the current to the new implementation plan and continue in the 2020-2022 period. Task teams are a mechanism for ad-hoc achievement of temporary activities like the set-up of the GEO-Wetlands website and knowledge-base or the development of specific reports and other documents.

Figure 1 visualizes the envisioned governance structure and shows the different governance bodies (Advisory Board, Secretariat, Community of Practice) and how they are connected through task teams and working groups to jointly work on the different components of GEO-Wetlands (e.g. R&D, Infrastructure, or specific services).

This loose structure has advantages and disadvantages at the same time. It is very flexible and allows to easily adjust to new situations and changed requirements or framework conditions. But at the same time, it lacks commitment and substantial resourcing. This is especially obvious when it comes to community management and communication activities, which are almost completely based on best effort. Therefore, one of the major goals for the 2020-2022 period is to move the governance structure into a more permanent and long-term model with financial support and stakeholder commitment. While this has already been planned for the first three-year phase, it showed that without tangible results and dedicated resources it is not feasible to setup such structures.

The vision for the future of GEO-Wetlands is that it keeps its bottom-up and community driven character while still introducing some more top-down elements in the form of advice and steering through key global stakeholders. Figure 1 below visualizes this governance structure. It shows the different governance bodies (Advisory Board, Secretariat, Community of Practice) and how they are connected through task teams and working groups to jointly work on the different components of GEO-Wetlands (e.g. R&D, Infrastructure, or specific services). Actually, this is a representation of how GEO-Wetlands currently works, only that currently the structure is not formalized enough. For example, the secretariat only exists in a virtual, best-effort form, and not as a permanently set-up body. The same is true for the advisory board. While exchange is taking place and advice is sought from key stakeholders like the Ramsar Convention and the UN Environment, no official advisory board has been established, yet. Therefore, a goal for the 2020-2022 period is to achieve the set-up of a financially sustainable and permanent secretariat to continue and strengthen the overall management of the initiative. In addition, the setup of an official advisory board involving representatives from authoritative organizations in the field of wetlands conservation such as the secretariat of the Ramsar Convention on Wetlands, Ramsar

regional initiatives, UN Environment and IUCN (besides others) is very high on the agenda for the next phase of the initiative.

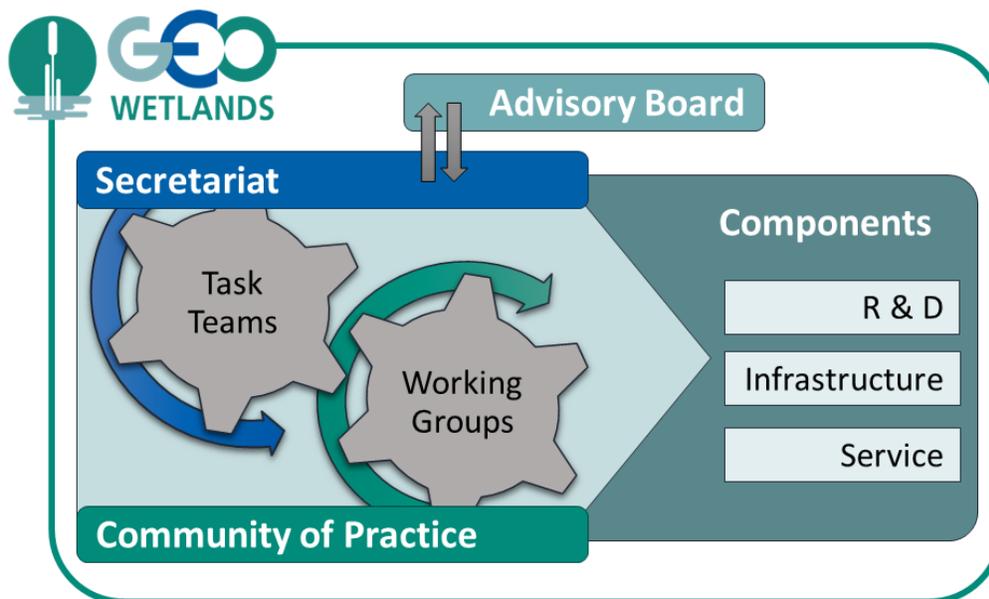


Figure 1: GEO-Wetlands governance structure with bottom-up and top-down components linked through a secretariat and specific task teams and working groups to jointly produce different components and outcomes.

The community of practice is at the core of GEO-Wetlands and it is where most of the developments and achievements come from. Collaboration between users and producers of wetland related information through projects and in working groups and task teams are the motor for achieving the goals of the initiative based on a co-design and co-creation approach.

There are several risks linked to the success of the GEO-Wetlands Initiative. The co-leads of the Initiative will monitor these risks and apply any necessary means to mitigate them as early as possible. In general, all possible risks will be monitored and managed by the management and coordination partnership of GEO-Wetlands and especially by the co-leads of the initiative. In case of problems, a solution will be reached in a collective decision process within the whole GEO-Wetlands partnership. The broad user- and partner network that is already involved in the initiative will help to find flexible solutions in case of financial difficulties, necessary changes of participation in the initiative or need for additional manpower.

The risks together with mitigation strategies and management procedures are summarized in table 1 below.

Table 1: Risks and mitigation strategies

Risk	Mitigation Strategy	Management Requirements
<b>Lack of continuous funding for the full 2020-2022 period</b>	While the project funding available during the first phase of GEO-Wetlands will not be maintained at the same level for the coming years, there is still some continuous funding available and several project calls expected to be opened in 2019	This requires human resources for communication and proposal writing. This will be provided by the different partners within the initiative mainly on an in-kind basis.

	provide possibilities for increasing the available resources for the coming period.	
<b>No GEO-Wetlands office set up within the 2020-2022 timeframe</b>	This was already a goal and a risk in the 2017-2019 implementation plan. The experience has shown that it is possible to maintain and coordinate the initiative on the basis of a “virtual” secretariat based on in-kind and best-effort contributions from different members of the GEO-Wetlands community. This is expected to also work for the coming years in case no more permanent structure can be achieved.	It requires willingness and capacities of one or several partners to commit some in-kind resources (in the form of workforce) to manage the initiative or specific components.
<b>Partners dropping out of the Initiative</b>	As the development of a Global Wetlands Observing System is a common goal of all involved partners, it is not to be expected that partners will drop out completely. In case of individual difficulties, other partners might be able to take over and/or share responsibilities etc.	Good planning and fast reaction in case of difficulties of individual partners to find solutions for distributing their responsibilities to other partners.

## 7. Resources

In its initial phase from 2016 to 2019, GEO-Wetlands could draw from substantial project resources that lead to the development of pilot infrastructure (Website, Knowledge-base, Community Portal), as well as method and toolkit development and application examples through several case-studies. This led to the establishment of a big user community and close relationships with stakeholders on different levels as described above.

For the coming phase (2020-2022), GEO-Wetlands faces some new challenges. Without substantial project resources the lack of permanent funding for management and maintenance of the initiative’s core activities and components will carry much more weight. Though there is still commitment from several partners to continue efforts in support of GEO-Wetlands, a major goal for the coming phase is the acquisition of additional funding and more permanent resources for maintenance as well as initiative and community management.

There is some direct funding already available to support the mangrove working group of GEO-Wetlands as well as the maintenance of the Community Portal. This sums up to the amount of 15.000 € for the years 2020-2022 but is subject to positive project evaluation mid-2019.

For further development of methods, tools and applications, the GEO-Wetlands team is planning to apply for several upcoming project calls in 2019 that will potentially increase the available budget for the 2020-2022 period. The manpower needed for writing proposals will be provided on an in-kind basis by different partners of the GEO-Wetlands initiative.

Some more permanent in-kind contributions of several GEO-Wetlands partners can be summarized as

following:

University of Bonn (Germany): continued support of GEO-Wetlands management, resource acquisition and communication activities; scientific coordination; reporting towards GEO and cooperation within GEO.

Wetlands International (Netherlands): support of GEO-Wetlands management and communication; science-policy interface (Ramsar, EU, Africa); website and knowledge-hub hosting and maintenance.

ESA ESRIN (Italy): support of GEO-Wetlands management and communication; science-policy interface (Ramsar, SDGs).

University of Jena (Germany): intermediate hosting and maintenance of the GEO-Wetlands Community Portal and integration of new content as far as possible and required; cooperation with the GEOSS GCI community.

University of Malaga (Spain): support to GEO-Wetlands communication; Capacity-building review and structure, link to European Commission's MAES Working Group.

Contributions of other team members are mainly based on linking their project- and in-house-activities to the GEO-Wetlands work plan in support of the initiative and through participation in working groups and task teams.

## **8. Technical Synopsis**

Within the framework of GEO-Wetlands technical and scientific developments have been implemented through different related projects. These activities can be roughly split into two branches.

1. Method development and research
2. Infrastructure and tool development

As for the method development and research, several teams have been working on improving the capabilities for using EO data to map, monitor, assess and evaluate wetland ecosystems and their changes over time. Developed methods specifically focus on the use of freely available Satellite Data (e.g. Landsat-Series; Sentinel 1-3; MERIS & MODIS data). The work of different projects (SWOS; GlobWetland-Africa) led to the development of wetland specific EO toolboxes for producing maps and indicators on land-use land-cover (wetland classification), land-use land-cover changes, surface water dynamics, soil moisture, water quality, surface temperature and other relevant parameters. Listing all the details about the toolboxes and the included methods, algorithms etc. would go beyond the scope of this document. But the GEO-Wetlands knowledge-base which is currently under development (see below) will provide all information to the community and make toolboxes, guidelines, products and reports available.

It remains challenging to map and monitor wetlands on a global scale. This is mainly caused by their heterogeneity and the fact that many quite different ecosystems are combined under the broad definition of wetlands. This ranges from natural to artificial wetland, from mountainous to coastal wetlands, and according to the Ramsar definition even includes water bodies (lakes, reservoirs and rivers) as well as marine ecosystems down to a depth of 6 m like coral reefs or seagrass beds. Therefore, producing global products on wetland ecosystems and their status and changes in an ongoing scientific challenge. One objective of GEO-Wetlands is to achieve such products in the future through strengthened cooperation and collaborative development, testing and validation of new methods and tools.

With regards to infrastructure and tool development GEO-Wetlands was able to achieve some major goals in its first three-year period. The GEO-Wetlands Community Portal provides new possibilities for users to discover, visualize and access wetland related data and information (see Figure 2).

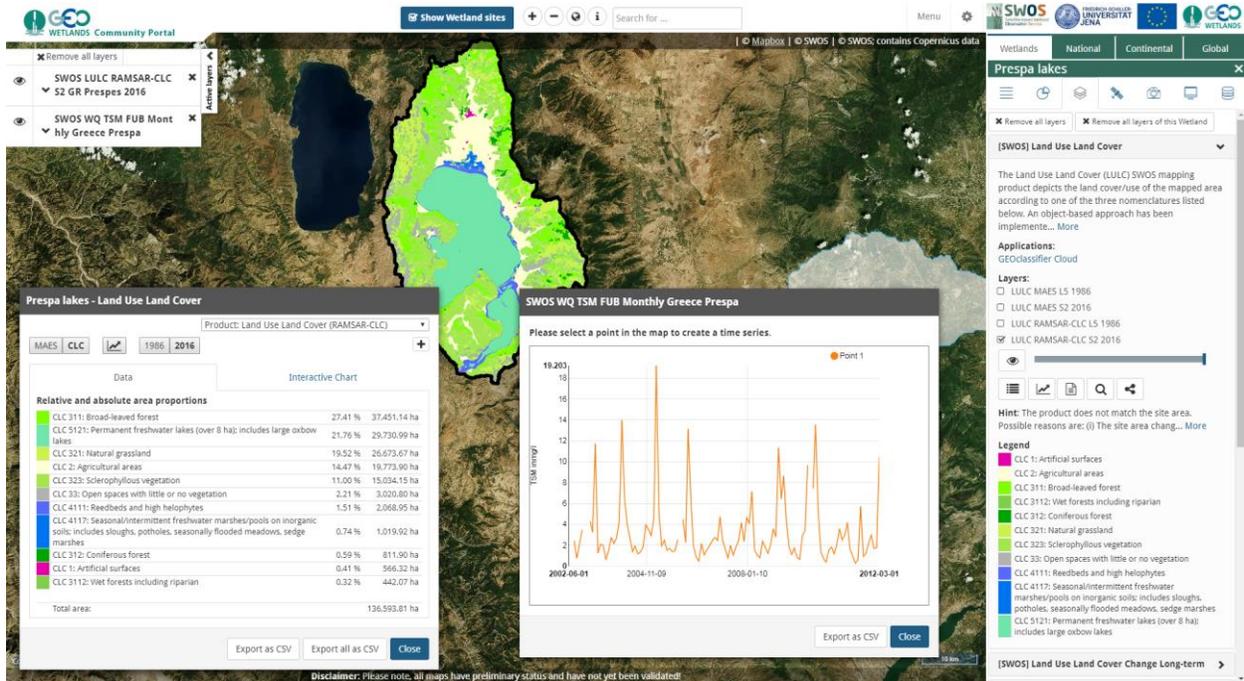


Figure 2: Screenshot of the GEO-Wetlands Community Portal showing its capabilities for visualizing data, maps and statistics. It has been funded through the SWOS Horizon-2020 project and developed by the University of Jena.

## 9. Data Policy

The GEO-Wetlands Initiative complies with the GEOSS Data Sharing principles and applies the GEOSS Data Management Principles to all data that is being uploaded to the GEO-Wetlands Community Portal infrastructure. Through standard-compliant web services any metadata and datasets can be linked to the GEOSS Common Infrastructure. There will be full and open exchange of data, metadata and products shared within GEOSS, recognizing relevant international instruments and national policies and legislation, and all shared data, metadata and products will aim to be made available with minimum time delay and at minimum cost. All shared data, metadata and products being free of charge or no more than cost of reproduction will be encouraged for research and education.

## Tables

**Table A -- Individual Participants in the GEO Work Programme Activity**

First Name	Last Name	Organization	GEO Member / PO Affiliation	Primary Role	Secondary Role	Email Address
Adrian	Strauch	University of Bonn	Germany	Lead or Co-lead	Staff member of the Secretariat to the Flagship or Initiative	<a href="mailto:adrian.strauch@uni-bonn.de">adrian.strauch@uni-bonn.de</a>
Lammert	Hilarides	Wetlands International	Netherlands	Lead or Co-lead	Staff member of the Secretariat to the Flagship or Initiative	<a href="mailto:lammert.hilarides@wetlands.org">lammert.hilarides@wetlands.org</a>
Paganini	Marc	ESA	ESA: European Space Agency	Lead or Co-lead	Steering Committee (Board, Advisory Cttee, etc) Member	<a href="mailto:marc.paganini@esa.int">marc.paganini@esa.int</a>
Jonas	Eberle	University of Jena	Germany	Component (Task, WG, etc) Lead or Co-Lead	Member / Participant	<a href="mailto:jonas.eberle@uni-jena.de">jonas.eberle@uni-jena.de</a>
Jonas	Franke	Remote Sensing Solutions GmbH	Germany	Member / Participant		<a href="mailto:franke@rsggmbh.de">franke@rsggmbh.de</a>
Christian	Tottrup	DHI GRAS	Denmark	Member / Participant		<a href="mailto:cto@dhi-gras.com">cto@dhi-gras.com</a>
Brian	O'Connor	UNEP-WCMC	United Kingdom	Member / Participant		<a href="mailto:brian.oconnor@unep-wcmc.org">brian.oconnor@unep-wcmc.org</a>
Kathrin	Weise	Jena-Optronik GmbH	Germany	Member / Participant		<a href="mailto:kathrin.weise@jena-optronik.de">kathrin.weise@jena-optronik.de</a>
Susanne	Thulin	Brockmann Geomatics	Sweden	Member / Participant		<a href="mailto:susanne.thulin@brockmann-geomatics.se">susanne.thulin@brockmann-geomatics.se</a>
Christoph	Schröder	ETC University of Malaga	Spain	Component (Task, WG, etc) Lead or Co-Lead	Member / Participant	<a href="mailto:christoph.schroder@uma.es">christoph.schroder@uma.es</a>
Ake	Rosenqvist	soloEO	Japan	Member / Participant		<a href="mailto:ake.rosenqvist@soloEO.com">ake.rosenqvist@soloEO.com</a>
Zoltán	Vekerdy	University of Twente	Netherlands	Component (Task, WG, etc) Lead or Co-Lead	Member / Participant	<a href="mailto:z.vekerdy@utwente.nl">z.vekerdy@utwente.nl</a>
Lisa-Maria	Rebelo	Intern. Water Management Institute	IWMI: International Water Management Institute	Member / Participant		<a href="mailto:l.rebelo@cgiar.org">l.rebelo@cgiar.org</a>
Chris	Dickens	Intern. Water Management Institute	IWMI: International Water Management Institute	Component (Task, WG, etc) Lead or Co-Lead	Member / Participant	<a href="mailto:c.dickens@cgiar.org">c.dickens@cgiar.org</a>
Eleni	Fitoka	Greek Biotope Wetland Centre (EKBY)	Greece	Member / Participant		<a href="mailto:helenf@ekby.gr">helenf@ekby.gr</a>
Anis	Guelmami	Tour du Valat	France	Member / Participant		<a href="mailto:guelmami@tourduvalat.org">guelmami@tourduvalat.org</a>

**Table B -- Contributions to the GEO Work Programme Activity**

Contributing Organization	GEO Member / PO Affiliation	Type of Organization	Type of Contribution	Estimated Value of the Contribution
University of Bonn	Germany	Academic organization (university / college / school)	In-kind Labour	50.000 €
Wetlands International	Netherlands	Charitable or not-for-profit organization	In-kind Labour	45.000 €
Wetlands International	Netherlands	Charitable or not-for-profit organization	Financial	45.000 € (subject to positive project evaluation)
ESA	ESA: European Space Agency	Intergovernmental organization	In-kind Labour	60.000 €
University of Jena	Germany	Academic organization (university / college / school)	In-kind Other	
University of Malaga	Spain	Academic organization (university / college / school)	In-kind Labour	
IWMI	South Africa	Research institute	In-kind Labour	

**Table C -- Task (or Work Package) Structure of the GEO Work Programme Activity**

Task Name	Task Description	Names of Task Leads	Task Starting Year	Year of Planned Task Completion
Infrastructure Maintenance	Maintain, prepare content and provide knowledge-base and community portal to users	Lammert Hilarides, Jonas Eberle	2018	ongoing
Infrastructure Development	Continuous development of the GEO-Wetlands community portal	Jonas Eberle	2015	ongoing
Ressource Mobilization	Acquire new projects and other funds to support GEO-Wetlands management and related research and development actions	Adrian Strauch	2016	ongoing
Project Management	Coordinate the initiative, fulfill reporting obligations, represent the initiative	Adrian Strauch	2016	ongoing
Policy frameworks	Engage with important policy stakeholders to ensure GEO-Wetlands support for global frameworks.	Marc Paganini, Adrian Strauch	2016	ongoing
Capacity building	Produce materials and organize events to provide training and guidance on the use of EO for wetland monitoring and conservation.	Christoph Schröder, Zoltán Vekerdy	2016	ongoing
Research & Development	Through targeted research and development activities, supported through GEO-Wetlands working groups and research projects, advance the possibilities and knowledge regarding EO-based wetland mapping, monitoring, inventorying and assessment.	N.N.	2020	ongoing
Demonstration & Testing	Application and testing of GEO-Wetlands tools in pilot studies e.g. on country or local level in collaboration with policy partners/users.	Chris Dickens	2019	2022

**Table D -- Planned Deliverables and Milestones of the GEO Work Programme Activity**

Task Name (from Table C)	Name of Deliverable or Milestone	Description of the Deliverable or Milestone	Year of Planned Completion	Current Status
Infrastructure Maintenance	Public launch of GEO-Wetlands knowledge-base	The knowledge-base will be officially launched after required content has been prepared and uploaded.	2019	In progress
Ressource Mobilization	GEO-Wetlands research funding	Secure funding for new major research project(s) to support further advances of methodologies and toolsets for GEO-Wetlands.	2020	In progress
Policy frameworks	Formal mandate for GEO-Wetlands	Through close engagement and coordination with the Ramsar Secretariat and STRP achieve clear wording on the role of GEO-Wetlands in resolutions or other important documents of the convention.	2021	In progress
Capacity building	Training component for knowledge-base	By 2022, it is intended to have dedicated materials on the GEO-Wetlands knowledge-base that support training and teaching of methods, tools and applications.	2022	Not yet started
Research & Development	Global Wetland Inventory	Until 2022, methods and tools for preparing a global wetland inventory according to requirements of the Ramsar Convention and SDG 6.6 shall be developed, tested and applied at least for several pilot countries.	2022	Not yet started
Demonstration & Testing	Pilot and Demonstration Report	A report summarizing the country pilots developed during the 2020-2022 period.	2022	Not yet started

## Annexes

### Annex I: Acronyms and Abbreviations

CBD	Convention on Biological Diversity
CoP	Community of Practice
ESA	European Space Agency
GECO	GEO Global Ecosystem Initiative
GEO	Group on Earth Observations
GEO BON	Group on Earth Observation Biodiversity Observation Network
GMW	Global Mangrove Watch
GWOS	Global Wetlands Observing System

IPBES	Intergovernmental Platform on Biodiversity and Ecosystem Services
SBA	Societal Benefit Area
SDG	Sustainable Development Goal
SWOS	Satellite Wetland Observation Service (EU Horizon 2020 Project)

## **Annex II: List of key scientific references describing the basis for the work of the Initiative**

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## **Annex III: Brief CV of Project Leader(s)**

*Adrian Strauch, University of Bonn:*

Adrian Strauch has a degree in Geography from the University of Bonn, Germany. Since 2013 he managed several GEO related projects at the Department of Geography, that were all related to global EO and had a strong focus on user-driven and multidisciplinary approaches. He is experienced with working in international and multidisciplinary project teams, project management and proposal writing. His special scientific interests are science-policy interfaces in the framework of global EO as well as user-driven co-design and co-creation of information and knowledge. Since 2015 he is working at the multidisciplinary Center for Remote Sensing of Land Surfaces (ZFL) of the University of Bonn. In the last

years he's been working in several wetland and GEO related projects. Recently a new focus is on EO based disaster and risk management. Since 2013 Adrian has contributed to several GEO tasks and activities. He is a member of the German Group on Earth Observations (D-GEO) and member of the German GEO delegation. He was a member of the GEO Societal Benefits Implementation Board from 2013-2015, contributor and co-lead of several GEO Task-Components, especially in the GEO water area, and he is a member of the GEO BON Freshwater BON, GEOGLOWS and EO4SDG initiatives. Since 2013 Adrian has contributed to the conceptualization and development of the Global Wetland Observation System, and since 2016 he's co-leading GEO-Wetlands.

*Lammert Hilarides, Wetlands International:*

Lammert Hilarides holds an MSc in Ecosystem Biology from Wageningen University, where he majored in ecology and GIS. He has 10 years of experience in ICT in both the public and private sector and has specialized in open standards and open source technologies. He has worked in different roles, ranging from developer to project manager, on complex international ICT projects. In his current position Lammert coordinates the Remote Sensing, GIS and software development components in various Wetlands International projects, such as landcover mapping of the Hawizeh Marshes in Iraq, ecosystem service assessments in the Athabasca Oil Sands region and the International Waterbird Census webportal. Lammert has coordinated the previous GWOS activities through GEO-BON WG4 and is actively involved in the SWOS and Global Mangrove Watch projects and additionally as a user in the GlobWetland Africa project enabling him to build the bridges between these projects. Since 2016 he is co-leading GEO-Wetlands.

*Marc Paganini, European Space Agency:*

Coming soon