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## WP23\_25: AquaWatch

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1166,248

### Basic Information

#### Full title of the Initiative

AquaWatch

#### Short Title or Acronym

AQUAWATCH

#### Current category in the 2020-2022 GWP

GEO Initiative

#### Proposed category in the 2023-2025 GWP

GEO Initiative

### Points of Contact

First Name	Last/Family Name	Email
Merrie	Neely	merrie.neely@Noaa.gov
Steve	Greb	srgreb@wisc.edu

### Purpose

#### Objective

The goal of the AquaWatch Initiative is to develop and build the global capacity and utility of Earth Observation-derived water quality data, products and information to support effective monitoring, management and decision making. AquaWatch encourages activities to engage, and be led by, early career scientists.

#### Please provide a short description of the Initiative

AquaWatch is an Initiative within the Group on Earth Observations (GEO) that aims to develop and build the global capacity and utility of Earth Observation-derived water quality data, products and information to support water resources management and decision making.

#### Why is this Initiative needed?

Water quality is a centerpiece of many international mandates including the SDGs, Sendai Framework, UNFCCC, and potentially the new Urban Resilience engagement priority. Other aquatic initiatives are focused on oceans in general (GEO Blue Planet) or water quantity (GEOGlow). Water quality is much bigger than a subset or working group within either of those groups – also being our own initiative enables us to leverage a broader application of water quality EO tools, products, services.

### **What evidence is there to support this need?**

Water quality is critical for both human and ecosystem health. Having safe and secure drinking water and adequate sanitation is critical to improve livelihood security, economic growth, and to reduce health risks and vulnerability in communities. Waterborne diseases remain one of the most significant threats to human health worldwide. According to the United Nations World Health Organization, an estimated 1.7 million deaths a year can be attributed to unsafe water supplies. Lack of progress in this Community of Practice area within GEO prior to the formation of GEO AquaWatch in 2009-2016 time period.

### **Is this Initiative open to participation by representatives of any GEO Member, Participating Organization, and GEO Associate?**

Yes

### **Are you aware of other projects or initiatives at a global or regional scale (both in GEO and externally) that provide similar products or services?**

Yes

#### **Please describe.**

World Water Quality Initiative- they are more in situ focused, International Water Association - they are more diverse in membership and broader in focus - also not open source, Aquaya -they are primarily focused on groundwater and public sanitation, especially in developing countries - not so inclined to use EO data.

#### **How is this Initiative unique?**

We are the only initiative solely dedicated to water quality. We are a long established global network of subject matter experts (SMEs)spanning private industry, academia, NGO, to local/state/federal/regional Government managers and researchers and the entire value chain from Data providers to end users. We are best effort, dedicated to providing free and open source guidelines and recommendation to best suit the GLOBAL water quality community. Through our best effort status we seek to democratize water quality information and enable users to utilize fit for purpose products which are already delivered by agencies - and to enable their knowledge and skillbuiding for their own customization of products to best suit their needs and build trust in end-users.

**Please identify the most important actual and/or intended outputs (products, services, etc.) produced by the Initiative, along with their intended and/or actual users. This list does not need to be comprehensive but should identify the outputs which are most used and are expected to have the greatest potential impact.**

<b>Output</b>	<b>Status</b>	<b>Users</b>	<b>Additional info</b>
NASA-funded Validation Workshop Outcomes and Report	Available but not updated	EO water quality Data providers and researchers	Co-sponsored by GEO AquaWatch. Held in Madison, WI Water Quality Validation (wisc.edu)
Early Career Society	Planned	Early Career scientists in the EO Water Quality Sector and those who support them	
user Needs Assessment Synthesis	Planned	EO water quality data providers and satellite agencies	
capacity building peer reviewed paper (in review) and survey results	Available but not updated	EO water quality data providers and satellite agencies	
Water quality Best Practices	Regularly updated	EO water quality users, data providers, and private sector	
recommended algorithms (intro and advanced) and Product Family Specifications	Regularly updated	EO water quality users, data providers, and private sector	First version completed Spring 2022
Updated outreach materials and project metadata lists	Planned	EO water quality community	
Communications Strategy, video and plain language messaging	In development	EO water quality community	
DEI metrics	Regularly updated	EO water quality community	
EO Water Quality Training Recommendations	Occasionally updated	EO water quality users	
Analysis Ready Data and associated Product Family Specifications including minimum metadata standards	Occasionally updated	CEOS, EO data providers and data users	First version completed Spring 2022
Water Quality portal of existing EO data	Regularly updated	EO water quality community	UW- Madison effort

**If needed, please provide additional comments or explanation to accompany the outputs table**

Formation of two thematic nodes (cal/Val and modelling) and a UK-European node are in progress

## **What kinds of decisions are the outputs of this Initiative primarily intended to support?**

Examples include lake health (harmful algae blooms), trends over time, fisheries management, dredging operations, water intakes.

EO users are informed on what products are fit for purpose, what algorithms and corrections, etc. to use as best practices

### **How will these decisions benefit from the outputs of this Initiative?**

Examples include when to close fishing, swimming areas, quantify sediment loads resulting in modifying dredging operations, how to better quantify spatial variability with a lake resulting in better sampling strategies, changing water treatment operations

They currently do not exist - we will be compiling them

## **What kinds of impacts (for example, reduced loss of life, monetary savings, conservation of biodiversity, etc.) are anticipated as a result of the use of the outputs of this Initiative?**

See above. Also these tools help examine long term trends in water quality affecting human health, aquatic biodiversity, blue economies. This may be particularly applicable to the new Urban Resilience engagement priority given the majority of the world's population live in proximity to coastal areas. Urban runoff (sediment, nutrients) can greatly impact coastal health.

improved water quality and increased efficiencies achieved. Also ecosystem preservation or restoration. Also ecosystem preservation or restoration.

## **Has this Initiative been asked to provide specific information (for example, reports, data, services) on an ongoing basis to an international convention, organization, or other multilateral body?**

Yes

### **Please identify the requesting organization.**

UN, Scotland, CEOS

### **Describe the nature of the request.**

UN - asked to provide training for African practitioners in EO water quality, Scotland our UK node host is the Scottish Hydronation chair - informing about water quality in the region and the EU regionally, CEOS requested reviewer and contribution of content support for a recent Product Family Specification for aquatic - the first of its kind. and just released in February 2022

### **Please provide supporting documentation of the request.**

- no supporting documents provided -

## **Technical Synopsis**

### **Please provide a brief description of the methods used by the Initiative to produce its (actual or planned) outputs.**

The fundamental technical method used by this initiative (and basis of its output) centers on the differential reflectance of surface water. Water quality data can be derived from the variability seen in the signal at different wavelengths, Working group and ad hoc focus group are refining these methods on a best available effort basis. Efforts such as the GEO/Google Earth Engine partnership are helping provide global coverage Planned: We seek funding to support dedicated work effort to continue momentum or initiate work where 'best available effort' has not succeeded to date. We recommend the following information: IOCCG Report 17 (2018) Earth

**If you would like to provide further details on the technical methods, you may upload one or more documents here.**

- no supporting documents provided -

**Are there any significant scientific or technical challenges that need to be resolved by the Initiative during the 2023-2025 period?**

Yes

**Please describe these challenges and the steps being taken to solve them.**

Inadequate sensor development for aquatic applications (improved radiometric, spatial, temporal capabilities)  
Need continued improvement in algorithm approaches of atmospheric correction, adjacency effect models, in addition to WQ parameter models ((empirical, semi-analytical, ML)

Continue to build trust in the scientific and other end user communities through successful demonstration projects on topics such as sedimentation, carbon cycling, harmful algae blooms, climate change.  
Build new visualization tools and dashboards to inform end-users and provide information in easy-interpretable graphics.

Better connect activities of the AquaWatch community with existing water policies. Address relevant scientific questions and conservation goals, including those outlined in the National Research Council Decadal Survey and the EU Water Framework Directive (from Topp et al. 2020)

Compiling and synthesizing in situ data sets for validation- Just held workshop on building a global validation network.

Yes, funding – generally for all our work, but especially of an Initiative Directorship position which NOAA will not be sustaining after FY22.

**Does the Initiative expect to complete any key new outputs, improvements to existing outputs, or improvements to the methods of producing outputs, in the 2023-2025 period?**

Yes

**Please describe these new outputs or improvements.**

As described in outputs above we plan to update our existing outreach materials and add new, we seek to update our existing best practices and DEI metrics and add new, we seek to update our existing list of training and citizen science projects in water quality and add new.

**Please identify the key tasks that must be implemented to ensure delivery of these changes, with target dates for completion.**

Task	Task description	Expected completion (month/year)
Working Group assumes ownership of the task	See list provided above	updates are expected to be fairly quick to make - perhaps 6 months or less, new projects will take longer perhaps 6 - 12 months

## Resources

**Have all resources required to implement the Initiative's planned work in the 2023-2025 period been secured?**

- Gap in financial resources

- Gap in human resources
- Gap in access to data

**What is the estimated funding gap for the 2023-2025 period?**

\$62K USD for a directorship position (annually), plus general funding to support initiative secretariat work (additional \$38K USD, annually). That is just to maintain status quo. we really need some dedicated funding to execute workplan activities, which could involve full or partial support of an early career or senior level scientist and paying for workshops, and printing and website changes needed to optimize information sharing with the community.

**What are the essential skill sets needed by the Initiative but are not currently resourced?**

Gap in human resources – advertisement or secondment of a director, also funding to support early career or research scientist positions to do the work of the initiative – best effort only goes so far (too many managers, not enough workers), website and social media managers, graphic designers, IT professionals to enable the portal development on our schedule not theirs.

**What data sets are needed by the Initiative but are not currently available?**

Gap in access to data – we do lack access to in situ data needed for validation in some regions around the world – Central and Latin America, SIN, Asia, Oceania/Australia, Africa and we could always use more data in the US and Europe.

**What actions is the Initiative taking to obtain the required resources?**

We have put out a call for supplying a directorship - it is under consideration by Deltares, perhaps others. We have a fiscal sponsor which enables us to apply for some limited funding, to date few grants have been received. We rely upon members to submit to funding and submit activities as part of the funding proposal that aspirationally support Initiative tasks

**Please list all financial and non-financial contributions to the Initiative (other than in-kind, voluntary participation by individual contributors) having a value of more than USD 50,000.**

Contributing Organization	GEO Status	Type of Resource	Value	Currency
Google Earth Engine -NA -		Other	unknown	USD
University of Wisconsin		Financial	80000	USD
NOAA	United States	Financial	62000	USD

**Lessons from the 2020-2022 Period**

**Were all planned activities for the 2020-2022 period implemented as expected?**

No

**Please describe which activities were delayed or not implemented and how has this affected plans for 2023-2025.**

We had expected to advance Inherent Optical Properties (IOPs) and a validation workshop was planned but due to COVID was delayed – actually many in person activities that could have advanced workplan progress were halted, which was a deterrent to completion. Lack of funding was responsible for the rest of the delays –

what wasn't overcome by the interim actions of the water quality community has been pushed into the 2022-25 workplan period.

### **Were there any key challenges faced by the Initiative in the 2020-2022 period?**

Yes

#### **Please describe.**

end of funding of the directorship and US-based secretariat by NOAA NESDIS in 2022, COVID-19 delays in holding key workshop and biennial meetings.

### **Were there any impacts or changes to operations due to COVID-19?**

Yes

#### **Please describe.**

We had expected to advance Inherent Optical Properties (IOPs) and a validation workshop was planned but due to COVID was delayed We were forced to abandon planned in-person initiative meetings twice - one online meeting was held instead, but should have occurred every 2 years not once in 4 years.

### **Please describe the key changes proposed for the 2023-2025 period, for example, new projects, new areas of focus, or adjustments to the activity governance.**

We will shift over to a new director, add an Early Career Society, add two new thematic nodes and one European Node - where previously we had none. We may adjust our working group structure to make two large ones (technical and outreach/education) with focus areas instead of the 5 working group we have now, which often overlap or topics do not fit solidly into one working group.

### **Does the Initiative have outputs (products, services, etc.) available to users now, even if only on a pilot or testing basis?**

Yes

#### **Please provide any available information describing this usage (for example, user statistics, results of user testing) and/or feedback from users (for example, user comments, evaluations).**

We have training modules, which we know students are using and perhaps making better decisions with data found as a result of this training, we will debut products this summer from the Google Earth Engine efforts and from the Real Earth Portal on the GEO AquaWatch website. - we hope to have testing or feedback from users on the products. We recommend you look at those websites: <https://eodatascience.com/Newsroom/GEO-GEE-Project-Global-water-quality-monitoring-w#:~:text=GEO-GEE%20Project%3A%20Global%20water%20quality%20monitoring%20with%20AquaWatch,to%20the%20pollution%20of%20rivers%2C%20lakes%20and%20oceans>.

and

<https://realearth.ssec.wisc.edu/>

#### **Please provide supporting documentation if available.**

- no supporting documents provided -

### **Do you have evidence of any impacts that have occurred in part as a result of using the outputs of the Initiative (for example, policy decisions taken, behaviour changes by users, risks mitigated)?**

Yes

**Please provide examples, with evidence where available.**

We have DEI metrics - one full year will be completed in June 2022. This measures our efforts to model DEI as an initiative - we are on track to meet our ambitious targets for year 1. Slides can be shared upon completion of the first year, with approval of the Management Team/Steering Committee

**Please provide supporting documentation if available.**

- no supporting documents provided -

**Have there been any internal or external reviews or evaluations of the Initiative since 2019?**

Yes

**Please provide a copy of the report, if available.**

- no supporting documents provided -

**Please indicate any GEO Work Programme activities with which you have ongoing collaboration.**

- EO4HEALTH - Earth Observations for Health
- EO4SDG - Earth Observations for the Sustainable Development Goals
- GEO-CITSCI - GEO Citizen Science
- BLUE-PLANET - Oceans and Society: Blue Planet

**Please indicate any additional GEO Work Programme activities with which you would like to establish new collaborations.**

- AFRIGEO - African Group on Earth Observations
- AMERIGEO - Americas Group on Earth Observations
- DE-AFRICA - Digital Earth Africa
- EUROGEO - European Group on Earth Observations
- GEO BON - GEO Biodiversity Observation Network

## **Stakeholder Engagement and Capacity Building**

**Are there specific countries or organizations that your Initiative would like to engage?**

Yes

**Please list these countries, regions or organizations.**

AFRIGEO, AMERIGEO, EUROGEO - we reached out to AOGEO who did not respond to several inquiries - we take this to mean they do not wish to engage with us

**What are your plans to engage them?**

We have established contact - continuing work on stakeholder engagement is planned

**Does your Initiative engage users in the work of the Initiative (for example, consultation, testing, co-design)?**

Yes

**Please briefly describe the Initiative's approach to engaging users.**

We identify stakeholders directly and engage in co-development with them. Regarding later questions on User engagement: We have a communications strategy in final development by Working Group 1 - this will

include user engagement. We can provide it when completed.

**Does the Initiative have a user engagement strategy or similar kind of document?**

Yes

**Please upload it.**

- no supporting documents provided -

**Are there categories of users that are not represented at this time, but you would like to engage?**

No

**Does the Initiative have a documented capacity development strategy?**

No

**Please describe the approach to capacity development that is being implemented by the Initiative?**

Surveys, direct contact, inviting them to be part of GEO AquaWatch

**Are there any commercial sector organizations participating in this Initiative?**

Yes

**Please list the commercial sector organizations.**

Organization name	GEO Member/PO/...	Country in which the organization is based	City in which the organization is based
Google Earth Engine		US	
ESRI (through collabo with GEO Blue Planet)		US	
Deltares	Netherlands	Netherlands	
Kisters	Germany	Germany	
Xylem	United States	US	
EMZIS	Greece	Greece	
Brockmann Consult	Germany	Germany	
CyanoLakes	South Africa	south Africa	

**Are there opportunities for commercial sector uptake of the outputs of the Initiative?**

Yes

**Please describe these opportunities.**

best practices, access to user needs assessments, information sharing, SME networks for questions, access to training.

**Is there already commercial uptake occurring?**

Yes

**Please describe the nature of this uptake and the relevant commercial sector organizations.**

see above

**Are there opportunities for further commercial sector participation in the Initiative?**

Yes

**Please describe these opportunities.**

participation is possible at all levels in GEO AquaWatch

**Does the Initiative have a plan for commercial sector engagement?**

No

## **Governance**

**Please describe the roles of each of the key leadership positions, as well as any team structures involved in day-to-day management.**

To date, AquaWatch active participants are associated with various organizations including state, federal, and international governmental agencies, private consulting companies, nonprofit organizations, nongovernmental organizations and academic institutions. Participants are part of the AquaWatch network and contribute to AquaWatch in a variety of ways depending on their interests and availability. AquaWatch Leadership: The primary leadership point of contact for AquaWatch is Director Steven Greb -University of Wisconsin-Madison.

The co-lead is Paul DiGiacomo - National Oceanic and Atmospheric Administration (NOAA)

Steering Committee: Guidance for, and approval of, workplan activities and expanding into new work areas are the main work product for the Steering Committee. The three roles for members are: promoting the initiative to all sectors, connecting the initiative with funders and funding sources, and garnering broader initiative participation (capacity building). In 2018 the Steering Committee was formed comprised of 9 members of the international science community representing North America, Europe, Africa, Latin America, Caribbean, and Asia; plus the co-chairs of Working groups 2, 3, and 5. Participants range from data users to data providers from the non-profit sector, national space agency, governmental agency, private industry, and academia. Leadership of the Steering Committee rotates through three elected positions each lasting 1 year in duration (Chair, Vice-Chair, and Vice-chair-elect). Annual elections are held from the nominations among Steering Committee members. Steering Committee meetings are held quarterly with an annual meeting.

Working Groups: Currently AquaWatch Working Group representatives have three co-leads including an early career member. Over the coming years, AquaWatch will be working to expand participation in the Working Groups. One co-chair from Working Groups 2, 3 and 5 also serve on the Steering Committee.

Secretariat: The Secretariat scientific coordinator duties are conducted Merrie Beth Neely (Global Science and Technology). Both the Director and scientific coordinator positions are supported part-time through funding provided by U.S. NOAA/NESDIS/STAR Satellite Climate and Oceanography Division. Expansion to include future full-time or part-time positions to conduct Initiative activities under consideration.

**Is there a steering committee or other governance bodies that advise the Initiative but are not involved in day-to-day management?**

Yes

**Please describe the roles of each body. If there are multiple governance bodies, please describe the relationships among them (such as through a governance structure diagram).**

see above

- no supporting documents provided -

**What methods does the Initiative use to communicate with its participants?**

- Email / e-newsletters
- Regular conference calls
- Website
- Regular events
- Other

**Please describe.**

Webinar series. Social media.

**Please describe the key risks that could delay or obstruct the completion of the planned activities and outputs of the Initiative, along with any actions taken to mitigate these risks.**

- no answer given -

**What methods are used by the Initiative to monitor its effectiveness?**

- Informal discussions with users / beneficiaries
- User or beneficiary surveys
- Website statistics
- Consultations or events
- Other

**Please describe.**

DEI metrics (nearing the end of beta testing next quarter). Webinar/meeting/Website/social media analytics, Informal discussions with users / beneficiaries, User or beneficiary surveys. Biennial meetings

**Would the Initiative be interested in assistance from the GEO Secretariat for developing an impact plan?**

Yes

**How are the results of the monitoring and evaluation activities shared with participants and the wider GEO community?**

We have shared results with the engaged GEOAquaWatch Community at biennial meeting through formal presentations and with the Management Team/Steering Committee on a quarterly basis also through formal presentation or shared report.

**Are any monitoring or evaluation activities required by funders/contributors?**

No

**Participants**

**Please list the active individual participants in the Initiative**

First name	Last name	Email address	Member	Org
Arnold	Dekker	arnoldgdekker@gmail.com	Australia	SAT-DEK - Satellite Based Discovery of Environmental Information
Els	Knaeps	els.knaeps@vito.be	Belgium	VITO - VITO
Ils	Reusen	ils.reusen@vito.be	Belgium	VITO - VITO
Thomas	Heege	heege@eomap.de	Germany	- EOMAP GmbH & Co.
Harald	Krawczyk	harald.krawczyk@dlr.de	Germany	DLR - German Aerospace Center
Daniel	Odermatt	daniel.odermatt@brockmann-consult.de	Germany	- Odermatt & Brockmann GmbH
Adrian	Strauch	adrian.strauch@uni-bonn.de	Germany	- University of Bonn
Amos	Kabo-Bah	amos.kabobah@uener.edu.gh	Ghana	UENR, Sunyani, Ghana - University of Energy and Natural Resources, Sunyani, Ghana
Steeff	Peters	steef.peters@ivm.vu.nl	Netherlands	- WaterInsight
Rose	Alabaster	rose.alabaster@gmail.com	Switzerland	WaterLex - WaterLex
Steve	Groom	sbg@pml.ac.uk	United Kingdom	- Plymouth Marine Laboratory
Stefan	Simis	stefan.simis@ymparisto.fi	United Kingdom	- Plymouth Marine Laboratory
Paul	Digiacomio	paul.digiacomio@noaa.gov	United States	NOAA - National Oceanic and Atmospheric Administration
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Bilqis	Hoque		Bangladesh	EPRC - Environment and Population Research Centre
Steven	Greb	srgreb@wisc.edu	United States	
Merrie-Beth	Neely	merrie.neely@noaa.gov	United States	- GEO Aqua Watch

## Other information

**Please provide any other comments or information that was not included in the previous sections, but you would like to appear in the Implementation Plan.**

It would have been helpful to upload website links to convey information in addition to reports. I had to reference the links in the narrative often because links were not enabled. Also our risks did not upload - please see attached document which captures them in the same format as you ask for it here.

- no supporting documents provided -

## Co-Editor Management

### List of co-editors for this initiative

- no answer given -