

**AquaWatch Meeting – Summary and Minutes
German Federal Institute of Hydrology (BfG)
Koblenz, Germany, June 8 – 10, 2016**

Summary

The GEO Water Quality Community of Practice – AquaWatch – held a meeting at the German Federal Institute of Hydrology on June 8 – 10, 2016. Day 1 of the workshop was a joint session with the GEO Integrated Global Water Cycle Observations (IGWCO) community of practice. This session included an overview presentation of AquaWatch, a review of the May GEO Work Programme Symposium and showcase presentations of water quality projects and programmes by AquaWatch members. Day 2 began with overview presentations of related GEO activities (IGWCO, Blue Planet, GEOBON & GEO-Wetlands). This discussion was followed by a review of work packages 1 & 2. The remainder of the day was focused on discussing work package 3 and work package 4. On day 3 of the meeting, Siegfried Demuth (Director for the International Center for Water Resources and Global Change) spoke with the group about possible linkages of AquaWatch with UNESCO and the UN System. There was then a discussion about AquaWatch and the GEO water strategy and linkages with other GEO activities. The group then discussed the status of the community of practice and the possibility of applying to be a GEO Initiative or Flagship. This was followed by breakout sessions for work packages 3 and 4 and a discussion of plans for moving forward. Specific outcomes are summarized below.

AquaWatch as a GEO Initiative: The group expressed unanimous support for applying to be a GEO Initiative next year with the goal of increasing the visibility and status of AquaWatch within GEO.

AquaWatch website and outreach: The current AquaWatch website is limited in functionality and was discussed that finding a new website host would be necessary to expand the website in the future. Brockmann Consult offered to host the website with the layout and content managed by Emily Smail. It was also suggested that CSIRO (the host of the Blue Planet website) should be approached as a potential host for the website. It was agreed that a brochure/2 pager, standard presentation and poster should be produced. Other ideas were also discussed including potential YouTube trainings, an inventory of capacity building activities and the production of YouTube informational presentations. It was decided that working group 5 should meet at the end of August to discuss potential capacity building activities.

AquaWatch functionality: There was a discussion whether or not AquaWatch should produce a water quality data portal and provide information about best practices for water quality data collection and analysis. It was generally agreed that these options should be considered as AquaWatch projects in the future.

Work Packages 1 & 2: Work package 1 (the initiation of the community of practice) has been completed and a first version of work package 2 (the project inventory) has been distributed. The inventory will be a living document that is continually updated and made freely available to the group as a resource. It was discussed that smaller research projects should be added to the

inventory. It was also agreed that it would be helpful for AquaWatch to provide notification of new fit for purpose products and create an inventory of existing capacity building activities for water quality monitoring.

Work Package 3: It was decided by the group that a global turbidity and reflectance product would be produced for work package 3. The product will be a global baseline at 300m resolution for freshwater and coastal areas with the main visible product being turbidity. Where higher resolution data is available, the product will include additional layers with higher resolution information. A work package 3 initiation committee was established and includes Carsten Brockmann, Maycira Costa, Arnold Dekker, Steve Groom, Ghada El Serafy, Andrew Tyler, Thomas Heege and Natascha Oppelt. Community of practice members that were not in attendance at the meeting and are interested in contributing to his committee should contact Carsten Brockmann (carsten.brockmann@brockmann-consult.de) and Emily Smail (emily.smail@noaa.gov). It was also decided that working group 1 (user engagement) should work to identify user requirements for turbidity and reflectance (using the GCOS requirements as a model) to ensure that the product meets user needs. Community of practice members that are interested in contributing to this effort should contact Carsten Brockmann (carsten.brockmann@brockmann-consult.de) and Emily Smail (emily.smail@noaa.gov).

Work Package 4: The group discussed that a sizeable component of the AquaWatch community is currently producing products that can be used as example demonstration projects. The importance of identifying the question that is answered by prototype projects and involvement of users was also discussed. End users were discussed, with the conclusion that users of a global product are generally less interested in near real time data with local users being more interested in near real time information and forecasting. Discussion of what components an AquaWatch prototype project should include resulted in the conclusion that prototype projects should include in situ, remote sensing and modeling; identify potential end users and accuracy requirements; and identify a timeline for data delivery. It was decided that the AquaWatch community should be asked to submit descriptions of prototype projects for a showcase to help spur interest and funding for the development of new AquaWatch projects. Andrew Tyler volunteered to create a project submission template that will be reviewed by a review team. Workshop volunteers for the review team include Vandra Brotas, Siegfried Demuth, Steve Greb, Wolfgang Grabs, Peter Hunter, Ils Reusen, Philipp Saile, Emily Smail, Andrew Tyler, Nicki Villars, Steve Groom, Daniel Odermatt, Damien Bouffard, Arnold Dekker and Ghada El Serafy. AquaWatch members that were not in attendance and would like to join the review team should contact Andrew Tyler (a.n.tyler@stir.ac.uk) and Emily Smail (emily.smail@noaa.gov).

Siegfried Demuth (Director for the International Centre for Water Resources and Global Change) offered to announce at the upcoming UNESCO intergovernmental council meeting that AquaWatch is working to provide example case studies of using new technologies for water quality analysis and will be preparing example case studies. Dr. Demuth gave an example of a booklet that was produced on land glaciers for UNESCO that was positively received. It was decided that the first project for work package 4 would be to compile a booklet of case studies with the hope that UNESCO and/or other parties may request and fund new projects similar to those of the case studies.

Actions

Action #	Action Description	Responsible Party	Goal Completion Date
8	Look into AquaWatch town hall at Ocean Optics	Emily Smail/Maycira Costa	July 1, 2016
5	Production and distribution of project prototype project submission template and for Work Package 4 brochure	Andrew Tyler	July 8, 2016
1	Workout plans for new website	Emily Smail/Steve Greb/Paul DiGiacomo/Arnold Decker	July 15, 2016
2	Set up a meeting for Working Group 1 to discuss user requirements for a turbidity & reflectance product	Emily Smail/Carsten Brockmann	July 29 , 2016
6	Send suggested list of Steering and Advisory Committee members to the AquaWatch group	Emily Smail	July 29, 2016
2	Production of standard a brochure/2 pager, presentation and poster	Emily Smail/Steve Greb/Paul DiGiacomo/Arnold Decker	July 30, 2016
4	Schedule meeting for Work Package 3 initiation team to discuss strategy	Emily Smail/Steve Greb/Paul DiGiacomo/Arnold Decker	July 30, 2016
7	Send invite letters to Steering and Advisory Committee	Emily Smail/Steve Greb/Paul DiGiacomo/Arnold Decker	August 12, 2016
9	Schedule working group 5 meeting to discuss capacity building	Emily Smail with support from Working Group 5	August 22, 2016
9	Review of prototype project submissions	Work Package 4 initiation committee	October 1, 2016
10	Select projects for pamphlet and work with Siegfried Demuth to arrange graphics	Work Package 4 initiation committee	November 1, 2016
11	Draft pamphlet circulated to community for review	Work Package 4 initiation committee	December 20, 2016
12	Pamphlet produced	Work Package 4 initiation committee	February 6, 2017

AquaWatch Attendees

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Siegfried Demuth	International Centre for Water Resources and Global Change	demuth@bafg.de

Minutes – Wednesday June 8th Afternoon

Presentation summaries for the Wednesday afternoon joint IGWCO session will be provided in the IGWCO meeting report.

Minutes – Thursday June 9th

IGWCO – Rick Lawford

Presentation: Rich Lawford (Morgan State University) presented on the Integrated Global Water Cycle Observations (IGWCO) Community of Practice (CoP). Below is a summary of his presentation:

The CoP works to coordinate the GEO water task, incubate new ideas, contribute to the assessment of the GEO water task, coordinates and developed the GEOSS water strategy, works to develop user interaction for GEO water and works to facilitate information exchange for water activities. Over the past year, the IGWCO CoP has worked to support the development of the GEOGloWS initiative, worked to implement the GEOSS Water Strategy, provided inputs to the CEOS Water Strategy Implementation Study Team (WSIST) and provided review of the water activities in the 2016 geo work plan. There has been some feedback from GEO that there are too many water community activities. There has been an effort to consolidate some of these. The GEOGloWS initiative has also invited water activities to become affiliated with the initiative. IGWCO is considering being listed as a “GEOGloWS affiliate” in the GEO work programme. Moving forward, IGWCO will continue to oversee the GEOSS water strategy implementation. IGWCO is also looking to increase the contributions of in situ measurements to GEO water activities and strengthen IGWCO for long term sustainability.

Discussion: The relationship of AquaWatch with GEOGloWS was discussed. Emily Smail explained that there have been discussions with Angelica Gutierrez and Bradley Doorne of GEOGloWS where it was agreed that AquaWatch would collaborate with GEOGloWS on their water quality interests but would remain a separate group.

Blue Planet – Emily Smail

Presentation: Emily Smail (NOAA-affiliate/Blue Planet Secretariat/AquaWatch Secretariat) presented on the GEO Blue Planet initiative. Below is a summary of her presentation:

The goal of Blue Planet is to bring together and leverage existing Earth observation and user engagement work in marine, coastal and large inland water body environments to enable informed policy and operational decisions and contribute to sustainable development goals. The Blue Planet Initiative has three major objectives:

Objective 1: Provide foundational support across the ocean observing and broader user communities by supporting and linking partners:

Objective 2: Identify and articulate user needs and gaps in meeting these needs and work with observing (in situ and earth observing) programmes to develop and demonstrate end-to-end services in the following service areas:

Objective 3: Provide sustained ocean observing information services to underpin policy-relevant regional and global ocean assessments.

GEO Blue Planet will work to galvanize the ocean observing community and produce end-to-end services that support GEO's sustainable benefit areas. The Initiative will be organized into Foundational and Service Components.

- **Foundational Components** represent the infrastructure, data collection, data processing and engagement mechanisms that are needed to produce end-user oriented services. These components will consist of working groups from existing organizations and associated projects in the ocean observing community and will link to and collaborate with GEO Foundational Tasks.
 - Component 1 – User Engagement
 - Component 2 – Sustained Ocean Observations
 - Component 3 – Ocean Forecasting
 - Component 4 – Data Access and Visualization
 - Component 5 – Developing Capacity and Societal Awareness
- **Service Components** will rely on the Foundational Components to develop and deliver end-to-end-services. It is envisioned that services that are associated with a specific policy mandate will evolve into GEO Flagships.
 - Component 6 – Services for Coastal Communities
 - Component 7 – Healthy Ecosystems and Food Security
 - Component 8 – Services for the Blue Economy
 - Component 9 – Maritime Services

Proposed activities for each of the service components were described with AquaWatch being affiliated with the “Services for Coastal Communities” component and can be supported by the work of the Blue Planet Foundational Components. Over the next year, Blue Planet will work to transition to a new governance structure and engage and increase participation from the community. Over the next 3 years, Blue Planet will work to develop end-to-end services and increase communication and coordination within the ocean observing community and with end users.

Discussion: The relationship of AquaWatch was discussed. AquaWatch will be affiliated with Blue Planet in a similar manner as GEOGloWS where water quality needs for Blue Planet projects will look to AquaWatch and resources from Blue Planet will be made available to support AquaWatch efforts.

GEOBON & GEO-Wetlands – Adrian Strauch

Adrian Strauch (University of Bonn, Germany) presented the GEO-Wetlands Initiative. Below is a summary of his presentation:

The GEO-Wetlands Initiative is a newly proposed GEO-Initiative that is strongly related to many activities of the IGWCO as well as the new AquaWatch water quality community of practice. GEO-Wetlands can be seen as an interface initiative mainly between the water, biodiversity and ecosystems parts of GEO. Therefore, it will be essential to immediately build and maintain efficient links to all of these other groups. Because of its multidisciplinary approach, and the general nexus character of wetland ecosystems, it has a great potential of linking existing and new initiatives and activities like e.g. GEO BON, IGWCO, GEOGLOWS, AquaWatch and GEO ECO, just to name a few.

GEO Wetlands is supported by the Ramsar Convention on Wetlands and resourced mainly through several currently ongoing projects (EU H2020, ESA, JAXA, DLR). Its implementation plan is being developed by a diverse global partnership of academia, NGOs, companies and agencies/conventions lead by the University of Bonn (Germany), the Ramsar Convention Secretariat (Switzerland) and Wetlands International (Netherlands). The overarching goal of GEO-Wetlands is to set up and maintain a Global Wetlands Observing System (GWOS) as a sustained service based on the requirements and needs of the global wetlands community. To reach this goal, main tasks of the initiative will evolve around engaging the wetlands and EO communities (scientists, developers, users, stakeholders) within a co-design and co-creation process, securing long-term funding and stakeholder support, building capacity as well as providing tailored information and products to the wetlands user community on different levels (local to global).

Work Package 1 & 2

Presentation: Emily Smail presented on work package 1 and 2. Below is a summary of her presentation:

Work package 1 (the initiation of the community of practice) has been completed and a first version of work package 2 (the project inventory) has been distributed. The current version of the work package includes in situ and remote sensing projects and freshwater and coastal projects. The inventory includes preoperational and operational services, on demand client services, data collection efforts and water quality databases. Of the 41 projects, 17 are global, 9 are U.S. based, 11 are Europe based, 2 are based in Africa, one is based in Brazil and one is based in Canada. The inventory is mainly focused on large projects.

The inventory will be a living document that is continually updated and made freely available to the group as a resource on the AquaWatch website. AquaWatch members are encouraged to send suggestions for additional projects or changes to the type of information included in the inventory.

Discussion: It was discussed that smaller research projects should be added to the inventory. AquaWatch members were encouraged to submit additions to the inventory, including small

projects and more projects from developing countries. It was also agreed that it would be helpful for AquaWatch to provide notification of new fit for purpose products and create an inventory of existing capacity building activities for water quality monitoring. It was also mentioned that it would be helpful for AquaWatch to provide notification of new projects that become fit for purposes.

General Discussion

There was a general discussion about AquaWatch roles. The possibility of AquaWatch facilitating the production of a water quality data portal was discussed. Emily Smail explained that GEO is developing a new portal that looks promising and that they will be providing their software for the production of community portals and that this may be a resource for producing a water quality portal in the future. The group also discussed the possibility of AquaWatch providing information on best practices for data collection and analysis for water quality. It was agreed that this should be discussed further and explored in the future.

Work Package 3 Discussion

The goal of work package 3 is to develop preliminary, visible demonstration products of water quality parameters.

The work package 3 discussion was facilitated by Carsten Brockmann and was organized around three major questions. In general, it was discussed and agreed that the project selected for work package 3 should be a baseline product that enhances rather than infringes upon the ability of other people to develop products.

What is already available?

It was discussed and agreed that the baseline product should focus on producing something that is not currently being provided somewhere else or provide information in a way that is not currently being provided by others. Parameters including water color, water leaving radiance and water temperature were discussed. Steve Groom proposed reflectance as a parameter because it has international standards and requirements and would allow for upstream/downstream products.

There was an agreement that the first step for work package 3 should be to work on products such as reflectance and turbidity that are used for more complex analysis such as identification of eutrophication. It was agreed that the objective of a selected baseline product is to show an example of something we have confidence in and can demonstrate quickly. It was then decided that the end product should be turbidity. Examples of available turbidity products were given including an example in Africa by Mark Dowell, lakes (i.e. Globalakes) by Andrew Tyler and the Amazon by Maycira Costa. It was discussed that reflectance is used to determine turbidity and should be included in the product for users that are interested in that data. There was then some discussion about uncertainties and it was agreed that uncertainties will need to be added to the products.

Who are the users and what do they need?

The group discussed that users typically need information about eutrophication, sediment loads and potential light availability. It was pointed out that users also need dissolved oxygen and total nitrogen and phosphorous. The group discussed that it is important to match user needs with parameters that can meet those needs and move forward from there. Sara Walker pointed out that users such as water managers will use products such as eutrophication and not a scientific upstream product like turbidity.

The types of users for a global baseline product were then discussed with a focus on the relationship with a global baseline product to international policies such as UFGCC, GCOS and RAMSAR. It was mentioned that if we are going to aim to address global conventions that it would be important to engage with those groups and identify their requirements early on to ensure that the proposed work is in line with what conventions need. Mark Dowell explained that for the GCOS lakes essential climate variable (ECV), they conducted a mapping exercise to identify requirements. He volunteered to join the user engagement group and it was decided that Carsten Brockmann would lead an effort within the user engagement working group to cross check conventions and discussed proposed products with user groups to ensure that the proposed project will meet user needs. Arnold Dekker also put together a list of international water quality activities, programs etc. that can be approached by the user engagement group.

What are the time scales and measures of success?

The time scale of the product was discussed. The need for real time data vs. historical data was discussed and it was stated that big international groups (UNEP, SDGs) typically are not looking at real time data.

Standardization was also discussed with an open ended question for further discussion of – should we create a working group on standardization as a specific task for one of the working groups? Philipp Saile weighed in on the standardization question with information about GEMStat. Philipp stated that GEMStat data collection in the past has been opportunity driven. He mentioned that GEMStat could look into gathering more specific parameter information but that what exactly is needed needs to be clarified. Reference data was then discussed. It was decided that in order for the product to be successful, we will need to specify what reference data is needed (location, temporal availability, etc.) and link authoritative data sources. Daniel Odermatt discussed the SPONGE project as an example stating that many regional sources have different methods for providing chlorophyll etc. and that we may need to define multiple standards based on the collection approaches that are available. Overall, it was agreed that getting consistent data over time is important and that getting existing stations to change methods may be challenging but that there may be opportunities to clarify collection methods for developing countries. It was agreed that we will need to make the product useful for various collection methodologies.

There were concerns about the success of the project with a lack of funding. It was agreed that producing example products may be a way to help secure funding and that we may also need to look for upcoming RFPs.

Conclusions

It was concluded that a global turbidity and reflectance product would be produced. It was discussed that remote sensing can help fill in gaps and fill in wholes for global assessments and that the main output for the turbidity/reflectance product would be a remote sensing product. There was also a discussion that the product should be linked with capacity building.

It was agreed that the global product would have a resolution lower than 1km and that the main visible product would be turbidity. In areas where time series or higher resolution information is available, this should be incorporated. Thomas Heege stated that EOMAP may have software available for mapping the data. It was discussed that the product could be used to showcase what information can be gleaned from the information.

To move the project forward, an initiation committee was created consisting of Carsten Brockmann, Maycira Costa, Arnold Dekker, Steve Groom, Ghada El Serafy, Andrew Tyler, Thomas Heege and Natascha Oppelt. The committee will put together an action plan for developing the global turbidity and reflectance product with the group tasks including:

- Developing an overall plan for the work package with identification of what is needed and establishment of an overall plan by October. The plan should include an analysis of what can be done without funding and a determination of if funding is required to move forward.
- Identify what is being produced and is available from current work and determine what is feasible with what is available.
- Identify a timeline
- Identify tasks for the working groups to undertake (example: interactions with users, capacity building, etc.)
- Determine product specifications including time scale

Working group 1 (user engagement) was tasked with developing a user requirements document using the GCOS requirements as a model. This project (to be led by Carsten Brockmann, Ghada El Serafy & Mark Dowell) will determine what resolution is required and what temporal time scales are required. It was mentioned that these may vary for rivers vs. other water bodies, UNFCCC requirements etc.

It was overall agreed that the broader AquaWatch community should be allowed and encouraged to contribute to the work package 3 initiation committee and the working group 1 user requirements mapping exercise.

Work Package 4 Discussion

The goal of work package 4 is to develop prototype projects that ultimately demonstrate the use of water quality data and information in management and decision making.

The work package 4 discussion was facilitated by Andrew Tyler who mentioned that there is a sizable component of groups that are producing demonstration projects. A series of questions for the development of prototype projects were presented:

- What is included in the prototype project?
- What question is answered by the demonstration?
- Is user feedback included?
- How do we define end-to-end?
- Does this link to work package 3?
- What are the measures of success?
- How accurate does the product need to be to be useful?
- Will there be only historical & descriptive work or should we focus on near real time information and forecasting?
- Where do models fit into this work package?
- Should the focus be on well-studied parameters or should we include other parameters as well?

Users needs were discussed with general agreement that users of global products are not as interested in near real time information and that local users are more interested in near real time products and forecasting. Types of users were identified as scientists, regulators and the commercial industry. A commercial example of aquaculture was given and it was discussed that aquaculture facilities have a need for near real time information and forecasting. It was agreed that because of this – modeling will be important for these types of users and it was decided that the prototype projects should have a goal of linking in situ, remote sensing and modeling.

Arnold Dekker gave an example of user interaction challenges with a Great Barrier Reef project: The Great Barrier Reef management made a decision to limit TSM and nutrients. They decided they wanted a water quality index that used chlorophyll and TSM and binned values as very poor, poor, etc. In 2014, NASA release SeaDASs data that was used to improve the analysis. With the new algorithm, a previously analyzed value changed to a different index binning category. However, this would not have been an issue had the government not removed error bars on the plots. Regardless, they used this binning change as rational for viewing remote sensing as being unreliable. It took a lot of conversation with the government for them to understand the issues.

Example prototype projects were then discussed. Arnold Dekker gave an example of a Great Barrier Reef project that includes a biogeochemical/hydrodynamic model component. Steef Peters mentioned a North Sea project that is a collaboration with Deltares that could be developed but would need remote sensing to be automatically provided as well as provider for turbidity, TSM or chl a. Maycira Costa gave an example of an active project in the Amazon that is looking at river turbidity where the end user is planning to use the information to advise the government on the status of Amazon turbidity. Peter Hunter gave the example of an emerging collaborative project with Globolakes and the CLEAT project in Lake Tanganyika that is looking at capacity building to see how the lake is changing and causing impacts to fisheries. He mentioned that those involved in this project may be willing to change their data collection to

validate remote sensing information. Carsten Brockmann gave an example of wetland Africa projects. Thomas Heege mentioned that he has several inland monitoring and river projects that could be examples but that he would need to check with his clients to verify if they are willing to share that information.

The discussion then turned to how best to showcase projects and give a high level overview of examples for decision making. There was also a discussion on if future prototype projects should use work package 3 and it was agreed that this would be desirable.

Conclusions

It was decided that requirements for proposed projects should:

- Use in situ data, remote sensing and modeling
- Identify potential end users and information and accuracy requirements
- Establish a timeline for data delivery

It was agreed that the AquaWatch community should be invited to submit proposed projects for showcasing. Andrew Tyler agreed to make a project submission template that would be distributed to the community with a submission deadline of September 1st. There would then be a review team to select projects to be highlighted. The review team will review and select projects by October.

Metrics of success for this effort were identified as:

- The number of case studies increasing
- Scalability and adoption of case studies by other groups/regions
- Increases of funding for these types of projects
- Increased use of highlighted projects

General discussion

The group then engaged in a general discussion of AquaWatch which resulted in some open ended questions for future discussion:

- Does AquaWatch develop the water quality monitoring and forecasting as a service or do we encourage the development of these tools?
- Do we move forward as an initiative where the group works on other issues like availability and consistency of data for inland waters, estuaries and coastal waters?

The governance structure was then discussed. It was agreed that the goal of the governance structure should be to support a progression similar to GFOI or GEOGLAM where involved agencies/governments advocated for funding. It was agreed that members of the Steering and Advisory Committee should include representatives from UNEP Water, World Bank, UNESCO, WRI, and UN Water. Sara Walker of the WRI agreed to be on the committee. It was decided that for building the Steering and Advisory Committee – Emily should a list of suggested groups/individuals to the AquaWatch community and request feedback.

Action items for moving forward included the production of an AquaWatch brochure/2 pager, a standard PowerPoint and a standard poster. It was suggested that we could consider making a booklet with project examples similar to a JAXA pamphlet. The JAXA pamphlet was made to highlight the use of remote sensing to benefit society. It was also suggested that an AquaWatch poster should be displayed at world water week. It was also discussed that it would be useful to have an inventory of proposals that are being submitted by the AquaWatch community that reference AquaWatch.

The website was then discussed. Steve Greb explained that if we want to add functionality/expand the website, that we will need to find another host for the website. Carsten Brockmann offered to physically host the website with his company. It was also discussed that the group should first check with CSIRO (who are hosting the Blue Planet website) to see if they would host the website.

A discussion followed on whether AquaWatch should pursue status as an initiative or flagship within GEO in the future. It was agreed that being an initiative or flagship would likely give AquaWatch some visibility. It was explained that the deadline for application to be a flagship or initiative for this year has passed (May 30) but that the group can pursue this option next year.

Outreach and capacity building were then discussed. Outreach examples given included the RSRC remote sensing toolkit form the University of Queensland. Arnold Dekker suggested potentially asking them to expand to include inland waters. Capacity building activities were discussed including training available by the Canadian Space agency. Other ideas were also discussed including potential YouTube trainings, an inventory of capacity building activities and the production of YouTube informational presentations. It was decided that Andrew Tyler & Emily Smail should work to schedule a meeting for working group 5 at the end of August to discuss potential capacity building activities.

The group reviewed the GEO activity definitions (below) and voted unanimously to proceed with submitting and Implementation Plan for consideration of AquaWatch as an initiative within GEO next year.

GEO Initiatives allow Members and Participating Organizations to coordinate their actions and contributions towards a common objective within an agreed, yet flexible framework. They develop and implement prototype services according to GEO priorities and have identified committed resources to a certain extent. GEO Initiatives may, for example, demonstrate technical feasibilities through pilot services, or serve a user need.

GEO Flagships allow Members and Participating Organizations with a policy-relevant mandate to spin-up a dedicated operational service serving common needs and/or well-defined user groups. They develop and implement near-operational services according to GEO priorities and are fully resourced. GEO Flagships may operate for as long as they are able to generate sufficient impact to attract support for their activities. Once they reach a mature, operational stage, they may be taken up by operational organizations (e.g. GEO Participating Organizations), for their continued operation over the long term.

GEO Community Activities allow stakeholders to cooperate flexibly in a bottom-up fashion and with a low initiation cost. They can include a broad variety of activities with varying degrees of coordination. GEO Community Activities may, for example, define user needs, explore new frontier applications or demonstrate technical possibilities, or agree on specific observation or analysis protocols and data exchange.

GEO Foundational Tasks allow GEO to implement selected, often enabling, tasks to achieve GEO Strategic Objectives. These include coordination actions, gap analyses, the implementation of technical elements for accessing GEOSS, and other routine operations of the GEO Secretariat. Thus, they provide important support functions to Flagships, Initiatives, and Community Activities.

It was agreed that a statement about AquaWatch applying to be an initiative in 2017 will be added to the AquaWatch GEO Work Programme summary and also highlighted on the website.

The possibility of a town hall at Ocean Optics in October was then discussed. Maycira Costa stated that it looks like lunch time on October 24th may be the only options. Emily Smail was tasked with following up on this possibility.

Minutes – Friday June 10th

Discussion with Siegfried Demuth

Siegfried Demuth – Director for the International Center for Water Resources and Global Change spoke to the group about possible linkages with UNESCO and the UN System. He explained that the German Federal Institute of Hydrology (BfG) is charged with helping UNESCO implement their water tasks. He explained that UNESCO has several water project areas including capacity building and is particularly interested in Africa and gender equality. Dr. Demuth mentioned that BfG is also working to provide the information for the monitoring and reporting of SDG 6.3.2. He further explained that there is an international initiative on water quality within the UN system and that Philipp Saile is on their steering committee. He explained that the group has been fairly dormant and that AquaWatch may be able to jumpstart this initiative.

Dr. Demuth suggested 3 ways in which AquaWatch could contribute:

1. Through the production of case studies
2. By assisting with the report on World Water Development – particularly on the area of how new technology (e.g. remote sensing, etc.) could help with water quality monitoring
3. By getting involved with the EU Switch-on program that works to develop web based tools for environmental monitoring

Dr. Demuth went on to explain that it would be important for AquaWatch to identify the audience of any products and information that are produced and that an advantage to working

with the UN system includes having direct contact with stakeholders. He stated that specific groups to potentially interact with include UNESCO, UN Water, WMO and FAO. He added that FAO is particularly interested in the water-food-agriculture-climate nexus and are interested in new technologies and are also responsible for the implementation of the GEF and the Green Climate program.

Dr. Demuth went on to suggest that it may be helpful for the group to inventory hot spots for case studies (such as China, India and Latin America) and produce 5-10 case studies. He offered to present at an upcoming UNESCO intergovernmental council in June that AquaWatch is working on producing information about case studies using new technology for water quality analysis that will be presented at the next council meeting.

Wolfgang Grabs encouraged the group to look at the link between water quality and quantity. He informed the group that the WMO often gets requests for water quality analysis and that Germany (via him) can speak up at an upcoming meeting about water quality issues.

The group then discussed the Steering and Advisory Committee and Dr. Demuth offered to provide suggestions for individuals to serve on the committee. Dr. Demuth then gave an example of how interactions with UNESCO can lead to request for projects. He described that Namibia approached UNESCO about a water quality monitoring project and that this led to the development of water quality monitoring in Namibia.

Steeff Peters then asked about advice on how to show case studies and provide information that is useful in order to make connections. Dr. Demuth gave an example of a climate change booklet that was produced for looking at the impacts of climate change on water in the Andes. For this project – the government had requested information that would be readable for politicians. The result was a booklet with glacier satellite images with a description of the methodology used to analyze the glaciers and a description of what the methodology can do. He suggested that an option would be for AquaWatch to produce a booklet with case studies with descriptions of what was measured and what that type of information can be used for. He noted that the target audience will not be interested in the technical aspects but need basic information about what monitoring technologies. He then stated that he has a good graphic designer who could help with the production of such materials.

Work package 3 breakout

Steve Groom started out the discussion by explaining that Global Lakes will be producing daily images from MERIS at 300m and that – depending on areas – all lakes will be processed by Global Lakes. Carsten Brockmann and Steve Groom explained that the Copernicus global land service can provide a turbidity global product of 300m to 1km with 10 day averages for lakes using MERIS. He further explained that in September the project will have turbidity and that in December they will also have trophic state and trophic reflectance information. Arnold Dekker noted that he may have validation data available to support this project.

There was then a discussion of Sentinel 3 where it was stated that near real time data will be available in December of 2017 that will be operational starting in October of 2017 at 1km and 300m for turbidity and radiance/reflectance and trophic state. Arnold Dekker stated that in Australia – there will be Landsat analysis for total turbidity with similar techniques being applied in Cambodia and Kenya. He stated that the project will be an example of how to analyze with Landsat and that his project will also start to incorporate Sentinel 2.

Steeff Peters then discussed possible other projects such as cyanobacteria and algal pigment analysis, giving an example of a project he is working on in lakes and the North sea with Deltares where they are analyzing floating layers of cyanobacteria using models, in situ data and remote sensing. Arnold Dekker stated that CSIRO is doing similar modeling for cyanobacteria. It was agreed that a project like this may be pursued in the future but that we should stick with a simple turbidity project to start.

The conversation was then focused on how to proceed with producing a global product. Maycira Costa noted – as an example – that there is temporal data in Brazil that has already been analyzed but that it is not all inclusive. It was also noted that the group might be able to use the global Landsat archive but that the data has not been atmospherically corrected for water. Steeff Peters made a suggestion that we do proof of concept for regions where data exists and put together a “project of projects”. It was noted that EOMAP has a project in the Mekong delta that may be appropriate and that Thomas Heege should be approached about this data.

Available data was then discussed and was determined to include lakes, coastal waters (including estuaries) with an example of continental coverage (Australia). Steve Groom mentioned that has been working on some estuaries, including the Thames, but that we will need to look at other projects. Arnold Decker mentioned that he has a 30 year data set that might be helpful for validation of estuary analysis. Wolfgang Grabs mentioned a project in the arctic that is looking at interactions of freshwater and marine areas that would be of interest.

The group then discussed the spatial and temporal resolution of the product. Carsten Brockmann suggested that we make the product a 300m global product. Steve Groom explained that for a global product – 300m using Sentinel gives you a usable signal to noise ratio. In addition, he explained that a product further from 300 m would exclude many inland waters. Maycira Costa brought up the point that there may be an issue with having to reprocess data that was processed at other scales. Guangming Zheng suggested that we make a global map at the 300m scale and add additional layers with a zoom in tool for areas that have higher resolution data. This was agreed upon by the group. Steeff Peters stated that ideally, the map would not be static.

The overall conclusion was that a 300m global baseline product for lakes, large rivers, estuaries and coastal areas would be produced with higher resolution in appropriate areas.

Work package 4 breakout session

In this session, chaired by Andrew Tyler, the group discussed the development of an action plan to deliver local/regional end-to-end prototype project demonstrations.

The group reviewed the work package description, summarized and refined the requirements for the end-to-end projects demonstrations to ensure that they:

1. Focus on one or more parameters of water quality
2. Examples are included from developed and developing countries
3. Should include inland and coastal waters
4. Should demonstrably impact practice, policy and/or quality of life
5. Should, where possible be user-driven and/or demonstrate where there was a technology push
6. Exploit and/or implement a combination of remote sensing/in-situ and modelling technologies
7. Ideally the data should be available for capacity building and educational product development (WP5)

The group discussed a number of possible examples and some of the issues that might be involved in delivering these examples. Where the demonstration products are driven by the end user, it was agreed that a measure of accuracy (end-user requirements) would be desirable and a demonstration as to how this would be met. It was agreed that the examples would be presented on the GEO AquaWatch web page and a glossy hard copy production would be produced with the assistance of BfG.

Summary of Actions and Deadlines

It was agreed that a form will be developed which would be sent out to the community to seek suitable examples for the demonstration projects. A small group of volunteers agreed to work together to review and prioritize the examples that are submitted.

1. A review panel was formed to review the examples put forward for demonstration projects
 - The review panel includes: Vandra Brotas, Seigfried Demuth, Steve Greb, Wolfgang Grabs, Peter Hunter, Ils Reusen, Philipp Saile, Emily Smail, Andrew Tyler, Nicki Villars, Steve Groom, Daniel Odermatt, Damien Bouffard, Arnold Dekker and Ghada El Serafy
2. The key points for the submission form were discussed
3. Form to be developed by Andrew Tyler and circulated by June 14th
4. Comments from the review panel by June 17th
5. Final form available – June 24th. Note that it was subsequently agreed to make this form available electronically (google forms).
6. Electronic Form to be circulated by Emily Smail – July 7th
7. Deadline for submission of examples – September 1st
8. Review of Examples – October 1st
9. Collation of material web pages and brochure – November 1st
10. Draft Brochure to be available by – December 20th
11. Comments on Draft Brochure – January 20th

12. Final Production – February 6th

Wrap up discussion

Wolfgang Grabs began the wrap up discussion by giving an overview of AquaWatch's relationship with the IGWCO community moving forward. He stated that it would be important for AquaWatch to maintain linkages with IGWCO and support implementation of the GEOSS Water Strategy. It was also discussed that AquaWatch can support GEOGloWS water quality activities. Dr. Grabs also suggested that AquaWatch could be a support partner to the GEMS Water program by providing expertise and providing a scientific backbone for using new technologies within GEMS Water. He added that AquaWatch could work with GEMS Water to contribute to UN Water.

Steeff Peterson then mentioned that the community should support optical ground sensor information that is related to water leaving radiance and is valuable data. Guangming Zheng added that optical ground sensors could be used for validation.

The conversation then focused on how to work with GEMS Water. Philipp Saile added that the group will need to provide more information about what type of data they need to be supplied. Steeff Peters mentioned that it would be helpful to have a central area for retrieving data on water leaving radiance and that this could perhaps be a good project for the group.

Siegfried Demuth explained that GEMS Water is aiming to have a global water database that is linked to other databases to supply information – or produce a global water portal. He explained that GEMS water is looking to evolve their database and is interested in discussing its evolution. It was discussed that training for data collection and reporting will be important.

Peter Hunter suggested that it may be helpful for GEMS Water to link to LIMNADES. He explained that LIMNADES is looking into being open access as it was originally only accessible for contributors. There was a suggestion to link LIMNADES to the Ocean CCI and perhaps produce a portal that incorporates all of these databases. It was then decided that it would be helpful to provide linkages to these services on the AquaWatch website.

The group then reviewed the conclusions for the work package 3 and 4 breakouts and assigned Carsten Brockmann as the point of contact for work package 4 and Andrew Tyler as the point of contact for work package 4.