Implementation of the GEOSS Water Strategy

Rick Lawford

10th Annual IGWCO Meeting
Tokyo, Japan

May 30, 2014

How can a broad topic like water be focused so it can develop meaningful goals and user groups? The strategy sets priorities for users.

1. Addressing water security and sustainable development
2. Supporting the climate change adaptation agenda.
3. Warning systems for hydrometeorological hazards.
4. Enhancing human and environmental resilience
5. Addressing the Water-Energy-Food nexus issues.
6. Improving the welfare of the poor in developing countries through more effective use of water management information.

Options for User Needs Definition and User Engagement

- Review of studies of user needs to derive criteria for data needs.

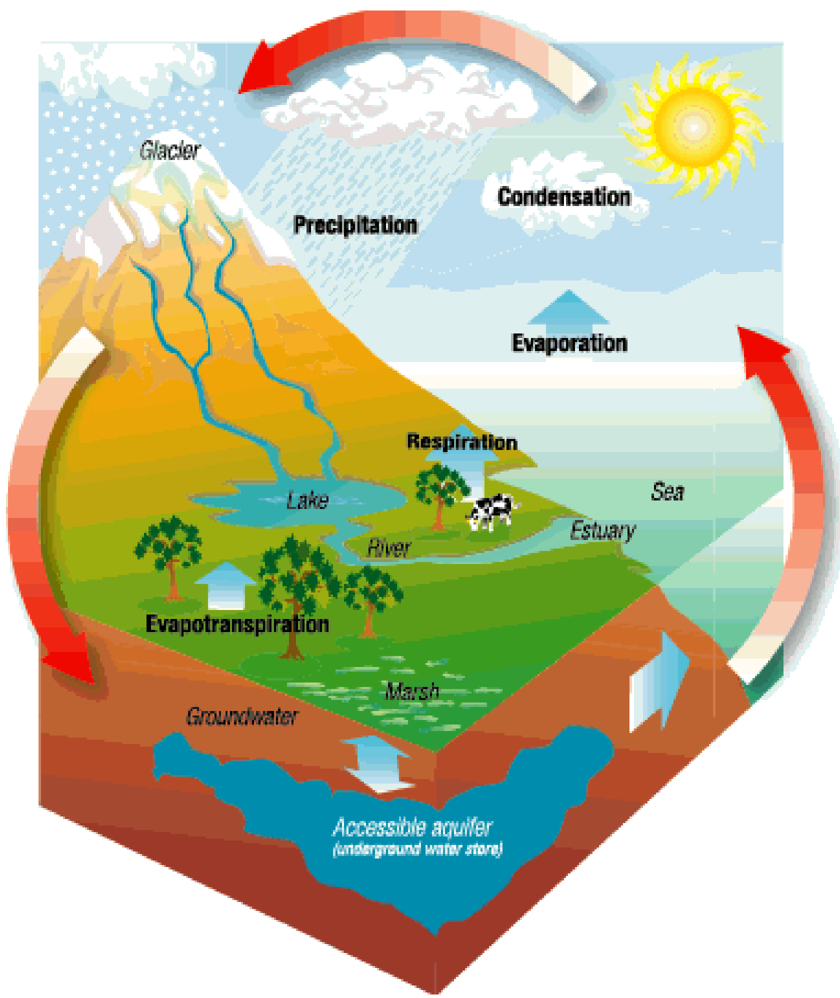
↓

- Engage with users of data products to assess how suitable and meaningful products are before making them operational.

↓

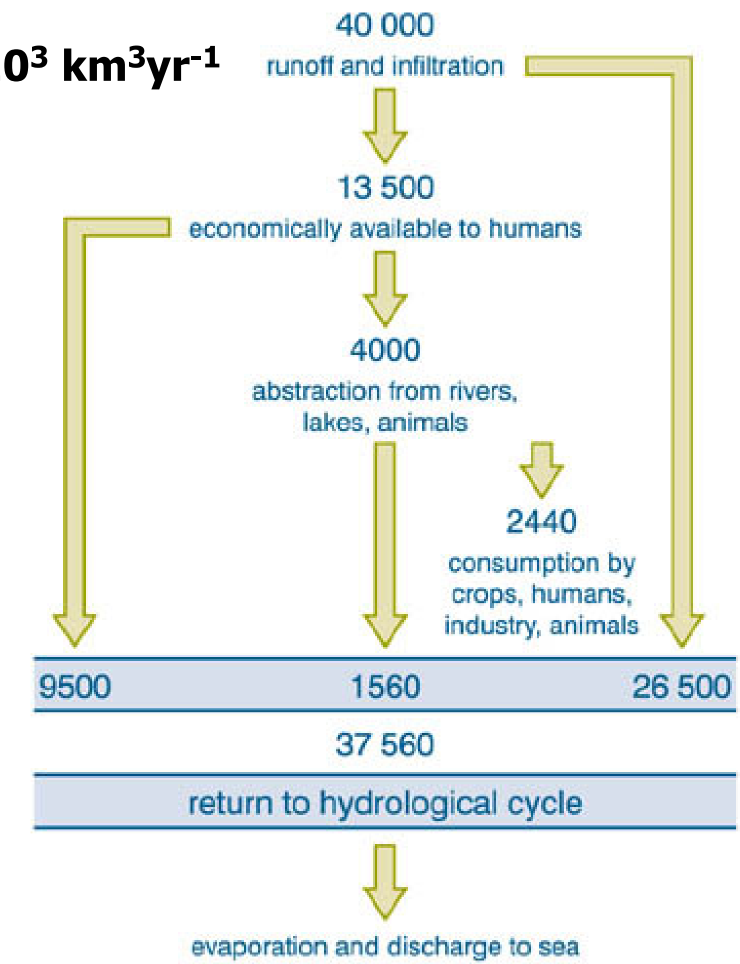
- Co-design products with users.

Data requirements depend on water data use



As an element of the natural system

$10^3\ km^3yr^{-1}$



(courtesy of Massimo Menenti)

As a contribution to economic productivity

The Provisional Essential Water Variables

Primary EWVs	Supplemental EWVs (Apply to Water and other SBAs)
Precipitation	Surface meteorology
Evaporation and evapotranspiration	Surface and atmospheric radiation budgets
Snow cover (including snow water equivalent, depth, freeze thaw margins)	Clouds and aerosols
Soil moisture/temperature	Permafrost
Groundwater	Land cover, vegetation and land use
Runoff/streamflow/river discharge	Elevation/topography and geological stratification
Lakes/reservoir levels and aquifer volumetric change	surface meteorology
Glaciers/ice sheets	Surface and atmospheric radiation budgets
Water quality	Clouds and aerosols
Water use/demand (agriculture, hydrology, energy, urbanization)	Permafrost

Cross-Task Activities to be developed in the new strategy:

1. Water-Biodiversity monitoring of wetlands
2. Earth Observations and the Water-Energy-Food Nexus
3. Use of EO data for monitoring Sustainable Development Goals for water and water-related topics
4. Water and water-borne diseases
5. Renewable energy from freshwater

Water and Sustainable Development:

Water is the entry point for Sustainable Development (SD) and the Green Economy. Without water security it will not be possible to realize these SD Goals and to cope with the wide range of economic and social risks that will arise from climate change, disasters and manipulation by humans of the Earth's surface.

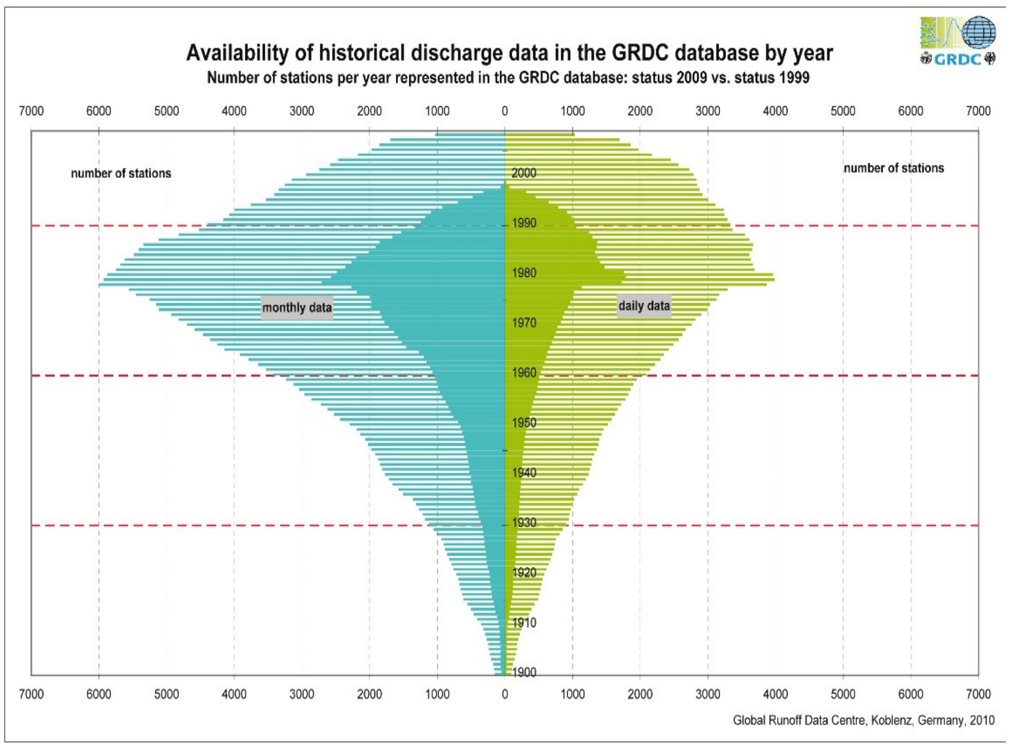
Water security requires the ability to:

- **Map the availability and quality of surface and sub-surface waters,**
- **Measure and understand how the water cycle varies and changes,**
- **Predict how the availability and quality of water resources will change on a range of time and space scales,**
- **Support the integrated planning and management of water resources both nationally, internationally, and globally,**
- **Implement new technologies for water discovery and supply.**

This can only be achieved with timely, Coordinated observations!

Challenges and Opportunities associated with Terrestrial Measurements

While 2015 marks a "golden" age for water-related satellite observations, in-situ networks and the data flows to global data centres have been reduced to 20 to 30-year lows.



Given the variations of capabilities and policies between countries, GEO Water is ready to contribute to any active GEO group that wishes to reverse this trend and to facilitate the sharing of data..

Development of a Water Quality Information System

The Elements:
In-situ observations conforming to best practices
Satellite observations of key optical properties related to water quality
Models to integrate the information into a single system indicator of water quality

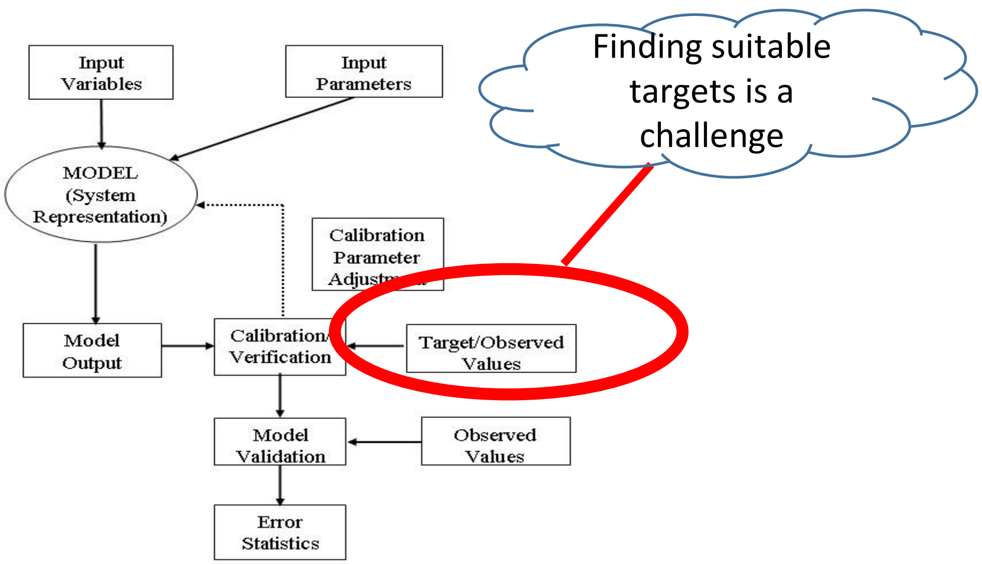
Challenges in Integrating them
Synchronizing satellite and in-situ measurements
Relating variables that are visible from space (turbidity) to those that cannot be seen
Obtaining satellite data at sufficient resolution

Needed: A hyperspectral mission focused on water quality

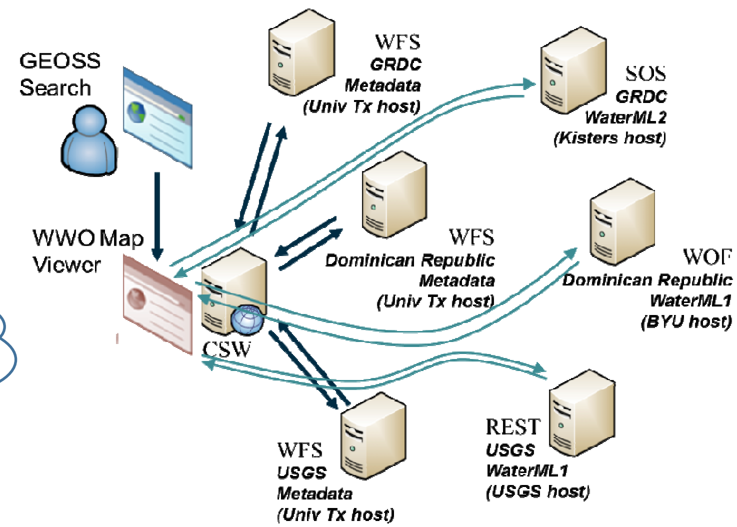
Interoperability Issues

Promote data sharing
Rescue data at risk
Balance desires for standardization with the needs for flexibility and ease of use

CAL/VAL



From Eric Wood

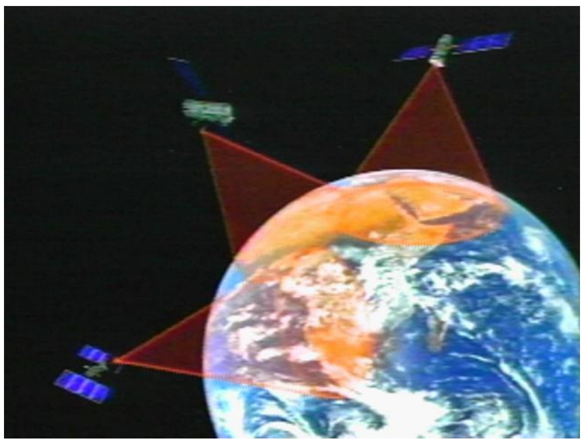


WATER ML-2: A world hydrometeorological Standard? (from D. Actur)

Integration (after Paul Houser)

Today:

Large space-based Observatories

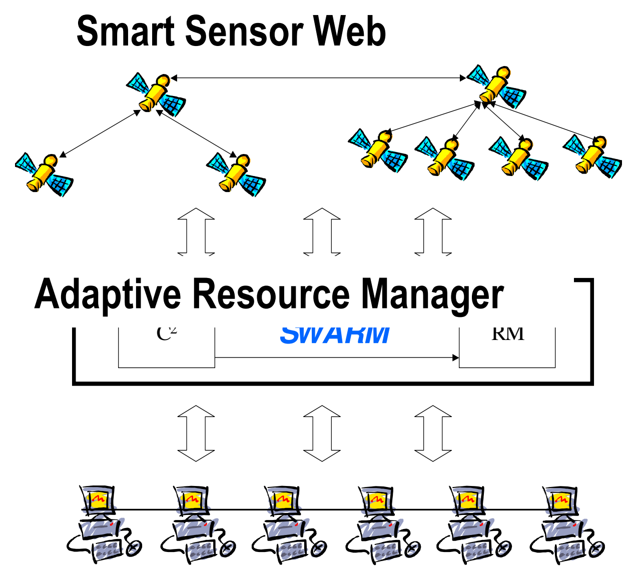


Single sensor retrievals
Spatial/temporal inconsistency
Parameter-driven requirements

Needed: A virtual Water Cycle constellation that accommodates this wide range of inputs.

Tomorrow:

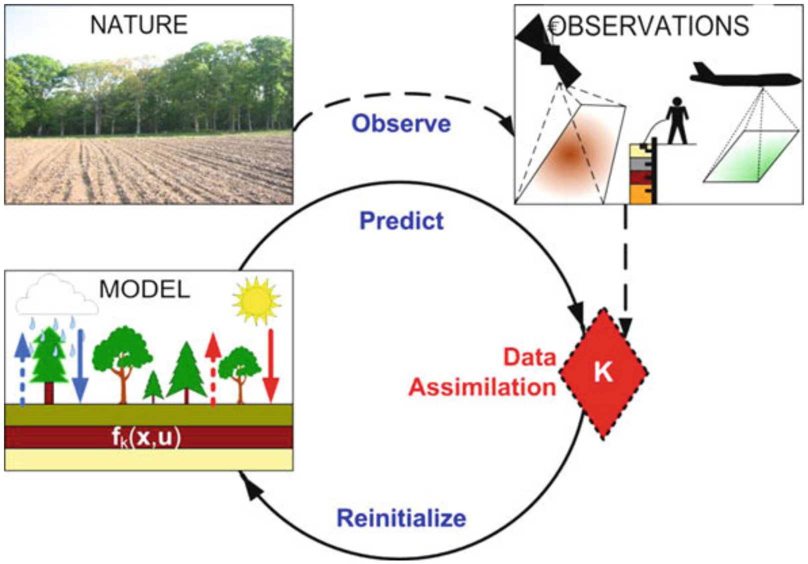
Integrated environmental information system

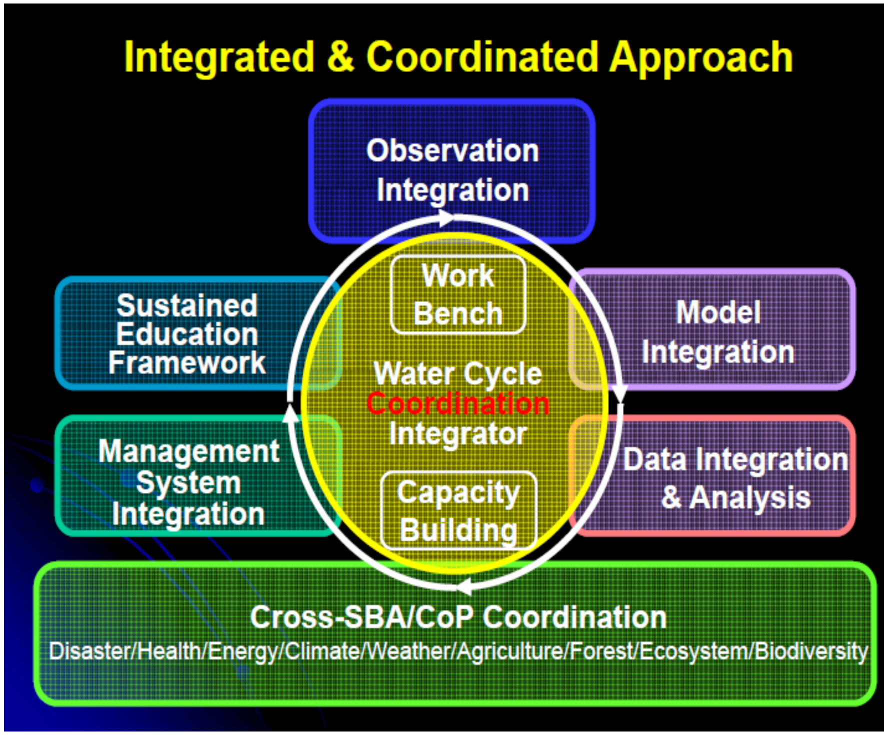


Citizen Science With a wide variety of data types

Integration: A water focus intended to promote many new innovations.

Data Assimilation to develop improved estimates of surface variables

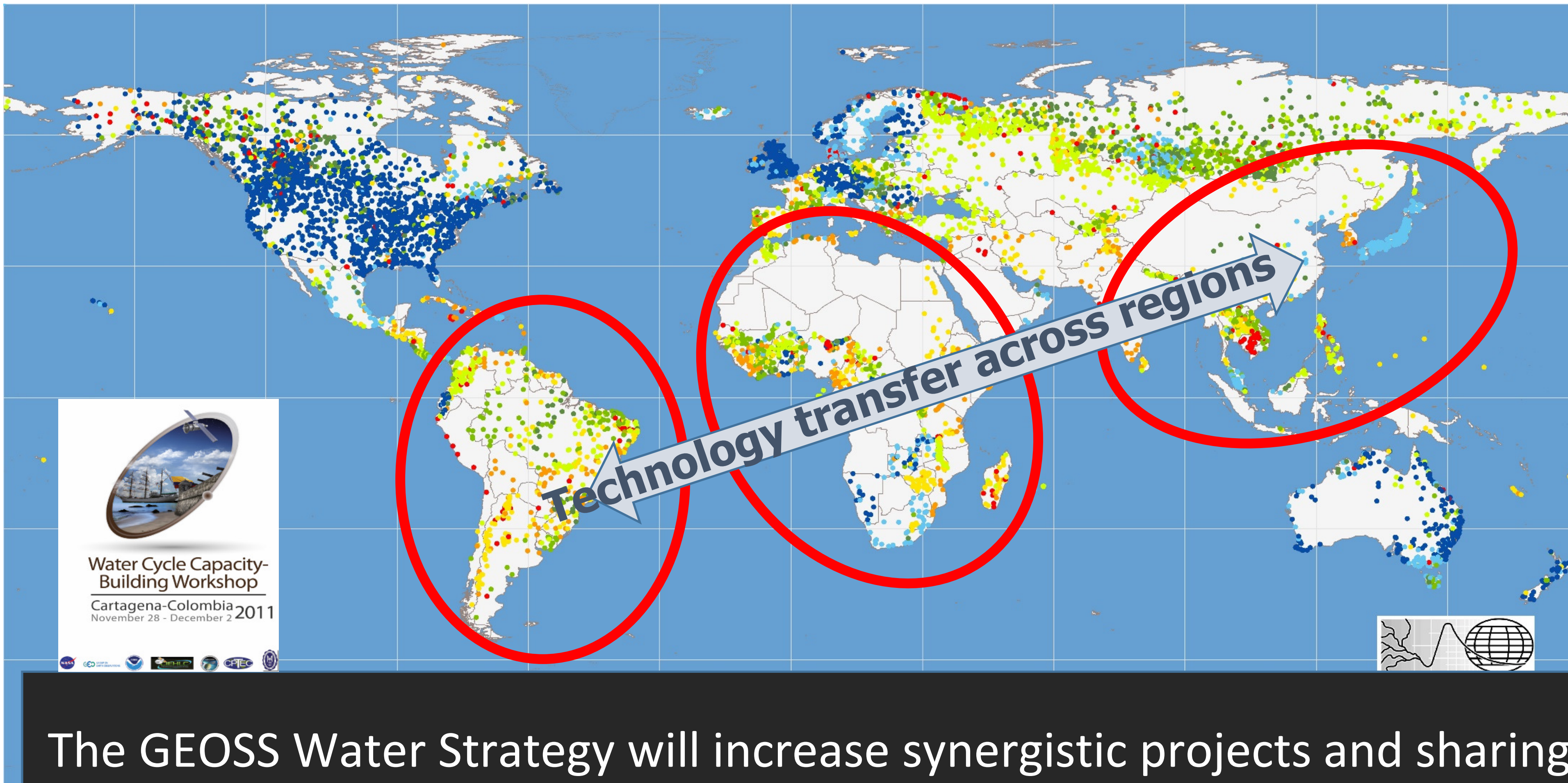




Integration beyond the Water SBA

(from Toshio Koike)

The GEOSS Water Strategy will focus its capacity building efforts in three main areas but add others as interest increases.



The GEOSS Water Strategy will increase synergistic projects and sharing of expertise, data and information systems across these regions.

Key Partners
- GEO Members
- CEOS Members
- UN Agencies
- Future Earth
- GWSP
- European Commission
-ODAS
-National science agencies

Key Activities
- Coordinating
- Planning & Reporting
- Platforms
- Research

Key Resources
- Experts who volunteer time
- Funded projects
-Agency support for workshops/ travel

Value Proposition
- Integrated data sets
- Global scale Systems
- Demo Projects
- monitoring Systems
-Advisory Services
-Capacity development

Customer Relations
- Workshops
- Training
- Brochures
- Consultation

Channels
- GEOSS Infrastructure
- Web Portals
- Data Centres
- Platforms
- **Reports**

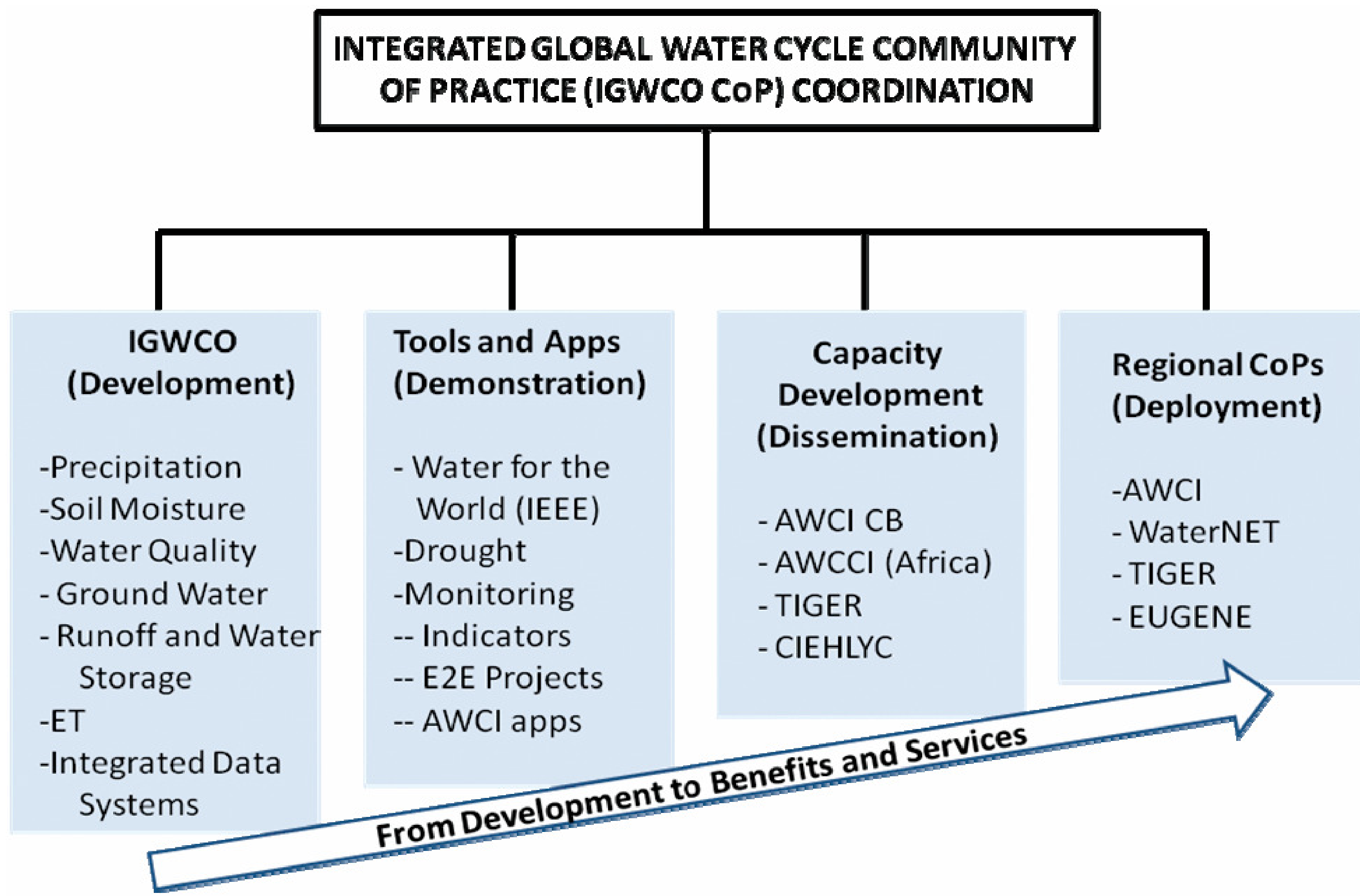
Client Sectors
- Water Managers
- IWRM
- WEF
- Resource Managers
- Environment Managers
- Policy Makers
- GEO SBAs

Costs:
Direct coordination funding: JAXA
Project funding: NASA, Eu Comm., etc
Support in kind: Many

Rev

Revenues (The Missing Link)

Use the IGWCO (GW?) CoP Structure for Implementation (making changes as needed)



What is needed to implement the GEOSS Water Strategy and address Future Requirements?

1.Commitments for GEO Members and POs to address specific recommendations in the GWS report will support broader implementation.

(We need your help! – Can you find a recommendation that benefits your objectives and supports your interests? If so, would you be willing to encourage your national principal to commit to an activity that addresses it.)

2. Strengthen User Engagement through relations with users and product co-design .

3. In-situ data networks need to be strengthened to support integrated product development and validation/calibration. (GEO needs to launch an effort to study the requirements for in-situ data)

4. There are Essential Water Variables that are not being addressed by GCOS (and CEOS) - a strategy is needed to obtain a commitment to produce better quality versions of these variables on the required space and time scales. Water use should be addressed as a critical missing variable at the global scale.

The Water Task collaborates in the ID-05 comparative study looking at how GEO water activities are funded in comparison with the Future Earth water activities and possibly other water initiatives. This exercise may uncover some opportunities to solicit third party funding.

Some details about the process

What the IGWCO COP provides for GEO and its Clients:

- Coordination of the GEO Water Task
- Identification of new activities and volunteers
- Access to experts, advice and User communities
- Visibility and support for efforts
- Training and capacity building
- Innovation and new initiatives
- New partnerships
- Market assessments

The support that IGWCO COP needs to deliver these services

- Effective integration of the COP into the GEO structure
- In-kind support (salary, travel, infrastructure) for individuals to participate in its activities
- GEO Support (TCs, Publicizing events, Travel arrangements)
- Meeting support in terms of travel and logistical support for meetings
- Publication costs
- Direct funding by contract for specific activities.

What can IGWCO COP do to address the needs of the GEOSS Water Strategy?

study of the methods for assessing the requirements and needs of users be undertaken by identifying precis
lifferent observational data types and derived information products end-applications sectors are used in dec
g tasks. Based on the results of this study, an analysis should be carried out to design the best available inte
ving technology and data analysis systems that deliver data products in a form that satisfies the input require
end-user decision-making process. This would entail some well-designed workshops, with strong represent
ser community.

EO Water develop and launch a continuous process to identify, articulate, and further refine user needs in th
us water communities from the local scale to the global scale. The process should build upon existing work b
as the Water SBA Needs report; utilize existing draft taxonomies of user types such as the one developed by t
nterface Committee; interact with communities of users in professional organizations such as the Internatio
r Resources Association and with UN agencies such as UNESCO and UNEP; identify and gain water-related
nation from other relevant GEO Societal Benefit Area connections, GEO networks, GEO projects, and Work P
ties; publish findings regularly; and prepare a sustainability strategy because user engagement is an ongoing
ltative process.

global-scale coordinated initiative should be developed and implemented to advance the future use of sate
e sensing for water quality applications. Factors such as the community requirements for continuity of existi
tes, development of new and improved sensor/platform technology, algorithm development, calibration/va
ties, and improvements in open and free data accessibility should be part of this initiative.

n inventory of current data services supporting GEO Water should be developed. This inventory should inclu
nation on the characteristics of available services and their data needs.

1. An integrated monitoring system should be developed to track consumptive and non-consumptive water e and its changes using satellite and in-situ observations along with models that relate water use to land cov d demographic information.

.1. The feasibility of developing a Water-Train satellite constellation should be assessed. This suite of atellites would be modelled after the A-Train, providing a space segment of an observation system that vould capture all fluxes and stores of the water cycle using a diverse suite of platforms and instruments. This ystem would operate as a Virtual Water Cycle Constellation.

.1. In-situ observational networks should be strengthened to ensure that the required data are collected nd made freely available to the international community. GEO and WMO members should both engage in ssessing gaps in their national networks and develop a plan for addressing those gaps. As an operational esearch activity, approaches should be studied to take advantage of the supplemental observational etworks (for selected variables) that are maintained by volunteers, education systems, and local overnments.

5. A strong rationale should be developed in order to encourage increased financial commitments by GEO embers and other nations to continuous operation and expansion of soil moisture networks. A strategy viewing the optimum network size and trade-offs between the number of stations and equipment upgrades a monstrating the benefits of soil moisture in key applications would be part of this rationale. The strategy sho o review the benefits of supersites; the full spectrum of environmental variables would be measured.

9. A workshop should be organized to address the application of in-situ measurement techniques and data in ater quality assessments. The workshop would explore ways to develop harmonized approaches and best actices for water quality measurements and ways to benefit from technological advances. Workshop ntributors should include experts in the fields of sensors, data communication, and management, and actitioners operating sensor networks.

10. Plans should be developed to rescue historical and local records and to make them available for torical water cycle studies and the assessment of local water issues.

6. An inventory of all surface water data archives, including both natural and man-made lakes, servoirs, and wetlands, should be developed. Based on the details of this inventory, a plan for plementing a process to establish protocols for collecting data and metadata on surface water stores ould be developed.

E.8. The feasibility of establishing a monitoring system of man-made reservoirs should be developed. The end result of this review could be the use of current and planned data systems to provide a real-time monitoring system of the surface water in storage.

E.9. An initiative should be launched to assess the feasibility of combining in-situ measurements and GRACE satellite data to produce an integrated groundwater product on a regional basis.

F.3. An international cooperation and coordination mechanism should be developed to advance the technical implementation of global sediment databases and data portals. This mechanism should include existing data initiatives and build on the GEOSS Common Infrastructure as a framework for bringing together all relevant Earth observation data.

F.4. A review of the WMO regulations on hydrometeorological data exchange should be undertaken to assess their effectiveness in enabling the exchange of data with the GRDC and GPCC and enabling the exchange of data between countries.

F.5. Efforts by GEO members to support initiatives leading to interoperability should be accelerated. At the same time, users and dataset developers need flexible, low-burden standards at all levels to enable easy adoption of the interoperability concepts being developed.

G.2. A web-based clearinghouse should be established for water cycle training materials, primarily intended for professionals and pre-professional students. This inventory would facilitate improved training and capacity building to have a central site and provide access to training materials appropriate to a variety of audiences that have been independently developed across many organizations.

G.3. Periodic GEO Water Strategy capacity building workshops should be convened without specific geographical focus to develop a broad strategy for GEO Water Capacity Building. These workshops should focus on developing synergies between the work done in different geographical areas, a means for more effectively transferring the results from one region to another, and common training materials that can be used in different geographical areas.

What can we do in the areas of:
-Citizen Science (and data collection)
-Use of Social media
-Studies using “big data” (not just large data sets)