
# Water Resources and Earth Observation

Shafick Adams

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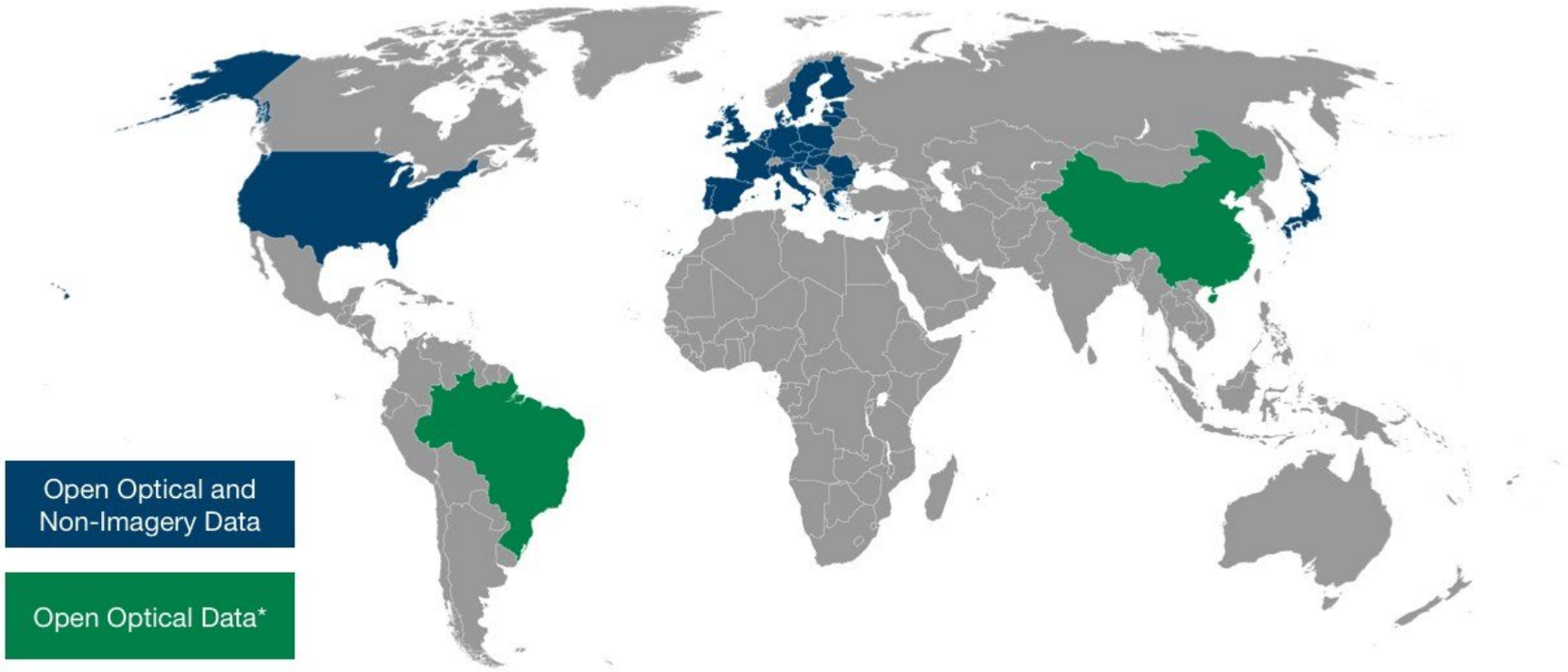
# Countries Providing Open Satellite Data

Optical and non-optical data from active and passive sensors




*The CBERS Satellite Series is a joint program between China and Brazil

Radiant.Earth
Earth Imagery for Impact



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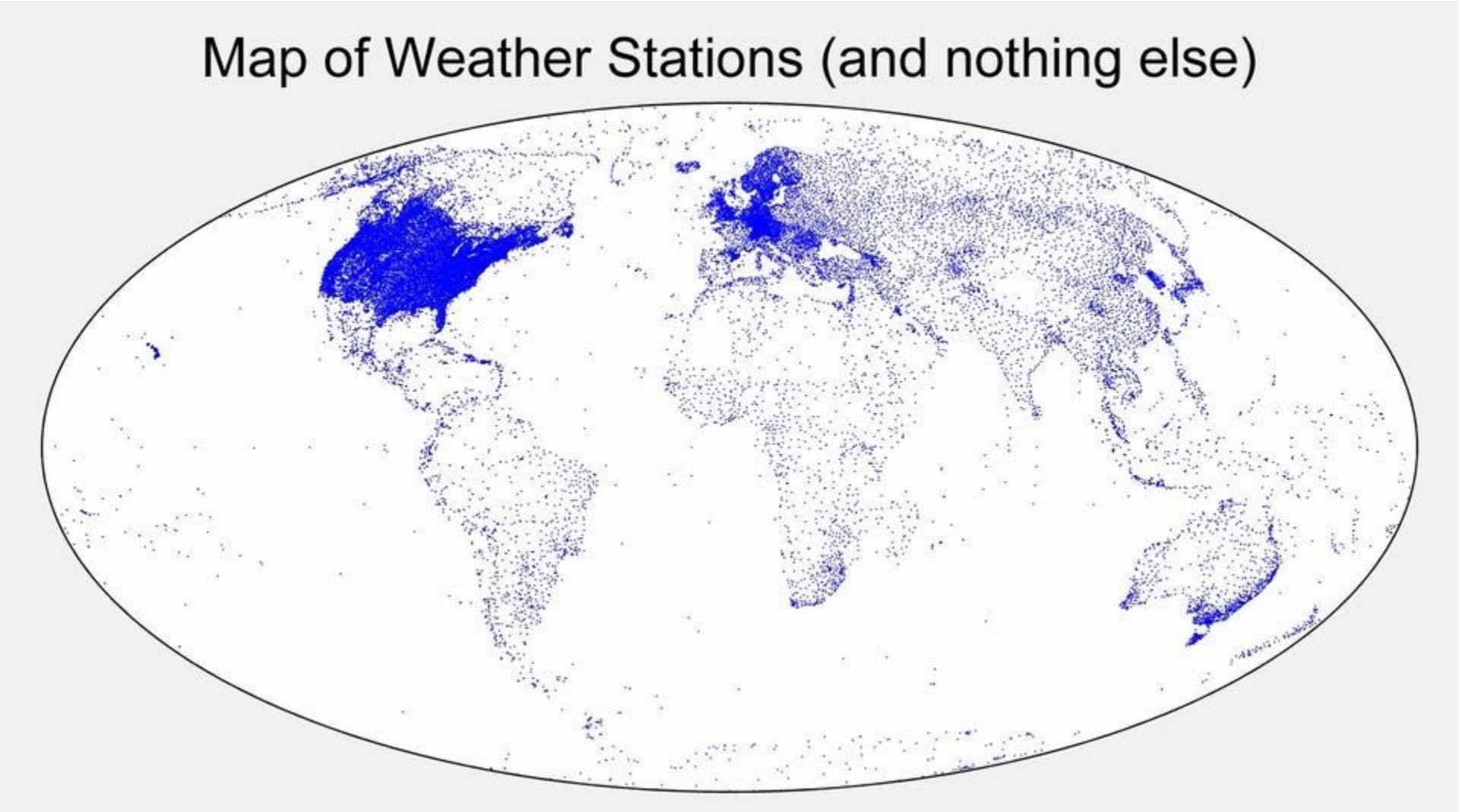


Op cit, Simon shows you maps

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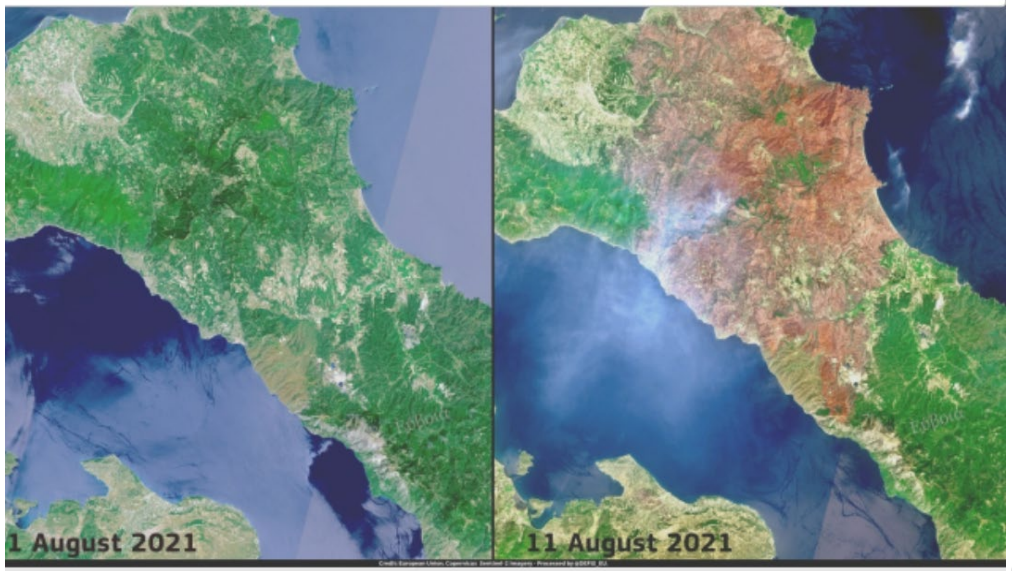
# Earth Observation Toolbox

**“Earth observation (EO) is the gathering of information about the physical, chemical, and biological systems of the planet via remote-sensing technologies, supplemented by Earth-surveying techniques, which encompasses the collection, analysis, and presentation of data...”**

## Decision -making

**“Advanced understanding of the Earth system will improve mitigation and adaption to climate changes, benefitting society.**
**Short term forecasts, projections and predictions continue to improve together with sustainable observing systems, including remote sensing, process understanding, evolving numerical models and data assimilation.”**




Copernicus

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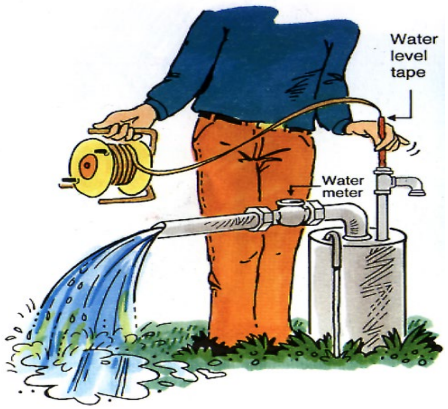
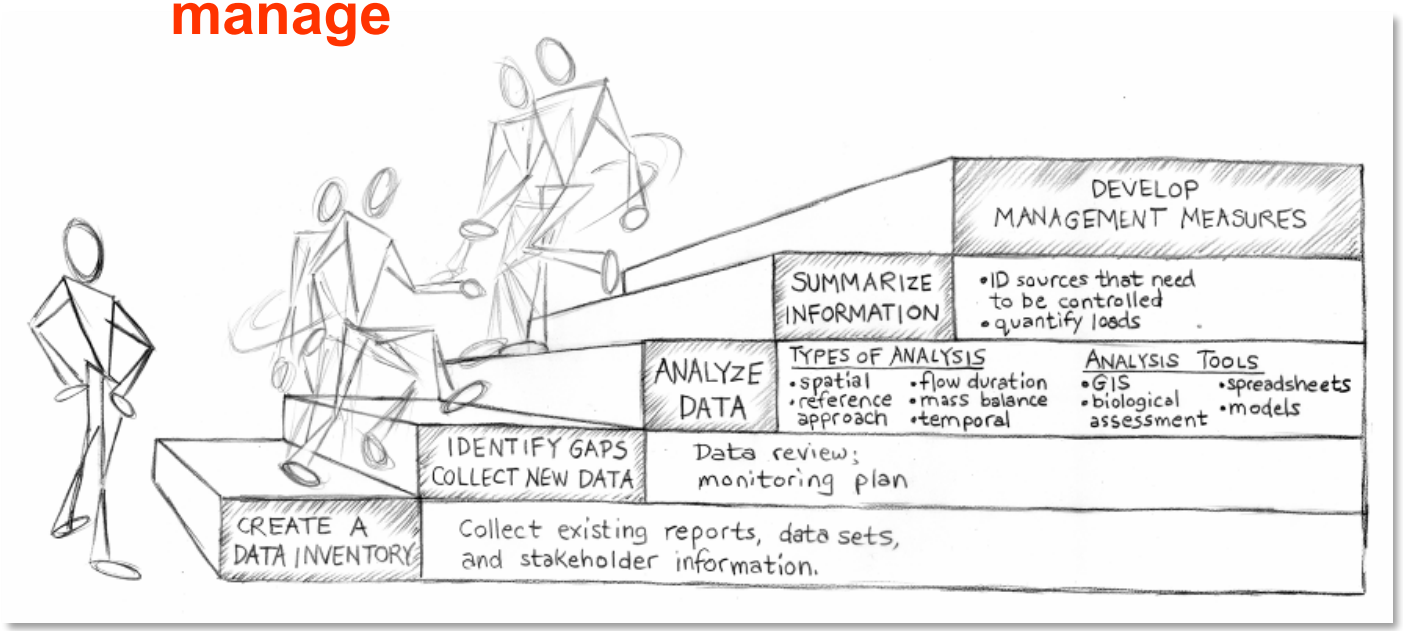
# Data, Information, Knowledge, Intelligence

**You can't manage what you can't measure**

**If you don't measure you can't manage**

**If you measure and do not interpret the data you can't manage**

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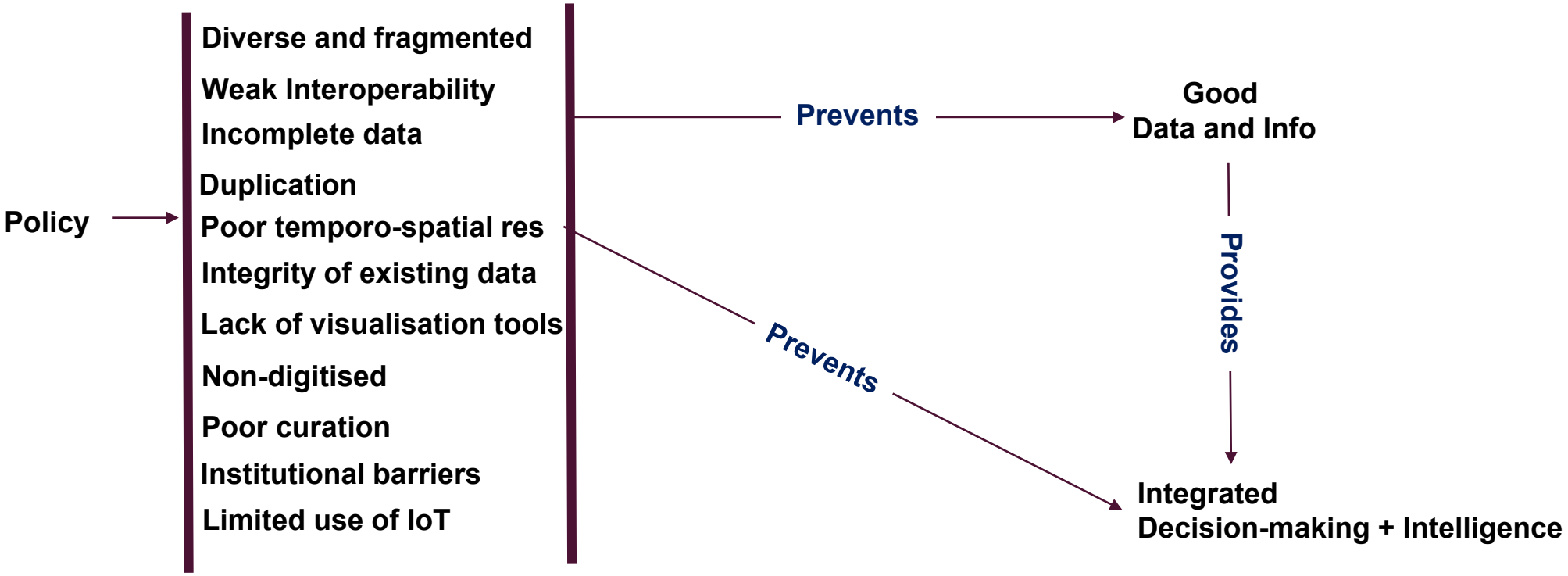
# Main Challenge




**CHASM**

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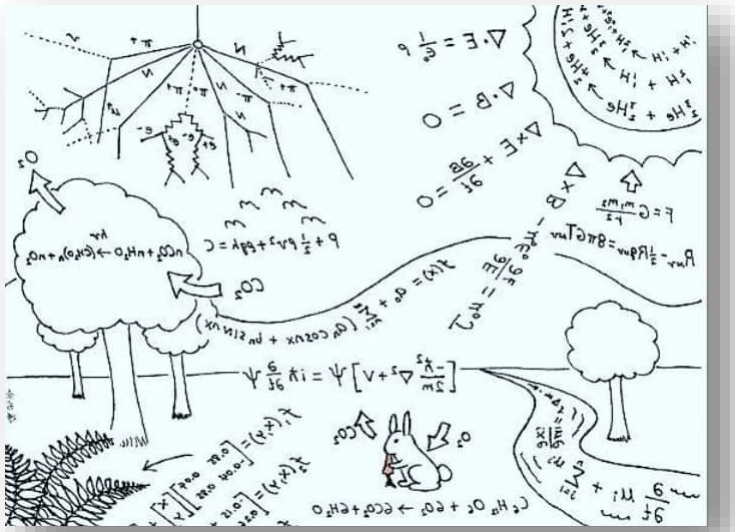
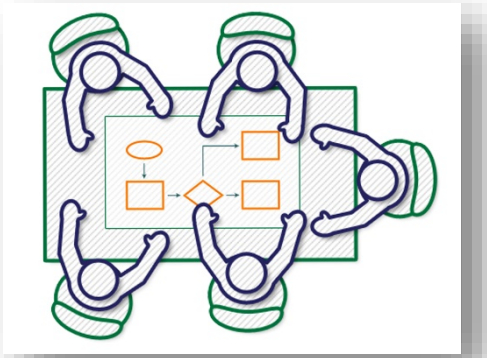
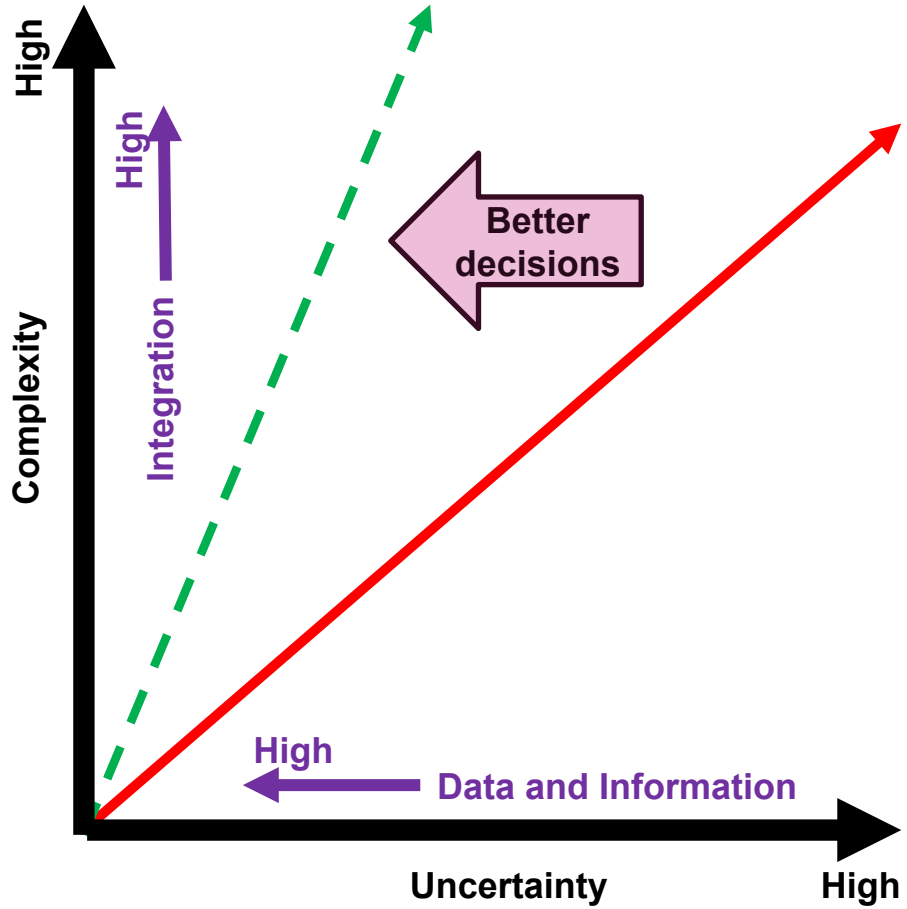
# Data for decisions and intelligence





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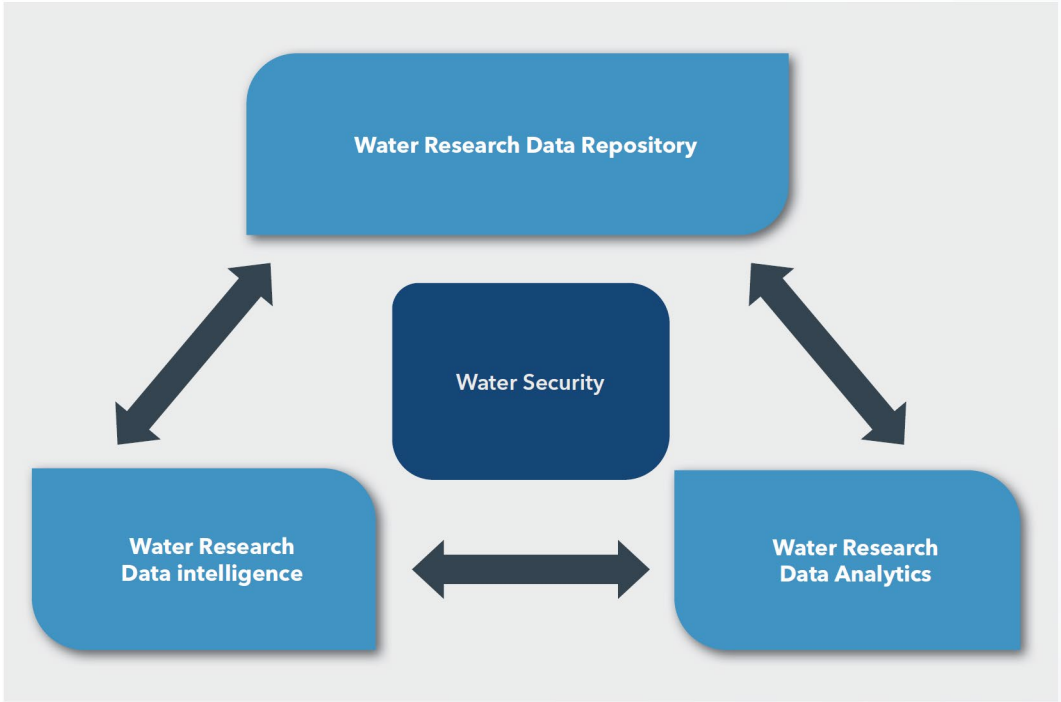
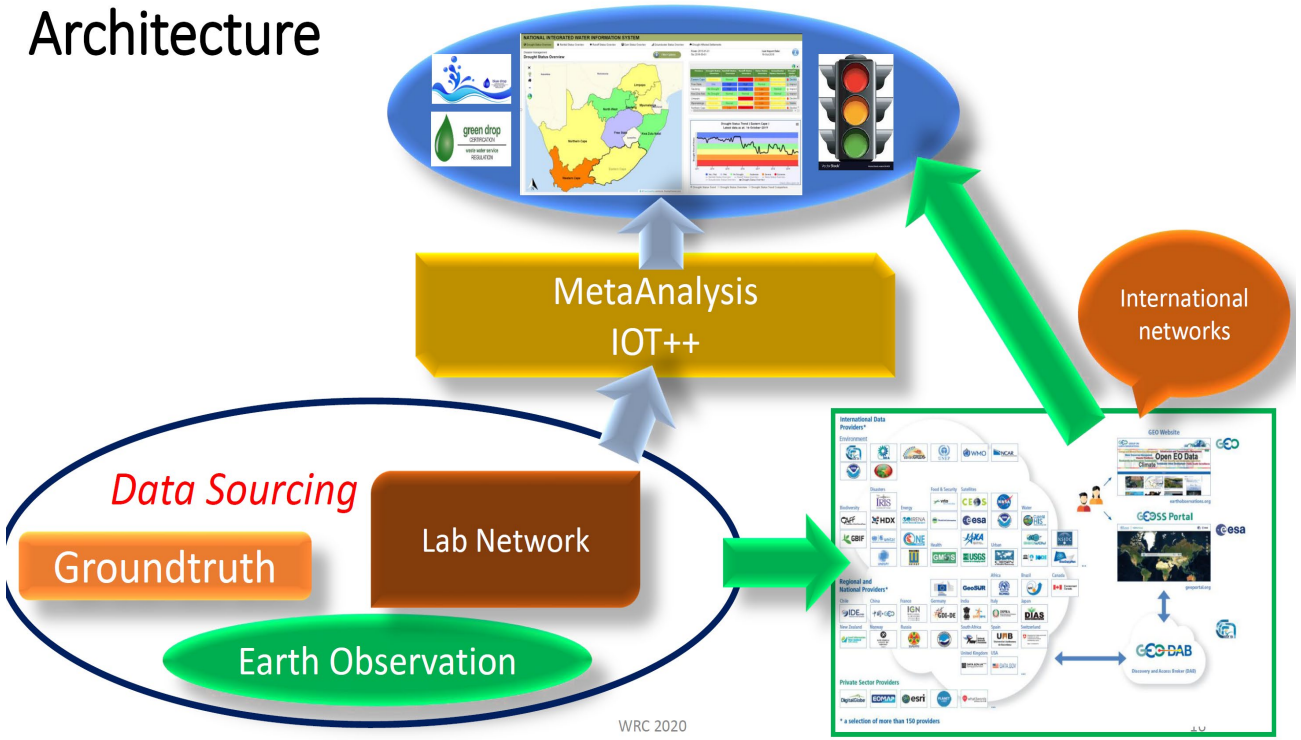
# Water Research Observatory




## Architecture

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**Remotely sensed information + ground-based data = Data and Information for decision-making**

**One does not replace the other!**

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# Opportunities for EO

## High-level challenges, that are not necessarily unique to water, include:

- Global change (e.g. climate change and variability)
- Water pollution and depletion
- Rapid urbanisation with increasing supply demands and higher pollutant loads
- Coupling of the various reservoirs in time and space
- Governance of water and related resources
- Emerging contaminants
- Data collection (monitoring) and data availability (management) including Big Data management
- Uncertainty quantification (e.g. model and parameter uncertainties)
- Poor land-use planning
- Scale and heterogeneity
- Capacity development
- Complete description of complex systems
- Operation and Maintenance of water schemes
- Water valuation and financing
- Ecosystem degradation and protection

**adaptive capacity** - "the ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences."


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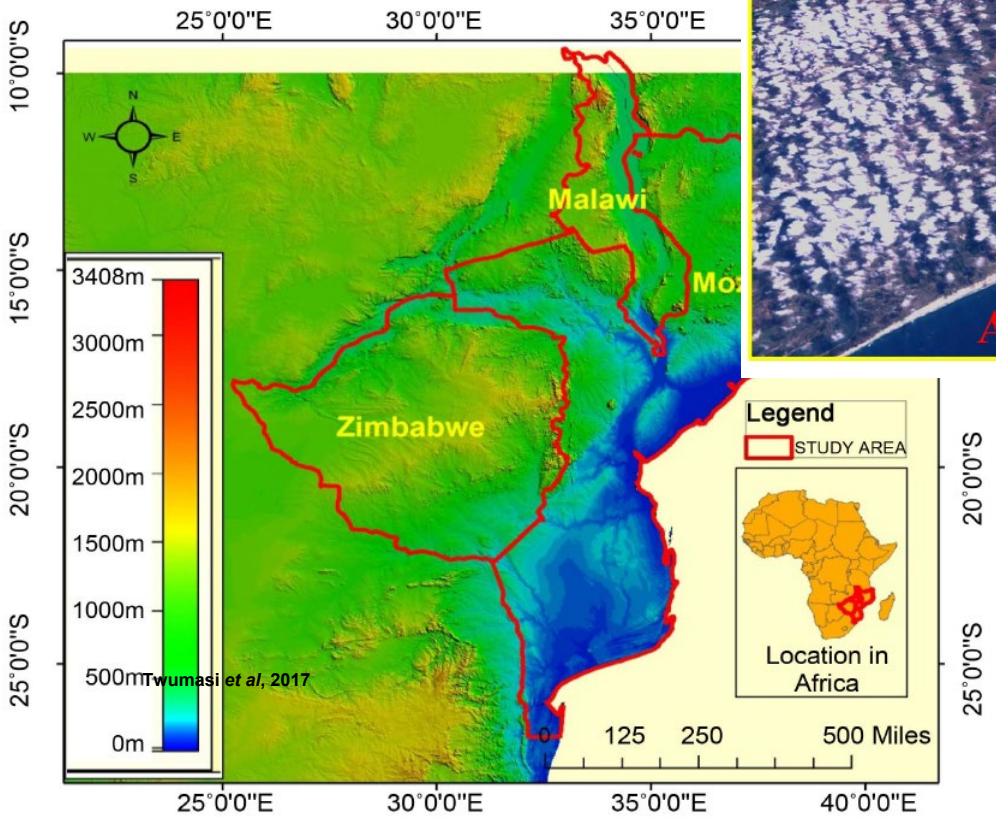
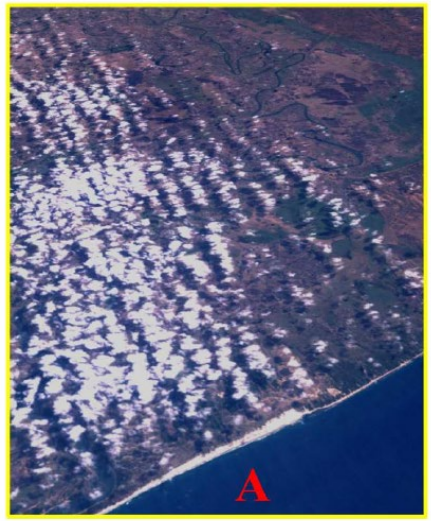
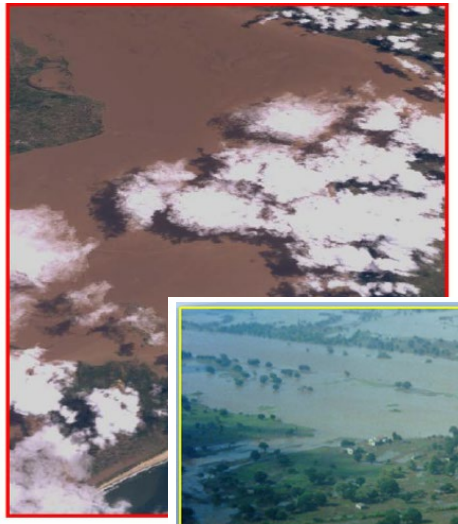
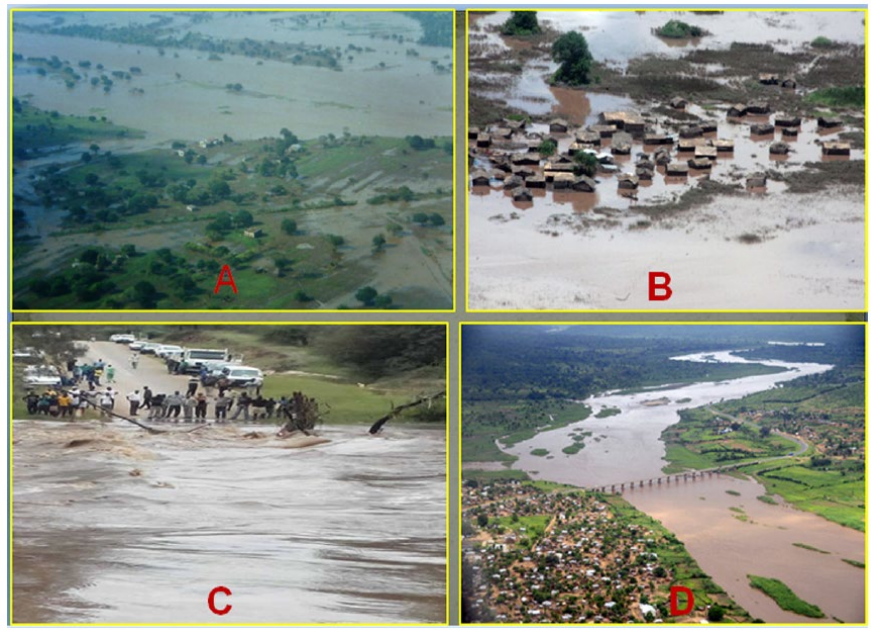
# Floods




Twumasi *et al*, 2017



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# EO Applications at Estuaries (K5/2268)

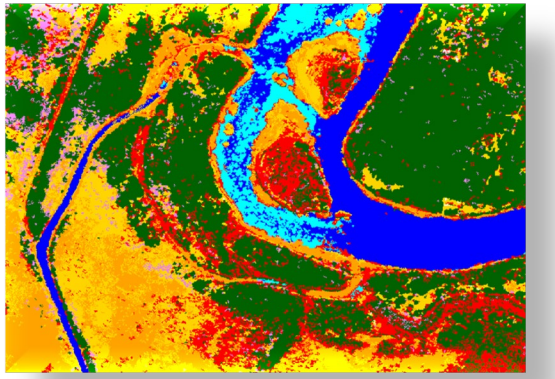

**Habitat classes after Rautenbach (2013)**

| |
|---|
| Submerged Macrophytes |
| Salt Marsh |
| Reeds |
| Swamp Forest |
| Grass and Shrubs |
| Groundwater-fed comms. |
| Juncus |
| Mangroves |

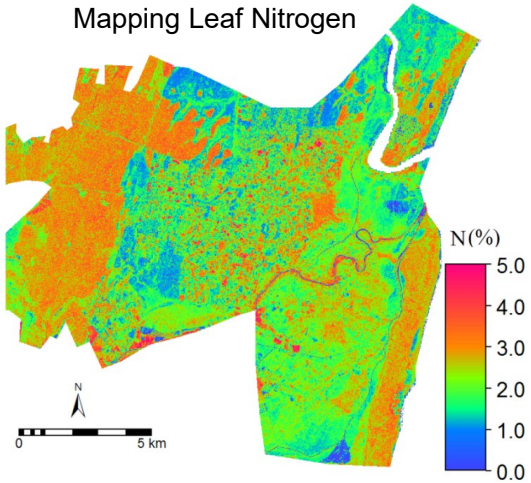
**Areas classified**

SPOT6 & RapidEye Coverage

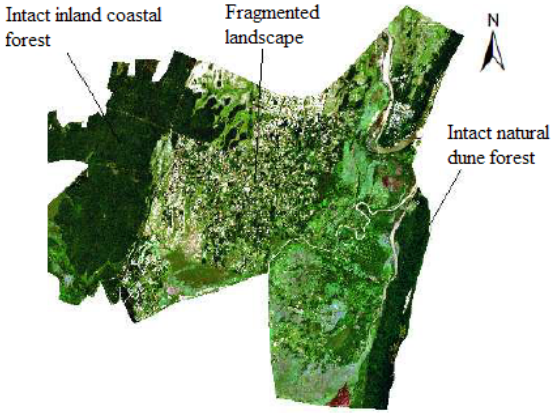
WorldView-2 Coverage



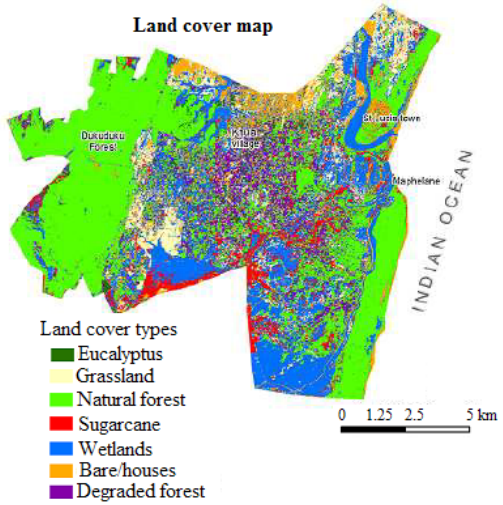
Mapping Leaf Nitrogen




**WorldView-2 image**




**Land cover map**

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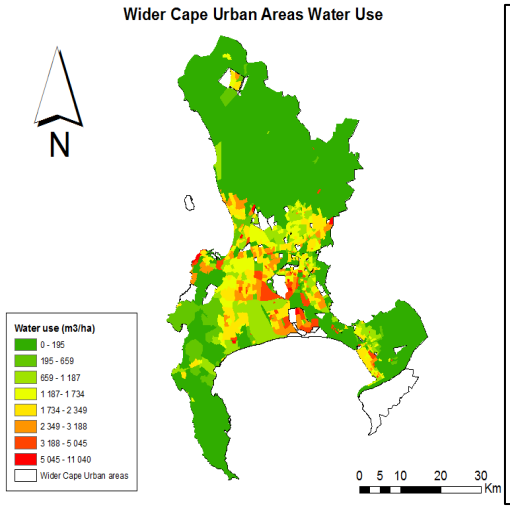
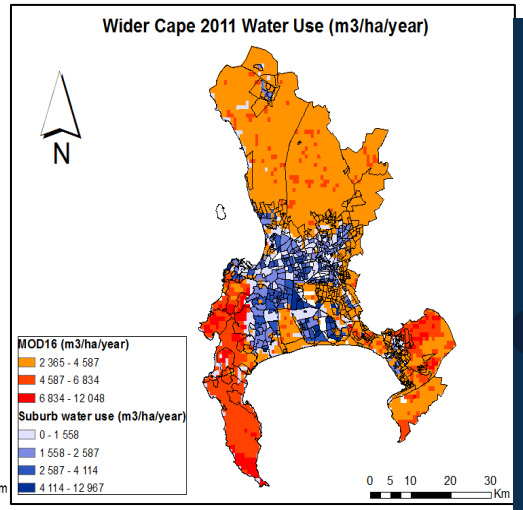
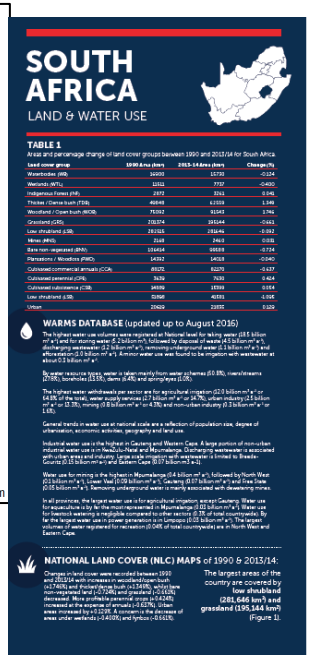
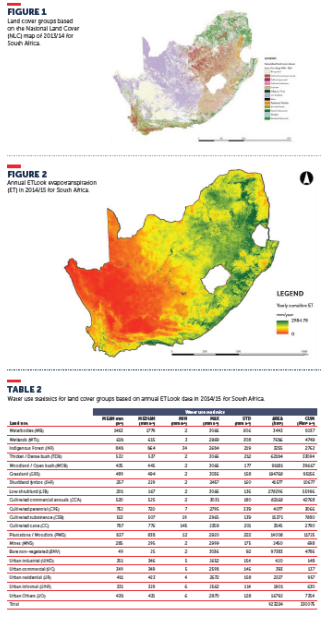
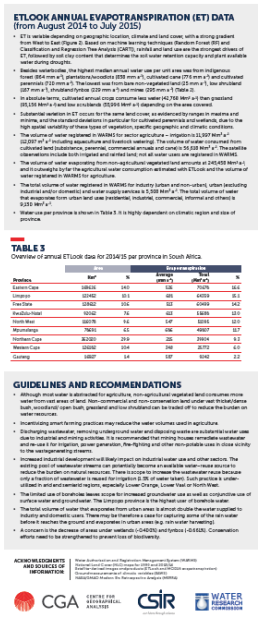
# Mapping Water Use versus Land Use (K5/2520)

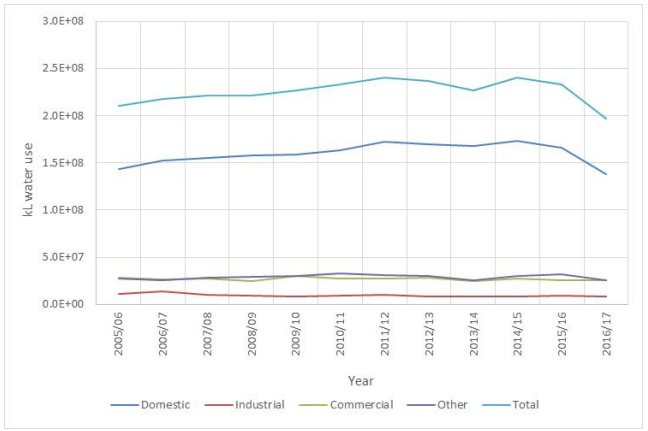


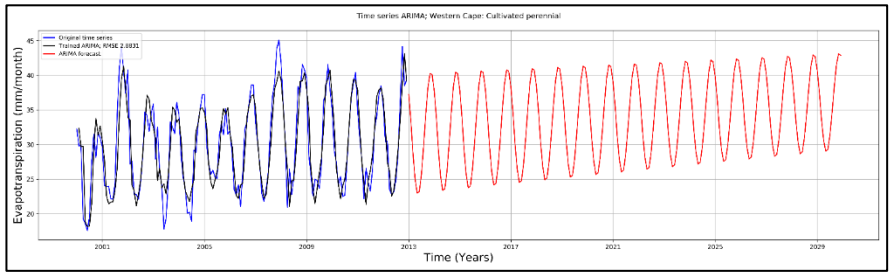




Historical/current water use and future projections

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# Citizen Science



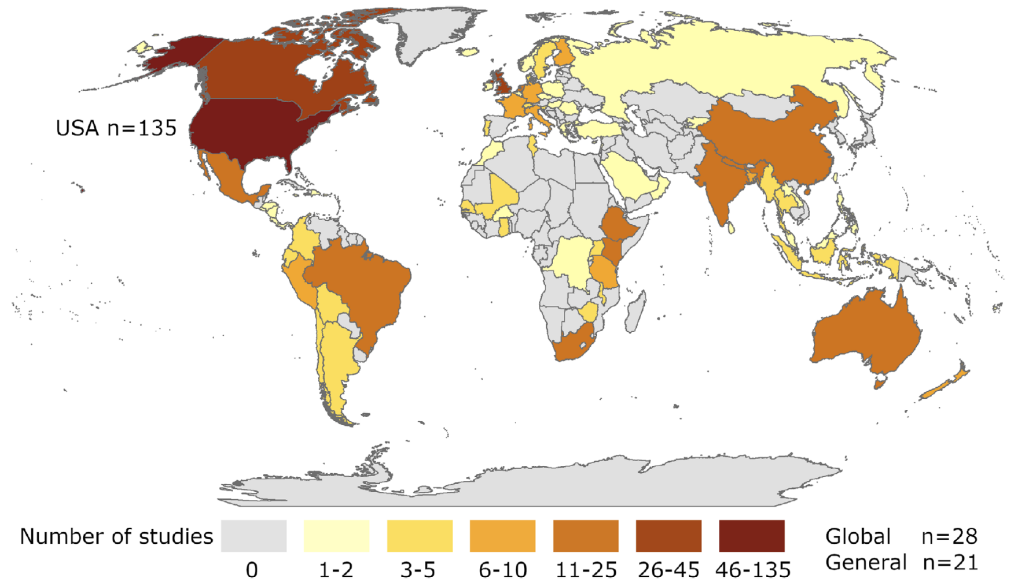
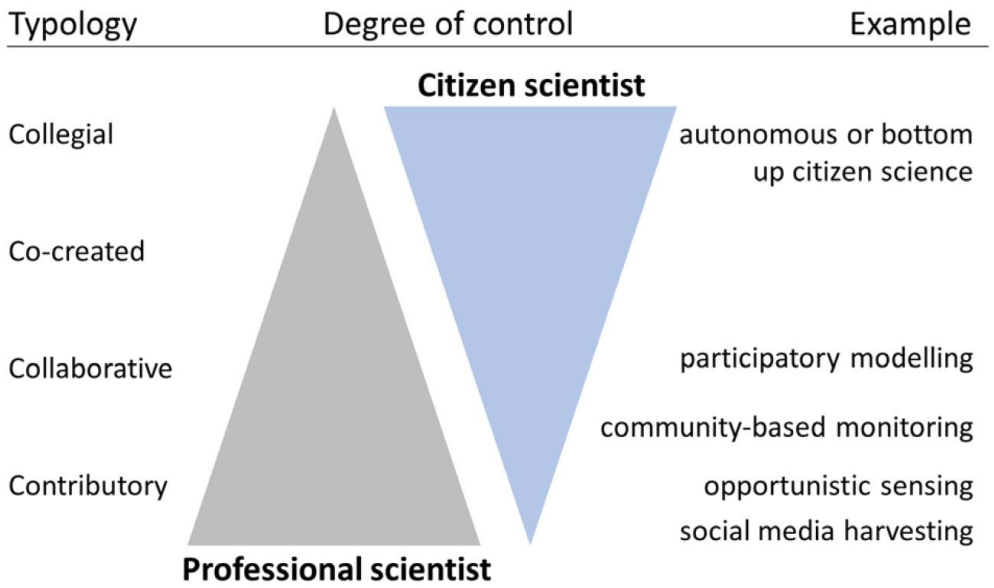



**FIGURE 2** Locations and number (*n*) of published citizen science water projects




Received: 15 May 2020 | Revised: 24 September 2020 | Accepted: 24 September 2020
DOI: 10.1002/wat2.1488

OVERVIEW

WIREs WATER WILEY

## The benefits and negative impacts of citizen science applications to water as experienced by participants and communities

David W. Walker[1] | Magdalena Smigaj[2] | Masakazu Tani[3]

Op cit -

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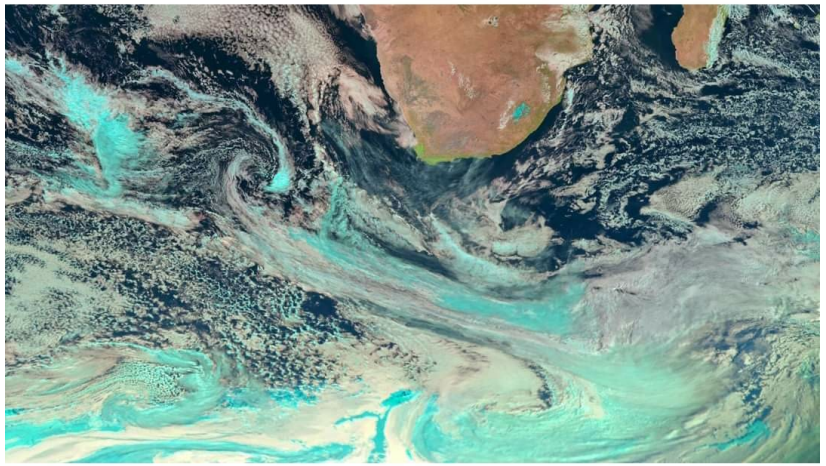
**LandWater**
10h •

⏰ 14:00 🗓️ 16 Aug 2021 • Die Week+ 🌧️ The Week+ • #waterstories

Ons interessante week lyk kortliks soos volg:…
See More

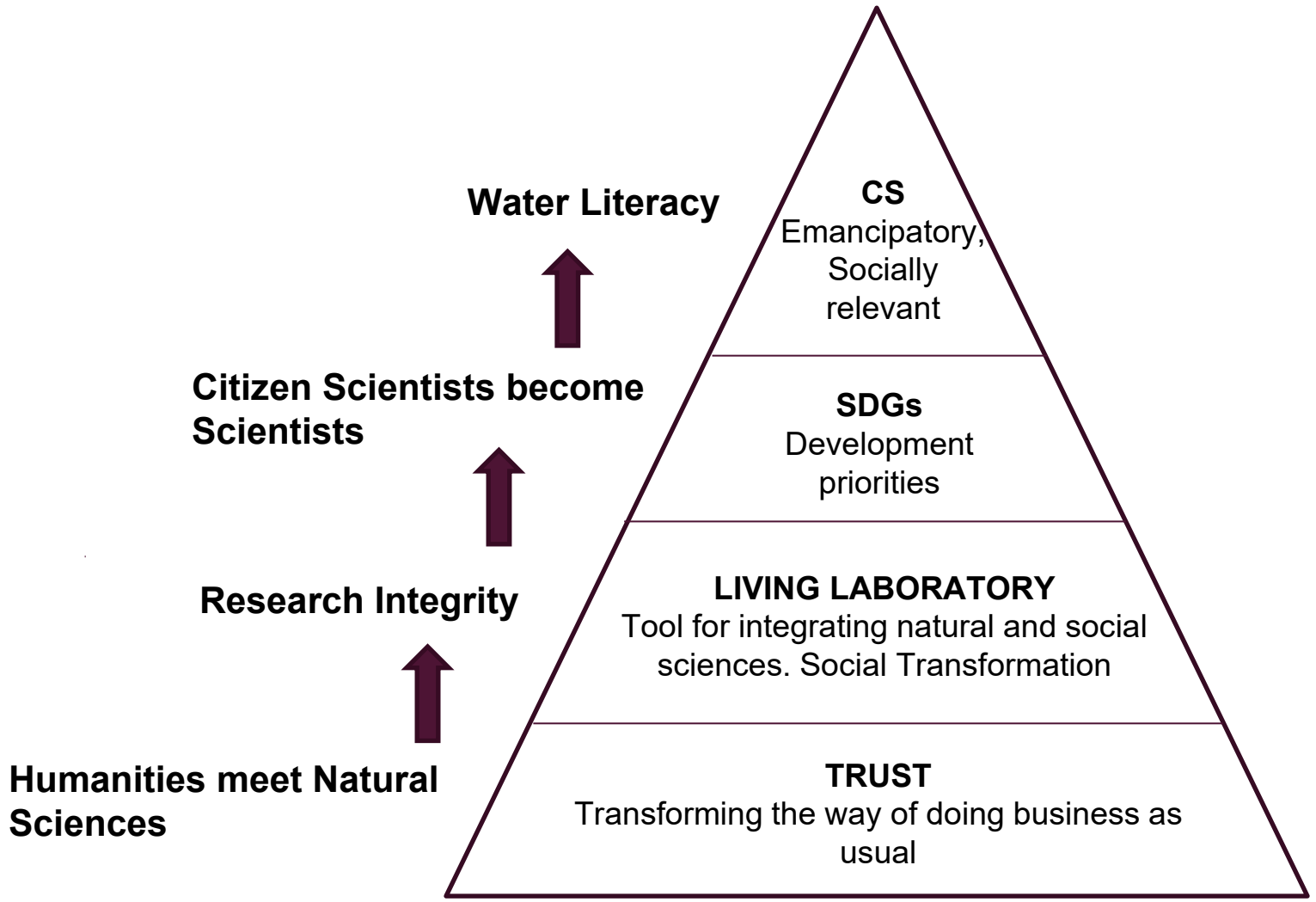


168 13 Comments • 26 Shares

## Citizen Science Conceptual Frame

**Framework hypothesis**

The hypothesis for the framework is as follows: CS is a contributor to wiser and better management of water resources in the catchment and provides the pivot around which ideas of the living laboratory, the sustainable development goals and trust are fixed. The application of CS mitigates for tension between social sciences, humanities and natural sciences, providing a lens where these disciplines benefit from science literacy and behavioural change across the spectrum of actors operating within the living lab.

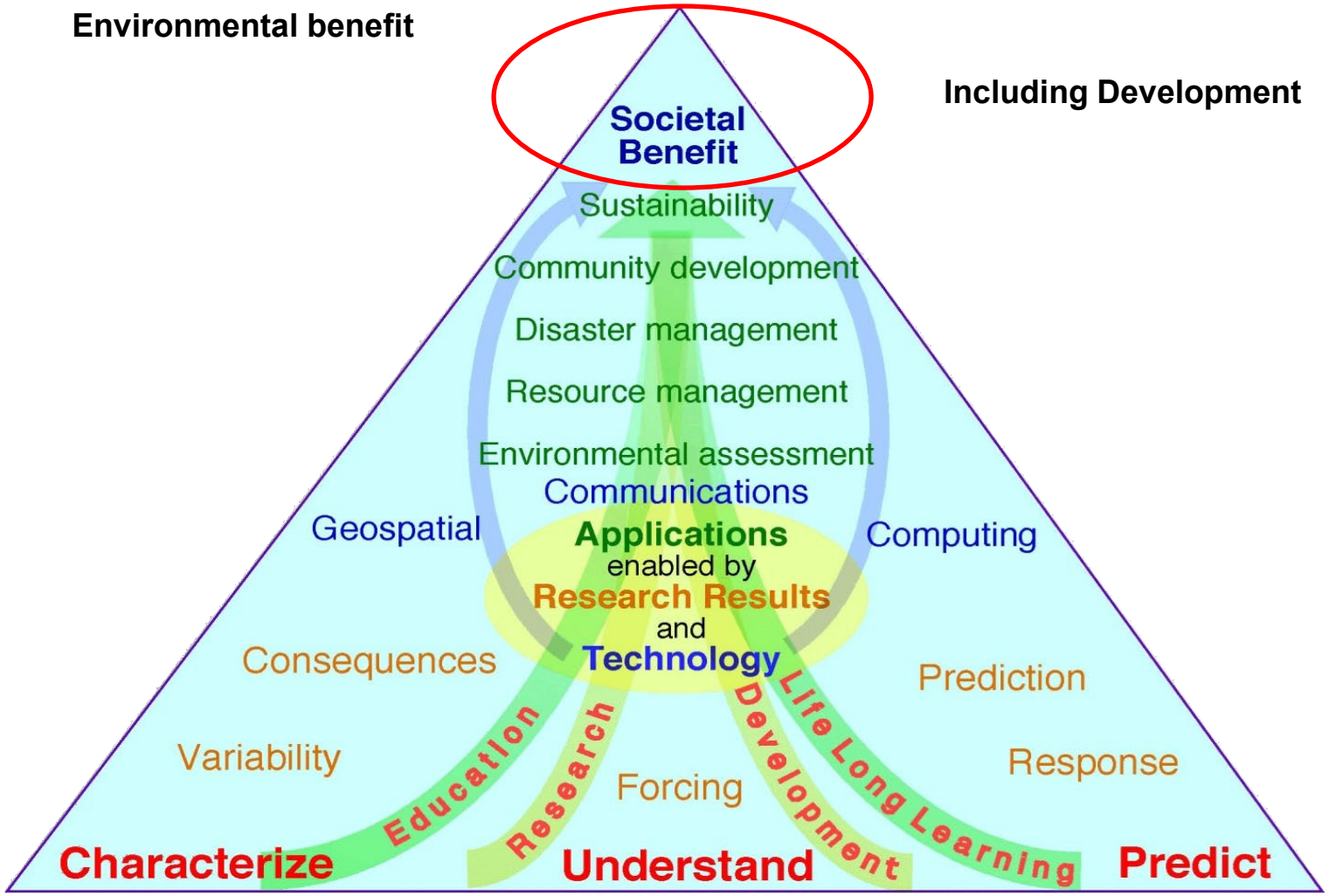



Goldin et al (2021)

# Building Blocks

**Environmental benefit**

**Including Development**




Earth System Science in NASA's Earth Science Enterprise

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# Thank You

shaficka@wrc.org.za
www.wrc.org.za

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