The role of citizen scientists in the monitoring and management of the Global Water System

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Recent research clearly shows that aquatic ecosystems in urban environments have been significantly compromised. This is a direct result of modified land cover and infringement on buffer areas and an indirect result from changes in consumption patterns and population density. Globally, urban growth will add 1.5 billion people to cities by 2030, further increasing the need both for integrated management approaches and to engage new audiences to address issues of water quantity, quality and aquatic ecosystem services. In a new global research program, we have partnered directly with a corporate sponsor to train and direct over 7500 corporate employees to become Citizen Science Leaders in major cities in Europe, Asia-Pacific and the Americas. Participants follow a globally consistent training program and monitoring methodology to support research by local scientists. They perform regular monitoring of hydrological, ecological and chemical parameters in local ecosystems. The curriculum of the training day informs the participants on regional and global water quality and quantity issues to both encourage them to collect data for the research program and make changes in their lives and communities to improve water quality. Participants are also taught effective communication skills to further empower action within their sphere of influence and are provided with online tools for educating themselves and others. Local and global data control mechanisms ensure that a consistent global database will allow an international team of scientists to explore controlling factors of freshwater ecosystem dynamics in urban environments. Our intention is that these datasets, collected by corporate employees and their wider communities, will inform policymakers' water resource management plans both locally and globally. A broader focus on outreach, outside of the usual audiences, is needed to ensure the sustainable use of one of world's most valuable resources. Keywords: Citizen Science, Global Freshwater Monitoring

Background

Figure 1: Collecting FWW data

FreshWater Watch (FWW) is a global freshwater research program which aims to empower citizens to address local and global challenges in the management of urban freshwater resources.

FWW was launched in 2012 by Earthwatch Institute as part of the **HSBC Water Programme** and currently operates in 32 cities in Europe, Asia-Pacific and the Americas.

Objectives

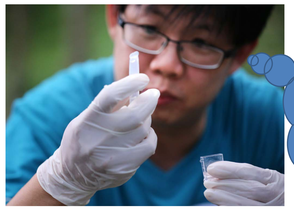
- To engage thousands of citizen scientists worldwide in data collection for peer-reviewed research projects
- To educate people about the global water challenge to empower action and influence behavior change
- To create a global database of over 15,000 water quality datasets
- To ground truth water quality models through data collected by citizen scientists
- To better understand the factors that make a large citizen science experiment effective

Figure 2: FreshWater Watch data will be set into a wider geographical context with other large datasets to help influence policy and management decisions

Methods

- **Global FreshWater Watch Parameters**

  Globally consistent methodologies are geared towards citizen scientists but allow for robust global comparison of aquatic ecosystem conditions and dynamics. They include:
  - Ecosystem and land use characteristics
  - Hydrological conditions
  - Nutrient concentrations
  - Optical conditions (turbidity and water color)



"Fabulous effort to inform people about water issues. Great to be able to test water on your own and understand how easy it is."

Figure 3: An HSBC participant measures nutrients in Shanghai

- **FreshWater Watch Training**

Figure 4: Training components for FWW 1 day field training or online training

Figure 5: Learning journey for field based training

- **Online Platform: www.freshwaterwatch.thewaterhub.org**

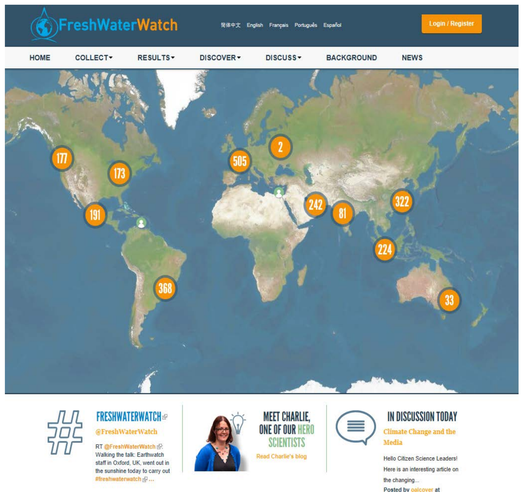


Figure 6: The home page of the FreshWater Watch website. Each number represents a dataset collected

- Open access global research database
- Online learning modules on global freshwater issues
- Social media components including online forums and blogs

"Hands on experience. The data is real and contributing to real science."

Figure 7: HSBC Participants collecting FWW data

Results

- Set up 20 research projects with local research partners
- Trained 2000+ citizen scientists from HSBC
- Built global freshwater database and online platform for learning

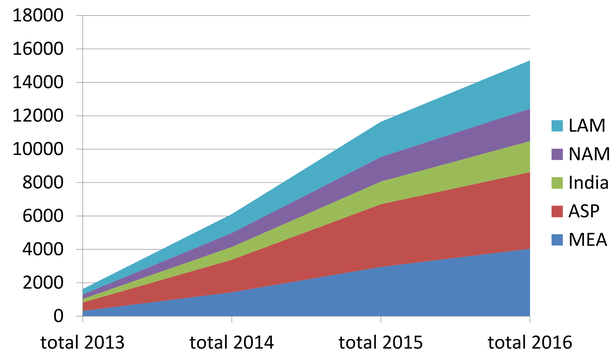


Figure 8: Projections on FreshWater Watch datasets taken and uploaded to the website over the program

- Collected 2300+ data sets that are uploaded onto the FWW website
- Secured funding and engaged employees from two major corporate partners: HSBC and Shell

Next steps

- Involve more audiences in FWW
  - Teachers
  - Students
  - Businesses
  - Individuals
- Create a mobile app for data collection
- Establish more research and local partnerships for data sharing purposes

"Good to know that even as a relatively minor individual you can have a global effect."

Figure 9: Engaging new audiences in FWW

Behavior Change → Protection → Policy → Management

Acknowledgements

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