



Participatory monitoring of aquatic environments - FreshWater Watch Beyond Museums. Tools for promoting the natural and cultural water heritage
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Earthwatch Europe

Connecting people with the natural world

Monitoring the health of natural resources

Using evidence to inform action

Enhancing the health of our coasts

Creating thriving places to live and work

Reducing pollution in our water bodies

Enabling sustainable agricultural land management

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CREATING KNOWLEDGE. INSPIRING ACTION.

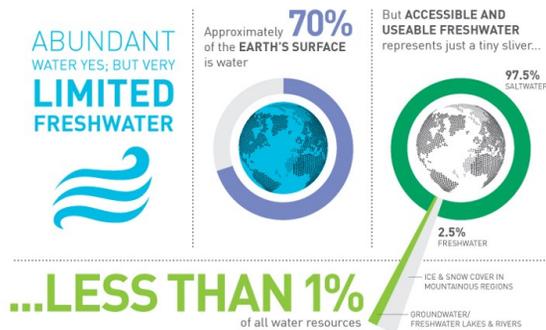
Today's talk

- Why water?
- Why citizen science?
- FreshWater Watch
- Whistle-stop tour
- Will citizen scientists save the world?



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Water is a precious resource

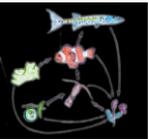


Source: United Nations Environment Programme (UNEP) with Clean Edge analysis



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The value of water



Lakes and Rivers: **\$12,512 ha⁻¹ yr⁻¹**

Wetlands: **\$140,174 ha⁻¹ yr⁻¹**

Costanza et. al. (2014) *Global Environmental Change* 26, 152 – 158.



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Increasing pressures ...

Drought and flooding

Sewage pollution

Plastic pollution

Nutrient enrichment

Pesticide pollution

Biodiversity/habitat loss

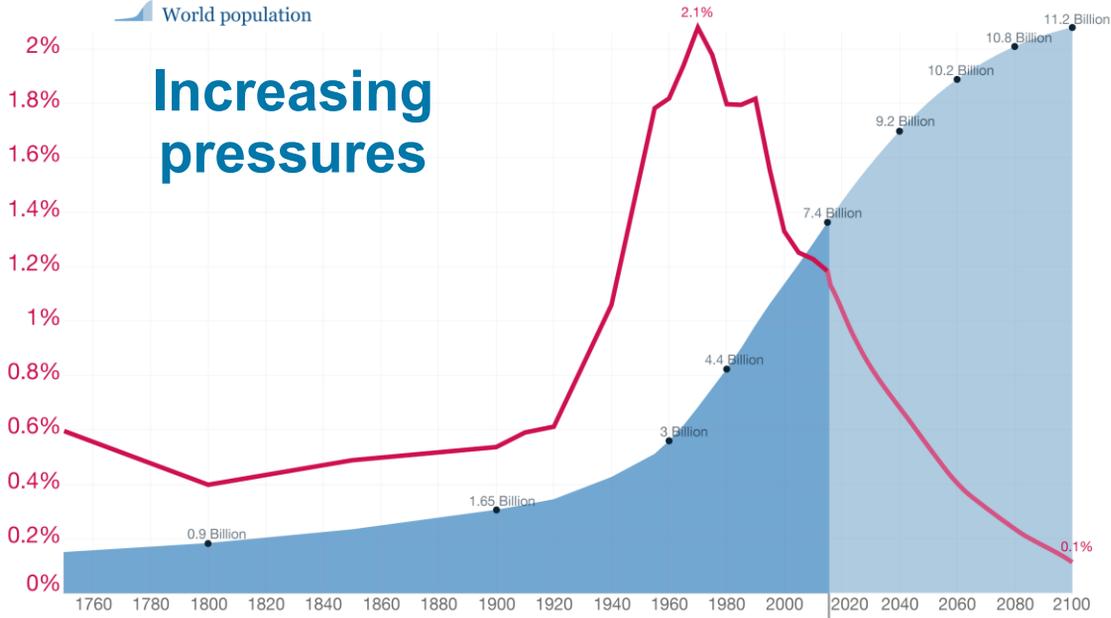


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Our World
in Data

World population growth, 1750-2100

Annual growth rate of the world population
World population



A global problem

- **New pollutants** are not easily removed by current wastewater treatment technologies – these have long-term impacts on **human health**
- **~ 1.4 million people die annually** from diseases associated with pathogen-polluted drinking water and inadequate sanitation
- Human illnesses and deaths due to **antibiotic and antimicrobial resistant infections** are projected to become a main cause of death worldwide by 2050
- **The agricultural sector** – the largest consumer of freshwater globally, major driver of eutrophication in freshwater ecosystems

UN Global Environment Outlook 6 (2019)

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Central to sustainable development



“By 2030, improve water quality by **reducing pollution, eliminating dumping** and minimizing release of **hazardous chemicals** and materials, halving the proportion of **untreated wastewater** and substantially increasing **recycling** and safe reuse globally”

Citizen science

Freshwater citizen science



Balmoral ghillies,
1856

- Before professional research, volunteers were monitoring and protecting our water
- ‘Riverkeepers’ (rivers) and Ghillies (lakes) have ensured sustainable trout stocking since Middle Ages

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People power (Citizen Science)

- “Scientific work undertaken by members of the public”
- “Often in collaboration or under the direction of professional scientists and scientific institutions” -Strasser (2018)

Crowdsourcing

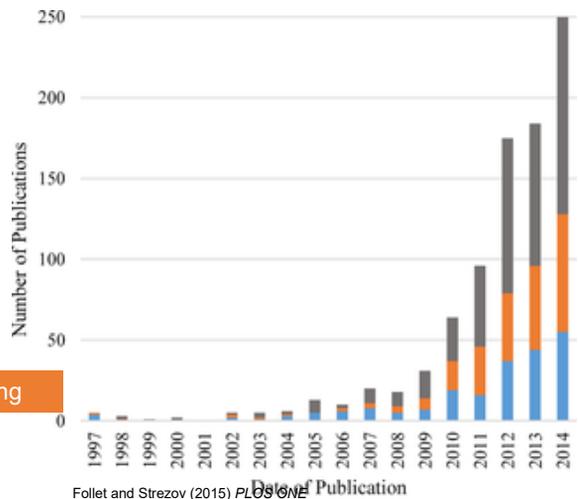
Smartphones

Internet of things

Cloud computing

Growth in higher
education

Environmental
awareness



Follet and Strezov (2015) PLOS ONE

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Benefits of citizen science

- *“Citizen science is providing unprecedented opportunities for engaging the public in collecting and analysing vast amounts of environmental data”*

Filling in knowledge gaps, supporting agency monitoring (underfunded)

Greater frequency of data covering more ecosystems

Increasing local participation and empowerment

Educate the public about environmental policy issues

UN Global Environment Outlook 6 (2019)

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Freshwater Watch

Overarching objectives

- To better manage and protect the world's freshwater
- To support a community of citizen scientists and environmental stewards



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Freshwater Watch

A global programme

- ~ 80 projects
- > 30,000 measurement events
- > 10,000 citizen scientists



Freshwater Watch

A FreshWater Watch Project

How it works



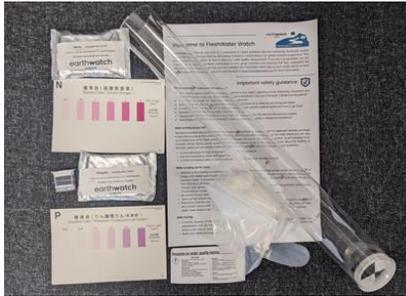
- Step 1: Ask a question (hypothesis), identify a problem
- Step 2: Engage interested participants
- Step 3: Co-design monitoring plan with local stakeholders
- Step 4: Train participants (safety, quality,...)
- Step 5: Collect data (repeatedly) with standard methods
- Step 6: Analyse data (quality control)
- Step 7: Feedback and discussion
- Step 8: Co-design actions with stakeholders



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Freshwater Watch

FreshWater Watch How it works



- Consistent measurement methods
- Online database (open data)
- Smartphone (Android/iOS) app
- Quality control (multi-level)
- Automated feedback
- Standard training methods (Train the trainer)
- Network of project leaders and participants



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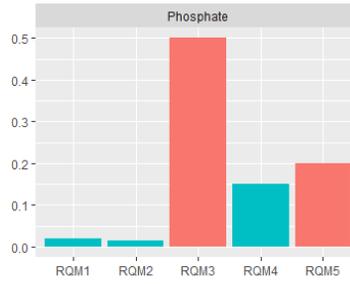
A whistle stop tour FreshWater Watch around the world

1. Evenlode Catchment Partnership (Oxfordshire, UK)
2. Basso Piave Ecosystem Services (Veneto, IT)
3. Fiume Pesa Observatory (Toscana, IT)
4. Pearl River Catchment (Guangdong, PRC)
5. Lobos reservoir (Sao Paulo, BR)
6. Lake Tanganyika (Kigoma, TZ)
7. Kafue Catchment (Kafue, Zambia)
8. European Urban WaterBlitz



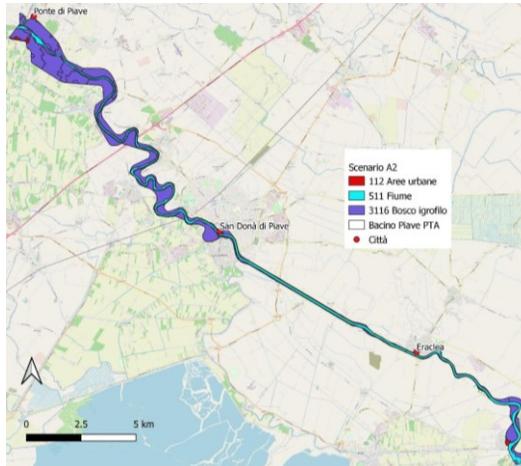
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Evenlode catchment (UK)



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Basso Piave (Veneto IT) – Analysis of ecosystem s



Di Grazia et al. 2021, Sustainability

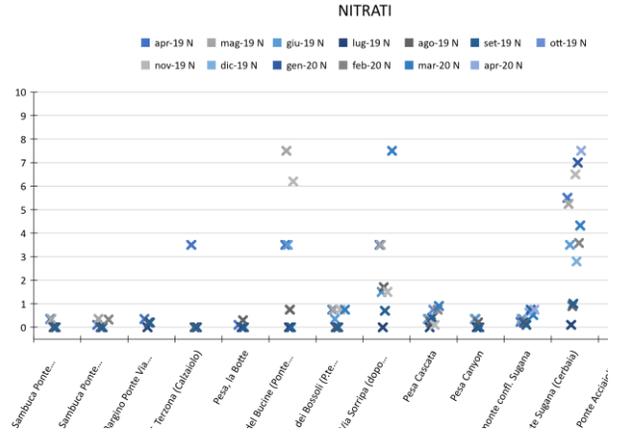


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Fiume Pesa (Toscana, IT)

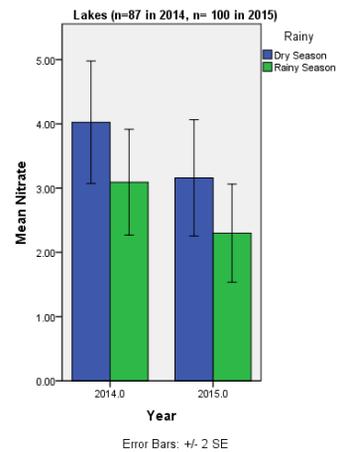


Progetto di Citizen Science "Fresh Water Watch"
 "Osservatorio cittadino per il monitoraggio di ecosistemi acquatici locali"
Applicazione sul Fiume PESA



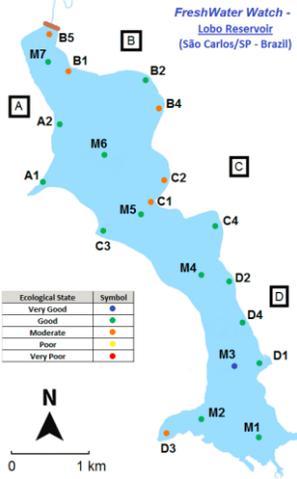
Results:
 Impact of rural housing areas on river quality
 ➤ (-) organic and nutrient pollution
 ➤ (+) minimum environmental flow
 ➤ informing water management

Pearl River Delta (Guangdong, PRC)

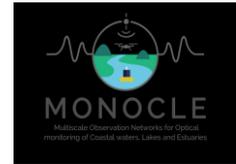


Li et al. 2017 STOTEN

Lobos Reservoir (São Paulo, BR)



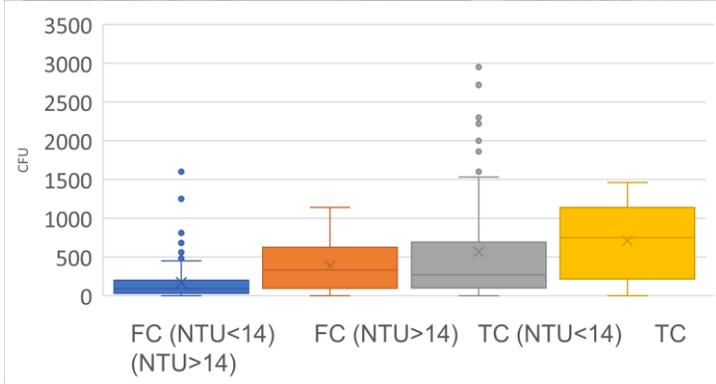
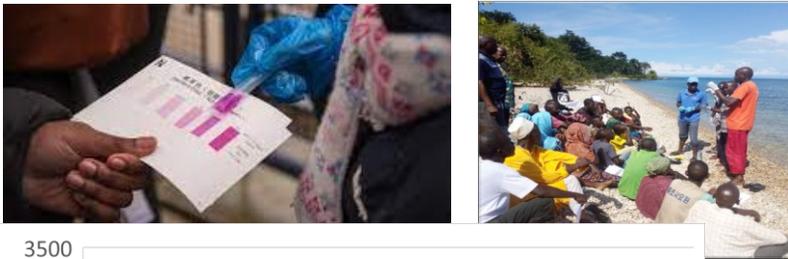
Cunha et al. 2018, *Inland waters*
Loiselle et al. 2016, *PLoS One*



Kafue River (Zambia) – UN SDG 6.3.2 reporting

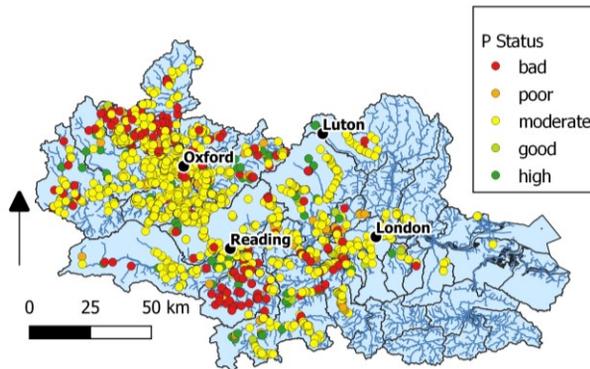


Lake Tanganyika coastal communities (Tanzania)



(Moshi et al. PLoS One, 2022)

Pan European Blitz – London, Paris, Luxembourg, Dublin, Eindhoven



(Thornhill et al. Biosciences 2018)



Thames
Blitz 2021

879

VOLUNTEERS

966

MEASUREMENTS

85

CONCERNS
INVESTIGATED

14

IMPROVEMENTS
INVESTIGATED

Will citizen scientists save the world?

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CREATING KNOWLEDGE. INSPIRING ACTION.

People + science = empowerment

- Citizen science
 - Produces new knowledge
 - Improves policy + ownership of governance
 - Increases public awareness
 - Improves participatory democracy
 - Supports new solutions



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*Huge thanks the thousands of FreshWater
Watch volunteers around the globe*

Want to know more?

<https://freshwaterwatch.thewaterhub.org/>

Want to get involved in FreshWater Watch?

Contact us!

water@earthwatch.org.uk

or

loiselle@unisi.it

**Questions?
Thoughts?
Comments?**

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