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Water and Sustainable Development
From vision to action
UN WATER
WATER FOR LIFE 2005-2015

Academia contribution to WASH

Case Study: Evaluating an inexpensive biosensor to detect anthropogenic pollution in river water and groundwater

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Upgro collaborative catalyst grant

http://upgro.org/

UP Gro Unlocking the Potential of Groundwater for the Poor

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- Background:

Majority of the population located in urban areas using on-site sanitation systems like pit-latrines which has increased anthropogenic groundwater and river water pollution (human waste: pathogens, nutrients, organic matter)

- Research Aim:

To facilitate the monitoring of anthropogenic pollution in urban environments with poor on-site sanitation systems.

- Objectives:
  - Develop a prototype biosensor
  - Test the biosensor in-situ in Tanzania
  - Collect data on groundwater quality
  - Improve the user-friendliness of the biosensor

UNESCO, 2014

Why should we use biosensors to monitor water quality?

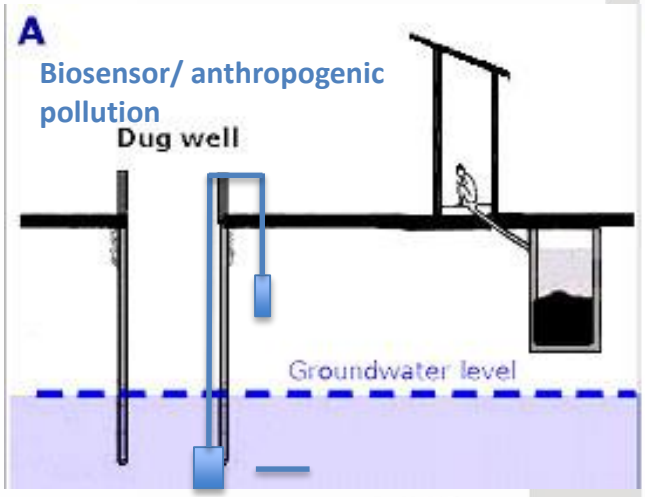
- *"To share the resources in an equitable way it is necessary first to have historical time series of all the components of the hydrological cycle, in quantity and **quality** terms"… "**It is also important to know the variability in time of the resource"**.* (Jimenez Cisneros, 2013).

- To develop practical, easy to self construct, biosensors that can be easily deployed in priority areas where efforts are needed to help achieve the Sustainable Development Goals and related UNESCO focal working areas.

- To measure an alternative type of data resolution in order to improve the affordability of sensors (in terms of cost and maintenance) for long-term data collection.

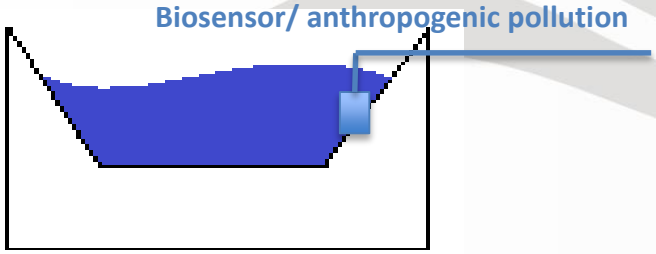
- To increase the amount of streams continuously tested *in-situ.*

- **Vision**: Implementation of the MFC biosensor
  - Groundwater monitoring



Taken from: Pidayasa et al., 2012

  - River water monitoring



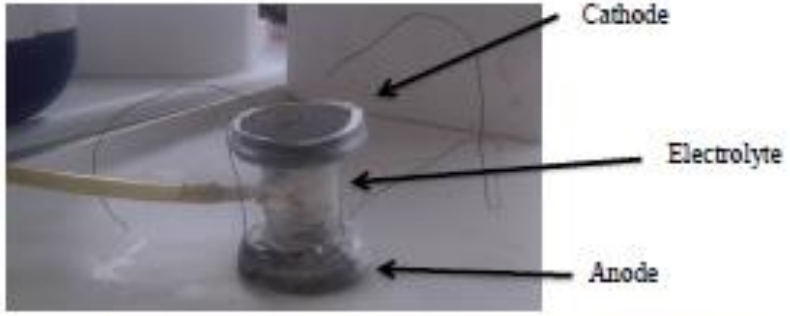
Robust technology that is able to work for increased periods of time

Data available to people that use the Resource: e.g. weather, water quality…

Maintenance conducted on site and by local people.

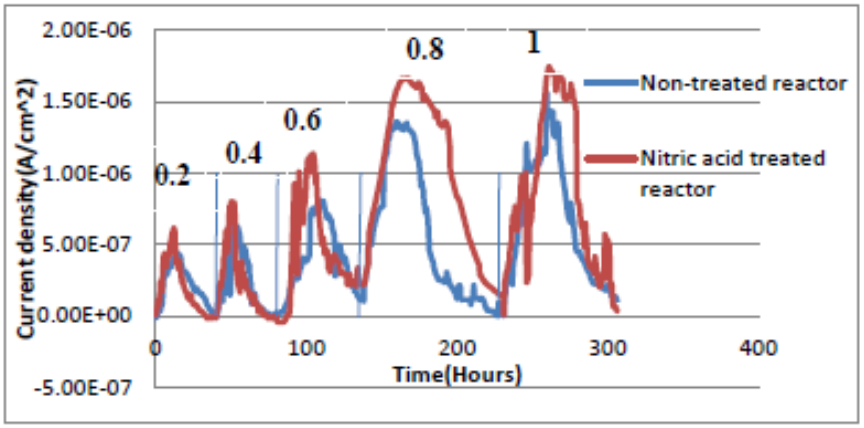
Ensuring treatment is conducted when it is needed before consumption.

- **Action**: Testing of MFC sensor using river water



A photograph showing the glass reactor. Picture was taken in the laboratory before placing the reactor inside the aquarium.

Photograph of the experimental setup of the two reactors inside the laboratory aquarium, front view.



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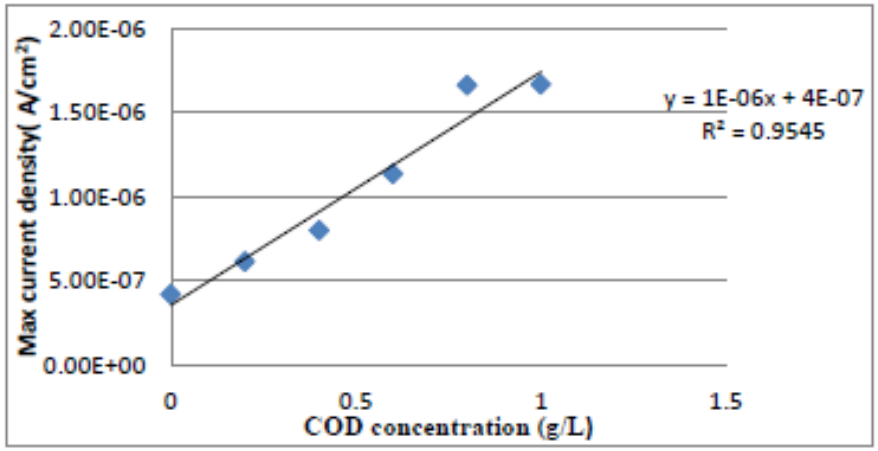
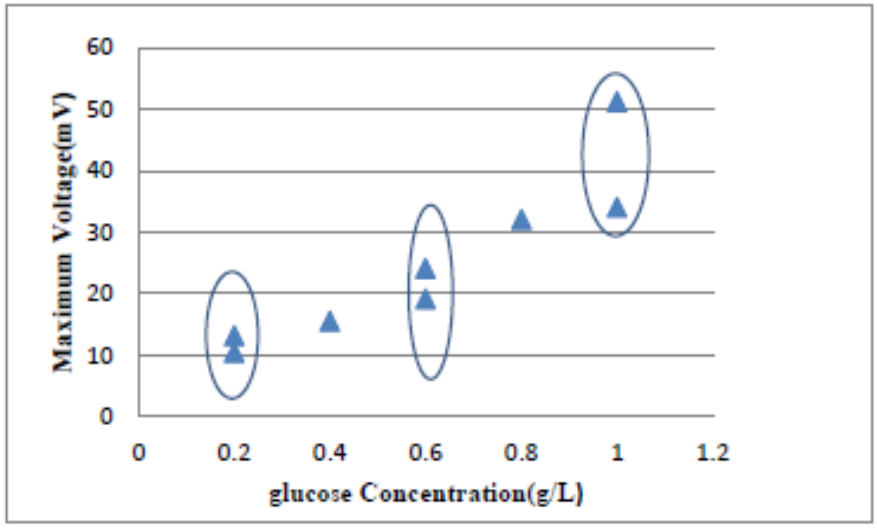
- Action: Experimental results obtained so far…
- Correlation between COD (anthropogenic pollution) and current density (biosensor response)
- Measurable variation obtained when reproducing the experiment





Project continuity:

Deployment and field testing of the biosensor:

- We are looking for organizations who would like to collaborate with us to help deploy the technology in areas where anthropogenic pollution is likely.
- We will also like to invite water experts to give feedback on the biosensor technology and the way the collected data should be deployed

Thank you!

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