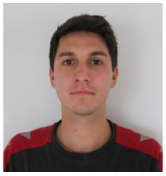
# Robust off-grid water treatments for low-resource settings

## A gravity-driven membrane for demonstration and teaching


Students



**Johannes Richert**

**Patrick Reusser**

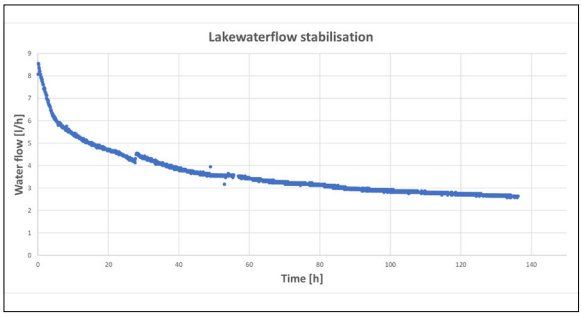

Initial Situation: Globally, over 2.2 billion people lack access to safe drinking water, a critical issue that disproportionately affects countries in the Global South. This semester thesis focuses on low-tech methods for removing pathogens (bacteria) from water. The primary techniques explored include chlorination, solar disinfection, heat treatment, activated carbon, filtration, and desalination. In the second part of the thesis, filtration technology was utilized to design and build a prototype system. Various tests were conducted to evaluate its functionality. These included flow tests to measure the output of purified water and bacterial tests to assess the system's pathogen removal performance.

Approach / Technology: The simple design make GDM technology the ideal drinking water treatment method for the Global South. This Prototype can now be used for practical training courses at our partner university in Liberia. The prototype developed can produce up to 3.5 litres of fresh water per hour (Graph). Practical instructions were written (including a Poster) for explanation purposes and for rebuilding the prototype. With the help of these instructions, the planning, understanding and construction of such a water treatment plant should be simplified or even made possible in the first place. Ensuring water quality is also part of the provision of drinking water. To quantify the safety of drinking water, methods were tested to detect bacteria in the water.

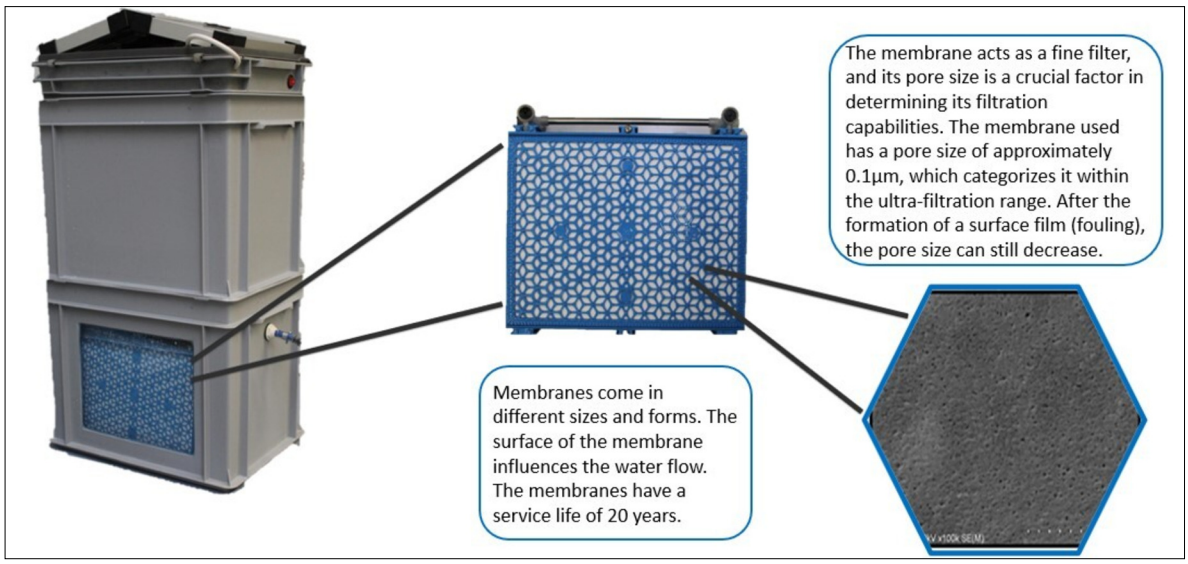
Result: An exciting test method was developed, which is very low in resources and thus also provides people with simple means a way to test the drinking water. To do this, the water to be tested is mixed with milk powder containing lactose. In the event of bacterial contamination of the water (E. coli serve as indicator organisms), this leads to phase separation of the liquids, which can be easily detected. In addition to the water tests, the membrane was also tested for its flow behaviour. These tests were able to demonstrate the stabilisation of the flow and thus also the formation of a surface film on the membrane.

**Wells in Liberia (typical drinking water supply)**
Picture by Enrico Bigger

**Results of the membrane flow-rate test with lake water**
Own presentment




**Gravity driven membrane prototype with most important components**
Own presentment




Advisor
**Prof. Dr. Michael Burkhardt**

Subject Area
**Electric solar technology, Water treatment, General environmental technology**