



Water from Heaven (Nước Mưa) in the Vietnamese Mekong delta

This technology can ensure enough storage capacity for rainwater harvesting in the dry season and produces a water quality high enough for drinking purposes.

The Issue

Due to changing climate conditions, drought problems increase in the deltas and as a result salt intrusion increases and subsidence as well. In the Mekong delta, this leads to problems in freshwater supply for economic activities and livelihoods, particularly domestic and agricultural uses of small farmers. Nowadays two major water sources are used in the dry season: surface water (from rivers or canals and stored during wet season in open ponds) and groundwater. The quality of the surface water is usually poor due to chemical or microbiological contamination and will deteriorate during the dry season. Extraction of groundwater is undesired, because increasing extraction will accelerate land subsidence, and hence severe salt intrusion, resulting in further deterioration of water quality



Rainwater harvesting might be a good alternative water source. During the rainy season (May – November) in the delta, an annual rainfall total is about 1,600 mm. There are some water harvesting systems in use, but with low capacity. While the climate is known for high annual precipitation. Current rain water harvesting is further hampered because of suspected bad rain water quality and deterioration of the in time. Due to nutrients and high temperature biological growth (algae and bacteria) take place in stored water, lowering the water quality and causing water-borne diseases.

Solution

This Water from Heaven technology will increase the water quality and the amount of rainwater harvesting. The water treatment is twofold: 1) a coarse separation method to remove particles, leaves, dirt, etc. and 2) a molecular separation with a biofilter to remove ammonia (nutrient) and ultra-filtration (UF) membrane technology to remove bacteria and viruses and store it for use during dry periods. The water treatment guarantees high water quality suitable for drinking, crop irrigation and livestock and husbandry in the coastal zone of the delta. This technology is very sustainable because it works on gravity so no energy or chemicals are needed. The landscape system needs some pumping energy (at 0.2 bar). Successful results will be even applied to salinity-affected areas as well as bio-physically disadvantaged freshwater areas like the Plain of Reeds or Long Xuyen Quadrangle with acid-sulphate soils and low population densities.

Based on several pilot studies the water quality showed better than any water guidelines.

Feasibility in the Mekong delta

The Water from heaven technology will be evaluated for different purposes in rural and agricultural areas in the Mekong delta.

Technology (patent pending)

In the upper tank storm water is collected from the roof. Any nutrients will be removed by Denutritor® technology (biofilter), followed by membrane filtration to remove bacteria and viruses. This all operates by gravity. The purified water is stored as *Water from Heaven* in the bottom tank. The whole system works automatically by gravity leading to: “Fresh water for everyone! With a roof” serving yourselves. The closed system prevents evaporation and introduction of insects and or bacteria or algae.

The system can provide enough water for any purpose during the dry season (ca. 100 days). The water quality meets WHO standards. No additives, chemicals or energy are required. A polishing filter before consumption is the finishing touch.

Awards winning concept

Water from Heaven is the winner of the Challenge City of the Future 2016 organized by 3 Dutch ministries; Finalist of the Herman Wijffels Innovation award 2016 and of the Dutch Water Innovation prize 2017. In 2020 The embassy awarded the first prize for water storage in the Mekong delta.

Value drivers

Safety: *Water from Heaven* is bacteria and virus free (Legionella, Corona, Zika, Malaria, Ebola, Guardia, Enterococci, Aeromonas Escherichia, Pseudomonas, etc..) thanks to certificated membrane technology.

Health: There are strong concerns on increasing concentrations of fluor, hormones and medicines (EDC's), plastics and nanoparticles in drinking water. Rainwater is free of these because it is distilled water and membrane filtration guarantees the claim.

Sustainability: *Mbinguni Maji* has no carbon footprint. The technology uses no power nor chemicals and leaves no waste streams.

Building and Construction: This concept can be fully integrated in buildings and is leasable.

Fresh water scarcity: Rainwater is normally spilled to river/sea/ground or evaporated. For this reason, we now have to drink treated surface- or groundwater; in fact, unnecessary contaminated rain water. Fresh water resources are now salinating by rising of sea levels and/or contaminations by waste streams. At the same time the availability of fresh water resources is diminishing.

Climate resilient cities: Rainwater harvesting contributes to rainproof streets and houses and does not leads to subsidence.

Social advantages: People and/or buildings can be self-supporting. In areas of non-available or non-drinkable water sources this opens possibilities to prevent long distance water collection or energy intensive water purification.

Independence: Each house its own drinking water facility makes civilians independent for supply.

Drinking water standards

The current water quality in the tested pilots meet several drinking water standards (Dutch-EU-WHO). The design of the building and maintenance protocol is recently certificated in The Netherlands by Kiwa. The Vietnamese standard will be evaluated.

Acknowledgement

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Partners and roles

WIC by Albert Jansen is the innovator; holds the IP and commercialization and is the project leader
WUR by Raymond Creusen brings in agro-water demand data and expertise from the Delta under Pressure program

Can Tho University by Dang Kieu Nhan (et.al) brings in the delta farm sites which could apply for demonstration and rain water data.

University of Utrecht by Dr. Carel Dieperink for advice governmental policies

Independent consultant Tamar Pieffers (ex. University Utrecht) for scouting activities in Vietnam.

More information:

Albert Jansen - Water Innovation Consulting (WIC)

Albert.wic@ziggo.nl

T +31 653 7371 97

