Module Three

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1. Why is community based managed essential in management of water resource?

According to the UNHABITAT manual (2007): On the right to water and sanitation “Communities (including community-bases organizations and residents’associations) have the knowledge of their environment, their needs and motivations to improve their situation.” It are the communities and their representing organizations that are aware of the local necessities on water and sanitation and what has to be done to improve and maintain the infrastructure. It are the same organizations that can select the poor and extreme poor households that have no access to the facilities because of their economic situation and take care of this.

Communities that are in charge of the management of the water resources become empowered. They will not only take care of the maintenance of the water resource (not necessarily by themselves- it can be outsourced to third parties) but can also undertake the necessary lobby and advocacy activities towards the (local) government and water company. Women play an essential role in this. According to John Oldfield (2011) *Community-based small-scale solutions work well if designed, built, and maintained effectively.* This decentralization of management and financing is very important, especially in rural areas but the role of government is important to scale up these initiatives and /or bring those to peri-urban areas. Projects that focus on WASH and not only water turned out to be more successful. J.Oldfield (2011) defines community based as follows: *Community-based: A community-based solution involves decentralized (village-level) decision-making, village-level ownership, locally appropriate technology, and locally sustainable business and financial models as much as possible.* But in my opinion, this is rather utopic. It can work only in case a local enterprise has been setup that takes care of the operations and maintenance of the services. And people need to pay a fee for the services delivered. It is important that the community as a whole claims its right to the water source. The right to water and sanitation is adopted by the UN General Assembly in 1966 and entered in force in 1976(UN Habitat Manual 2007). But if everybody is responsible, nobody is. Several studies show that as soon the donor leaves WASH infrastructure deteriorates. There are several reasons for this. The project design has not be done in a proper way. Or water points were constructed without taking care of hydrogeology. An important factor is that people in the communities simply do not have the opportunity to take care of the maintenance if they are not well trained and do not get paid properly. That is a botleneck experienced by a lot of water projects. So yes, community based project management is important and relevant because it guarantees the right to the local water source of all inhabitants. But at the same time, it is important to take care of a sustainable maintenance and operation system.

1. With examples, discuss the difference between Community Management and Community Participation.

Community participation means that the community is stakeholder in all stages of project development and implementation. Community management refers to community based development projects were people have direct control over key issues like financing and investment. According to G.Mansuri and V.Rao (2013) they are the ones in control.

In a study performed by Gwynneth Smith (2011) she comes to the conclusion that if communities are not involved in the whole project management cycle, projects lose their impact. The consensus of the whole community is important, but it is not enough to involve them only in the design and initial implementation phase. The building contractor responsible for the construction of the rural water systems did not involve the communities in all stages of the project. The feasibility study did not include the environmental aspects and so the project had a negative impact after completion. There was no official management plan for the water system and after a couple of months of completion the water committee was not functioning anymore. Although they played an important role in the water supply of the households, women were not actively involved. Because of missing checks and balances for the financial administration people started to suspect financial mismanagement. A lack of a final budget review continued this misunderstanding. So, the difference between community participation and management is that in the first case community is involved but only in the second case they are owner of the project/process.

1. Give five maintenance problems and difficulties. How can you overcome maintenance difficulties in the water supply system management?
2. Design and construction
3. Inadequately trained staff
4. Maintenance is performed on voluntary base and no one takes responsibility for it
5. Inappropriate technology
6. In rural areas it can be rather expensive and ineffective to perform maintenance on regular base.

* Ad a. According to J. Omotayo (2014) it is important to do some research before setting up a water supply system. A hydrological study should be performed to learn about the availability of water. Piping systems need to be installed in such a way the broken pipes can be avoided and that no leaking occurs. Water pressure is also important. For the mid-and long-term it is important to have insight in the water source because the system should have an impact of at least 15 year. Z. Kundzewicz and L. Somlyódy (1997) state that the analysis should also include other water users like hydropower plants, industry and agriculture. Expected population growth is also an important factor.
* Ad b train staff better and take care that they earn an income. This can be done by letting people pay for the services. Generally new technology and business models are introduced, and it is important to train local staff in the use and maintenance of this. Local governments often do not have finance for training or need to be convinced first of the importance. Jonny Crocker et al (2016) believe that trainings should be organized and offered in a structured way instead of an one-off event and local government staff should also be involved so the training can be embedded locally.
* Ad c Connect a local entrepreneur to the water supply system, so he/she can take care of the maintenance and have an income. The last aspect is important since in developing countries especially young people are looking for job opportunities. In some countries training centres are taking care of the training of young entrepreneurs. An example is CEWAS in the Middle East. https://cewasmiddleeast.org/trainings/trainings-and-tools/
* Ad d What we see (also in the Netherlands) is that water technology companies want to export their technology. If that technology has been developed especially for developing countries and is not too expensive, this is not a problem. But what is often the case is that those companies have developed technologies that fit perfectly in the local (Dutch) context but often does not match with local expertise and technology. On the other hand, it is not enough to just focus on locally available technologies because they may not meet the required standard. An example for this is the fluoride problem in Arusha, Tanzania. Local people are used to use bone char filters to get the fluoride out. This works only when the level of fluoride is low and it is not practical also because a lot of cows and plants to burn the bones are needed.

Organizations like <https://www.engineeringforchange.org/news/ten-technologies-for-rural-water-supplies/> and <http://www.aaws.nl/> are developing technologies that fit in the local context. In case spare parts are needed and not available locally, a 1year stock should be delivered. The best option, besides using local technology, is setting up a local factory producing the technology imported from developed countries. See also W.Jury and Henry Vaux (2005). This can only be done if local context is favourable: market, experienced staff, local financing etc.

* Ad e Install fully automated systems using water ATM system. The software provides information on water production and disruptions and technicians get the information via their smartphones. So, they only must travel if necessary. People can pay with coins or upload balance on their water ATM cards (local shopkeeper can do this).

1. What are Water technologies available in your area? Explain five.

I am living in the Netherlands, so I do not have to worry about water safety. We use groundwater and surface water. We use sand filtration (dunes), coagulation, flocculation, sedimentation, membrane filtration, active carbon filtration, UV lamp, chlorine, and aeration.

4.1 Reverse osmosis: in areas with saline water RO is necessary to purify the water. The unpurified water is first going to a filter to remove larger particles like sediment. The water is pressed through a RO membrane. By this process all contaminants will be removed. After this the water is treated by a UV filter. The water that comes out is called flat water and it is better to remineralize it for a better taste and it is also healthier. According to Frantisek Kozisek (2006) little or no intake of calcium and magnesium from low-mineral water and the loss of calcium, magnesium and other essential elements in prepared food are important consequences of demineralized water. This process needs a lot of energy but there are off grid systems on the market that work on solar energy. System is rather expensive and for the maintenance specialized technicians are requested. Although no chemicals are used the rest product is brine: water with high concentration of salt. If the plant is nearby sea this is not a problem because the sea is much saltier.



Picture: M.Nitzsche- Smart Water Solutions India using RO

4.2 Superfloc -developed in India (AAWS 2017) - is an integrated technology: to remove iron, fluoride, arsenic and bacteria can be removed as well as viruses and protozoa. Source water is routed through an electrolysis cell and automatically mixed with small concentrations of coagulant/flocculant. Pollutants react with the chemicals forming flocs because the flocs have a higher density than water. The floc sinks down and can be removed using an automatic valve system. Bacteria, viruses and protozoa are removed using a small dose of disinfectant (harmless) chemicals. It runs on solar power.

##### 4.3 Ceramic filters: such a filter is made of clay and sawdust mixed with colloidal silver powder and water. The most used model is designed by Potters for Peace (1998), locally produced in Nicaragua. The filters are impregnated with colloidal silver powder to ensure complete removal of bacteria in treated water and to prevent growth of bacteria within the filter itself. It however does not remove viruses.

##### A more sophisticated version of the ceramic filter is the Tulip filter.  The filter is made of diatomaceous earth treated with nano silver.To clean the water and avoid recontamination and algae growth. The filter contains carbon to improve taste and remove colour.

##### candle.jpg (197Ã250)

The filter of the tulip system.

The dirty water in the first container drips through the filter and is catched in the bucket. The water is clean and free of bacteria, parasites and turbidity.

4.4 Disinfection by boiling or chlorine: water can also be boiled or exposed for six hours to the sun. In Bolivia people in the Highlands were told to put a coca cola bottle filled with water on their roof and after 6-8 hours in the sun it was safe to drink. Boiling water is an effective way to kill bacteria. According to a study performed by Ghislaine Rosa et.al (2010) the results showed that the practice of boiling in the study community significantly improved the microbiological quality of water but did not fully remove the potential risk of waterborne pathogens. Boiling does either remove contaminants like iron, fluoride and arsenic. It costs energy to boil the water and often people must cut trees to boil the water. Tree cutting has not only a negative environmental impact but is also time consuming.

If there is no opportunity to boil the water, it is also possible to use chlorine (or iodine) tablets to remove bacteria but the disadvantage is the change of taste. People do not like it. It is used during emergencies because it is easy and cheap to apply. Jay Burch et al (1998) state that a limitation of chlorine is that cysts and worm eggs are resistant to chlorination. Another disadvantage of chlorine is that liquid bleach loses its disinfecting ability quickly and therefore constant supply is needed.

4.5 Clothes: this I have seen in India and Bangladesh. People put a cloth in the water to get microorganisms out. It is mainly used by poor people. But also, by the Jain people who do not want to kill animals/organisms. People (women) fold a sari cloth 4-8 times to filter (surface) water. Laboratory tests have proved that this method removes cholera bacteria (Hug A. et al 2010). Water treated this way has a reduced pathogen count of almost 99%.  Where no options are available or affordable the cloth solution is a good option.

1. How do you ensure cost effectiveness in supply of water?

This can be done by keeping the capex and opex as low as possible. In our water company in India we do this by setting up fully automated systems. As already described above using software which facilitates monitoring from a distance. The technology should fit in the local context and, if possible, produced locally. In India we buy the RO systems locally and developed the Superfloc with a local partner. Produce the technology in the Netherlands would be too expensive.

People come to fetch the water. Home delivery is organized by our company but is performed by private entrepreneurs. We setup water kiosks that are managed by local franchisees. They want to have an income and are keen on low costs. As a company we are responsible for the quality of the water and this sometimes causes some tension between the company and the franchisee.

Another way to cut costs is scaling up. The first goal after a supply service has been setup is to reach break-even, so the operational costs can be covered. The next goal is to make profit. The profit can be used to setup more services and by doing this reducing the overhead and to have more income. Etc etc.

Local utilities often are confronted with the problem of non-revenue water and therefore the World Bank (Kingdom B, 2006) introduced the Performance-Based Service Contracting. Non-revenue water can be caused by leakages in the piping system, inefficient water distribution networks, theft and/or by not billing for the water. In both cases the utility loses money and as a consequence thereof, cannot provide the necessary maintenance of the system. Under performance-based service contracting,” a private company is contracted by the management of a public utility to carry out a comprehensive NRW reduction program, with sufficient incentives and flexibility to ensure accountability for performance and with payment linked to actual results achieved in NRW reduction. Such an approach could be especially attractive in situations where the government has decided to keep the water utility under public management but is looking for ways to capitalize on the technical expertise and potential efficiency of the private sector.”

In its press release Safer drinking water for all Europeans, the European Commission (2018) informs about the proposed revised legislation to improve access to and availability of safe water. In Europe an estimated 25% of the drinking water does not reach the consumer One of the proposed improvements concerns the better management of drinking water to avoid unnecessary loss of water and contribute to lowering the CO2 footprint. This way money will be saved which can be reinvested.

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