22. Smart Techs: new options to improve WASH in schools

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What is the Issue?

In Tanzania around 70 % of the primary schools in rural areas do not have adequate WASH (Water Sanitation Hygiene) facilities. Old pumps and water tanks are often no longer

working because nobody can carry out maintenance. For instance some 50% of the hand piston pumps are not working. Other developing countries face similar problems.

A key issue is the limited funds available, mixed with the high cost of installing and maintaining water and sanitation equipment. At Smart Techs, we came to the belief that new ideas were needed to improve this situation. And through innovative thinking, the cost of a number of water and sanitation options have been cut by half – and at the same time have made the technology more effective and easier to maintain than conventional options.

Some of the key areas in which Smart Techs have been most effective are manual borehole drilling, water filters, hand pumps (EMAS and Rope pumps) Ecosan latrines and hand washing options such as Tippy Taps.

What Are Smart Techs?

Smart Techs are innovative low cost technologies that can be managed by their users, because they are simple, affordable and available. Smart Techs are generally produced and/or sold by the local private sector meaning that spare parts are available resulting in a "**profit-based sustainability**".

Can you Give Some Examples of Technologies?

An example of a Smart Tech is the **Rope Pump**, which upgrades ancient pump technology with new materials and designs in an effective way[44]. The first Rope Pump was installed in Nigeria in 1990. Eighteen years on, there are some 80,000 rope pumps worldwide used by some 3 million people of whom 1.4 million are in Africa. One of the huge benefits of Rope Pumps is that they can be produced using local skills and materials. The shift from imported piston pumps to locally produced Rope Pumps led to the rural water supply in Nicaragua increasing three times faster than that of countries using conventional hand piston pumps. Rope pumps are between five and eight times cheaper than piston pumps and are much easier to repair because of their simplicity and the availability of spares at the local blacksmith. Where they have been installed properly, IRC research suggests that 95% of the pumps stay working. (IRC 2001).

Other new lower-cost water and sanitation options for schools are:

- **Upgraded dug wells**: This uses simple technology to improve hand-dug wells by installing a cover and a hand pump. Additionally, if collapsing of the well is a problem, this technology enables it to be reinforced with the "underlining system" which make it possible to deepen the well without collapsing.

- **Rota sludge** and **Baptist drilling.** This involves improved manual drilling options that can drill in compact clay and semi-hard ground layers to 50 and 80 meters deep, respectively[45].

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[44] Based on Smart Water Solutions. www.NWP.nl
A hand operated Rope pumps can pump from 35 m deep. (60 m deep with 2 handles)

[45] Cost of machine drilled boreholes including a piston pump in Africa range from US$3000 to $10,000, depending on depth of water layer.

- **Emas tanks, Wire cement tanks.** Underground or aboveground cement tanks to collect rooftop or ground runoff water. These tanks use wire instead of construction steel and local material as bricks or bamboo. The cost is 30-40% lower than Ferro cement tanks and volumes can be up to 60 cubic meters.

- **Tube recharge:** A simple option to recharge the aquifer with 10 to 100 m3 of rainwater that otherwise would flow away to the rivers. Experiences in Zambia and Zimbabwe indicate that dug wells which previously went dry, now have water all year round. **Cost; US$2-5**

- **Filtron filter** A pot-shaped ceramic filter promoted by Potters for Peace. It eliminates turbidity and bacteria and now is locally produced in 20 countries

- **Family life straw, Pureit** and **Siphon filters**. Small and effective water filters that produce 60-120 litres of safe drinking water per day. **Cost per filter: 10 - 35 US$.**

Can you give some examples of Smart Techs water projects?

In the Njombe area of south Tanzania some 20 schools with between 200 and 400 students have a water supply from Rope pumps installed on hand drilled wells (boreholes). The shift from machine drilling to hand drilling and from imported piston pumps to locally produced Rope pumps caused the cost of school water points in this area to fall from 3000 US$ to 600 US$ each. The first pumps were installed in 2004 and today in 2009 90% of the pumps are still working. The pump maintenance - oiling and replacing the rope and washers - is so simple that it can be done by a teacher and up to four children. For sanitation simple pit latrines were built at a cost of around 60 US$ per latrine. After using the latrine, children wash their hands with a "Tippy Tap", a hand-washing tool that costs just US$5.

What other low cost options are there for every school?

There now are low cost solutions for almost every situation.

- If **water** is turbid or contaminated with harmful bacteria, it can be made clean and safe to drink with new filter options. One filter is needed for every 10-40 children depending on filter model, requiring a one-time investment of between 70c and $1.5 per child

- Where ground water is at 60 m deep or less, dug wells or hand drilled boreholes can be made. Cost; US$300 to $1500 per well.

- Where water layers are deeper or in the case of very hard ground layers or water contaminated with chemicals as arsenic or fluoride, rainwater can be caught from the roof (or the ground) and filtered for drinking purposes.

Only if the options mentioned above are not adequate, should machine drilled boreholes be used.

- For **sanitation;** in most cases simple pit latrines can be made. Eventually using urine diversion and Ecosan. The human waste may even become income generating for the school if they are sold as fertilizer to farmers in the surroundings of schools.

- For **hand washing** a simple and popular option is a Tippy Tap at a cost of 10c per child, $50 per unit

In all cases hygiene education is needed, but if combined with practical tools it is more easily adapted by children. Another advantage of introducing Smart Techs in schools is that children will convince their parents to start using these new options. For example, the Tippy Tap is disseminated in Mozambique via children's requests. (ADPP Itoculo)

Why aren't more schools provided with these options?

Mainly due to:

- **Lack of awareness.** Local and national governments are hardly aware of the new options so do not include them yet in planning. It takes publicity and demonstration in real situations to make stakeholders aware of what is available. There are many wrong assumptions about "appropriate technologies." For example people remember the Rope pump from 35 years ago when it was introduced in Africa as a low lift pump only fit for family wells. Sometimes the rope pump does not count as an improved water source since it is an "open" pump and the well can be contaminated. Experiences indicate that both assumptions are not correct.

- **Simple is not always easy.** One lesson learned in the past is that to make WASH facilities sustainable the most importance condition is Reparability. Whatever technology is installed, the school should be able to manage the maintenance. (Simple, Affordable Available) A problem with low cost options like Rope pumps is that they are "too simple". Many think they can make it themselves. But although they are indeed simple, they are not easy. Basic construction and installation details are essential. For instance a small error in a bushing can cause the handle to break within two months. "The devil is in the detail" but if it is made right it will last for 20 years.

- **Lack of capacity in some areas.** For successful dissemination of Smart Techs, capacity building is needed regarding technical, organizational as well as marketing and financial aspects. Training is needed in production, installation, quality control, maintenance management etc. To guarantee spare parts, training is needed in supply chain and financing systems.

Conclusion

With a wide-scale dissemination of Smart Techs, the cost of sustainable water and sanitation for schools, especially in rural areas, can reduce by 50% or more.

Recommendations

- Publication to schools, policy makers etc. on the huge positive economic impact of water and sanitation. This has been estimated as a benefit of between $5-28 per $1 invested. (SIWI/ WHO 2007)
- Evaluate existing low cost school WASH practices and compare these Smart Techs with conventional approaches and technologies.
- Disseminate existing information on Smart Techs through the SWS booklet.

- Wherever new water and sanitation facilities are installed, take in account the Reparability.

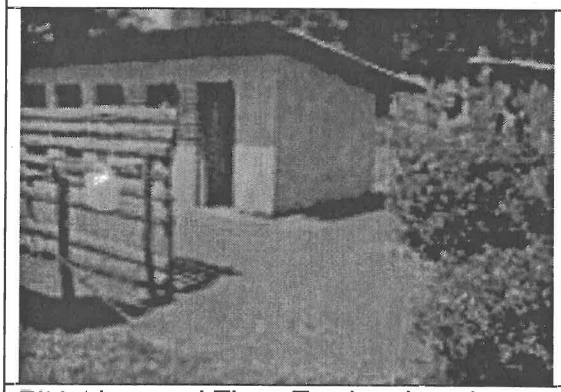
- Before installing new WASH facilities, investigate low cost options. For instance before starting a machine-drilled borehole, investigate if hand drilling is an option.

- Create Smart Tech centres specialized in school WASH that demonstrate options and have capacity to train local private sector in production, marketing, installation and maintenance via hands on training.
- Create "Millennium schools" in every region. They demonstrate new and sustainable WASH facilities, and can function as an example in that specific area.

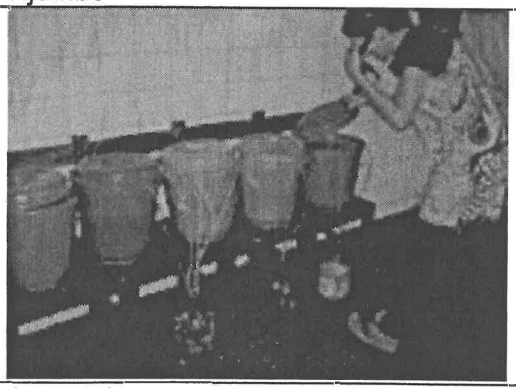
- Create "Smart Financing Solutions" to fund investments in school WASH

Drilling a 30 m deep borehole in Njombe

Rope pump installed at a school in Njombe



Pit latrines and Tippy Tap hand wash tool



Siphon filters in a school in Mozambique