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DELIVERING WATER, SANITATION AND HYGIENE SERVICES
IN AN UNCERTAIN ENVIRONMENT

Context-specific validation and introduction of technologies for sustainable WASH services

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Using the most suitable technology is a key pillar to achieve sustainable WASH service delivery. Too often these services fail because chosen technologies do not sufficiently fit in the institutional, economic/financial, social, environmental and technical context. The result is low functionality of the WASH technologies. The WASHTech project in Uganda, Ghana and Burkina Faso did technology reviews, conducted action-research and developed a context-specific tool to validate potential WASH technologies, Technology Applicability Framework. And the project developed Technology Introduction Process Guide. These processes involve participation of various sector stakeholders including the technology producers. These tools and processes have a promise to significantly contribute to a more systematic technology approval and introduction process, which would lead to better uptake of validated WASH technologies contributing to more sustainable services.

Introduction

Evidence shows that water services and sanitation facilities often do stop functioning due to failure of the water or sanitation technology used. For instance, WaterAid (2009) found that 46% of the rural water supply schemes in Tanzania were not functioning. The JMP (2012) reports that 61% of the poorest quintile in Sub-Saharan Africa were defecating in the open, also due to technology problems. Even so-called 'appropriate' technologies often fail when the expectations of the users and requirements to sustain the technology are not met. Are these 'appropriate' technologies not sound for that context? Technologies are successful or fail if they are or are not being taken up; see figure 1 and figure 2.

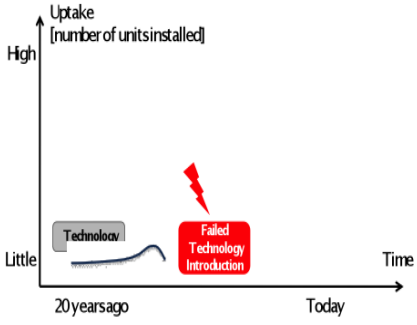

Figure 1. Unsuccessful technology

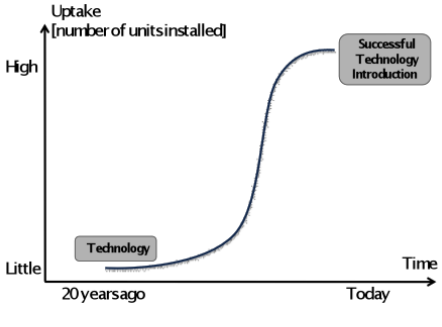

Figure 2. Successful technology

On the other hand, promising technologies that have been pilot tested and theoretically fulfil the requirements to be sustainable are not being scaled up. They may even have not been considered by the national or local sector agencies as potential water and sanitation technologies. The right, context-sound technology is a key requirement to achieve sustainable water and sanitation services (WaterAid, 2011)).

The WASHTech project aims to develop a comprehensive tool to validate new or existing WASH technologies on their applicability to a specific context to contribute to a water or sanitation service delivery. The second main purpose is the development of a process for the successful introduction of a validated technology in the institutional framework of the country or province.

The main outputs of the research are the Technology Applicability Framework (TAF) and the Technology Introduction Process Guide. Field-testing in real situations and workshops with all relevant stakeholders took place to ensure that the tools will enable decision makers in the WASH sector make the right decisions on technologies and can introduce these successfully.

The WASHTech is an action-research involving all relevant stakeholders throughout the project period to ensure strong embedding and realistic results. The aim was not only to raise interest but also to sign agreements to have the process and tools adopted and hosted in established and recognised national institutions. WASHTech is a 3-year EU-FP7-funded action-research project implemented by a consortium of IRC International Water and Sanitation Centre, Cranfield University, Skat Foundation, WaterAid, WSA, TREND, KNUST and NETWAS Uganda; http://washtechafrica.wordpress.com

Action-research methodology

The research included a literature review on a selection of different WASH technologies on the African continent. Technology reviews were conducted in the project countries, Burkina Faso, Ghana and Uganda. The main questions initially were: what are typical successful, promising, failing and new opportunities in WASH technologies, and what factors bring them in these categories?

The knowledge, attitudes and practice (KAP) of sector stakeholders towards WASH technologies and existing processes for technology approval were also assessed in the three project countries. The changes in these attitudes were assessed throughout the project duration by collecting change stories and reviewing these using the Most Significant Change methodology (Davies and Dart 2005). A strong embedding and communication strategy was designed to have full participation of the key sector stakeholders from the onset of the project. To achieve this national and district Learning Alliances were set up supported by in-country and global communication http://washtechafrica.wordpress.com.

The research consortium developed the TAF concept, detailed in the section on 'TAF and Manual'. This paper focuses on this assessment methodology. The TAF was field tested in three rounds in each country; each round followed by an extensive review of research findings with subsequent adaptation of the draft process and tools. The TAF was applied on 13 water, sanitation and hygiene technologies selected in the country technology reviews. The field methodology tested the TAF itself including a reporting format, and also produced technology recommendations for direct use in the sector in each country.

The Technology Introduction Process (TIP) included a concept development based on new paradigms in product and business development. The process was discussed in a series of in-country workshops with all relevant sector stakeholders with a focus on developers and manufacturers of technology products, the national government agencies and Development Partners.

Findings and outputs

The Africa-wide water supply and sanitation technology review focused on technologies that filled different roles in the service delivery chains, had been introduced in different ways and been developed at different times. The report describes in detail the technologies listed in table 1, using their relative technical, financial, social and institutional successes (Parker 2011).

The conclusion is that there is no similar pattern for technology adoption across different technologies. All imported technologies got government approval. Several technologies were marketed by charity-givers that got attracted to the specific technology by the awards it won, that may not necessarily reflect the technology's contextual appropriateness. Non-affordability was an issue for the VIP latrine and the UDDT. Several low-cost technologies, for instance rope pumps, household bio-sand filters, and rainwater harvesting jars struggled to get government approval and funding, and therefore relied on NGO efforts.

The Country Technology Reviews (from Burkina Faso, Ghana and Uganda, see website) revealed the factors contributing to the success or failure of major water and sanitation technologies. This resulted in each country team developing a list of technologies that were further tested on their context-specific applicability using the TAF. Table 2 shows the successful, failed, promising and new opportunities technologies in water, sanitation and hygiene per country.

Table 1. Overview of selected /reviewed water and sanitation technologies

	Technology	Technically successfully?	Financially successfully?	Socially successfully?	Institutionally successfully?
Water	Rope Pump	Yes	Yes	Yes	No
Water	India Mark II	Yes	Yes	Yes	Yes
Water	Play pump	No	No	No	Yes
Water	Bio-sand filter	Yes	Yes	Yes	No
Water	Hand dug well	Yes	Yes	Yes	Yes
Water	Rainwater jars	Yes	No	Yes	No
Water	Water jetting	Yes	Yes	Yes	No
Water	Life straw	Yes	No	Unknown	Yes
Water	Jerry can	Yes	No	Mixed reports	Unknown
Sanitation	Bio-additives	No	No	Unknown	Yes
Sanitation	VIP latrine	Yes	No	No	Yes
Sanitation	UDDT	Yes	No	Yes	Mixed reports
Sanitation	Gulper	Yes	Unknown	Unknown	Unknown
Hygiene	Tippy Tap	Yes	Yes	Yes	No

Table 2. Overview of categories of WASH technologies in Burkina Faso, Ghana and Uganda

Status	Water supply	Sanitation	Hygiene
Successful	Slow Sand Filtration-Ghana U2 pump – Uganda India Mark II ump – Burkina Faso	UDDT – Uganda SanPlat-VIP – Burkina Faso	
Failed	Rope pump - Uganda	Aqua Privy – Ghana Enviro-Loo - Ghana	
Promising	Rope Pump – Ghana Rope Pump – Burkina Faso	EcoSan latrine - Burkina Faso	Tippy Tap – Uganda Veronica Bucket - Ghana
New opportunities	UGA pump – Uganda Sand dams - Burkina Faso	EcoSan technology - Ghana	Tippy Tap – Uganda Veronica Bucket - Ghana

The KAP baseline (Cranfield, 2012) showed that in Ghana the government agency has an open mind for new technologies. In Burkina Faso the promotion of new technologies appears to be linked to the availability of funds and the ability of the technology to meet a need. Where in Uganda the stakeholders' attitude depended on the type of technology with no clear reasons why some technologies were not supported. Overall, there was little evidence that stakeholders are actively seeking new technologies from overseas. Uganda has a clear set of criteria on what an appropriate technology is but no formal technology approval process. Ghana has such a process but no clear criteria on appropriate technologies. Burkina Faso has neither a set of standards nor a technology approval process. All sector stakeholders, recognising the shortcomings in technology approval and introduction process, welcome this research.

Technology Applicability Framework (TAF) and Manual

The project found that a potential technology needs to go through two distinguished processes: (i) the validation of technology to be applicable in the specific context where it will be used; and (ii) the technology introduction process (Olschewski 2013a). Only if successful it can contribute towards sustainable service delivery. For the first process, the TAF was developed, for the second the TIP. This paper focuses on the TAF and how it is used at decentralised level, with field-testing experiences from Africa.

The TAF validates a potenial water, sanitation or hygiene technology on its promise to fit for application in the prevailing conditions of a specific context (country, province, district, sub-district) and to be one of the pillars of delivering a sustainable WASH service. The TAF has four steps: (i) screening for need and applicability, (ii) assessment of the technology in the field and in the validation workshop, (iii) presentation of the results, and (iv) interpretation of results and conclusion. The screening is a rapid test to see there is adequate need to consider this specific technology, and whether the overall requirements are available. For example, when considering rainwater harvesting the rainfall should be adequate. The technology applicability is assessed comprehensively from three perspectives: the users (buyers), the producer/provider, and the investor/regulator/facilitator. The technology is also assessed on six sustainability dimensions (fig 3), that –when crossed with the three perspectives– gives 18 indicators as shown in figure 4.

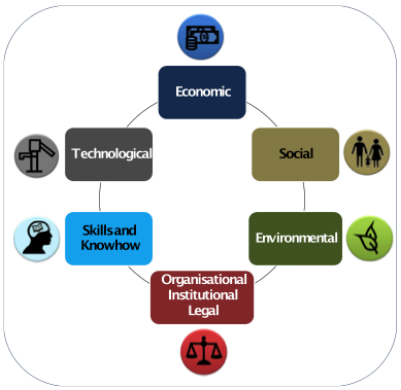

Figure 3. TAF Sustainability dimensions

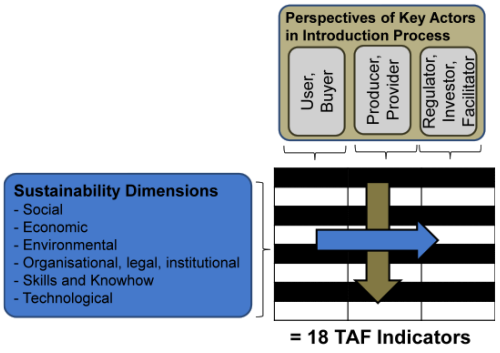

Figure 4. TAF Components

The entire process is very participatory with the key stakeholders participating in the field and workshop part of the process. The facilitator, possibly supported by a research institute, needs to contextualise the generic guiding and scoring questions provided in the TAF for each indicator considering the local context and the specific technology. Two sets of TAF guiding/scoring questions have been developed, one for water, and one for sanitation. Each has subcategories for specific water/sanitation technologies, and whether the TAF is being applied on a technology that is already existing or new for the context. Furthermore, the researcher needs to collect specific information on the technology, for instance the life cycle cost, CapEx, OpEx, CapManEx (Fonseca 2011). The facilitator then calls for an orientation workshop to inform all participating stakeholders about the technology validation process. A small core group of researchers and facilitators will conduct surveys using the contextualised guiding questions on the three perspectives (users, producers, regulator), partly in the field with the (potential) users (perspective-1), partly in the offices of the producer (perspective-2) and investor (perspective-3). After that 'field'-work, the validation workshop will bring all participating stakeholders together for a session to hear the three consolidated survey results, discuss the findings, ask the scoring questions and come to a scoring on each of the indicator with full consensus.

The validation workshop result is best visualised as shown in figure 5. The final result is a Technology Recommendation note to the sector (forthcoming), a 4-page document with an introduction on the technology, a line diagram and image of the technology, the expected life cycle cost, the validation scoring result with explanations why these scores, an overall conclusion applicable for the specific context of testing and recommendations for follow up. This entire TAF process is described in the TAF Manual (Olschewski 2013b).

The TAF validation process needs a competent and neutral facilitator with good research and facilitation capacities and able to present and explain the results to the sector.

In the three project countries, a total of 13 different technologies have been tested using the TAF, while testing the TAF itself as well. The tested technologies are largely those listed in Table 2 except the UGA pump and the Veronica Bucket, but the solar-powered groundwater pump, (ferro-cement) rainwater tank and the pour-flush latrine were added for testing.

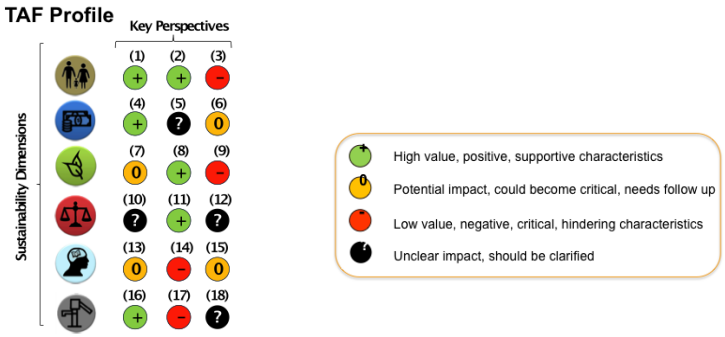

Figure 5. Technology Applicability Result visualised

Source: Olschewski (2013) WASHTech Research Report

Technology Introduction Process (TIP) Guide

From the country technology reviews it had become clear that a positive validation and official sector approval do not guarantee a successful uptake of the promising technology. Therefore, this research project developed a Technology Introduction Process and guidance on roles and responsibilities for stakeholders to be involved. Analysis found that not a single sector actor can make the technology introduction a success; it is a process involving various actors. The main actors include the Government at national and local level, Development Partners, NGOs, private sector, Research & Development organisations, and the user community. They take on the roles such as regulation, investing, facilitation and supervising, R&D, producing and buying and/or using. The Introduction Process depends on the Technology itself but also on the funding, institutional and legal frameworks in a specific country. The research looked at two investment models: (i) highly subsidized investment model (conventional approach with CapEx largely covered by the government or a donor) and (ii) no-subsidy approach (also called the market-based approach in which the users cover all cost, no government or donor subsidies). In a series of in-country workshops, the action-research partners in close collaboration with the relevant sector actors developed a Technology Introduction Process (TIP) specific for each country on water technologies sound for the two investment models. The results are in the Technology Introduction Process Guide (forthcoming).

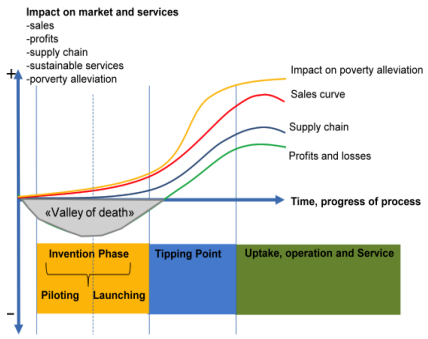

Figure 6. Technology Introduction Process Phases Source: Olschewski 2013c

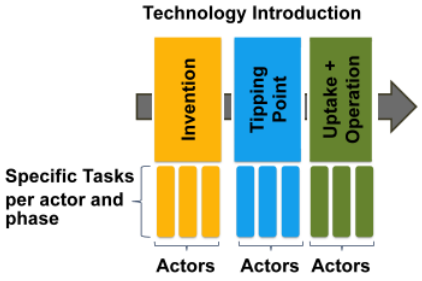

Figure 7. Specific tasks for actors in the three technology introduction phases

Conclusions

The reviews, processes and tools resulting from this action-research, particularly Africa-wide and country-specific reviews, TAF (Manual) and TIP (Guide) appear to be well received by the project countries' WASH sectors for its usefulness both in validation of new technologies and in evaluating or monitoring existing technologies on their context-specific applicability. In addition, global WASH professionals who have been contacted for feedback confirmed the value of these processes and tools.

The intensive embedding through the Learning Alliance concept and substantial communication at national and decentralised level in Burkina Faso, Ghana and Uganda throughout the project period has indeed resulted in change of perceptions on WASH technologies, and the interest to consider the adoption of the TAF and TIP in the national WASH sector guidelines. The embedding process resulted in agreed TAF & TIP hosting arrangements in the three countries: in Burkina Faso in the Direction des Etudes et de l'Information sur l'Eau (DEIE)), in Ghana in Community Water and Sanitation Agency (CWSA) and Environmental Health and Sanitation Directorate (EHSD), and in Uganda the Appropriate Technology Centre (ATC) under the Ministry of Water & Environment.

Recommendations

The processes and tools, primarily developed for rural and small town technologies, have the potential to be applied for urban water and sanitation technologies; further action-research is therefore recommended. The same applies to the use in emergency WASH. It is very much recommended that WASH-related education and training institutes consider these processes and tools in their curriculum for engineers, social scientists, economists etc. Finally, the scaling up of the methodologies is recommended for use in the WASH sector in other countries in all continents in the South and the North. Tools and process guides will become available on the RWSN website www.rural-water-supply.net.

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