Rural Water Supply Network

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Handpump Standardisation in Sub-Saharan Africa

Seeking a champion

Summary

Handpump standardisation is the formal or informal mechanism that governs the varieties of community handpumps used within a particular country. In a handful of countries this also includes standard handpump designs. With over a million handpumps in sub-Saharan Africa and new installations every day, handpump standardisation is still vital for the policy and practices of governments and implementing organisations. While rural water practitioners are polarised about the future of formal standardisation, the extent of informal standardisation is of significant importance to the sustainability of handpumps across the continent. Of the thirty-five countries in sub-Saharan using handpumps, formal standardisation has emerged in fifteen through regulations (nine countries), and endorsements (six countries). However in the remaining countries, informal standardisation determines what handpumps are installed where, either through recommendations (fourteen countries), or de facto standardisation (six countries).

Contents

Acronyms and abbreviations

CWSA	Community Water and Sanitation Agency (Ghana)
DEA	Directorate of Water and Sanitation (Mozambique)
DNA	Direccao Nacional de Aguas (Madagascar)
DNAAS	National Directorate of Water Supply and Sanitation (Angola, Portuguese acronym)
MLGH	Ministry of Local Government and Housing (Zambia)
NGOs	Non-Government Organisations
PPRA	Public Procurement Regulatory Authority (Tanzania)
RWSN	Rural Water Supply Network
SNAPE	National Service for Water Points (Guinea, French acronym)
TAF	Technology Applicability Framework
VLOM	Village Level Operation and Maintenance

Definitions

Handpump An apparatus or machine for raising water by means of a piston, plunger, or washers in a pipe powered using human energy from the hands, arms, or feet.

Handpump Standardisation The formal or informal mechanism that governs the types of community *handpumps* used within a particular country, sometimes including *handpump standards*. In Mozambique and Madagascar standardisations also include *self-supply*, household or low-cost (as opposed to community) *handpump* models.

Handpump Standards Design standards for a specific *handpump*. For *public domain* pumps the standards can either be specified in a standardisation policy (e.g. Ghana, Nigeria, Uganda and Zimbabwe) or held by a third party such as RWSN. For *private domain* pumps the standards are held by the private organisations.

Public Domain Product designs not protected by patents or royalty rights. Anyone can copy or manufacture the product (e.g. India Mark II, Afridev.).

Private Domain Product designs held by a private manufacturer protected by patents and/or royalty rights (e.g. Kardia, Vergnet etc.).

VLOM Village Level Operation and Maintenance (VLOM) is the unofficial classification of *handpumps* that are maintainable at the village level (Arlosoroff et al., 1987: 68-69; WEDC, 1999). *Handpumps* specifically classified as VLOM include the Afridev and the Tara.

Self-supply Self-supply is defined as improvements to household or community water supplies that are fully financed by the owners themselves.

1. Introduction

Across sub-Saharan Africa, an estimated 184 million people rely on *handpumps* for access to domestic water (Figure 1). To date almost one million *handpumps* have been installed across the continent, and every year over 60,000 new pumps are installed (Delta Partnership, 2009). *Handpump standardisation* drives the choices around what specific *handpumps* are installed in a particular country. These policies almost solely refer to community *handpump* installations by governments and donors, however there are examples of standardised *self-supply*, or low-cost pumps.

Formal standardisations began in Guinea in 1982 and Zimbabwe in 1987 leading to a wave of *handpump standardisation* across the continent. The 1990s witnessed a considerable push for *handpump standardisation* led by UNICEF with the support of the wider donor community. In 2013, Angola became the most recent country to adopt formal *handpump standardisation*. Today, *handpumps* such as the Afridev, India Mark II, India Mark III, Kardia, Nira, Vergnet Hydropump (generally called the Vergnet), and Volanta pumps are typically cited in *handpump standardisations* and remain the most common *handpumps* in sub-Saharan Africa.

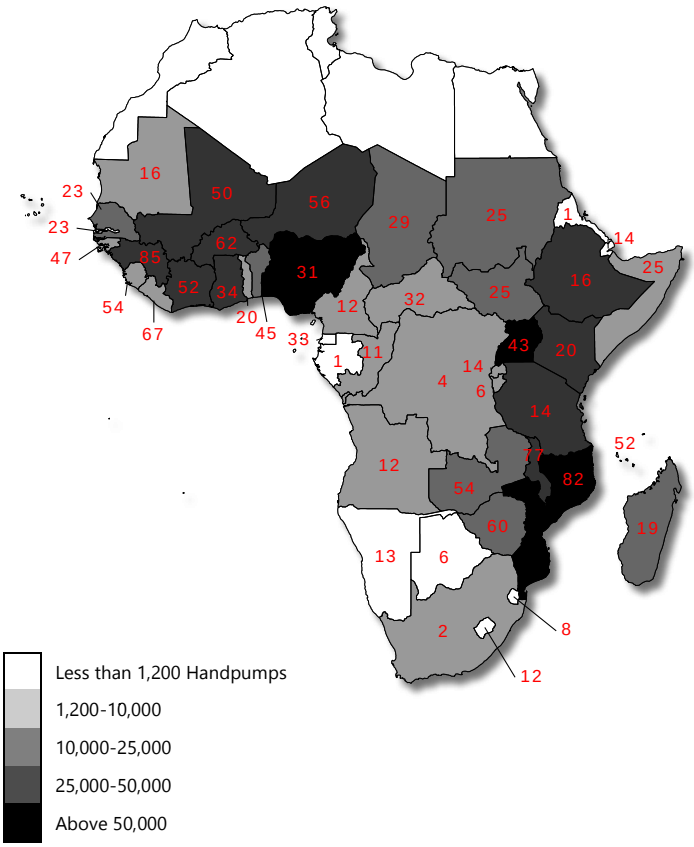


Figure 1: Estimated quantity of installed handpumps (shaded) and the percentage of the population reliant on handpumps (%)

The phrase '*handpump standardisation*' has been used interchangeably with *handpump standards* within literature and network discussion groups. However, for this publication *handpump standardisation* refers to the governing mechanism for *handpump* selection within a nation. While a handful of these policies do include *handpump standards*, the majority of standardisations do not.

Currently Sierra Leone and Ethiopia are reviewing the possibility of adopting formal *handpump standardisation*. Sierra Leone is evaluating if a standardisation policy would address the challenges of sustainability that were uncovered in recent water point mapping exercises (MEWR, 2012). Similarly, Ethiopia would like to strengthen rural *handpump* supply chains through a more formal standardisation policy (Abdi and Baumann, 2010). In both of these countries the debate around standardisation continues against a backdrop of increasing innovation in technology and service delivery models.

"If improved designs become available, [formal] standardisation can inhibit their adoption. It should be remember[ed] that one cannot compare existing designs with future designs on a national basis.... Choices are often based on forceful personalities, which is rarely a good way to make decisions (Anon, 2013)".

Thirty-two years after Guinea took the lead, *handpump standardisation* holds great influence over the choice of *handpumps* and the sustainability of water services across the continent. Yet alarmingly, over 40% of the twenty-two polled organisations for this research were uncertain about the standardisation in the countries where they work. In several countries formal policies may have been adopted, however in practice and on paper these policies are no longer the governing mechanism for *handpump* selection. They have faded with institutional memory. Additionally, there are growing concerns that *handpump standardisation* inhibits innovation and stifles the opportunity for a vibrant private sector.

"But we don't have a policy about handpump types!" (Anon, Zambia, 2013)
On the ground, the unique Zambian standardisation has faded into dusty records, but its spirit lives on in countless new handpump installations.

This publication provides an overview of the selected *handpumps* for each country, the different ways in which countries have standardised and the different ways that *handpump standardisation* is enforced. Only fifteen out of thirty-five sub-Saharan Africa countries actually follow formal standardisations. The remaining twenty countries have informal standardisations through socio-political and economic factors. While these informal standardisations are not published as policies, they are within the collective norms of those working on rural water supplies.

This publication has developed out of a Master of Science thesis in the Water Science, Policy, and Management program at the University of Oxford in 2013. Data was collected through archival research, survey responses from twenty-two countries, contact with experienced informants, and six weeks of fieldwork in Ghana, Togo and Zambia (June and July 2013). To ensure that this document is accessible to non-technical readers, page two provides definitions for a number of key terms, which are set out in *italics*.

Children taking a break from fetching water at a Vergnet, Togo

2. Handpump varities in sub-saharan Africa

If you cross the border from Zambia to Malawi, you might notice that the India Mark IIs fade into Afridevs. This was all set in motion by standardisation, as the Afridev was born in Malawi.

Handpumps, WEDC

Although *handpumps* have been used for centuries, they became the key component for aid and water access starting in 1967 when a severe drought hit several states in India. The Government of India asked UNICEF for assistance, but after drilling thousands of wells it became apparent that the design and production of old cast iron pumps was inadequate. Approximately 75% of the installed cast iron pumps were not working in 1974, just seven years later (Mudgal, 1997). This led to the development of the India Mark II *handpump* in 1975, which was used by the Indian Government and UNICEF throughout South Asia and later brought to Africa (Baumann & Furey, 2013).

During the International Decade for Drinking Water and Sanitation in the 1980s, an UNDP-World Bank project set out to catalogue and test *handpump* types from around the world (Arlosoroff et al., 1987). This project tested pumps in the *public domain* (Afridev, India Mark II, and India Mark III), as well as *private domain* designs including the Duba, Kardia, Nira, Vergnet, and Volanta (Arlosoroff et al., 1987). Additionally, the project developed the concept of Village Level Operation & Maintenance (*VLOM*) from which the Afridev and Tara pumps were developed and promoted as national standard pump types.

Since the 1990s, *VLOM* has become an informal international standard, with some donor organisations and governments only accepting '*VLOM* pumps' in their procurement and policy guidance. However, the lack of any formal, explicit definition of *VLOM* has caused confusion and is sometimes seen as a barrier to design innovation. Furthermore, the Afridev design – the most widely recognised and used *VLOM* pump – while largely successful, has not solved the maintenance and management problems, which led to its development (Baumann & Furey, 2013). The causes of failure are varied and complex and the functionality is often no better than non-*VLOM* pumps like the India Mark II[1] (Foster, 2013).

Country	India Mark II	Afridev	Vergnet	Nira	Volanta	Kardia	Other
Angola							
Benin							
Burkina Faso							
Burundi							
Central Afr. Rep.							
Cameroon							
Chad							
Congo							
Cote d'Ivoire							Abi; Sath
DRC							Duba
Ethiopia							
Ghana							
Guinea							
Guinea-Bissau							
Kenya							
Liberia							
Madagascar							Tany
Malawi							Malda
Mali							Duba
Mauritania							Solar Pumps
Mozambique							
Niger							
Nigeria							India Mark III
Rwanda							
Senegal							
Sierra Leone							
South Africa							Mono
South Sudan							Duba
Sudan							
Tanzania							Walami
The Gambia							
Togo							
Uganda							India Mark III; Uganda Modified III
Zambia							
Zimbabwe							Bush Pump

	Most common pump(s)
	Other installed pumps

Table 1: Installed handpump types in sub-Saharan Africa

[1] The India Mark II is generally considered a non-*VLOM* pump because it requires specialist tools and skills to service and repair (Arlosoroff et al, 1987).

In 2014, over thirteen types of *handpumps* were being installed in sub-Saharan Africa. This is compared to thirty-five *handpump* varieties in Burkina Faso alone in 1985 (Baumann, 2014). Today, the India Mark II remains the most common *handpump* in nineteen countries. The Vergnet has considerable domain in West and francophone Africa, while the Bush Pump has remained solely in Zimbabwe. Table 1 displays the types of pumps installed in each sub-Saharan African country with more than 1,200 installed *handpumps*. The reliance on a handful of *handpumps* has occurred in countries both with and without published policies.

3. The history of handpump standardisation

Handpump standardisation has had a unique history with different champions and sceptics, however over the last thirty-two years, fifteen countries have adopted formal standardisations. In 1982, Guinea became the first country to discreetly standardise behind the Indian experience. Zimbabwe's standardisation came shortly after with the Bush Pump.

Following the successes of India and Zimbabwe, but never mentioning Guinea, UNICEF became the largest force behind a continent wide push towards national standardisation policies aiming to minimise market fragmentation, focus efforts, strengthen supply chains, encourage effective management, facilitate community familiarisation, and increase quality control (Skinner, 1996; UNICEF, 1996; Harvey and Reed, 2004). In 1996, a memo from UNICEF headquarters (Box 1) charged UNICEF country programs to encourage national governments to formally adopt a single pump variety (UNICEF, 1996).

Box 1: Excerpts from the Guidelines for Handpump Selection and Standardisation (UNICEF, 1996)

> ...Handpump standardisation on a national scale requires a firm and long term commitment from the government and donors on the use of a particular handpump. However, to eliminate ambiguity during procurement, production and quality control, it is necessary to define the handpump adequately and document it in the form of a standard covering material specifications, design, quality control, packaging, performance and warranty aspects. Establishing a handpump standard in a country is a major accomplishment and is the final step in the handpump selection process...
>
> ...Country level handpump choice and standardisation may take 4 to 5 years. There are no short cuts to attain standardisation. No matter how strong the desire is to introduce a new handpump or make a change in the design, the time tested process of choosing an appropriate handpump must precede standardisation. Any compromise will result in loss of faith in handpump technology and the technical capability of UNICEF. Note: Although the standardisation on one pump in a country is the most desirable outcome, there are cases where it is necessary to standardise on two pumps. Such cases are most common in countries where there are two or more significantly different hydrogeological zones...

The push towards standardisation was two-fold: to develop specific *handpump* standard designs and to develop a national policy of standardisation to adopt these pumps. The 1990s saw the majority of *handpump standardisations* in Africa (Figure 2). UNICEF's guidelines were important for this movement and worked to move the donor community from the development of new *handpumps*, to the development of national standardisation (Arlosoroff et al., 1987; Erpf, 1998; James, 2004; Mudgal, 1997).

India Mark II, Togo

Single pump standardisation, based on successes in India and Zimbabwe, was strongly recommended and a national pump was seen as an important step to ensuring sustainability. It was believed that if one pump type was formally regulated, governments would be more capable of managing the infrastructure handed over from donors and the training of local mechanics for maintenance (Harvey and Reed, 2004; Reed and Skinner, 2001). Four countries have adopted standard *handpump* designs and only two countries have followed the one-pump recommendation. During this time, the Handpump Technology Network – HTN (now the Rural Water Supply Network – RWSN) was formed to promote national *handpump standardisation* as a network of practitioners committed to quality *handpump* technologies.

In the last ten years, management of *public domain handpump standards* have shifted to third parties such as the RWSN. Consequently the more recent standardisation policies do not include *handpump standards*, but refer to existing *handpump* standard designs.

Recent concerns about *handpump* functionality and a diversity of *public domain* designs have sparked a growing polarisation of the efficacy of current formal policies. Apprehensions around standardisation include: monopolisation of the market; stifling of innovative and low cost technologies; lack of incentive to improve the quality of pumps; and possible unsuitable technology selections (Delta

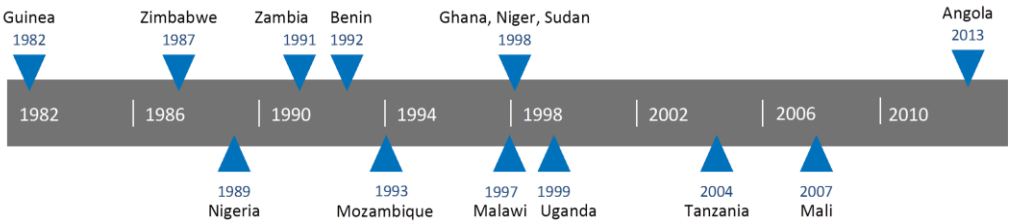


Figure 2: Timeline of formal handpump standardisation in sub-Saharan Africa[2]

[2] The dates above have been estimated based on policy documentation. Where ranges of dates are mentioned in referenced documentation, the earliest date has been selected for this timeline. Additionally Zambia's policy has faded with institutional memory (Box 6).

Partnership, 2009; Sansom and Koestler, 2009; Moriarty, 2011). While many practitioners believe that standardisation is 'complete', with twenty countries without formal policies and an increasingly innovative market, there still is a need for dialogue and development of formal policies.

Box 2: The first formal African standardisation – Guinea

The West African nation of Guinea was the first to formally standardise *handpumps* in Africa in 1982, under the National Service for Water Points (SNAPE). The policy is rarely cited in literature, but Guinea boasts the highest functionality on the continent at 90%. The standardisation policy is mandatory for organisations working within Guinea. Since its emergence, the standardisation has received complete government support and implementer compliance (SNAPE, 2007, 2009; Vergnet Hydro, 2011). Guinea is divided into two geographic zones by administrative districts and the selected handpumps are suitable for the working conditions. The Kardia pump is installed in the east zone and the Vergnet pump in the west zone. 32,000 pumps have been installed under standardisation since the 1980s (Vergnet Hydro, 2011) and the pumps provide access for 65% of the population. These pumps benefit from aftersales support from the European manufacturers. In spite of being the first country to standardise in sub-Saharan Africa, no other country has followed Guinea's strict geographic policy and Guinea remains the only country to rely solely on commercial designs, rather than *public domain* pumps. Many practitioners believe that the strict policy in conjunction with the appropriate technology selections has been the recipe for success in Guinea.

Box 3: The latest formal African standardisation – Angola

In 2013, the southern African nation of Angola became the most recent country to formally standardise under the Ministry of Water and Energy and the National Directorate of Water Supply and Sanitation (DNAAS). National and provincial water directorates, the Development Workshop, UNICEF, UNDP, Oxfam, Cowater, and SKAT all assisted in the standardisation process with technical, practical, and administrative support. The policy addresses the full sustainability of water supply points and includes aspects such as implementation strategies; management and monitoring; and technical guidelines on water-lifting devices. A 2008 survey from six Angolan provinces on handpump performance led to the selection of the three most viable handpumps: the Volanta, Afridev and Vergnet. The Angolan Government has plans to issue generic standards with drawings and assembly instructions to ensure high quality pumps (DNAAS, 2013).

4. Handpump standardisation today

Today every country in sub-Saharan Africa has experienced *handpump standardisation,* either formally or informally. This is manifest in the limited varieties of *handpumps* that are typically installed in each country (Table 1). Some standardisation exists in published documents, while other standardisation exists in the collective norms of government bodies and implementing organisations.

Formal (published) standardisation is cited in national *handpump* literature or rural water supply policy. It is quickly recalled by implementing organisations and is maintained by government agencies. Formal policies are often found in countries with a strong emphasis on rural water access. Published policies are not all written or cited in the same method. Some published standardisations are only found in passing within government-published documents. For example, in Niger, *handpump standardisation* is included parenthetically within other water policy documents (Ministere de l'Hydraulique, 2009) and in Sudan several sentences about the standardisation of *handpumps* exist in a manual for field staff and practitioners (MIWR-GONU and MWIR-GOSS, 2009). Other published standardisations exist explicitly. For example in Angola, standardisation is a whole section of a larger water supply policy (DNAAS, 2013) and in Ghana, standardisation is a stand-alone document (CWSA, 2011). These differences make policies particularly difficult to compare. Two types of formal standardisation exist: 1) regulations and 2) endorsements.

Informal (collective norms) standardisations are not found in national *handpump* literature; are difficult to find information on; and are held primarily as institutional knowledge. In countries with informal standardisation, while implementing organisations cannot cite a formal policy, they can quickly recall which *handpumps* are installed. The decentralised nature of such collective norms has led to the evolutionary development of informal standards. Two types of informal standardisation exist: 1) recommendations and 2) de facto.

Formal standardisations (published)

A. Regulations[3] are the oldest and most formal type of standardisation in sub-Saharan Africa. Regulations exist as a published list of *handpumps* by national law, a decree by a government agency, and/or through a national standards bureau. In four cases (Ghana, Nigeria, Uganda and Zimbabwe), *handpump* design specifications (*handpump standards*) are included within the regulations. In other countries, regulations refer to manufacturer standards (e.g. Guinea) or to standards held by the RWSN (e.g. Mali and Niger).

Regulations are the most formal type of standardisation. A central rural water agency or other government body can issue penalties for violation. Uniquely, in **Tanzania**, it is the Public Procurement Act that regulates the *handpump* type. Countries with regulation and their relevant governing agencies include:

- **Ghana** – the Community Water and Sanitation Agency (CWSA);
- **Guinea** – the National Service for Water Points (SNAPE);
- **Nigeria** – the Standard Organisation of Nigeria and the Ministry of Water Resources and Rural Development;
- **Tanzania** – the Public Procurement Regulatory Authority (PPRA); and
- **Uganda** – the Ugandan National Standards Bureau.

B. Endorsements[4] refer to a published list of *handpumps* for use within country that have been endorsed by the national government through the ministry responsible for water supply or rural water supply. Often a specific option of a *public domain* pump is stated. These certifications can include specific suppliers such as in Benin. However, the national standards bureau is not involved and there is no legislation in place. Countries with endorsements and their relevant governing agencies include:

- **Angola** – DNAAS;
- **Madagascar** – Directorate of Water and Sanitation (DEA); and
- **Mozambique** - the Direccao Nacional de Aguas (DNA).

[3] Also described as national standards.
[4] Also explained as homologatory policy, certifications, or validations.

Informal standardisation (Collective Norms)

C. Recommendations are a written list of pumps with no official government backing. These recommendations are usually held by implementing organisations but have not undergone an official selection process. Often larger donor funded projects and socio-political[5] forces have led to recommendations such as in Senegal, Burkina Faso, and the Central African Republic. In the research for this paper many of the countries with informal recommendations were identified by private sector stakeholders as countries without formal policies, but with a donor preference to specific pumps.

D. De Facto standardisation refers to countries where a shift to a single pump variety has occurred without government or socio-political interventions. This process has fundamentally been facilitated by the availably of *handpumps* through economic forces (for example, it is easier to get French-made pumps in francophone Africa). As South Africa explicitly chose not to formally standardise and therefore lock-into a specific brand of *handpump*, economic forces have limited the installed pumps to just the Mono pump (Harvey and Kayaga, 2003). Where recommendations are shaped by socio-political forces, de facto standardisation is shaped by economic forces.

[In Sierra Leone there is]...no enforced policy. The only standardisation comes from economic drivers. The India Mark II is about half the cost of any other pump, so it is more common (Campbell, 2013).

Girl with an Afridev handpump in Zambia

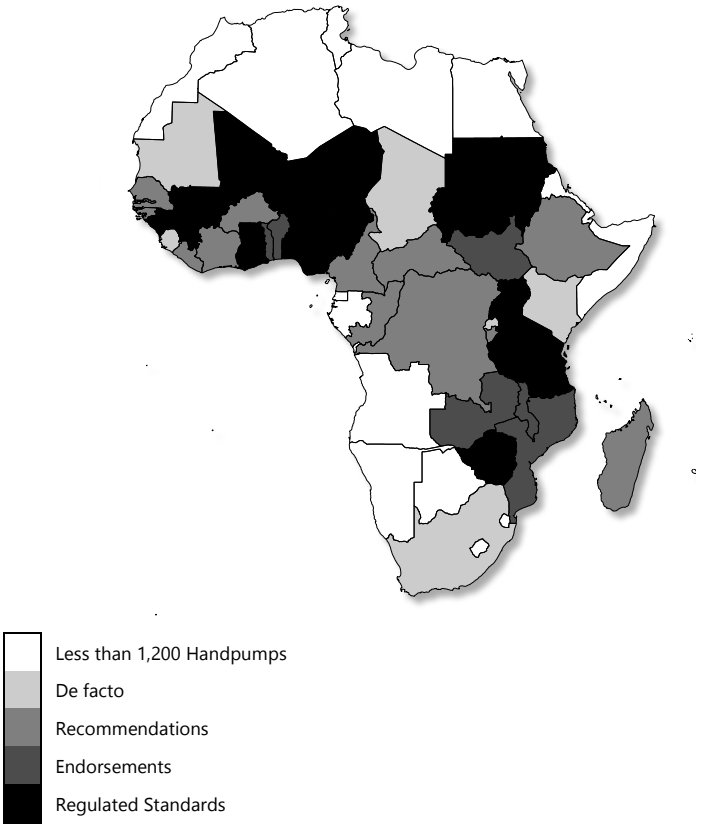
Table 2: Standardisation types and standardised pump varieties by country

Country	Type of Standardisation	Standardised Pumps
Angola	Endorsement	Vergnet, Afridev, Volanta
Benin	Endorsement	India Mark II, Afridev, Vergnet
Burkina Faso	Recommendations	
Burundi	Recommendations	
CAF	Recommendations	
Cameroon	Recommendations	
Chad	De facto	
Congo	Recommendations	
Cote d'Ivoire	Recommendations	
DRC	Recommendations	
Ethiopia	Recommendations	
Ghana	Regulation[6]	Ghana Modified India Mark II, Afridev, Nira, Vergnet
Guinea	Regulation	Kardia, Vergnet
Guinea-Bissau	Recommendations	
Kenya	De facto[7]	
Liberia	Recommendations	
Madagascar	Endorsement	Tany, Vergnet, India Mark II, Canzee
Malawi	Endorsement	Afridev, Malda
Mali	Regulation	India Mark II, Afridev, Duba
Mauritania	De facto	
Mozambique	Endorsement	Afridev, Volanta, Rope Pump
Niger	Regulation	India Mark II, Afridev, Volanta, Kardia
Nigeria	Regulation[6]	RUWATSAN I (India Mark III), RUWATSAN II (Afridev)
Rwanda	De facto	
Senegal	Recommendations[7]	
Sierra Leone	De facto[7]	
South Africa	De facto[7]	
South Sudan	Endorsement	India Mark II, Afridev, Nira, Duba
Sudan	Regulation	India Mark II
Tanzania	Regulation	Nira, Walami[8]
The Gambia	Recommendations	
Togo	Recommendations	
Uganda	Regulation[6]	India Mark II, India Mark III, Uganda Modified III
Zambia	Recommendations	
Zimbabwe	Regulation[6]	Bush Pump

[5] involving a combination of social and political factors

[6] Country which has a standard handpump design within the regulation
[7] Country which has explicitly chosen not to have a formal policy
[8] The Walimi pump was previously called SWN

Figure 3: Standardisation in sub-Saharan Africa by geography



Broken down India Mark II handpump in Zambia

5. Formal standardisations unpacked

In countries with formal standardisation no two policies are alike. Whereas Sudan and Zimbabwe have standardised on one pump, as recommended by UNICEF (1996), other countries have standardised on two or more pumps (Table 2). Some countries limit certain pumps to specific purposes (such as for communal use, school use or medical clinic use) while others consider depth, water quality, and/or settlement size (Table 3). Four specific examples of policies are outlined in Box 4. An overview of the qualifying specifications for selecting standardised pumps can be found in Table 3.

Box 4: Examples of formal standardisation in four countries

Angola (DNAAS, 2013)

In Angola, the policy is based not just on community use handpumps, but also adopts pumps for use in schools.

- Extra Deep: Over 30 meters, in Southern part of Angola: Volanta Pump
- Deep: 10 – 50 meters, Central & Northern part of Angola: Afridev Pump
- For washing facilities for schools (feeding water to overhead tank): Vergnet Hydro India Pump

Benin (Decherf, 2013)

In Benin, an endorsement policy recommends four specific vendors and only pumps by those vendors can be installed for large scale implementation projects.

- Vergnet HPV60-2000 and HPV100 made by Vergnet
- India Mk II made by Pumpenboese (GWE)
- India Mk II made by Sovema
- Afridev made by Meera

Ghana (CWSA, 2011)

In Ghana, the standardised pump varieties are not actually listed within the Community Water and Sanitation Agency (CWSA) regulated standards documentation. However, it is stated that organisations must follow the standardised pumps adopted by the CWSA and this list is available separately.

Community size and depth determine the type of technology:

- 75 – 1,000 people: handpumps, at 300 people per pump
- 1,200 – 5,000: a mechanised submersible borehole
- Greater than 5,000: piped water system
- Shallow: Less than 16.5 meters: Nira
- Mid: 16.5 – 30 meters: Afridev
- Deep: 30 – 70 meters: India Mark II (Ghana modified) or Vergnet

South Sudan (MIWR-GONU and MWIR-GOSS, 2009)

In South Sudan, pumps are determined by depth and implementers have the choice between two options in 'deep' areas, similarly to 'deep' wells in Ghana.

- Shallow: Less than 15 meters: Nira
- Deep: Up to 45 meters: India Mark II and Afridev
- Extra Deep: Over 45 meters: Duba

Table 3: Sample comparisons for selection criteria within formal policies

Country	Specification considerations	Number of pumps in the policy
Angola	Depth, Use	3
Benin	Approved Vendors	3
Ghana	Settlement Size, Depth	4
Guinea	Geographiy	2
Malawi	Depth	2
Mali	Geographiy	2
Mozambique	Depth	2
Niger	Depth	4
Nigeria	Depth	2
Senegal	Depth	2
South Sudan	Depth	3
Tanzania	Procurement Guidelines	N/A
Uganda	Depth, Water Quality	3

6. Compliance to standardsiation

Why does the organisation only install India Mark II handpumps? "Because everyone else does." (Anon, 2013)

[We have]...tried to install whatever model [of handpump] saturates a region we are in. (Allen, 2013)

Compliance ensures that the benefits of standardisation are realised. Formal standardisation policies are intended for all implementing organisations and agencies operating in the county. This would include installations funded directly by Government, in partnership, e.g. with UNICEF, or by Non Government Organisations (NGOs). Formal standardisation policies have explicit mechanisms to encourage compliance. For countries with informal standardisation the pull towards compliance by implementers is due more to supply chain considerations or for financial reasons. Overall, compliance remains very high in both formal and informal standardisation.

The most popular method to bring about compliance with formal standardisation is through forums and collaborative meetings. Notably, many of those who attend are already familiar with the policy and choose to comply as they work closely with government. Organisations that do not work closely with government are unlikely to attend such meetings and may thus be left out. Startlingly, over **40%** of the twenty-two polled organisations for this research were uncertain about the standardisation in the countries where they work.

Some governments publish *handpump standardisations* and make them easily available in a printed form to implementing organisations. Angola, Guinea, and Ghana have done this well through their centralised agencies. Some regulations have financial penalties for non-compliance (e.g. Box 5). Lastly and uniquely, organisational licenses to operate in Mozambique are contingent on approval from the Direccao Nacional de Aguas (DNA) and require organisations to read through the endorsements list before the license is granted (Gibbs, 2013).

Box 5: Ghanaian Compliance Mechanism

The western African nation of Ghana is relatively small in geographic size, yet boasts a high population of 25.37 million people, where 80% of the population has access to improved water sources. The national standards policy in Ghana was developed alongside the formation of the Community Water and Sanitation Agency (CWSA) in 1998. Four pumps were selected: two public domain pumps (Ghana Modified India Mark II and Afridev) and two private domain pumps (Nira AF85 and Vergnet). Specific pumps are selected for installation based on depth, water quality, existing area infrastructure, and community size. Modifications were made to the India Mark II to account for challenges with acidic Ghanaian groundwater and to encourage interchangeability between pumps. Initially the country was divided along geographical borders (Northern Regions: Afridev; Ashanti, Eastern and Western Regions: Ghana Modified India Mark II; Central Region: Vergnet). Only when the Nira was introduced were shallow wells included. Practically only the Ghana Modified India Mark II and Afridev are currently being installed.

The four selected pump varieties are not published in CWSA regulations, yet a clause exists that only approved pumps should be installed for communities and this pump list is available from the CWSA. Fines can be levied against non-endorsed installations. As of 2014 however, no fines have been given and organisations have just been asked to switch pumps when non-regulated pumps have been installed.

Even though compliance to standardisation is high, it is also important to examine why some organisations do not comply with formal standardisation. There are cases where organisations install non-standardised pumps, as well as those that do not adhere to specifications such as depth or use. The research found four reasons for non-compliance:

Unfamiliarity – Organisations are unaware of *handpump standardisation* and therefore do not know what to comply with. This research found published cases of this in Nigeria and Ghana, and over 40% of organisations polled were unfamiliar with the status of standardisation in their countries. Additionally, small organisations or organisations who do not focus on water are especially unfamiliar with *handpump standardisation*. They are not as involved within the national water sector as some of the larger organisations and are unlikely to attend sector meetings. Some of these organisations install pumps they are familiar with from other countries, not knowing that standardisation changes across borders (such as India Mark II installations in Malawi by organisations with experience in Zambia).

Simplification – To simplify the procurement of *handpumps* for large tenders, often one type of pump is selected, even where two or more are called for within the formal standardisation policy. This perpetuates regional challenges, particularly with respect to aggressive water.

Contestation – Occasionally, an organisation will deliberately not comply in protest. This may be due to:

1) perceived high prices for the purchase of a standardised *handpump*;
2) the lack of applicability of standardised *handpumps* for particular working conditions;
3) concerns around user maintenance;

4) unavailability of the standardised *handpumps* on the local market; or

5) a belief that some water through a non-standard pump is better than no water at all (Harvey, 2003; Foxwood, 2005).

Tearfund publically contested the recommendation of the Kardia in Burkina Faso because of its high price and many organisations (such as JICA and UNICEF) are refusing to use the India Mark II in Zambia and South Sudan because of corrosion (Harvey, 2003; MLGH, 2007b). In Uganda, the Busoga Trust ignored the regulations for over 20 years and continued to install the Consallen (WASHTech, 2012). An organisation in Ghana has justified purposefully bypassing standardisation, by installing low-cost 'household' pumps instead of 'community' pumps, aiming to quickly increase the number of households with water access points. The former usually fall outside regulated standardisation.

Pilots – In countries with formal standardisation, non-compliance is sometimes necessary to pilot innovations**.** This occurs especially where government agencies are not open to, or able to pilot new technologies and the requirements for changes to *handpump standardisations are* unclear or non-existent.

Specific projects in Angola, Ghana, Madagascar, Mali, Niger, Uganda, and Zambia have defied standardisation with the specific purpose of piloting non-standardised technologies. Uniquely, in both Madagascar and Mozambique new pumps have been successfully piloted and standardised. However, these have been for *self-supply* purposes, in which the government deemed it necessary to also standardise a low-cost pump.

Initially, standardisation targeted only community pumps, however in Madagascar, Bushproof was successfully able to see the Canzee pump tested and adopted into standardisation by the Direccao Nacional de Aguas (DNA) as a shallow lift pump (Bushproof, 2013). In Mozambique, in 2011 the Rope Pump was adopted by the Directorate of Water and Sanitation (DEA) as a *self-supply* shallow-lift pump for use by less than 20 families and a lift of less than above 25 meters (WaterAid, 2011). Also in Mozambique, the Playpump was adopted for a short time in the late 2000s under donor influence, but was later retracted due to concerns with the pump's safety (Gibbs, 2013). The above cases from Madagascar and Mozambique are endorsement policies and remain the only documented successes of piloting to standardisation, after formal standardisation was established.

Box 6: Piloting the Afridev against the illusive Zambia standardisation[9]

If you wander long enough in Zambia, you may run across a lone Afridev or two in the sea of India Mark IIs. While many documents (e.g. Harvey and Skinner, 2002; Delta Partnership, 2009), quote a Zambian standardisation policy from the early 1990s with the sole standardisation of the India Mark II, such a policy is illusive on the ground and with implementing organisations. In 2002, the Ministry of Local Government and Housing (MLGH) published a list of proposed water lifting devices for standardisation (including the India Mark II, India Mark III, Bush Pump, Blair Pump and Consallen), but the list was never officially approved. One practitioner claims that the widespread use of the India Mark II is because the program officer liked the pump from previous experience in India. While standardisation may have never officially occurred in Zambia, the historical use of strictly the India Mark II is changing with or without an official policy. JICA and UNICEF have been installing Afridevs as pilot pumps around the country in areas with aggressive water where corrosion is common. However efforts to formally change the habitual installation of India Mark IIs have been met with resistance and a formal published endorsement has not been made. Uniquely, in 2007 an Afridev made its way to the cover of the National Water Supply Documentation (MLGH 2007a). In 2010, the MLGH published an Operation and Maintenance Implementation Manual and User Guide which includes the following description of the current status of the Afridev endorsement "the focus will be on the India Mark II (which is the most popular hand pump in Zambia] and the Afridev (which is slowly gaining popularity and is being encouraged as the alternative pump…)" (MLGH, 2010:72).

The lack of clarity around the Afridev is causing confusion with both pump installers and implementing organisations and further clarity is required. This is evidenced in an unpublished 2013 memo from the MLGH, which encourages the use of the Afridev in specific contextual situations, which are the **exact opposite** from what leading installation contractors used by NGOs and the government are following. Additionally, the contractor was unaware of this government memo. The lack of formality around the use of Afridevs in Zambia highlights the importance of published policy that is accessible for those involved in rural water supplies. In areas without formal standardisation these concerns are amplified and in areas with informal recommendations, challenges such as this are to be expected.

[9] In this discrepancy MLGH memo encourages the Afridev in areas with a pH less than 7 or a depth less than 30 meters and the India Mark II in all other installations. The contractor uses the Afridev between 31 and 46 meters and the India Mark II only in wells less than 31 meters, with no mention of pH.

7. Suitability and the future of standardisation

A major concern within standardisation is standardising the 'wrong pump'. While endorsement policies do leave space for change, the publication of standards leaves lasting legacies on *handpumps* throughout a country, as seen in Sudan and Zambia. To ensure suitable pumps, four early standardisers adopted national standard *handpump* designs (Harvey, Jawara and Reed, 2002; Harvey, 2003; Onugba and Sara, 2003; WASHTech, 2012). However, to avoid locking-in to a specific pump, countries that have standardised more recently have not followed this process (DNAAS, 2013). Instead they rely on the design standards for *public domain* pumps published by RWSN. Options are specified in purchase orders and tenders. There are many options of *public domain* designs such as the India Mark II and Afridev, such as different materials and components. This leaves governments and donors ambiguous and puts the burden on the purchaser to define the specifications required.

In Uganda, South Sudan and Zambia issues with corrosion have become of increasing concern. In both Zambia and South Sudan donors have explicitly stated that a second standardised pump is required, but no actions have been taken by governing bodies to address the 'wrong pump' predicament. Any changes will require an unprecedented, and probably lengthy process.

Since the wave of policies in the 1990s, only three policies have been changed. In the mid 2000s, Benin adapted their policy to endorse specific vendors along side the endorsed *handpumps* (Decherf, 2013). Additionally, *self-supply* pumps have been endorsed in Madagascar and Mozambique (Bushproof, 2013; WaterAid, 2011).

Countries such as Togo and Zambia (Box 6), have originally had policies in the 1990s, however with diminishing institutional memory and the lack of formal documentation in primarily oral cultures, these policies have faded into what can be classified as recommendations.

Several implementing organisations have additionally expressed concern over the lack of household affordability for the majority of standardised pumps. Only Madagascar and Mozambique have endorsed low-cost pumps (the Canzee and Rope Pumps respectively). The need for practical flexibility and openness to suitable innovation in light of the necessity for robust spare part supply chains and maintainability has been identified as the greatest requirement of standardisation throughout this study.

While current formal standardisations are held by national governments, in many cases the role of the donor community cannot be underplayed. The selections have often been done by a donor representative or consultant and personal *handpump* preferences have been married into policies.

Summarising the pros and cons of the different standardisation types: regulations offer the highest level of government support, however they require strong institutions and governance to maintain them and are very difficult to change (Erpf, 2013). Recommendations carry the risk of unverified *handpump*s for the specific geographic, hydrogeological, and social environments, but are relatively easy to create. De facto standardisation is effective in areas with strong governance and capable implementing partners yet in areas with weak governance and/or inexperienced implementing partners, economic forces can promote pumps that are not suitable for the environment. Endorsements allow for flexibility, yet remain practical about the importance for consistency.

Based on the trajectory of the last several countries to standardise, the face of standardisation is turning towards endorsements (DNAAS, 2013). Ghana and Uganda are shifting towards models that encourage the innovation and flexibility of endorsement policies, while keeping the pump design standardised through the national standards bureaus. This shift encourages standardisation to address concerns about innovation, suitability, flexibility, and a changing market. A similar shift is expected in other countries with regulations in place. Additionally, countries with informal standardisation seem to be shifting to endorsements, such as those being considered in Sierra Leone and Ethiopia.

One tool that can assist governments in determining the suitability of new or improved *handpump* designs for the national context while evading the 'familiarity pick' dilemma, is the Technology Applicability Framework (TAF)[10]. The framework can also be used to monitor and diagnose successes and failures of existing *handpump*s within the country.

It is recommended that future policies and policy revisions include periodic reviews and adoptions of suitable innovations and adaptations from the recommendations of relevant implementing partners and research. Policies should state the appropriate operating conditions for specific *handpump*s and ideally should include several price points (Delta Partnership, 2009). Prescribed suggestions on the important aspects of *handpump standardisation* could be a follow up to this publication.

[10] www.washtechnologies.net. The TAF was piloted on India Mark II (and variants) and rope pumps in Uganda, Burkina Faso and Ghana.

8. Key messages

Standardisation has occurred everywhere in sub-Saharan Africa. Even though formal policies only exist in fifteen of the thirty-five countries using handpumps, every country has focused on one to four pumps. Informal *handpump standardisation* is happening and should be reviewed to ensure appropriate selections.

Some formal standardisations need a facelift. While many formal policies started out with good intentions, a lot has changed since the 1990s and some policies need to be revised due to improper selections or limitations on the incorporation of improved technologies. This is a lengthy and costly process, which requires the collaboration of many handpump stakeholders on both the local and global levels. Additionally, while standardisation is controlling the installations across the continent, the topic has lost momentum in the global sustainability dialogue.

Some informal sandardisations should rethink formalisation. Countries with significant volumes of *handpumps* such as Ethiopia, Sierra Leone and Zambia, should seriously consider moving toward formal policies with appropriate and unbiased selections. This formalisation could be in the form of endorsements, with a certification of pumps and suppliers.

Endorsement policies may have a bright future. While the flexibility and pragmatism in endorsement policies seems to resonate with the current handpump market, further research is required to establish best practices and a methodology on how regulations can develop into endorsements.

An institutional champion for standardisation is required. There is a need to document and better understand ways to innovate and improve policies, pumps, and selections. While many practitioners acknowledge that adaptation to the changed handpump market is necessary, there is little documented experience about where to start. Standardisation was originally championed by one organisation and this new wave of adaptable-standardisation requires an institutional champion to give guidance and validation.

Annex A: Sources by country

Country	Source
Angola	Erpf, 2013; DNAAS, 2013
Benin	Decherf, 11 February 2013; MMEH, 2005
Botswana	Under 1200 Handpumps
Burkina Faso	Diarra, 2013; Decherf, 4 May 2013; WASHTech, 2012: 8
Burundi	Decherf, 4 May 2013)
Cameroon	Diarra, 2013; Decherf, 21 May 2013
Central African Republic	Allen, 2013; Decherf, 21 May 2013
Chad	Diarra, 2013; Decherf, 21 May 2013
Comoros	Under 1200 Handpumps
Congo	Decherf, 4 May 2013
Cote d'Ivoire	Decherf, 11 February 2013
Djibouti	Under 1200 Handpumps; Decherf, 21 May 2013
DRC	Decherf, 4 May 2013
Equatorial Guinea	Under 1000 Handpumps
Eritrea	Under 1000 Handpumps; Daw, 2013
Ethiopia	Abdi and Baumann, 2010
Gabon	Under 1000 Handpumps
Ghana	Bugase, 2013; Decherf, 11 February 2013; WASHTech, 2012: 8
Guinea	Decherf, 11 February 2013
Guinea-Bissau	Decherf, 21 May 2013
Kenya	Harvey et al., 2003:8
Lesotho	Under 1000 Handpumps
Liberia	Government of Liberia, 2014
Madagascar	Erpf, 2013; Monteleone, 2013
Malawi	Baumann and Druck, 2000; Erpf, 2013
Mali	Diarra, 2013; Decherf, 11 February 2013
Mauritania	Diarra, 2013
Mozambique	Erpf, 2013; Gibbs, 2013
Namibia	Under 1000 Handpumps; Gibbs, 2013; Decherf, 21 May 2013
Niger	Diarra, 2013; Ministere de l'Hydraulique, 2009: 2, 18
Nigeria	Anon and Odukuye, 2003: 91; Daw, 2013
Rwanda	Saltzman, 2013
Senegal	Decherf, 4 May 2013
Sierra Leone	Cambell, 2013; Foxwood, 2005: 14
Somalia	Decherf, 21 May 2013
South Africa	Harvey and Kayaga, 2003: 27
South Sudan	MIWR-GONU and MWIR-GOSS, 2009: 37
Sudan	MIWR-GONU and MWIR-GOSS, 2009: 37
Swaziland	Under 1200 Handpumps; Wurzel, 2013
Tanzania	Adkins, 2013; Erpf, 2013; Government of Tanzania, 2004
The Gambia	Decherf, 4 May 2013; Mak, 2013
Togo	Diarra, 2013; Decherf, 21 May 2013; Ministere de L'Eau, 2009
Uganda	Erpf, 2013; Harvey, 2003; WASHTech, 2012: 7,9
Zambia	Harvey and Skinner 2002: 15; MLGH 2007a
Zimbabwe	Eprf, 1998

Country	Survey JMP	Method 1 (JMP Data Estimate)	Method 3 (WPM or informant)	Overall Pump Estimate	Method for Estimating Pump Count
Angola	IBEP11	9,107		**9,107**	Method 1
Benin	DHS06	7,002		**7,002**	Method 1
Botswana	MIS07	463		**463**	Method 1
Burkina Faso	ENA10	33,488		**40,843**	Method 1
Burundi	MICS05	1,610		**1,610**	Method 1
Cameroon	ECAM07	8,859		**8,859**	Method 1
Central African Republic	MICS06	5,236		**5,236**	Method 1
Chad	MICS10	12,844		**12,844**	Method 1
Comoros	WHS03	1,168		**1,168**	Method 1
Congo	AIS09	1,780		**1,780**	Method 1
Cote d'Ivoire	ENV08	39,519		**39,519**	Method 1
Djibouti	EDAM02	441		**441**	Method 1
DRC	DHS07	8,527		**8,527**	Method 1
Equatorial Guinea	MICS00	676		**676**	Method 1
Eritrea	*DHS02*	123		**123**	Method 1
Ethiopia	WHS03	23,584	44,964	**44,964**	Method 2 (Government of Ethiopia)
Gabon	*QUIBB05*	49		**49**	Method 1
Ghana	DHS08	34,174	26,221	**26,221**	Method 2 (CWSA, 2013)
Guinea	ELEP07	19,544		**19,544**	Method 1
Guinea-Bissau	pMICS10	2,824		**2,824**	Method 1
Kenya	DHS09	32,063		**32,063**	Method 1
Lesotho	DHS09	1,032		**1,032**	Method 1
Liberia	LMIS09	10,200	9,389	**9,389**	Method 2 (GoL, 2014)
Madagascar	DHS09	10,225		**10,225**	Method 1
Malawi	DHS10	32,896		**32,896**	Method 1
Mali	MICS10	23,209		**56,105**	Method 1
Mauritania	MICS07	1,824		**1,824**	Method 1
Mozambique	MICS08	21,343		**21,343**	Method 1
Namibia	DHS07	1,072		**1,072**	Method 1
Niger	ENBC08	8,394		**8,394**	Method 1
Nigeria	BLS08	187,068		**187,068**	Method 1
Rwanda	DHS08	5,651		**5,651**	Method 1
Senegal	MIS09	10,564		**10,564**	Method 1
Sierra Leone	DHS08	6,345	12,004	**12,004**	Method 2 (MEWR, 2012)
Somalia	MICS05	8,346		**8,346**	Method 1
South Africa	SAGE08	2,954		**2,954**	Method 1
South Sudan		unknown		**unknown**	unknown
Sudan	CEN08	41,831		**41,831**	Method 1
Swaziland	pMICS10	313		**313**	Method 1
Tanzania	DHS10	25,470		**25,470**	Method 1
The Gambia	MICS06	1,397		**1,397**	Method 1
Togo	MICS10	2,725	4,705	**4,705**	Method 3
Uganda	MIS09	55,842	42,000	**42,000**	Method 1
Zambia	LCMS06	13,082	25,000	**25,410**	Method 2 (MLGH, 2013)
Zimbabwe	MIMS09	38,200	50,000	**50,000**	Method 2 (Erpf, 2013)

Two methods were used to estimate a handpump count as explained below. The JMP survey year is displayed in the table above and full references are found in the references appendix.

Method 1: Derived estimate using Joint Monitoring Program (JMP, 2013) data.

$$\frac{\text{JMP \% of population using protected wells and tubewells urban and rural} * \text{JMP total population}}{250 \text{ people/pump}}$$

Method 2: Derived from informant information, published government estimate or water point mapping estimate.

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Jess MacArthur is a water and sanitation specialist currently residing and working in Bangladesh with iDE. With extensive international experience and an engineering background, Jess is currently exploring innovative and practical market based water and sanitation solutions for the rural poor in South Asia through human centred design principles and market development.

Disclaimer: Information regarding handpump standardisation is notoriously difficult to unravel. The author has taken great effort to unearth information about standardisation in each country in sub-Saharan Africa, however the information presented in this paper only offers slivers of the picture, especially in areas with informal standardisation. This compendium of policies will be constantly evolving and the author requests that any additional information regarding standardisation be shared with the wider RWSN community.

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