WaterAid

Sustainability framework

WaterAid/Marco Betti

This document sets out a framework for sustainable water supply and sanitation services and hygiene behaviour change in low-income countries. It is intended primarily to guide WaterAid country programmes, but it is hoped it may stimulate the thinking of other agencies too. Its focus is primarily on rural populations who constitute the majority of those as yet unserved by improved water supply and sanitation services. However, where relevant, references are made to urban practice. It focuses more on water supply than sanitation and hygiene, since the evidence base is stronger in the former than the latter.

This framework document was drafted by Richard Carter, Vincent Casey and Erik Harvey. It has benefited from comments from numerous individuals in WaterAid's country programmes and International Programmes and Policy and Campaigns departments. External reviews by Harold Lockwood, Ned Breslin, Kerstin Danert and Joe Gomme have also strengthened it considerably.

The paper should be cited as *WaterAid (2011) Sustainability framework*.

The paper can be found in the documents section of WaterAid's website – **www.wateraid.org/publications**

WaterAid/Alex Macro

Contents

Glossary

Access	People are described as having access to a water or sanitation service if they can use a functioning facility within a reasonable distance of their home, and without exclusion on grounds of race, tribe, religion, gender or other cause.
Capital maintenance	Renewal, rehabilitation or replacement of assets, beyond routine maintenance. Capital maintenance expenditure is abbreviated as CapManEx.
CLTS	Community-led Total Sanitation – an approach to the promotion of sanitation which brings about a collective community decision to reject open defecation. Communities strive to achieve Open Defecation Free (ODF) status. CLTS in its 'pure' form does not recommend or subsidise specific sanitation technologies.
Coverage	The proportion or percentage of the population who enjoy an 'improved' water or sanitation service, as defined by the WHO/UNICEF Joint Monitoring Programme (JMP).
Hardware	The 'hard' or physical infrastructure (eg pumps, pipes, taps and toilets) which make water, sanitation and hygiene services possible.
Hygiene	Personal and household practices such as hand-washing, bathing and management of stored water in the home, all aimed at preserving cleanliness and health.
Infrastructure	The basic physical and organisational structures needed for a society or enterprise to function. In this paper we refer to the 'hard' or physical infrastructure (eg pumps, pipes, taps and toilets) and the 'soft' infrastructure (especially community level management structures).
Life cycle costs	The costs of keeping a service running permanently, including the capital costs, the costs of routine operation and maintenance, and the capital maintenance costs. All software and institutional overhead costs are also included.
No-regrets actions	Actions which are undertaken in anticipation of a future threat, but which are of value whether or not that threat materialises.

O&M	Operation and Maintenance – shorthand for the post-construction activities involved in water and sanitation services.
Sanitation	In the narrow sense, the safe disposal or re-use of human excreta. In the broad sense, excreta management together with solid waste and storm water management.
Sector	The arena in which the collective endeavours of governments, donors, the private sector and civil society collaborate to improve water, sanitation and hygiene services.
Self-supply	The initiatives undertaken by individuals and communities to enhance their own water or sanitation services. Also used to describe the approach in which such initiatives are encouraged and supported.
Social marketing	An approach which uses marketing principles to achieve social benefits such as changes in attitudes and behaviours which are deemed to be good for society as a whole.
Software	Activities which mobilise households and communities and establish the 'soft' infrastructure (especially community level management structures) which is necessary for the functioning of water, sanitation and hygiene services.
Sustainability	Sustainability is about whether or not WASH services and good hygiene practices continue to work and deliver benefits over time. No time limit is set on those continued services, behaviour changes and outcomes. In other words, sustainability is about permanent beneficial change in WASH services and hygiene practices.
Tippy tap	A low-cost water dispenser for hand-washing, usually made from a discarded plastic container.
WASH	Water, Sanitation and Hygiene

WaterAid/Caroline Irby

Part 1

Introduction

Widening access, extending impact ...

Progress in achieving safe, convenient and affordable water supply and sanitation services is sometimes frustratingly slow, both for those working in the sector and those outside it. In 2010, nearly 900 million people (of which 84% live in rural areas) still lack access to a convenient supply of safe water and nearly three times that number (70% of whom live in rural areas) have inadequate sanitation. Furthermore, the evidence suggests that simple improvements in hygiene practices could have even greater beneficial impacts on human health than those gained from better sanitation or water supply. Much more needs to be done to achieve the Millennium Development Goal (MDG) targets in water supply and sanitation, to promote better hygiene and, ultimately, to bring services to all.

... while keeping services working

However, at least as important as the imperative to do more is the urgent need to do better. Whether we progress slowly or quickly to the achievement of water and sanitation services for all, it is crucial that the systems put in place – both 'hardware' and 'software' – and the changes in practice brought about in people's lives, last. Somehow we in the water and sanitation sector need to live with this constructive tension between accelerating progress on coverage and getting the sustainability story right. We indeed need more taps and toilets, but at the same time we need fewer defunct and abandoned water and sanitation services. The neglect of the word 'sustainable' in the MDG target to 'halve by 2015 [relative to 1990] the proportion of people without sustainable access to safe drinking water and basic sanitation', needs to be corrected.

Lasting change

Sustainability means beneficial change in access to services leading to corresponding lasting outcomes and impacts in people's lives. The time dimension implied in the idea of sustainability is not finite. Once change for the better has been brought about, that trajectory of change must be maintained and enhanced. If communities slip back into a situation where they have to rely on unimproved water and sanitation services then investment has effectively been wasted. A greater emphasis is required on getting the 'service' component of service delivery right if progress is to be made.

WaterAid's experience

WaterAid, like many organisations, has always striven for sustainability in its service delivery work in country programmes. Its achievements in delivering long-term change have been impressive in some places, and less so in others. In the countries where WaterAid works, and more widely in the developing world, the picture among other organisations, including governments and utilities, is similarly mixed. Achieving sustainability, as others have pointed out, is a continuing struggle. Throughout its three decades in the Water, Sanitation and Hygiene (WASH) sector, WaterAid has worked directly and with numerous partners to bring water and sanitation services and improved hygiene practices to many millions of disadvantaged people in low-income countries. Part of this has been carried out through the directly supported service delivery work of WaterAid, and part through WaterAid's advocacy and influencing work, which has resulted in other organisations delivering more or better services to rural and urban people.

WaterAid's Global Strategy

WaterAid's current Global Strategy (2010-2015)[1] contains the ambitious targets of delivering WASH services to 25 million people directly (through funded partnership agreements) and another 100 million indirectly (by influencing others) by 2015. The first figure represents a two- to three-fold increase in the annual rate of WaterAid's service delivery work, while the second figure is articulated for the first time in the current Strategy. WaterAid therefore has grand and laudable ambitions to **do more**. At the same time however, we need to **do better**.

Sustainable services and sustainable change

First we need to state what 'better' means in this context. There is extensive evidence from many low-income countries that newly delivered WASH services often perform effectively for a period, and then either fall into disrepair or otherwise fail to provide continuing benefits to their users. Figure 1 is a graphic representation of this problem. It shows data from six districts of Tanzania collected and analysed as part of a WaterAid research study carried out in 2006. To our knowledge it is the only published time-series of rural water supply functionality data[2].

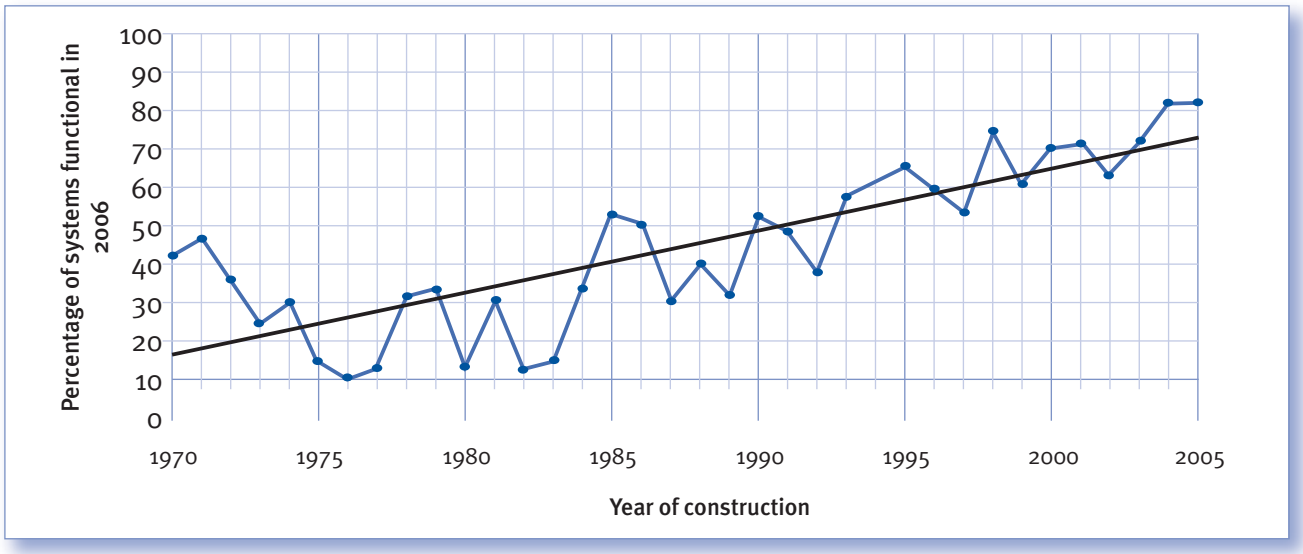

Figure 1 Functionality of rural water supply schemes by age (six districts of Tanzania)

In regard to sanitation and hygiene, the evidence of sustainable outcomes lies in permanently changed attitudes and behaviours. The *use* of improved sanitation (as opposed to simply having a latrine) and the habitual practice of good hygiene – including hand-washing, personal and home hygiene and safe storage and management of water – are the outcomes which are likely to lead to the greatest health benefits for those who practise them and for those with whom they come into contact. In contrast to water supply, we have far less evidence of the factors which contribute to the sustainability of sanitation use and hygiene behaviour change.

Beyond business as usual

The responsibility of communities to manage their water and sanitation services forms a central component of much WASH sector policy and strategy. However, subscription to this principle has not delivered the results expected. In some cases this is due to poor implementation, in other cases the principle is simply inadequate. The community management model has sometimes been presented as a panacea for achievement of lasting services but in the absence of external support, there is extensive evidence of its weaknesses. The evolution of community management as a pragmatic response to weaknesses in public service provision, and its subsequent promotion as the ideal model of service delivery was a triumph of hope over realism[3].

Figure 2 shows how an external intervention providing water supply infrastructure, together with the establishment of a community management structure, is only a partial solution to the problem of poor services. Limitations in community capabilities to manage their services highlight the need for effective external support – both to the physical infrastructure and to the management arrangements. Later in this paper, evidence is presented which shows that effective external support to community management can achieve a great deal in terms of sustainability. The ability of households, communities and institutions (such as schools) to manage their water supply and sanitation systems is highly context specific. Although this diagram illustrates the situation for water supply, similar principles apply in the case of enhanced sanitation services.

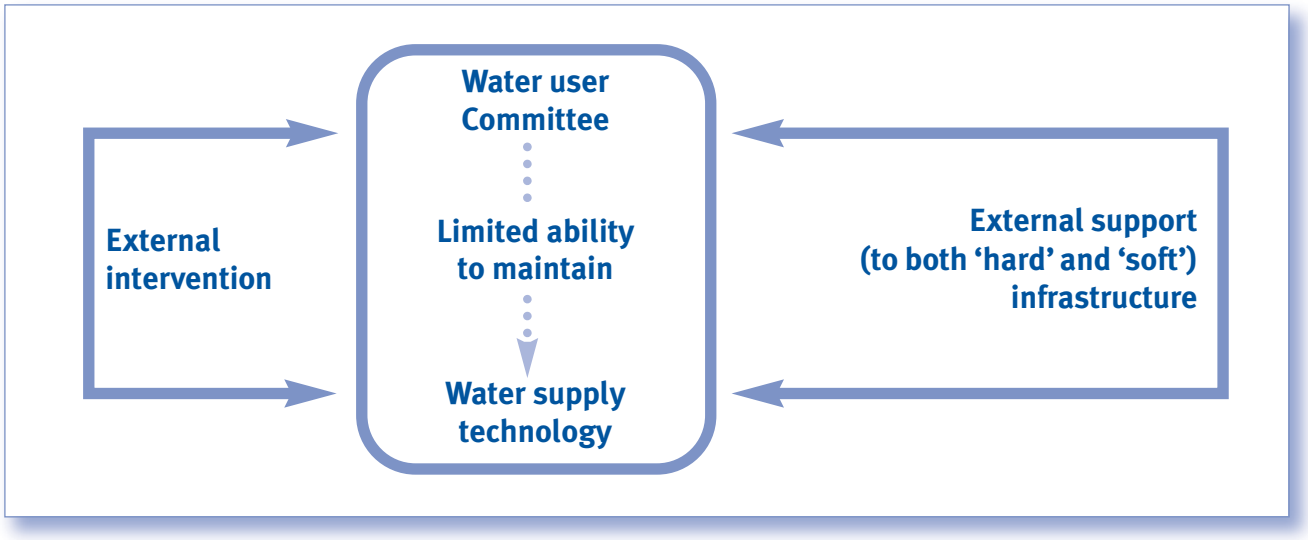

Figure 2 The need for external support to community management of water supply

New approaches

New understanding of what sustainability means, how it can be achieved and the obligations which that understanding places on governments and service providers has been emerging over recent years. That knowledge and the commitment to achieve sustainability in our work now need to be promoted and embedded across WaterAid and beyond, in our partnerships with numerous national governments, utilities, private sector providers, local and international NGOs and development partners.

WaterAid's Sustainability framework

This framework sets out WaterAid's understanding of sustainability and how it can be achieved. It commits WaterAid to a renewed effort, with others, to bring about the lasting changes which those in low-income communities and nations need and demand. It sits alongside other processes for monitoring, reporting and learning within WaterAid. It is intended to guide WaterAid's country programmes and also to inform WaterAid's partners, supporters and donors about our thinking in this important area.

The message of this paper

There is a single overarching message in this document:

> *The services which WaterAid provides, and for which it advocates more widely, must provide lasting benefits to users. WaterAid will continue to enhance its understanding of the factors which contribute to this goal and will strive in all its service delivery work to achieving it. In its work with partners and collaborators, WaterAid will advocate for practices and policies which can enable water and sanitation services and hygiene behaviour changes to continue providing benefits indefinitely.*

Roles and responsibilities

This ambition raises questions about roles and responsibilities within the wider WASH sector and WaterAid's specific remit. Clearly there are factors that impact on the permanence of services which are beyond WaterAid's control. National governments are ultimately responsible for ensuring that WASH services are delivered to their citizens and for deciding how these services should be delivered, be this through local government, utilities, the private sector, community-based organisations or by households themselves. Households and communities have a key role in demanding improved services and corresponding responsibilities in relation to management and recurrent financing. In its own service delivery work WaterAid has a responsibility from the outset of its projects and programmes to help ensure that the right elements are in place to achieve lasting services. It has a responsibility to effectively monitor interventions and act upon challenges, refining its programmes and policies in response to lessons learned. If elements required to achieve lasting services are not present, WaterAid has a responsibility to work with governments and other sector players to foster them.

WaterAid's other framework documents

Figure 3 shows how framework documents are situated beneath WaterAid's Global Strategy. The commitments embodied in this and WaterAid's other framework documents constitute our more detailed policy statements. Detailed guidance and context specific strategies regarding the implementation of work in the water and sanitation sector lie 'downstream' of frameworks such as this.

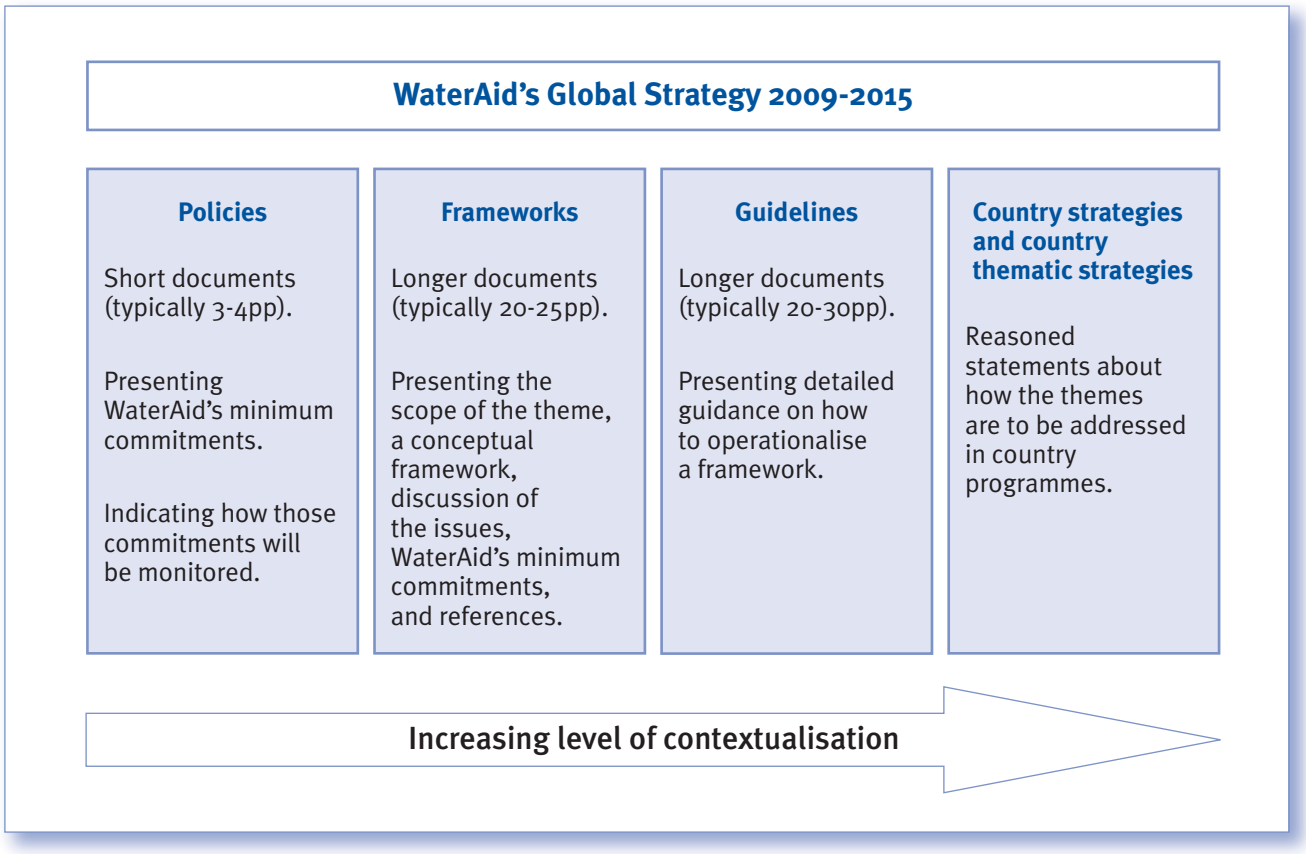

Figure 3 WaterAid's framework documents

This framework should be used in conjunction with:

- WaterAid's Global Strategy.
- Urban framework.
- Sanitation framework.
- Water security framework.
- Equity and inclusion framework.
- Counting users and post-intervention monitoring guidance.

As a framework, this document is not a 'one size fits all' blueprint. It is intended to provide a generic set of concepts and reasoning, approaches and commitments, which WaterAid's country programmes can (and must) modify to fit their national and programme contexts.

WaterAid/Pierrot Men

Part 2

An understanding of sustainability

This part of the document reviews an extensive body of academic and 'grey' literature on sustainability in the water, sanitation and hygiene sectors, including studies carried out by WaterAid. This forms the evidence base on which the remainder of the framework is constructed.

What sustainability means

It is easy to over-complicate what we mean by sustainability, and it is important not to do so. Sustainability is about the time dimension of the changes brought about directly or indirectly by WaterAid. It is possible to argue about the 'design life' of the services or systems which we initiate, and to get side-tracked into discussions of how long such service lives should be. This is unhelpful.

This framework proposes the following working definition of sustainability, based on a simple definition given some years ago by Len Abrams[4].

> *Sustainability is about whether or not WASH services and good hygiene practices continue to work and deliver benefits over time. No time limit is set on those continued services, behaviour changes and outcomes. In other words, sustainability is about **lasting** benefits achieved through the continued enjoyment of water supply and sanitation services and hygiene practices.*

The challenging nature of this definition is explored below. In addition, the implications in relation to technology, management, demographics and the environment, among other key issues, are developed.

Why sustainability is such a challenge

There are many inter-related reasons why the achievement of sustainability poses such a challenge to the WASH sector. There are three particularly important reasons which stand out. The first is the limited capacity (in the sense of knowledge, skills and material resources) of communities, local government institutions and other service providers to manage systems. The second is the inadequacy of financial revenues to cover the full operation, maintenance and capital maintenance costs of infrastructure. The third relates to the historical approach to service delivery of different actors in the WASH sector. This has been carried out in a fragmented way, with competing agendas and a general disregard or lack of understanding of government frameworks. WaterAid has sought to combat this issue in the past. Although coordination between different sector players has seen improvements in recent years, hindrances have been entrenched for a long time and their legacy continues to frustrate progress.

What is needed to achieve sustainability of community-based services?

The brief review of WASH system sustainability set out in this document is structured around a simple conceptual framework shown in Figure 4. This model, set out here in terms of rural water services, can provide an understanding of the necessary components for sustainable water and sanitation services, and for sustained hygiene practices, with relevant modifications for each of these sub-sectors, and for the context.

Overall, this conceptual framework attempts to represent a number of important factors, which are evidenced in the literature, and which are reviewed in the following parts. First, without real need and demand there is little or no prospect of changed practices being sustained (1). Second, there are several aspects of programme design and implementation which are fundamental to the achievement of effective and sustainable community-based operation and maintenance (2-8). The evidence of a functioning community-based management system is to be found in the existence of an active water user committee, sanitation committee or equivalent, and the others aspects shown in the central shaded box (9). External support to the community management system is needed in relation to the various aspects shown (10-14). Normally such external support would come from national and local government, together with private suppliers of goods (such as spare parts) and services (such as repairs). The existence of national policies and budget lines which reflect the need for external support, and a regulatory framework surrounding private providers, are essential aspects of the enabling environment.

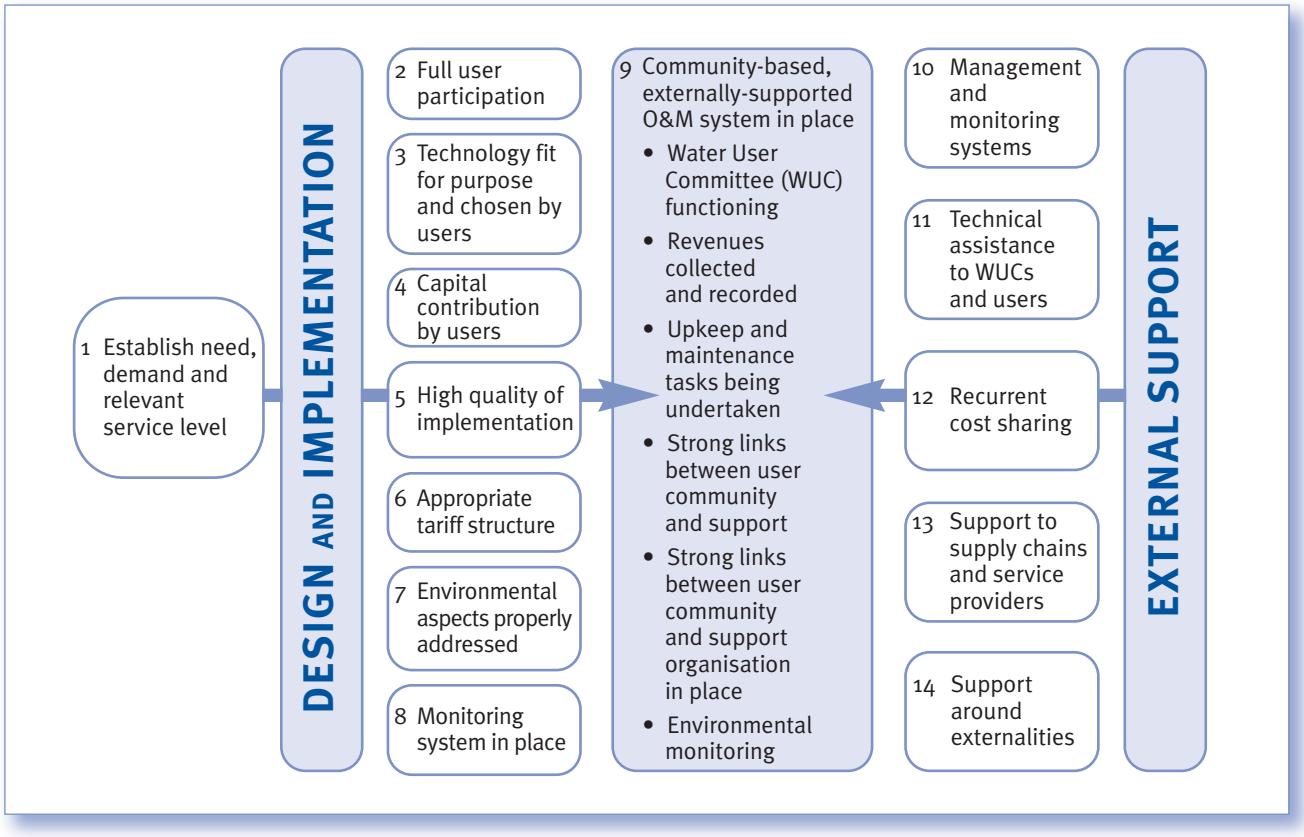

Figure 4 Conceptual framework for effective externally supported community-based management of rural water supply services

Demand (1)

A real need or demand for an improved service or changed practice, which is more profound than the 'demand' often articulated in government or NGO programmes, is necessary to overcome management challenges which are likely to arise in future. A positive response to an offered intervention in a community is not sufficient evidence of that demand. A WaterAid case study of two villages in Ethiopia[5] found that a significant reason why the intervention to improve water supply in Atsede Mariam had been more sustainable than a very similar project in Bohona was that '… *water was the main problem in Atsede Mariam. Women had to leave early in the morning and spend some five or six hours fetching water every day* … ' while in Bohona, '… *water was not a critical problem for the community – perhaps it was not their first priority*'.

If real demand for the services or changes offered is weak, this can completely undermine prospects for sustainability. Such situations arise, for example, when water users have alternative water sources which are easier or less costly to manage; when latrine users are not convinced of the value of such structures; or when better hygiene practices are difficult to maintain (for instance, if soap is expensive) or apparently not beneficial. Lack of demand or low levels of motivation act as a killer factor (in other words a factor which can completely destroy the possibility of the service or behaviour being sustained). However, determining this in advance of interventions to improve services is not always easy.

It is worth noting that when there is a significant demand for water for livestock, for crop production or for other productive (and income-generating) uses, this can often offer greater incentives to users to manage and maintain their systems.

Whatever model of service provision is adopted, unless the users truly desire the 'improved' service, in preference to what they have already, then the service will break down. It is important to bear in mind that people already have a certain level of supply or service (even if that involves a distant contaminated water source and/or open defecation). We are therefore trying to improve the level of service which people enjoy, but that perception of improvement must be shared by the users or sustainability will fail at the first step. This is not as simple as it may appear, not least because expressed demand and need are not always directly related.

It has been commonly accepted in the past that demand for improved water supply exceeds that for sanitation or for hygiene behaviour changes. This may be changing however, as population densities increase everywhere in the developing world, and consequently the possibility of finding private and safe places for open defecation diminishes. Much more is understood today about the determinants of demand for improved sanitation than in the past – and that demand is usually more to do with emotional and social needs for privacy, dignity, safety, status and cleanliness than health[6,7].

User participation (2)

A major study[8] which attempted to relate the degree of community participation in 121 rural water supply projects with their subsequent effectiveness (including their continuing sustainability) concluded, '… *the analysis consistently shows that beneficiary participation was more significant than any other factor in achieving functioning water systems and in building local capacity*'.

The literature[9] is justifiably critical of projects and programmes which pay lip-service to community participation, while actually failing to understand the nature and limits of participation and attempting to achieve it in a mechanistic 'tool-driven' manner.

Nevertheless, in cases where the best principles of community participation are taken seriously and implemented effectively[10], this provides a solid foundation for subsequent sustainability.

Technology (3)

Technology which fails to fulfil the needs of its users, which is poorly installed or which is difficult to maintain, poses significant challenges for sustainability. WaterAid's recent sustainability study in Zambia[11] has highlighted, for example, the rapid corrosion of handpump rising mains as a constraint to sustainable community management of rural water supplies.

There is no such thing as a maintenance-free technology and even gravity water supply schemes, which were expected to provide sustainable service, have failed to live up to that promise[12].

Hardware (including pumps, pipes, spare parts) is sourced and procured by international agencies, governments, private providers and NGOs. The questions around who buys, what is procured and how quality of hardware is assured are all important for sustainability. In particular the links between the community and the suppliers of spare parts are crucial.

Concerns have been expressed about the maintenance of ODF status and the sustainability of latrines (in other words, their technical quality and service life and the arrangements when they fill up) especially when constructed by households under 'no-subsidy' arrangements such as in CLTS approaches. WaterAid's recent three country study and synthesis of CLTS experiences[13] found that '… *a significant number of study communities that had declared ODF status were no longer Open Defecation Free often less than two years after the end of the intervention*'. However, there was evidence of some households upgrading, emptying or relocating latrines.

Capital contribution (4)

In rural community water supply most national policies require a capital contribution from the users, either in-kind (labour and local materials) or, if in cash, in the region of five percent of the capital cost. This is rarely recovered however, and so improved services are by default a gift (albeit often with some community participation in construction) from the government or NGO to the community. There is disagreement among practitioners about whether user cash contributions to capital costs help to cement community ownership of rural water supply systems and so contribute to sustainability. However, there are cases in which a cash contribution to capital cost is raised but then ring-fenced for the water supply, for instance by putting it into an operation and maintenance account on behalf of the community. In this way it is of direct benefit to the users. The only approach to rural water supply in which the users pay the full capital costs of new or upgraded water points is 'self-supply'[14]. In some regards this is the equivalent of CLTS or social marketing of sanitation in the water sector – in which external organisations promote the value of water point upgrading, but the capital investments come entirely from the users.

In regard to sanitation, the current consensus in the sector is that we should no longer give away latrine slabs or other physical infrastructure to households. This 'no-subsidy', or more accurately, 'no-hardware-subsidy' approach is central to both CLTS[15] and social marketing[16] approaches to sanitation. The sector is not completely dogmatic about this however, and a recent study published by WSSCC[17] reflects a degree of flexibility in relation to subsidies for sanitation. See also WaterAid's Sanitation framework.

The capital costs of household hygiene facilities are invariably borne by the users, but the cash costs involved are very limited. Bathing shelters, dish racks, rubbish pits and many hand-washing facilities are constructed from locally available materials. It is only the small capital costs associated with, for instance, purchased tippy taps or infants' potties which incur a cash cost. Hygiene facilities (hand-washing stations, bathing shelters) at schools and clinics are more costly, but these are normally borne by the implementing agency.

Quality of implementation (5)

Serious failings in the quality of implementation may act as killer factors from which recovery is impossible without significant additional investment.

In the case of physical infrastructure, the quality of construction – the installation of technology – is a necessary but not sufficient condition for sustainability. Poor construction quality can undermine all efforts to keep systems working, while high quality construction may lead to a very considerable service life, despite weaknesses in other aspects of the Operation and Maintenance (O&M) system.

Poor construction quality may be caused by unprofessional practices, sometimes involving corruption. We know that poor construction quality may often be the result of contractors or even partners short-changing, cutting corners and using sub-standard materials or not enough cement. Adequate and appropriate supervision of partners and contractors is therefore essential.

The quality of implementation of the 'software' aspects of interventions is also crucial. If the promotion of sanitation or of improved hygiene is not carried out systematically, rigorously and to a very high standard, then sustainable outcomes should not be expected.

There is no room for amateurism in either the engineering, social or management aspects of service delivery – hence the increasing calls for 'professionalisation'[18] of the sector. Transparent procurement procedures, competent management and supervision of partners and contractors as well as rigorous enforcement of standards can all help here.

Tariff structure (6)

Services other than the most basic (open water sources and open defecation) inevitably incur costs. All water-lifting devices (ranging from rope and bucket to handpumps to motorised pumps) need repairs and maintenance (and fuel in the case of motorised pumps). All sanitation options require repairs from time to time, and costs, at least

in terms of labour, are incurred when latrines fill up and have to be emptied or relocated. Even basic hand hygiene requires an investment in soap. Someone has to pay, and it is usually the users. A lack of demand sometimes – perhaps often – translates into an unwillingness to pay for an improved service. Failure to really address the role of or need for subsidies or understand the true cost of a service often means that the approach used to introduce a service does not lend itself to longevity.

There is general agreement about two aspects of the recurrent costs of WASH services. First, if these costs are not covered, systems will gradually (or quickly) deteriorate. Second, certain individuals or households should be subsidised, on the grounds of poverty, disability or other disadvantage (this is implicit in WaterAid's Equity and inclusion framework)[19]. Furthermore, it has been generally assumed that the recurrent costs of rural services should be borne entirely by the users (even when urban water supply has often been State-subsidised).

There is ample literature on the ways and means of constructing cost-reflective but simultaneously pro-poor tariff structures for urban utility managed services[20,21]. However, in the rural water sector there is very little literature describing existing tariff structures, let alone guiding programme planners[22]. What is clear, however, is that commonly (a) project implementers do not know with any precision what the true recurrent costs will be, (b) consequently, this information is not conveyed to users or consumers, (c) tariffs are too low to cover O&M costs, still less capital maintenance costs, (d) where the poor or otherwise disadvantaged are exempt from paying, the tariff paid by the less disadvantaged is not adjusted upwards to compensate and (e) there is rarely any recurrent cost-sharing by organisations (government or NGO) external to the community.

These issues of adequacy and structure of tariffs are crucial to the sustainability of water, sanitation and hygiene in both rural and urban contexts. Much more work is needed to trial, research and learn from innovative recurrent funding approaches[23,24].

Recent studies have highlighted that full cost recovery for Capital Maintenance Expenditure (CapManEx) is almost always overlooked when rural water supply systems are introduced. Revenue required for purchase and replacement of significant components of a water supply system (for example, new pump rods, rising mains and foot valves) is rarely raised and entire facilities are neglected after the failure of just one component. More work is needed to understand how asset management principles, which are widely used in the high-income countries and the urban sectors of some low-income countries, can be applied in the context of rural water and sanitation.

Unlike rural and urban water supply services, household on-site sanitation and hygiene are not subject to tariffs in the usual sense of that word. However, households are expected to find the cash needed to repair, empty and/or replace latrines as well as for soap and other household hygiene artefacts. In low-income communities this poses real challenges, so making the links between WASH programmes and household savings and credit and income generating initiatives is particularly important.

WaterAid/Richard Carter

Environmental aspects (7)

Even if a water supply system is functioning and used, if the water resources on which it depends are deteriorating in either quantity or quality relative to need, then the system is under threat. If a sanitation service is polluting the environment, and therefore threatening the health of its users or others, then it cannot be said to be sustainable. A key underlying issue here is population growth. Population is growing at significant rates in all of WaterAid's countries of operation and urban growth rates are generally about double the national average. Population growth and urbanisation are putting a great deal of pressure on the natural and built environment and on WASH services.

Two important inter-related environmental aspects need consideration when designing and implementing water and sanitation interventions. The first is the security of the water resource, from both quantity and quality points of view. The second is the way we conceptualise sanitation.

Consideration of water security has rarely integrated the quantity and quality aspects, and yet this is essential from the point of view of water users. The quantitative aspect is generally focused on water resources management, where there are widely accepted principles, but few good examples of putting them into operation[25]. The water quality aspect is increasingly framed in terms of water safety planning[26], with good health being the objective. Water safety planning is narrow in focus but very practical in terms of implementation. At the time of drafting this framework, WaterAid is working on a corresponding framework which will bring together the best principles and practices of water resources management with water safety planning procedures, under the single heading of water security.

Sanitation is often thought of in terms of (a) what to do with excreta and (b) how to dispose of it. Both of these ways of thinking about sanitation are too narrow. First, (environmental) sanitation should be focused not only on excreta, but also on solid waste and drainage[27]. Second, wherever possible, excreta should be viewed as a resource to be safely re-used rather than a toxic substance to be disposed of[28]. Such a viewpoint not only makes environmental sustainability real in regard to sanitation, but it also enhances the prospects for water security. See also WaterAid's Sanitation framework.

Monitoring systems (8)

In the context of the struggle for sustainability, monitoring has two important functions. It is essential both for accountability (assuring governments, donors and user communities that services are appropriate, affordable and in compliance with standards) and for management ('you can't manage what you don't measure'). The first is about knowledge, the second about action. When monitoring systems explicitly feed back information on performance to those who have the mandate to do something about it – for example, area handpump mechanics – then performance can improve. This has been WaterAid's experience for example in Masindi District, Uganda[29].

When monitoring is carried out by households and communities it can further contribute to the achievement of sustainability because attention remains focused on the desired outcomes and users of services are empowered to influence their

management and performance[30]. The participation of service users in monitoring is important and relatively neglected, but a focus here should not draw attention away from the responsibilities of government.

Effective community-based management (9)

Community-based management of water and sanitation services can work. Documented examples in the literature point to the impressive work done by communities in managing their services and overcoming challenges[31]. However, the viability of community-based management of rural water supply systems has been increasingly questioned in recent years[32,33]. Although the community management model gained widespread acceptance from early in the UN Water Decade of the 1980s, and although it is still widely promoted by governments and NGOs, the weaknesses in the concept are increasingly evident. In general it is now widely recognised that community-based management alone (in the absence of external support) is not a sound basis for sustainability. Where it works, such a situation is remarkable, but it is the exception rather than the rule. Flaws in the concept are highlighted by the following questions:

- How can community-level institutions (such as water user committees) solve major problems to do with internal breakdown of trust or unwillingness of members to serve voluntarily, in the absence of external mediation?
- What should communities do if a major technical problem arises? To whom can they turn?
- If user-generated revenues are insufficient to cover repairs and maintenance and eventual capital replacement, how can sustainability be assured?
- Communities are dependent on spare parts supply chains, on quality assurance of purchased hardware and on specialist service providers. Who should support these structures, functions and providers which lie outside the control of the community?
- What source of support can user communities turn to in the event of a livelihood or climatic shock or in the face of steadily increasing demand for services because of population growth?

Current thinking increasingly emphasises the need to move beyond 'community management' to 'community management plus'[34], an approach which emphasises the support needed from external organisations (typically local government). That support needs to cover five main areas, each of which is addressed in the following parts. The extent to which each is needed depends greatly on context, as does the ability of local government and other players.

External support to management (10)

Households and community institutions experience numerous challenges in relation to skills and knowledge, material resources, relationships and trust, and power. When management issues arise in relation to sanitation (for example, latrine pits filling up) or water supply services (for example, mismanagement of revenues) external support is needed. Not all instances of conflict, breakdown of trust, fatigue with voluntarism, or mishap can be solved by the household (in the case of home

sanitation) or institution (in the case of a community water supply or school sanitation) on its own. The Kigezi Diocese Water and Sanitation Programme in Uganda provides an excellent example of 'light' external support to community management, which has led to high levels of performance that have been sustained over at least two decades[35]. Although external support to community decision-making and management is clearly necessary, collaborations between communities and external institutions are not always straightforward[36].

External technical support (11)

It is not uncommon for technical problems to arise which exceed service users' ability to cope. Rapid corrosion of handpump rising mains, damage to piped systems by landslides, inundation of latrines or exceeding the capacity of storm drains by floodwaters, and salt water intrusion into water supplies are all likely to severely challenge communities. External technical assistance is therefore essential.

Many national O&M policies recognise that there is a distinction between tasks which households and communities can and should manage, and those which lie beyond their abilities. It is important, however, to define this boundary precisely and to establish a clear mandate setting out who will address the technical challenges which lie beyond the scope of community management[37]. The dividing line between community responsibilities and those of external support organisations is context-specific and WaterAid can assist national governments to define it. Judgments need to be made about what tasks realistically lie within the capability of user communities and households, and which ones can only be carried out by a support service to the community.

Recurrent cost sharing (12)

Given the common finding that water users are not financing the full recurrent and replacement costs of their water and sanitation services, it is important to consider cost-sharing as one option alongside other innovative funding mechanisms. If communities cannot raise the necessary revenues (either individually or as part of communal income generating activities) then two alternatives exist: either the community downgrades to a lower service level (as happens frequently when handpumps fail and users revert to rope and bucket) or the users wait for another entity to step in and support the recurrent costs. There is generally resistance to the latter on the grounds that it would be unsustainable for the organisations involved[38], but in some cases it may be necessary.

Sometimes that cost-sharing is expressed in the willingness of government to undertake periodic (and expensive) rehabilitation. In this case such periodic rehabilitation work may be more expensive than carrying out regular and planned capital maintenance. It may be possible to make the financial argument to government that such planned maintenance is more cost-effective than a costly (and repeated) rehabilitation programme. WaterAid was successful in deploying this argument in Mozambique.

Support to supply chains and service providers (13)

The effective functioning of spare parts supply chains lies outside the control of the communities and even the private sector and civil society organisations which also need to access them. Consequently a higher level organisation (such as a district, provincial, regional or national government) needs to take responsibility for ensuring that supply chains work. Although supply chains must ultimately exist because of user demand for parts and services (a demand which is passed up the commercial line via, for example, local mechanics, retailers, wholesalers and importers) government needs to provide the right enabling environment for supply chains to function properly. In some cases governments and national standards organisations need to be involved in supporting both demand and quality of supply[39]. Given appropriate expertise, WaterAid can work with governments to achieve functioning supply chains.

Small scale providers of goods and services (materials, spare parts, consumables, construction services and so on) need business support in the form of registration and licensing, training and technical assistance, access to capital, and financial and administrative services. Government may need to be directly (in the case of registration and licensing) or indirectly involved in encouraging a supportive environment for such services to emerge and flourish[40]. Government should also encourage (but not directly arrange) the establishment of professional associations of, for example, drillers, well diggers or other trades and professions[41].

Support in relation to externalities (14)

Many changes are taking place in both rural and urban settings of low-income countries. These will increasingly impact upon the sustainability of services. To quote IFAD[42], '*Rapidly increasing populations, more migration from rural to urban areas and the feminisation of the rural economy [more female-headed households as men seek work in towns and cities] are significantly changing the rural context. This 'new rurality' is also affected by external shocks – such as the effects of climate change and globally interdependent markets. Such changes augment the vulnerability of many poor rural people and demand innovative approaches to the provision of rural water, sanitation and hygiene.*'

It is unreasonable to expect that communities will be able to cope with all the trends and shocks which may occur in the future. Furthermore, there is considerable uncertainty as to the exact nature and magnitude of future shocks which communities will experience. Adaptation therefore has to focus on generic capabilities of communities and support organisations (especially local government) to analyse and solve their own problems; to generate income and savings; to develop contingency plans; to reduce their vulnerability to specific types of shock; and to forge links with other communities and support organisations. Such actions are often referred to as components of 'no-regrets' adaptation strategies, since they will serve communities well whatever the future holds.

WaterAid/Anna Kari

Part 3

Experience in WaterAid country progammes

In May 2010 all WaterAid country programmes were asked to submit a short summary of their approaches to sustainability of water and sanitation services. Specifically they were asked to summarise the main measures which they are taking to ensure the sustainability of the services delivered by implementing partners and the sector more widely. In particular, country programmes were asked what, if any, procedures they have in place for monitoring long-term functionality of water and sanitation systems (a) implemented by WaterAid and (b) by national service providers.

Numerous common issues were raised across country programmes. Most related to the measures put in place to achieve sound community management of water points. The issues most commonly mentioned in the summaries are:

- The need to work on demand for services.
- The need to establish community water user committees and develop their capacity to manage water supply systems.
- The need to identify adequate sources of funding for O&M costs.
- The need to define roles and responsibilities of different players, and in particular to build partnerships with and capacity of local government.
- The need to learn about what works in regard to sustainability.
- The need to support communities, partners and local authorities in their efforts to achieve sustainability.

Important issues omitted

Only a few of the country programmes which responded to the request for information referred to the following issues:

- User initiatives ('self-supply').
- The importance of construction quality.
- The role of local leaders and champions.

There was also relatively little mention of the sustainability of hygiene and sanitation efforts (compared to water supply). Although the need for external support to community management was mentioned by some country programmes, the role of national monitoring, supply chain support and establishment of favourable operating environments was not mentioned. Little or no mention was made of recurrent financing options and models. It appears that there is a good opportunity for WaterAid to innovate in this area.

Arguably the most important need in each country programme is the establishment of a clear understanding about the factors which influence sustainability nationally, and how WaterAid's service delivery and advocacy work relate to that analysis. Some country programmes (including Tanzania and Nepal) have already carried out considerable work on such analysis, but many others need to develop it.

WaterAid/Layton Thompson

Part 4

Design and implementation principles

This part of the document draws out principles from the evidence base presented earlier, making relevant links with WaterAid's Global Strategy. The aim is to distil core elements that can form the basis of WaterAid's approach.

Why sustainability matters

There are numerous reasons why WaterAid must take the issue of sustainability seriously. Four fundamental reasons are highlighted here. The first reason concerns our obligation to those whom we and our partners serve. Our work with communities raises expectations of better services, improved health and other benefits. On completion of our project work those expectations may largely be met – for a time. However, if services fail after a few months or years and remain in a state of disrepair, the hopes and expectations of communities are dashed. This is unacceptable.

The second reason is to do with cost-effectiveness and good stewardship. We have an obligation to invest the resources entrusted to us wisely. Money spent on services which soon fail is money ill-spent. If, as appears common, one third to one half of rural water points are out of action at any one time, then the effective unit cost (per person served or per functioning facility) of those remaining in service is raised by 50-100%. The simple arithmetic shows that at levels of functionality typical of the rural water sector in the countries where WaterAid works, for every one percentage point improvement in functionality we can gain a reduction in unit costs of two percent or more [43]. It is highly probable that such a cost reduction could be achieved with a relatively small investment, resulting in a high benefit-cost ratio. In other words, money invested in improving sustainability is money well spent.

The third and fourth reasons follow from the first two. Once WASH services have fallen into disrepair or disuse (with no immediate prospect of repair) communities have little alternative than to wait for another NGO or service provider to either rehabilitate or replace the defunct system. Far from building self-reliance, this exacerbates and accentuates the dependence of communities on external organisations. Our work must assist in developing the capacity of local support organisations (especially local government) so that when WaterAid is no longer present there is a good prospect of sustainable service continuing.

Finally, there is some evidence[44] that raising the standard of water supply services and then letting even occasional short-term failures in water supply or water treatment occur, can very quickly (in a matter of days) reverse many of the hard won public health benefits.

Water points which fail to deliver water, latrines which fill and are never emptied or re-located, hygiene practices which change but are not sustained – these must become a thing of the past in our own programmes and the work of the sector as a whole.

Sustainability and WaterAid's Global Strategy

In relation to Aim 1 (WaterAid's own programme of service delivery) the Global Strategy says that WaterAid will '… *develop and promote equitable and sustainable water, hygiene and sanitation services …* '. It also highlights threats to the sustainability of groundwater (re)sources '*from changing climates and the competing and largely unregulated demands of agriculture, industry and domestic consumption*'.

In relation to Aim 2 (our attempts to influence the service delivery work of others) the Global Strategy highlights a number of reasons for failure of WASH services. It criticises national plans for focusing '*on increasing coverage rather than ensuring longevity*.' In the same context it commits WaterAid to '… *strive for sustainability in all areas of work by promoting appropriate and affordable technology and developing the management capacities needed to maintain these services*.'

Sustainability is one of a small number of cross-cutting programme principles for WaterAid's own work and for our influencing of other bigger players (especially national governments and development partners). It is therefore of the highest priority that we deliver on this commitment.

General requirements for sustainability

From the review presented earlier it is possible to distil five general things that are needed to ensure sustainable WASH services and hygiene practices:

- There must be real demand from users which is evidenced in the consistent use of improved water and sanitation services and the practice of improved hygiene behaviours.
- There must be adequate revenue to cover recurrent costs, with appropriate tariff structures that include the poorest and most marginalised.
- There must be a functioning management and maintenance system comprising tools, supply chains, transport, equipment, training and individuals/institutions with clear responsibilities.
- Where systems are managed by communities or institutions there must be effective external support to those community-level structures and institutions.
- The natural resource and environmental aspects of the system need due attention.

WaterAid's approach

The achievement of sustainable services and behaviour changes must largely take place at the level of WaterAid's country programmes. It is at the national level that critical issues and needs must be analysed and addressed, from policy and legislation on downwards. The country programmes must first know whether or not WASH systems are delivering sustainable services. Then, to the extent that either WaterAid programmes or the programmes of others are failing to do so, country

programmes must understand why. With sound knowledge and learning in place at the country level (a national sector sustainability analysis) programmes can be designed to address shortcomings in sustainability. These may then need to be trialled or, with others, delivered at scale. These various elements – monitoring, analysis, programme design – are addressed further below.

Monitoring and learning

The first priority for WaterAid is to generate data on the continued functioning of the services which we have funded. A full inventory should be maintained in each country programme office of all water points constructed and all communities where sanitation and hygiene promotion activities have taken place. This inventory should contain information on the outcome following the work in the community, for example, whether the water point construction was successful, whether the community was declared ODF and any qualitative or quantitative commentary on the results of hygiene promotion efforts.

The WaterAid country office should then maintain records of periodic functionality monitoring relating to the inventory. These may cover all interventions in the case of country programmes with relatively small programmes of service delivery work, or sample surveys if the numbers are too large. In the latter case, rigorous statistically valid random sampling methodologies need to be used.

WaterAid country offices should maintain information about functionality and sustainability of WASH services provided by others. This information may come from studies commissioned by WaterAid, studies by other organisations including consultants and from national monitoring systems.

Mapping systems such as the Spreadsheet Mapper developed by WaterAid, using Microsoft Excel and Google Earth, provide both a convenient and user-friendly database and also a powerful visualisation system.

Analysis

In countries where the monitoring data and information reveal poor levels of sustainability of services or behaviours the question 'why?' must be asked and adequately answered. This means starting out with a conceptual framework for sustainability which fits both the national context and the sub-sector (eg rural/urban, water/sanitation/hygiene). Each country programme should develop its own conceptual framework(s), either from first principles or by adopting or modifying a simple framework such as that presented in Part 2. An appropriate conceptual framework provides the basis for assessing where failings in the sustainability of services and behaviours may lie.

The analysis and assessment of sustainability is by its nature both backward- and forward-looking. In looking back, we are trying to answer the questions, '*How and why have broken down systems failed?*' or, '*How and why have apparently successful systems continued to perform well?*' This is relatively straightforward. In looking forward however the task is more difficult. We need to ask, '*What is the present prospect that this (WASH) system will continue to provide good service in future?*'

This may involve assessing likelihood of future sustainability in terms of various dimensions such as degree of user motivation, condition of technology, adequacy of water resources, quality of community management, quality of external support and adequacy of financial revenues.

Programme design

The foregoing discussion suggests that the following questions need to be adequately answered in the design of sustainable WASH programmes.

1 **Demand.** Does the project or programme respond to need and demand? How is that demand demonstrated? How strong is the desire of potential water and sanitation users to 'upgrade' to the proposed new system or to change hygiene practices? What social and cultural barriers exist that could impact on demand?

2 **Design and implementation.** How exactly will user participation be addressed, together with user contributions to capital and recurrent costs, choice of technology and participation in monitoring? How will technologies be identified and options put forward? How will implementation or construction quality be assured? How will the appropriate level of tariff be determined, together with agreement about who should pay for recurrent costs? Apart from the community, who else will participate in system monitoring, and in what ways?

3 **Community-based O&M.** How will user communities be supported to establish structures and arrangements for managing and financing their WASH services? How will community structures be linked to those external organisations providing support?

4 **Alternative arrangements for O&M.** Although the majority of water and sanitation systems implemented by WaterAid's country programmes are rural community-managed systems, there are cases, in both rural and (especially) urban settings where professional management is deployed, and the users of water and sanitation services become consumers (simply paying a tariff for a service) rather than active participants in system management. In these cases, WaterAid needs to question (a) whether those management arrangements are fit for purpose (including especially their ability to raise sufficient revenue for financial viability) and (b) whether effective pro-poor arrangements are in place (including cross-subsidies of very poor or disadvantaged consumers).

5 **External support.** Who will provide external support to community-based management, in particular in relation to management systems, technology, supply chains and externalities such as demographic trends, disasters and climate change? How can the effectiveness of those organisations be assured? What level of local government capacity and determination exists for provision of external support? Critically, who will pay for this external support?

6 **Environmental factors.** What impact could external factors such as water resource availability, water quality, land use, agricultural, industrial and ecosystem water needs and climate have on WASH infrastructure and the longevity of a project?

WaterAid/Layton Thompson

Part 5

WaterAid's minimum commitments

This part of the document sets out core minimum commitments that should be implemented as part of all WASH service delivery work and advocacy relating to provision of WASH services.

Project and programme design and implementation

In projects and programmes involving household level or community management of services, WaterAid will ensure that:

1 All attempts are made to elicit the true nature of demand for improved services, and to create demand and promote behaviour change prior to interventions to improve services to households and communities. Wherever possible, a range of options should be offered to households and communities, so that they can make informed choices.

2 Households and communities are fully informed of the likely life cycle costs (operation, maintenance and eventual rehabilitation) of their services, and that viable tariff structures or other arrangements[45] are put in place to generate the necessary revenues, in a manner which takes full account of those unable to pay (for example, the elderly, widowed, disabled or otherwise disadvantaged).

3 Best practices are followed in the mobilisation, organisation, training and equipping of communities and their institutions in order to achieve maximum participation in the management of WASH services.

4 Effective arrangements are put in place to ensure continuing support to community management by competent external organisations. These will usually be local governments, but in exceptional circumstances may have to be non government organisations supported by WaterAid. Where paid-for services (such as handpump repairs or latrine pit emptying) are needed, local private sector service providers need to be present and competent.

5 Interventions to provide water and sanitation services or to promote improved hygiene behaviours have every likelihood of leading to lasting and beneficial changes in services and in practices.

6 Water supply projects are designed to accommodate inter-annual fluctuations in water availability and quality. The activities of different water users, land uses and potential threats from external factors such as drought and flooding are taken into account during project design. Sanitation projects do not pollute nearby water sources.

In projects and programmes where those benefiting from water and sanitation services are tariff-paying consumers (typically urban, small town and occasionally large village systems) WaterAid will further endeavour to ensure that:

7 The service provider is competent to manage the service (through appropriate capacity development).

8 The revenues generated by the service are (a) adequate to maintain business viability and (b) provide appropriate cross-subsidies for those unable to pay.

9 There are contingency plans in place, especially in the case of small scale service providers, in the event of failure of the business to serve its consumers.

10 The service provider is accountable to its customers.

11 Some form of regulatory function exists to monitor service provider performance.

Advocacy and influencing

As an NGO, WaterAid carries out service delivery on a relatively limited scale. Apart from its direct value to the small numbers of people served, we argue that our involvement in service delivery is important for at least two reasons. First, it maintains our credibility when we participate in discussions around sector policies and strategies. Without this direct engagement we would risk becoming detached and theoretical. Second, the innovative aspects of our service delivery work act as an example to other (bigger) service providers who can apply our approaches at scale.

In relation to sustainability therefore, we will:

12 Design our service delivery actions not only to bring sustainable services to households and communities, but also to demonstrate good practice and influence larger service providers.

13 Innovate, analyse and document our experiences, and take all necessary actions to involve governments, utilities and development partners in debate about the merits and scalability of our sustainability innovations.

14 Keep sustainability on the agenda through advocacy targeted at local and national government institutions which are ultimately responsible for ensuring that sustainable WASH services are delivered to poor and marginalised communities and for deciding how these services are to be delivered.

15 Ensure sustainability is a central theme of advocacy efforts targeted at improving the policies of international aid agencies, including bilateral and multilateral donors.

Monitoring

It is unlikely that sustainability will be achieved if it is not monitored. Households, communities, partners and WaterAid country offices need to know the status of the services implemented and the changed hygiene behaviours brought about. In all our country programmes therefore, WaterAid will:

16 Maintain records of functionality and utilisation of water and sanitation services, based on simple 'red flag'[46] indicators, with data generated through community and household monitoring and surveys at one year, three years, five years and ten years after implementation, and, especially in the case of hygiene practices, through special studies.

17 Work with government institutions to strengthen monitoring systems which include data from all sector players.

Sector analysis

In our country programmes WaterAid will:

18 Regularly review studies and analyses of functionality and utilisation of services, and sustainability of hygiene practices in the nation as a whole.

19 Where such studies are missing or inadequate, WaterAid will work with national governments to support such studies of WASH sustainability.

20 In each country, WaterAid will carry out its analysis of weaknesses in national systems for achieving sustainability, incorporating this analysis in the Country Strategy Paper, and addressing key weaknesses in its programming.

Documentation and dissemination of learning

WaterAid prides itself on being a learning organisation. Trials of innovative approaches, monitoring of service performance and hygiene behaviours, and sector analyses all provide opportunities to learn. However, unless that learning is documented, communicated, assimilated and applied, it is potentially lost. In relation to sustainability, all WaterAid country programmes will therefore:

21 Undertake periodic studies of sustainability in the water, sanitation and hygiene sub-sectors.

22 Document and publish these studies in print and electronic form.

23 Disseminate these studies widely within country and beyond.

24 Take active measures to involve others in debate, reflection, learning and action arising from these studies.

WaterAid/Layton Thompson

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36 See, for example, Lasker R D and Weiss E S (2003) *Broadening participation in community problem solving: a multi-disciplinary model to support collaborative practice and research*. Journal of Urban Health: Bulletin of the New York Academy of Medicine Vol 80, No 1, March 2003. http://www.cacsh.org/pdf/modelpaper.pdf accessed 27 May 2010.

37 The Government of Uganda's *National Framework for Operation and Maintenance of Rural Water Supplies* (2004) provides much sound thinking on the subject, but even in this document some roles and responsibilities are still rather vague – http://www.rwsn.ch/documentation/skatdocumentation.2008-08-14.1276280120/file accessed 27 May 2010.

38 See, for example, *Financing water supply and sanitation in Uganda*. The Uganda Water and Sanitation Dialogues, August 2008. http://www.waterdialogues.org/documents/FinancingWaterSupplyandSanitationinUgandaOpportunitiesforPrivateSectorParticipation.pdf accessed 27 May 2010.

39 See, for example, Baumann E (2004) *Pondering over supply chains*. http://www.rwsn.net/documentation/skatdocumentation.2009-03-06.1207538781/file accessed 27 May 2010; Erpf K and Baumann E (2004) *Supply chain issues for WES facilities*. RWSN/Skat Foundation, August 2004. http://www.rwsn.net/documentation/skatdocumentation.2005-11-14.2240368959/file accessed 27 May 2010 and Oyo A (2006) *Spare part supplies for handpumps in Africa: success factors for sustainability*. WSP/RWSN Field Note, October 2006. http://www.rwsn.net/documentation/skatdocumentation.2007-06-04.2775193546/file accessed 27 May 2010.

40 Solo T M (1999) *Small scale entrepreneurs in the urban water and sanitation market*. Environment and Urbanisation, Vol. 11, No. 1, April 1999. http://eau.sagepub.com/cgi/reprint/11/1/117 accessed 27th May 2010; Kariuki M and Schwartz J (2005) *Small scale private service providers of water supply and electricity: a review of incidence, structure, pricing and operating characteristics*. World Bank Policy Research Working Paper No. 3727. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=822386## accessed 27 May 2010 and Sansom K (2006) *Government engagement with non-state providers of water and sanitation services*. Public Admin. Dev. 26, 207–217 (2006) DOI: 10.1002/pad.419. http://www.newscentre.bham.ac.uk/debtrelief/Government_Engagement.pdf accessed 27 May 2010.

41 As exemplified by the initiative to establish a drillers' association in Nigeria – http://www.rwsn.ch/documentation/skatdocumentation.2009-02-17.3299794625/file accessed 27 May 2010. http://www.ifad.org/english/water/innowat/topic/sanitation.htm accessed 27 May 2010.

42 *Myths of the rural water supply sector*. RWSN Perspectives No 4. May 2010. http://www.rwsn.ch/documentation/skatdocumentation.2009-07-27.8158674790/file

43 If functionality is 60% and the unit cost of construction was £X, then this reduced functionality means that in effect each water point costs £X/0.60 or £1.67X. If we could raise functionality to 61%, then the effective unit cost would be £X/0.61 or £1.64X, a reduction of 2.7%.

44 Hunter P R, Zmirou-Navier D and Hartemann P (2009) *Estimating the impact on health of poor reliability of drinking water interventions in developing countries*. *Science of the Total Environment* 2009, 407, pp2621-4.

45 For example, micro-finance (savings and credit) or income generating initiatives.

46 By this we mean simple indicators which can alert programme managers to possible problems which need to be investigated further. In other words, routine monitoring should collect very limited types and quantities of data, but be sufficient to flag up problems which only if present are investigated in more detail and depth.

WaterAid/Marco Betti

WaterAid

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February 2011