

Improving sustainability using incentives for operation and maintenance: The concept of water-person-years

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Substantial sums of money have been poured into developing countries by donors, aid agencies and NGOs to improve people's access to water. However, many of the constructed water sources have broken down or are dysfunctional. At the same time, donors, governments and NGOs rush to achieve coverage targets, ambitiously set and inaccurately measured. This paper proposes a new way of measuring the impact of investments. Assessing investments in 'water-person-years' over a defined period of time, allows for a more efficient allocation of resources, and calls for a rethinking of the current development approach. Measuring in water-person-years is necessary in order to shift focus from new infrastructure development to operation and maintenance of existing water systems, something that is crucial for sustainability.

Keywords: sustainability, operation and maintenance, monitoring

FOR MORE THAN 50 YEARS, developed countries have invested substantial sums of money in developing countries to improve their water supply services. However, anecdotal and numeric evidence shows that a number of water supplies are not functional, and every year a proportion of water supplies cease to function and are not repaired. At the same time, donors and governments are asked to continuously report increases in 'coverage' of water services, in order to meet international and national targets. This paper argues that, in addition to increasing the access of populations to sustainable water supplies, it is equally important to maintain the existing infrastructure. There is far too little focus on operation and maintenance, and consequently not enough available funds. This lack of awareness is directly linked to the goal of increased coverage that gives incentives to fund short-lived projects. This is a paradox at a time when sustainability is an important criterion in aid allocation. The paper will first look at what sustainability really means

There is far too little
focus on operation
and maintenance

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in the context of water services, and how it should be interpreted in terms of successful development aid. Then it will look at the problems and challenges with the main current indicator of success: access to water. Lastly, it proposes a new indicator to measure the progress in the development of water supply services, water-person-years (WPY), and analyses how the use of this indicator could change the dynamics and improve the results of development aid in the water sector.

Sustainability of water installations

In order to understand the current situation, it is necessary to look at the context of water supply projects. Most governments, especially in Africa, receive significant proportions of their budgets from richer nations. The money comes either as aid or as grants, and is normally subject to some sort of conditionality. The flow of finance from the North to the South has emerged into its own sector with its own rules. Since there are other values in addition to capitalism and profit that guide decisions and investments in this sector, it becomes necessary to look at what factors are decisive for decision making. In other words, what are the goals that the aid business wants to achieve? How are they measured? On what conditions is the aid allocated?

The overall goal should be to provide water services to a maximum number of people over a maximum period of time. One of the main key concepts in the aid sector is therefore 'sustainability'. The term 'sustainable development' was first defined in the Brundtland Report of 1987 as: meeting the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland 1987), and this focus should be kept in mind. If we are to build a 'sustainable' water supply scheme, we are therefore to put in place infrastructure that can serve today's generation, but also give the possibility for future generations to get water. Assuming the water source is long lasting, it is, however, clear that all technological installations and construction materials have their limits. It is impossible to put in place a technology today that will last for 30 years without maintenance, repair and replacement. The challenge therefore lies in how the technology is maintained.

From experience, in the context of a rural water project in a developing country, the following factors ensure good operation and maintenance:

- appropriateness of the project;
- technology;
- funding;
- motivation;
- knowledge.

The overall goal should be to provide water services to a maximum number of people over a maximum period of time

Technologies will not last for 30 years without maintenance and repair

It can be seen that technology is only one point on a list that mostly consists of factors related to implementation approaches, management models and institutional contexts. What becomes clear is that the environment in which the water infrastructure is embedded is decisive for how it will be maintained in future; hence how sustainable it will become. The following paragraphs will show how the current environment generally does not ensure the above-mentioned factors; on the contrary, it provides incentives to work against them.

The sorry state of water infrastructure today

The RWSN estimated in 2007 that 34 per cent of all handpumps in sub-Saharan Africa are not working

To start with it is necessary to look at the results on the ground. What is the state of the water infrastructure that has been constructed in developing countries in the current environment? When moving around in rural areas in sub-Saharan Africa, the frequent sight of an abandoned handpump is a constant reminder of how maintenance systems have failed. The Rural Water Supply Network (RWSN) estimated in 2007 that 34 per cent of all handpumps in sub-Saharan Africa are not working (RWSN, 2007). According to other sources, 90 per cent of the handpumps installed in Africa break down within the third year of operation (WATSAN Consult, http://www.handpump.org/afri_pump/index.htm). This number might be high and has not been confirmed, but it gives an indication of the magnitude of the problem we are faced with. Recent studies from Asia show a similar picture: 30 per cent of all new water supplies in some areas of East Timor break down in the first year of operation (Bond et al., 2009). Luckily, there are a number of positive examples, too, such as a large water scheme in western Tanzania where, after some 10 years, around 70 per cent of the water supply systems are still working (NORAD, 2007). However, it is still clear that there is a general weakness in the current environment and project approach concerning operation and maintenance. At the same time, these general figures are only rough estimates, and country figures are dramatically different. It is difficult to capture the extent to which water infrastructure is not working for several reasons. First, NGOs and donors are reluctant to report on projects that are 'failures' and not successes for fear of losing funding or recognition. Second, governments often do not have numbers on non-functioning water systems because of a lack of monitoring and reporting structures, lack of capacity and funding for monitoring and evaluation, and fear of displeasing donors. For example, when 46 random water points (out of 1,462 registered water points in total) were visited in the Ugandan district of Kanungu from October 2008 to May 2009, only 40 per cent were functional to the extent that people could draw water from the point. The official functionality for Kanungu district, however, is 78 per cent.

Governments often do not have numbers on non-functioning water systems



The initial investment is significant compared with the cost of maintaining a handpump. Water well drilling in western Tanzania in 1995 and an abandoned handpump in Kanungu, Uganda (2008)

It is dangerous to use functionality as a proxy for sustainability

A third problem is the criteria and indicators used to measure functionality. According to the sector performance framework in Uganda, a water point is not functional if it is not working at the time of spot-check (MWE, 2008). However, in practice government officials in Uganda only rate a water point as non-functional if the technology is beyond repair. This means that if a handpump lacks one spare part and can be potentially repaired, it still counts as 'functional'. A handpump can have been out of order waiting for the spare part for three weeks, or for three years, and it is still reported as functional. There is no general international consensus on how to measure functionality, because if a water point is inspected on a spot-check basis, this does not give any indication of whether the water point will be repaired in the near future or not at all. In other words, it is dangerous to use functionality as a proxy for sustainability, since the other elements of sustainability such as motivation to repair the water supply infrastructure are not taken into account. Any water technology breaks down once in a while, so a short breakdown does not mean the water supply is not sustainable. Other indicators used are downtimes, which give a better picture of sustainability because it can indicate how good and effective the maintenance system is. However, this is time-consuming and costly to measure. In conclusion, official functionality rates are therefore not very reliable, and the real rates are likely to be lower.

The myth of the self-sustaining community

One of the explanations for the low rates of functional water systems can be found in the management approach that dominates water projects in the developing world: community management. The approach was first introduced in the 1980s as a response to the failure of

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local governments to provide effective services. It quickly became an attractive approach for donors, because it puts the receiving community in focus, is based on cost recovery and aims to make projects self-sustaining. The approach has many merits and, if implemented well, it can have positive outcomes. However, in one area the approach normally fails: in producing enough funds for long-term operation and maintenance of water supplies. Cost recovery means in practice that the water-users pay for operation and maintenance (and sometimes also capital) costs through water tariffs or other arrangements. However, full cost recovery in water supply services is extremely hard to achieve. Even utilities that serve large populations and benefit from economies of scale can struggle to recover their costs. Water services have the characteristic that they require high spending on construction and maintenance of large infrastructure, but at the same time water is a social good and governments put in place laws and tariff caps in order to ensure basic services for all. Even if many private companies successfully provide urban water supplies, they often benefit from some kind of subsidy or economies of scale. In rural settings in developing countries, neither of these is available. In addition, poor communications and road networks make inputs such as power, chemicals and spares more expensive and the purchasing power of rural populations is low. All this makes it doubtful that a rural village can recover all costs for long-term operation and maintenance from water sales, not to speak of recovering the capital investment.

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independently

In addition to funding for operation and maintenance, community management relies on community members in order to manage and maintain the water point in future. This requires knowledge and motivation. It was thought that with enough initial training in management and technical maintenance, the community would start a learning process and through experience it would be fully capable of maintaining the water system in future. For the last decade, scholars and practitioners have increasingly recognized the need for a support mechanism. It is now accepted among scholars and practitioners that communities are not able to manage their water supplies independently, but that they need a 20 per cent support to their 80 per cent contribution (Carter, 2002). This means that the community needs support both in terms of continuous training and follow up, and through financial means. This is because a community will only take full ownership of a technology as long as it feels it has the knowledge and capacity to do so. As many developing countries are going through decentralization processes, the most natural entity to take on this responsibility of support is local government. However, in many countries financial authority has not yet been transferred to the lower administrative levels, and there is a general lack of capacity and resources in local government structures. Some

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countries such as Uganda experiment with institutional support mechanisms that support communities independently of local government through 'umbrella' organizations (Koestler, 2008). However, the approach still needs improvement before it can be scaled up. Other solutions, such as contracting long-term maintenance out to the private sector, are also being tried out in some countries, but only in isolated cases (Harvey and Reed, 2004). In practice, there is therefore merely a theoretical awareness of the need for back-up support, and few initiatives are tested on the ground. Consequently, most communities in developing countries are still left alone after the project period is over, something that translates into a high rate of non-functional water supplies.

Both the lack of focus on operation and maintenance and the implementation of a management system that does not ensure sustainability can be traced back to the general context of aid spending and hence the targets and objectives that matter in development aid for water. There is a general reluctance to accept the real meaning of sustainability and make sure interventions and projects are designed for longer periods of time. Community management is not a wrong approach *per se*, but has shown limited results as it is currently implemented with a short intervention and no long-term support. Why have donors, NGOs and governments not learned, after all these years, that only long-term involvement brings us closer to the development goal: to supply more people with water over a longer period of time? One of the reasons for this is the excessive focus on coverage as an indicator for progress.

Measuring coverage

Coverage is normally expressed as the percentage of a population that has access to sustainable and safe water supply. Although there are other indicators used to measure the output of development interventions such as the 'sustainability snapshot' and the 'equity distribution indicator' (Sugden, 2003), coverage is by far the most common and the one used for the Millennium Development Goals (MDGs). Based on the MDGs, countries have formulated their own targets, and the most common indicator used is coverage. The indicator is useful and should be considered; however, there are several problems related to it.

First, the indicator has no time aspect. This means that it only gives a 'snapshot' of reality at a certain time. When data is collected periodically, comparisons can be made and trends identified. However, what does 'coverage' say about the service level in a country? Coverage is affected by many factors, especially population growth. In countries such as Uganda, where population growth is extremely

high (2.692 per cent) (CIA World Factbook, <https://www.cia.gov/library/publications/the-world-factbook/>), developments in infrastructure are struggling to follow the pace of population growth. This means that the coverage figure can drop from one year to another, not because there are fewer water supply schemes, but because the population has increased. In addition, it does not take into account how sustainable the water supplies are.

There is no simple way to calculate and collect coverage data

In Uganda, the number with access to clean water is probably grossly overestimated

As for functionality, there is a general lack of reporting, monitoring and evaluation procedures

Second, there is no simple way to calculate and collect coverage data, and countries use a number of different methods. In Mali, they currently use two different methods to calculate coverage and differences are large; for rural water supplies the general method gave a coverage figure of 69.9 per cent whereas the detailed method gave only 60.1 per cent (DNH, 2008). In Uganda, WaterAid found that the number of people actually having access to clean, safe water is probably grossly overestimated, because of the crude methods for estimating the number of people using each water point. The method used in Uganda assumes that 300 people use a handpump, and that people within a radius of 1.5 km have 'easy access' to this water supply. However, this is unlikely in reality since many communities in rural areas are small and dispersed, and 1.5 km is a considerable distance to carry water (Sinclair, 2004). If these official numbers were applied in Kanungu district (western Uganda), for example, the coverage rate would be 150 per cent. In order to avoid this, the government caps the numbers so that they do not exceed the total population of a given sub-county, a method that again gives skewed results. In addition, the method of calculation in Uganda assumes a functionality rate of 80 per cent and, as mentioned before, this is unlikely to be the case (Sinclair, 2004).

Third, the data used to calculate coverage at a national level is often wrong. A study carried out in Wakiso and Tororo districts in Uganda in 2004 by WaterAid showed that the districts had about twice as many water points as was captured in the national water database (Kanyesigye et al., 2004). As for functionality, there is a general lack of reporting, monitoring and evaluation procedures that ensure a flow of information from the lowest administrative levels to the national level. If calculation methods or updating procedures are adjusted, there is always a danger that the new coverage figure will be lower than the current one, and since increase in coverage is an important indicator used to measure performance, this can affect funding to the district or the national government in future. Therefore, there are often conflicts between district and national governments; national governments accuse the districts of quoting lower figures of coverage in order to get more funding. After such a conflict, Kanungu district chose to do its own calculation and survey of water points using questionnaires distributed to local leaders. This gave a figure of 67 per cent

coverage instead of the 91 per cent quoted by the government (MWE, 2008). Other monitoring mechanisms such as the Joint Monitoring Programme are not based on government figures but on household surveys. This shows that there is a lack of coordination and also a political connotation to the coverage figures that makes it difficult to know which number is closest to the situation on the ground.

Wrong incentives – wrong priorities

The focus has been on building new infrastructure to cover as many new people as possible each year

In addition to the unsystematic calculation methods and the lack of adequate data, the use of coverage as a development indicator in the first place is problematic. When local and national governments are continuously asked to report on increased coverage, focus is on building new infrastructure in order to cover as many new people as possible each year. An example from Uganda shows what this means in practice. In Uganda, donors and the government have implemented a sector-wide approach (SWAp). Donors contribute to a basket fund, and this money is channelled through government to the districts in the form of a 'conditional grant'. The districts have to follow strict guidelines to spend the conditional grant and only 8 per cent of it is earmarked 'rehabilitation'. Of the remainder, 72 per cent is for the construction of new water supplies, and the rest is for community activities, monitoring and evaluation (MWE, 2000). This shows how the government is investing heavily in new water supply systems in order to reach its coverage targets. The performance of the district in the previous year and the coverage is also used in order to allocate the conditional grants for next year. This means that a district with a high coverage will receive less money the following year because the government wants to prioritize districts with low coverage. In practice a district with high coverage will have even less money for operation and maintenance, despite the fact that it has more water supply infrastructure to maintain. Each NGO or donor that wants to 'give' a water supply system to a district government should realize that the project puts an extra financial burden on the district for operation and maintenance, and the financial means for this are extremely limited.

NGOs wanting to give a water supply system should realize that the project puts an extra financial burden on the district for O&M

As a consequence, governments cannot be counted on financially for operation and maintenance. NGOs and local governments also tend to assume that sufficient revenue will be generated locally from within the community, something that has proved to be difficult in practice. It is therefore not surprising that such a high number of water supply structures in the developing world are out of order; there is simply no money to pay for operation and maintenance. No technology is completely maintenance free and, even if well maintained, every technology or infrastructure will require replacement

If people had enough money to buy spares, supply chains would be created

of certain parts after some time. Non-functional systems are often blamed on a weak enabling environment, wrong technology, wrong management model, lack of local ownership, bad implementation or absence of supply chains. However, if there was money allocated for operation and maintenance, all these obstacles could be overcome. If there was a flow of money from governments, donors and communities for operation and maintenance, institutions to take care of this would emerge. If people had enough money to buy spares, supply chains would be created (Oyo, 2002). During a recent study looking at management models for rural water supplies in Uganda, the conclusion was that no type of management model or support mechanism worked if there was no money for operation and maintenance (Koestler, 2008).

A bad investment

Why is it so hard to convince donors that money for operation and maintenance is important? This question becomes even more surprising when the economic arguments are taken into account. Driven by the wish to increase coverage figures, donors have invested in an utterly inefficient way. This is shown in Figure 1, where the thin curves represent individual projects and the thick curve is the cumulative number of people with access to water. It is clear that as long as the individual projects break down after a few years, the overall goal is never achieved. At the same time, the investment spent on water infrastructure is significant. The fact that populations *continue* to have access to water should therefore be valued as much as the fact that new populations gain access to water. In economic terms, it is much cheaper to maintain systems for a given number of people than to construct new ones, but the same objective is achieved; people have access to safe water.

It is much cheaper to maintain systems for a given number of people than to construct new ones

This can easily be demonstrated through an example looking at the cost of installing and maintaining a borehole with a handpump. The cost of a new borehole with a handpump in sub-Saharan Africa is between US\$5,000 and \$15,000. Using the average, for an investment of \$10,000, 300 people get access to safe water, using the Ugandan standard figure. According to research done by the French handpump provider Vergnet Hydro in West-Africa, about \$35 is needed on average per year in order to maintain a handpump (Ndingambaye, 2008). Using this figure of \$35 per year, it means that with \$10,000, about 280 handpumps could be maintained in a year. This gives us $280 \times 300 = 84,000$ people. In other words, instead of 300 people gaining access, 84,000 people continue to have access to water in that particular year, for the same price.

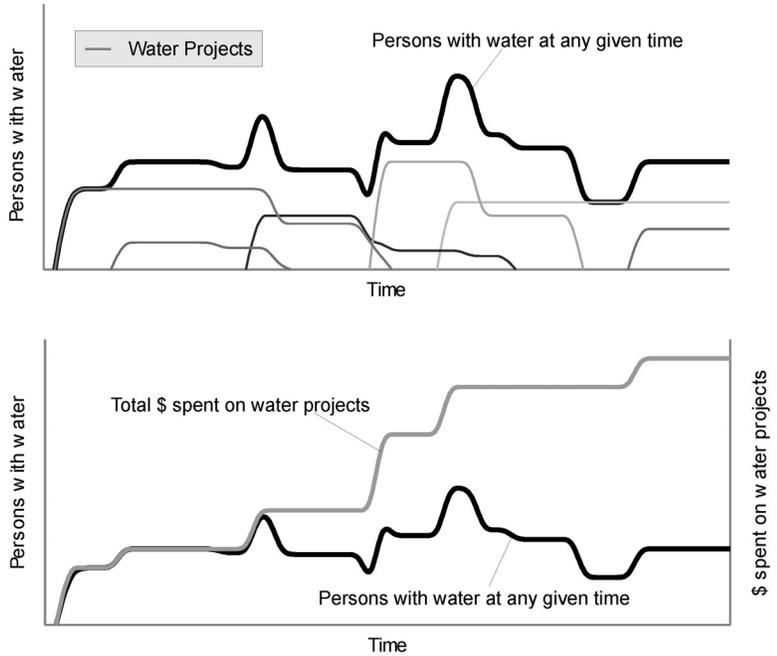


Figure 1. Persons with access to water over time using a short-term approach focusing on new infrastructure

The coverage indicator does not take into account the number of people that will get water every year in future

This effect is multiplied if the access is maintained over time. Being a static indicator, the coverage indicator does not take into account the number of people that will get water every year in future from the new water system, if it is kept functional. It is therefore necessary to add a time aspect to the coverage figure when allocating funds, and we call the indicator ‘water-person-years’ (WPY) (Koestler et al., 2009). This indicator tells us how many people get access to water from year one and each year throughout the lifetime of the infrastructure, and makes it possible to express the impact of an investment in a cumulative way, over a period of time.

Thinking in water-person-years

The easiest way to explain this concept is to look at a simple example: an organization has in total 300 units of money to spend on water supply, and the investment cost of each supply is 100 units for a village of 1,000 people. To simplify, the 100 units include both hardware and software costs, where the relative distribution will depend on local settings. For this example, we also assume a constant population and that money today has the same value tomorrow. According to

the approach used today, the main goal of the implementing organization will be a quick increase in coverage. It will therefore construct three water systems for 100 units each in three villages of 1,000 people each. The total cost is 300 units. However, without any money reserved for follow up, operation and maintenance, each water system can be assumed to break down after about 3 years. The total water-person-years this investment gives is therefore:

$$3 \text{ villages} \times 1,000 \text{ people} \times 3 \text{ years} = 9,000 \text{ WPY}$$

If the organization instead focused on one village and constructed one water system for 100 units, and set aside 10 per cent of the investment cost (10 units) for operation and maintenance each year for the next 20 years, the result looks like this:

$$1 \text{ village} \times 1,000 \text{ people} \times 20 \text{ years} = 20,000 \text{ WPY}$$

Thinking in water-person-years, a maintained system should be even more valuable than a new system

The example shows that the impact of the investment is more than doubled (20,000 WPY instead of 9,000 WPY) if enough money is allocated for operation and maintenance. Thinking in water-person-years, a water system maintained should be even more valuable than a new system constructed. This is because for each additional year that the infrastructure lasts, the capital cost per delivered WPY diminishes, hence increasing the effectiveness of the initial investment. In addition, if the system is properly designed, it will serve even more people in future due to population growth. Figure 2 shows how a considerably higher access figure is achieved over time if projects are made sustainable and funding is allocated to operation and maintenance. It also shows how the resources spent on water projects stand in relation to the outcome; the people with access to water over time.

Donors should allow for operation and maintenance, even if this is less prestigious than new projects

What are the implications of the calculations above? The goal of donors and governments should be to supply as many people as possible with water over time with a certain amount of money. This means simply making a good investment and allocating resources in an efficient way. According to the result of the small exercise above, donors should, therefore, value the fact that a water system has been maintained and run for an additional year as much as the construction of a new system. Donors and governments should allow for money spent on operation and maintenance, even if this is less prestigious than commissioning new infrastructure projects and requires long-term thinking and commitment. In economic terms, therefore, focus should shift from only *new* people supplied to people supplied in *general*, regardless of whether it is from a new or an existing infrastructure. It is only by allocating resources in this way that they will have the highest potential impact and the projects will be truly sustainable.

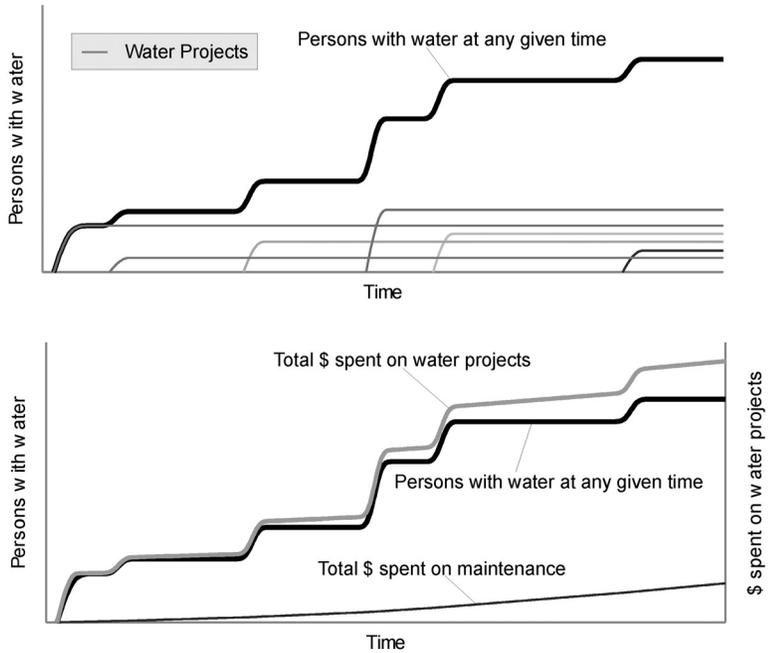


Figure 2. Persons with access to water over time using a long-term approach focusing on operation and maintenance

Introducing this indicator would have profound impacts on the way work is carried out in the water sector

The WPY concept in practice

Introducing WPY as an indicator for development projects would have profound impacts on the way development work is carried out in the water sector. It would most certainly bring countries closer to their development objective: more people have access to sustainable water supply services. It would also have implications on how NGOs, donors, governments and the private sector would work.

For NGOs, thinking in WPY means that it is necessary to make a long-term commitment for each water project. This stands in sharp contrast to common practice today, where NGOs use project cycles of 1–3 years, maximum five years, and there is a clear focus on new infrastructure. It would make it much harder for an NGO to start a project in an area, because it would mean a presence in that area for a long period of time. Hence the ‘entry barrier’ for an NGO to start activities in a certain area would be high. Once the NGO is present, it will be incentivized to carry out more projects in the same area in order to benefit from economies of scale. This would lead to fewer NGOs in each area, but NGOs that are specialized in the local context because

of the experience gathered over time. For NGOs this would represent a number of challenges, especially the fact that a long-term commitment is necessary. For the beneficiaries, it would mean better and more appropriate projects because of the specialization of the NGO; it would mean fewer NGOs and organizations to relate to and there are many potential benefits of 'clustering' NGOs such as shared experiences, better coordination in one area and easier relations with local government. It also makes scaling up easier, because projects are more easily replicated in the same geographical area. In certain ways, we are already moving slowly in this direction through the involvement of community-based organizations (CBOs) or grassroots organizations that are considered more 'permanent' than international NGOs, and are increasingly used as partner organizations that carry out the work in the field. However, even if the CBO is more permanent, without funding the long-term impact of the CBO is also limited.

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For donors, thinking in WPY would mean longer commitments of funding. Currently, donors often decide one year at a time how much they are giving, depending on national budgets, the global economic climate and politics. When NGOs are funded through donors, they also need to work on limited project periods. For example, the Norwegian Agency for Development (NORAD) allocates money for some NGOs only on a yearly basis. Projects are normally funded over three years, five years maximum. The application process also clearly demands an 'exit strategy'. Based on the experiences from communities and water supplies discussed above, an exit strategy after a three year project will in many cases lead to a swift breakdown of the water supply. The initial reaction of donors is often to reject long-term commitment. At the same time, when looking back in time, most international donors have been present in developing countries over a long period of time. NORAD has been active in Mozambique since 1977 (www.norad.no). The French Agency for Development (AFD) started its activities in Benin even before independence, in 1956 (www.afd.fr). In addition, donors are increasingly coordinating their support and making it more predictable for national governments through sector coordination programmes and the progress towards SWaps. The SWAp is actually a step in the direction of commitments for longer periods of time, since it gives government a leadership role and aligns donors around targets and strategic plans. Even if donors change their contributions from year to year, it puts in place a favourable environment for long-term thinking. A second trend that is also favourable to a long-term perspective is the move from a project approach to a programme approach. This has been a fundamental theme in many sector coordination processes, and is widely recommended by literature. These examples show that there is a general understanding about the need for long-term commitments and

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solutions, however the process is too slow and too many water systems will break down before the communities will feel the difference.

For national governments, thinking in WPY would dramatically change policies, strategies, sector documents and programmes, and sector finance. It would require a review of funding mechanisms such as the conditional grants in Uganda, and it would set new priorities and identify new focus areas of intervention. Eventually, it would have a profound impact on the access of populations to sustainable water supply, over time. However, the impact on the ground would largely depend on funding, and the fact that donors embrace the same objectives and strategies.

For the private sector, increased spending on operation and maintenance will mean a new business opportunity. Funds from donors, NGOs and local governments can be used to support communities directly; however several countries are already experimenting with using the private sector for operation and maintenance services. In Madagascar, handpump suppliers are paid by NGOs and local government not only to supply and install the pump, but also to keep a certain number of pumps in an area running and functional over a certain period of time. In Angola, a water company is responsible for several hundred handpumps in an area. A local operator collects money from the community and does routine maintenance, and the company provides maintenance services for larger repairs (Harvey and Reed, 2004). Using the private sector can be more efficient than providing services through local government structure since the private sector is often more flexible and able to adapt quickly to user demands. Such initiatives can be expanded and as long as there is a demand and money to pay for a service, the private sector can easily be mobilized to take on a new role.

Using the private sector can be more efficient than providing services through local government structures

Conclusion

In conclusion, WPY is a powerful tool that can be used by governments, donors and NGOs to justify long-term funding and higher budget allocations for operation and maintenance. The indicator should be used alongside existing indicators such as coverage and functionality. It is clear that the indicator needs some adaptation to reality, such as taking into account population growth and the value of money spent today versus its future value. The indicator will also suffer the same weaknesses as functionality and coverage if data collection methods and updating of databases are not improved. In addition, it is clear that corruption, dysfunctional government structures, lack of human resources and slow decentralization processes are challenges that cannot be overcome just with more funding for operation

and maintenance. However, it is hoped that through increased focus on real sustainability, adequate systems, structures and institutions can come into existence. These could be semi-autonomous maintenance units or private companies working on service contracts, it could be the local water utility being paid for maintaining the rural water supplies in the area, or a local community group contracted to carry out maintenance of a number of handpumps. The solutions are many, what is needed is for the donor community, the NGOs and the governments to be given the right incentives to allocate resources in a more sustainable way, and one way to do this is to use water-person-years as an indicator.

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