WASHCost

Briefing Note 1b

Services are forever:
The importance of capital maintenance (CapManEx) in ensuring sustainable WASH services

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WASHCost researches the life-cycle costs of water, sanitation and hygiene (WASH) services in rural and peri-urban areas in four countries, Burkina Faso, Ghana, Mozambique and Andhra Pradesh State in India. The rationale is that WASH governance will improve at all levels as decision makers and stakeholders analyse the costs of sustainable, equitable and efficient services and put their knowledge to use.

WASHCost publishes working papers and briefing notes to show emerging results, explain some of the concepts behind WASHCost and stimulate discussion on these topics. These 'works in progress' will be revised as our understanding of the issues increases; WASHCost welcomes feedback on them. Please send your comments to washcost@irc.nl

Front page photo
IRC International Water and Sanitation Centre
Figures in this document are adapted from: 'Sustainable Service Delivery Costing and WASHCost', Richard Franceys, presentation to WASHCost Research Group Meeting, June 2009, Hyderabad, India.

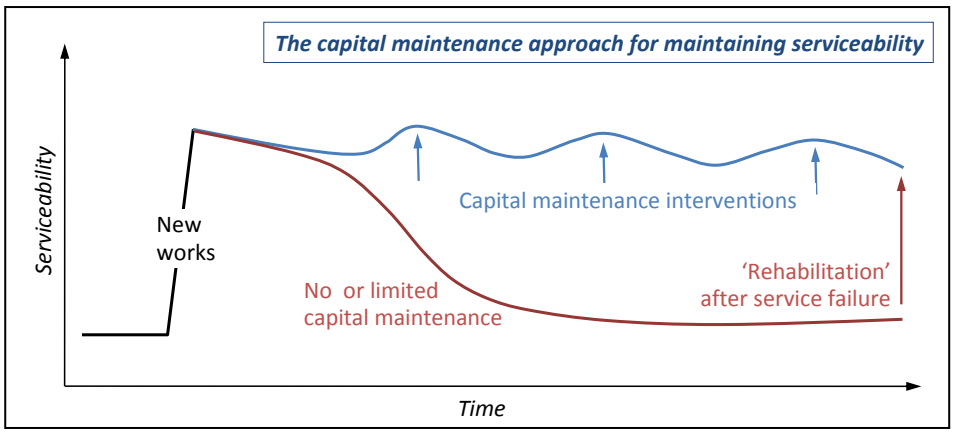
Services are forever:
The importance of capital maintenance (CapManEx) in ensuring sustainable WASH services

This briefing note is intended to promote an important concept in ensuring that WASH (water, sanitation and hygiene) services can be sustained, and do not collapse when there is a problem with infrastructure. It explains the value of collecting, analysing and budgeting for capital maintenance expenditure (CapManEx) and how this relates to capital expenditure (CapEx) and operating expenditure (OpEx). The idea behind promoting understanding and use of these terms is to focus the thinking of planners, funders, service providers, regulators and users on all the elements that make up a successful and sustainable service, rather than just thinking about the cost of providing new equipment or wells.

Capital expenditure (CapEx) refers to the one-time costs of constructing fixed assets such as boreholes, pumps, pipes and concrete structures when a water or sanitation system is built, or when the system is extended or enhanced. CapEx can also include the 'software' costs of working with stakeholders prior to and during construction or implementation, for example the planning costs, the community mobilisation costs and the hygiene education costs.
Operating and minor maintenance expenditure (OpEx) covers the cost of operating a system and includes such things as wages, energy costs and the cost of chemicals that are regularly needed, in addition to the ongoing cost of lubricating moving parts, checking and tightening bolts and connections, and facilitating community involvement.
Capital maintenance expenditure (CapManEx) refers to the (occasional) costs of renewing (replacing, rehabilitating, refurbishing, restoring) assets in order to ensure that services continue at the same level of performance that was first delivered. Examples of CapManEx include replacing a motor on a power pump or the pump rods/rising main/handle in a handpump; cleaning/re-excavating the base of a hand-dug well; relaying the drainage field for a septic tank; flushing a borehole which no longer delivers the desired flow; cleaning a water tank, etc. The renewal of these assets, often after some years of operation, ensures the same level of service that the initial users of the assets received when the capital expenditure was first incurred.

Recognising the need for CapManEx is absolutely crucial to improving the sustainability of WASH services. When there is no timely capital maintenance expenditure the quality of services tends to decrease over time, in some cases leading to complete failure. The resulting need for a new capital project to replace the original service will normally be more expensive overall in addition to leaving consumers without an adequate service in the meantime, as illustrated in Figure 1. This briefing note clarifies the concept of CapManEx relative to CapEx and OpEx, outlines reasons to investigate these cost classifications and addresses some challenges in collecting and using the data.

Figure 1: Capital maintenance and serviceability



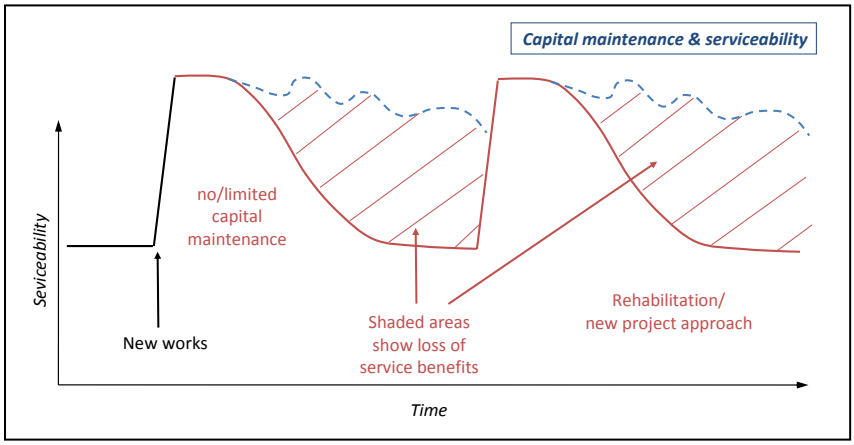
The blue line shows that regular capital maintenance maintains serviceability, while (red line) service levels fall away over time without capital maintenance, eventually requiring the service to be 'rehabilitated' or replaced.

Six reasons to include CapManEx in our classification of WASH costs

1. The major problem facing the water and sanitation sector is the failure of systems due to lack of maintenance.

Our goal is improved water and sanitation services, not just when a new scheme is constructed or implemented but continuously from that point forward. WASHCost promotes an understanding that the sector needs to move from projects with limited time frames and horizons to programmes which deliver long-term benefits over. Capital expenditure on infrastructure is a means to an end: to provide an effective service. One goal in relation to capital investment may be described as to ensure **ongoing 'serviceability'** of the assets which deliver water and sanitation to people. Water and sanitation delivery is a capital intensive activity with considerable dependence upon the use of fixed assets. However, all assets wear out over their life cycle and all systems are made up of assets of different lifespans. It is therefore necessary to have an approach that ensures funding for the continuing serviceability of those assets and the system of which they are a part, if they are to maintain their ongoing ability to deliver water and sanitation services. The failure to undertake capital maintenance leads to many systems being abandoned, with the initial investment wasted and users unable to access the required benefits. Figure 2 illustrates how a failure to invest in capital maintenance can lead to a rapid decline in service levels, followed by the need for overly-expensive new investment required to rebuild a system from scratch. Loss of serviceability is a serious failure of public health and convenience. It keeps people dependent and perpetuates the use of unprotected water sources and unsafe defecation.

Figure 2: Delayed capital maintenance and the loss of service benefits



The wavy blue line again shows how regular capital maintenance maintains serviceability, while the red line shows that delays lead to periods of substantial loss of service. These have to be made good with extensive rehabilitation costs or with new projects to restore services to where they were.

To ensure that appropriate funding is available for capital maintenance, service providers and enablers need to classify the costs which are incurred in maintaining serviceability, separately from the costs of constructing and implementing the programme and from the everyday costs of operation. This information is often not collected or classified appropriately which limits the ability of planners and policy-makers to make appropriate provision.

So far as possible, WASHCost collects CapManEx data to compare costs (and service levels) of properly maintained services with costs (and service levels) of services where assets are not replaced. To encourage governments and donors to switch from a project approach to a service delivery approach it is necessary to demonstrate that it costs less to maintain existing systems than to build new systems. It is one of the central themes of WASHCost that a well maintained service is more cost-effective (same money, more people supplied) *AND* ensures the continuity of services.

2. Many low-cost technologies require earlier capital maintenance.

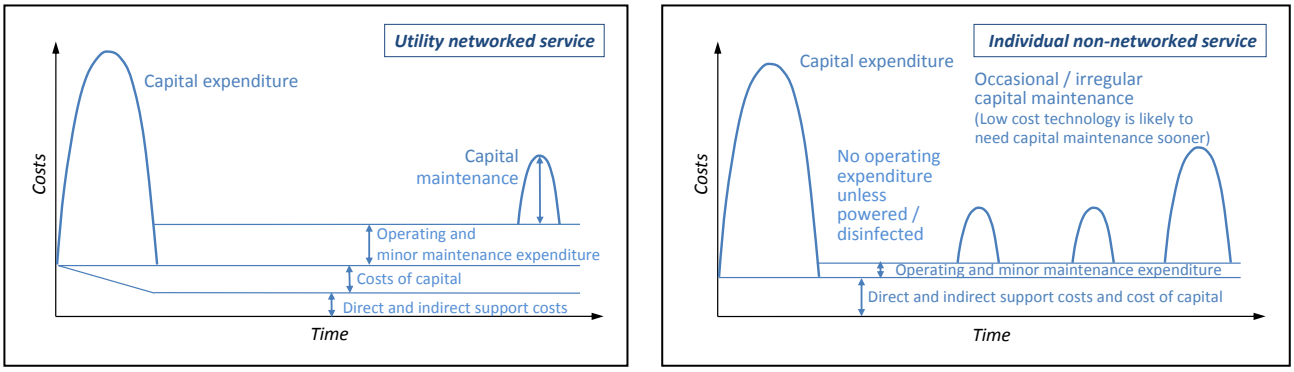
A typical piped network system in an urban area can maintain some level of serviceability for many years. Even with leaking pipes and occasional bursts, they tend to be very robust. However stand-alone systems such as handpumps lose all serviceability when parts fail, while the asset life of a handpump (perhaps five years) is significantly less than a piped network (50 years). For low cost, 'appropriate' or 'intermediate', technology, capital maintenance cannot be ignored in the way that rich countries have tended to ignore the capital maintenance needs of their piped systems.

3. We need to increase understanding about the need to cover long-term maintenance costs.

Consumers and communities are often willing to pay a contribution towards new services, particularly when they have no service to start with. Where people do not understand the costs and do not have to pay anything for operations (handpumps, pit latrines, gravity flow piped water, improved hand-dug wells, for example) it has proved extremely difficult to access the funds necessary for long-term capital maintenance. Communities, households and local government institutions either fail or are simply unable to pay for apparently unexpected, and occasional, expensive service failures. When parts of the system do fail at the end of their designed asset lives – and they rarely last that long – it is often the case that the whole system is abandoned, resulting in total service failure.

The psychology of preparing for occasional, intermittent and unpredictable expenditure needs to be supported, particularly for the most common 'non-networked' services. The psychology of paying is quite different where people or organisations are used to paying regularly for power costs, chemical and staffing in a larger system which then enables capital maintenance payments to be explained and included as an element that has to be met by somebody.

Figures 3a) and 3b): Capital maintenance a) as an included cost or b) an unexpected and unmet cost



Figures 3a) and 3b) show how capital maintenance fits into the sequence of costs in a utility networked service and individual non-networked service, where maintenance may needed earlier in the life of low cost components.

Getting a better understanding of what these capital maintenance costs are, or should be, will assist in budgeting to maintain assets. Where there is some sort of community management delivery model for providing water supply and sanitation, with local private sector or government involvement, it is beneficial to have a system which informs all the parties what these occasional costs are likely to be. Capital maintenance costs do not necessarily have to be paid for directly by consumers or communities. The challenge at present is that neither consumers/communities nor the appropriate government departments are making allowance for these occasional costs.

4. We need to begin to classify and understand capital maintenance costs in order to facilitate *'optimisation'* of the costs of providing water and sanitation.

Because WASH services are provided using assets with different lifespans and costs (borehole/foot valves/pump rods/pump heads/pump handles, for example) it is valuable to collect data on the lives of each of those asset parts and the costs of maintaining them when they occasionally fail ("fix on failure") or, ideally, just before they fail. There is also an 'OpEx/CapEx trade-off' whereby it is possible to have a capital intensive system which apparently requires very few operating costs (solar panels to power pumps for example) or an OpEx intensive approach which, for example, uses labour to carry water rather than investing in pipes. Optimisation can only be achieved through a full understanding of the ongoing capital maintenance costs. For example, if solar panels fail after three years rather than the expected ten years, the benefits may be far less than presumed. Examining capital maintenance costs may also encourage those who are responsible for meeting costs to focus on quality and to question why some assets fail well before their useful life span is reached. If the focus is only on CapEx, this weights investment decisions in favour of the cheapest infrastructure, which may be a false saving if poor quality leads to much higher CapManEx at an earlier time.

5. It is *accounting best practice* to account for using up the value of fixed assets

Conventional accounting has long understood the challenge of fixed asset renewal in order to determine the true costs and profit margin of products and services delivered by commercial enterprises. If 'using up the value of the fixed assets' over time is not recognised in the pricing of products and services the enterprise will not be sustainable. Accounting therefore uses the concept of 'depreciation' to charge for the true cost of activities and produce the best understanding of the costs incurred and the value of any surplus achieved over a period. Accounting terminology of 'current' costs and liabilities and 'fixed/long term' assets and liabilities makes the distinction between costs incurred regularly within a single accounting year and costs incurred where the asset has a lifespan longer than a year.
Regulatory accounting of water services requires a 'broad equivalence' between accounting charges for depreciation and expenditure on capital maintenance so as to ensure serviceability of the assets in the long term. This is a useful approach to begin the process of determining who should pay for what element of the services and when.

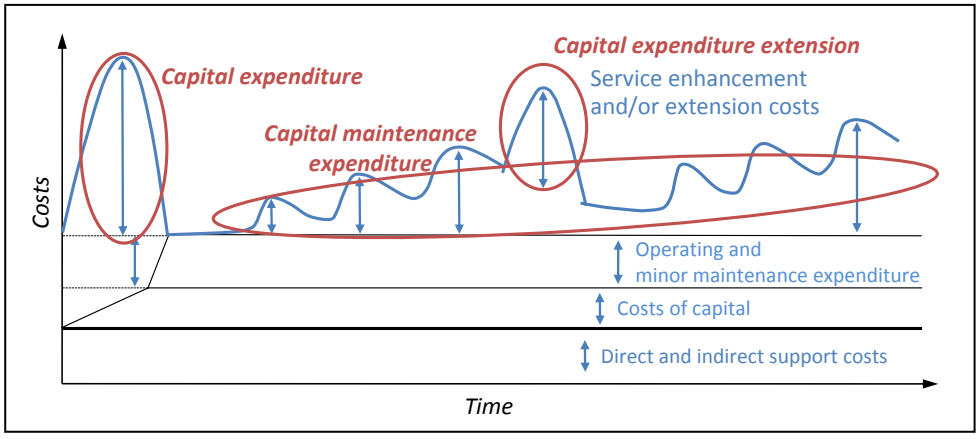
6. Some of our partners are beginning to require *'fixed asset/accrual/double-entry accounting systems'* in local government.

India, for example, now requires this for 4,000 urban local bodies. It is appropriate for WASHCost to account for costs in a way that matches the accounting systems of the areas where we work.

Difference between CapManEx and capital expenditure (CapEx)

When an existing system is upgraded in order to increase its serviceability (more people served or improved service level to the same users or both), the related expenditures are CapEx (Figure 4). When a system collapses or reaches the end of its lifespan and has to be replaced in order to maintain a service level, it is tempting to see this as capital expenditure, since it may mean the construction of a 'new' system. However, if we focus on service delivery rather than on specific infrastructure, then replacing the system should be regarded as CapManEx, since it is done to maintain the same service level to the same people. The principle is that the extension or enhancement of a system (better quality or to more people) counts as CapEx, while expenditure needed to keep the service the same as before counts as CapManEx.

Figure 4: 'Sustainable Service Delivery Costing' - SSDC



The blue line shows the sequence of costs in a sustainable service delivery system with regular capital maintenance to maintain high service levels to the same number of people, and CapEx extension to upgrade a service or to expand it to reach a greater number of people.

WASHCost is considering systems in small towns as well as multi-village and single village schemes in some countries which make extensive use of pipe networks. The question has been raised regarding the usefulness of capturing capital maintenance expenditure for rural settings. It has been argued that the breakdown of costs between CapEx and CapManEx fits network / urban systems in developed countries but is not appropriate for decentralised rural systems in developing countries. It is sometimes argued, for example, that in rural areas, when a system runs down, it is more likely to be replaced than to be repaired. When a handpump fails, a new borehole is drilled and a new handpump is installed. It is then argued that this is a new system and the costs should be considered as CapEx. However, from

a sustainable service delivery perspective, if this is installed simply to replace the previous failed service, it should be considered as CapManEx, even where a new borehole is provided. Of course, where the existing borehole is still sound, it is a huge waste of resources to drill a new one and only the handpump should be replaced. It is easier to see in this case, that spending on the handpump is capital maintenance, CapManEx. However, the principle is that CapEx is the cost of a new or expanded service, while CapManEx is the cost of sustaining or renewing an existing service.

Difference between CapManEx and operating expenditure (OpEx)

When an existing system undergoes minor maintenance, for example regular greasing of bearing points or tightening of pump bolts, the related cost is part of ongoing operating expenditure (OpEx). The point where minor maintenance becomes capital maintenance is a matter of frequency (does the cost occur more than once a year?) and of amount (is the cost significant compared to the ongoing OpEx?). The concept of accounting for this expenditure as CapManEx renewal if the cost occurs less frequently than once a year mirrors the useful accounting practice of distinguishing between current assets (held for less than a year) and fixed assets (held for longer than a year).

For instance, although the cost of emptying a twin pit or shallow pit-latrine may be significant compared to the initial investment, it occurs frequently, at least compared to the life cycle of the latrine itself, and does not constitute a physical renewal. Thus, it is considered as OpEx. However, the cost of emptying a single deep pit might only be needed once every five to ten years and might usefully be considered as CapManEx. The replacement of a small valve on a piped system, or repairing a leaking pipe is OpEx, although its failure can significantly affect the serviceability of the system, because this is a small cost which occurs frequently compared to the life of the system. Replacing a length of pipe because there have been a number of leaks, or replacing a major valve after several years of use would be classified as CapManEx.

What is challenging in collecting data about CapManEx?

When there is no capital maintenance, either because major maintenance has been neglected or because the system is new, there are obviously no CapManEx data to collect. When data do exist, the terminology of assets, systems and services must be clearly understood to start collecting this data.

- A simple system is made with a single asset. This happens rarely. A service can be provided by a single system (one borehole in a village). However, normally that system is made up of various components with different asset lifespans. A borehole with a handpump comprises borehole, casing, filter (perhaps), foot valve (perhaps), pump rods, handpump, handle, and drainage area. Even a rainwater catchment tank might be made up of the tank, the outlet tap, rainwater guttering and perhaps a first flush mechanism. The idea of capital maintenance is that each of these elements is renewed either when it fails or when it begins to perform less satisfactorily, ideally just before failure. Without capital maintenance, many systems are abandoned when just one of these elements fails.
- A complex system (for instance a water network) is composed of many more assets, often over a wide area. With long-life pipe assets it may be many years before the pipe network requires capital maintenance and therefore data might be scarce.
- A service can also be provided by multiple similar or different systems (e.g. several boreholes or one borehole and one small network) each with its own asset life and different expectations and requirements for capital maintenance.

WASHCost collects CapManEx data at the service level to identify what is actually being spent on capital maintenance. Where a service is provided by multiple independent items of water supply infrastructure, it is a mistake to collect data on a single system/infrastructure alone, as this will fail to achieve the main objective which is to assess the life-cycle costs of WASH services. This requires information to be collected on the CapEx, OpEx and CapManEx of all those elements to the extent to which data are available.

The WASHCost experience is that less capital maintenance is undertaken than is needed to maintain serviceability and that data is rarely recorded in an appropriate manner. The information collected therefore cannot represent the cost of necessary capital maintenance but rather the cost of inadequate capital maintenance. As described earlier, the accounting response is to estimate the costs of actual, necessary, capital maintenance through a depreciation calculation where an average lifespan of the system or part of the system is assumed, based on past experience.

In reporting total costs of WASH services to governments, donors and civil society, WASHCost is therefore initially using a 'normative' (assumed) lifespan for fixed assets to calculate the capital maintenance cost. As the WASHCost data expand and improve they are expected to show not only that existing capital maintenance is inadequate but also that normative allowances are too high. Which is to say that it is possible to extend the lifespan of non-networked services by timely spending on capital maintenance to everybody's benefit.

WASHCost is therefore reporting actual, current CapManEx alongside a calculation of presumed CapManEx (depreciation) whilst collecting sufficient data to validate more accurate figures for the CapManEx required to ensure serviceability.

The investigation of CapManEx becomes more uncertain where necessary capital maintenance is appropriately combined with improvements in quality or extensions to give greater accessibility or increased quantity. This will require a more complex approach to the apportionment of costs between CapEx and CapManEx - a normal accounting challenge for which WASHCost will develop simple guidelines in due course.

For further ideas, explanations and helpful examples regarding the principles of accounting for sustainable water and sanitation please read the briefing note from the economic regulator for water in England and Wales: OFFICE OF WATER SERVICES Annex to REGULATORY ACCOUNTING GUIDELINE 3.06 Issued May 1992, Revised February 2007 – 'THE LONG RANGE NORMATIVE CHARGE FOR INFRASTRUCTURE RENEWALS'.