perspective paper

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Introduction

According to projections of the latest Joint Monitoring Programme (JMP) report – in 2015 the number of people globally without access to improved sanitation (2.4 billion) will exceed those without access to improved drinking-water supply by at least four times (UNICEF and WHO 2012). Hence, the authors of the Challenge Paper rightly focus their assessment on sanitation, one of the most off-track MDG targets. While the sector is indeed redressing the imbalance between water supply and sanitation, it is now widely recognized that increased financing and political attention are not enough: the sector needs successful models of scaling up in order to make a lasting dent on the billions still without basic sanitation. And although risky, as pointed out by the Challenge Paper authors, we do need to identify 21st Century solutions to the sanitation challenge, recognizing that managing the wastewater and sewerage of more than 7 billion humans is in dire need of a different approach to that of 19th Century engineers.

For some years now, it has been known that both improved drinking-water supply and sanitation offer attractive returns on investment (Hutton and Haller 2004). Benefit-cost ratios, varying from returns of US$ 3 to US$ 34 per Dollar invested[1], have been widely disseminated among the media, at international conferences and in country dialogues. Recently, more detailed country-level studies have been conducted specifically on sanitation interventions under the Economics of Sanitation Initiative (ESI)[2]. These country studies, which now cover the globe, give sector stakeholders and policy makers added firepower for arguing to obtain more funds and political support for sanitation, as well as informing selection of efficient and appropriate sanitation technologies[3]. For all three sanitation interventions described in the Challenge Paper, the authors draw heavily on the ESI datasets and recalculate benefit-cost ratios and net benefits under different scenarios.

How the authors used the ESI data

Various brief technical responses should be made to the utilization and adjustment of ESI data for the purposes of the Challenge Paper's three sanitation interventions. On CLTS++, it should be noted that in the 2 countries where ESI studies evaluated CLTS-type interventions (Cambodia and Indonesia), program costs of implementing CLTS were included. Indeed, program costs were found to be very high in Cambodia, exceeding by several times the hardware cost of the

[1] Depending on which world region or report is cited.
[2] Lead by the World Bank Water and Sanitation Program - www.wsp.org
[3] What have been termed 'ESI Phase 1' studies measured the economic impacts of poor sanitation at national level ; while 'ESI Phase 2' studies focus on measuring the costs and benefits of alternative sanitation interventions and delivery approaches in selected field sites.

simple latrines selected by the majority of rural households. Second, benefit-cost ratios were presented in ESI reports under 'ideal' and 'actual' scenarios – the former being 100% adoption of toilet facilities, and the latter accounting for the fact that a proportion of the targeted households either do not adopt the intervention, or after some time of latrine use, fall back to former practices. These results are presented in detail in the ESI country reports. Third, the reduction in diarrheal disease incidence and mortality used for basic sanitation interventions is 36% (from meta analyses), is arguably not overly optimistic as claimed by the authors. Hence the thinking behind the adjustments made in the Challenge Paper are correct, but the ESI reports have in fact largely accommodated these concerns and issues.

Sanitation as a business is a concept gaining ground within the sector, but still facing many practical challenges. While economic analyses conclude that sanitation is a profitable investment from society's viewpoint, this fact alone does not automatically indicate the existence of a thriving market place, with customers ready and willing to pay for sanitation, and suppliers responding to that demand. Indeed, this is the exact problem of sanitation globally: there is no financially lucrative market in many developing countries because the costs of (off-site) excreta management are perceived by households or local authorities to be greater than the benefits, or simply that individuals and communities lack motivation to change their current habits.

In this respect, it is necessary to distinguish between on-site sanitation whose benefits are mainly to the household and immediate vicinity (containment of unpleasant waste and pathogens, and time savings) versus off-site sanitation whose benefits are to the wider community, especially 'downstream' populations (aesthetic and environmental benefits, including pathogen removal). Hence, improved collection, transport and disposal of excreta have potentially large positive 'externalities' and few benefits to the household itself[4]. However, households need to be persuaded to avoid the lower cost approach of informal self-emptying which is likely to lead to illegal dumping of waste in rivers and elsewhere. Hence, if improved waste management is to become a profitable business, then either the demand of households needs to be stimulated (the 'carrot' approach) and/or regulatory measures need to be taken (the 'stick' approach). Showing impressive benefit-cost ratios – as the authors do, of US$ 47 return per US$ 1 invested – can inform and motivate these solutions. However, it should be underlined that this figure represents the return to public or philanthropic budget, which the authors assume to be 25% of the total investment required; furthermore, the pit emptying service claims 80% of the health and water quality benefits to sanitation, leaving only 20% of the benefits for the latrine intervention itself. Certainly these proportions are debatable, but little empirical evidence exists to date.

The analysis of the third sanitation innovation – reinventing the toilet – is a useful abstraction, asking whether technical innovations could play a role in

[4] An exception is that pit or septic tank emptying allows the household to continue using that facility, rather than constructing a new one.

scaling up sanitation globally. The key question relates to the value-added of such a technical solution: is it cleaner, cheaper and more environmentally friendly than existing solutions. The analysis relies heavily on the stipulation that the solution should cost less than 5 US cents per day per capita, giving roughly US$ 90 per household per year. Based on the per capita incomes of the lower quintiles in low-income countries, especially subsistence farming households, such a cost will be unaffordable for solving what is only one of many basic needs. It is also unclear whether there can be a universal reinvented toilet that will gain 100% acceptance among the extremely diverse attitudes around the world that characterize sanitation. Taboos, cultural and individual preferences abound in relation to sanitation choices, making a single 'reinvented' toilet of universal appeal unrealistic.

Omitted benefits

One of the authors' conclusions that the payoffs to water and sanitation are 'modest' is not supported by their own findings (of BCRs of 3.4 to 47). Such ratios indicate highly attractive interventions. Neither is this conclusion supported by a series of other benefits of improved sanitation that have been previously evaluated in the same ESI studies, but not referred to in the Challenge Paper. These include 'intangible', environmental and broader economic benefits.

Due to empirical limitations of doing otherwise, cost-benefit analysis for water and sanitation have so far focused on evaluating household level benefits, and to some extent community level benefits. Some benefits have been easier to quantify than others, such as health and time benefits. Hence cost-benefit analysis has been partial, and needs to become broader in the future to highlight some of the other key benefits that may help sell sanitation to both governments and the private sector. The ESI phase 2 has explored some of these issues, and it is hoped will stimulate further research to more fully quantify these benefits.

One key driver of sanitation demand that has largely been ignored in cost-benefit analysis is the group of benefits known broadly as 'intangible' benefits: safety and security, dignity, privacy, and comfort, among others. Some of these benefits are closely linked with the human right to water and sanitation, which was explicitly recognized through resolution 64/292 by the United Nations General Assembly in July 2010. While CLTS++ recognizes and targets aspects related to social values, such as dignity and disgust, there is limited quantification of these aspects so far. In an attempt to raise the profile of these benefits, results on intangible aspects (using ranking scales and focus group discussions) were presented alongside benefit-cost ratios in the ESI phase 2 reports. In Indonesia, for example, the major intangible benefits cited were convenience (being able to go conveniently at any time, even at night and during rainy season), ease of accompanying children to toilet, privacy, pride, reduced risk of accidents, avoided queuing at public toilets, and improved cleanliness and hygiene. Many of these benefits have strong gender dimensions. In marketing sanitation, many populations are more likely to respond to messages based on these intangible benefits than from quantitative 'proof' of cost-benefit, which is more the domain of policy makers.

A second key aspect of sanitation is its link to the environment. Some of the positive benefits have been highlighted in the Challenge Paper, such as the reuse value of human excreta and related business opportunities. However, the removal of negative environmental impacts of poor sanitation has been largely omitted in cost-benefit analyses to date. These are partly broader 'intangible' benefits such as aesthetic value of a clean city environment (without pungent open canals that serve as sewers). Some environmental impacts can in fact be quantified in economic terms, such as the value associated with changes in land use, safeguarding water sources for municipal use, and avoided costs of river clean up. Such impacts have been captured, although incompletely, in the ESI phase 1 studies. However, the second phase of the ESI – field-level cost-benefit analysis – found it methodologically difficult to capture the household cost savings in specific locations as a result of well-managed human excreta. For example, household-level water sourcing and treatment behavior depends on other sources of pollution than just human excreta. Also, many households do not stop taking mitigative measures, such as boiling their drinking water, after water sources become clean. Experience shows habits are hard to change.

A third key aspect of sanitation brings together intangible and environmental impacts, where sanitation is a driver of the tourism industry and firms' location decisions. To make the point, the argument focuses on foreign rather than domestic[5] tourists and firms, as foreign tourists and firms are likely to be more sensitive to the quality of the environment. While these links are not open to scientific analysis (e.g. randomization) and thus difficult to make empirically, there is clearly a strong association between environmental quality and the attractiveness of locations to foreign visitors and foreign firms (Kirigia, Sambo et al. 2009). While some firms may be attracted by lax environmental laws (to reduce their own costs), on the other hand international companies seek locations where the local population is healthy for work, where basic infrastructure is available, where water is cheap but can be treated to the quality standards demanded by production process, and where senior foreign employees are willing to locate to. Hence, governments of developing countries (e.g. Ministers of Finance) may find arguments of sanitation as an engine of economic growth more concrete and convincing than equity and human rights arguments.

'Lining up' the solutions through cost curve analysis

The Challenge Paper has helped understand some of the bottlenecks to scaling up effective sanitation interventions, and the solutions to overcoming these bottlenecks. However, there is a risk that when these solutions are further developed and 'inserted' into development programs, they will continue to operate in isolation from each other. Such fragmentation is common in water and sanitation sectors of developing countries. The macro picture on how resources can be best allocated by government, and spent by households, is lost.

It is accepted wisdom in the field of water and sanitation that different technological solutions and management approaches are required for different

[5] 'Domestic' refers to developing countries.

populations, due to different preferences, different socio-economic backgrounds, different climatic and geographical contexts, and so on. Hence on the demand side, the market is extremely diverse. However, on the supply side, each player implements solutions that are most appropriate to their own organization. Governments are heavily influenced by engineering approaches. The private sector minimizes business risk and targets the majority taste or preference, or the cheapest to reach (e.g. urban areas). There is virtually no pooling of funds to work on common solutions; likewise, pooling of knowledge is limited. Agency programming cycles, donor funding cycles, stakeholders' objectives, monitoring and evaluation systems, are not aligned so that sector resources are used in the most efficient way.

Furthermore, as stated in the Challenge Paper, economic benefits are very rarely fully realized due to market 'failure', such as the existence of externalities[6] and inefficiencies in private financing that puts the (rural) masses out of reach of viable micro-credit schemes. A key bottleneck is that the short-term market value (i.e. demand by households and hence return to investors) is below the longer-term economic benefit of declining mortality rates and poverty-reduction. Furthermore, the sub-optimal rates of latrine adoption in sanitation programmes further reduces their benefits, thus affecting the confidence of funding agencies to support public programmes.

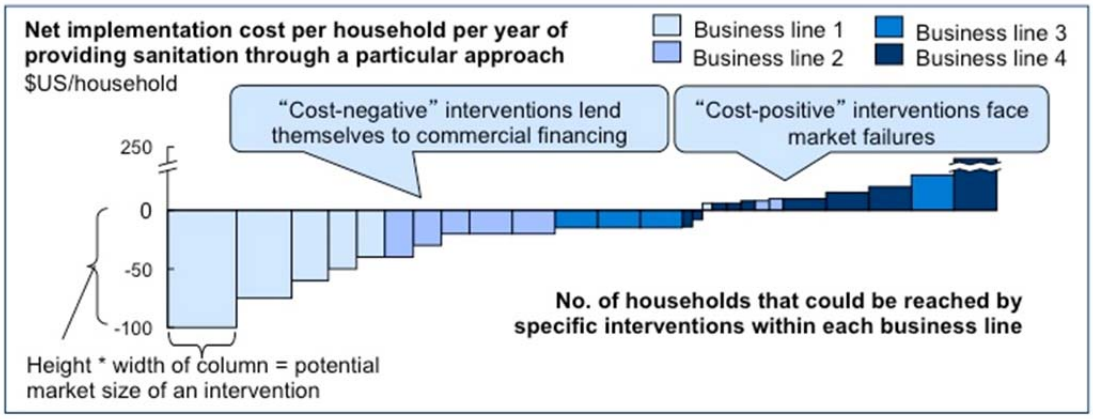
One way to stimulate dialogue and acquire a common understanding of investment options is through a tool that combines the *economic* and *financial* aspects of sanitation, both of which are crucial to the successful functioning of a market 'at-scale'. The technique, known as the 'cost curve' analysis, was developed by McKinsey & Company and has been applied to the water resources sector and to greenhouse gas abatement (Ankvist, Nauclér et al. 2007; Addams, Boccaletti et al. 2009). The cost curve analysis dissects the market, providing a microeconomic analysis of the cost and potential of a range of existing technical measures to close the projected gap between demand and supply in a given market, whether it be water, carbon or sanitation. Each of the technical measures is represented as a block on the cost curve (see Figure 1). The width of the block represents the unit of analysis, whether it is water volume, carbon emissions or in the number of population covered by a sanitation option. The height of the block represents its net cost to society: above the horizontal x-axis are interventions that are net positive (i.e. price exceeds production cost – hence with market potential) and below the horizontal x-axis are measures that are net negative interventions (i.e. production cost exceeds price – hence with need to subsidize this market segment).

The unique feature of the cost curve analysis is to determine pathways to bring sufficient and appropriate private and social sector solutions as well as finance to significantly impact sanitation coverage. It provides a comprehensive context for investments as well as a prioritization framework for the allocation of funds, by identifying effective, scalable, and sustainable sanitation solutions and their associated financing needs and economic attractiveness. It classifies solutions

[6] The health and environmental benefits are not enjoyed by the investing household alone.

into 'business lines' that can be pursued by different agents according to their expertise and interest.

Figure 1. Illustrative cost curve for sanitation



Source: McKinsey & Company

Three different cost curves can be identified – (1) a (financial) market analysis under the status quo, shown in Figure 1; (2) an economic analysis that builds on the financial analysis, and incorporates the value provided by positive externalities (if a solution can be provided to capture externalities, such as regulation or financing innovations), and (3) the previous cost curve at scale, where producers and providers exploit economies of scale and innovations that are driven by a larger market potential, thus reducing unit costs. This third scenario would be enabled by improved government policies and large-scale funds from financial markets, attracted by the significant externalities afforded by sanitation. The effect of externalities and interventions at scale is to increase the number of measures (i.e. blocks in Figure 1) that are net positive – that is, with potential for delivery via the private market.

Such a technical tool has several limitations. First, its findings and hence recommendations are limited by the classifications of population groups, technological options and geographical locations. Second, robust data are not available for all variables, hence requiring sourcing of second-best data sources or assumptions. Third, the higher the scale (e.g. global or national level), the less specific are the recommendations for lower levels such as districts or communes, where contexts may vary significantly. On the other hand, the cost curve analysis does not aim to be highly precise; its value lies in providing insights to the range of various solutions, and linkages between solutions, which can address the problem at scale. A larger purpose of the tool is to catalyze dialogue between a range of stakeholders, whose involvement and collaboration is key to the solutions. Case studies are therefore urgently needed to apply the cost curve approach to sanitation and explore its potential.

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