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Closing the Sanitation Gap - the Case for Better Public Funding of Sanitation and Hygiene.

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CLOSING THE SANITATION GAP – THE CASE FOR BETTER PUBLIC FUNDING OF SANITATION AND HYGIENE[1]

1 The sanitation "gap"

Official statistics suggest that somewhere in the order of 2.4 billion people do not have access to "improved" sanitation. Eighty percent (1.9 billion) live in Asia, 13 percent (0.3 billion) in Africa, and 5 percent (0.1 billion) in Latin America and the Caribbean. The numbers may be even higher and this lack of sanitation at the household is exacerbated when there is limited sanitation also available in schools[2,3].

Over the past twenty years progress has been slow. Between 1990 and 2000 an estimated additional 1 billion people have gained access to "improved" sanitation, but this has been insufficient to keep pace with population growth; in Sub Saharan Africa the percentage of the population with access declined slightly, in Oceania it declined steeply (albeit from initial high levels)[4]. By contrast in East Asia the percentage coverage doubled, and in South Central Asia it rose by three-quarters.

WHO burden-of-disease analysis suggests that lack of access to safe water, sanitation and hygiene is the third most significant risk factor for poor health in developing countries; the first is low bodyweight which in many cases will be causally linked to lack of water supply and sanitation[5]. 1.6 million deaths per year are attributed to unsafe water supply, sanitation and hygiene[6]. Diarrhoea is the most significant disease associated with unsafe water, sanitation or lack of hygiene and causes the deaths of 1.5 million people every year, 90% of which are children under five. Those without access to adequate sanitation are 1.6 times more likely to experience diarrhoeal disease[7].

Approximately 2 billion people are infected with schistosomiasis and soil-transmitted helminth infections globally[8]. At the United Nations General Assembly in 2002 the Special Session on Children reported that nearly 5,500 children die every day from diseases caused by contaminated food and water[9].

The numbers of deaths and incidence of illness caused by lack of adequate sanitation and poor or inadequate water supply are comparable with other major disease groups. Globally diarrhoeal disease alone kills more people than TB or Malaria. But it is in children that the burden falls most heavily. Four times as many children die because of diarrhoeal disease as die because of HIV/AIDs for example[10]. In developing countries the overall disease burden of these two major diseases is comparable. Furthermore lack of adequate sanitation in the home constrains the quality of care which can be provided by families to victims of these other diseases.

Lack of sanitation also impacts on educational access and potential[11], and economic productivity[12]. Lack of a toilet in the home means millions of people have to spend time walking to unhealthy and sometimes unsafe locations to defecate. In short, lack of access to sanitation and the means of good hygiene is an assault against human dignity.

There is a strong international consensus that increased access to appropriate sanitation hardware (toilets) when coupled with the adoption of key hygiene practices (notably, handwashing after defecation, after cleaning children after defecation, and before preparing food) would have a major impact on health

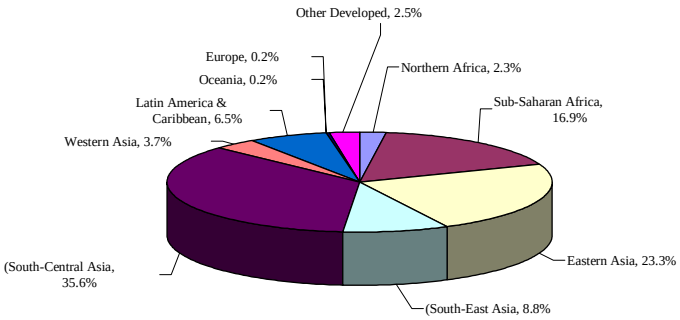
status, particularly for the poorest families, with significant knock-on benefits to education and the economy.

2 The Targets

The over-riding or "governing" target for sanitation was agreed at the WSSD in Johannesburg; to halve the proportion of people without access to basic sanitation by 2015. Importantly the Johannesburg Plan of Implementation also calls for an improvement in sanitation in public institutions especially schools.

What does this target really mean? At the simplest level it means that at least 1.47 billion additional people need to gain access to basic sanitation before 2015[13]. Numerically the biggest challenge appears to be in Asia (see **Figure 1**) but many Asian countries will be on target if they maintain current rates of progress. Perhaps more worrying are regions where progress is slow – in Africa for example, many countries which are extremely poor and/or experiencing civil strife face numerical targets which seem almost insurmountable[14].

Figure 1: Distribution of population to be extended access, 2000-2015, to meet sanitation MDG



For **rural areas** as a whole the target means doubling the rate of progress of the last decade.

For **urban areas**, it means even more – since it is here that the current numbers almost certainly underestimate the lack of access experienced by slum dwellers and those who live on the margins of cities and towns. Furthermore in urban areas, the longer the delay the harder it will be to rectify the situation – rapid unplanned urban growth can seriously hamper the ability of technicians to deliver workable sanitation infrastructure.

In the year 2000 it was estimated that India and China between them were home to more than 1.2 billion rural people without access to sanitation. Serving them alone would go a long way to meeting the target in rural areas. Furthermore in Asia some 330 million urban dwellers currently have no access to sanitation; serving them along with new populations moving to the cities and towns of the region would significantly improve global access in urban areas. However, India and China, and many of the smaller countries of Asia are home to the sort of economic growth and development which may enable them to make steady progress without high levels of external financial support, provided political will exists or can be generated. By contrast many smaller countries and those in other regions (particularly Africa, Central America) are unlikely to be able to make this sort of progress unaided. These are the areas where external assistance might be better deployed.

While the choice of the word **"basic"** in the target may seem like semantic nit-picking it is not. It explicitly recognises that access is access – to any means of safe excreta disposal, and that this, linked to

improved hygiene behaviour (principally handwashing) will yield large benefits. Technologies per se are only meritorious when they are appropriately used. In general sanitation technologies need to be locally appropriate and based on what people want and are willing to use and maintain. Nonetheless professional and political pressures do sometimes resist the use of "alternative" or "low-cost" options. There is a body of evidence to suggest that rigid adherence to "higher" definitions of levels of service constrains access in many countries[15].

Finally it is important to remember what this target does NOT mean. It does not mean that everyone will have access to services. If it is achieved, in 2015 there will still be 1.7 billion people living in the world without access to basic sanitation[16].

3 What is actually happening?

Financing

Governments can seek investment for sanitation from six main sources:

- central government funds (including tax revenues and receipts from international organizations including ODA);
- regional/ local/ urban government (typically property tax, taxes on goods and trading);
- large scale private sector (ultimately passed on to the users/ community/ household);
- small scale private sector (ultimately passed on to the household);
- shared community resources; and
- the household directly.

a) Central government and ODA

Overall public sector expenditure on sanitation falls well behind that for water supply. Sanitation investment makes up 20 percent of total investment in the water supply and sanitation sector (12% in Africa, 15% in Asia, 38% in Latin America)[17]. **Table 1** shows the average annual investment in sanitation made by region in the decade to 2000.

Table 1: Annual Investment in sanitation 1990-2000 (US$ billion)

Region	Urban			Rural			Total		
	Domestic	ODA	Total	Domestic	ODA	Total	Domestic	ODA	Total
Africa	0.195	0.215	0.410	0.063	0.068	0.131	0.258	0.283	0.541
Asia	0.901	0.120	1.021	0.050	0.032	0.082	0.951	0.152	1.103
LAC	1.062	0.381	1.443	0.051	0.009	0.060	1.113	0.390	1.503
Total	2.158	0.716	2.874	0.164	0.109	0.273	2.322	0.825	3.147

Source: UNICEF/WHO Joint Monitoring Program (2000)

Despite commitments made at the Monterrey conference there is no sign yet of a notable upsurge in ODA support for the water supply and sanitation sector which had been in decline through the nineties. Furthermore the big spenders in the sector have tended to steer resources to "large systems" and waste water treatment plants rather than on support to increasing access at the household level[18].

b) Regional/Local/Urban government

In many countries local government is responsible for delivery of sanitation services. Sometimes this responsibility is matched by appropriate rights to raise funds through local taxes or through tariffs on water supply and sewerage. In other cases funding and responsibilities do not match, leaving local governments dependent on central-government subsidies.

In urban areas sanitation services cannot be handled solely by households acting independently. Household decisions and investment need to be supported at the municipal level. Municipal utilities or government departments retain *responsibility* for planning and oversight of waste management (either implementation of piped sewerage and wastewater treatment; pit and septic tank waste management; or regulation of independent household and community service providers). Many municipalities struggle to balance local/household demand within the constraints of a city-wide system.

Further, the level of investment needed to construct and operate conventional reticulated sewerage often proves prohibitive[19]. New approaches use lower cost sewerage designs and tend to localize collection and treatment. In many cities there is more potential to use on-site solutions if technical norms and standards would permit[20]. The key is municipal capacity to oversee a managed process of investment – ideally one which links sanitation with housing and land-use planning.

c) Large- and small-scale private sector

Even at the height of interest in large scale private sector participation in developing-country water supply and sanitation, few projects sought to deliver services outside major cities. Few dealt with sanitation services where the backlog of investment was considered too high and the revenue stream hard to secure. Now, as private sector interest in the "emerging" market is on the wane, it seems even less likely that the private sector can provide the massive levels of investment needed for urban wastewater management.

Nonetheless, there is still scope for medium- and small-scale private sector participation in some aspects of sanitation and hygiene promotion. Research from Africa and case studies in Asia have shown that there is a small but flourishing private sector market in areas such as pit and septic-tank emptying, and in the operation of small localized sanitation systems[21]. Civil society may have a key role to play in hygiene promotion; sanitation marketing may be best left to small private sector companies. The role of private and civil-society businesses in provision of public and semi-public latrines is also well established (pay-as-you-use public toilets are now common, for example in India where, when set up on a sound commercial footing, they have met with success).

d) Community/ household

The available global data fail to capture the contribution made directly by households (through self-provision of latrines and investment in household infrastructure (taps, pans etc)) and communities (usually through shared management and oversight). This can be significant.

It seems inevitable that public-sector funds will still be needed to invest in substantial public-good elements of the system. The public-good nature of sanitation justifies public expenditure. However, *household decision making is crucial to effective uptake and use of latrines and changed hygiene behaviour*. For this greater consideration must be given to household decisions about *investment* in sanitation[22].

Ways and means

The Johannesburg Plan of Implementation, as well as the proceedings of CSD6 and Agenda21 contain some additional detailed calls for action on sanitation:

National Implementation

- **Hygiene** – hygiene is recognised as an important lever for improved health outcomes – most new approaches to sanitation focus on household behaviour coupled with sanitation investment[23]. Recent research shows that investment in hygiene promotion has outcomes which are robust and long lasting[24]. However few countries seem to make the link between sanitation and hygiene promotion in policy, and at the implementation level, the experience is poor. The biggest problem is perhaps that sanitation is still housed institutionally with water supply and it is often hard to make practical links with outreach workers (from health and education for example) on the ground.
- **Affordable and appropriate technologies** – these could bring down costs, increase demand and penetration but there has been limited action to address the constraints which prevent innovation[25].
- **Re-use and waste minimization** – this makes sense, but few countries are institutionally equipped to deal with the complex issues which arise when contaminated wastes are to be re-used[26].
- **Coordination** – while calls for coordination are common, few details are ever provided.
    - Sanitation is already usually bound up institutionally with **water supply** but this may not always be the best place since the nature of the two services is very different; this closeness may in fact directly impact on low levels of attention and investment in sanitation.
    - Sanitation gets short shrift within **Integrated Water Resource Management**[27]. International initiatives on IWRM do little to link with institutions which support sanitation. The best international support comes from UNEP/ GPA which has developed a framework to protect the marine environment but it is questionable how well linked this is to practical decision making at national level on sanitation.
    - Sanitation disappears from **Poverty Reduction** Strategies[28]
- Sanitation is seen as having a central role in removing **gender biases** and addressing **social equity**[29]. But in reality the poorest may still be excluded from many sanitation programmes and internationally there remain persistent regional and country biases[30].

International support

Technical support

- Calls abound for better **financial initiatives** and more **partnerships** – more money is probably needed, but it may be more important to spend what money there is effectively. Little work has been done on developing financial initiatives that are effective in leveraging greater sanitation access[31].
- **Information networks** – international support to share information may be important and this has been achieved through some successful inter-agency efforts[32]. But it may be more important to create incentives for local technical and institutional innovation. What the international community can do is to strongly endorse new approaches which use technology appropriately or which successfully address hygiene promotion and sanitation marketing ideas.

Monitoring

- There are three **international monitoring** initiatives which merit further scrutiny and perhaps support to make them more effective:
    - the Joint Monitoring Program (JMP) managed jointly by WHO and UNICEF which

provides the basic data on access and also covers financing[33];

- the GEMS/Water programme of UNEP which provides information on the state of inland water quality[34]; and
- the Global Program of Action (GPA), also of UNEP, which monitors the marine environment[35].

JMP has been central in the effort to assemble global information about access to sanitation. Data is generated by participating national governments and cannot be independently verified due to lack of resources. The data sets suffer due to differing definitions of access and levels of service and because national monitoring systems may themselves be unreliable. The information, particularly on investment and hygiene outcomes, is scant and should be treated cautiously.

4 What Progress could be made?

Estimates of the costs of reaching the 2015 target vary widely due to differences in approach as well as the weak information base from which all estimates must be made. Detailed analysis from WHO estimates the total annual cost of meeting the 2015 target for sanitation to be just over US$11.5 bn or nearly US$13.7 bn when water supply is included[36]. If all current estimates were correct, this means that resources in the sanitation sector would have to almost quadruple to meet the 2015 target. Adding full tertiary wastewater treatment for all urban waste streams takes these numbers up towards a figure of $ 100 billion[37]. This figure approximates the current annual level of all ODA and diverting so much to sanitation alone is implausible. More cost-effective alternatives need to be explored as a matter of urgency if the sanitation target is to be met.

The WHO cost estimates are the most sophisticated currently available as they take into account existing levels of service and incremental improvements[38]. Estimates from UNEP suggest that the total costs could vary widely if different technological approaches are taken. These range from an annual cost of US$3.1 bn (using the simplest possible approaches) to US$80billion (using the most expensive technologies including tertiary wastewater treatment.[39].

The wide range of cost estimates reflects the significance of making the best choices about ways and means of extending access to sanitation. But there are further problems with cost estimates. The WHO calculations are based on data provided by member states to the JMP – the unit rates are likely to be those attached to official (usually subsidised) sanitation programmes. These may be artificially high because: standardized designs are elaborate; a state monopoly has driven up costs; official rates are subject to "manipulation"; or they represent a level of service which is higher than it needs to be.

By contrast the lower-bound UNEP estimate (annual costs of US$3.1 bn) almost certainly underestimates the minimum rate of investment needed to meet targets [40]. Nonetheless it does show that significant progress could be made even if the level of investment remains steady at the levels reported through the nineties. The key will be to ensure that the available funding is used to maximise access. This can be done through:

- Technological innovation – finding ways to reach more people, more cheaply and sustainably. In many countries this means introducing flexibility and there are four likely instruments for this –
  - frame overall policy in terms of outcomes not inputs[41];
  - review technical norms and planning regulations;
  - fund research; and
  - build capacity and provide finance for hygiene promotion and sanitation marketing

- Using subsidies effectively – specifically to finance public/ semi public sanitation – especially in schools and in support of self-sustaining approaches;
- Ensuring that funds for "sanitation" are not just used to finance "toilets and taps"- rather that they focus on household behaviour and access; and
- Ensuring that the need to protect the environment does not stifle progress on access. Crucially wastewater treatment and environmental management, which are vitally important, should be managed separately from increasing access to basic sanitation – very different sorts of financing and technological instruments needed.

5 Economic/developmental benefits

While the costs of investing in sanitation may seem huge, they are dwarfed by the potential economic benefits.

- 1.47 billion people (20% of world's population in 2015) would benefit if the sanitation target was met, rising to 2.16billion if water and sanitation are both addressed. 391 million cases of diarrhoea would be averted annually simply by meeting the sanitation target.
- Total economic benefits of reaching the sanitation target may be of the order of US$63 bn annually. This rises above US$225 bn annually if 100% access could be achieved[42]. The bulk of the economic value of these benefits is associated with time savings[43].

From the perspective of the health sector alone reaching the water and sanitation target appears to be a cost-effective intervention. It is particularly cost-effective in regions where mortality from diarrhoeal disease is high[44].

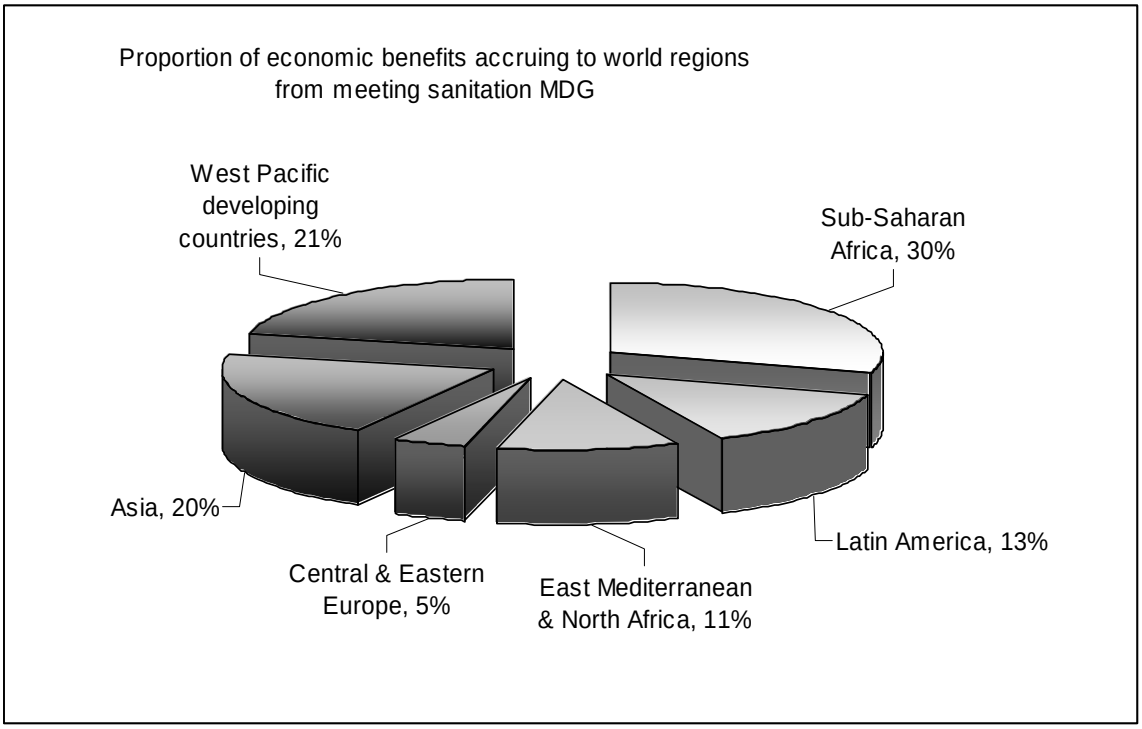
WHO cost effectiveness analysis shows that "point-of-use" interventions such as chlorination of water at household level (for which detailed analysis was carried out) and hygiene promotion (for which detailed analysis is yet to be carried out) are likely to be highly cost effective and a good short-term intervention in view of the high investment costs associated with provision of water supply and sanitation in the home (which is the most cost-effective intervention)[45].

Not surprisingly the benefits of reaching the MDG accrue in the poorest regions of the world (see **Figure 2**). What is surprising is that the largest share of the total benefit arises from meeting the MDG targets in sub-Saharan Africa[46].

The cost-benefit ratio of meeting the combined water and sanitation target is consistently high across all regions, not falling below US$2.8 per US$1 invested and rising considerably higher in some cases see **Table 2**[47].

While the cost and benefit numbers sometimes appear so large as to preclude rational decision making a look at two country-cases provides a more comprehensible sense of what investment in sanitation could achieve. In Tanzania for example an annual investment of US$20.5 million would achieve the sanitation target, with potential *economic* benefits to the health sector alone of US$15.4 million each year and more than 1.5 million diarrhoea cases averted every year. In Vietnam an annual investment of US$96.7 million would avert more than 4 million cases of diarrhoea alone, and achieve potential savings in the health sector of over US$66.7 million[48].

Figure 2: Proportion of economic benefits accruing to world regions from meeting the sanitation MDG target



Source: Hutton – calculations updated for this paper

Table 2: Cost-benefit ratios of meeting combined water and sanitation MDG

World Region	Population (million)	Cost-benefit ratio
Sub-Saharan Africa	968	8.7
Latin America	624	9.9
East Mediterranean & North Africa	373	23.2
Central & Eastern Europe	460	10.0
South and SE Asia	2,162	2.8
West Pacific developing countries	1,673	3.4
All regions	**7,183**	**5.9**

Source: Hutton – calculations updated for this paper

6 Empirical Evidence, Monitoring and Evaluation

While the profile of sanitation is rising slowly, it is difficult for governments and civil society to know how best to respond. While some of the resistance to making progress lies in entrenched interests (ie from resistance to change and corruption in technical agencies, and political interests) part of the problem lies in the lack of reliable information about what is happening and what could be done to improve access effectively. While some resources can be justified to improve global evidence, monitoring and evaluation, perhaps a more important area is in building capacity of local and national entities to generate *and make use of* data at the local level.

Monitoring

The JMP is constrained by limited resources and by its dependence on information provided by member states (who are not disinterested parties and may not place a high priority on providing reliable data). There is an urgent need for more support for monitoring of some key aspects of service provision.

Firstly we need to know more about **how much money is currently being spent, where it is being spent and by whom**. Current classification systems make tracking hard. Governments and donors would gain much if they could establish how much money is really being invested in sanitation (as distinct from water supply) and within the field of sanitation if it were possible to track the various mechanisms for delivering public subsidies. At the very least it would be useful to know the relative levels of public expenditure on:

- large-scale and public infrastructure (an easily justifiable public expenditure),
- small scale local infrastructure and household services (which may or may not be a justified targeted provision to increase access) and
- hygiene promotion, sanitation marketing and support to small scale providers (where there is a strong case for a public expenditure).

The current convention of bundling water supply and sanitation together, and further bundling "public" sanitation infrastructure with household level investment make it hard to assess how effectively public funds are being directed to address the MDG *access* target.

Secondly we need to know more about **household expenditure**. While many sector specialists agree that households are investing heavily in sanitation more information is needed about the circumstances under which this occurs, and the best means of providing financial support so that the poorest households can also participate. At the local level technical agencies often discount this investment and well-designed support for participatory research could also improve local understanding of how household really invest and seek to solve their own sanitation problems. In addition it would be useful to know more about investment made by Small Scale Independent Providers – the provision of services outside the public sector may be an important mechanism for increasing choice and reach, and improving the link between what is on offer and what households want and are willing to pay for. More information is needed to help government find the best ways to support providers in this emerging market.

Thirdly governments and donors need to know more about **access and hygiene behaviours**. The current data does not tell us what people really have access to. As time passes, having a real feel for access will matter more and more, if the MDGs are not to matter less and less. Current approaches – with a focus on counting all the latrines ever built, will simply create an impression of progress without showing us what is happening on the ground. But assessing access is extremely hard and needs to cover inter alia:

- numbers of latrines (public and private) built, including the full range of latrine types, complemented with an assessment of how many remain in use and in good repair;
- levels of access, degree of proper use and identification of "pockets of exclusion" within the household, the community or nationally ;
- prevalence and robustness of hygienic practices; and
- proxy indicators of outcomes (health, economic, educational impact) data.

Here there is a strong case for incorporating monitoring of sanitation and hygiene into established processes of social monitoring (household surveys and so on) as a priority.

Evaluation

This type of ongoing monitoring needs to be supported by periodic evaluations of:

- effectiveness of subsidies and public expenditure (penetration, sustainability);
- effectiveness of Hygiene Promotion;
- effectiveness of sanitation marketing; and
- empirical confirmation of theoretical benefits.

External support agencies have an important role to play, providing both funds and institutional support for independent evaluations of public sanitation programmes.

Capacity Building

Having said all of this it would be easy to roll out the inevitable call for "capacity building". But in the case of sanitation it is perhaps more important to think first about building political capacity to face up to a problem which is often talked about, but rarely acted upon. Local and national actors will need support if they are to re-evaluate the situation and establish a meaningful benchmark from which we can measure progress towards the MDGs. Skills training is needed of course, and it will be necessary to find ways of helping technicians, health professionals, social development specialists to work together. But first we need to establish how bad things really are, and take some collective responsibility for it[49]. Better monitoring of progress will follow once the commitment to making that progress is secured.

7 A Final Word

The sanitation crisis is just that – a crisis. It is as shocking as AIDS, as debilitating as Malaria, and as solvable as Polio. Simply meeting the sanitation target by 2015 could avert 391 million cases of diarrhoea a year (and with them the loss of years of schooling, and years of productive and social life). Overall, meeting the target could garner an economic gain in the order of US$63 bn every year. And if we get it right all this could come at the price of just over US$11.5 bn each year – it is a large number, but it is dwarfed by the potential gains which could result, and we already know that significant elements of this could be mobilized in households and within communities who are desperate to improve their appalling living conditions.

Notes:

[1] This paper was prepared in February 2004 by Barbara Evans, Independent Consultant, Guy Hutton of the Swiss Tropical Institute, and Laurence Haller, Associate Professional Officer, Water Sanitation and Health Program, World Health Organisation.. The paper was commissioned by the Right Honourable Simon Upton, chair of the OECD Round Table on Sustainable Development, as part of the preparation for CSD12, and financed by the Millennium Project; Task Force on Water and Sanitation. Thanks are due to Marcia Brewster who worked with Barbara Evans on the main background document on sanitation for CSD12 from which some of this analysis is drawn. Financial support for the main CSD document came from the Water, Sanitation and Health Program of WHO. Thanks are also due to Meera Mehta and Andreas Knapp (Water and Sanitation Program – Africa) who have shared their thinking on financing of sanitation with the authors.

[2] WHO/UNICEF (2000) *Global Water and Sanitation Assessment 2000 Report.* The revised estimates (2001) cited in this report are available at the Joint UNICEF/WHO Monitoring Program (JMP) website at http://www.wssinfo.org/en/welcome.html

The global target for sanitation framed at WSSD in Johannesburg refers to 'basic sanitation', whereas the term used in the JMP report of 2000 is 'improved sanitation'. In choosing 'basic sanitation' as its preferred terminology, the Johannesburg Summit was reflecting the widely accepted view that improved health and hygiene arise through a combination of behaviour change and improved access to sanitation hardware (see for example Environmental Health Project for USAID (2003) *The Hygiene Improvement Framework: A comprehensive Approach for Preventing Childhood Diarrhoea* USA). For its year 2000 reporting, however, the JMP sought to use an agreed shared definition of 'improved sanitation' which would facilitate inter-regional and inter-temporal comparisons. This has resulted in a focus on technology (i.e. on types of toilets and excreta disposal systems to which households have access.) In the JMP "improved sanitation" refers to the following:

Connection to a public sewer;
Connection to septic system;
Pour-flush latrine;
Simple pit latrine;
Ventilated improved pit latrine.

Two categories of latrine which are considered acceptable in many countries are thus excluded from the assessment; "traditional" latrines (which take many forms in different societies) and shared (semi-public) and public toilets. In assembling global data from UN member states the JMP is reliant on public-sector information generated at national level. Use of a simplified definition of sanitation has been a pragmatic decision to enhance the quality and robustness of the data. Furthermore the limited focus on hygiene promotion and the impact on behaviours was also a reflection of the inability of many member states to provide realistic data.

Beyond definitional problems, JMP data is also subject to errors of overestimation (many countries do not account for facilities falling into disrepair or reaching the end of their design life, facilities which are built but not used, and in urban areas, the count often includes all households falling within a utility service area irrespective of whether they have house connections to utility services) and errors of underestimation ("basic" sanitation facilities are not counted, "private" facilities financed directly by the household may not be counted). Overall the overestimations are likely to outweigh the underestimations (and this may be a particular problem for data on urban access).

[3]. A 1995 survey in 14 countries found that many primary schools could not provide more than 1 latrine per 50 students, and that none of the surveyed countries had increased the number of school toilets by more than 8% since 1990. These findings confirm the general conclusions of the School Sanitation and Hygiene Education programme of UNICEF which finds that the "sanitary conditions of schools in rural and urban areas in developing countries are often appalling, creating health hazards… thus schools are not safe for children" [UNICEF (1997) *Progress of Nations* p13 and Burgers, L. (2003) *Background and Rationale for School Sanitation and Hygiene Education* UNICEF SSHE website at http://www2.irc.nl/sshe/

[4] JMP – revised estimate 2001

[5] WHO (2002) *World Health Report*

It is estimated that 4% (60.7 million Disability-Adjusted Life Years) of the global burden of disease are attributable to lack of access to safe water and sanitation.

[6] This figure corresponds to 88% of diarrhoeal diseases worldwide which is considered to be the attributable fraction of diarrhoea due to unsafe water supply, sanitation and hygiene, and the following diseases: trachoma, schistosomiasis, ascariasis, trichuriasis and hookworm disease.

[7] According to the multi-country study conducted by Esrey (1996), a reduction of 37.5% in diarrhoeal diseases can be observed when providing access to improved sanitation facilities to unserved population

In 1993 WHO/SEARO convened a meeting of health specialists to review the evidence linking sanitation interventions with improved health. The meeting gave safe excreta disposal, especially by diseased people and children and more water for personal hygiene, especially handwashing and protecting water quality, in that order as *the most influential factors on reducing morbidity and mortality of diarrhoeal disease.* This finding confirmed a 1991 review of 144 studies linking sanitation and water supply with health, which clearly states that the "role [of water quality] in diarrhoeal disease control was less important than that of sanitation and hygiene" [Esrey, S.A., J.B. Potash, L. Roberts and C. Schiff (1991) *Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookwork infection, schistosomiasis and trachoma* in Bulletin of the World Health Organisation, 69(5): 609-621]

A 1986 study emphasizes the importance of sanitation specifically, as compared to stand-alone water supply interventions. Seventy-seven percent of the studies which looked at sanitation alone, and seventy-five percent of those which considered sanitation and water supply, demonstrated positive health benefits, compared with 48 percent of those which considered water supply alone [Esrey, S.A. and J.-P. Habicht (1986) *Epidemiological evidence for health benefits from improved water and sanitation in developing countries* in Epidemiological Reviews, 8:117-128]. Furthermore, the health impacts of improved sanitation go beyond diarrhoea. The 1991 study identified six classes of disease where the positive health impacts of water supply, sanitation and hygiene have been demonstrated (**Table a**).

Table a: Impacts of Improved water supply, sanitation and hygiene on morbidity and mortality for six common diseases: evidence from 144 studies

	Expected reduction in morbidity and mortality from improved water supply and sanitation (%)					
	All studies			Methodologically more rigorous studies		
	N	Median	Range	N	Median	Range
Ascariasis	11	28	0-83	4	29	15-83
Diarrhoeal disease						
Morbidity	49	22	0-100	19	26	0-68
Mortality	3	65	43-79	-	-	-
Dracunculiasis	7	76	37-98	2	78	75-81
Hookworm infection	9	4	0-100	1	4	-
Schistosomiasis	4	73	59-87	3	77	59-87
Trachoma	13	50	0-91	7	27	0-79
Child Mortality	9	60	0-82	6	55	20-82

Source: Esrey, S.A., J.B. Potash, L. Roberts and C. Schiff (1991) *Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookwork infection, schistosomiasis and trachoma* in Bulletin of the World Health Organisation, 69(5): 609-621

[8] WHO (2003) *Looking back, looking ahead: five decades of challenges and achievements in environmental sanitation and health*

[9] Additionally a number of significant diseases are related to inadequate water resource management (including poor drainage) including malaria and Japanese encephalitis. These 2 diseases account for 3% of the global burden of disease (45.4 million DALYs). The proportion of these diseases that could be prevented by better water management is still unclear.

[10] **Table b** and **Table c** show the deaths and total morbidity attributable to some of the major disease groups.

Table b : Deaths by Age, Sex and Cause (2002)

	World		Developed countries		Developing countries (high mortality)		Developing countries (low mortality)	
	Total	Children (0-4)	Total	Children (0-4)	Total	Children (0-4)	Total	Children (0-4)
Tuberculosis	1,604,819	40,548	80,813	192	977,714	36,044	545,287	4,289
HIV/AIDS	2,821,472	370,841	56,860	543	2,610,716	363,149	151,651	7,041
Malaria	1,222,180	1,098,999	151	44	1,196,085	1,076,074	25,093	22,232
Diarrhoeal diseases	1,767,326	1,578,583	20,187	12,114	1,509,541	1,360,321	236,483	205,355
Respiratory infections	3,844,724	1,919,083	454,004	35,464	2,749,685	1,692,473	636,668	189,974
Lower respiratory infections	3,765,624	1,890,284	445,718	32,841	2,709,579	1,677,957	606,015	178,334
Upper respiratory infections	75,497	28,259	7,991	2,588	37,660	14,121	29,800	11,529
Otitis media	3,603	540	295	35	2,446	394	853	110

Source: World Health Report 2003

Table c: DALYs by sex, age and cause (2003)

	World		Developed countries		Developing countries (high mortality)		Developing countries (low mortality)	
	Total	Children (0-4)	Total	Children (0-4)	Total	Children (0-4)	Total	Children (0-4)
Tuberculosis	35,361,041	1,484,288	1,705,998	7,904	23,552,560	1,313,151	10,079,835	162,330
HIV/AIDS	86,072,449	12,669,214	2,081,536	18,875	78,955,133	12,403,703	4,974,370	242,948
Diarrhoeal diseases	61,095,069	55,204,697	852,874	543,308	50,194,080	47,194,529	10,007,757	7,435,931
Malaria	44,715,596	40,491,492	19,949	3,526	43,553,813	39,668,459	1,113,096	795,592
Respiratory infections	90,251,887	67,634,673	3,513,538	1,249,943	74,566,653	59,031,525	12,095,819	7,309,230
Lower respiratory infections	87,022,413	66,395,618	3,187,983	1,137,114	72,849,645	58,392,859	10,913,254	6,822,953
Upper respiratory infections	1,794,995	972,703	178,845	87,930	964,015	490,703	650,627	393,351
Otitis media	1,434,479	266,352	146,710	24,898	752,993	147,963	531,939	92,926

Source: World Health Report 2003

[11] School children in the age range of 5-14 are particularly prone to infections of round worm and whip worm and there is evidence that this, along with guinea worm and other water-related diseases, including diarrhoea, result in significant absences from school. [WHO (1997) *Strengthening interventions to reduce helminth infections : an entry point for the development of health-promoting schools*]

A second impact arises due to the impact of illness on learning ability. Helminth reduction programmes in schools can have a dramatic impact on health and learning. Nokes C, Grantham-McGregor S.M., Sawyer A.W., Cooper E.S., Bundy D.A.(1992) *Parasitic helminth infection and cognitive function in school children* Proc R Soc Lond B Biol Sci. 1992 Feb 22;247(1319): pp77-81; Nokes, C. and Bundy, D.A.(1993) *Compliance and absenteeism in school children: implications for helminth control* Royal Society of Tropical Medicine and Hygiene, 1993 Mar-Apr 87(2): 148-52, Wellcome Trust Research Centre for Parasitic Infections, Department of Biology, Imperial College, London, UK

[12] The WHO commission on macro economics and health links low initial infant mortality rates with strong subsequent economic growth. **Table d** shows growth rates in a selection of several dozen developing countries over the period 1965-1994, according to their initial income levels and rates of infant mortality. The table shows that for any given initial income interval, economic growth is higher in countries with lower initial infant mortality rates. Overall WHO estimates that a 10 year increase in average life expectancy at birth translates into a rise of 0.3 – 0.4% in economic growth per year.

Table d: Growth Rate of per capita Income 1995-1994 by income (GDP) and infant mortality rate, 1965

Initial GDP, 1965 (PPP-adjusted 1990 US$)	*Infant Mortality Rate*			
	≤ 50	*50 - ≤100*	*100 - ≤ 150*	*>100*
≤ 750	-	3.7	1.0	0.1
750 - *≤1,500*	-	3.4	1.1	-0.7
1,500 - *≤ 3,000*	5.9	1.8	1.1	2.5
3000 - *≤ 6000*	2.8	1.7	0.3	-
>6,000	1.9	-0.5	-	-

Source: WHO (2001) *Macroeconomics and Health: Investing in Health for Economic Development* Report of the Commission on Macroeconomics and Health

Secondary benefits arise through improvements in educational attainment (particularly of girls). This is likely to further bring down infant mortality rates - the 1993 World Development Report estimated that maternal education was highly significant in reducing infant mortality and cites data for thirteen African countries between 1975 and 1985 which show that a 10 percent increase in female literacy rates reduced child mortality by 10 percent.

On the negative side of the equation inaction can be costly. Peru's 1991 cholera epidemic is estimated to have cost the national economy as much as US$1billion in health costs, tourism and production losses. The outbreaks of plague in India in 1994 meant a loss of two billion dollars due to import restrictions. On top of that was the loss from thousands of cancelled holidays and public health costs. Even more extreme impacts have been noted by the WHO Commission on Macroeconomics and Health which cited research showing a strong correlation between high infant mortality and subsequent state collapse.

[13] Hutton G., Haller L. *Evaluation of the non-health costs and benefits of water and sanitation improvements at global level*, document WHO/SDE/WSH/04.04, World Health Organization, 2004. Report undertaken for the Evidence and Information for Policy Department, in collaboration with the Department for Protection of the Human Environment, World Health Organisation (80 pages). The JMP calculates that there are 1.9billion people to be covered. The reason for this discrepancy lies in the assumptions made about people born during the period to 2015. JMP assumes that 100% of the new population will need to be served with new sanitation infrastructure. Hutton on the other hand assumes that the percentage coverage at 2000 applies to the new populations (assuming that, if they are born into households already having access to latrines, they too will have access). The truth probably lies somewhere between these two assumptions.

[14] A rough analysis of the JMP data suggest that in the SADC region for example, approximately eighty-five million people need to gain access – equivalent to more than five and a half million people each year - and that assumes that this sort of progress has already been made since 2000. Seventy-three million of these people live in five countries; Angola, DRC, Madagascar, Mozambique and Tanzania. Angola, Madagascar, Mozambique and South Africa all have to reach more than 300 thousand rural people each year; Angola, Madagascar, Mozambique and Tanzania all have to reach more than 200 thousand urban people. UN Habitat suggest that the figures for urban coverage are even more bleak because peri-urban areas have not been considered in the existing reporting. [UN Habitat (2003) *Cities; Competing Needs in an Urban Environment* in *Water for People, Water for Life: UN World Water Development Report* UNESCO, New York]

[15] There are a range of technology choices to be made in any situation. The choice of latrine technology is constrained by water and land availability and funding (**Table e**). The choice of wastewater treatment options is also constrained by land and financing (**Table f**).

Table e: Household latrines: range of technology choices

Treatment/ disposal Point	*Water Supply*	
	Limited (<20 lpcd)	*Ample (>20 lpcd)*
On-site	Pit latrine and variants, Pour flush latrines Ecological (including composting) latrines	Septic Tanks Pit latrines + soakaways Ecological (including composting) latrines
Off-site	Conservancy/bucket system Public toilets	Sewers (including non-conventional variants)*

Source**:** authors' table

* note that conventional sewerage has extremely high investment costs and high operating costs if pumping is required.

Table f: Wastewater treatment (off site): range of technology choices

Relative operational costs	*Land Requirements*
	Low----------High
Low	Soil aquifer treatment
|	Reed beds
|	Waste stabilization ponds
|	Aerated lagoons
|	Oxidation ditches
|	Rotating biological contactor
|	Trickling/ percolating filters
|	Activated sludge process
High	Upward flow anaerobic sludge blanket (UASB)

Source**:** authors' table

[16] WHO data updated for this report. WHO projections suggest that without a change in the status quo, there will be over 2 billion people without access by 2015.

[17] JMP data suggests that sanitation investment make up 20 percent of total investment in the water supply and sanitation sector (12% in Africa, 15% in Asia, 38% in Latin America). These low percentages partly reflect the difficulties most governments have in separating out expenditures on sanitation, and they almost certainly underestimate the contribution made by households directly. Nonetheless, the level of public expenditure is clearly too low to do more than maintain the status quo.

[18]. OECD DAC CRS data suggest that the total ODA for all water supply and sanitation was about US$4.5 billion in the period 1999/2001. [reported in GPA/UNEP (forthcoming) *Financing Domestic Wastewater Collection and Treatment in relation to the WSSD target on water and sanitation*]. Through the nineties investment in the water and sanitation sector grew from around 3 percent of total aid to a high of 6.6 percent in 1996. It may now be declining Country reporting from the JMP suggests that over the ten years to 2000 total external aid to *sanitation* specifically averaged just over US$0.8billion per year. UNEP estimates based on the OECD CRS suggest that in the period 1999/2001 about 4 percent of the allotments to water supply and sanitation (equivalent to 0.18billion) were channeled to some aspect of "waste" management. The discrepancies in the data illustrate the problem of tracking expenditures on sanitation specifically.

A review of the regional distribution of this aid shows that Asia is a consistently high recipient (**Table g**).

Table g: The Regional Distribution of DAC registered donor commitments to Water & Sanitation (USD billions)

	2001	**2000**	**1999**
Africa	1.37	0.80	0.67
America	0.28	1.21	1.42
Asia	1.98	2.35	1.71
Europe	0.28	0.13	0.06
Middle East	0.36	0.37	0.27

Source: GPA/UNEP (forthcoming) *Financing Domestic Wastewater Collection and Treatment in relation to the WSSD target on water and sanitation*

Furthermore, figures compiled from OECD/DAC data by the USAID Development Information Service show 52% (US$52billion) of donor aid in the water sector went to support "large system" water supply and sanitation over the period 1995-2000 as compared to 6% to "small systems" water supply and sanitation. It is reasonable to assume that a significant proportion of ODA in santiation is also going to "large systems" – with a focus on urban sewerage and wastewater treatment. There is some evidence that this trend is beginning to change. A 2000 review of World Bank funding for sanitation observed that expenditure on software (non-construction activities including community development, hygiene promotion etc) "increased markedly in the nineties" jumping from 6% to 14% of total costs for projects prepared after 1994 [World Bank (2000) *The State of Wastewater and Sanitation at the World Bank* in Investing in Sanitation: World Bank Water Supply and Sanitation Forum, Staff Day April 5, 2000]

[19] Looking back to the sanitary revolution which took place in Victorian Britain for example, the levels of investment are astounding. Between 1880 and 1891 urban authorities in Britain borrowed more than UK£3.2 million for waterworks and UK£7.7 million for sewage works alone. It is important also to note that "middle class" interests held up this public investment for around twenty years after the scientific case had been made to link insanitary conditions with ill-health; where politically influential

segments of society can insulate themselves from the ill-effects of insanitary conditions in slums and villages, progress may be slow.

Flinn, M.W. (ed) (1965) *Report on the /sanitary Conditions of the Labouring Population of Great Britain by Edwin Chadwick (first published in 1842)* Edinburgh University Press and see also Chaplin, S.E (1999) *Cities, Sewers and Poverty: India's Politics of Sanitation* Environment and urbanisation vol 11 No 1, April 1999

[20] Non-conventional variants of sewerage (technological innovations such as the use of shallow, small-bore pipes, sometimes coupled with institutional innovations such as the use of so-called "condominiums" or shared household management groups) can drastically reduce costs. Latin America has perhaps gone farthest with the development of such approaches, partly because in Latin America many urban populations aspire to and are willing to pay for household connections and piped sewerage. Transfering the condominial sewer approach from Brazil has not been straightforward however. Often an external catalyst is needed to create the needed 'space" for innovation. In La Paz/El Alto, Bolivia an externally funded pilot project working with the utility company was able to demonstrate the applicability of the technology. This resulted in a national debate on the need to modify national norms and standards, which were subsequently revised. [http://www.wsp.org/condominial/indexeng.html]

Another type of technical innovation involves separation of sewer networks into several smaller systems serving different zones within a city, as in Bangkok, Thailand. The inner part of the city has been divided into 10 sewerage zones, each with an independent collection and treatment system. The total sanitation investment among the ten zones is lower than the amount that would have been required for a single project that covered the entire city. Moreover, each zone-level project is technically simpler than would be a city-wide project, and the Bangkok Metropolitan Administration has thus been able to implement a more affordable phased investment programme. Task Force on Water and Sanitation, Millennium Project (2003) *Achieving the Millennium Development Goals for Water and Sanitation: What Will It Take?* Interim Final Report.

[21] Collignon, B. and M. Vezina (2000) *Independent Water and Sanitation Providers in African Cities: Full Report of a Ten-Country Study* Water and Sanitation Program, Nairobi.

[22] Data on household investment is scattered – and more is needed. However a striking aspect of many of the better-known sanitation success stories is the *absence of large scale public funding.* The Orangi Pilot Project in Karachi Pakistan, for example, used external funding to support technical innovation, participatory research, hygiene education and social marketing, but households invested in the sewers. Similarly, in Midnapore West Bengal India, households were provided with support but invested in on-plot latrines themselves [Hasan, A. (1997) *Working with Government: The Story of OPPs collaboration with state agencies for replicating its Low Cost Sanitation Programme* City Press, Karachi, and UNICEF (1994*) Sanitation, the Medinipur Story, Intensive Sanitation Project*, UNICEF-Calcutta, India, and Ramasubban, K.S., and B.B. Samanta (1994) *Integrated Sanitation Project, Medinipur*, UNICEF, India].

Recent research in India indicates as many as 8% of rural households across the country had invested their own money and used small private providers to construct latrines which is comparable with the achievements of the governments own rural sanitation programme. [Kolsky, P., E Bauman, R Bhatia, J. Chilton, C. van Wijk (2000) *Learning from Experience: Evaluation of UNICEF's Water and Environmental Sanitation Programme in India 1966-1998* Swedish International Development Cooperation Agency, Stockholm]. Globally the number of people gaining access to sanitation in the nineties was out of scale with the official levels of investment reported. The JMP concludes that one reason for this "might be that investment has been made… directly by householders through low-cost technologies".

[23] The following cases are taken from WSSCC, USAID, UNICEF (forthcoming) *Sanitation and Hygiene Promotion: Programming Guidance*

The Sanitation and Family Education Project was developed and implemented by CARE Bangladesh, with technical assistance from the International Centre for Diarrhoeal Disease Research (Bangladesh). The SAFE project had no hardware component but was designed as a supplementary or follow-on activity after an earlier cyclone relief project which provided tubewells and latrines. SAFE worked by targeting a small number of specific behaviours including: drinking pond or open well water, improper storage of tubewell water, adding pond water after cooking, using unhygienic latrines, poor handwashing practices and low use of latrines by children under the age of five. The project area saw a two-thirds reduction in diarrgea prevalence when compared with control areas, and a substantial increase in hygienic behaviours including handwashing and hygienic latrine use. What is interesting about the SAFE experience, was that it operated in an area which had already been targeted with hardware and showed significant health benefits. Without the additional push on hygiene promotion, it is unlikely that the investment in latrines and water supply would have yielded expected benefits.

In comparison, the Environmental Health Project (EHP) was able to implement a full range of 'HIF' interventions in Nicaragua during a two –year project which was set up in the aftermath of Hurricane Mitch. The project provided: hardware, through water supply and environmental projects implemented by local NGOs; hygiene promotion, using trained community members and schools as the two primary mechanisms to deliver messages; and strengthening of the enabling environment, through capacity

building of local water committees and at the national level. Here the benefits were substantial and the advantages of the coordinated approach did not preclude a range of innovative institutional arrangements and partnerships being established.

In general hygiene promotion is a long-term process, which links an understanding of the current situation with a vision of what behaviours can be changed, and how this can happen. In Zimbabwe, ZimAHEAD have pioneered the Health Club approach to provide a framework for this needed long-term change. Community Health Clubs provide a forum for community-members to learn about simple and effective ways of improving hygiene in the house and community, and they also provide the community with a focus for planning and implementing water supply and sanitation activities. But perhaps more significantly the CHCs also provide support for wider economic activities, and provide a more interesting and stimulating framework within which the Ministry of Health Environmental Health Technicians can see long term structured change occurring in the communities with which they work. The CHC approach has proved to be extremely robust, and even with the recent decline in development budgets and the loss of funds from external support agencies, the CHCs have been able to sustain their activities and keep operating. [Sidibe, M. and V. Curtis (2002) *Hygiene Promotion in Burkina Faso and Zimbabwe: New Approaches to Behaviour Change* Field Note No. 7 in the Blue Gold Series, Water and Sanitation Program – Africa Region, Nairobi]

Ensuring a robust structure for hygiene promotion is important, but, as was the case in Bangladesh, this may be outside or in parallel with a programme of hardware provision. Investment in increasing access to hardware, and promoting hygienic practices need to be coordinated but can sometimes be successful when they are carried out by different agencies. In Ghana, the Northern Water Supply and Sanitation Project (NORWASP) integrated health and hygiene into water supply and sanitation for rural communities. A thorough evaluation of baseline data was carried out before a community-based hygiene education programme was developed, and this in turn was first piloted, and evaluated by the community. The approach drew from PHAST and PLA methods, but was tailored to local conditions, and made use of a locally-developed health and hygiene game. Identifying and training a cadre of committed fieldworkers is crucial, and this is a key strategy in NORWASP. The project was not bound to one particular agency, but sought out the best institutional "homes" for different activities, while providing an overall coordinating framework. . Further discussion of CHCs, along with information about NORWASP and the EHP project in Nicaragua is available in the case studies in the IRC Thematic Overview Paper (TOP) available on the web at www.irc.net

As well as getting the institutional structure right, hygiene promotion needs to apply appropriate approaches. In some contexts for example, shocking messages may work well; in Zimbabwe, the CHCs use a slogan which is often "chanted at health club meetings" in the local language, which when translated states baldly "don't share your shit". In Bangladesh, VERC carry out village transect walks during which households discuss where each family member defecates, and identify areas in the village which are regularly soiled with feaces. [Kar, K. (2003) *Subsidy or self respect? Lessons from Bangladesh* id21insights, issue 45 on the web at www.id21.org/insights/insights45]

Such approaches may not work in other situations, and each case must be assessed on its own merits.

[24] Bolt, Eveline (2004) *Are changes in hygiene behaviour sustained?* and Cairncross, S. and K. Schordt *It does last! Some findings from a multi-country study of hygiene sustainability* in Waterlines Vol 22, No 3 Jan 2004.

Despite the success of the Blair latrine in Zimbabwe (see footnote below), its cost is still prohibitive for many of the poorest families. Recent successes with the promotion of simple hygiene interventions through Community Health Clubs, have led large numbers of poor households in Zimbabwe to begin to practice safe sanitation even without constructing a VIP latrine. This has led to a reassessment of the national approach to sanitation and the widespread adoption of an approach based on hygiene promotion

Sidibe, M. and V. Curtis (2002) *Hygiene Promotion in Burkina Faso and Zimbabwe: New Approaches to Behaviour Change* Field Note No. 7 in the Blue Gold Series, Water and Sanitation Program – Africa Region, Nairobi

[25] In Kenya a review of technical norms and standards relating to "building codes" was carried out in the 1980s which examined the role that restrictive building codes and standards had on sanitation (and other infrastructure and services) for low income households in urban areas. As a result of the review, code II standards were proposed (under the local government act - passed in the late 1990s) which allowed latrines to be built in urban areas, but only in locations zoned as "special development areas" for this purpose. Unfortunately only a limited number of local authorities have adopted code II bylaws or declared "special development areas". By contrast in Zimbabwe the Blair Latrine, an indigenously developed technology, became (as the Ventilated Improved Pit (VIP) latrine) the standard technology for low-cost rural sanitation programmes. The VIP, in a variety of guises, has been instrumental in increasing sanitation coverage in many locations in Africa and Asia. Even cheaper and simpler approaches are now used to increase access to the poorest segments. [Robinson, A. (2002) *VIP Latrines in Zimbabwe: From Local Innovation to Global Sanitation Solution* Field Note 4 in the Blue-Gold Series, Water and Sanitation Program – Africa Region, Nairobi]

[26] Safe re-use of waste water and excreta falls into two broad areas: the large-scale "public" reuse of treated waste water (usually for irrigation); and "local" reuse of excreta for household or local agriculture. Emphasis is made repeatedly in Agenda 21 for the need to recycle and minimize waste. According to the US EPA reuse of water for agriculture is practiced in "almost all the arid areas of the world" and "numerous countries have established water resources planning policies based on reuse.[United States Environmental Protection Agency (forthcoming) *Guidelines for Water Reuse*]

However, the report goes on to note that unplanned use of inadequately treated wastewater for irrigation is a "major health concern" which makes it "imperative to governments… to implement proper reuse planning and practices emphasizing public health and environmental protection". The EPA suggest that the best water reuse projects in terms of economic viability and public acceptance are those which substitute reclaimed water in lieu of potable water for irrigation, environmental restoration, cleaning, toilet flushing and industrial use. Countries where significant contributions are being made to total water demand by reuse projects tend to be clustered in the arid regions of north Africa and the Middle East..

Local reuse of treated excreta (faeces and urine), sometimes termed "ecological sanitation", has traditionally been practiced in China, Mexico, Vietnam, countries of Central America, Yemen and more recently in Sweden. Ecological sanitation technologies treat waste through dehydration or through composting/ decomposition and some technologies rely on the separation of urine from feaces. When constructed and used properly these technologies: ensure that wastes are treated; prevent pollution of ground- and surface-water bodies; generate a product which can be used locally or sold; and remove the need for water for flushing as in sewered systems. Some observers have expressed concern about the quality of the product from some latrine models; evidence of the persistence of hookworm for example requires further research. Furthermore, where demand for sanitation itself is low, there is concern that the introduction of relatively complex technologies which require handling of excreta may be inappropriate, and this may explain why "there are few large scale examples from which to draw conclusions" about these approaches particularly in urban areas. [Esrey, S.A., J. Gough, D. Rapaport, R. Sawyer, M. Simpson-Hébert, J. Vargas, U. Winblad (ed) (1998) *Ecological Sanitation* Swedish International Cooperation Agency, Stockholm]

[27] A recent review of National Environmental Action Plans prepared by thirty-four African countries observed that although "several acknowledged health concerns… environmental health concerns were rarely internalised in the development strategies" [Listorti and Doumani (2002) *Environmental Health: Bridging the Gaps* World Bank]

Bodies which focus on IWRM (the Global Water Partnership (GWP), The Capacity Building network (CAPNET) for example) have had little success in forging links with agencies which deliver support to countries in implementing water supply and sanitation (for example the Water and Sanitation Program (WSP), and infrastructure units of development agencies). This mirrors the "silo" effect of many national institutional frameworks which bundle sanitation with water supply as a (mostly urban) utility service, while ignoring its potential and importance within more developmental service delivery arrangements.

[28] A 2001 review of Poverty Reduction Strategy Papers in the poorest countries of Africa found that while sanitation was often cited as a pressing need at the community level, it failed to be addressed in final budgetary recommendations at national level. A follow-up workshop concluded that sanitation professionals have failed to engage adequately with the PRSP process, but also that this failing results from a lack of understanding about how to use public investment most effectively to drive increases in sanitation access [Water and Sanitation Program – Africa (2002) *Water Supply and Sanitation in PRSP Initiatives: A Desk Review of Emerging Experience in Sub-Saharan Africa (SSA)]*

[29] Better sanitation helps to improve the status of women because they suffer disproportionately when facilities are not available: having to travel further to avoid being overlooked when defecating; taking the burden of caring for sick family members; and (as girls) disproportionately missing out on education when school sanitation facilities are not available. Furthermore, the social intermediation needed to carry out a good hygiene and sanitation programme can be instrumental in empowering women within the community and the family.

[30] Participatory research carried out in communities with high levels of sanitation coverage in Cambodia and Vietnam found that while a high percentage of households classified as "rich" had access to and made use of sanitary toilets (86% for Cambodia and 73% for Vietnam) these percentages were much lower for households classified as "poor" (13% and 12% respectively)[Mukherjee, N (2001) *Achieving Sustained Sanitation For the Poor: Policy and Strategy Lessons from Participatory Assessments in Cambodia, Indonesia and Vietnam* Water and Sanitation Program for East Asia and the Pacific.]

These findings confirm earlier studies which found that early latrine programs benefited the better off. They also indicate a failure to address the particular needs of the moist vulnerable, particularly children and women who are most affected by failures in sanitation and hygiene promotion.

[31] A report on financing, prepared for the 3rd World Water Forum in Kyoto (the "Camdessus Panel), made over 87 recommendations of which only 3 made a reference to sanitation. Isolated cases of innovative local programmes can be found, but it appears that the global community is grappling with the challenge of steering public resources most effectively to generate increased household access to services.

[32] **Water Supply and Sanitation Collaborative Council:** The WSSCC brings together UN agencies, governments, bilaterals and non-governmental groups to develop consensus on appropriate strategies to move forward with hygiene, sanitation and water supply. The Council is a membership-based organisation with a small secretariat based in Geneva. Since 2000 Council members have encouraged the organisation to push for greater awareness and political commitment to investment in hygiene and sanitation

in particular. The resultant campaign, known as WASH, has provided a visible platform for the sector at national and international meetings and has been instrumental in raising the profile of sanitation. WSSCC has been able to bring together many of its members to debate sanitation needs at a series of follow-up regional meetings (AfricaSAN in Africa and SacoSAN in Asia). The fact that implementing agencies are members of the Council is key to its ability to deliver both an advocacy message and implementation support.

MaESTro: stores and disseminates environmentally sound technologies, including technologies for sanitation, and is managed by the United Nations Environment Programme through its International Environmental Technology Centre (IETC). Based in Japan, IETC have established MaESTro, a database of environmentally sound technologies which has been set up to provide both quality controlled reference materials and fora for information exchange, debate, and publicity for locally developed technologies and for those who provide local goods and services.

Sanitation Connection: MaESTro complements a wider sanitation information platform, called SANITATION CONNECTION or Sanicon. Sanicon was established and is now managed by a consortium of international agencies, including WHO, The Water and Sanitation Program, the International Water Association, UNEP GPA and the Water Supply and Sanitation Collaborative Council. It provides a web-based information service, including information on approaches for supporting effective sanitation interventions, access to international and bilateral agencies active in the sanitation sector, a selection of peer reviewed references and links to databases, websites and international electronic conferences on sanitation.

[33] http://www.wssinfo.org/en/welcome.html

[34] http://www.wri.org/statistics/unep-gle.html

[35] GPA's full title is Global Program of Action for the Protection of the Marine Environment from Land-based Activities. More information is at http://www.gpa.unep.org/

[36] Hutton, Guy op.cit. The cost estimates have been updated for this report using the latest UN population projections for 2015.

Table h shows the breakdown of costs by region.

Table h: Total annual costs (investment and recurrent) of meeting sanitation MDG (US$ million)

		Sanitation MDG 2015			
World Region	**Population (m.)**	**Annual cost**	**People receiving improvement (millions)**	**Water MDG Annual cost**	**World population receiving improved water and sanitation Annual cost**
Sub-Saharan Africa	968	1,821	220	581	4,805
Latin America	624	731	75	224	1,911
East Mediterranean & North Africa	373	250	32	67	635
Central & Eastern Europe	460	237	27	74	622
South and SE Asia	2,162	4,513	592	475	9,977
West Pacific developing countries	1,673	3,736	490	667	8,806
Developed regions	923	269	32	44	625
All regions	**7,183**	**11,557**	**1,468**	**2,134**	**27,380**

The costs of meeting the MDG were calculated by applying estimated annual cost per person covered with each type of intervention to the population that would need to receive improved sanitation in order to meet the MDG for 2015. The analysis was done at country level and aggregated to the regional level. Current coverage levels of improved sanitation facilities and UN population estimates for 2015 were used for each country. The costs included were investment costs per capita for each level of technology (taken from the W&S Global Assessment Report 2000) and recurrent costs (based on estimates of operation and maintenance, sewage disposal, and hygiene and sanitation education for each type of improved sanitation which includes sewer connection, small bore sewer, septic tank, pour flush, VIP, and simple pit latrine). Each technology was given an estimated length of useful life in order to calculate equivalent annual cost.

[37] Hutton estimates that the total annual costs of serving the whole world's population with regulated water supply and a household connection to sewerage would be US$152 bn. The most often quoted estimates to reach the MDGs are based on the work of John Briscoe at the World Bank. For the Camdessus panel, these estimates were collated together and the published figures suggest a total annual investment of US$17 bn for sanitation and hygiene promotion, with a further US$70 bn needed annually for municipal wastewater treatment. While the exact number vary one thing is clear; there is an urgent need to find ways to manage urban waste streams in ways which are more effective and cheaper than those commonly used today.

[38] The WHO cost estimate fair assumptions about recurrent costs, but uses nationally-provided unit investment costs (leading probably to an overestimate of total annual costs).

[39] The range of technologies used has an important impact on overall costs. **Table i** shows a range of technologies and a range of estimates of their costs which provide some guidance as to both the difficulty of developing meaningful global estimates of costs,a nd also the impact of making the right "appropriate" technology choices.

Table i: Sanitation Technology Cost Estimates (US$ 2000)

IMPROVEMENT	INITIAL INVESTMENT COST PER CAPITA					
	JMP estimates			Other estimates	Recurrent Costs	
	AFRICA[*1]	ASIA[*1]	LA&C[N]		Level	Source
Sewer and WWT				450[*1]	v. high	User fees/ subsidy
Sewer connection	120	154	160	150-260[*2]	High	User fees/ subsidy
Small bore sewer	52	60	112	120[*3]	Medium	User fees/ household
Septic tank	115	104	160		High	Household
Pour-flush	91	50	60		med/low (lumpy)	Household
VIP	57	50	52		low (lumpy)	Household
Simple pit latrine	39	26	60		low (lumpy)	Household
Improved trad. Practice + Hygiene Promotion				10[*8]	low (US$0.60 per annum)	Household

Source: adapted from UNEP/GPA *Financing Domestic Wastewater Collection and Treatment in Relation to the WSSD Target on water and sanitation*

Notes:
(1) Adapted from Global Water Supply & Sanitation Assessment 2000 Report (www.who.int/docstore/water_sanitation_health/Globassessment/Global3.3.htm). Unless stated, figures are based on the average construction cost of sanitation facilities for Africa, Asia and Latin America & the Caribbean for the period 1990-2000 and include a small charge to account for inflation and currency fluctuations. These data were provided by member states as part of the JMP data collection exercise.
(2) Taken from Water: A World Financial Issue (PricewaterhouseCoopers, March 2001). The figure is based on a per-head cost of $20/year multiplied by 13 years to reflect the timescale required for meeting the MDGs.
(3) This figure is quoted by Suez in the publication Bridging the Water Divide (Suez/Ondeo, March 2002) and is based on a one-off connection cost for households in poor neighbourhoods in the Aguas Argentinas concession area and assumes the bartering of local labour in exchange for connection to a network. However, no data is given for the number of persons per household.
(4) From Sustainable Local Solutions, Popular Participation and Hygiene Education (Richard Jolly) writing in Clean Water, Safe Sanitation: An Agenda for the Kyoto World Water Forum and Beyond (Institute of Public Policy Research, February 2003). Based on the Vision 21 estimate of average external costs per person for sanitation and hygiene promotion.

[40] The accuracy of the UNEP estimate is hard to assess; it is likely to underestimate total costs because the JMP data underestimates the total population needing to be reached and because significant proportions of unserved populations will demand a higher level of service (in Latin America for example many urban populations will demand piped sewerage); it may overestimate costs because it uses the full cost of latrine and hygiene promotion rather than the incremental costs for populations already having some degree of access.

[41] A recent research programme funded by USAID identified only three countries which had developed national sanitation policies (these are South Africa, Uganda and Nepal) [Elledge, M., F. Rosensweig and D. Warner with J.H.Austin and E. Perez *Guidelines for the Assessment of National Sanitation Policies* Environmental Health Project (2002) Washington DC] Of these South Africa provides the most interesting case. Here the naitoanl policy provides a "performance specification" (ie a description of outcomes) rather than defining technologies. This approach gives more flexibility at the local level for the development of new and appropriate approaches and for multiple service providers to enter the market.

Single-agency approaches which focus on the delivery of a sanitation "product" may have limited impact, and correspondingly there may not be a need for unitary national "sanitation policies". Greater importance should perhaps be placed on aligning programs and approaches in other sectors (primary health, water supply, urban infrastructure, education, and social safety nets) in such a way that they all support rational decision making about sanitation and hygiene at the household level [see for example WSSCC, USAID, UNICEF (forthcoming) *Sanitation and Hygiene Promotion: Programming Guidance*].

[42] Total benefits across all regions are shown in **Table j** and the benefits breakdown in shown in **Table k**..

Table j: Total annual benefits of meeting sanitation MDG in natural units

			Meeting sanitation MDG (annual figures, in millions)				
World Region	Pop'n (m.)	Current annual diarrhoea cases (million)	Diarrhoea cases averted	Hours gained per year due to closer access	Productive days gained (15+ age group) due to less illness	Nr of school days gained (5-14 age group)	Baby days gained due to less illness (0-4 age group)
Sub-Saharan Africa	968	1,239	115	38,616	304	66	257
Latin America	624	552	25	9,306	114	21	41
East Mediterranean & North Africa	373	286	9	4,156	30	5	21
Central & Eastern Europe	460	130	3	3,818	17	1	7
South and SE Asia	2,162	1,795	135	28,445	587	61	287
West Pacific developing countries	1,673	1,317	102	39,929	1,239	39	90
Developed regions	923	69	2	2,253	15	0	3
All regions	**7,183**	**5,388**	**391**	**126,523**	**2,306**	**194**	**707**

Source**:** Hutton – calculations updated for this paper

Table k: Some economic benefits of meeting sanitation MDG, and cost-benefit ratios

		Meeting sanitation MDG (annual figures, in US$ million)				
World Region	Population (m.)	Health sector treatment costs avoided	Patient health seeking costs avoided	Annual value of time gain	Total benefits*	Cost-benefit ratio*
Sub-Saharan Africa	968	1,130	72	12,873	16,183	8.9
Latin America	624	514	16	5,695	7,325	10.0
East Mediterranean & North Africa	373	148	6	5,157	5,865	23.5
Central & Eastern Europe	460	60	2	2,381	2,508	10.6
South and SE Asia	2,162	1,378	84	8,112	11,104	2.5
West Pacific developing countries	1,673	1,645	64	8,905	11,619	3.1
All regions	**7,183**	**4,955**	**244**	**51,525**	**63,269**	**5.5**

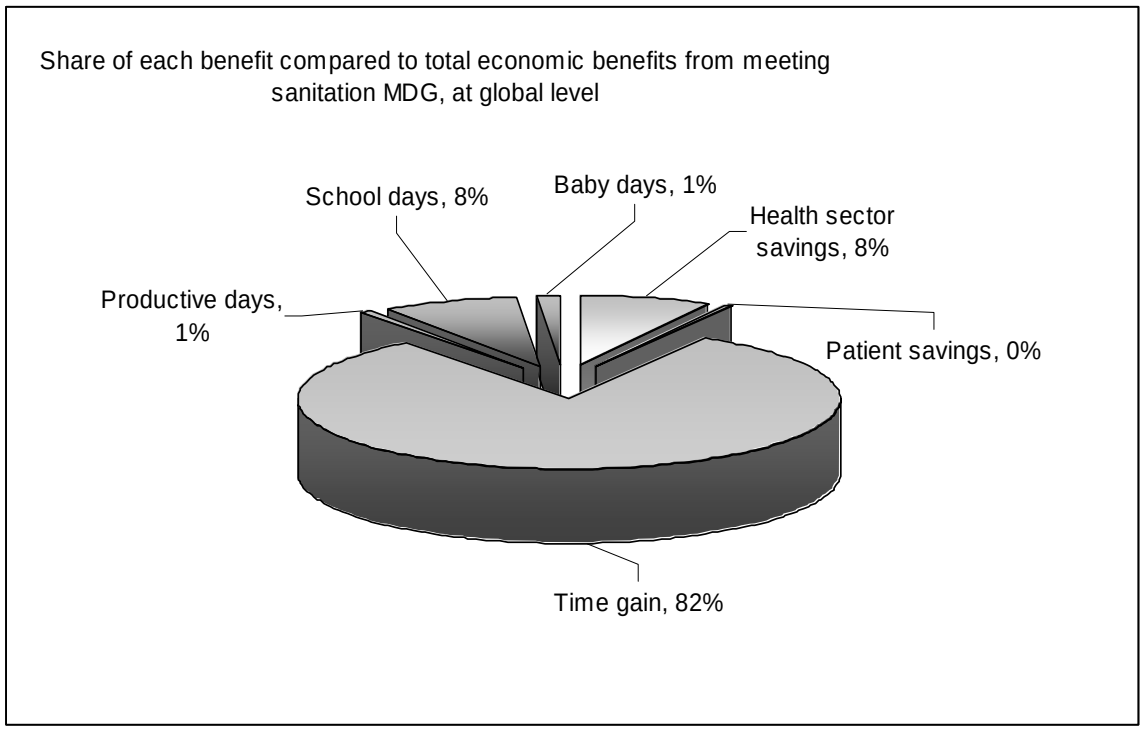
Source**:** Hutton – calculations updated for this paper.

Note***:** Total benefits Includes time savings due to closer sanitation facilities, productive and educational time gain due to less ill from diarrhoea, and health sector and patient savings due to less treatment for diarrhoeal disease. Time savings per person were day from closer access to sanitation services was assumed to be 30 minutes. Days off work and school were assumed to be 2 and 3 days per case of diarrhoea, respectively, which were valued at the minimum wage for each country. A baby was assumed to be ill from a case of diarrhoea for 5 days, at a value of 50% of the minimum wage to take into account the opportunity cost of the carer. The economic benefits of reduced mortality were not included in the calculations of total economic benefit.

It is important to note that health sector costs are not actual costs saved, as the calculation includes health sector infrastructure and staff time, which are not saved in a real sense when a diarrhoeal case does not show up. This figure reflects the opportunity cost: in settings where services are used to 100% capacity, if someone does not show up with diarrhoea, then someone else with another disease can be treated.

[43] **Figure a** shows a breakdown in the distribution of benefits.

Figure a



Source: Hutton – estimates updated for this paper

Where households fail to anticipate the full economic value of such time savings investment in sanitation may be undervalued at the household level. This is another reason why household subsidies for sanitation improvements can be justified, provided that they are used to effectively increase household access. Valuing time saved is a controversial field – however sensitivity analyses carried out by Hutton suggest that the benefits are large in comparison to costs, even where conservative assumptions are made about the value of time.

44Haller L.,Hutton G., Bartram J. *Estimating the costs and health benefits of water and sanitation improvements at global level* (forthcoming. For each WHO sub-region, a set of potential interventions for improving access to safe WS&S service levels was assessed. Different proportions of population in each WHO sub-region were moved to lower exposure categories. All the intervention scenarios were compared to the situation in 2000, where coverage in WS&S services reported in the Global Water Supply and Sanitation Assessment 2000 Report (WHO / UNICEF, 2000), would be sustained.

Health benefits are presented in terms healthy years gained (or DALYs averted) by the whole population due to less cases of diarrhoeal diseases. Costs consist of all resources required to put in place and maintain the interventions, including investment costs (planning, construction, house alterations...) and recurrent costs (operation, maintenance, monitoring and regulation...). Cost-effectiveness ratios are presented for each intervention in terms of US$ per healthy year gained or DALY averted.

Summary CER data is shown on **Table l**

Table l: Average CER by WHO Region (US$ per DALY averted)

	AFRO D	AFRO E	AMRO D	SEARO B	SEARO D	WPRO B
Halve pop without access to improved WS	338.8	498.3	954.9	3,362.0	427.4	2,611.1
Halve pop without access to improved WS&S	686.0	822.5	1,898.4	5,654.0	1,117.0	5,618.6
Disinfection at point of use to pop currently w/o improved WS	23.5	26.0	94.3	156.8	25.7	156.8

	AFRO D	AFRO E	AMRO D	SEARO B	SEARO D	WPRO B
Universal access (98%) to improved water supply and improved sanitation (Low technologies)	648.5	718.9	1,886.6	5,251.2	1,116.1	5,618.5
Universal access (98%) to improved water supply and improved sanitation plus disinfection at point of use	283.8	332.7	736.6	1,484.1	471.4	2,552.2
Universal access (98%) to piped water supply and sewer connection (High technologies)	852.9	943.6	1,693.7	7,765.0	1,121.7	4,693.2

Source: Haller op.cit.

Notes:

AFRO	**D**	Algeria, Angola, Benin, Burkina Faso, Cameroon, Cape Verde, Chad, Comoros, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Madagascar, Mali, Mauritania, Mauritius, Niger, Nigeria, Sao Tome And Principe, Senegal, Seychelles, Sierra Leone, Togo
AFRO	**E**	Botswana, Burundi, Central African Republic, Congo, Côte d'Ivoire, Democratic Republic Of The Congo, Eritrea, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, South Africa, Swaziland, Uganda, United Republic of Tanzania, Zambia, Zimbabwe
AMRO	**D**	Bolivia, Ecuador, Guatemala, Haiti, Nicaragua, Peru
SEARO	**B**	Indonesia, Sri Lanka, Thailand
SEARO	**D**	Bangladesh, Bhutan, Democratic People's Republic Of Korea, India, Maldives, Myanmar, Nepal
WPRO	**B**	Cambodia, China, Lao People's Democratic Republic, Malaysia, Mongolia, Philippines, Republic Of Korea, Viet Nam

[45] Provision of piped water and household sanitation connections in the home is the intervention which maximises the amount of health gains compared to the other WS&S interventions This highlights the fact that the large overall health benefits are associated with the provision of higher service levels within the household.

[46] While the absolute numbers of people affected is higher in Asia, the higher total benefits in Africa arise because of the higher estimated economic value of time in the region.

[47] These cost-benefit ratios are very similar to the CBRs to meet only the sanitation MDG, due to the fact that the CBR is dominated by the costs and benefits of improved sanitation, compared to improved water supply and quality.

[48] **Table m** details two country calculations

Table m: estimate of costs and benefits – Tanzania and Vietnam

Variable	Tanzania	Vietnam
Population coverage and impact figures		
Population 2015 (m)	49.3	94.4
Sanitation coverage in year 2000	90%	47%
Population not covered with sanitation services in 2015 at current sanitation coverage	4,930,000	50,032,000
Predicted diarrhoea cases averted from increasing sanitation coverage to meet the MDG	1,523,105	4,140,161
Costs		
Total annual cost from 2000 to 2015 to increase sanitation coverage to meet the MDG (US$) *	20,504,753	96,676,336
Benefits		
Health sector cost avoided (US$) **	15,389,056	66,754,137
Patient costs avoided (US$)	948,894	2,579,320
Total time gain per year (million hours) ***	2,049	3,781

Total work days saved (age 15+ years) ****	399,226	1,629,973
Total school days saved (age 5-14 years) ****	879,101	1,750,934
Total ill baby days saved (age 0-4 years)	3,401,973	9,499,770

Source**:** Hutton – estimates updated for this paper

Notes**:**

* Based on investment costs per capita for different interventions to improve sanitation (taken from Global W&S Assessment Report 2000), and estimating associated operation and maintenance costs.

** Based on an average health sector cost per diarrhea case averted of US$10.10 in Africa, and US$16.12 in Asia.

*** Based on an average time saving per person per day of 30 minutes due to more convenient sanitation service access

**** Based on an average 2 days off for working adults and 3 days off school for children

Once again it is important to note that health sector savings are calculated by multiplying the average cost of treating a case by the total cases averted. These are estimates because a) average costs are not saved, but only the marginal cost would be, i.e. the antibiotic or the ORS, and (b) the savings depend on treatment seeking behaviour. If only 20% of vases actually consult the health system, the actual savings would be a fraction of the stated values.

[49] A number of simple tools can help. Latrine acquisition curves for example, which plot the take up of latrines from national or external programmes over time, can provide a useful picture of how and why households decide to change hygiene practices and invest in sanitation. More importantly, they need to be built up based on detailed discussions with householders about their toilets, about defecation and about hygienic practices. Such discussions can help to break down the taboo of talking about sanitation, and give technicians and decision makers a better feel for what is happening at the local level. In the same way that many countries have learned to discuss HIV/AIDS (with all its troubling associations) it is essential to build up a national ability to talk about defecation, toilets and handwashing.