RESEARCH REPORT

A review of sanitation and hygiene in Tanzania

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Executive summary

Tanzania is not on track to meet its Millennium Development Goal of 62 per cent improved sanitation coverage by 2015. This failure is due to population growth characterised by rapid urbanisation which the Government of Tanzania is unable to service due to limited capacity and resources, and a lack of coordination between the other implementing stakeholders. Inadequate sanitation and hygiene can result in morbidity and mortality due to endemic infections which cause diarrhoea and other illnesses. This review summarises the available literature to provide the current status of sanitation and hygiene and an overview of projects and programmes in Tanzania. In addition, it identifies gaps in current knowledge and offers recommendations on how to improve sanitation and hygiene in Tanzania.

The current stakeholders in sanitation and hygiene in Tanzania identified include; the office of the Prime Minister, three government ministries, local government, 12 donor and multilateral agencies, five private donors, 13 international non-governmental organisations (NGOs), 18 local NGOs, two faith-based organisations, two networks, as well as numerous actors from community-based organisations and the commercial sector. Stakeholders interact through the policy, funding implementation and evaluation processes, research, networks and partnerships.

The health burden due to poor sanitation and hygiene is significant. On average, 15 per cent of children under five years of age are reported,to have suffered from diarrhoea in the preceding two weeks, and diarrhoea is responsible for 9 per cent of all mortality for this age group. Cholera and typhoid is endemic in some areas of Tanzania and outbreaks are common. Then there is the ever present problem of water related parasitic infections such as malaria and schistosomiasis. Prevalence of these infections in Tanzania has been scientifically linked to poor sanitation and hygiene; in particular access to latrines, poor hand washing behaviour, and inadequate drainage.

Across Tanzania it is estimated that 93 per cent of the population has access to a latrine. However, access to improved sanitation could be as low as 24 per cent, depending on the definition of improved sanitation used. There are also differences between urban and rural areas, with urban areas - particularly in Dar es Salaam - reporting lack of access to affordable sanitation due to the costs of construction, high water table and de-sludging expenses. The lack of solid waste collection and poor drainage, combined with the extensive use of pit latrines, make for very poor hygiene conditions in these areas. Hygiene behaviour in Tanzania varies. While hand washing is widely practiced, this is not always with soap or at critical times such as before preparing food or after disposing of children's faeces.

Programmes and projects implemented across Tanzania vary in their scale. Large government-run multi-donor programmes, such as the Water Sector Development Programme (WSDP), operate on a national scale. The WSDP brought together a number of the stakeholders. However, the programme has only a fraction of its budget allocated to sanitation and hygiene projects, with the majority focused on water supply. Upscaling of the World Bank-funded Water Sanitation Programme (WSP) market-led approach to hand washing and sanitation adoption has been shown to be successful in reaching a large number of people in the community, although quantifying the impacts of the programme has been difficult.

International and local NGOs are conducting programmes and projects on a smaller scale across most regions of Tanzania. Affordable improved sanitation and safe sustainable pit latrine emptying practices in urban areas are examples of such projects. The projects vary in their approaches and some focus on the needs of specific groups such as pastoral tribes, women and children, refugees, schools and health care clinics. Hygiene education programmes through schools have been shown to be effective at changing behaviour. The results from this work vary from ineffective or unmeasurable outcomes to sustained uptake and changed behaviour. The challenge is to replicate the results seen at small project level at scale through national sustainable programmes.

Within the literature reviewed, there were gaps identified in knowledge of sanitation and hygiene in Tanzania. For sanitation, there is a lack of information regarding the markets for sanitation in urban areas. There was even less information available about the state of hand washing hardware and behaviour. There was also very little information about oral or anal washing, or menstrual hygiene practices.

Recommendations on how to improve sanitation and hygiene practices in Tanzania are centred on the adoption of participatory approaches among all the stakeholders. However, this requires the Tanzanian Government to have clear policies and regulations with respect to sanitation and hygiene. Therefore, it is of paramount importance that the draft policy on sanitation is accepted promptly. Furthermore, there needs to be more investment in sanitation and hygiene at all levels of government. NGO and community-based organisations have a role to play, not only in driving this policy, but also in assisting the government in implementation and efficient use of resources, otherwise Tanzania will not reach its 2015 Millennium Development Goal for sanitation. There has been growing attention directed at the importance of sanitation and hygiene. Now, a change of direction, characterised by a coordinated response between all the stakeholders, is paramount for real improvements to be seen.

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Acronyms and abbreviations

ADB	African Development Bank
AFD	Agence Française de Développement (French Development Agency)
AGENDA	Agenda for Environment and Responsible Development
AMREF	African Medical Research Foundation
ARU	Ardhi University
AWSETEC	Agriculture, Water & Sanitation Education Training & Environment Conservation
BORDA	Bremen Overseas Research and Development Association
CBHCC	Community Based Health Care Council
CBO	Community Based Organisations
CCI	Centre for Community Initiatives
CEMDO	Community Environmental Management and Development Organisation
CLTS	Community Led Total Sanitation
CSO	Civil Society Organisations
CSUPPU	Citywide Slum Upgrading and Prevention Programme Unit
CWSSP	Community Water Supply and Sanitation Programme
DALY	Disability Adjusted Life Years
DANIDA	Danish International Development Agency DAWASA
	Dar es Salaam Water and Sewerage Corporatoin
DAWASCO	United Kingdom Department for International Development
DWSSP	Dar es Salaam Water Supply and Sanitation Project
DSM	Dar es Salaam
ECO-SAN	Ecological Sanitation
EEPCO	Environmental Engineering and Pollution Control Organisation
GIS	Geographic Information System
HAPA	Health Actions Promotion Association
HESAWA	Health Through Sanitation and Water
HNCDA	Hanna Nassif Community Development Association
iWASH	Integrated Water, Sanitation and Hygiene Programme

JEMA	Joint Environment Management Action
JMP	Joint Monitoring Programme
KfW	Kreditanstalt fur Wiederaufbau (German Bank for Reconstruction)
KIWODET	Kisutu Women Development Trust Fund
LGA	Local Government Authorities
MAMADO	Maji na Maendeleo Dodoma
MAPET	Manual Pit Emptying Technology
MCC	Millennium Challenge Corporation
MDG	Millennium Development Goal
MKUKUTA	Mkakati wa Kukuza Uchumi na Kupunguza Umaskini Tanzania (National Strategy for Growth and Poverty Reduction
MoEVT	Ministry of Education and Vocational Training
MoHSW	Ministry of Health and Social Welfare
MoWI	Ministrt of Water and Irrigation
MSABI	Maji Safi Kwa Afya Bora Ifakara (Safe Water for Better Health)
MWAUWASA	Mwanza Urban Water and Sewerage Authority
NBS	National Bureau of Statistics
NEHHASS	National Environmental Health, Hygiene and Sanitation Strategy
NGO	Non-Governmental Organisation
NHBS	National Household Budget Survey
NSGPR	National Strategy for Growth and Poverty Reduction (see MKUKUTA)
OR	Odds ratio
PHAST	Participatory Hygiene and Sanitation Transformation
PMO-RALG	Prime Minister's Office – Regional Administration and Local Governments
PRA	Participatory Rural Appraisal
ROSA	Resource Orientated Sanitation concepts for peri-urban areas in Africa
SAWA	Sanitation and Water Action
SDI	Shack/Slum Dwellers International
SHARE	Sanitation and Hygiene Applied Research for Equity
SHIPO	Southern Highlands Participatory Organisation
SIDA	Swedish International Development Corporation Agency
SNV	Stichting Nederlands Vrijwilligiers (Netherlands Development Organisation)
TaWaSaNET	Tanzania Water and Sanitation Network
TDCF	The Desk and Chair Foundation

TESCO	Tanzania Environment and Sanitation Conservators
TUPF	Tanzania Urban Poor Federation
TWESA	Tanzania Water and Environmental Sanitation
TZS	Tanzanian Shilling
UN HABITAT	United Nations Human Settlements Programme
UN HCR	United Nations Refugee Agency
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USD	United States Dollar
VEFDA	Victoria Environmental and Fishery Development Association
VIP	Ventilated Improved Pit Latrine
VSO	Voluntary Services Overseas (Tanzania)
WASACODE	Water and Sanitation for Community Development
WASH	Water, Sanitation and Hygiene
WB	World Bank
WHO	World Health Organisation
WRBWO	Wami/Ruvu Basin Water Office
WSDP	Water Sector Development Programme
WSP	Water and Sanitation Programme

Definitions

Key terms	Definition	Reference
Informal urban settlements	Areas in an urban environment that are both unplanned and un-serviced. They can be further defined as high, medium or low density settlements.	(United Nations Human Settlements Programme (UN HABITAT *et al.*, 2010)
Improved sanitation	A latrine that is connected to a sewer, septic tank, ventilated improved pit latrine, ecological sanitation, pour flush latrine or pit latrines with a washable floor and a complete super-structure.	(Ministry of Health and Social Welfare (MoHSW), 2008)
Non-government Organisation	A legally constituted organisation that operates independently from any form of government on a not - for - profit basis.	(World Bank *et al.*, 2011)
Improved Water Point	The point at which water is intended to emerge from an improved water supply, such as a tap or a pump	(Stichting Nederlandse Vrijwilligers, 2010)

Introduction

Sanitation and hygiene in Tanzania

Despite quadrupling the funding for water and sanitation since 2002, Tanzania is not on track to meet the Millennium Development Goal (MDG) targets for sanitation provision. The target is for 62 per cent of the population to have access to improved sanitation by 2015 (World Bank *et al.,* 2011). Presently, only 24 per cent of Tanzanian's have access to improved sanitation (World Bank *et al*., 2011). Inadequate sanitation combined with poor hygiene result in considerable and largely preventable mortality and morbidity in Tanzania.

Consequences of inadequate sanitation and hygiene

Diseases caused by inadequate water, sanitation and hygiene (WASH) result in 4.2 per cent of global deaths and 90 per cent of that burden is born by children under five years of age (Bartram and Cairncross, 2010). In Tanzania, 9 per cent of all mortality in children under the age of five is due to diarrhoea (World Health Organisation (WHO), 2010). This is an improvement on the health status in 20002003 when it was estimated that 17 per cent of all mortality in children under five was attributed to diarrhoea (WHO, 2006). For the adult population, diarrhoea accounted for 6 per cent of mortality and attributed morbidity was estimated to be 6 per cent of the total disability adjusted life years (DALY) for all causes (WHO, 2006). Table 1 shows the prevalence of diarrhoea in adults and children in Tanzania.

However, there are large differences between regions: Kigoma reported a 29 per cent frequency of diarrhoea in children under five, while Shinyanga reported only 4 per cent (NBS, 2010). Cholera is endemic in seven regions of Tanzania; Tanga, Kigoma, Mwanza, Singida, Dar es Salaam, Zanzibar and Mara (Masauni *et al.*, 2009). Typhoid fever has also increased significantly ($p < 0.0001$) in some urban areas in Tanzania (Malisa and Nyaki, 2010).

Table 1. Prevalence of diarrhoea in adults and children in Tanzania.

Prevalence				
Adults	**Children**		**Source**	**Reference**
>15 yrs	**<15 yrs**	**<5 yrs**		
-	-	**15%**	National Demographic and Health Survey	(NBS, 2010)
7.1%	**12.2%**	-	National Household Budget Survey (NHBS)	(NBS, 2009)

It has been estimated that inadequate sanitation costs Tanzania 301 billion Tanzanian Shillings (TZS) each year (US$ 206 million) (Water and Sanitation Programme (WSP), 2012). This is equivalent to 1 per cent of the Tanzanian gross domestic product (GDP) and US$ 5 per person (WSP, 2012). The economic losses are directly related to loss of time for people having to find places to defecate, premature death, productivity losses whilst sick and money spent on health care (WSP, 2012). In order to find the best approaches to improve sanitation and hygiene in Tanzania a thorough understanding of the current status of sanitation and hygiene and the programmes and projects that have been or are currently being implemented is needed.

Tanzania country profile

Tanzania has a population of 44.9 million people (NBS, 2013). The average population growth rate in 2012 was 2.7 per cent, although in the country's largest city, Dar es Salaam, the growth rate was 5.6 per cent (NBS, 2013). In 2013 it is estimated that 27.8 per cent of the Tanzania population lives in cities (WHO and United Nations Children's Fund (UNICEF), 2012). The population of the 20 largest cities in Tanzania is estimated to increase by 50 per cent this decade (9.2 million people in 2010 to 13.8 million people in 2020) (Pauschert *et al.*, 2012). By 2025 it is projected that the urban population will have doubled to 21 million (Abebe, 2011). Rapid urbanisation in Dar es Salaam has resulted in 70-80 per cent of the population living in informal settlements. 50 per cent of these people live off less than US$ 1 a day (Chaggu *et al.*, 2002; Ndezi, 2009; UN HABITAT, 2010).

Review methodology

This review aims to collate and summarise the available literature on sanitation and hygiene in Tanzania. The review reports on:

- the health impacts of poor sanitation and hygiene;
- the current status of sanitation and hygiene;
- completed sanitation and hygiene programmes and projects;
- current sanitation and hygiene programmes and projects;
- knowledge gaps in sanitation and hygiene; and
- recommendations to improve sanitation and hygiene.

The methodology for this literature review consisted of an initial stakeholder analysis (Annex 1) through a review of current actors and internet searches. Following this, a review of the published literature was conducted using select databases and search terms with the geography restricted to Tanzania (Annex 2). Non-published literature was sourced from the identified stakeholders by contacting them directly or through established networks such as Tanzania Water and Sanitation Network (TaWaSaNET) (Annex 1). A selection of practitioners currently working in sanitation and hygiene in Tanzania (Table 6) were interviewed on their perspectives, using semi-structured interview questions (Annex 3). Finally, recommendations and conclusions were made based on all the material reviewed.

Current state of sanitation in Tanzania

The 2007 NHBS reports that nationally 93 per cent of Tanzanian households have a latrine (NBS, 2009). However, in 2008 only 24 per cent of Tanzanians had access to improved sanitation according to the definition provided by the UNICEF and WHO Joint Monitoring Programme (JMP) (World Bank *et al.*, 2011). The JMP definition of improved sanitation does not include shared facilities or traditional pit latrines, regardless of the floor material or super-structure (World Bank *et al.*, 2011). If pit latrines with slabs are included in the definition of improved sanitation, then in 2004, 47 per cent of Tanzanians had access to improved sanitation (WHO and UNICEF, 2006). The current absence of any legislated Tanzanian definition of adequate sanitation limits an assessment of the current status of sanitation or comparisons of sanitation coverage statistics (Chaggu, 2009; Pauschert *et al.*, 2012).

Urban areas

Sanitation coverage

The 2007 NHBS reported that 97.3 per cent of households have a basic latrine in urban areas (NBS, 2009; MoHSW, 2011). However, 78.6 per cent of households in other urban areas and 80.5 per cent of households in Dar es Salaam use pit latrines (NBS, 2009). A household survey in Dar es Salaam that found 80 per cent of population used pit latrines, 2.5 per cent used septic tanks, 2 per cent ventilated improved pit latrines, 6.5 per cent with sewerage connection and only 1 per cent without any sanitation options (Chaggu *et al.*, 2002). The World Health Organisation (WHO) in 2008 estimated that the urban population having access to improved sanitation facilities was only 27 per cent (MoHSW, 2011). Urban sanitation coverage was assessed to have increased 5 per cent between 1990 and 2008 (World Bank *et al.*, 2011).

Based on achieving the MDG targets, the National Strategy for Growth and Reduction of Poverty (NSGRP), *Mkakati wa Kukuza Uchumi na Kupunguza Umaskini Tanzania* (MKUKTA), target for coverage of improved sanitation in urban areas by 2015 is 45 per cent (MoHSW, 2011).

Service provision responsibilities

At present the Tanzanian government's public service capacity is weak and, despite pressure, they have been unable to provide urban sanitation and solid waste services (Oosterveer, 2009). The African Minister's Council on Water status overview report for the country in 2011 assessed that Tanzania was still in the establishing stages of urban sanitation service provision. This was based on a poor score across the required criteria: policy, planning, budget, expenditure, equity, markets, uptake and use (World Bank *et al.*, 2011). Additionally, the current Tanzanian government policy is to invest public funds in sewerage network expansion which results in the wealthy being serviced before the poor (World Bank *et al.*, 2011). In Dar es Salaam the Water and Sewerage Corporation (DAWASCO) has the contract for water and sewerage provision but it has not met the contractually required service provisions for a number of years (World Bank, 2011).

Formal urban settlements

Sewerage coverage: Sewerage coverage in Dar es Salaam is estimated at about 4.8 per cent of the population (Pauschert *et al.*, 2012). In Dar es Salaam flush toilets are reported in 10.3 per cent of households in 2007 (NBS, 2009) with septic tanks accounting for the difference. Some smaller cities in Tanzania have greater coverage (Table 2). The coastal city of Tanga has a population of 265,549, but only 2495 households are connected to the sewerage system (Mhina, 2013) with coverage estimated at 9.3 per cent of the population (Pauschert *et al.*, 2012; Mhina, 2013).

Sewerage treatment: Dar es Salaam is typical of other Tanzanian cities where there is minimal treatment of sewage, and direct discharge via a short ocean outfall into the Indian Ocean (Yhdego, 1992; Mwalimu, 2012). There are also large discharges of sewage into the Msimbazi River in Dar es Salaam with coliform bacterial counts once it reaches the Indian Ocean of 2.5 - 4.0 x 10^5 cfu/100 mL (Yhdego, 1992). Even large five star hotels discharge their sewage directly into the Indian Ocean in Dar es Salaam (Mwalimu, 2012). Smaller cities also have inadequate or no sewage treatment. In Tanga, there is no sewage treatment facility and 2164 m^3 of raw sewage is discharged directly into the Indian Ocean each day (Mhina, 2013).

Some areas of Dar es Salaam have waste stabilisation ponds to treat sewage from 2000-6000 people, but in 1989 there were only nine such ponds (Mbwele *et al.*, 2003; Weatherell *et al.*, 2003). A survey of waste stabilisation ponds across Tanzania found that the majority were not functioning properly and had become stagnant sites for mosquito breeding (Yhdego, 1992). The reasons behind the failure were: they had not been designed correctly for the specific conditions initially; they were not maintained properly; there was a lack of sludge removal, lack of funds for maintenance and lack of trained operators (Yhdego, 1992). For example, waste at the University of Dar es Salaam had not been de-sludged in 16 years (de-sludging should occur every five years) and, when it did occur, was ineffective at removing nutrients from waste water (Mbwele *et al.*, 2003).

Table 2. Sewerage coverage in the urban areas of Tanzania (Pauschert *et al.*, 2012).

City	Sewerage
Dar es Salaam	4.8
Arusha	7.0
Moshi	5.8
Dodoma	11.6
Morogoro	1.6
Mwanza	3.1
Iringa	11.9
Mbeya	0.6
Songea	3.7
Tabora	1.3
Tanga	9.3

Informal urban settlements

Informal urban settlements continue to grow as the government is unable to control land use and development due to the rapid increase in population and limited resources available (UN HABITAT *et al.*, 2010). A survey of 19 urban settlements in 2010, commissioned by GIZ, identified that 74 - 90 per cent of the populations lived in informal settlements (Pauschert *et al.*, 2012). In Dar es Salaam it is estimated that 70-80 per cent of people live in unplanned and unserviced settlements (Ndezi, 2009; UN HABITAT *et al.*, 2010).

Service provision: Informal settlements have very limited sanitation services and the majority use on-site sanitation (Pauschert et al., 2012). A survey of informal settlements in 20 urban areas of Tanzania, including Dar es Salaam, reported that only 57 per cent of households had on-site sanitation (pit latrines, ventilated pit latrines, composting latrines) (Pauschert *et al.*, 2012). Those households without their own sanitation reported using public or shared facilities (Pauschert *et al.,* 2012). When looking at the quality of the sanitation it was found that in Dar es Salaam on average 92.4 per cent of informal settlements across 45 wards did not have access to improved sanitation (Penrose et al., 2010). In 2007 it was estimated that only 7.8 per cent of households in Dar es Salaam and 12.9 per cent in other urban areas used improved sanitation such as a ventilated improved pit latrine (NBS, 2009).

Latrine construction: A survey of construction of pit latrines in Dar es Salaam found that 86 per cent of pit latrines are built with sand cement blocks, 94 per cent had floor slabs and only 53 per cent had a roof (Chaggu et al., 2002). The high proportion of pits using sand cement blocks reflects the fact that it is a means to prevent pit collapse resulting from the high water table (Chaggu et al., 2002). Of the pits, 93 per cent are dug to between 2.5 - 5 m (Chaggu et al., 2002). Households do have a preference to dig their pit as deep as they can afford so that it lasts longer (Biran, 2010). The cost of latrines, including labour and materials, ranges from TZS 320 000 (Biran, 2010) to 400,000, with 88 per cent of latrines built by a craftsman (Chaggu et al., 2002). In contrast, in the informal settlements of the coastal city of Tanga shallow pits, which are covered with a sheet after use, are often constructed in the household back yard. These are a form of very shallow pit latrine without a super-structure (Mhina, 2013).

Building a septic tank is aspired to for residents surveyed in informal settlements of Dar es Salaam, as they last longer, have less smell and fewer flies and are easier to empty (Biran, 2010). However, due to cost, septic tanks are not accessible to most people in informal settlements (Chaggu and Edmund, 2002; Biran, 2010).

Latrine de-sludging: In Dar es Salaam full pits were due to the high water table in 50 per cent of cases (Chaggu *et al*., 2002). Solid waste and sand are also commonly present in the pit latrines (Biran, 2010). Reported data on the frequency of pit de-sludging varies. One a study undertaken in Dar es Salaam reported that when pits were full 72 per cent of people said they de - sludged them, 23 per cent planned to build a new one and 5 per cent did not know what to do (Chaggu *et al.,* 2002). A similar study in the same city reported that only 30 per cent of households de-sludged their pits and the remainder preferred to establish new pits due to costs (Pauschert *et al.,* 2012). Furthermore, the methods used to de-sludge vary considerably. Again, two studies undertaken in Dar es Salaam report different practices.

One study, undertaken in 2008 by WSP, reports that only 19 per cent of people surveyed (n = 600) used de-sludging pumping services, with the majority (58 per cent) using the 'vomiting' method to divert the sludge to a second pit (Biran, 2010). A second study reported that the majority (94 per cent) of people surveyed reported using pit-latrine de-sludging services at a cost of TZS 25,000–70,000 depending on the distance to the disposal area (Chaggu *et al.,* 2002). A further method reported in 12 per cent of those surveyed in Dar es Salaam was flooding the pit to flush out the sludge to the surface and into local waterways or the drainage system (Biran, 2010; Mwalimu, 2012). Sinking the sludge by using a chemical coagulant was also reported, but not widely (2 per cent) (Biran, 2010). There is a large variation in the data collected from informal settlements about pit latrine de-sludging which is likely indicative of large variation in practices across different settlements.

In Dar es Salaam in 2002 there were 28 privately owned de-sludging operators and 14 city council operators (Chaggu *et al*., 2002). However, access to latrines in informal settlements to de-sludge them is a continual problem as the large 5 m^3 tankers cannot obtain access and there is a limited number of mini-tankers available (Chaggu *et al.*, 2002). In addition, the majority of pit latrines are emptied during the wet season when they are full due to the raising water table. Furthermore, some de-sludging operators techniques are not adequate, as they primarily remove the water and not the sludge (Chaggu *et al.*, 2002). A further problem is the cost of safe sludge disposal and the locations for carrying it out. Sludge is frequently dumped onto fields or mixed with other solid waste and buried (Chaggu *et al.*, 2002).

Absence of sanitation

Open defecation was reported as < 1per cent in the urban areas surveyed (Chaggu *et al.*, 2002; Pauschert *et al.*, 2012). Through community focus groups and interviews in Mbuyni sub- ward, Dar es Salaam, the problems associated with lack of access to sanitation became clear (Shack/Slum Dwellers International (SDI) and Centre for Community Initiatives (CCI), 2009). The community reported that 40 per cent of the 7489 people living in the ward do not have a latrine and there is no public facility (SDI and CCI, 2009). Those that don't have a latrine either share with their neighbours or defecate in the Ng'ombe River and Mwanaanyamala reservoir (SDI and CCI, 2009). Environmental waters are also frequently used as a site for open defecation in other cities, as observed in the coastal city of Tanga where members of the informal settlements use the adjacent Indian Ocean (Mhina, 2013).

Solid waste

Solid waste disposal in urban centres is a continuing problem as the population continues to grow and public service provision cannot meet the demand. In Dar es Salaam, through the NHBS, it was estimated that 36.7 per cent of households used rubbish pits, 32.8 per cent garbage bins and 25.5 per cent of households dump their waste (NBS, 2009) into water courses, valleys, pit latrines or other drainage areas (Chaggu *et al.*, 2002). There has been a steady increase in the number of households using rubbish bins in Dar es Salaam over the last three household surveys (5.3 per cent in 1991/92 and 20.3 per cent in 2000/01) (NBS, 2009). Rubbish bins are more popular in Dar es Salaam than other urban areas where their usage was only 9 per cent (NBS, 2009). Likewise, focus groups with community members from 197 informal settlements in Dar es Salaam highlight that in those settlements where there are no available solid waste collection services people will simply dump their rubbish on the ground or burn it in pits (SDI and CCI, 2009). In other urban areas the majority (70.1 per cent) of rubbish was disposed of in rubbish pits (NBS, 2009).

In Dar es Salaam the solid waste management has been successfully contracted out to commercial operators at the municipal government level (Venkatachalam, 2009). In 2009 there were 23 different solid waste operators and solid waste collection had increased to 45 per cent of the city area from only 2-4 per cent in 1992 (Venkatachalam, 2009). In smaller cities, such as the coastal city of Tanga, solid waste collection is also a problem due to inconsistent city council-facilitated or private collection. As a result, rubbish is dumped on the street or in front of houses, even in formal settlements (Mhina, 2013). However, there is also evidence of informal community-based collections whereby a community member takes a wheelbarrow and collects waste for a small fee (TZS 500 - 1000) (Mhina, 2013).
Industrial waste

In Dar es Salaam the river that runs through the industrial area of Mabibo Viwandani appears heavily contaminated and local community members, who grow vegetables along its banks, report that it changes colour (Barozi, 2011). It is suspected that the colour changes are due to the local textile dying factories discharging wastes directly into the rivers (Barozi, 2011). Environmental wastewater discharge also comes from other industries in Dar es Salaam including food processing, tanneries, fertilizer and petroleum refining (International Water Association Water Wiki, 2013). Discharging industrial wastewater requires a permit from the Wami/Ruvu Basin Water Office (WRBWO), but at present in Dar es Salaam no permits have been issued (Barozi, 2011). The contamination of environmental waters with industrial waste is a continued environmental health problem that does not receive the same attention as does the problem of domestic sewage management problem.

Water drainage

The rapidly increasing size of cities since the 1970s and especially informal settlements means that basic infrastructure such as storm water drainage has not been constructed (Yhdego, 1992; Castro *et al.*, 2010). Further, when drainage is present it is not cleaned or maintained adequately, becoming blocked with sediment, rubbish or vegetation (Castro *et al.*, 2009). The lack of adequate drainage in Dar es Salaam means that after short periods of rain water pools and storm water floods the limited sewerage network (Mwalimu, 2012). The same drainage problems exist In the coastal city of Tanga, despite the construction of a new drainage system by the city council (Mhina, 2013). When surveyed, over 75 per cent of the drains were not functioning properly and most were blocked (Mhina, 2013). Due to the inadequate drainage network in Dar es Salaam drains are treated with costly insecticide as part of the lymphatic filariasis and malaria control programmes (Castro *et al.*, 2010).

Rural areas

Sanitation coverage

The NHBS in 2007 reported that 90.4 per cent of households had a latrine in rural areas (NBS, 2009). However, improved latrines were lower than urban area with only 2.2 per cent of households having Ventilated Improved Pit Latrines (VIP) latrines and 1 per cent with a flush toilet (NBS, 2009). The World Health Organisation (WHO) in 2008 estimated that the rural population having access to improved sanitation (including pit latrines with slab floor) was

only 23 per cent (MoHSW, 2011). Tanzania was also assessed at being in the establishment stage of rural sanitation provision in the country status overview (World Bank *et al.*, 2011). It was assessed that there has actually been a 2 per cent decrease in sanitation coverage in rural areas between 1990 and 2008 (World Bank *et al.*, 2011). The national target for 2015 - reported in the *Mkakati wa Kukuza Uchumi na Kupunguza Umaskini Tanzania* (MKUKUTA), which is kiSwahil for 'National Strategy for Growth and Poverty Reduction' - is 42 per cent access to improved sanitation (MoHSW, 2011).

Absence of sanitation

Overall in rural areas it is estimated that 9.5 per cent of households have no toilet (NBS, 2009). The proportion of people practicing open defecation in rural areas is likely to vary between locations. For example, in the Kongwa District open defecation was reported at a slightly higher rate than other districts (11.5 per cent) by the households surveyed (n = 678) (Montgomery *et al.*, 2010).

Solid waste

In rural areas in 2007 the NHBS estimated that 54.9 per cent of households place their rubbish in a pit and burnt it while 42.8 per cent threw it on the ground (NBS, 2009).

Specific institutions or groups

Schools

Access to adequate school sanitation is a basic need and also linked directly to attendance rates, particularly for girls. The Ministry of Education and Vocation Training (MoEVT) has latrine ratio guidelines for schools of one latrine for every 20 girls and one for every 20 boys enrolled (Stichting Nederlandse Vrijwilligers *et al.*, 2009). A study of 162 schools in the Bagamoyo district found that only 16.7 per cent (n = 27) met the minimum standard and 8.6 per cent (n = 14) had no latrines at all (Stichting Nederlandse Vrijwilligers *et al.*, 2009). In this district, across all schools surveyed based on the number of pupils (69,715 children) there is a need to provide an additional 1 704 latrines to meet minimum standards (Stichting Nederlandse Vrijwilligers *et al.*, 2009). Nationally, only 11 per cent of schools have sufficient latrines to meet the government required ratio (Stichting Nederlandse Vrijwilligers *et al.*, 2009).

The MKUKUTA goal for 2015 is that there is at least one latrine per 40 girls and 50 boys as schools move towards meeting the minimum standard (MoHSW, 2011).
Health facilities

It is important to have safe and improved sanitation at health care facilities due to the risks of disease transmission between patients. Despite this, it was estimated in 2006 by the Tanzania Service Provision Assessment that only 63 per cent of health facilities had at least one latrine for patients (MoHSW, 2011).

Disposal of hospital waste is also another significant problem, with a survey of across Tanzania finding that 50 per cent of hospitals burn their waste in an open pit and 30 per cent bury it (Manyele and Anicetus, 2006). Concerns about poor hygiene in Tanzanian hospitals have been found to actually be a deterrent for women seeking paediatric care (Mwangi *et al.*, 2008).

Women and children

Children under five years are the most at risk group for mortality following diarrhoea (Bartram and Cairncross, 2010), so understanding the sanitation behaviour of mothers is especially important. Lack of sanitation education for mothers is a contributing factor to poor sanitation practices for young children. In the Temeke Municipality only 31 per cent of mothers surveyed (n = 161) understood the risk factors for childhood diarrhoea and the impacts of poor sanitation (Mwambete and Joseph, 2010). Further, children's feaces are thought of as safe by many Tanzanians (Hooks, 2008). The defecation practices of young children are a significant sanitation issue for mothers. In a survey in Dar es Salaam it was reported for young children that 35 per cent defecate in the home and 37 per cent used the courtyard or area near the home (Chaggu *et al.*, 2002). The excreta is collected and added to solid waste or placed in the latrine (Chaggu *et al.*, 2002). The hygiene disposal of infant faeces is a problem, with 6 per cent of urban households and 27 per cent of rural households disposing of faeces in an unsafe manner (disposed in the area around the dwelling or rinsed away) (MoHSW, 2011). Having an infant in the household was found to significantly ($p = 0.01$) increase the quantity of faecal indicator bacteria on mothers hands in Dar es Salaam to 1×10^3 cfu/ pair of hands (Pickering *et al.*, 2010). Contaminated hands then serve as source of contamination for household members. Hence, the disposal of children's faeces has been shown to be a reliant indicator of general sanitation and hygiene practices in Tanzania (Almedom, 1996).

Different tribal groups

Overall, sanitation access is much lower (12 per cent) for nomadic communities compared to rural averages of 90 per cent (MoHSW, 2011). The rural Maasai communities in northern Tanzania have a 'virtual absence of sanitation' (Nangawe, 1990).

Refugees

Refugee camps and refugees present a very vulnerable group of people within Tanzania. Burundi refugee mothers living in the community have higher instances of childhood mortality compared to Tanzanian mothers (Mbago, 1994). In addition, lack of adequate sanitation in refugee camps in Tanzania is responsible for increased instances of diarrhoea, although associated mortality does not follow, due to the availability of medical care (Cronin *et al.*, 2009).

Health consequences of inadequate sanitation

In Tanzania there were 13 different studies identified which linked sanitation factors to mortality and six different diseases (Table 3). Lack of access to a latrine or improved latrine was a common significant factor for increased mortality and morbidity. The studies reviewed varied in quality, from large sample sizes and robust methodologies published in highly ranked journals (Graham *et al.*, 2004) to smaller studies published in lower ranked journals (Urassa *et al.*, 1995). However, despite this, the impacts of poor sanitation are clearly evident.

Figure 1. Un-improved sanitation: a simple pit latrine

Table 3. Impact of sanitation on mortality and morbidity in Tanzania.

Health outcome	Sanitation factors	Location	Sample size	Impact	Reference
Maternal mortality	Latrine type	National	16 085 house-holds	Increased risk (p = 0.049)	(Graham *et al.*, 2004)
	Lack of access to a latrine	Illala District, DSM	for each death 3 other mothers matched^	Increased risk (OR = 8.3)	(Urassa *et al.*, 1995)
Diarrhoea	Unsafe disposal of faeces	~ 11 different sites^	~330 house-holds^	Increased risk (OR = 2.73)	(Tumwine *et al.*, 2002)
	Pit latrine covered	Kilombero Valley	278 house-holds	Reduction in children < 5 yrs (OR = 0.26)	(Owuor *et al.*, 2012)
Cholera	Lack of access to improved sanitation	Informal settlements DSM	114 593 plots	Increased incidence (p < 0.0001)	(Penrose *et al.*, 2010)
Typhoid fever	Unsanitary toilets	Singida urban	120 people	Obstacle for reduction	(Malisa and Nyaki, 2010)
Trachoma	Latrine use	Kongwa District	678 house-holds	Reduction in cases (p = 0.03)	(Montgomery *et al.*, 2010)
Malaria	Drains with stagnant water	15 wards, DSM	338 drains	Increased number of larvae (p < 0.001)	(Castro *et al.*, 2010)
	Preventing breeding on pit latrine surface	Zanzibar	550 pit latrines	98 % drop in mosquitoes in households	(Curtis and Maxwell, 1997)
Helminths	Pit latrines	Sululu village	72 latrines	Helminth presence (p = 0.05)	(James, 2011)
	Absence of a latrine	Zanzibar	38 house - holds	Increased infections	(Ericsson and Stephansson, 1996)
	Absence of a latrine	Mbulu district	800 house-holds	High importance for infections with *Taenia solium*	(Ngowi *et al.*, 2007)

^details of sample size or locations not supplied in the reporting publication

Current state of hygiene in Tanzania

Personal hygiene behaviour

It is important to understand hygiene behaviour in Tanzania, as the health benefits of provision of adequate sanitation and drinking water can be quickly eroded if poor hygiene practices are present in the household. For example, households surveyed (n = 20) in Bagamoyo, indicated that the type of latrine floor (concrete or dirt) did not make a significant difference in the concentration of faecal indicators in households but hygiene practices did (Pickering *et al.*, 2012). In this section, the types of personal hygiene behaviour will be covered, followed by a description of the differences in urban, rural or specific institution or group hygiene behaviours.

Hand washing

Hand washing at critical times in Tanzania has been shown to be a rapid and reliable indicator of general hygiene behaviour in households (Almedom, 1996). Critical times were determined to be after defecation, after handling children's faeces, before handling food, before feeding young children and before eating (Almedom, 1996). Hand washing with soap after using the toilet was reported at 62 per cent in low income urban areas (Pauschert *et al.*, 2012). Other studies in Dar es Salaam and rural districts of Mpwapwa and Rufiji report that only 4 per cent of mothers and 5 per cent of children wash their hands with soap after using the toilet (Hooks, 2008). A MoHSW study in 2004 reported that only 31.3 per cent of latrines had hand washing facilities (MoHSW, 2011). In addition, although soap is found commonly in the household it is more frequently used for bathing and laundry than hand washing (Hooks, 2008). In a study of women's hand hygiene, faecal bacteria on hands were significantly ($p = 0.023$) associated with the length of time since last washing hands with soap and water (Pickering *et al.*, 2010). The MKUKUTA goal for 2015 is that at least 25 per cent of households have hand washing facilities with soap and water (MoHSW, 2011).

Face washing

Face washing is important in reducing eye infections such as trachoma (Montgomery *et al.*, 2010). In Dodoma region of Tanzania there was a perception from mother's that washing children's faces regularly used a lot of water and they were therefore reticent to change their hygiene behaviour as they needed the water for other purposes (McCauley *et al.*, 1990).

Bathing

It is very common to bath in the same super-structure as the latrine. In Dar es Salaam a survey reported that 52 per cent of people bath in the latrine, while 32 per cent use a separate room adjacent to the latrine but the water goes into the latrine pit (Chaggu *et al.*, 2002). Bathing and clothes washing in rivers is known to increase the instances of schistosomiasis infections (Poggensee *et al.*, 2005).

Anal cleaning

Tanzania is a society where anal washing is the most common form of cleaning after defecation. A survey in Dar es Salaam found that 84 per cent of people reported using water for anal washing, one per cent used only toilet paper and 15 per cent used both

(Chaggu *et al.*, 2002). Combined with a failure to wash hands with soap after defecation this hygiene behaviour is likely to be linked to a large portion of faecal contamination on hands and in households.

Menstrual hygiene

In Mwanza, a study related to the use of microbicide for prevention of HIV/AIDS contraction reported that intra-vaginal cleaning was a hygiene behaviour practiced by women regularly (Allen *et al.*, 2010). Women used their fingers alone or with soap and/or water to remove post coital excretions or menstrual blood (Allen *et al.*, 2010).

Water and food hygiene

Stored drinking water quality

Uncovered drinking water containers were identified as a risk factor for diarrhoea in households in Dar es Salaam (Badowski *et al.*, 2011). Also, the presence of faecal indicator bacteria on the hands of mothers and children in households in the city were positively related to faecal contamination of stored drinking water (Pickering *et al.*, 2010). Even those sources of water considered safe can be contaminated. A survey of purchased drinking water in bottles and plastic bags (n = 130) in Dar es Salaam found faecal coliforms in 3.6 per cent of samples (Kassenga, 2007). Contamination of drinking water after it is collected is a very important hygiene issue in Tanzanian households as it reduces the health benefits gained from safe water supply provision.

Food preparation

Preparation of food was found to be one of the highest sources of faecal indicator bacteria (enterrococci) on women's hands in a study in Dar es Salaam, where the average was of 6310 cfu/pair of hands (Pickering *et al.*, 2010). This correlates with other research where thermotolerant coliforms were detected in 58 per cent of household meals (1×10^3 cfu/g) and 98 per cent of milk products (3×10^4 cfu/g) on Pemba Island (Vigano *et al.*, 2007). During food preparation it is likely that faecal contamination is present both on the hands of the person preparing the food and on the food itself when it is purchased.

Urban and rural areas

Access to sufficient clean water for hygiene practices is an important factor in both urban and rural areas. The large majority of water used by Tanzanian's is extracted from unimproved sources such as ground water (Owuor *et al.*, 2012). It is not uncommon for improved water points to not function properly. A survey of 10 districts in Tanzania found that 43 per cent of improved water points were not functioning (Stichting Nederlandse Vrijwilligers, 2010). Failures in supply of safe water directly impact upon the ability for households to practice adequate hygiene.

Informal urban settlements

The high population densities (25, 000 pers/km^2 in Dar es Salaam), poor housing, low income, inadequate sanitation and clean water lead to very poor hygiene and devastating public health in low income urban areas in Tanzania (International Food Policy Research Institute, 2002; Pauschert *et al.*, 2012). The risk of contamination with faecal indicator bacteria in drinking water wells in peri-urban areas of Dar es Salaam can be significantly linked to close proximity of a pit latrine to the water point (< 10 m) (Mushi *et al.*, 2012).

Specific institutions or groups

Schools

A survey of 162 schools in the Bagamoyo District found that only 14.2 per cent (n = 23) had hand washing facilities available and even less 3.7 per cent (n = 6) supplied soap (Stichting Nederlandse Vrijwilligers *et al.*, 2009). The MKUKUTA target for 2015 is that at least 15 per cent of schools have hand washing facilities with soap (MoHSW, 2011).

Health facilities

It is informally estimated that less than one per cent of health facilities have hand washing facilities with soap for patients (MoHSW, 2011). A major determinant is access to safe water; in 2006 it was estimated that only 34 per cent of facilities had regular access to safe water (MoHSW, 2011). The MKUKUTA target for 2015 is that at least 20 per cent of health facilities have hand washing facilities (MoHSW, 2011).

Women and children

Women bear the main responsibility for maintaining hygiene in the home and educating children about good hygiene practices (Obrist, 2004). Women and girls have to collect water for the household for all needs including hygiene purposes (Waititu, 2009). In Ilala Ilala, Dar es Salaam, qualitative interviews with women (n = 100) showed that they had good knowledge of hygiene with phrases like 'cleanliness is health' (*usafi ni afya*) and 'safe water' (*maji safi*) used commonly (Obrist, 2004). However, many women are not able to provide the level of hygiene that they would want in their homes or for their children because they do not have enough money and food takes priority over soap and shoes (Obrist, 2004). Other studies have also reported that women are knowledgeable about better hygiene practices but are restricted by finances and also a perception that changing the behaviour would be impractical (Badowski *et al.*, 2011).

Different tribal groups

As reported for sanitation practices, tribal groups also have poorer hygiene practices. The rural Maasai communities in northern Tanzania generally have very poor hygiene practices in comparison to non-tribal groups, in part due to their lack of access to water (Nangawe, 1990).

Refugees

Hygiene for refugees and in refugee camps is often poor compared to non-refugees. A large cholera outbreak in a Rwandan refugee camp in Tanzania was attributed to poor hygiene and limited access to water supplies for hygiene practices (Plummer, 1995). However, through education and effective medical care the outbreaks were controlled within three months and there was no attributed mortality (Plummer, 1995).

Health consequences of poor hygiene

Hygiene factors were identified in ten studies to have a significant impact on mortality and five separate diseases (Table 4). Hand washing, distance to the water point and quantity of water used for personal hygiene were common contributing factors to disease. Access to sufficient safe water is intrinsically linked with good hygiene practices. Therefore, water supply should be central to hygiene promotion.

Table 4. Impact of hygiene on mortality and morbidity in Tanzania

Health outcome	Hygiene factors	Location	Sample size	Impact	Reference
Maternal Mortality	Access to piped water	Illala District DSM	for each death 3 other mothers matched^	Increased risk (OR = 7.2)	(Urassa *et al.*, 1995)
Diarrhoea	Quantity of water used for cleaning	~ 11 different sites^	~330 house-holds^	Increased risk (p = 0.001)	(Tumwine *et al.*, 2002)
	Distance from household to water source	Kilombero valley	309 children < 5 yrs	Increased risk (p = 0.011)	Gascon *et al.*, 2000)
	Hand washing before cooking	Kilombero Valley	278 house -holds	Reduction in children < 5 yrs (OR = 0.45)	(Owuor *et al.*, 2012)
	Clean children	Kilombero Valley	278 house -holds	Reduction in children < 5 yrs (OR = 0.32)	(Owuor *et al.*, 2012)
Cholera	Hand washing after defecation	Zanzibar	cases and controls^	Reduced risk (p < 0.001)	(Masauni *et al.*, 2009)
	Open water containers	Zanzibar	cases and controls^	Increased risk (p = 0.017)	(Masauni *et al.*, 2009)
Skin infections	Inadequate hygiene	DSM and 5 Ujamaa villages	1855 children	Increased instances of scabies but not pyoderma	(Masawe *et al.*, 1975)
Trachoma	Inadequate hygiene	Kongwa	3800 children	Increased risk due to limited water	(McCauley *et al.*, 1990)
	Clean faces	Kongwa District	1417 children	Reduced incidence (0R = 0.4)	(West *et al.*, 1996)
	Quantity of water for personnel hygiene	Kahe Mypa village	914 children	Reduced risk (p = 0.01)	(Polack *et al.*, 2006)
	High density of flies	Central Tanzania	8409 people	Increased risk (OR = 1.63)	(Taylor *et al.*, 1989)
Dental gum infections	Inadequate dental hygiene	DSM	640 school children	Widespread gingivitis	(Kerosuo *et al.*, 1986)

^ details of sample size or locations not supplied in the reporting publication

Stakeholders in sanitation and hygiene in Tanzania

An overview of identified Tanzanian sanitation and hygiene stakeholders are presented as a schematic and are described in detail with a list of current programmes and head office locations in Annex 1. Presently active in sanitation and hygiene policy and programmes are: the Prime Minister's Office, three government ministries, local government, 12 donors/multilateral agencies, five private foundations, 13 International non-government organisations (NGO), 18 local NGO, two faith based organisations, two networks and numerous actors from community based organisations (CBOs) and the commercial sector. The Tanzanian Government provides policy and regulations for sanitation and hygiene, with input from the other stakeholders. The Tanzanian Government, donors/multilateral organisations and private foundations give funding and direction to programmes and projects. These programmes and projects are then implemented by the Tanzanian Government, international NGOs, local NGOs, faith based groups, CBOs and the commercial sector. All these stakeholders also interact, to varying degrees, through networks, partnerships, research and evaluation.

Figure 2. A school latrine with a mural promoting hand washing.

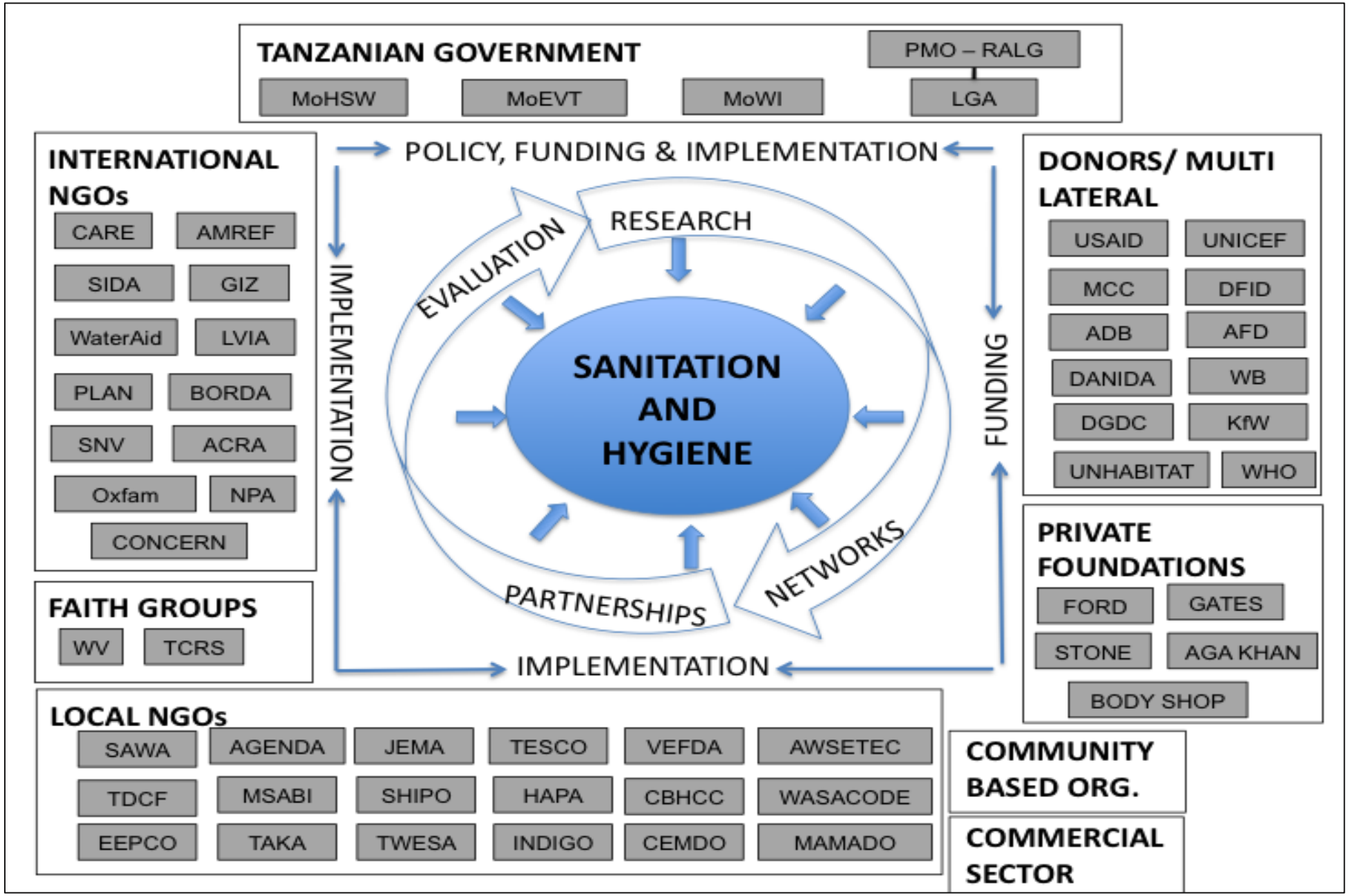

Figure 3. Schematic of current stakeholders in sanitation and hygiene in Tanzania

Completed sanitation and hygiene programmes in Tanzania

National programmes

The socialist government of Tanzania in the 1970s implemented a very high profile sanitation campaign *Mtu ni Afya* (Health is Life). This campaign resulted in widespread latrine construction, the results of which are still evident today, as Tanzania has high sanitation coverage compared to other African countries (World Bank *et al.*, 2011). In 1991, the first National Water Policy was introduced which included the formation of water utilities which charged for services and were designed to be self-sustaining (World Bank *et al.*, 2011).

Urban programmes

A joint initiative between the Tanzanian Government and UN HABITAT in 2007 saw a Citywide Action Plan developed to increase services to informal settlement areas of Dar es Salaam (UN HABITAT *et al.*, 2010). The plan was implemented by the Citywide Slum Upgrading and Prevention Programme Unit (CSUPPU) which is linked to the communities via a technical support team in each municipality (UN HABITAT *et al.*, 2010). The Citywide Action Plan aimed to increase the number of people serviced with basic sanitation and waste collection from 30 to 60 per cent by 2020 (UN HABITAT *et al.*, 2010). For sanitation, the objectives were to conduct assessments on user needs, constructing 159 communal latrines, constructing three demonstration latrines and establishing a regulatory framework for de-sludging (UN HABITAT *et al.*, 2010).

Urban centralised sanitation projects

Under the Dar es Salaam Water Supply and Sanitation Project (DWSSP) the technical and commercial operation of water and sewage services in Dar es Salaam was contracted out for 10 years to a private company, City Water Services, in 2002 (Venkatachalam, 2009). The project was funded by the World Bank and had the following project development objectives: 80 per cent of effluent collected to be treated; 95 per cent of effluent to be compliant with standards; construction of 26 km of new sewers, rehabilitation of 140 km of existing sewers, 15 pumping stations and nine waste stabilisation ponds and a Community Water Supply and Sanitation Programme (CWSSP) (onsite sanitation facilities and hygiene promotion) (World Bank, 2011) However, the contract was cancelled in 2005 due to problems with providing adequate services and meeting other contractual requirements (Venkatachalam, 2009). Presently public utility company DAWASCO provides services (Venkatachalam, 2009). DAWASCO has not met its contractual requirements for consecutive years, and there is inconsistent data on the number of customers served and operating costs remaining higher than revenue (World Bank, 2011). The funding body rates the overall project as 'moderately unsatisfactory' and cites problems with meeting contractual requirements by DAWASCO due to the lack of impartiality and accountability between DAWASCO, Dar es Salaam Water and Sanitation Authority (DAWASA) and the Government of Tanzania (World Bank, 2011).

In smaller cities in Tanzania, improving the capacity of local water utilities has shown to be an effective approach. The Mwanza Urban Water and Sewerage Authority (MWAUWASA)

orientated sanitation concepts for peri-urban areas of Africa conducted a pilot study in Arusha (Shewa *et al.*, 2009). The pilot started with construction of demonstration composting and urine diverting toilets, which then led to subsidised construction of further toilets and ultimately, it is hoped, will transition to a loan scheme to help the community to finance the cost of the toilets (Shewa *et al.*, 2009).

The construction of 96 ecological sanitation (Eco-san) toilets in the Majumbasita peri-urban area of Dar es Salaam was found to be very suitable for Tanzanian conditions (Chaggu and Edmund, 2002). It was found that women and children were the main household members who maintained the Eco-san and that their negative social perceptions around handling waste were reduced once they began using a workable Eco-san (Chaggu and Edmund, 2002). Similarly, in Arusha a demonstration urine diversion dry toilet with a garden fertilised with the compost and urine was built as part of the Resource Orientated Sanitation concepts for peri-urban Africa (ROSA) (Tendwa and Kimaro, 2010). The demonstration was found to positively influence people's uptake of the technology and showed potential for up-scaling (Tendwa and Kimaro, 2010).

There are continued perception issues and a lack of understanding around the re-use of faecal sludge. In Dar es Salaam 49 per cent of people were not aware that faecal sludge is used as a fertiliser and 96 per cent of people believe that re-using sludge will transmit communicable disease (Chaggu *et al.*, 2002). Even after education and explanation 37 per cent of respondents stated that they would not re-use faecal sludge for cultural and health reasons (Chaggu *et al.*, 2002). There are conflicting findings on the perception of the safety of sewage, with 53 per cent of respondents in Dar es Salaam and 33 per cent from Zanzibar reporting that they believed there was a health risk from sewage (Crona *et al.*, 2009). However, the study cohort was small (Dar es Salaam n = 61; Zanzibar n = 15) and was centred around environmental discharge (Crona *et al.*, 2009).

Previous programmes to assist with pit latrine emptying have not been particularly successful. In 1992 the Manual Pit Emptying Technology (MAPET) programme did not upscale well due to limitations in transportation volumes, manoeuvrability of the vehicle and travel times (EWAREMA Consult, 2010).

Biogas reactors with above ground super structures using enclosed 3000 L plastic tanks seeded with 10 per cent septic pit sludge have potential as an alternative, but more work is needed to optimise the bio-degradation conditions incubation length needed (Chaggu *et al.*, 2007).

Urban hygiene programmes

Handwashing: Hand washing campaigns can be successful when delivered correctly in Tanzania. It has been shown that information individually given to 334 households in Dar es Salaam about hand washing and water treatment significantly ($p < 0.05$) increased the occurrences of improved behaviour (Davis *et al.*, 2011).

As shortage of available water for hygiene practices has been identified as a constraint to adoption of improved behaviours, non-water based hygiene projects could help improve sanitation. Hand cleaning with alcohol-based hand sanitiser was found to be more effective at removing faecal origin bacteria than soap and water in a trail in Dar es Salaam (Pickering

et al., 2010). Hand sanitiser presents a feasible alternative when water is not readily available although the product is more expensive than soap and water. Furthermore, there would have to be a supply chain developed, as it is not as readily available as soap. In a study of women hand hygiene practices faecal bacteria on hands was significantly ($p = 0.023$) associated with the length of time since last washing hands with soap and water (Pickering *et al.*, 2010).

Solid waste

As urban populations grow so does the quantity of solid waste generated, which the public collection service cannot manage. The majority of solid waste is burnt, creating environmental health hazards. In the Alinyanya settlement in Arusha a small team (nine people), initially formed as part of the Participatory Hygiene and Sanitation Transformation (PHAST) model, successfully created a small community-run 'users pay' waste service (Tanzania Urban Poor Federation (TUPF) and CCI, 2011). The team charged TZS 200 per bag of waste and employed locals to collect the rubbish with carts once weekly (400-500 bags/week) as well as cleaning. The waste was transported to a town garbage tip using a hired truck and at the time of collection they also promoted hygiene messages (TUPF and CCI, 2011). This solution represents a community driven cost effective solution to waste disposal and has been replicated in other communities successfully (TUPF and CCI, 2011).

Another example can be found in a group formed in Dar es Salaam by local women called the Kisutu Women Development Trust Fund (KIWODET) (Oosterveer, 2009). The group collected solid waste and were later given a contract by the City Council to sweep streets and collect household waste, which it then brought together at a transfer centre, where it is sorted for recycling and collection by the council (Oosterveer, 2009). Research was conducted by The Bremen Overseas Research and Development Association (BORDA) on the markets for recycled material in Dar es Salaam. However, they found that at present there was insufficient demand from industry for recycled plastic, aluminium or glass (Bremen Overseas Research and Development Association, 2013).

A government-led approach is present in Tanga City Council which has had a weekly campaign since 2010 called 'Kalembo Day', where households and businesses are required to clean their street front and household area of rubbish (Mhina, 2013). Between the hours of 6-10 am on a Saturday morning businesses are closed to facilitate the cleaning, which can sometimes be opposed by the community, but is generally accepted (Mhina, 2013).

Drainage

As part of the Community Managed Upgrading project in the informal settlement of Hanna Nassif in Dar es Salaam, community labour was used to construct drainage as well as other infrastructure between 2004 and 2007 (UN HABITAT, 2010). The project was a collaborative partnership of a local CBO, the Hanna Nassif Community Development Association (HNCDA), Dar es Salaam City Council, UN HABITAT, Ardhi University and the Ford Foundation (UN HABITAT, 2010). The project generated employment for the local residents through the construction of storm water drainage, buy the ongoing maintenance schedules were not implemented (UN HABITAT, 2010). Cleaning and correct maintenance of the drains is of particular importance as it has been shown to significantly ($p < 0.001$) reduce the chances of malaria infection (Castro *et al.*, 2009). The Hanna Nassif project, nonetheless, is an example of how partnership programmes can use the community to improve their sanitation in informal settlements (UN HABITAT, 2010).

Rural programmes

The Health through Sanitation and Water Programme (HESAWA) was implemented by the Tanzanian Government in the Lake Zone (Mwanza, Kagera and Mara Regions) between 1985 and 2002 and funded by the Swedish International Development Cooperation Agency (SIDA) (Tufvesson *et al.*, 2005). The programme reached 5 million people in rural areas with sanitation and hygiene education, using the Participatory Rural Appraisal (PRA) approach through schools and using the Local Government Authority (LGA) district health and community development officers (Smet *et al.*, 1997). However, there were concerns with sustainability, due to the communities' reliance on donor funds (Smet *et al.*, 1997). There were sustained benefits of the programme and in 2005 it was found that, due to effective capacity and institution building at the community and LGA levels, there was sustained commitment to some of the programme objectives even after it had concluded (Tufvesson *et al.*, 2005).

Specific institutions or groups

Schools

Sanitation programmes: Improved sanitation in some schools has been partly achieved through programmes to reduce schistosomiasis infections that included latrine construction (Magnussen *et al.*, 2001; Poggensee *et al.*, 2005) and education (Freudenthal *et al.*, 2006). For example, 11 schools were involved in a schistosomiasis reduction study beginning in 1995 (Magnussen *et al.*, 2001). Initially the schools did not have any functioning latrines, butat the conclusion of the study in 1999 all the schools had at least two functioning latrines (Magnussen *et al.*, 2001). These projects have only been completed at small scales and not consistently across different districts.

Hygiene programmes: Schools have been the target of a number of successful hygiene promotion projects in Tanzania. The Lushoto Enhanced Health Education programme, which taught personal hygiene to primary school children to control schistosomiasis and helminth infection, found evidence after one year that children had retained knowledge and behaviours (Lansdown *et al.*, 2002). Through primary schools education programmes in central Tanzania focusing on face-washing hygiene, the instances of dirty faces and nasal discharge were significantly reduced (Lewallen *et al.*, 2008). This was despite a lack of access to water at school, which inhibited the application of the education programme (Lewallen *et al.*, 2008). Furthermore, a study of primary school children in the Kilombero District found that supplying them with a bar of soap for bathing over a two month period significantly reduced their instances of skin infections (Dinkela *et al.*, 2007).

Figure 4. Using drama to educate school children about sanitation and hygiene.

Current sanitation and hygiene programmes in Tanzania

Sanitation and hygiene programmes

Government hygiene promotion campaigns are part of the National Environmental Health, Hygiene and Sanitation Strategy (NEHHASS). Developed by the MoHSW , the strategy includes community sensitisation of hygiene and health problems (Hooks, 2008). Furthermore, the Ministry of Water and Irrigation coordinates the 2006-2025 WSDP, which includes hygiene promotion encompassing schools and health clinics (Hooks, 2008). The WSDP is primarily for water provision and a much smaller portion of the US$ 2.85 billion budget is for sanitation and hygiene activities (MoHSW, 2011). The programme is funded by the World Bank, African Development Bank (ADB), German Bank for Reconstruction (KfW), Netherlands Development Organisation (SNV) and French Development Agency (AFD) (MoHSW, 2011). One of the objectives of the WSDP is to upgrade two million latrines across Tanzania (ADB, 2011).

The World Bank WSP is employing Community-Led Total Sanitation (CLTS) to increase sanitation (World Bank *et al.*, 2011). Tanzania is one of the trial countries for the Global Scaling Up Sanitation Project which is funded by the Gates Foundation (World Bank, 2008). The intervention is being evaluated in 10 districts to access which campaigns were more effective; sanitation activities, hand washing activities or a combination of both (World Bank *et al.*, 2011). The programme aimed to complement the existing Tanzanian Government WSDP and NEHHASS programmes (Hooks, 2008). The project was funded by the Gates Foundation for 4 years commencing in 2006 (Hooks, 2008). The programme successfully reached 14.5 million people through mass media campaigns and hundreds of thousands through direct consumer contact and interpersonal contact (Coombes and Paynter, 2011). These campaigns were designed and targeted to convey both emotive and pragmatic messages about hand washing.

Initial findings have reported that the use of registers at local government level as means of recording any changes in sanitation behaviour were not reliable (Coombes *et al.*, 2011). This is due to the variation in record keeping; in some districts only 13 per cent of sub-villages had a register present while in other is was a high as 100 per cent (Coombes *et al.*, 2011). However, even if a register was present the accuracy and frequency of the information collected was not sufficient (Coombes *et al.*, 2011). If government registers are to be used to evaluate the effectiveness of CLTS then training and incentives for accurate record keeping will need to be made (Coombes *et al.*, 2011). Additionally, the programme used community volunteers coordinated through the local government to deliver the interpersonal contact message. The return of forms from these volunteers was low (67 per cent) and there was volunteer lag as they were not being reimbursed for their time nor expenses (Coombes and Paynter, 2011). There was also message creep identified in the direct consumer contact promotions which is one of the challenges of communicating a consistent hygiene message (Coombes and Paynter, 2011). There was also difficulty actually quantifying the level of behaviour change, due to data collection inconsistencies at the local government level (Coombes *et al.*, 2011).

Urban areas

Dar es Salaam: The DWSSP aims to supply affordable and sustainable sanitation to all areas designated by DAWASA (UN HABITAT *et al.*, 2010). The DWSSP is implemented in partnership with Care International, Plan International and WaterAid (UN HABITAT *et al.*, 2010). The DWSSP aims to provide sanitation to 200 000 people by designing and installing sanitation facilities (UN HABITAT *et al.*, 2010). The Citywide action plan developed for Dar es Salaam aims to upgrade 50 per cent of informal settlements with adequate sanitation and waste disposal by 2020 and prevent the creation of new informal settlements (UN HABITAT *et al.*, 2010). However, this only goes part way to servicing the remaining estimated 3 million people in Dar es Salaam who do not have access to improved sanitation. In addition to DWSSP, DAWASA has funding to improve its efficiency as part of the US$ 64 million provided under a Tanzania Compact by the United States Millennium Challenge Corporation (MCC) to improve the water sector in Tanzania (MCC, 2013).

Gulper pit latrine technology is a human powered action pump and is capable of removing 500-700 litres of sludge at a height of 2.3m. It has been used in Dar es Salaam by contractors since 2008 (EWAREMA Consult, 2010; Mgana, 2012). The technology was successfully trialled between 2008-2011 in a ward in each of the Temeke and Illala Municipalities (Mgana, 2012). WaterAid Tanzania is in the process of up-scaling the Gulper pit latrine emptying business model in Dar es Salaam to reach 123 000 people by 2015/16 (Cox, 2011). This programme plans to give access to affordable sludge removal where other programmes have not been as successful (EWAREMA Consult, 2010). Increasing sludge dumping prices, however, can negatively impact on any sustainable sludge removal business (EWAREMA Consult, 2010)

Other urban areas: The Zanzibar urban water supply and sanitation project is due to commence in December 2013 (ADB, 2013). The project is to be implemented by the Zanizbar Water Authority and is partly funded by ADB (ADB, 2013). To improve sanitation in Zanzibar town awareness campaigns will be run and latrines and hand washing facilities will be built in schools and in public areas (ADB, 2013).
Rural areas

National programmes: In 2012, the MoHSW began a national water and sanitation promotion campaign as part of the WSDP (Hooks, 2008; World Bank *et al.*, 2011). In January 2013, the sanitation marketing component of this promotion was started in 42 rural LGAs (Mwakitalima, 2013). The sanitation marketing campaign focuses on marketing improved sanitation using the district health officers and community development officers as well as radio campaigns (Mwakitalima, 2013). The MoHSW definition of improved sanitation is a flush toilet, VIP, Eco-san, enclosed septic latrine or pit latrine with a washable floor and complete super-structure (Mwakitalima, 2013). The programme is aiming for 1.52 million people adopting improved sanitation after four years and plans to up-scale to urban areas (Mwakitalima, 2013). The programme is financed by a local ADB grant and a grant from the UK Department for International Development (DFID) (Mwakitalima, 2013). In addition, the NEHHASS has developed guidelines on sanitation and waste management (Hooks, 2008).

MKUKUTA, which as described above is the National Strategy for Growth and Poverty Reduction, is supported by the African Medical Research Foundation (AMREF) and includes projects in the rural areas of Tanzania (AMREF, 2013). Specifically, AMREF is supporting

the *Maji ni Uhai* (Water is Life) project in the Serengti District which has trained people in PHAST (AMREF, 2013). The programme has also delivered hygiene and sanitation education, and trained local ward officials and labourers to construct and repair latrines (AMREF, 2013). In addition, since 2001, AMREF has been working in the Mkuranga District, which is 50 km south of Dar es Salaam (AMREF, 2013). The project outcomes include an increase from 40 per cent to 85 per cent access to sanitation facilities using the PHAST approach (AMREF, 2013).

Regional programmes: There are a number of regional programmes focusing on rural sanitation and hygiene. The programmes involve a combination of local and international NGOs (Table 5) and local government. There is overlap between some of the specific achievements of certain organisations, as larger international NGOs contract work out to smaller local NGOs such as MSABI, which is implementing the iWASH interventions.

To protect Lake Victoria the Lake Victoria Basin Commission is currently implementing the Lake Victoria Basin Water and Sanitation Programme which began in 2011 and is partly funded by the ADB (ADB, 2013). The programme covers the regions that border Lake Victoria which in Tanzania are the Mwanza, Kagera, Geita, Simiyu and Mara Regions (ADB, 2013). The programme includes improving communal sanitation facilities, faecal sludge management, solid waste management and storm water drainage (ADB, 2013).

Specific institutions and groups: Tanzania has hosted more refugees than any other sub-Saharan African country. Refugees come from Burundi, Democratic Republic of Congo, Kenya, Rwanda, Somalia, Sudan and Uganda (Tanganyika Christian Refugee Service, 2013). Oxfam and the Tanganyika Christian Refugee Service are working with the UN Refugee Agency (UNHCR) and the Tanzanian Government to provide water and sanitation facilities in refugee camps (Oxfam, 2012; Tanganyika Christian Refugee Service, 2013).

Oxfam and World Vision have programmes that work with Maasai pastoralists in the Ngorongoro Region to assist them in gaining access to water required for drinking and hygiene purposes (Oxfam, 2012; Tanganyika Christian Refugee Service, 2013).

Schools are an important focus for a number of NGOs. BORDA conducts school-based sanitation as part of the MKUKUTA programme (BORDA, 2013). BORDA use decentralised wastewater treatment solutions employing low cost technology that low maintenance requirements (BORDA, 2013). Local NGOs also work extensively with schools. Examples include The Desk and Chair Foundation (TDCF), MSABI and Health Actions Promotion Association (HAPA), which construct latrine facilities and provide sanitation and hygiene education (MSABI, 2011; HAPA, 2013; TDCF, 2013).

Table 5. Organisations delivering sanitation and hygiene programmes in rural areas in Tanzania

Organisation	Locations	Programmes	Specific details	Reference
Care International	Wami - Ruvu and Great Ruaha basins	Integrated Water, Sanitation and Hygiene Programme (iWASH)	Reached 140 000 people with market driven WaSH	(Care International, 2013)
Plan International	DSM, Coast, Ifakara, Geita and Mwanza	Improving child health through sanitation and hygiene	Programmes commenced in 1991	(Plan International, 2013)
LVIA	Dodoma and Morogoro Regions	Latrine construction and education	Programmes commenced in 1986	(LVIA, 2013)
WaterAid	Mbulu, Iramba, Nzega, Babati, Hanang and Kiteto Districts	Mtumba sanitation marketing approach	Aim to reach 229 000 people by 2015/16	(Cox, 2011)
Concern	Ngara, Biharamulo and Kibondo Districts	Integrated WaSH programme	Aim by 2014 to construct 9000 latrines and educate 40,000	(Concern, 2012)
Maji Safi kwa Afya Bora Ifakara **(MSABI)**	Kilombero and Ulanga District	Integrated WaSH programme	Sanitation for 5 500 and education for 300,000	(MSABI, 2011)
Community Environmental Management and Development Organisation **(CEMDO)**	Ulanga District	Community development	Sanitation projects	(Community Environmental Management and Development Organisation, 2010)
Southern Highlands Participatory Organisation **(SHIPO)**	Njombe Region	Integrated WaSH	Micro-insurance for sanitation facilities	(Southern Highlands Participatory Organisation, 2013)
Health Actions Promotions Association **(HAPA)**	Singida Region	Participatory sanitation and hygiene promotion	Funded by the Body Shop Foundation	(Body Shop Foundation, 2013)
Community Based Health Care Council **(CBHCC)**	Arusha Region	Women and children's health improvement	Sanitation facility construction. Funded by Oxfam	(Community Based Health Care Council, 2013)

Lessons learned about sanitation and hygiene from practitioners working in Tanzania

Practitioners interviewed

A selection of practitioners working with government, donors and NGOs were interviewed (Table 6). The interviews were semi-structured and the questions are listed in Annex 3. The perspectives given are not linked to individuals but grouped based on theme and intent.

Table 6. Practitioners working in sanitation and hygiene in Tanzania.

Name	Organisation type	Organisation	Position	Tanzanian WASH experience
Mr Anyitike Mwakitalima	Government	MoHSW	Acting Head of Environmental Health and Sanitation Unit	10 years
Mr Akley Galawika	Local Government	Kilombero District Water Engineers Office	Environmental Engineer	16 years
Mr Kristoffer Welsien	Donor	World Bank	Country Officer	0.5 years
Ms Gertrude Mapunda Kihunrwa	Donor	UK DFID	Policy Advisor for WASH	5 years
Mr Herbert Kashililah	International NGO	WaterAid	Sanitation Officer	15 years
Ms Dhahia Mbaga	International NGO	CARE International	WASH Programme	1.5 years
Mr Morten van Donk	Local NGO	SHIPO	Programme Manager	1.5 years
Ms Naomi Ng'endo	Local NGO	MSABI	Sanitation Program	2.5 years

Practitioners' perspectives

Experiences in improving sanitation

All stakeholders interviewed stated that in their experience some form of community motivation aimed at enabling community members to improve their own sanitation (independent of the approach) was the most effective in triggering change. However, this model was more easily implemented in rural areas due to the existing local government structures, compared to the informal urban settlements which lack formal governance structures. Timing was a critical factor for success. The ideal time for implementation of community motivation in rural areas was considered to be between June to August (the start of the dry season) when people are not busy on their farms and have money from the sale of their crops. Equally important to timing is involving the right people from local government. The involvement of community health care workers and community development workers was a positive association that helped ensure the success of the sanitation marketing programme. In one particular instance cited, the local health officer had informed the community that they could no longer build pit latrines, due to health reasons, and this assisted in triggering demand for improved sanitation. Further, the selection of the right people within the community, effective training and ongoing support was also essential. A respected senior person, such as a religious leader, who mobilises the community, is a very powerful factor that should be sought. Also, the use of demonstration latrines and gardens in the markets was one approach that was found to be effective in aiding community motivation.

A problem commonly reported was that when the programmes were implemented there needed to be sufficient resources to meet the demand that the market driven sanitation programme was going to create; resources both in terms of local labours trained to be able to construct improved latrines and also in terms of subsidies or loan schemes to assist households reach their sanitation goals. There were examples of government triggering community demand for improved sanitation which a local NGO was able to meet by training local labourers. However, this was a rather ad-hoc arrangement. There were other examples where there was not sufficient follow up, due to lack of funds and trained labourers, and where the triggering of the community demand was in part a wasted effort.

It was even stated by some that a community motivation based approach should be adopted more widely as it is more successful than a health based approach. However, there was also acknowledgement that the community motivation approach does not reach the "poorest of the poor" but only further marginalises them, as they do not have the resources to improve their own sanitation status. It was recommended that subsidy schemes for the poorest were needed for a community motivated market based approach.

With respect to financing, there were successes cited using local micro-finance institutions to offer sanitation products to the community. Market research was needed to find the right sanitation product demanded by the community. Interestingly, there was more demand for complete new improved latrines of a higher sanitation standard than simply improving existing pit latrines with precast slabs or improved super structures. Another example of local financing for sanitation improvement that was found to be successful was the engagement of local lending groups.

Experiences in improving hygiene

Improving hygiene was generally seen as a more complex and difficult area compared to sanitation as it required sustained behaviour change, whereas hardware provision can improve sanitation. Promoting hygiene messages along with sanitation improvement through community motivated based programmes was seen as the best method, especially when coupled with resources for radio or television advertising campaigns. It was also highlighted that hygiene promotion messages must be tailored to the specific community. Some approaches such as using drama, poems and dancing were found to be effective in some villages but not in others.

Overall the use of hygiene education through schools was reported to be very effective and widely utilised. Ownership of the school hygiene programme was also cited as an important factor for success. The creation of school hygiene committees with responsibility for ensuring latrines were cleaned and that other students were practicing good hygiene ensured empowerment and engagement of the student body. However, there was mixed feedback on specific programmes such as the 'child to child' approach for hygiene education, which was not found to be very effective at communicating messages in some contexts. Other successful avenues of hygiene education have included using the local health dispensaries and the local health workers.

A number of interviews made mention of the successful hygiene promotion programme of the Nyerere government in the 1970s. This national programme was in part so successful because it was driven by the government and conducted at a national level with sufficient resources. It was stated that programmes of this scale are needed to have significant impact on hygiene behaviour change in Tanzania.

Roles of stakeholders in improving sanitation and hygiene

All stakeholders spoken with were in consensus that the government needed to play a central role in improving sanitation and hygiene. One respondent commented that "without political will, there will be no change" and that presently "politicians do not believe that there is a problem" with sanitation and hygiene and that there is "no political will". The government needs to provide the policy direction, regulation, enforcement, funding and implementation while working in conjunction with the community, commercial sector, donors and NGOs. A common problem observed within government is the disjointed approach to water, sanitation and hygiene across the different departments. Water is the responsibility of the Department of Water and Environment, sanitation the Department of Health and Social Welfare and schools and hygiene education the Department of Education. This division results in a lack of information sharing and co-ordination to improve sanitation and hygiene. In addition the different departments have competing demands on their budgets which often means that resources are not allocated to sanitation and hygiene programmes. Further, the different departments have distinctive focuses, which impacts on their programmes. The Department of Water and Environment have a very technical approach to service provision and this can results in a lack of evaluation of the social and other soft influences on the success of the programmes. The Department of Health and Social Welfare generally has a more holistic community perspective, which can be very effective for implementation of sanitation and hygiene programmes.

To improve hygiene and sanitation “water and sanitation need to go together”. A successful example of co-ordination was the formation of a water and sanitation committee at local and district government level with representatives from all the involved departments, including the Departments of Planning and Community Development. Water and sanitation committees facilitate information sharing, co-ordination of plans and pooling of resources, which will ultimately enable effective programme implementation. Appropriate people must also be selected for these roles in committees - “the right people at the right time with the right motivation and resources can make big changes”.

Securing sufficient funding for the sector was in part seen as the responsibility of the donor stakeholders. It was stated that at present there is not sufficient funding for sanitation and hygiene in part because other programmes were given greater priority with the donor programmes. Donors could not only ensure that more funds were available for sanitation and hygiene but could also place pressure on the government to allocate more funding and resources to the area.

The role of NGOs was seen as important and multifaceted. NGO roles included: being able to advocate for the sanitation and hygiene agenda; mobilise the community and other groups; to conduct research; supplement funding sources; provide technical knowledge for programmes; and work with the government in implementation. However, NGOs need to take the initiative to form good working relationships with the government and ensure that their programmes complement the local government work. This relationship takes time to forge. Protocol must be followed and, furthermore, the relationship can frequently need to be re-established when there is a change of position or responsibility.

Involving the commercial sector (both entrepreneurs and established businesses) in sanitation and hygiene service provision and promotion are “key to solving the problems”. Given the right conditions the commercial sector has the capacity to fill the demand created by a market based approach for improved latrine construction and sludge removal. Further, those businesses which sell sanitation and hygiene products, such as soap, need to play a role in actively marketing their products.

The responsibility of the individual was also mentioned. The individual citizen should be “responsible for and take an interest in their own sanitation and hygiene”. They should form community-based organisations to demand services both from the government and private sector. However, it was also acknowledged that many communities were “lost” with respect to what sanitation products they should use. Identifying and promoting “champions” within the community who have adopted improved sanitation and hygiene practices was given as one solution. Another option was for NGOs to guide the community through demonstration of effective solutions.

Current sanitation and hygiene knowledge gaps in Tanzania

Sanitation

Nationally there is a lack of accurate data on latrine coverage (World Bank *et al.*, 2011). The large variation in the data available on the methods and frequency of pit latrine emptying indicates that the practices are varied and more research is needed to gain an accurate understanding of pit latrine practices especially in informal urban settlements. There is a need for more publically available statistics on sanitation coverage and population growth. The national census and surveys currently report on broad geographic regions only. There is demand for more detailed statistics at the level of individual wards and streets. Accurate data on sanitation coverage will facilitate further research on how to get households to invest in and up-take improved sanitation (World Bank *et al.*, 2011).

Overall, the achievements and plans of all the stakeholders in sanitation and hygiene are not currently being tracked in Tanzania. The sector needs to be monitored so that progress can be measured and attainment of targets and goals determined.

Sanitation marketing

There are a number of knowledge gaps identified in uptake of improved sanitation. In particular, what are the exact triggers for a household to change their behaviour and what are the costs associated with that change? These costs are in terms both of the necessary finances to buy sanitation hardware and also the time taken to implement behaviour change. What are the restricting factors that prevent people from “moving up the sanitation ladder”? Finally, to assist in motivating both the community and the government there needs to be more research conducted on the cost-benefit of investing in sanitation and hygiene; Specifically, the exact impact of sanitation and hygiene investment on improving the country’s economy prosperity through reductions in mortality and morbidity. Another area for cost-benefit research lies in a better understanding of the potential business earnings from creating sanitation markets for both product demand but also for re-use of faecal waste products. Investing in sanitation and hygiene should be viewed as a “tool to increase economic growth”, not another drain on limited funds.

Urban areas

Informal settlements in urban areas deserve special attention because of the rapid urbanisation. For informal urban settlements there needs to be a greater understanding of what the demands are and the capacity for people to pay for services, both public and private (Pauschert *et al.*, 2012). Specifically, to facilitate the up-scaling of sustainable sludge removal research is needed on the market demand for sludge removal and the ability and willingness of people to pay for it (EWAREMA Consult, 2010). More work is also needed on appropriate technologies for affordable and sustainable removal of sludge in areas with high water tables and large quantities of sand in the pits in informal settlements (EWAREMA Consult, 2010). Also, more research is needed as to how to get the commercial sector involved in service provision and how to make effective businesses in this area. In addition, how to work effectively within existing informal community structures or how to form new

local governance structures to enable implementation of sanitation programmes. Finally, mechanisms to get the urban population to invest in and finance their own sanitation are required (World Bank *et al.*, 2011).

The Sanitation and Hygiene Applied Research for Equity (SHARE) consortium is presently undertaking research on sanitation marketing that will address some of these knowledge gaps (SHARE, 2012).

Rural areas

In rural areas more work is needed on capacity building for the construction of affordable improved sanitation. As the rural population is expected to finance their sanitation improvements to a greater degree than urban populations (World Bank *et al.*, 2011), affordability is a critical factor for adoption. Further, more work is needed to evaluate the effectiveness of the different approaches (CLTS, PHAST and RPA) and determining which ones are most effective in what contexts in Tanzania. It is likely that a hybrid approach as adopted by WaterAid Tanzania (Cox, 2011) is the answer, but effective and standarised evaluation tools are needed in order to measure any impact.

Hygiene

Overall there was less literature available about the current hygiene status compared to sanitation. In part this could be due to the fact that it is easier to collect data on hardware (number of toilets) than on reported behaviour (frequency of hand washing). More research is needed on hygiene practices at a national level in both urban and rural areas to enable design and effective evaluation of hygiene promotion programmes.

There is also less literature evaluating the effectiveness of hygiene programmes and projects. This is likely because there have been less hygiene specific programmes and projects implemented. Another problem, as demonstrated with the WSP CLTS programme (Coombes *et al.*, 2011), is that the data collection around hygiene behaviour change is challenging and needs to be monitored closely in order to get accurate and representative information.

Anal washing

There is very little information on the contribution of anal washing to faecal contamination in the household and associated illness. Considering that anal washing is the most common form (84 per cent) of cleaning post defecation in Tanzania (Chaggu *et al.*, 2002) it is important that more research is done on both the impacts of the behaviour and how to improve associated hygiene.

Menstrual hygiene

Women's hygiene remains an area that needs more attention. In the literature only one study in Tanzania was identified that briefly covered menstrual hygiene behaviour as part of an HIV/AIDS intervention (Allen *et al.*, 2010). Information about menstrual hygiene behaviour, especially for girls while attending school, is needed to enable design of effective hygiene education strategies and also to provide the necessary facilities for girls while attending school to enable attendance.

Oral hygiene

In the literature reviewed there was no information identified which described the oral hygiene practices of Tanzanians. Due to the high reported rates of gingivitis in children (Kerosuo *et al.*, 1986) more research is needed in this area.

Health impacts of hygiene and sanitation

Despite infections like dengue fever, yellow fever, polio and hepatitis being present in Tanzania there was no literature identified within a Tanzanian context that linked these infections with environmental conditions. The literature search terms (Annex 2) specifically covered these viral pathogens and therefore this review reveals a knowledge gap that needs to be addressed. Knowledge of the links between enteric and mosquito borne viruses are important in order to tailor sanitation and hygiene programmes and projects to help prevent them.

Recommendations on how to improve sanitation and hygiene in Tanzania

Coordinated response

It is proposed that the Tanzanian Government adopt a network approach to provision of services, whereby government at all levels collaborates with private partners, businesses, NGOs and communities, to provide services (Oosterveer, 2009). This interaction is also referred to as tripartite partnerships between government, private sector and civil society (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007). There are risks to this approach, including a lack of legitimacy and the constant need for negotiation (Oosterveer, 2009). The government will need to provide regulation and capacity for law enforcement for the private sector (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007). However, the benefits of bottom up participation and actual service provision make it a more acceptable model for Tanzania (Oosterveer, 2009). Examples of this in action are the collaboration with private pit latrine emptying businesses and community waste collection businesses to provide services to informal settlements and the Community Managed Upgrading project in Hanna Nassif in Dar es Salaam (UN HABITAT, 2010).

Government

Responsibilities: At present the Tanzanian Government's public service capacity is weak and, despite pressure, the Government has been unable to provide urban sanitation and solid waste services (Oosterveer, 2009). There is also a consistent transfer of responsibility from central to local and municipal level (Montgomery, 2008), which can result in disjointed policy implementation and action as local government might not have the capacity to fulfil their responsibilities (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007). There needs to be clear roles and responsibilities for ministries, along with a national monitoring and evaluation framework (including national definitions) and database (MoHSW, 2011).

Policy and regulation: The current draft National Sanitation and Hygiene Policy needs to be finalised and operationalised (World Bank *et al.*, 2011). This national sanitation policy will need clear regulations, definitions of adequate sanitation and frameworks to be effective (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007; Chaggu, 2009; World Bank *et al.*, 2011). The allocation of funds from the PMO - RALG to the Local Government Areas (LGA) to implement sanitation programmes and systems is more likely to ensure that the sanitation budget is actually spent in the communities (Ndgendo, 2012). However, research has shown that if LGAs are not regulated and monitored services will not been adequately provided (WaterAid, 2011).

Policy objectives need to prioritise the poorest Tanzanians who have the most inadequate sanitation. Specifically, this means that sanitation services for informal urban settlements should be prioritised over sewerage network expansion in formal areas of the city (World Bank *et al.*, 2011). Further, it means promotion of hygiene activities that will reach the poorest who do not have regular access to mass media (MoHSW, 2011).

Monitoring and surveillance: There is a need to improve monitoring and surveillance systems in line with international best practice so that the outcome of sanitation improvements can be monitored and evaluated effectively (World Bank *et al.*, 2011). Mapping of informal communities is also necessary to enable understanding of the scale of the problem. In Dar es Salaam informal community mapping for water and sanitation was successfully carried out by selected and trained community members in five 'streets' (Glöckner *et al.*, 2004). The data collected about housing density and sanitation are very useful tools for future planning of appropriate sanitaiton systems (Glöckner *et al.*, 2004). In addition, with allocated housing lots and addresses, surveys and enforcements of sanitation policy and regulations are more feasible (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007).

Financing: It is recognized that investment in sanitation by the government has been well below what is required to provide adequate sanitation services (Cox, 2011). In Dar es Salaam a recent evaluation found that 99 per cent of government funds were spent on sewerage, which services less than 10 per cent of the city (Tremolet and Binder, 2013). As a consequence 70 per cent of the city disposes untreated faecal sludge from onsite sanitation into the environment (Tremolet and Binder, 2013). There is a need for increased funding for sanitation and hygiene infrastructure but also operation and maintenance (MoHSW, 2011). It is recommended by the African Ministers' Council on Water that a minimum of 5 per cent of government revenue is needed to be invested in water and sanitation in order to meet coverage targets (World Bank *et al.*, 2011). Additionally, the economic benefits of investing in sanitation and hygiene need to be quantified and leveraged to secure funding for the sector.
Donors and multilateral agencies

Interventions need to complement and work with existing national policies in order to facilitate scaling up (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007). Capacity building at all levels needs to involve people in all levels of planning, operation and management of systems (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007).

Improvements in the monitoring indicators for the Joint Monitoring Programme are needed (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007). Clear consensus on the definitions of improved sanitation is needed from multi-lateral agencies. Shared latrines should be promoted as a means to gain access to sanitation for the poor; work surveys in Dar es Salaam and Ifakara revealed no difference in the hygiene of private or shared facilities (Exley, 2011). The WHO/UNICEF JMP does not classify shared facilities as improved, but research findings suggest this should be reviewed as a means for the poor to gain access to sanitation (Exley, 2011).

Non-governmental organisations

The role of NGOs, both local and international, should be in capacity building for the public sector and also in fulfilling service provision (Chaggu, 2009). Also, NGOs should continue to play an important role in raising sanitation on the agenda, both through national politics and on an international level (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007; WaterAid, 2011). Further, they can assist in monitoring, evaluating and ensuring the accountability of government and multi-lateral programmes (WaterAid, 2011). The continued expansion and strengthening of multi-stakeholder alliances and networks is needed (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007) such as the TaWaSa and the National WASH Coalition. Finally, NGOs are well placed to further develop and implement social marketing strategies for sanitation and hygiene (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007).

Community-based organisations

CBOs have an important role in voicing the concerns of the people regarding sanitation and hygiene and demanding more from the government (WaterAid, 2011). CBOs can play a role in service provision but will not start without adequate support or without the right conditions with respect to Government, NGO assistance and financial support and incentives (Dill, 2010). CBOs, along with NGOs, are also well placed to further develop and implement social marketing strategies for sanitation and hygiene (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007).

Private sector

Through developing business opportunities such as latrine construction, solid waste removal and pit latrine de-sludging, the commercial sector can develop to provide the necessary sanitation services (MoHSW, 2011). However, local micro-finance institutions need to be developed to assist local businesses in getting established in the sanitation and hygiene sector (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007).

Improving sanitation

For a sanitation programme to be sustainable in East Africa it needs to have three things: effective community demand, local financing and cost recovery and dynamic operation and maintenance (Montgomery *et al.*, 2009). It is recommended that all actors involved in designing sanitation programmes or services include these three criteria to ensure that the programmes actually result in health gains and development (Montgomery *et al.*, 2009). Capacity building is particularly important for the maintenance and ongoing sustainability of sanitation systems (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007).

As people's knowledge of latrines is generally gathered from observation of what is presently in use, the construction of demonstration improved latrines such as anaerobic digesters and ecological sanitation toilets would be a good awareness tool (Chaggu *et al.*, 2002). Further, the marketing of sanitation is an effective tool - when the messages are clear and the means of delivery accepted - and should be employed further (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007).

Latrine construction

Masons and providers need to be trained on the construction of non-leaching pit latrines (Mgana, 2012). Latrines should be constructed for faecal waste only (not water from bathing and other solid waste) and emptied regularly (Mgana, 2012). Pit latrines should be built with concrete floors and positioned in the sun to limit helminth transmission (Baker, 2010).

Further, having a latrine super-structure with a roof is recommended to reduce the number of flies breeding in the latrine and the associated risks of disease transmission (Knudson, 2011). Further, these types of latrines should be regulated (Mgana, 2012).

Focus groups with community members from 197 informal settlements in Dar es Salaam reveal that there is large community demand for public latrines (SDI and CCI, 2009). The public latrines were seen by the community as a good option for those households without a latrine and also for those areas where the high water table meant that the construction of pit latrines was not feasible because they filled too quickly (SDI and CCI, 2009). In high density informal settlements, shared sanitation facilities should be promoted (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007).

Latrine de-sludging

Pit latrines are a reality within urban areas and there need to be clear policies on their construction, emptying and places to safely dispose of sludge. Effective management of faecal sludge is a problem that requires significant resources. It is estimated that each pit latrine receives 0.48 m^3 per year of faecal waste (Chaggu *et al.*, 2002). In a city the size of Dar es Salaam, 254 000 m^3 of sludge needs to be disposed of per year (Chaggu *et al.*, 2002). Effective disposal sites and education about when and how to de-sludge are vital.

Locations for dumpling sludge that are environmentally safe, affordable and accessible need to be maintained and expanded in order to facilitate sustainable sludge management practices (EWAREMA Consult, 2010). At community or Ward level there needs to be decentralised faecal sludge treatment systems (Mgana, 2012). Furthermore, decentralised collection points for faecal sludge and mobile transfer stations need to established within communities to facilitate sludge removal using manual techniques and motorbike tricycles from informal settlements (EWAREMA Consult, 2010). The Municipal Councils and Street Government need to assist in regulating private pit emptying businesses and enforcing penalties for illegal dumping (EWAREMA Consult, 2010).

Financing

Current financing for sanitation in urban areas is insufficient, with an estimated 40 per cent of the per capita cost of sanitation (US$ 52) not met by investment (household, domestic or international) (World Bank *et al.*, 2011). However, due to capacity restrictions, resulting in budget under spending, increasing funding without first increasing the ability to supply sanitation services is futile (World Bank *et al.*, 2011). There needs to be targeted development and public funding towards the low income areas of urban settlements (Chaggu, 2009; Pauschert *et al.*, 2012). Further, tariffs must be raised for public sewerage provision to make it cost effective to service the poor (Pauschert *et al.*, 2012). The urban poor have the capacity to be a profitable customer base for public service providers, as they are presently paying up to 13 times more than middle or high income households for service provision via informal providers (Pauschert *et al.*, 2012).

Loans and latrine construction funds should be available for the community (Chaggu *et al.*, 2002). Also micro-finance for the commencement of pit empyting businesses, including training of operators, is needed to foster business creation (EWAREMA Consult, 2010).

Public-private partnership where the cost of services is partly regulated by the government could improve and enhance sustainable sludge removal businesses (EWAREMA Consult, 2010).

To increase rural sanitation coverage it is assumed that the community and external funding will contribute 100 per cent to the costs of low cost sanitation technology which means that sufficient finance is present for rural sanitation (World Bank *et al.*, 2011; World Bank *et al.*, 2011). This needs to be led by a national effective approach to promote sanitation in rural areas (World Bank *et al.*, 2011).

Specific institutions or groups

Schools: There is insufficient government funding for school sanitation and hygiene infrastructure and no funding for on-going operation or maintenance (Stichting Nederlandse Vrijwilligers *et al.*, 2011). The schools have to rely on raising capital from the communities with mixed results and there is little support or understanding of maintaining sanitation and hygiene within the schools (Stichting Nederlandse Vrijwilligers *et al.*, 2011). Sanitation and hygiene within school needs to be a government priority. School children learn quickly and should be the focus for marketing of sanitation messages (Gesellschaft für Internationale Zusammenarbeit *et al.*, 2007).

Drainage

Drains need to be maintained and better designed in urban areas in order to reduce mosquito breeding sites and reduce flooding. Training of local government and resources needs to be made available to construct and maintain drains. There also needs to be greater synergy between the National Malaria Control Programme and the National Lymphatic Filariasis Elimination Programme (Castro *et al.*, 2010). Government commitment, community education, resources for drain maintenance and collaboration between involved sectors are all required. (Castro *et al.*, 2009).

Improving hygiene

Providing sufficient quantities of safe water combined with Tanzanian tailored effective hygiene promotion will facilitate adequate hygiene adoption. One possible option for effective hygiene promotion with a potential revenue source for the people tasked with community engagement could be through the sale of soap or water treatment tablets as a means to make an income from the process (Coombes and Paynter, 2011).

Effective public service of drinking water in low income areas would mean that people had sufficient clean water for hygiene. If the public service traffics for drinking water were raised from 500 TZS/m^3 to 1500 TZS/m^3 on average this would only be 23 per cent of the price being charged by informal private water vendors (Pauschert *et al.*, 2012). For low income families the cost of public service connection is often prohibitive and hence loans, installment payments or subsidies for these fees need to be put in place (Pauschert *et al.*, 2012). Also it is recommended that people use a separate room for bathing as a good hygiene practice (Chaggu *et al.*, 2002).

Impacts of climate change

Climate chance impacts need to be kept in mind when looking at solutions in the sector. Precipitation changes may see a larger number of droughts in the country and changed precipitation patterns place a larger burden on women who have to travel further or wait longer to collect water (Waititu, 2009). Also increases in temperature will result in changed infection patterns. It is estimated that risk ratio of cholera infection will increase in Tanzania from between 23 - 51 per cent for each 1 ºC increase in annual mean temperatures (Trærup *et al.*, 2010).

Conclusions

Improvements in Tanzania in sanitation and hygiene are needed to meet the MDG and interim Tanzanian Government targets. Providing adequate sanitation and hygiene will be effective in reducing the current associated morbidity and mortality. A number of projects and programmes have been implemented or are currently being implemented in Tanzania. In large these programmes have failed to achieve scale and impact in both rural and urban areas. It is important to learn from the findings of past projects and programmes and adopt that knowledge into effective programmes for the future. A participatory approach is needed between all the stakeholders; government, NGOs, donors, multilateral organisations, CBOs and the commercial sector. The Tanzanian government needs to be central in a participatory approach, providing suitable policy and regulation. With a coordinated response and a change in direction, Tanzania can adapt to the confounding challenges of population growth, urbanisation and climate change to improve the populations' health through adequate sanitation and hygiene provision. Population growth and rapid urbanisation are confounding factors in this failure to meet this MDG.

Figure 5. Improved sanitation – ecological sanitation with a double vault to compost sludge and urine diversion

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Annexes

Annexes

Annex 1. Main actors in sanitation and hygiene in Tanzania

Type	Department/ Organisation	Specific programmes/responsibilities^	Location of head office in Tanzania	Reference
Government	Local Government Authorities (LGA)	- Water Sector Development Programme (WSDP) - Implementation of policies and programmes	All regions	
	Ministry of Education and Vocational Training (MoEVT)	- School WASH	Dar es Salaam	
	Ministry of Health and Social Welfare (MoHSW)	- National Environmental Health, Hygiene and Sanitation Strategy (NEHHASS) - Monitoring LGA	Dar es Salaam	(MoHSW, 2011)
	Ministry of Water and Irrigation (MoWI)	- WSDP - Monitoring LGA	Dar es Salaam	
	Prime Ministers Office - Regional Administration and Local Governments (PMO - RALG)	- WSDP - Supervise and monitor LGA and private sector	Dar es Salaam	
Donors and multi-lateral agencies	African Development Bank (ADB)	- WSDP - Zanzibar Urban Water Supply and Sanitation Project - Lake Victoria Water Supply and	Dar es Salaam	(African Development Bank, 2011)

	Sanitation Programme		
Agence Française de Développement (French Development Agency) (AFD)	- WSDP	-	(French Embassy Tanzania, 2013)
Belgian Directorate-Generale for Development Co-Operation (DGDC)	- Local Government Development Grant Scheme (water and sanitation)	-	(Belgian Directorate-Generale for Development Cooperation, 2010)
Danish International Development Agency (DANIDA)	- Wastewater treatment research - Informal settlement upgrading - Agenda for Environment and Responsible Development (AGENDA)	-	(Yhdego, 1992) (United Nations Human Settlements Programme (UN HABITAT) *et al.*, 2010)
Kreditanstalt fur Wiederaufbau (Germany Bank for Reconstruction) (KfW)	- WSDP	-	(MoHSW, 2011)
Millennium Challenge Corporation (MCC)	- Tanzania Compact - DAWASA efficiency	-	(MCC, 2013)
United Kingdom Department for International Development (DFID)	- WSDP - Sanitation and Hygiene Applied Research for Equity (SHARE)	-	(SHARE, 2012)
United Nations (UN HABITAT)	- Dar es Salaam informal settlement upgrading	-	(UN HABITAT *et al.*, 2010)
United Nations Children's Fund (UNICEF)	- School WASH - Joint Monitoring Programme (JMP)	Dar es Salaam	(Stichting Nederlandse Vrijwilligers *et al.*, 2011)
United States Aid (USAID)	- East African Community Regional Development - water and sanitation	Dar es Salaam	(United States Aid, 2013)
World Bank (WB)	- Dar es Salaam Water Supply and Sanitation Programme (DWSSP) - Water and Sanitation Programme (WSP)	Dar es Salaam	(World Bank, 2011) (Hooks, 2008)
World Health Organisation (WHO)	- WSDP - Joint Monitoring Programme (JMP)	Dar es	(World Health Organisation and United Nations Children's

			Salaam	Fund, 2006)
International NGOs	ACRA cooperiamp lo sviluppo	- Water supply protection and capacity building	Njombe and Dar es Salaam	(ACRA, 2013)
	African Medical Research Foundation (AMREF)	- National Strategy for Growth and Poverty Reduction (MKUKUTA)	Dar es Salaam	(AMREF, 2013)
	Bremen Overseas Research and Development Association (BORDA)	- School WASH	Dar es Salaam	(Bremen Overseas Research and Development Association, 2013)
	Care International	- Tanzania Integrated Water, Sanitation and Hygiene Programme (iWASH)	Dar es Salaam	(Care International, 2013)
	Concern	- Water, Sanitation and Hygiene Programme	Dar es Salaam	(Concern, 2012)
	Gesellschaft für Internationale Zusammenarbeit (German Development Organisation) (GIZ)	- Urban sanitation	Dar es Salaam	(Pauschert *et al.*, 2012)
	LVIA solidarietà e cooperazione internazionale	- Water, Sanitation and Hygiene programme	Kongwa	(LVIA, 2013)
	Oxfam	- Refugees - Water supply for Maasai	Dar es Salaam	(Oxfam, 2012)
	Plan International	- Child focused sanitation programme	Dar es Salaam	(Plan International, 2013)
	Stichting Nederlandse Vrijwilligers (SNV) (Netherlands Development Agency)	- School WASH	Morogoro	(Stichting Nederlandse Vrijwilligers *et al.*, 2009)
	Swedish International Development Corporation Agency (SIDA)	- Health through Sanitation and Water Programme (HESAWA)	-	(Tufvesson *et al.*, 2005)
	WaterAid	- Sanitation to Scale (Gulper and Mtumba approaches) - Tawasanet	Dar es Salaam	(WaterAid, 2011)

		- SHARE		
Foundations	Aga Khan Foundation	- Raha Leo community health programme, Zanzibar	Dar es Salaam	(Aga Khan Foundation, 2007)
	Ford Foundation	- Dar es Salaam informal settlement up-grading	-	(UN HABITAT, 2010)
	Gates Foundation	- Community-Led Total Sanitation, Water Sanitation Programme	-	(Hooks, 2008)
	The Body Shop Foundation	- Health Actions Promotions Association (HAPA) - Maji na Maendeleo Dodoma (MAMADO)	-	(Body Shop Foundation, 2013)
	The Stone Family Foundation	- Gulper pit latrine emptying business model	-	(Cox, 2011)
Networks	Tanzania Water and Sanitation Network (TaWaSa)	- Coordination and policy making	Morogoro	(WaterAid, 2011)
	National WASH coalition	- Sanitation and hygiene promotion	Dar es Salaam	(Water Supply and Sanitation Collaborative Council, 2013)
Research institutions	Ardhi University (ARU)	- Sanitation research	Dar es Salaam	(Chaggu, 2009)
	London School of Hygiene and Tropical Medicine (LSHTM)	- Gulper pit latrine emptying- - Helminths association with pit latrines	-	(Mgana, 2012)
	SHARE	- Sanitation markets - Latrine hygiene	-	(SHARE, 2012)
	Swiss Tropical and Public Health Institute	- MSABI	-	(MSABI, 2011)
	University of Dar es Salaam	- Wastewater treatment research - Joint Environment Management Action (JEMA)	Dar es Salaam	(Yhdego, 1992)
Local NGOs	Agenda for Environment and	- Wastewater treatment	Dar es	(Agenda for Environment and

Responsible Development (AGENDA)		Salaam	Responsible Development, 2013)
Agriculture, Water & Sanitation Education Training & Environment Conservation (AWSETEC)	*	-	(Chaggu, 2009)
Community Based Health Care Council (CBHCC)	- Concern Water, Sanitation and Hygiene Programme - Water and sanitation development programme	Arusha	(Community Based Health Care Council, 2013)
Community Environmental Management and Development Organisation (CEMDO)	- Water and programme	Ulanga	(Community Environmental Management and Development Organisation, 2010)
Environmental Engineering and Pollution Control Organisation (EEPCO)	- School WASH - Sanitation and solid waste		(Environmental Engineering and Pollution Control Organisation, 2013)
The Desk and Chair Foundation (TDCF)	- School WASH	Mwanza	(TDCF, 2013)
Health Actions Promotion Association (HAPA)	- School WASH - Sanitation facilities	Singida	(HAPA, 2013)
Indigo Women Links	*	Kilimanjaro	(Tanzania Water and Sanitation Network, 2012)
Joint Environment Management Action (JEMA)	- Waste management		(University of Dar es Salaam, 2013)
Maji Safi kwa Afya Bora Ifakara (MSABI)	- Integrated WASH programme	Ifakara	(MSABI, 2011)
Maji na Maendeleo Dodoma (MAMADO)	- Sanitation and health education	Dodoma	(Body Shop Foundation, 2013)
Sanitation and Water Action (SAWA)	- Sanitation and hygiene	Dar es Salaam	(Water for All, 2013)
Southern Highlands Participatory	- Sanitation and hygiene programme	Njombe	(Southern Highlands

	Organisation (SHIPO)			Participatory Organisation, 2013)
	TAKA NGUMU Group	*	-	(Chaggu, 2009)
	Tanzania Environment and Sanitation Conservators (TESCO)	- Environmental sanitation	Morogoro	(Chaggu, 2009)
	Tanzania Water & Environmental Sanitation (TWESA)	- Concern Water, Sanitation and Hygiene Programme	Dar es Salaam	(Concern, 2012)
	Victoria Environmental and Fishery Development Association (VEFDA)	- Environmental sanitation	Mwanza	(Chaggu, 2009)
	Water and Sanitation for Community Development (WASACODE)	- Environmental sanitation	Morogoro	(Tanzania Water and Sanitation Network, 2012)
Faith Based Organisations	Tanganyika Christian Refugee Service (TCRS)	- Concern Water, Sanitation and Hygiene Programme - Sanitation for refugees	Dar es Salaam	(Tanganyika Christian Refugee Service, 2013)
	World Vision (WV)	- Water Supply for Maasai		(World Vision, 2013)

* Programmes undertaken could not be identified in the literature and more research is needed to locate this information

^ Examples of current programmes and not an exhaustive list

Annex 2. Literature review search terms

Topic	Search terms
Sanitation	sanit$, latrine$, toilet$, ecosan, bathroom$, f?ece$, f?ecal, excreta, waste, refuse, disposal, management, collection, contamination, treatment, sewage, sewer$, sewerage, drainage
Hygiene	hygien$, food, domestic, personal, education, promotion, behaviour, soap, handwashing, hand washing, water, storage, treatment, filter, contamination
Diseases	f?ecal, coliform$, bacteria;, microbiological, viral, diarrh?ea?, intestinal, enteric, gastro-enteric, protozoa$, diarrhea, dysentery, parasitic diseases, campylobacter, helicobacter, legionellos$, vibrio, cholera, Escherichia, salmonell$, shigell$, campylobacter infections, enterobacteriaceae infections, helicobacter infections, legionellosis, vibrio infections, Escherichia coli infections, salmonella infections, enterovirus, enteric virus, poliovirus, rotavirus, norovirus, norwolk-like virus, hepatitis, virus diseases, ascaris, trichuris, hookworm, roundworm, whipworm, nematode$, protozoa$, giardia, geohelminth$, soil-transmitted helminth$, worm$, cryptosporid$, helminth$, entamoeba, am?ebiasis, isospora, cyclospora, microspora, blastocystis, balantidium, dientamoeba, helminthiasis, intestinal diseases, parasitic, protozoan infections, Arsenic Poisoning, arsenic or arsenicosis, Schistosomiasis, schistosoma, schistosomiasis, schistosome, trachom*, Trachoma
Geography	Tanzania

Annex 3. Semi-structured interview questions

1. What is your current position and role?

2. For how long have you worked in the WASH sector in Tanzania?

3. What programmes is your organisation currently implementing in Tanzania?

4. In your experience what do we need to do to improve sanitation in:
    a. Urban areas;
    b. Rural areas; and
    c. Specific groups (schools, hospitals, refugee camps, tribal groups)?

5. In your experience what do we need to do to improve hygiene in:
    a. Urban areas;
    b. Rural areas; and
    c. Specific groups (schools, hospitals, refugee camps, tribal groups)?

6. What do you view as the roles and responsibilities of the following groups in implementation of suggested solutions:
    a. Government;
    b. International NGOs;
    c. Local NGOs; and
    d. Communities?

7. With regards to sanitation, from your own experience, what information/ research is need to find better solutions?

8. With regards to hygiene, from your own experience, what information/research is need to find better solutions?

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