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Sustainable Rural Sanitation in Sub-Saharan Africa –
An essential contribution to reaching the MDGs and formulating the SDGs for the post 2015 development agenda?

Seminararbeit

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Index

Abbreviations

CLTS	Community led total sanitation
DRA	Demand Responsive Approach
EcoSan	Ecological Sanitation
MDGs	Millennium Development Goals
ODF	Open Defecation Free ´
PRSPs	Poverty Reduction Strategy Papers
SSA	Sub Saharan Africa
VRWSSP	Volta Rural Water Supply and Sanitation Project
WASH	Water, Sanitation and Hygiene

Tables

Figures

1 Introduction

The year 2005 marked the beginning of the "International Decade for Action: Water for Life" and renewed the effort to reach the Millennium Development Goal (MDG) number 7 Target 10, which is to half the world's population without sustainable access to safe drinking water and sanitation by 2015 (Jewitt 2011a). According to Arku (2010, et al. 2013) and Cumming (2009) Target 10 concerning water issues has mostly been reached, while the sanitation issue for the most part remained and remains unsolved[1]. This constitutes a tremendous problem, because simple as it is, poor sanitation leads not only to water contamination but also to the transmission of preventable diseases, consequently leading to economic and social losses as well as ecological pollution (Jewitt 2011; Moe & Rheingans 2006). The United Nations (2008) state, that without "improving sanitation, none of the other Millennium Development Goals, to which the world has committed itself, will be achieved" (United Nations 2008). Notwithstanding the political declarations for the improvement of sanitation coverage, it is estimated that the real sanitation coverage in 2015 will be short by 580 Million people threatening to fail Target No. 10 (WHO 2012, p.3). Naturally figures differ according to source, but it is estimated that in total between 2.1 and 2.6 billion people worldwide lack access to improved basic sanitation facilities[2] (Arku et al. 2013; Bartram et al. 2005; Moe & Rheingans 2006; WHO & UNICEF 2013). Most of the affected people are living in Asia (75%) and Sub-Saharan Africa (SSA)(18%)(BORDA 2014), where sanitation coverage in rural areas is far less progressed than in urban areas (Esrey et al. 2001; Massoud et al. 2009; Mehta 2011; WHO 2012). One reason for this is, that despite the fact that knowledge of linkages between sanitation and public health is not new at all[3], its effects on development initiatives in the international development cooperation and in national development strategies, however, are still widely being ignored and development initiatives are furthermore mainly focusing on water issues (Arku 2010; Bartram et al. 2005; Cumming 2009; Jewitt 2011b; Mehta 2011). Target number 10 consequently remains the most neglected MDG target of all (Aertgeerts 2009; Cumming 2009; Jewitt 2011a; Mehta 2011).

The interest of rural geography in this particular field is twofold. On the one hand it shows the negative effects of poor sanitation on economic, ecologic, and social development in rural areas of the Global South depending on the respective socio-cultural and socio-economic background (Jewitt 2011a). On the other hand it elaborates sustainable opportunities of improved sanitation in rural areas for solving these issues and their interconnectedness with

[1] Jewitt (2011a) notes that MDG Goal 7 Target No. 10 concerning sanitation has only been added after lobbying at the World Summit on Sustainable Development in Johannesburg in 2002.
[2] See Glossar: Improved Basic Sanitation Facilities
[3] The connection between sanitation and improved public health has firstly been discovered by Aristotle and was being rediscovered in the modern age in England approximately 150 years ago (Bartram et al. 2005).

overall national and international development policy and goals- e.g. the MDGs. The working questions for this paper are:

- Which are the most important factors and determinants for sustainable rural sanitation in SSA and why?
- Which contribution does improved rural sanitation (MDG No 7 Target No.10 Indicator 31) entail for other MDG targets and what can be inferred from this concerning its importance?
- What do these findings imply for the formulation of the SDGs in the post 2015 development agenda?

This paper is structured in four main parts. The first part gives an introduction and entails an overview of geographical literature on sanitation particularly in rural areas of the Global South. A worldwide scale of access to appropriate sanitation shows the hot spots of unsatisfactory sanitation coverage. The second part describes factors and determinants of sustainable rural sanitations and their importance for successful and sustainable implementation. Part three further elaborates on the relationship between the neglect and improvement of sanitation in rural areas of SSA and its possible hazards and contributions to the overall achievement of the MDGs. Part four summarizes and discusses the findings, draws a conclusion and subsequently elaborates a short outlook on possible future research questions in the field of rural geography, which will be interesting for the upcoming post 2015 sustainable development agenda. The overall aim of this paper is to indicate the importance of rural sanitation for the elaboration of the SDGs which will be pivotal for the next decade of development cooperation beyond 2015.

1.1 Geographical Literature on Rural Sanitation

Geographical research literature on rural sanitation in the Global South is sparse. There is some literature from the urban and peri-urban context (Gandy 2004, 2005; Krantz 2006; Paterson et al. 2007; Swyngedouw et al. 2002; Swyngedouw 2004, 2006), and some research indicates, that there is a great need for more place and cultural-sensitive participatory approaches that focus on the specific social, economic, ecological and political needs of the respective community in dealing with human excreta (O'Hara et al. 2007; Gandy 2008; McFarlane 2008a, 2008b). Concerning rural areas there are but few scholars who are concerned with this topic. Jewitt's (2011a) paper on "Geographies of Shit: Spatial and temporal variations in attitudes towards human waste" deals with the distribution and differences of taboos surrounding human waste and their consequences in access to, and quality of sanitation facilities as well as the economical, ecological and health wise concomitants. This paper does not directly focus on rural environments, though it mentions some individual cases from India. Jewitt's (2011b) article "Poo gurus? Researching the threats and opportunities presented by human waste", mainly focusses on the threats and

possibilities human excreta offers for different settings, including rural areas. It elaborates the potentials of Ecological Sanitation (EcoSan) and biogas technologies and the socio-cultural requirements, meaning a cultural revolution towards accepting human excreta as a valuable resource. Jewitt (2011b) asks, if "more applied geographical research on this topic could help to achieve such a cultural revolution?" (Jewitt 2011b, p. 765). Geographically, both articles focus on the Asian, particularly the Indian, context. Also, exploring the potentials of EcoSan, Hannon & Andersson (2001) focus on gender aspects of sanitation in rural and urban areas of the Global South. Eric Gutierrez's (2007) field note on "Delivering pro-poor water and sanitation services: The technical and political challenges in Malawi and Zambia" is the only article found, which is set in a rural SSA context. It scrutinizes the political and technical challenges that both countries are facing and elaborates on certain suggestions for amelioration and improvement towards meeting the MDGs via their adopted *Poverty Reduction Strategy Papers*[4] (PRSPs). Paterson et al. (2007) in addition focus on pro-poor sanitation facilities and the obstacles these technical solutions are facing in development efforts. The article, however focusses mainly on in the peri-urban context of the Global South, but nevertheless also explores the potential of improved on-site sanitation in rural areas. Ben Campkin's and Rosie Cox's (2008) book "Dirt: New geographies of Cleanliness and Contamination" is the only compilation of articles concerning "dirt" and in parts sanitation in a geographical reference book. However, it mainly focusses on socio-anthropological aspects of human behavior concerning cleaning practices and only refers to sanitation aspects in small parts. Rural sanitation moreover is left out completely, as the only two articles focusing on sanitation concern urban regions. Other than this no further geographical literature could be obtained, and most of the sources used for this paper stem from more or less related disciplines.

1.2 A Worldwide Scale of Access to Sanitation

In the Global North access to improved sanitation facilities and water is believed to be an ordinary good; its provision is seen as a given and is mostly not questioned at all. In the Global South, on the contrary, there are about 3900 children[5] dying every day from the effects of poor sanitation, lack of fresh drinking water and bad hygiene conditions (Bartram et.al 2005). Even though some parts of the Global South are making substantial progress in achieving Target No.10, others like SSA and South Asia (India) and their rural regions are way behind the set goals (see Fig. 1 & Fig. 2) (Moe & Rheingans 2006). Additionally Massoud et al. (2009) indicates that significant progress has been made in urban areas with rural areas lagging far behind. In SSA and South Asia where the majority of people still live in

[4] See Glossar: PRSPs
[5] According to Moe & Rheingans (2006) there are 4000- 6000 children dying on a daily basis due to lack of adequate sanitation, clean water and bad hygiene. The same number gives Mehta (2011, p.1).

rural areas, four out of ten people do not have access to adequate basic or improved sanitation (Moe & Rheingans 2006; Paterson et al. 2006; WHO & UNICEF 2013). “For example, while only about 25% of India’s rural residents lacked access to clean water, as many as 75% did not have access to sanitary latrines.(Arku 2010, p.168).” According to Cumming (2009, p.8) Target No.10 will not be reached if continued at current rates (he wrote his paper in 2009) and in SSA it is estimated to take until 2076 for Target No.10 to be fulfilled (Cumming 2009, p.10). Looking at the African continent in order to identify sanitation improvement hot spots the progress of coverage has to be differentiated. According to the WHO (2014a) and WHO & UNICEF (2013) the Northern African countries have made substantial progress in sanitation coverage while improved sanitation, unimproved sanitation and open defecation urban regions in SSA remained at almost the same level in 2011 as they were in 1990 (see. fig 1 and fig. 3). In reference to the overall population, Sah & Negussie (2009, p. 666) furthermore state that the number of people without sanitation in SSA has as increased by over 30% from 1990 to 2004. The sanitation coverage in rural regions of SSA is substantially lower than in urban regions, but nevertheless has increased its share of improved sanitation facilities from 19% in 1990 to about 24% in 2011 (see table 1 & fig. 2). Nevertheless open defecation continues to be prevalent in rural SSA with a rate of 35 % in 2011 (see table 1 & fig. 2).

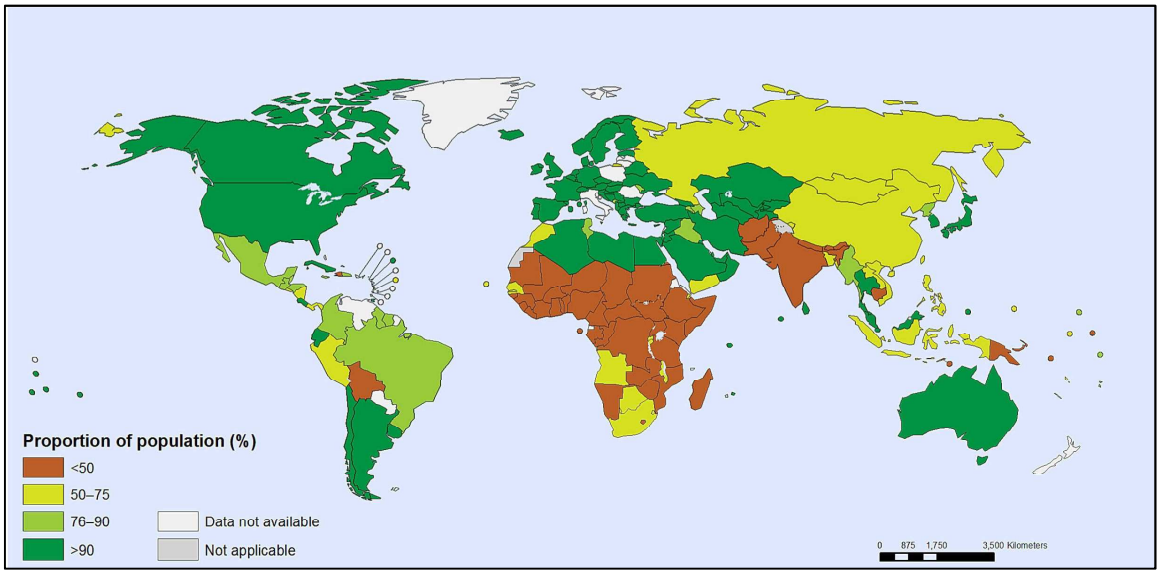

Figure 1: Proportion of Population using improved Sanitation Facilities in 2011. Source: WHO (2014a).

Table 1: Use of Sanitation Facilities of Rural Population in SSA. Source: WHO & UNICEF (2013).

Use of Sanitation Facilities (SF) of Rural Population in Sub Saharan Africa (%)					
Year	Share of Rural Population in %	Improved SF	Shared SF	Unimproved SF	Open Defecation
1990	72	19	8	27	46
2000	68	20	9	28	43
2011	63	24	11	29	36

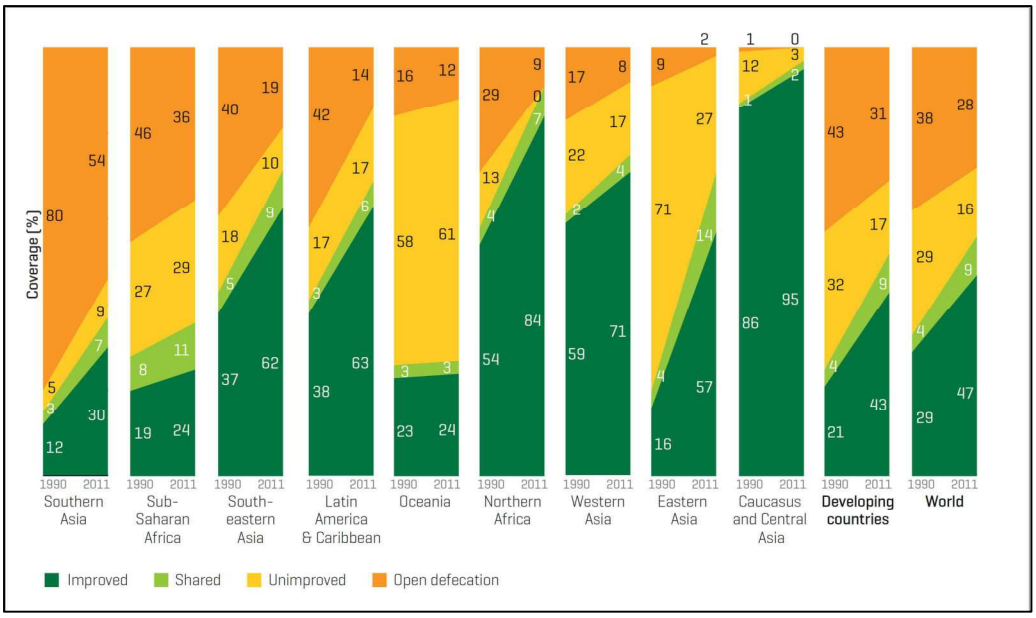

Figure 2: Trends in Rural Sanitation Coverage by Developing Regions and the World between 1990 and 2011. Source: WHO & UNICEF (2013), p. 36.

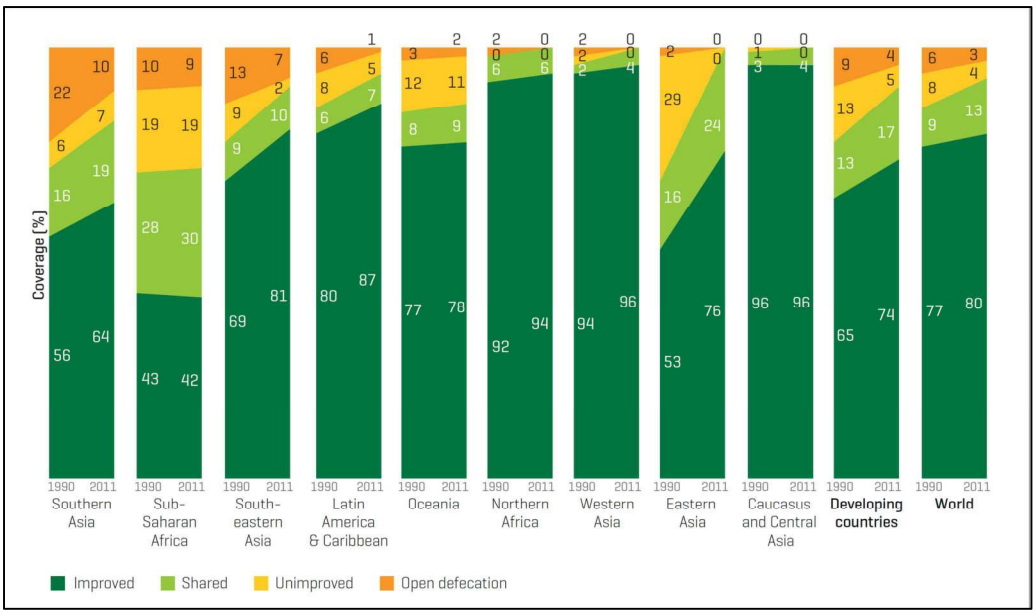

Figure 3: Trends in Urban Sanitation Coverage by Developing Regions and the World between 1990 and 2011. Source: WHO & UNICEF (2013), p. 36.

It needs to be mentioned that all numbers presented in this papers, must be considered as a guideline. As Gutierrez (2007) illustrates via the examples of Zambia and Malawi, all figures, especially if aggregated, are mostly based on projections and the quality of their indicators is essential for their validity. Depending on their source, numbers can differ substantially and therefore could give way to a wrong perception of the situation leading to false implications for political decisions concerning development initiatives (Gutierrez 2007).

Notwithstanding the argument that due to the massive urbanization rates in SSA, sanitation in its urban context might be the more pressing issue (Murphy et al. 2009); this paper will

focus on the rural regions of SSA for several reasons. First of all, there are specific technical and socio-economic, as well as ecological limitations for rural areas that make them especially accessible for alternative technical and participatory approaches and preclude conventional solutions (Massoud et al. 2009). Secondly, will rural behavioral norms concerning defecation practices of rural-urban migrants not only affect the environment and facilities of urban regions, but even more importantly will improved sanitation facilities combined with pro-poor and ecological sanitation technologies offer many more opportunities on health, food security and income for the rural population let alone contribute potentials to meet several other MDGs and targets of the Post 2015 development agenda (Gutierrez 2007; Hannan & Andersson 2002; Jewitt 2011a, 2011b; Langergraber & Muellegger 2005; Zurbrügg & Tilley 2009). The number of people lacking adequate sanitation in rural SSA is staggering and Target No. 10 will most likely not be reached by 2015 (Cumming 2009). It is therefore, even more important to elaborate the potentials on improved sanitation, to put them on the overall development agenda and into the people's and stakeholder's mindsets in order to scale up the sanitation coverage process. The next chapter will illustrate three important determinants for sustainable rural sanitation before moving on to the relationship between sanitation and reaching the MDGs in chapter 3.

2 Factors and Determinants for Sustainable Rural Sanitation in SSA

As mentioned above sanitation is one of the, let alone, most neglected development issues worldwide (Aertgeerts 2009; Cumming 2009; Jewitt 2011a; Mehta 2011). As will be shown later, this negligence is seriously affecting the achievements of several other MDGs as well (Mehta 2011; UN 2008) and especially the SSA context shows a high degree of negligence concerning sustainable sanitation (Sah & Negussie 2009). Nevertheless, there have still been numerous initiatives to improve access to sanitation, to enhance sanitation coverage and to ban open defecation practices in order to create *Open Defecation Free* (ODF) communities in rural as well as urban areas of SSA. However, many of those initiatives did not meet their goals and subsequently often failed to operate entirely (Aertgeerts 2009; Sah & Negussie 2009). Resistance of rural population foremost stems from the reluctance of people to use non-properly maintained and smelly facilities and results in the preference of open defecation, as it is perceived to be enough open space available (Jewitt 2011a). One reason, for instance, are poor participation methods resulting in refusal of the facilities and the second concomitant factor for failing sustainability is inappropriate and too sophisticated technology which does not suit the needs of poor and extremely poor rural communities (Jewitt 2011a; Langergraber & Muellegger 2005). According to the literature, inadequate policy making and national frameworks on sanitation are the third cause for the poor sanitation status (Gutierrez, 2007; Kürschner-Pelkmann 2008; Jewitt 2011b). The following subchapters explore these three causes and will give examples for amelioration opportunities that hence have the potential to not only result in the amelioration of the results concerning Target No. 10, but also several other MDGs along with their corresponding targets.

2.1 Community Participation and Sanitation in Rural Areas

The first reason why so many already implemented sanitation projects and programs were not successful can be found in the lack of people's acceptance and ownership for the measures being undertaken (Jewitt 2011a). Sah & Negussie (2009, p.667) summarize five main problematic areas, which mostly concern participation related issues:

- Top-down interventions with superficial and poor participation methods
- Focus on sanitation coverage at the expense of improving hygiene behavioral change
- Neglect of demand-driven approaches in favor of donor/supply driven approaches
- Neglect of empowering the people to take action on their own in favor of externally funded and designed facilities, which created dependency among the people and were often technically not sustainable
- Weak sense of ownership towards facilities and low acceptance and maintenance rates

This results from poor and badly designed participation processes as well as top down rather than bottom up development approaches (Arku 2010; Mehta 2011; Sah & Negussie 2009). However, there are participatory methods and technical approaches that deliver good and sustainable results and their potentials need to be reviewed accurately and need to be incorporated into conventional participation methods (Arku 2010; Jewitt 2011a, 2011b; Paterson et al. 2007).

Hence, the following subchapter will firstly discuss the neoliberal and nowadays very common *Demand Responsive Approach* (DRA). In order to contrast this conventional approach this paper will secondly evaluate the revolutionary and newly used *Community-led Total Sanitation* (CLTS) approach for rural sanitation measures and critically analyze its potential for the sustainable implementation of sanitation improvement initiatives in rural areas.

2.1.1 The neoliberal Demand Responsive Approach

The 1980s marked the beginning of the neoliberal age (Rauch 2007; Willis & Kumar 2009) and it was during the 1990s that rural water and sanitation supply started to be driven by the neoliberal concept known as *Demand Responsive Approach* (DRA) (Arku 2010). Its innovation rooted from the Earth Summit on Sustainable Development in Rio de Janeiro in 1992 and its gist was that water and sanitation facilities should be built according to demand (Rao 2006). Meaning that to obtain such facilities relies on the ability to pay for their daily usage and is also implies that local residents and the respective institutions or government agencies will have to split the costs for construction (Arku 2010). It is assumed the implemented facilities are more sustainably used, if people have to contribute monetary wise. Arku (2010) argues that in terms of water supply this concept has been working very well and there are certain studies which prove this success. For example, the case of a study on water issues in three villages Ghana shows that the time women have to spent to collect water could drastically be reduced. This positive outcome not only affected women but also men in terms of increasing their spare time for improving the wellbeing of their households. The implemented structures are also maintained sustainably (Arku 2010). There is however a lack of literature concerning the effects of DRA on the improvement of sanitation in rural areas, which led Arku (2010) to conduct a second study concerning sanitation in two of the previous three research villages. In his study on the effects of the DRA approach in the *Volta Rural Water Supply and Sanitation Project* (VRWSSP), Arku (2010) found that in contrast to the success in water issues, there were certain factors that drastically limited the success of sanitation implementations. The first factor is traditional defecation behavior and cultural issues. In term of defecation behavior the study showed that the majority of respondents

practiced open defecation and mainly used the bush as a toilet[6]. A small minority of 5% used home latrines for defecation, so in total 95 % (226) of the respondents used facilities outside of their home. It is interesting, that despite the fact that all of the 95% (226) wished to have home or public latrines at vantage points, only 82%(194) of them were willing to contribute to their construction costs and from those only 5% (10) were willing to pay for using the toilets (Arku 2010, p. 172). When asked why, about 34% (184) of the non-willing respondents noted, that paying for a toilet is not part of their culture the other 64% said that they simply did not think they should pay each time they are using the toilet (Arku 2010, p. 172). The second factor can be seen in monetary reasons. Most of the villagers were relatively poor and did not understand why they should pay money for something that has always been free and they did not see the benefits from it either (Arku 2010).

Arku (2010) summarizes that rural residents consider access to clean water more important than access to decent sanitation facilities when those facilities are being implemented via the DRA. The conventional DRA misses certain very important issues such as cultural conformity and the issue of health education. Therefore, it is very important to elucidate people to the derogatory effects of open defecation and bad sanitation facilities via educational measures in order to encourage them to take action themselves (Arku 2010). The following chapter will present one option for an educational measure that has, according to Mehta & Movik (2011), successfully been used in several cultural contexts and could be helpful to improve the acceptance and implementation of sanitation measures in rural areas of SSA.

2.1.2 Community-let Total Sanitation in Rural Areas

The approach of CLTS has been anteceded and subsequently developed in the year 2000 by Kamal Kar, who is a development consultant from India (Mehta 2011). During an evaluation investigating the reason of the non-usage of traditionally subsidized latrines and the continuing of open defecation in rural Bangladesh, Kar and his colleagues came upon the substantial effect of alerting the community of a village to the fact that, due to the transmission of excreta to their food via flies and other insects, they are practically eating their own excreta when practicing open defecation (Kar 2011; Mehta 2011). Raising the villager's awareness to this fact gave way to this revolutionary participatory approach. The combination of scientific and emotional arguments to raise awareness among people is not new, as similar ways have been used in early twentieth century Britain by modernist hygiene reformers. However, the emotional arguments have proven to give better results (Campkin & Cox 2008). CLTS has by now been introduced to 43 countries, let alone 28 countries in SSA (Kar 2011, p.XIV) and has shown extraordinary successful results on the reduction of open defecation in the particular communities (Sah & Negussie 2009).

[6] 73% bush; 8% bus and public latrines; 6% bush and home latrines (Arku 2010, p. 171).

> "CLTS differs from earlier approaches to sanitation which prescribed high initial standards in order to reduce the costs of operation and maintenance. These involved upfront hardware subsidies in order to induce people to use the latrines and toilets. However, instead of adoption, toilets were often not used or used for other purposes like storage." (Mehta 2011, p.1f)

Many of these obtruded approaches additionally advocated toilets for individual households, which often resulted in affordability problems and non-sufficient maintenance behavior (Mehta 2011). Furthermore, the overall bad condition or even lack of adequate public waste water infrastructure resulted in the failure of the systems implemented (see chapter 2.2) (Aertgeerts 2009). CLTS on the contrary was founded on two pillars: "Total" and "Community led" (Sah & Negussie 2009, p.667). CLTS' main assumption is that a village has to be ODF (*total*) in order to minimize the adverse effects of open defecation and that partial sanitation is not enough to do so (Mehta 2011). Hence it promotes low-cost as well as low-maintenance sanitation solutions with a shift to a zero subsidy approach (Sah & Negussie 2009). CLTS also promotes that awareness raising, the persuasion to need sanitation and finally sustainable behavioral change (*community-led*) are the main key issues that subsequently lead to the implementation of appropriate, customized and hence sustainable sanitation facilities (Mehta 2011).

The process of CLTS is divided into four phases namely (1) *Pre-triggering*, (2) *Triggering*, (3) *Post-Triggering*, (4) *Scaling up and going beyond CLTS for sanitation ladder*. The *Pre-Triggering* phase includes the selection of appropriate communities and initial communications with community leaders. More remote and homogenous communities are more favorable for CLTS than peri-urban and more heterogeneous communities because they are more prone to conflicts and therefore social challenges in the process. The *Triggering* phase comprises participatory approaches in order to create a sanitation profile of the village and to lead to the ignition momentum, where the whole community realizes the unhealthy effects of their defecation behavior. The *Post-Triggering* phase involves action planning of the community and the following design and construction of sanitation facilities by local people and with local materials. The last phase of *Scaling up* is going beyond the scale of the local community, but focusses on the dissemination of CLTS and changes in policy making at national and regional level (Sah & Negussie 2009).

One significant element of the approach is to identify natural leaders who then steer the newly passionate involvement of the community members not only via the implementation of sanitation facilities but also to bring forth the development of other sustainable livelihood projects (Sah & Negussie 2009). Very important is the non-exclusive part of CLTS which constitutes that all members of the community will have to take part in the process. In very exclusive societies like e.g. India, where there are many socially and economically

marginalized people, this constitutes a great challenge (Jewitt 2011a). Also women, who in many contexts are socially and economically more vulnerable than men and are most effected by the consequences of open defecation (exposition to venomous insects in darkness, assaults and rape, menstruation) would profit the most from sanitation amelioration (Jewitt 2011a). The traditional lack of involving women in the technical design of sanitation facilities is another problem, which however will- due to the limited space- not be deeply discussed in this paper. Suffice it to say that due to their sort and load of work, women are substantially important when it comes to designing the facilities as it is them who will utilize and mostly maintain the implemented structures (Murphy et al. 2009). During the CLTS process the members of the communities will see the reasons that open defecation not only concerns some members but all and if some parts of the community are excluded from the process the others will still be affected from the adverse effects of open defecation (Mahbub 2011). Musembi Musyoki (2011) states that even though CLTS is relatively new to the SSA context, its use is spreading and it also offers enormous potentials, if culturally rightfully adapted and implemented.

2.2 Technical Approaches for Pro-Poor Sanitation in Rural Areas

In general there are four main sanitation models of excreta disposal which can be distinguished as follows: “flush and discharge”, “flush and forget”, drop and store” and “sanitize and reuse” (Jewitt 2011a; Nawab et al. 2006, p. 236). The first two models are waterborne and mostly use freshwater as carrier for feces which is then disposed into the environment- with or without treatment. Released without treatment the waste water causes serious environmental and health problems, especially for children (Jewitt 2011a; Kürschner-Pelkmann 2008). In rural SSA moreover water scarcity is, besides poverty and the lack of education as well as infrastructure, one of the major problems (Moe & Rheingans 2006). Especially for poor people living in a dry or semidry climatical context this option is not at all a sustainable solution (Nawab et al. 2006; Kürschner-Pelkmann 2008; Moe & Rheingans 2006). Hence the applicability of expensive and intensive waterborne sewerage technologies is very restricted (Moe & Rheingans 2006). However:

> “(…) government based sanitation initiatives, where they exist, often prioritize flush and discharge systems over low cost or community based systems; regardless of demand for them by potential users or their appropriateness within local socio-economic, political, cultural and geographical contexts” (Jewitt 2011a, p.623).

Additionally people, given the choice between “dry” and “wet” solutions (especially in faecophobic cultures) strongly tend to choose the water toilet, as it is also a symbol for social status (Jewitt 2011a). The third model refers to dry and flush pit latrines. It is financially more viable for poor people but it nevertheless involves the danger of groundwater contamination and additionally restrains nutrients from reentering the agro-ecological cycle. This model does not solve the problem of where to discharge the contents of the pits once they are full.

Indiscriminately discarded fecal sludge can cause major environmental pollution (Nawab et al. 2006). The last model is the urine-diversion technology, which aims to recycle the nutrient contents of human feces in order to bring them back to the agro-ecological cycle (Langergraber & Muellegger 2005). Out of all these four only the last option regards feces not as a waste but as a resource and treats it accordingly. Dependent on their general set up, as shown above, the other three models can have serious health, economic and environmental consequences (Jewitt 2011b; Nawab et al. 2006). Another reason, especially for rural areas to fall out of the national sanitation scheme, is the lack of political support and adequate lobbying for their cases. Many of the main sanitation initiatives are focusing on peri-urban and urban environments and the technical design goes along with that (Zurbrügg & Tilley 2009). Thinly populated rural environments call for different, decentralized and pro-poor approaches that are simpler and cost effective (Jewitt 2011a, 2011b; Massoud et al. 2009).

For this reason this subchapter gives a short overview and discussion on two pro-poor sanitation technologies- one of them waterborne- that are distinguished by their low cost and low maintenance attributes, which make them especially applicable in rural contexts. Their applicability in diverse sociocultural settings will also be discussed, as it is- besides many others aspects (Murphy et al. 2009) - downright essential to address this factor in order to achieve sustainable implementation of the sanitation structures (Jewitt 2011a; Nawab et al. 2006).

2.2.1 Decentralized Waste Water Treatment Systems and Biogas

Rural settings demand specific requirements for sustainable sanitation systems, especially if they are water-borne (Massoud et al. 2009). Decentralized waste water treatment systems are, according to the United States Environmental Protection Agency's (USEPA 2005) findings, an appropriate technology for rural areas even with a low density population. Their usage is however limited to non-arid or non-semi-arid areas with a sufficient supply of water for the treatment of feces. The task to choose the right decentralized technology for the particular setting therefore is remaining difficult and additionally depends on affordability and appropriateness. Appropriateness is referring to the social and ecological situation, while affordability alludes to the economic condition of the community (Massoud et al. 2009). It also depends on the technical approach whether, human excreta is seen as a waste, or as a resource. This fact immensely affects the all three conditions stated above.

An approach, that seizes to achieve the 'waste to resource' principle, is called *Integrated water-energy-sanitation system* (IWESS) (see fig. 4) (Odhiambo et al. 2009). Odhiambo et al. (2009) conducted a study on a pilot project in a peri-urban and rural community in Kenya in order to evaluate the applicability of this approach. Being referred to as a closed-loop system

(Odhiambo et al. 2009) IWESS contradicts the above mentioned statement that only EcoSan technologies are regarding feces as a waste rather than a resource.

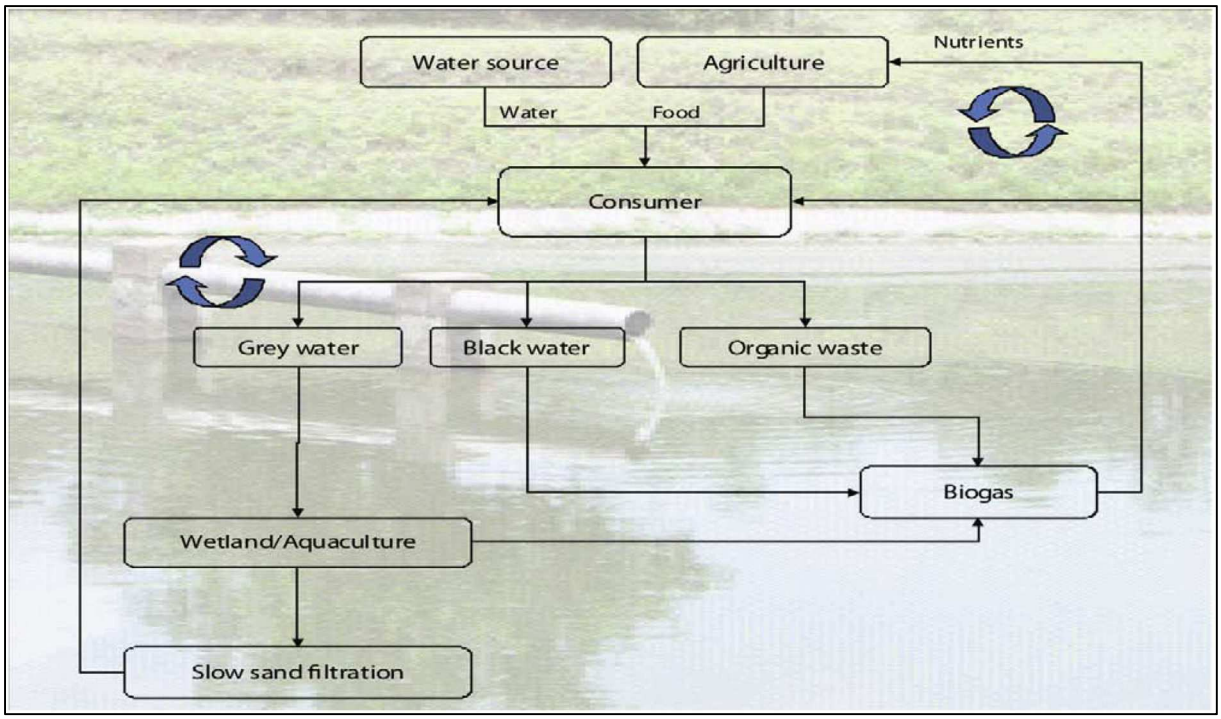

Figure 4: Integrated water-energy-sanitation system (IWESS). Source: Odhiambo et al. (2009), p. 573.

IWESS integrates agricultural use, the energy contributions of biogas as well ecological enhancement into the waste water management system. Additionally even more benefits are being created. For example, fast growing bamboo is used in the constructed wetlands not only to purify the water but also to be harvested as construction material for all sorts of buildings and raw material for hand craft industries, hence contributing economically. Bamboo has another important advantage as it regulates the environment and substantially accounts for being a carbon sink, thus reducing CO2 in the air. Biogas is produced with a special system called *plug flow biogas system*. This system assures that kitchen and human waste are properly mixed and are being held in the digester for a retention time of 25 days which is needed to result in hygienic and pathogen free effluent. The effluent is used as a fertilizer on the fields reducing fertilizer expenditures, while the biogas is used for cooking, lightning and other purposes reducing energy costs. Due to the usage of special ecologically friendly, locally obtainable and economically feasible water purification methods the system is able to reach drinking water quality from surface water resources and wetland effluent (Odhiambo et al. 2009).

This holistic approach is a very good technical example for the applicability in rural areas of SSA having sufficient access to water sources. According to Odhiambo et al. (2009, p.577) will the system, if applied at macro scale, “stem the increasing trends of environmental

degradation while providing a lifeline to the disenfranchised rural communities who do not have access to safe and adequate water, sanitation and energy supplies".

2.2.2 Ecological Sanitation: A closed loop approach

The technological approach of EcoSan is not new but according to Esrey et al. (2001) it constitutes a very attractive solution for arid environments and rural regions. Due to the low scale demand of many rural settings decentralized EcoSan solutions have the potential to offer cost-effective solutions for these contexts (Jewitt 2011a, 2011b; Haq & Cambridge 2012). EcoSan is a comprehensive sanitation approach incorporating all aspects of sanitation such as human excreta, solid waste, black and grey water as well as drainage (Duncker et al. 2007). EcoSan is based either on composting or dehydrating toilets (Jewitt 2011a). An example for where both of these methods can be used, are urine diversion toilets[7] (see fig. 4). The relatively simple system separates urine and feces and stores them in separate containers.

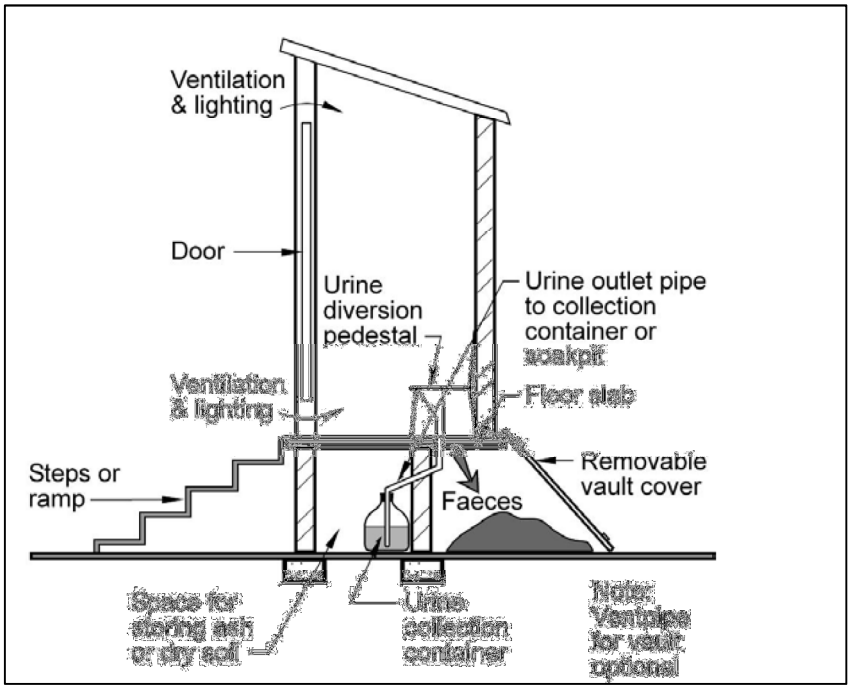

Figure 5: Urine Diversion Toilet. Source: Duncker et al. 2007, p. 10.

Urine can be used immediately after separation, but is recommended to be stored up to six months. Feces, on the other hand, naturally contain pathogens that first have to be killed and made harmless through the above mentioned dehydrating or composting process (Langergraber & Muellegger 2005). Moe & Rheingans (2006, p. 47) refer to EcoSan being based on four main principles:

[7] See Glossar: Urine Diversion Toilet

1. Conservation of water
2. Containment of human excreta to prevent environmental contamination and disease transmission
3. Treatment of human excreta to inactivate microbial pathogens
4. Recycling nutrients from human excreta (feces and urine) for agriculture to promote better crop production, home gardens and ultimately improved nutrition.

Thus nutrients are recycled through composting, the whole system is based on an *ecosystem approach* (see principle No.4), which offers some very important advantages over conventional solutions (Duncker et al. 2007; Esrey et al. 2001; Hannan & Andersson 2002; Langergraber & Muellegger 2005; Nawab et al. 2006). EcoSan is described to be able "to close the loop" by exploiting the co-benefits of nutrient recovery from human excreta (e.g. feces and urine), which thereafter have the potential to improve soil fertility, food security and reduce water use (Duncker et al. 2007; Esrey et al. 2001; Jewitt 2011a, 2011b). Haq & Cambridge (2012, p. 431) state that:

> "(h)uman excreta can result in higher cabbage yields compared to the use of goat manure while urine-fertilized plants produce equal amounts of tomato fruits as mineral fertilized plants." (Haq & Cambridge 2012, p. 431)

Feces and urine have but differences in fertilizer value, with urine containing up to 80% of it (Esrey et al. 2001, p. 13). EcoSan systems therefore reduce the need to use chemical fertilizers which deplete fossil fuel resources and summing up EcoSan can be defined as a system that prevents disease and promotes health, protects the environment and conserves water and recovers and recycles nutrients and organic manner and is therefore technically particularly applicable to rural areas (Duncker et al. 2007; Esrey et al. 2001; Jewitt 2011a).

Nevertheless, there are some major restraints to the success of EcoSan toilets and their dissemination especially in the developing world (Jewitt 2011a; Nawab et al. 2006). One major problem for a sustainable or even an implementation at all lies in cultural reservation of the respective people. In many cultural contexts, like "the faecophobic culture of muslims" (Jewitt 2011a; Nawab et al. 2006, p.244) there are massive reservations against using human feces and urine for agricultural use. This is particularly the case in middle-eastern countries such as Pakistan but also in Indian cultures (Jewitt 2011a; Nawab et al. 2006). Unfortunately no literature on this was found on this fact for communities in SSA. In faecophilic cultures such as China or many South Asian countries human waste has long been used for agricultural purposes and the dissemination of EcoSan technologies is not opposed by cultural restraints (Jewitt 2011a; Nawab et al. 2006). Haq & Cambridge (2012, p.433) identify the three main hindering factors for EcoSan technologies being public fear and faecophibia, opposition of water companies and most importantly the lack of political will. EcoSan has nevertheless already successfully been installed in many communities in SSA (e.g. Uganda Langergraber & Muellegger 2005) but the scale of still underserviced rural

areas calls for proliferation (WHO & UNICEF 2013). The next chapter will deal with the role politics, governments and politicians play in disseminating decentralized low-tech and low-cost sanitation approaches for rural areas.

2.3 Political Strategies and Regulatory Frameworks for Sustainable Rural Sanitation

As it has been mentioned above, due to a lack of understanding water and sanitation problems and their relevance in meeting respective development targets, political leaders often neglect water, but especially sanitation issues, or prioritize inadequate technical and participatory solutions (Arku 2010; Cumming 2009; Gutierrez 2007; Jewitt 2011a; Kürschner-Pelkmann 2008). Sustainable pro-poor technologies are furthermore often perceived as being second class and therefore do not achieve the appropriate political attention (Paterson et al. 2007). This constitutes a problem especially for rural areas, where poverty is high and sanitation coverage particularly low (Kürschner-Pelkamann 2008; Moe & Rheingans 2006). Gutierrez (2007) states that in in Zambia and Malawi, due to weak state support and enforcement of PRSPs as well as poor sectoral coordination and fragmented donor support it will remain to be seen, whether the PRSPs of both countries can deliver to meet Target No. 10. The role of water and sanitation for development is recognized in Malawi's and Zambia's PRSPs, but according to Gutierrez (2007) it is not fully appreciated yet specified. Consequently, this leads to a lack of prioritization and making the wrong policy choices within the strategy. Coming from the Ghanaian context, Arku's (2010) study supports this argument and shows that most of the respondents to his study (87%) did not even know about the possibility to obtain sanitation facilities via the DRA. He discusses that development and government officials do not sufficiently address sanitation and asks, if maybe "white collar officials" regard sanitation matters as a "no go area" because they find it a "distasteful subject matter" (Arku 2010, p. 173).

Furthermore it is very important to recognize the influence international donor agencies on government expenditures via their strategic bias. Malawi's overall expenditure on water and sanitation, for example, has dropped from 5 % in 2001-2002 to 1 % in 2003-2004 (Gutierrez 2007; 889). The European Union as a recent major donor, for instance, has outlined its focus on agriculture and therefore more funds are flowing into agriculture. Other hindering factors include a general mistrust of the Ministry of Water Development, a general lack of interest in water and sanitation issues by other donor agencies and inefficient lobbying (Gutierrez 2007). One further reason for the negligence of water and sanitation issues in Malawi and Zambia is the omission of specific definitions in their PRSPs. In both cases water, let alone sanitation is absent in the definition of 'basic need'. Basic needs are, in the Malawi case, very generally defined and include food and non-food requirements, but sanitation and water are

not specifically mentioned. When it comes to the definition of the Zambian 'poverty line', Zambia even leaves out water issues completely. The poverty line is defined by the monthly income that is needed to sustain the calorific requirements of a family of six. Not identifying the urgency and importance of improved sanitation in the national development agendas, respectively the PRSPs, these topics are likely to be omitted in actual development efforts (Cumming 2009). The last important key challenge in Malawi and Zambia is poor sectoral coordination and fragmented donor efforts. Projects that don't 'communicate' and who are not aligned to the country's overall poverty reduction strategy will not be able to contribute to the MDGs as they could and therefore need to be redesigned (Cumming 2009; Gutierrez 2007).

The role of governments and donor agencies is pivotal for the improvement of sanitation and water infrastructure development (Cumming 2009). Governments have to accept and advocate pro-poor technologies, which can be sustainably implemented in urban as well as rural contexts (Paterson et al. 2007). There are however, as shown by means of Malawi and Zambia, substantial challenges, which undermine the enforcement of improving sanitation in rural and urban areas, which lead to a substantial lag in achieving so many development goals (Cumming 2009).

2.4 Preliminary Discussion

In the previous paragraphs a number of methods and techniques have been elaborated, which show there is a possibility to provide sustainable water and sanitation supply for rural SSA. Therefore the question remains, why has this still not been done? Aertgeerts (2009, p. 248) summarizes several important stumbling rocks which antagonize the achievement of Target No. 10 and who, completed with additional aspects from this chapter, give a proper answer to the papers first working questions (Cumming 2009; Jewitt 2011a, 2011b; Sah & Negussie 2009):

- **National Policy**- Weak national strategies, fragmented governance systems, inadequate financing, lack of awareness of the benefits from improved basic sanitation in national, regional and local governments and development executives
- **Behavior and cultural context-** Improvements through improved sanitation are invisible and firstly need to be shown to the people. Until then they will continue to prioritize water before sanitation issues. Different cultural and social contexts demand adapted participatory and technological approaches. This fact has not yet been taken into account sufficiently
- **Perception-** Sanitation is not perceived to be a public rather than a private matter

- **Poverty-** Poverty remains a major constraint in gaining access to sanitation (and water)
- **Geographical location**- Rural areas remain substantially disadvantaged compared to urban areas.
- **Technical approaches**- Inappropriate technological solutions thwart any sustainable development initiative concerning sanitation. Existing appropriate technology has to find favor with decision makers
- **Gender-** Gender issues have to be taken into account when planning, designing and implementing. They are, however, in many cases still being ignored. Women are often still being excluded from decision making and planning, let alone implementation.

> "Environmentally sound development requires appreciation of local cultures, active participation of local peoples in development projects, more equitable income distribution, and the choice of appropriate technologies." (Massoud et al. 2009, p. 656).

It seems unlikely that the MDGs concerning sanitation will be met by 2015. For this reason it is even more important to put them on the post- 2015 development agenda in order to upscale the measures being taken. This chapter has focused on the main aspects that have to be taken into account in order to make sanitation projects more socially acceptable, financially affordable and technically maintainable as well as institutionally embedded, hence simply sustainable in the long run. Subsequently, the next chapter will elaborate the relationship of improved and unimproved rural sanitation and the achievements of the MDGs for SSA.

3 The Relationship of Sanitation in Rural Areas of SSA and the achievement of the MDGs

The MDGs consist of eight goals with eighteen corresponding targets (see fig.6). Between them Target No. 10 is believed to be the single most important factor for achieving all other MDGs (Gutierrez 2007; United Nations 2008). It has nonetheless remained to be the most neglected target of all (Aertgeerts 2009; Cumming 2009; Jewitt 2011a; Mehta 2011). SSA in addition is the region where Target No. 10 is especially lacking behind (see chapter 1.2). It is therefore reasonable to look at the negative effects of inappropriate sanitation and to elaborate which positive connections there are for appropriate rural sanitation and the other MDGs.

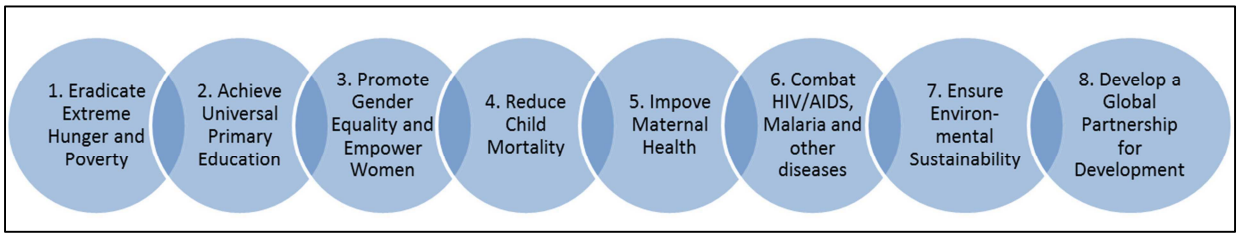

Figure 6: Millennium Development Goals. Source: United Nations 2014.

Many of the authors used in this paper referred to the MDGs and their relation with sanitation. Threats on poor sanitation to achieving the MDGs as well as sustainable sanitation's prospects in achieving them were highlighted (Aertgeerts 2009; Arku 2010; Arku et al. 2013; Bartram et al. 2005; Cumming 2009; Gutierrez 2007; Haq & Cambridge 2012; Jewitt 2011a, b; Kürschner-Pelkmann 2008; Langergraber & Muellegger 2005; Massoud et al. 2009; Moe & Rheingans 2006; Mwendera 2006; Odhiambo et al. 2009; Paterson et al. 2007; Zurbrügg & Tilley 2009). This chapter will therefore elaborate and summarize the implications of inadequate and the contributions of improved sustainable rural sanitation in respect to reaching the MDGs.

3.1 Implications of Inappropriate Rural Sanitation for MDGs in SSA

In not achieving Target No.10 Indicator 31 the international development community of SSA is depriving their urban and rural population from many benefits of improved and sustainable sanitation and contributions to many other MDGs and their targets.

3.1.1 Goal 1: Negative Impacts on Economic Situation and Food Security

Due to political negligence most rural settings in SSA have not yet been the focus of sanitation improvement initiatives. As many urban areas have to deal with the economic consequences of badly maintained and inefficient centralized water and sanitation systems, rural areas on the contrary are mostly affected by the lack of any facilities at all and therefore open defecation remains one of the most pressing issues (Haq & Cambridge 2012; Odhiambo et al. 2009). This has several effects on achieving MDG No. 1.

As mentioned above flies and unwashed hands can transport pathogens causing diarrhea and other transmittable diseases. Medical Treatment in rural areas is often hard to obtain and very expensive considering the economic situation many patients. Hence, downstream costs of medical treatment caused by these transmitted diseases could result in economic losses that can substantially affect the economic viability of single persons, families and certain rural groups (Cumming 2009). Inadequate rural sanitation indeed has a negative impact on economic performance of the rural population as it can profoundly limit the monetary means of rural inhabitants and hence, can have negative impacts for Target No. 1 Indicator 1.

In order to be able to feed an expected global population of about 9.1 billion people in 2050, the global food production will have to be increased by 70%[8] (Haq & Cambridge 2012, p.431). Although the vast majority of these people are anticipated to be living in cities of the global south, the rural population in these countries will also substantially be affected by this development in many ways (Duncker et al. 2007). Firstly, urban areas most likely will not be able to autonomously meet their food demand and therefore will have to be supplied with food stuffs from rural areas. This can offer economic opportunities but also food security threats for rural communities. Secondly, as there are many rural-urban migrants traditional open defecation behavior will affect urban areas despite of any sanitation measures undertaken. Thirdly concerning soil fertility it is estimated that there will be scarcities concerning nutrient supply for plant growth, especially in relation to the availability of phosphorus (P) as the phosphate rock is predicted to be depleted in around 50-100 years[9] (Haq & Cambridge 2012, p.431). Phosphorus, nitrogen (N) and potassium (K) are the most important nutrients for crop cultivation and obtaining their commensurate amount will constitute a major challenge in the future. Human excrements contain all these three nutrients which are also the main ingredients of chemical fertilizer and one individual- depending on dietary intake- is able to produce about 5.7kg of N, 0.6kg of P and 1.2kg of K annually (Haq & Cambridge 2012, p. 432). Treated accordingly in order to kill the dangerous containments such as pathogens, bacteria, worms and parasites, human feces is a viable substitute for chemical fertilizer. However, most of this potential is still wasted through inadequate or non-existing sanitation facilities and not only in the urban but also in rural areas are the potentials of human feces still being neglected. Additional constraints like biophysical factors such as soil acidity, low nutrient availability, pests and diseases impair smallholder crop yields especially in SSA. This leads to rural and urban citizens spending the little money they have on chemical fertilizer or additional food, which of course has negative

[8] This fact is debatable, because currently about 1/3 of global food production goes to waste due to food wastages along the global value chains. The amount of additional food having to be produced by 2050 could be reduced about 25%, if these food wastages could be eliminated (Zeit 2014)
[9] Depending on Region

impacts on Target No. 1 Indicator1 (Haq & Cambridge 2012). Crops that are not fertilized also have a much lower crop yield than fertilized crops (chemical and human excreta) and wasting this potential negatively affects Target No.2 Indicator 4 and 5. The linear solutions (flush and discharge; drop and store) and open defecation behavior hence contribute to three major development problems: poverty, loss of soil fertility and lack of food security (Esrey et al. 2001; Odhiambo et al. 2009).

3.1.2 Goal 2: Negative Impact on School Attendances

Cumming (2009) indicates that investments in education are substantially undermined by inadequate sanitation at home and at school. Sick children cannot go to school, or if they do, they cannot learn as well as their unaffected peers. According to UNICEF (2012) sanitation-associated helminthes infections, or parasitic worms for example, have been shown to impede learning and inhibit child development, hence, leading to lifelong economic and social disadvantages. There are many other infections or parasites that lead to children not attending school properly or even going to school at all (Cumming 2009; UNICEF 2012). This entails life lasting negative outcomes and therefore negatively affects not only Target No. 3 Indicator 6, 7 and 8 but in the long run also Target No. 1 and 2.

3.1.3 Goal 3: Negative Gender Implications

Especially for rural women unimproved sanitation has many disadvantages. Exposed to sexual harassment and animals- especially in the dark- women are particularly vulnerable (Jewitt 2011a). Discrimination, sexual harassment and missing days due to menstruation when becoming an adolescent are only some reasons for the disproportionate effect of poor sanitation on girl's enrolments and attendances (UNICEF 2012). According to Cumming (2009, p.10) inadequate sanitation in schools is a major hindrance for girl's attendances and acts as a significant barrier to achievement of Target No.4 Indicator 9, 10 and 11.

3.1.4 Goal 4 and 5: Negative Impact on Child and Maternal Health

Poor and inadequate sanitation is proven to be the major cause of child mortality (Cumming 2009). Often obtaining bacteria, worm eggs, parasites and pathogens, human feces are likely to be the cause for diarrhea, malnutrition and mineral as well as vitamin deficiency. Traditional rural defecation behavior and poor rural sanitation facilities expose the population to these threats. Flies and human hands can contaminate food and drinking water leading to infections and serious health problems (Haq & Cambridge 2012). According to UNICEF (2012, p.8) more than 20% of deaths and years lived with illness among all children under the age of 14 are related to unsafe sanitation or inadequate hygiene. UNICEF (2012, p.8) furthermore assumes that in developing countries about 47% of all children between the ages of 5 and 9 are infected with soil-transmitted worms, which for example can reduce physical growth and delay intellectual development. Sick children can furthermore affect their

wider community by transmitting infectious agents from schools to the home environment, hence, infecting their kin, such as their mothers and siblings (UNICEF 2012). Inadequate rural sanitation is also believed to affect maternal health as pregnant or birth-giving women are especially threatened by infections and parasites (Hannan & Andersson 2002). Summing up, unimproved sanitation can have serious negative effects not only on Target No. 5 Indicator 13 and 14, but also to Target No. 6 Indicator 16.

3.1.5 Goal 7: Negative Ecological Implications

Open defecation practices can have substantially negative impacts on water quality in rural areas and therefore negatively affect the sustainable access to safe drinking water and lowering the achievement rate for Target No.10 Indicator 1 (Haq & Cambridge 2012).

3.2 Contributions of Appropriate and Sustainable Rural Sanitation to the Overall MDGs in SSA

Human excreta, if neglected or treated inappropriately can have diverse negative effects. However, threated accordingly and it offers many potentials for further use in rural areas and moreover is able to contribute substantially to the achievement of many MDGs (see fig. 7).

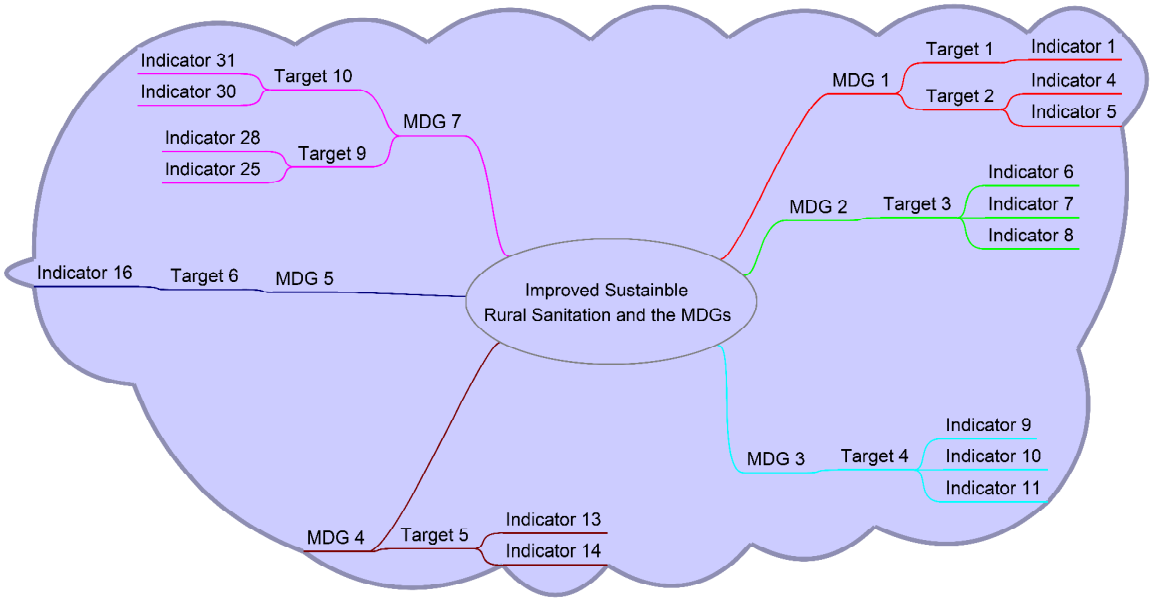

Figure 7: Contributions of Improved Sustainable Rural Sanitation to the Achievement of the MDGs. Source: Own Depiction.

3.2.1 Goal 1: Contributions to Economic Sustainability and Food Security

There are a number of reasons why improved rural sanitation is contributing to Target No. 1. As shown above, the use of human excreta as solid fuel, soil fertilizer or for biogas production is able to reduce the amount of monetary resources being spent for energy supply as well as chemical fertilizers and is therefore able to improve economic vitality of rural inhabitants and increase their crop yields leading to better income or more independent food

security (Esrey et al. 2001; Haq & Cambridge 2012). A cost benefit analysis from WHO implies that the opportunity for economic benefit of improved urban and rural sanitation will be, depending on the region, around 3 to 34 USD for every 1 USD spent. It could also lead to the avoidance of around 7.3 billion USD concerning health related costs per year and the reduction of diarrheal episodes by 10%. An annual global value of 750 Million USD of adult working days could also be achieved (Bartram et al. 2005, p.810). Cumming (2009) remarks, that sanitation can be a powerful force for pro-poor economic development. Globally, since 1990, the proportion of people living on less than a dollar a day has fallen by just 6% against the targeted goals of 50% by 2015 (Cumming 2009, p.11). Moreover saving money spent on medicine and healthcare will have benefits on the consumption of food, education and other essentials. A recent study in Bangladesh has shown that access to sanitation improved the economic status of the poorest households even in the context of broader economic decline. These findings offer great potential for pro-poor growth as the greatest benefits accruing in the poorest countries and regions even occur against a backdrop of broader economic decline (Cumming 2009).

Consequently closing the loop of human excreta with technologies like EcoSan or DEWATS and applying socio-culturally adapted participatory approaches, which ensure the sustainable adoption of improved sanitation facilities in rural areas of SSA can therefore substantially benefit to Target No. 1 Indicator 1 and Target No. 2 Indicator 4 and 5.

3.2.2 Goal 2: Contributions to School Attendances

Providing improved sanitation- and water- facilities for schools in rural areas has tremendous positive impacts on the improvement of school attendances for boys but especially for girls (Bartram et al. 2005, Gutierrez 2007). UNICEF (2012) indicates that *Water-Sanitation and Hygiene* (WASH) in Schools significantly reduces hygiene-related disease and substantially increases student attendance and learning achievements. A secure school environment can protect children from illnesses, abuse and exclusion and only a child, who is well nourished and healthy, is fully capable to participate in class and gain maximum learning benefits (UNICEF 2012). But not only improving water and sanitation in schools but also in homes and public spaces is essential to sustain a decent way of living, eradicating exposure to infectious diseases and minimizing malnutrition caused by the effects of bad sanitation (WHO & UNICEF 2013). Children educated in WASH will also serve as multipliers in their homes helping to eliminate unhealthy sanitation behaviors such as open defecation or the neglect of washing hands (UNICEF 2012). Deworming programs in Kenya have been particularly successful as due to improved sanitation facilities there were low rates of reinfection. Through these programs the absenteeism could therefore be reduced by 25% (UNICEF 2012, p.8). Sanitation is hence an important factor to improve the educational

prospects especially for the rural poor and for rural girls (Cumming 2009). It can also improve the quality of education, as teachers often reject being sent to communities without improved water and sanitation facilities (Gutierrez 2007). Consequently improved sanitation- and water- facilities for schools in rural areas, contribute to Target No. 3 Indicators 6, 7 and 8 and also has substantial positive effects on gender equality in education (see Goal 3).

3.2.3 Goal 3: Contributions to Gender Equality

For girls and women the positive effects of improved water and sanitation is especially remarkable. WASH in schools, for example, provides gender-separated toilets that can be locked. This assures privacy, dignity and safety, especially for girls, who otherwise are often victims of sexual harassment or do not attend school due to their monthlies (Gutierrez 2007; UNICEF 2012). Improved sanitation facilities are but one of the most important improvements for women in rural areas. Whereas men due to their social and physical characteristics are less exposed to the many daily chores as well as humiliating effects of open defecation, women especially during their monthlies but also in respect to the dangers of sexual harassment and profits of time-savings, profit remarkably from improved sanitation (Hannan & Andersson 2002; Jewitt 2011a). According to Gutierrez (2007) and UNICEF (2012) the impacts of up-scaling rural sanitation substantially contributes to the achievement of Target No. 4 Indicator 9, 10 and 11.

3.2.4 Goal 4 and 5: Contributions to Child and Maternal Health

As history demonstrates sanitation improvements were able to reduce child mortality at drastic rates in 20th century North America and Europe (Cumming 2009). In Sri Lanka sanitation improvements could reduce child mortality from 141/000 in the 1940ies to 13/1000 at the beginning of the 21st century (Cumming 2009, p. 9). The improvement of sanitation in rural areas, for instance, can therefore provide an environment, where traditional birth attendants can deliver babies in a much safer environment (Gutierrez 2007), thus contributing to Target No. 5 Indicator 14 and Target No. 6 Indicator 16. As poor sanitation is the major cause of child mortality its amendment could reverse its effects and lead to a drastic reduction in child mortality, hence, contributing to Target No. 5 Indicator 13 (Cumming 2009; UNICEF 2012; WHO & UNICEF 2013).

3.2.5 Goal 7: Contributions to Ecological Sustainability

Improving sanitation and rural sanitation is included in the MDGs as Target No. 10 Indicator 31 and has many benefits to the other indicators of MDG No. 7. As appropriate and sustainable sanitation in rural areas could be achieved by installing decentralized waste water treatment solutions including biogas or could even mean using human feces as solid fuel (Sanivation 2014), it could reduce deforestation processes leading to the protection of trees and bush. Constructed wetlands in decentralized waste water treatment solutions offer

the opportunity off storing CO2 thus contributing to climate protection (Odhiambo et al. 2009). The last contributing factor is the improvement of water sources due to lesser pollution via human excreta (Massoud et al. 2009). Therefore within the scope of MDG 7 improved sustainable rural sanitation can furthermore contribute to Target No. 9 Indicator 25, Indicator 28 and Indicator 29 as well as Target No. 10 Indicator 30.

4 Summary and Conclusion

Elaborating various aspects of improved and unimproved sanitation in rural SSA this paper has given an overview of the many linkages of sanitation to other development issues. According to Gutierrez (2007) sanitation should be one of the, or even be the most important development goal and he furthermore states that water and sanitation should be a cross-cutting theme in its own right:

> "Water Aid argues *that* improvements in water, sanitation and hygiene behavior together constitute the greatest single advance in preventive health care; it underpins the history of economic development; and most importantly, that these improvements were made possible in the developed world by political will and public resources." (Gutierrez 2007, p.888)

The approach for water and sanitation measures which is widely used today is somewhat different but nevertheless equally important. Rather than providing water and sanitation measures from public resources- as indicated has been the case in Europe and the US- the focus has to lie on decentralized, pro-poor, bottom up approaches that need to use locally and traditionally adapted technical and social solutions (Jewitt 2011a; Murphy et al. 2009). Cummings (2009) argues by tackling the global sanitation crisis, which is most pressing in SSA and parts of South Asia, as a single intervention, there are great potentials to accelerate progress towards the most off-track MDG targets and to multiply existing investments in these sectors. The reduction of child mortality, improvement of maternal health or the promotion of gender equity in access to education are just some of the many contributions. Concerning the second working question, as shown in chapter 3.2, there are many positive linkages between improved rural sanitation in SSA. According to Cummings (2009), Gutierrez (2007) and other authors Target No. 10 is the most important of all MDG targets. This leads to the answer to the last working question. Improved rural (and urban) sanitation should substantially be more emphasized in the discussion about the post 2015 development Agenda. "Access to improved sanitation is a human right and must be urgently re-examined by policy makers as a means to accelerating process across all the MDGs" (Cumming 2009, p. 9). While writing this paper the year 2015 is within short reach and the international development community is in the middle of the process of formulating the *Sustainable Development Goals* (SDGs) for the post- 2015 development era. It is therefore substantially important to ensure putting more emphasis on sustainable sanitation, especially in the rural SSA context in order to ensure the success of ongoing and future development initiatives.

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Glossar

Improved basic sanitation facility	"(…) a sanitation facility which is safe, reliable, private, protected from the weather, ventilated, keeps smells to the minimum, is easy to keep clean and minimizes the risk of the spread of sanitation related diseases by facilitating the appropriate control of disease carrying flies and pests, and enables safe and appropriate treatment and/or removal of human waste and black or grey water in an environmentally sound manner" (DWAF 2003).
Poverty Reduction Strategy Papers	PRSPs resulted from the Poverty Reduction Strategy evoked in 1999. They are since being used in more than 60 countries worldwide. Their adaption is prerequisite for debt relief and the grant of new concessionary loans (Eberlei 2009).
Urine diversion toilets	Urine diversion sanitation is one of the sanitation technologies implemented in various parts of the world (urban and rural, developed and developing countries), including South Africa. Its most important feature is the low moisture content in the feces receptacle. The urine is diverted at source by a specially designed pedestal and is not mixed with the feces (Duncker et al. 2007).

Appendix

http://www.alliance2015.org/fileadmin/user_upload/MDGs.pdf

Millennium Development Goals (MDGs)

Goals and Targets (from the Millennium Declaration)	Indicators for monitoring progress
Goal 1: Eradicate extreme poverty and hunger	
Target 1: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day	**1.** Proportion of population below $1 (PPP) per day[a] **2.** Poverty gap ratio [incidence x depth of poverty] **3.** Share of poorest quintile in national consumption
Target 2: Halve, between 1990 and 2015, the proportion of people who suffer from hunger	**4.** Prevalence of underweight children under-five years of age **5.** Proportion of population below minimum level of dietary energy consumption
Goal 2: Achieve universal primary education	
Target 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	**6.** Net enrolment ratio in primary education **7.** Proportion of pupils starting grade 1 who reach grade 5 **8.** Literacy rate of 15-24 year-olds
Goal 3: Promote gender equality and empower women	
Target 4: Eliminate gender disparity in primary and secondary education preferably by 2005 and to all levels of education no later than 2015	**9.** Ratios of girls to boys in primary, secondary and tertiary education **10.** Ratio of literate females to males of 15-24 year-olds **11.** Share of women in wage employment in the non-agricultural sector **12.** Proportion of seats held by women in national parliament
Goal 4: Reduce child mortality	
Target 5: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	**13.** Under-five mortality rate **14.** Infant mortality rate **15.** Proportion of 1 year-old children immunised against measles
Goal 5: Improve maternal health	
Target 6: Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio	**16.** Maternal mortality ratio **17.** Proportion of births attended by skilled health personnel
Goal 6: Combat HIV/AIDS, malaria and other diseases	
Target 7: Have halted by 2015 and begun to reverse the spread of HIV/AIDS	**18.** HIV prevalence among 15-24 year old pregnant women **19.** Condom use rate of the contraceptive prevalence rate[b] **20.** Number of children orphaned by HIV/AIDS[c]
Target 8: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	**21.** Prevalence and death rates associated with malaria **22.** Proportion of population in malaria risk areas using effective malaria prevention and treatment measures[d] **23.** Prevalence and death rates associated with tuberculosis **24.** Proportion of tuberculosis cases detected and cured under directly observed treatment short course (DOTS)
Goal 7: Ensure environmental sustainability	
Target 9: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources	**25.** Proportion of land area covered by forest **26.** Ratio of area protected to maintain biological diversity to surface area **27.** Energy use (kg oil equivalent) per $1 GDP (PPP) **28.** Carbon dioxide emissions (per capita) and consumption of ozone-depleting CFCs (ODP tons) **29.** Proportion of population using solid fuels
Target 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water	**30.** Proportion of population with sustainable access to an improved water source, urban and rural
Target 11 By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers	**31.** Proportion of urban population with access to improved sanitation **32.** Proportion of households with access to secure tenure (owned or rented)

Goal 8: Develop a global partnership for development	
Target 12: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system Includes a commitment to good governance, development, and poverty reduction – both nationally and internationally **Target 13**: Address the special needs of the least developed countries Includes: tariff and quota free access for least developed countries' exports; enhanced programme of debt relief for HIPC and cancellation of official bilateral debt; and more generous ODA for countries committed to poverty reduction **Target 14:** Address the special needs of landlocked countries and small island developing States (through the Programme of Action for the Sustainable Development of Small Island Developing States and the outcome of the twenty-second special session of the General Assembly) **Target 15:** Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term	*Some of the indicators listed below are monitored separately for the least developed countries (LDCs), Africa, landlocked countries and small island developing States.* *Official development assistance* **33.** Net ODA, total and to LDCs, as percentage of OECD/DAC donors' gross national income **34.** Proportion of total bilateral, sector-allocable ODA of OECD/DAC donors to basic social services (basic education, primary health care, nutrition, safe water and sanitation) **35.** Proportion of bilateral ODA of OECD/DAC donors that is untied **36.** ODA received in landlocked countries as proportion of their GNIs **37.** ODA received in small island developing States as proportion of their GNIs *Market access* **38.** Proportion of total developed country imports (by value and excluding arms) from developing countries and LDCs, admitted free of duties **39.** Average tariffs imposed by developed countries on agricultural products and textiles and clothing from developing countries **40.** Agricultural support estimate for OECD countries as percentage of their GDP **41.** Proportion of ODA provided to help build trade capacity[e] *Debt sustainability* **42.** Total number of countries that have reached their HIPC decision points and number that have reached their HIPC completion points (cumulative) **43.** Debt relief committed under HIPC initiative, US$ **44.** Debt service as a percentage of exports of goods and services
Target 16: In co-operation with developing countries, develop and implement strategies for decent and productive work for youth	**45.** Unemployment rate of 15-24 year-olds, each sex and total[f]
Target 17: In co-operation with pharmaceutical companies, provide access to affordable, essential drugs in developing countries	**46.** Proportion of population with access to affordable essential drugs on a sustainable basis
Target 18: In co-operation with the private sector, make available the benefits of new technologies, especially information and communications	**47.** Telephone lines and cellular subscribers per 100 population **48.** Personal computers in use per 100 population and Internet users per 100 population

The Millennium Development Goals and targets come from the Millennium Declaration signed by 189 countries, including 147 Heads of State, in September 2000 (www.un.org/documents/ga/res/55/a55r002.pdf - A/RES/55/2). The goals and targets are inter-related and should be seen as a whole. They represent a partnership between the developed countries and the developing countries determined, as the Declaration states, "to create an environment – at the national and global levels alike – which is conducive to development and the elimination of poverty."

[a] For monitoring country poverty trends, indicators based on national poverty lines should be used, where available.

[b] Amongst contraceptive methods, only condoms are effective in preventing HIV transmission. The contraceptive prevalence rate is also useful in tracking progress in other health, gender and poverty goals. Because the condom use rate is only measured amongst women in union, it will be supplemented by an indicator on condom use in high risk situations. These indicators will be augmented with an indicator of knowledge and misconceptions regarding HIV/AIDS by 15-24 year-olds (UNICEF – WHO).

[c] To be measured by the ratio of proportion of orphans to non-orphans aged 10-14 who are attending school.

[d] Prevention to be measured by the % of under 5s sleeping under insecticide treated bednets; treatment to be measured by % of under 5s who are appropriately treated.

[e] OECD and WTO are collecting data that will be available for 2001 onwards.

[f] An improved measure of the target is under development by ILO for future years.