SFD Promotion Initiative

Bure
Ethiopia

Final Report

This SFD Report was created through field-based research by UoL as part of the SFD Promotion Initiative.

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SFD Report Bure, Ethiopia, 2016

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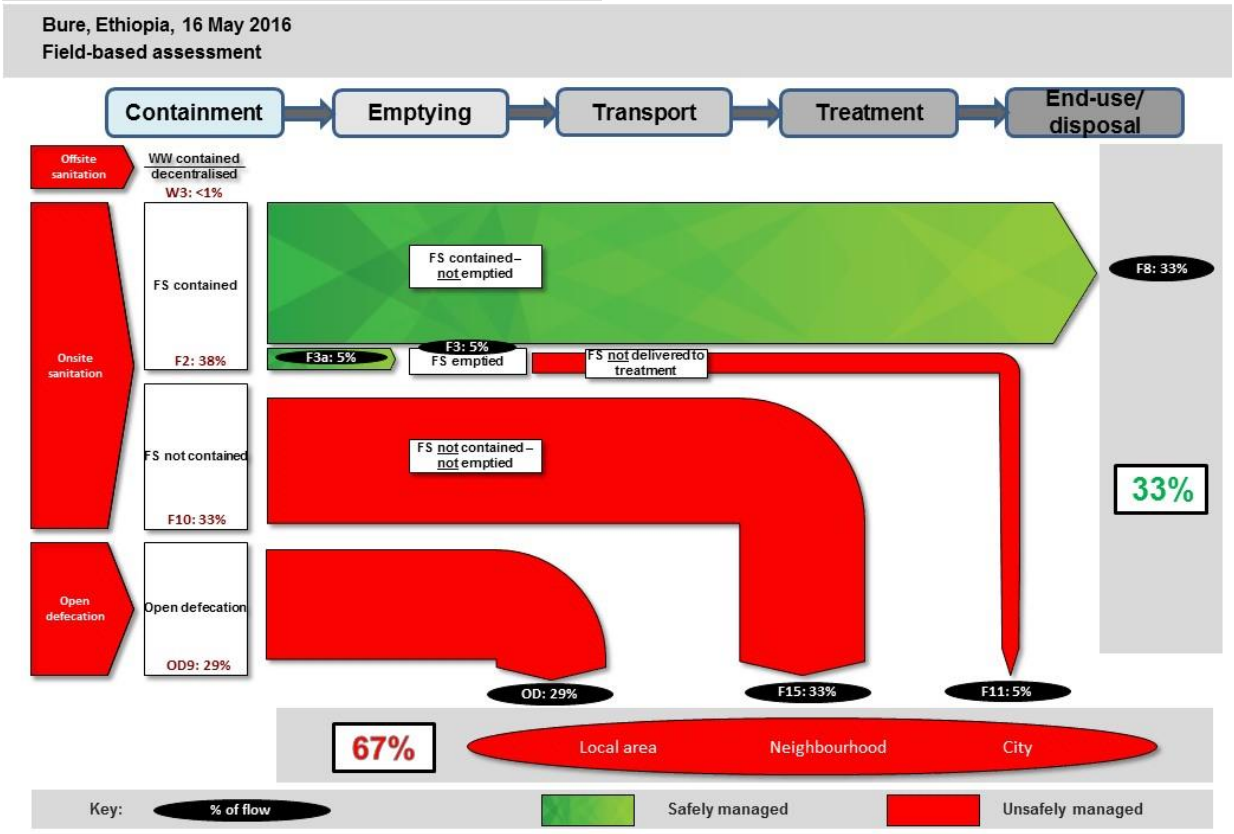
1. The Diagram



2. Diagram information

Desk or field based:

The SFD was generated from field-based work.

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Univesity of Leeds (UoL) with support from Mr. Haile Dinku, WaSH capacity building consultant from WaterAid Ethiopia.

Collaborating partners:

WaterAid Ethiopia, Municipality of Bure, Bure Water Supply and Sewerage Service (WSSS)

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3. General city information

Bure is located 400 km north of the capital Addis Ababa and 148 km south west of Bahir Dar and is within the Amhara State, Western Gojjam Administrative Zone of Ethiopia. It has a total urban population of 27,386 people (RWA and GIZ, 2015), a tropical climate with an average annual temperature of 20°C and a mean annual rainfall about 1505mm (CD, 2016).

The town has a mixture of different economic activities including agriculture, industrial manufacturing and service sector; there are several small businesses in the town. The town also hosts an agricultural training college and Bure Baguna, a mineral water factory (RWA and GIZ, 2015).

Drinking water is provided by four deep wells, which is chlorinated and distributed through a pipe network to both public and private water points. There is no faecal sludge treatment plant or solid waste disposal facility in the town; all faecal sludge collected is discharged to agriculture fields and used as a soil conditioner. All solid wastes are dumped to open spaces or ditches or river banks.

4. Service delivery context

The Federal Democratic Republic of Ethiopia included the protection of public health in the 1995 National Constitution. The Article 90.1 states that "to the extent the country's resources permit, policies shall aim to provide all Ethiopians access to public health and education, clean water, housing, food and social security".

At national level, a seven year program (2013-2020) under the name of One WASH National Program (OWNP) was launched in September 2013 by the Government of Ethiopia with additional support of UNICEF with a total budget of more than USD $2 billion (Goyol and Girma, 2015).

In 2013, in order to meet national and global commitments, the GoE developed the Sanitation and Hygiene Strategy, Sanitation Protocol, Strategic Sanitation Action Plan. The plan was created to facilitate changes in the sanitation and hygiene situation in Ethiopia and promote improved sanitation (MoH, 2013).

There are no by-laws regarding solid or liquid waste management. There is no involvement of governmental and NGOs to improve the existing solid and liquid management challenges and problems of the town (BRE, 2016e; RWA and GIZ, 2015).

However, the Health Extension Program (HEP) is an essential service providing advice to families and improving sanitation and waste management practices at household level (BRE, 2016f; BRE, 2016g).

The Water Supply and Sewerage Service (WSSS) manages the town's water supply network, while the municipality has overall responsibility for faecal sludge management. The municipality does not provide emptying services but facilitate the private sector to carry out these emptying services. A private company from the city of Debre Marcos, charges a tariff to customers for the service provision (BRE, 2016b; BRE, 2016h).

Nevertheless, there is a lack of qualified professionals in the solid and liquid waste management. There is only one urban planner working in the management chain. The rest of the people are not professionals of the sector which have not received the appropriate capacity building to carry out their duties (RWA and GIZ, 2015).

There is no monitoring and reporting access to services regarding faecal sludge. There is a lack of supervisory staff to monitor any activity related to solid or liquid waste or to take any action to increase coverage of the service delivery at all (RWA and GIZ, 2015). However, Health Extension Workers (HEWs) monitor on a weekly basis that people apply the guidelines and good practices related to WASH at household level (BRE, 2016c; BRE, 2016f, BRE, 2016g).

There is also a lack of legislations and law enforcement. It well known that illegal dumping of waste occurs but since there is no proper dumpsite or treatment options available for the population and there are no compensations given by the municipality to avoid illegal dumping (BRE, 2016e; BRE, 2016h). Only the HEWs play an important role to increase the awareness of people related to good WaSH practices at household level.

5. Service outcomes

The majority of the population use pit latrines (69%), around 2% use flush toilets connected to septic or fully lined (sealed) tanks (with no outlet or overflow) which are mainly found in high-income households and hotels, spas, lodges and recreational centres focused on tourism) and approximately 29% of the population practice open defecation (CSA, 2007).

Emptying of latrines and septic tanks is carried out by vacuum trucks of one private company that comes once per year from the town of Debre Marcos (BRE, 2016b; BRE, 2016h).

All faecal sludge collected is discharged in agricultural fields and used as organic soil conditioner but utilized in an unsafely way (Figure 1). Farmers are not charged for this practice and there is no plan to strengthen the collaboration between farmers and the municipality to produce a safe product that could be used as organic soil conditioner. The absence of capacity building in solid and liquid waste management also constitutes a challenge to address this issue (RWA and GIZ, 2015).

Figure 1 Faecal sludge discharged in fields used for agriculture as organic soil conditioner (photo credit: Oscar Veses)

Drinking water comes from three wells and one spring (BRE, 2016d; BRE, 2016e). Near these water points, agriculture activities and cattle rising can be found. People only have access to water 3 days per week and 4 hours per day (BRE, 2016b; BRE, 2016d). Water is chlorinated on a daily basis in two reservoirs and distributed through pipes to the public and private water points.

The mean water table of the wells is greater than 15m (BRE, 2016e). All wells are located away from waste disposal sites, latrines and septic tanks but some cross-contamination due to agriculture and farming activities carried out near the wells might occur.

The situation described above is reflected in the SFD which shows that 67% of the faecal sludge generated is considered to be 'unsafely managed'. Although no data is available on the percentage of pit latrines that are covered when full, that number is estimated to be 33% of the total faecal sludge; this percentage is considered to be safely disposed, as shown on the SFD.

6. Overview of stakeholders

The main stakeholders are outlined in Table 1. The municipality of Bure is responsible for faecal sludge management in the town.

The WSSS has the mandate to deliver water supply and sewerage in the town. However, as there is currently no sewerage system, it only manages the water supply service.

Key Stakeholders	Institutions / Organizations
Public Institutions	Municipality of Bure Water Utility (WSSS) Health Extension Workers (HEWs)
Private Sector	Private emptying service providers
Development Partners, Donors	Several international institutions

Table 1 Key stakeholders

Private companies are responsible to provide emptying service in the town with a signed agreement with the municipality. Several international institutions and the government at regional level provide with funding to the WaSH sector in Bure.

7. Credibility of data

The main data sources include published national level WaSH policy and implementation documents – these are available online with public access. However, a literature search revealed that no local or town level documents are available with public access. The visit was therefore essential to collect data on WaSH services and, in particular, to gain access to unpublished reports on service outcomes and details of future plans for the sanitation sector in the town.

The main uncertainties of the data are the percentage of people using onsite technologies and the percentage of the population that use pit latrines that are covered and safely abandoned when full.

8. Process of SFD development

All data were collected by unstructured key informant interviews. The unstructured interviews were useful in gaining access to unpublished reports, including the technical report of the study of the situation of the solid waste management. Some of the interviews were conducted jointly with a group of stakeholders. This allowed for an open discussion and cross-checking of data.

Key Informant Interviews (KII) were conducted with senior representatives of the public institutions and one HEW. In addition, five KII

were conducted with representatives from several institutions at national level, including the Ministry of Water, Irrigation and Energy (MoWIE) and the Ethiopian Institute of Architecture in order to provide a general view on the WaSH situation at country level.

After collecting all necessary data, the SFD was produced using the SFD calculation tool and shared with the stakeholders who collaborated in the data collection (WaterAid Ethiopia).

9. List of data sources

BRE, 2016b. Interview with Haimanot Tafere, Bure town health office hygiene officer of Bure.

BRE, 2016c. Interview with Yihunile Gosna, health office head of Bure.

BRE, 2016d. Interview with Tilahun Shemeka, water supply and sewerage service of Bure.

BRE, 2016e. Interview with Shimelis Baru, water and energy office head of Bure.

BRE, 2016f. Interview with Zemenu Mossde, health officer of Bure.

BRE, 2016g. Interview with Mitsuh Abebam, health extension worker of Bure.

BRE, 2016h. Interview with Tesfaye Melaku, Coordinator of waste cleaning of Bure.

CD (Climate data), 2016. http://en.climate-data.org/location/54436/.Consulted on 29/02/2016.

CSA (2007). Housing Characteristics and Conditions. Online document available at: http://www.csa.gov.et/. Consulted on 02/03/2016.

Goyol, K., Girma, A. 2015. One WaSH national program (OWNP) Ethiopia: A SWAp with a comprehensive management structure. 38th WEDC International Conference, Loughborough, England.

MoH (Ministry of Health), 2013. National Sanitation Marketing Guideline. June 2013, Addis Ababa, Ethiopia.

RWA and GIZ (2015). Ethiopian urban solid waste management sector (2015). Produced by RWA (Resources and waste advisory group) and GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH).

SFD Bure, Ethiopia, 2016

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Abbreviations

CSA	Central Statistical Agency
CSO	Civil Society Organization
EEPA	Ethiopian Environmental Protection Authority
ETB	Ethiopian Birr
EWRMP	Ethiopian Water Resource Management Policy
FMHCAC	Food, Medicine and Health Care Administration and Control
GTP	General Growth and Transformation Plan
GTP II	General Growth and Transformation Plan II
GoE	Government of Ethiopia
HEP	Health Extension Program
HEWs	Health Extension Workers
KII	Key Informant Interview
JMP	Joint Monitoring Program
MDG	Millennium Development Goal
MWA	Millennium Water Alliance
MoE	Ministry of Education
MoFED	Ministry of Finance and Economic Development
MoH	Ministry of Health
MoWIE	Ministry of Water, Irrigation and Energy
SNV	Netherlands Development Organization
NPHOSS	National Protocol for Hygiene and “On-Site” Sanitation
NWI	National WaSH Inventory
OWNP	One WaSH National Program
UAP	Universal Access Plan
UNICEF	United Nations Children's Fund
WASH	Water Sanitation and Hygiene
WIF	WaSH Implementation Framework
WRDF	Water Resources Development Fund
WASH	Water Sanitation and Hygiene
WSSS	Water Supply and Sewerage Service
WHO	World Health Organization

1 Town context

Bure is an Ethiopian town located 400 km north of the capital Addis Ababa and 148 km south west of Bahir Dar (Figure 1). It belongs to the Amhara National regional State, Western Gojjam Administrative zone. It has a total urban population of 27,386 people. The town has around 10,140 households out of which 1407 are constructed informally. In the town each household contains an average of 2.7 family members (RWA and GIZ, 2015). Bure has a tropical climate with an average annual temperature of 20°C and a mean annual rainfall about 1505mm (CD, 2016).

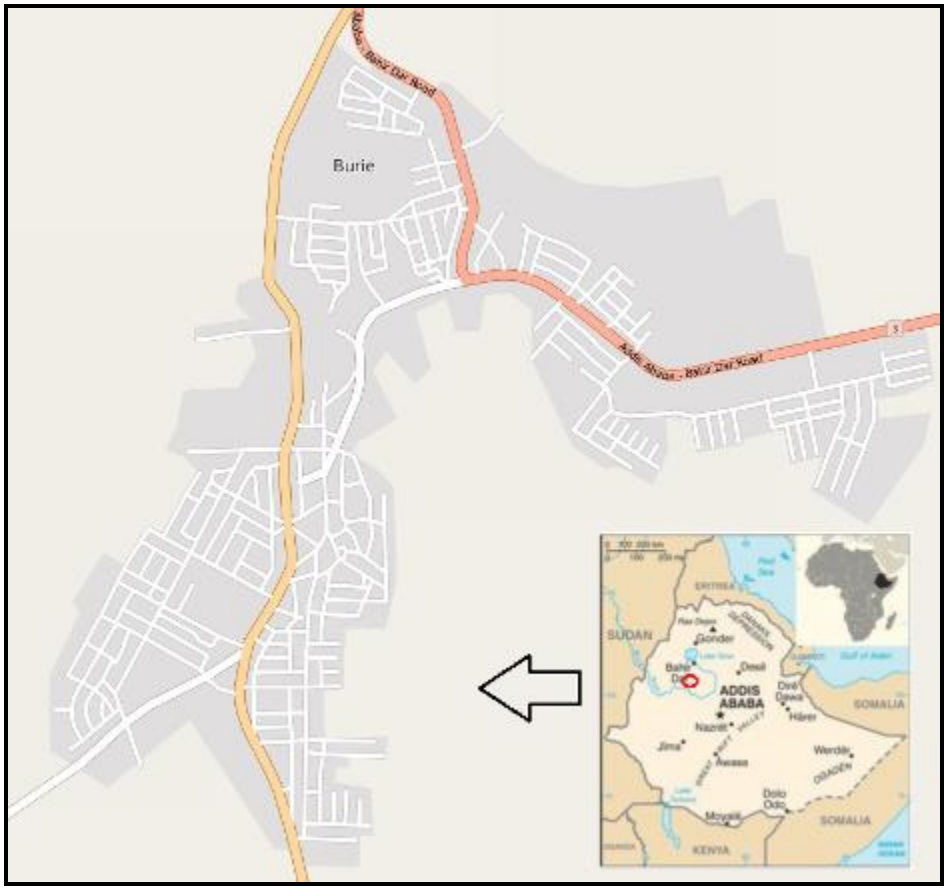

Figure 1: Location of Bure (also spelled *Burie*). Adapted from (Lindfors, 2011) and (OPS, 2016).

Bure is experiencing mixed economic activities: agriculture, industrial manufacturing and service sectors. The town hosts several small businesses, acting as a business hub between Wolega, Gondar and Shewa. Furthermore, Bure is the home of 58 social and governmental institutions, 7,614 residential houses and 1,061 commercial centres, one private hospital, one health centre, six clinics, and three pharmaceutical centres. The town also hosts an agricultural training college and Bure Baguna, a mineral water factory (RWA and GIZ, 2015).

Drinking water is provided by four deep wells, chlorinated and distributed through pipes to the public and private water points. The town does not have any disposal site for any kind of waste. All solid wastes are dumped to open spaces, ditches or river banks. All faecal sludge collected is discharged to agriculture fields and used as organic soil conditioner.

2 Service delivery context analysis

2.1 Policy, legislation and regulation

2.1.1 Policy

The Federal Democratic Republic of Ethiopia included the protection of public health in the 1995 National Constitution. The Article 90.1 states that "to the extent the country's resources permit, policies shall aim to provide all Ethiopians access to public health and education, clean water, housing, food and social security".

Since that time, several documents have been redacted to guide the implementation of national policies regarding water and sanitation (WaSH) developed by the government. The main ones are listed as follows:

- Ethiopian Water Resource Management Policy (1999).
- Universal Access Plan for Water and Sanitation (2005).
- National Sanitation and Hygiene Strategy (2005).
- National Protocol for Hygiene and "On-Site" Sanitation (NPHOSS) (2006).
- Needs Assessment to Achieve Universal Access to Improved Hygiene and Sanitation by 2012 (2007).
- National Sanitation and Hygiene Implementation Guideline (2011).
- Urban Sanitation Universal Access Plan (2011).
- One WaSH National Program (OWNP) (2013).
- National Sanitation Marketing Guidelines (2014).

The Ethiopian Water Resource Management Policy (EWRMP) developed in 1999 by the Ministry of Water Resources, currently the Ministry of Water, Irrigation and Energy (MoWIE), aimed to promote the development of adequate management of water resources in Ethiopia to contribute to the accelerated economic growth of the country.

In 2002, decentralization of powers and functional responsibilities from federal to local government was a major step toward the development of WaSH infrastructures (WaterAid, 2013). In 2006, The National Protocol for Hygiene and "On-Site" Sanitation (NPHOSS) was produced by the Ministry of Health (MoH) to "follow the national strategy for hygiene and sanitation improvement with its focus on universal access (100% hygienic and sanitized households) in primarily rural or peri-urban environments" (MoH, 2006).

In 2010, the General Growth and Transformation Plan (GTP), developed by the Ministry of Finance and Economic Development (MoFED), is the first phase to attain the goals and targets set in the Millennium Development Goals (MDGs) at a minimum, including those related to WaSH. Although water and sanitation are seen as priority areas, the only goal set is to have "better and closer access to safe water and sanitation facilities", with no other specification whatsoever (MoFED, 2010).

A seven year program (2013-2020) under the name of One WASH National Program (OWNP) and the related WaSH Implementation Framework (WIF), was launched in September 2013 by the Government of Ethiopia (GoE) with additional support of UNICEF with a total budget of more than USD $2 billion, the largest ever developed in the WaSH sector in Ethiopia (Goyol and Girma, 2015). The Program will be carried out in seven years and accomplished in two phases; Phase I from July 2013 to June 2015 and Phase II from July 2015 to June 2020. This program is the main tool of the GoE to achieve the targets for sanitation and hygiene proposed in the Universal Access Plan (UAP), outlined in section.

There are no by-laws, rules or regulations regarding solid or liquid management in Bure. There is no involvement of governmental and NGOs to improve the existing solid and liquid management challenges and problems of the town, as it will be stated in the following sections (BRE, 2016e; RWA and GIZ, 2015).

However, the Health Extension Program (HEP) is an essential service providing advice to families and improving sanitation and waste management practices at household level (BRE, 2016f; BRE, 2016g). Thus, there needs to be more coordination among the institutions and a clear strategy to address urban sanitation.

2.1.2 Institutional roles

The institution in charge of monitoring sanitation and hygiene interventions in Ethiopia is the Ministry of Health (MoH) with more than 38,000 Health Extension Workers (HEWs). They work at community and household levels to promote the use of improved sanitation facilities and eradicate open defecation (Jones, 2005).

The Ministry of Water, Irrigation and Energy (MoWIE) is responsible for water policy, coordination and monitoring whereas the Ministry of Education (MoE) tries to build an education and training system which assures quality and equity education. The Ministry of Finance and Economic Development (MoFED) is responsible for budgeting and managing economic resources in both federal and regional governments.

In recent years, profound dialogue and collaboration between the MoWIE, MoE and MoFED has been carried out to monitor and report the status of WaSH in the country including the launch of the OWNP, among others (Jones, 2005).

There are five divisions in terms of governance and administration of the WaSH sector in Ethiopia (Girma and Suominen, 2013):

1. Federal government, with its capital in Addis Ababa.
2. Nine Regions and two city administrations (each with a Water Bureau).
3. Over 70 Zones (Some of the Zones are important for ethnic reasons, and have autonomous status. These are called “Special Zones”.)
4. 805 Woredas (Districts). Each Woreda has a Water Office.
5. Around 16,000 administrative Kebeles (comprising several villages or “peasant associations”).

The organizational arrangements of the OWNP are depicted in Figure 2.

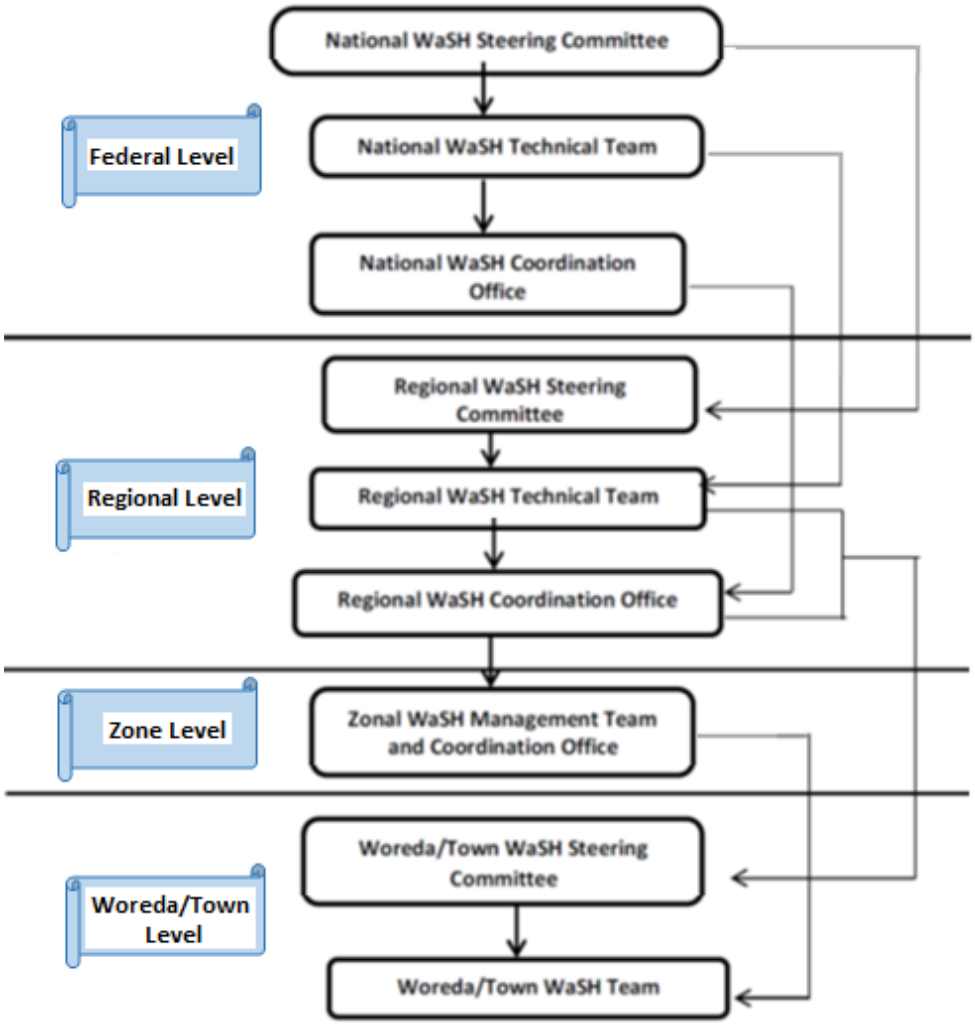

Figure 2: Organizational arrangement for OWNP implementation. Adapted from (GoE, 2013a).

A summary of the institutional roles of each WaSH structure is presented in Table 1.

In addition to those institutions, about 100 Civil Society Organizations (CSOs) work in water and sanitation service delivering, hygiene promotion, piloting new approaches and reaching remote areas and groups. CSOs have also created the Water and Sanitation Forum to coordinate planning and implementation of WaSH activities even in conjunction with the Millennium Water Alliance (MWA) (GoE, 2013a).

Finally, The Urban Health Extension Program (UHEP) targets the wellbeing of urban populations through selected high-impact interventions, which include improving sanitation and waste management services and practices (BRE, 2016c; BRE, 2016f; BRE, 2016g). There are HEWs directly addressing the community on sanitation and hygiene education and promotion based on 16 health packages (BRE, 2016g; WaterAid, 2013).

Table 1 Summary of the duties and responsibilities of WaSH structures. Adapted from (GoE, 2013a).

Institution	Duties and Responsibilities
National WaSH Steering Committee	-Reviews and endorses the National WaSH Strategic Plan and Annual WaSH Plans -Oversees the proper functioning of the WaSH Program
National WaSH Technical Team	-Regularly monitors program implementation -Designs programs for experience-sharing within and outside the country
National WaSH Coordination Office	-Preparation of manuals, guidelines and generic training materials -Maintains national WaSH management systems and records -Promotes and facilitates national networks among WaSH actors
Regional WaSH Steering Committee	-Ensures the establishment and functioning of WaSH structures in the region
Regional WaSH Technical Team	-Facilitates inter-sectoral communication and cooperation -Regularly monitors program implementation and provides guidance
Regional WaSH Coordination Office	-Ensures Woredas have consolidated WaSH plans -Maintains regional WaSH management systems and records
Woreda WaSH Team	-Prepares consolidated Woreda WaSH plans (strategic and annual) -Review and monitor WaSH program implementation at woreda level -Support training and engagement of artisans in the private sector

2.1.3 Service provision

The current urban wastewater management system in Ethiopian towns and cities is “a linear treatment system that is based on figured system operation majorly on disposal, open dry beds and small size conventional treatment” (MoWIE, 2015).

Except Addis Ababa, which is equipped with a sewerage system to serve part of the city and an ongoing project to expand it (ETP, 2016a; ETP, 2016c), the rest of the cities in Ethiopia have onsite sanitation systems. Service provision is maintained by the following institutions (Stolz et al. 2013; ETP, 2016e):

- Sewage utilities. Septage collection, treatment and disposal is mainly conducted by the utilities. They are also responsible for technical interventions, operation and maintenance, customer services and financial and administrative aspects.
- Sanitation and beautification agencies. They administer public latrines.
- Municipality. In some cities, municipalities provide septage collection, treatment and disposal.

The Water Supply and Sewerage Service (WSSS) is the organization mandated with sewerage management. However, the municipality is in charge of the faecal sludge management. The municipality does not provide emptying services but facilitate the private sector to carry out these emptying services. These private companies come from the city of Debre Marcos, charging a tariff to customers for the service provision (BRE, 2016b; BRE, 2016h).

Nevertheless, there is a lack of qualified professionals in the solid and liquid waste management. There is only one urban planner working in the management chain. The rest of the people are not professionals of the sector and have not received the appropriate capacity building to carry out their duties (RWA and GIZ, 2015).

There is a lack of communication and coordination between the WSSS and the municipality. In the future, the town administration is planning to transfer the management of the faecal sludge to the WSSS (BRE, 2016b; BRE, 2016h).

2.1.4 Service standards

Following the Ethiopian Constitution, The Food, Medicine and Health Care Administration and Control (FMHCAC) issued the *Proclamation No*. 661/2009 to address waste handling and disposal and the availability of toilet facilities in articles 30 and 31, respectively (Table 2).

Although there are national quality standards regarding the maximum concentration of several chemicals that can be discharged into the receiving waters for several industries such as tanneries or processing of steel, among others (EEPA, 2011), there are no quality standards set for wastewater or sludge disposal.

However, in the "Guidelines for Social, Environmental and Ecological Impact Assessment and Environmental Hygiene Impact Assessment and Environmental Hygiene in Settlement Areas", a draft from the Ethiopian Environmental Protection Authority (EEPA) from 2004, it is stated that "latrines should be connected to digesters to produce both biogas and slurry as organic fertilizer. As a minimum, they should be connected to a compost pit and the human waste should be used to produce compost".

Table 2 Articles related to WaSH in Proclamation No. 661/2009.

Waste handling and disposal (art. 30)	**Availability of toilet facilities (art. 31)**
30/1. "No person shall collect or dispose solid, liquid or other wastes in a manner contaminating the environment and harmful to health"	**31/1.** "Any institution providing public service shall have the obligation to organize clean and adequate toilet facilities and keep it open to its customers"
30/2. "Any wastes generated from health or research institutions shall be handled with special care and their disposal procedures shall meet the standards set by the executive organ"	**31/2.** "Any city or rural administration shall be responsible to provide public toilet and ensure its cleanliness"
30/3. "It is prohibited to discharge untreated waste generated from septic tanks, seepage pits, and industries into the environment, water bodies or water convergences"	----

According to several interviews with the head of the WSSS (BRE, 2016c), people from the health office (BRE, 2016c) or HEW (BRE, 2016f), the WaSH situation in Bure has improved over the last 10 years. However, there are several problems that still need attention such as lack of budget, monitoring, proper disposal site for solid and liquid wastes and lack of awareness of people, among others (RWA and GIZ, 2015).

Reports and data related to solid waste management and water quality assessments are not published online and were only accessible locally. However, both the health office and the WSSS provided any document, study or report if it was requested and available, always collaborating in the process of data collection.

Disposal of wastes is a problem in the town. There is no proper disposal site for any waste stream, there are reports of illegal dumping, a lack of law enforcement to prevent this (BRE, 2016e; BRE, 2016h; BRE, 2016i; RWA and GIZ, 2015) and there is no quality standard regarding the faecal sludge that is used as organic soil conditioner (it is discharged in the agricultural fields with no treatment at all).

The municipality has a plan to bury solid waste at specific locations in the city wards to dispose of solid waste, but there is no indication of these arrangements being correctly designed.

2.2 Planning

2.2.1 Service targets

Ethiopia's water and sanitation coverage was reported as 19% and 5% respectively in 1990 (Defere, 2015). Since that time, important progress has been achieved. The Millennium Development Goal (MDG) target was to achieve a 56% of people with sanitation coverage. According to the National WaSH Inventory (NWI), in 2011 national access to water supply and sanitation was 52.1% and 63%, respectively (GoE, 2013b), suggesting almost a complete accomplishment of the MDG target.

Despite that improvement, those numbers indicate that the practice of open defecation (37%, over 35 million people from 2011 data) result in a risk of disease infection and/or transmission. However, there are differences between people living in rural areas practicing open defecation (43%) and people leaving in urban areas (8%) (Jones, 2015).

The GoE developed the Universal Access Plan (UAP), a document setting the following targets for sanitation and hygiene within the government's policy (Girma and Suominen, 2013):

-98.5% access to water supply, and reduction of the proportion of non-functioning facilities to 10%.

-All Ethiopians will have access to basic sanitation by 2015.

-77% of the population will practice hand washing at critical times.

-Safe water handling and water treatment at home.

-80% of communities in the country will achieve open defecation free status.

Targets after 2015 and the following years, proposed by the World Health Organization (WHO), the Joint Monitoring Program (JMP) and UNICEF have also been set and are outlined in Table 3 (JMP, WHO/UNICEF, 2013).

Table 3 Proposed targets for WaSH within the years 2025-2040.

	Water	Sanitation	Hygiene
2025		*Open defecation free status.	
2030	*Universal basic drinking water in schools and health centres. *Universal basic drinking water at home.	*Universal adequate sanitation in schools and health centres.	*Universal adequate handwashing in schools, health centres and households.
2040	*Progress towards intermediate drinking water at home.	*Universal adequate sanitation at home. *Progress towards safe management of excreta.	

Faecal sludge is collected once a year by a private company based in Debre Markos, which charges a fixed tariff per emptying. The municipality coordinates this service.

Since all emptied faecal sludge is already used as an organic soil conditioner (although not in a safe way as discussed in section 3.6), there is potential to foster this initiative and transform it into a final product of high value such as compost.

In addition, proper access to drinking water needs to be improved to meet the proposed targets for WaSH within the years 2025-2040, see section 3.7.

2.2.2 Investments

The OWNP objective is “to contribute to improving the health and well-being in rural and urban areas by increasing water supply and sanitation access and the adoption of good hygiene practices in an equitable and sustainable manner” (GoE, 2013b). The total budget is distributed in four main components: Rural and Pastoral WaSH, Urban WaSH, Institutional WaSH and Program Management and Capacity Building. The costs of these components are shown in Table 4.

Table 4 Distribution of the budget designated for WaSH in the OWNP.

Component	Destination	Water supply[1]	Sanitation and hygiene[1]
1	Rural and Pastoral WaSH	USD 1.03 billion	USD 0.4 billion
2	Urban WaSH	USD 786 million	USD 95.7 million
3	Institutional WaSH	USD 545.7 million	
4	Program Management and Capacity Building	USD 178.8 million	

[1]USD exchange rate in 2013

Urban WaSH budget designated to sanitation and hygiene is mainly assigned to desludging equipment and facilities and management of wastewater and public toilets in selected locations. Institutional WaSH budget is designated to improve water supply, sanitation facilities and hygiene practices at health institutions and schools (GoE, 2013b).

USD78.6 million (out of USD178.8 from the component 4) are designated for urban WaSH program management and capacity building, including training, post-construction management support, equipment, tools, and support to monitoring and reporting. Finally, there is also an amount of money from the project designated to train WaSH professionals (GoE, 2013b).

Apart from the OWNP, the GoE created in 2002 the Water Resources Development Fund (WRDF) to promote development of viable and sustainable urban water supply and sanitation services throughout the country (GoE, 2013b). International aid funding plays an essential role for funding WaSH activities since 61% of water budget and 70% of sanitation budget is financed by external agencies such as donors and NGOs (Girma and Suominen, 2011). Donors involved in the WaSH sector include the Department for International Development, the European Development Bank, the World Bank and the Government of Italy. International NGOs such as WaterAid, Netherlands Development Organization (SNV), Plan International and about 70-100 local NGOs are active in the sector (Stolz et al. 2013).

According to RWA and GIZ (2015), there is one single budget designated for all urban services, including solid and liquid waste management. Thus, it is difficult to know and monitor how much money is allocated and how it could be used for these purposes. There is also no reliable information showing an overall budget for planning and implementation of faecal sludge management. There is no cooperation with cities and regional bureaus and any other organizations for solid waste management. The municipality does not receive any financial grant/loan/aid from NGOs in solid and liquid waste management (BRE, 2016e; BRE, 2016h; RWA and GIZ, 2015).

There is no budget assigned for the construction of new facilities such as pit latrines since the national policy states that the household itself has the obligation to build its own pit latrine (or any other sanitation system) to contain the faecal sludge (BRE, 2016e; BRE, 2016f).

Finally, the promotion of activities related to the WaSH sector at household level mainly lies on the Health Extension Workers (HEWs).

2.2.3 Policy and Program Initiatives

A further revision of the GTP, currently under development (GTP II), includes a target to increase the proportion of households using latrines to 93% in all Ethiopia by 2017 (Jones, 2015).

Although there is no strategy/plan to be implemented at town level for improving solid and liquid waste management, the municipality is thinking to develop a future strategy to improve the current management of solid wastes. The future waste management plan includes the use of reusable woven bags, composting at home level, installation of public street bins and use of controlled landfill disposal of wastes, among others with an estimated cost of 985,520 USD (RWA and GIZ, 2015).

2.3 Reducing inequity

2.3.1 Current choice of services for the urban poor

There is no pipeline sewage system and thus, no off-site sanitation options available. All people use on-site sanitation facilities, no matter of their social status.

Although there is an obligation for each new household to have a pit latrine, the poor people who cannot afford to build one rely on communal or public latrines since the government or the municipality does not provide any kind of funding for such purpose (BRE, 2016e; BRE, 2016f).

2.3.2 Plans and measures to reduce inequity

The OWNP states that, first; it is necessary to identify and target areas with low access to safe water or improved sanitation and once they are identified, propose priority action plans to reduce inequity in the areas identified. In concordance with this, reducing regional and social disparities in access to safe drinking water and improved sanitation must be accomplished. Gender disaggregated indicators are to be used to track gender equity in roles and benefits (GoE, 2013b).

The budget for the OWNP clearly prioritizes the water supply over sanitation and hygiene both at rural and urban levels (Table 4). This is in concordance with previous reports where different policies in developing countries have been assigning higher budget and thus, more importance, on water supply over sanitation and hygiene over the last years (Sandec/Eawag, 2015).

One of the major problems, not only in Bure but also in all Ethiopia, is the lack of awareness of people (and also the local authorities) regarding WaSH (BRE, 2016b; BRE, 2016c; BRE, 2016h, ETP, 2016a; ETP, 2016d). For that reason, the Health Extension Program (HEP) “targets the wellbeing of urban populations through selected high-impact interventions, which include improving sanitation and waste management services and practices (ACIPH, 2015)”.

All HEWs in Bure are females, previously trained as nurses, becoming HEWs after training according to the policy developed by the MoH. Currently, 320 households have received the proper training and it is planned that an additional 740 households receive that training in the future (BRE, 2016b; BRE, 2016c; BRE, 2016g). HEWs provide advice and capacity building

on how to make a latrine, how to manage properly solid and liquid wastes at household level, good hygiene practices, etc.

The town has insufficient funds to create a plan in order to extend solid and liquid waste collection coverage to the informal settlers (RWA and GIZ, 2015).

2.4 Outputs

2.4.1 Capacity to meet service needs, demands and targets

The public participation and involvement in the area of solid waste management is very low. Only around 5% of the total solid waste is collected, which suggests coverage of around 10% of the population (RWA and GIZ, 2015) and a very poor capacity to meet service needs, demands and targets. There is no such data regarding faecal sludge, however it was estimated that around 5% of the population have access or use the service provided to empty their latrines and septic tanks (fully lined tanks) when they get full, see section 3.8.

In the interview conducted to a HEW, it was stated that there are several challenges related to WaSH that need to be addressed in the near future. One challenge is to deal with the hilly topography of the town and the poor condition of the roads, making it difficult for people (especially for people with disabilities) to properly dispose the solid waste in the dumpsites. Another complain was the lack of a proper disposal site for any kind of waste, community containers and public street bins to handle any waste, in addition to the poor maintenance of some public latrines.

2.4.2 Monitoring and reporting access to services

Before 2004, all WaSH interventions in the country were project-based and therefore, there was no integration between water supply, sanitation and hygiene. However, GoE's policy on the WaSH sector is now being addressed jointly. That is the reason why MoH, MoWIE, MoE and MoFED share the responsibility for achieving WaSH targets set by the GoE's policy (GoE, 2013b). The OWNP entitled the MoH to operate a monitoring system to develop one plan, one budget and one report for the WaSH sector (Jones, 2015). In Table 5, a summary of the monitoring responsibilities from organizations at different levels currently being taken by the WIF under the frame of the OWNP is presented.

Between 2010 and 2011, a National WaSH Inventory in all regions (Somali region was later added in 2014) was carried out by the MoWIE with financial support from the World Bank and UNICEF (ETP, 2016b). This has provided the country with a first baseline of the WaSH sector at a national level. Furthermore, a successful initiative between UNICEF and Akvo (a not-for-profit foundation) used mobile phone software (Akvo FLOW) to collect WaSH inventory data in the Somali region in 2014 has the potential to open new possibilities on future data gathering and analysis (Jones, 2015). It can be said that both the development of OWNP and NWI has strengthen the monitoring and reporting activities of the WaSH sector in the country but needs further follow up (Jones, 2015).

Table 5 Summary of monitoring responsibilities at different levels. Adapted from (Jones, 2015).

Institution	Responsibilities
Kebele WaSH Teams	− Study data and complete analysis of Kebele WaSH situation − Prepare monthly, quarterly and annual WaSH progress reports and send the Woreda − Conduct quarterly WaSH progress review meeting with WaSH stakeholders
Woreda WaSH Team	− Conduct technical assessment every 3 years − Prepare monthly, quarterly and annual WaSH progress reports and send the Zone/Regions − Conduct quarterly WaSH progress review meeting with WaSH stakeholders
Region/ Zone Coordination Office	− Prepare Regional Annual WaSH Plan − Prepare monthly, quarterly and annual WaSH progress reports and send the National WaSH Coordination Office − Conduct quarterly WaSH progress review meeting with WaSH stakeholders
National WaSH Coordination Office	− Prepare and propose investment plan, loan/grant applications and national annual WaSH plan − Prepare monthly, quarterly and annual WaSH progress reports

All census studies regarding population and sanitation preferences among people in Bure are carried out by government institutions and by the municipality at local level. The report carried out in 2014 to conduct a situation analysis of the solid waste management system was only accessible upon arrival on the town and through email since it was not published on the internet (RWA and GIZ, 2015).

There is no monitoring and reporting access to services regarding faecal sludge. There is a lack of supervisory staff to monitor any activity related to solid or liquid waste or to take any action to increase coverage of the service delivery at all (RWA and GIZ, 2015). However, HEWs monitor on a weekly basis that people apply the guidelines and good practices related to WASH at household level (BRE, 2016c; BRE, 2016f, BRE, 2016g).

2.5 Expansion

2.5.1 Stimulating demand for services

Although there is not much experience in sanitation marketing in Ethiopia, part of the national budget for OWNP is assigned to urban WaSH program management and capacity building as mentioned in section 2.2.2. The responsibility of promoting household sanitation and good hygiene practices lies in the town health office under the town/city administration. The idea of using trained HEWs for sanitation and hygiene promotion at household level was launched by the GoE and increased the WaSH promotion in the country (Stolz et al. 2013).

The GoE developed a National Sanitation Marketing Guideline to foster sanitation marketing and promote, with the participation of the private sector, the use of different technologies to assess sanitation issues. The guideline also includes approaches including micro and small enterprise development agencies, microfinance institutions and technical and vocational education and trainings in the woredas to identify and develop appropriate environments for the private sectors (MoH, 2013).

In order to meet national and global commitments, the GoE developed in 2013 the Sanitation and Hygiene Strategy, Sanitation Protocol, Strategic Sanitation Action Plan. This plan was created to facilitate changes in the sanitation and hygiene situation in Ethiopia and promote improved sanitation (MoH, 2013).

There is a lack of legislations and law enforcement. It is well known that illegal dumping of waste occurs but since there are no proper dumpsite or treatment options available for the population, there are no compensations given by the municipality to avoid illegal dumping (BRE, 2016e; BRE, 2016h). Only the HEWs play an important role to increase the awareness of people related to good WaSH practices at household level.

2.5.2 Strengthening service provider roles

The OWNP includes a section to promote and strengthen private sector capacity by generating information, training and business opportunities in the WaSH sector (GoE, 2013b). According to Stolz et al. (2013), there are several individual consultants and consultancy companies doing capacity building activities in the WaSH sector. However, there is no policy framework for private-sector engagement on faecal sludge management or any particular government institution responsible for promoting private-sector engagement in urban waste management (ACIPH, 2015).

The National Hygiene & Sanitation Strategic Action Plan for Rural, Per-Urban & Informal Settlements in Ethiopia is a guideline that includes several targets such as capacity building of the private sector, creation of lines of credit, development and promotion of products and services that respond to consumer preferences (GoE, 2011). However, it is only targeted for rural, per-urban and informal settlements, not for urban areas (GoE, 2011).

As stated in section 3.6, all faecal sludge is unsafely discharged to agricultural fields where it used as an organic soil conditioner. Farmers are not charged for this practice and there is no plan to strengthen the collaboration between farmers and the municipality to produce a safe product that could be used as a soil conditioner. The absence of capacity building in solid and liquid waste management constitutes a challenge to address this issue (RWA and GIZ, 2015).

3 Service Outcomes

3.1 Offsite technologies

There is no sewerage system (BST, 2016a).

3.2 Onsite technologies

There is no wastewater or faecal sludge treatment plant. Faecal sludge is collected once per year by a private company (from Debre Marcos) and discharged untreated to open fields (BRE, 2016e; BRE, 2016h).

3.2.1 Flush toilet

Flush toilets (locally known as water closets) are only found in high-income households and hotels, spas, lodges and recreational centres, focused on tourism. All flush toilets are connected to fully lined tanks (sealed) with no outlet (often referred to locally as septic tanks).

3.2.2 Pit latrines

These latrines mainly consist of a squatting slab over a pit. Pit latrines are used by the majority of the population (BRE, 2016c; BRE, 2016g).

3.2.3 Improved latrines

People who can afford to build a ventilated improved pit latrine to reduce fly and odour nuisance by ventilating the pit by means of a pipe, use this type of latrine (BRE, 2016c; BRE, 2016g).

3.3 Usage

A total of 400-450m^3 of faecal sludge per month is collected and discharged in agricultural fields and used as organic soil conditioner (BRE, 2016h). Table 6 shows the usage of sanitation technologies by percentage of population according to the study carried out by the CSA in 2007. These percentages will be used in the SFD calculations since it was not possible to obtain updated data.

Table 6 Percentage of people using different sanitation technologies according to the CSA study (CSA, 2007).

	%
	CSA (2007)
No toilet	29
Flush toilet	2
VIP	2
Pit latrine	67

3.4 Categories of origin

Categories of origin can be classified as households, shared or communal latrines, public toilets and institutional toilets. A brief description of each origin is presented as follows.

3.4.1 Households

The majority of people use pit latrines or VIPs (Table 6).

3.4.2 Shared or communal latrines

There are 97 communal pit latrines. As seen in Figure 3, several residues such as plastics, paper, etc. are found inside the latrine highlighting poor maintenance.

Figure 3: Inside and outside of a public latrine (photo credit: Oscar Veses)

During the visit, there was an opportunity to visit one communal latrine that was full and not emptied (Figure 4a, b); here excrement was observed outside the latrine.

Figure 4: a) Front of a public latrine which is not emptied when full. b) Outside of the latrine with some faecal matter in the ground (photo credit: Oscar Veses).

Owners find pit latrine management challenging with some pit latrines being abandoned before they reach the end of their design life. This can be due to the pit walls or superstructure collapsing or because the household cannot afford to pay for a full pit to be emptied (BRE, 2016e; BRE, 2016h).

3.4.3 Public toilets

There are six public pit toilets, of which only three are functioning (BRE, 2016d).

3.4.4 Institutional toilets

In places such as educational institutions, public institutions, hospitals, and some local restaurants and hotels the use of pit latrines are the preferred option. The inside of such a pit latrine can be seen In Figure 5.

Figure 5: Inside of a latrine (photo credit: Oscar Veses).

3.5 Motorised Emptying

Motorised emptying is the main option used to empty pit latrines, septic tanks and fully lined (sealed) tanks. A private company coming from the city of Debre Markos collects faecal sludge once a year. They visit for one week (normally in January during the dry season) and collect all faecal sludge with a truck with a capacity of 10 m^3, charging 1,000 ETB per emptying service. Households request the service through the municipality (BRE, 2016e; BRE, 2016h).

3.6 Treatment, end-use and disposal

There is no faecal sludge treatment plant or disposal site. All faecal sludge is unsafely discharged in open fields belonging to farmers and used as organic soil conditioner (Figure 6). The main crops are grains such as teff, whey, maze, etc. (BRE, 2016h).

As seen in Figure 6, some solid wastes such as plastics are mixed together with the faecal sludge, probably due to improper use of the latrines.

Figure 6: Faecal sludge discharged in fields used for agriculture as organic soil conditioner (photo credit: Oscar Veses).

Importantly, since faecal sludge can contain pathogens, it requires treatment before re-use or disposal, for example by composting. As defined by Haug (1980), composting is "the biological decomposition and stabilization of organic substrates under conditions which allow development of thermophilic temperatures as a result of biologically produced heat, with a final product sufficiently stable for storage and application to land without adverse environmental effects". This composting is needed to stabilize the waste, inactivate the pathogens and for better absorption of nutrients (N and P), which when present in faecal sludge are usually in complex organic forms and difficult for the crops to uptake. After composting, these nutrients are in inorganic forms such as NO^{-3} and $PO4^{-3}$ suitable for uptake by the crops.

Solid wastes are disposed in several pits located in each kebele or ward within the city (around 13 pits/kebele). The average municipal solid waste generated in the town is estimated to be 6,261.9 Ton/year and its composition is showed in Figure 7.

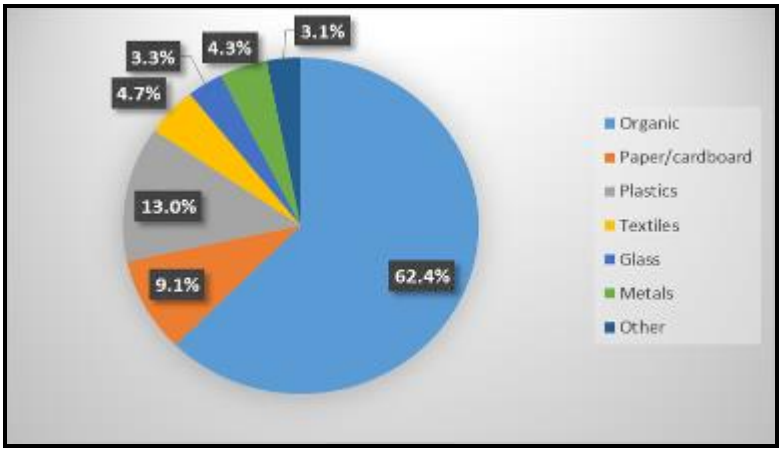

Figure 7: Composition (% by weight) of solid waste collected. Adapted from (RWA and GIZ, 2015).

There is one private company that collects solid waste (not faecal sludge) both organic and inorganic, having 300 customers to date and distributed as follows: 20 institutions and 280 households. In case of institutions, solid wastes are collected twice per week and they are charged with 25 ETB per month. At household level, solid waste is collected four times per

month and each household is charged 15 ETB per month for the service. The company has four assistants and four carts (Figure 8a) to collect solid wastes; workers do not use personal protective equipment (BRE, 2016a). However, this informal private sector collector is estimated to cover only 10% of the population and collect around 5% of the total solid waste (RWA and GIZ, 2015).

Figure 8: a) Owner of the company with the cart used to collect solid wastes. b) Sacks to collect solid wastes (photo credit: Oscar Veses).

Solid wastes are collected in sacks (Figure 8b), which are emptied and disposed in the nearest pit. When the pit is full, another pit is dug or even part of the residues is burnt to reduce their volume and continue to use the existing pit.

Pits have no protection fence and during the visit, several children were observed playing around the pits (Figure 9a, b), clearly representing a potential health risk. Some residents state that asthma and respiratory tract diseases are common in the areas where waste is dumped (RWA and GIZ, 2015).

Some illegal dumping occurs as shown in Figure 9. There are around four illegal dumping sites (BRE, 2016b; BRE, 2016c). In the one showed in Figure 9b, residues from a slaughterhouse are disposed along with other solid wastes. However, there is no penalty since the city has no proper disposal site for solid wastes (BRE, 2016e; BRE, 2016h; BRE, 2016i).

Figure 9: a) Pit used for solid disposal. B) Illegal dumpsite (photo credit: Oscar Veses).

Water runoff is collected in a drainage system distributed through the city with no treatment at all. This network also serves grey water collection points and improper solid waste disposal as seen in Figure 10.

Figure 10: Drainage system (photo credit: Oscar Veses).

A new properly designed sanitary landfill is planned to be built within three years (BRE, 2016h; BRE, 2016i).

3.7 Drinking water supplies in the town

The town has 22 public water points as the one showed in Figure 11, from which 15 are functional. Water coverage is 56% of the population. People are charged 4 ETB per $1m^3$ of water consumed. The number of people having their own tap is 3,200 from a population of 27,386 people and more than 100 households do not have access to water at all (BRE, 2016b, BRE, 2016d).

Figure 11: Typical water point (photo credit: Oscar Veses).

Drinking water comes from four wells (one has salty and non-potable water and the other three were built by the Japan Government) and one spring (BRE, 2016d; BRE, 2016e). Near these water points, agriculture activities and cattle rearing can be found (Figure 12a). All these four water sources produce less than 10l/s.

Drinking water is scarce; on average households have access to water 3 days per week and for 4 hours per day (BRE, 2016b; BRE, 2016d). WaterAid is working in a project to dig two new wells to increase this low water provision. Water is chlorinated on a daily basis in two reservoirs (one is showed in Figure 12b) and distributed through pipes to the public and private water points.

Figure 12: a) Well for water supply surrounded by cattle rising. b) Reservoir with chlorine dispenser (photo credit: Oscar Veses).

There is no control or monitoring of heavy metals or organic compounds in the water, which could be present due to cross-contamination (especially from organic matter coming from farming activities or nitrates and phosphates from fertilizer use).

3.7.1 Ground water pollution assumptions

According to the head of the water and energy office, the mean water table is greater than 15m (BRE, 2016e). All wells are located away from waste disposal sites, latrines, septic tanks and fully lined (sealed) tanks but cross-contamination due to agriculture and farming activities is a concern, as stated in section 3.7.

3.8 SFD Matrix

The data outlined in Table 6 shows the percentage of people using onsite sanitation technologies. Since there is no data on emptying and transport the following assumption was made.

Assuming that humans produce an average of 1 l/day of excreta (around 0.8 l of urine plus 0.2 l of faeces) (Franceys et al. 1992), the total sludge produced (on a yearly basis) is:

$$\frac{1L}{day * person} * 365\frac{day}{year} * 27{,}386person * \frac{1m^3}{1{,}000L} \approx 9{,}996m^3$$

According to the municipality, a total of 400 to 450m^3 of faecal sludge per year is collected and discharged in agricultural fields as organic soil conditioner (BRE, 2016h). Therefore, assuming on average 425m$^{3/}$year is collected and discharged, around 9,571 m^3/year (95%) of faecal sludge remains unaccounted for.

From that 95%, 29% is coming from open defecation practises, leaving a 66% of the sludge unaccounted. Since there is no data that indicates how much of this faecal sludge is safely buried and how much is not safely buried, it is assumed that 50% of the faecal sludge is safely buried (i.e. the latrines are safely abandoned) and 50% of the faecal sludge is not safely buried (i.e. the latrines are not safely abandoned). Therefore, it is estimated that 33% of the total population uses pit latrines that are never emptied but abandoned when full and safely covered with soil – i.e. excreta is safely managed. While 33% of the population use pit latrines that are never emptied but abandoned unsafely i.e. excreta is unsafely managed (e.g. pit latrines that are failed, damaged or collapsed, etc.). Of the remainder, 5% of the population uses pit latrines and septic or fully lined tanks (sealed with no outlet or overflow) that are emptied and the faecal sludge discharged to agricultural fields.

Table 7 summarizes the types of the sanitation containment systems currently in use. This table shows the description of the system, how it is defined in the SFD calculation tool and its reference and the percentage of people relying on each system.

Table 7 Estimation of the containment systems for the SFD matrix calculations.

Description of the system	SFD defined	Reference	% Faecal sludge
Open defecation	T1B11C7TOC9	L20	29
Containment (septic tanks and pits) failed, damaged, collapsed or flooded - connected to water bodies, or open ground or 'don't know where'	T1B10C7TOC9	Reference L18	33
Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow	T1B7C10	Reference L12	33
Lined pit with semi-permeable walls and open bottom, no outlet or overflow	T1A5C10	Reference L11	4
Fully lined tank (sealed), no outlet or overflow	T1A3C10	Reference L10	1

4 Stakeholder Engagement

The municipality of Bure was contacted ahead to gain permission to undertake this study. Eight Key Informant Interviews (KIIs) were conducted to primary stakeholders in relation to faecal sludge management. A telephone call was made upon arrival in Ethiopia to the municipality of Bure (Mr. Haile Dinku from WaterAid kindly did that call in Amharic) to explain the project and to arrange the days of the field trips. Those KIIs included stakeholders from the municipality, health extension workers, water utility, etc. All interviews were conducted either in the offices of the stakeholders or during the visits to different places of interest such as the dumping sites in the wards, public water points, public latrines, etc.

In addition to those interviews, five more KIIs were conducted to different stakeholders in Addis Ababa in order to provide with an overview of the sanitation situation in Ethiopia. Previous to the field visit, an introduction letter explaining the project was sent through email to the different stakeholders in Addis Ababa to explain the project and to set up a day for the interview. Those KIIs included stakeholders from the MoWIE, the Ethiopian Institute of Architecture and the Addis Ababa Water and Sewerage Authority, among others.

The town had no documents available on internet. The visit was essential to collect data and to have access to unpublished reports. The visit was also essential to gain knowledge about the current situation of sanitation as well as for having access to the future plans about the WaSH sector in the town.

Another benefit from the visit was to have first-hand data on the final end-use of the faecal sludge. It was of great interest to know that all faecal sludge is used as organic soil conditioner although in an improper way. This is a good initiative but clearly not well implemented due to a lack of budget and skilled people. Since there is room for improvement and the window for that opportunity is already open, it is encouraged to try to work on this

option in the near future with different stakeholders to find a solution in a sustainable way that could be beneficial for all.

4.1 Key Informant Interviews

All data were collected by unstructured key informant interviews. The unstructured interviews were useful to have access to unpublished reports such as the study carried out to conduct a situation analysis of the solid waste management. Some of these interviews were conducted jointly with different stakeholders. For example, interviews with the water and energy office head, the coordinator of waste cleaning and the person from water supply and sewerage service were held together during the field visit to the dumping sites in the wards and visits to the public water points and public latrines. This was helpful to cross-check data regarding the current condition of some public latrines out of order or the types of wastes that are found on these latrines due to improper use. Finally, just to mention that all interviewed people answered any question asked and they are willing to participate in further discussions and projects in the future.

4.2 Focus Group Discussions

Unfortunately, focus discussion groups were not carried out since the lack of available time. However, as mentioned in section 4.1, some interviews were conducted jointly with different stakeholders, allowing for an interchange of opinions and views regarding the sanitation situation and for data triangulation. Vivid discussions on the main challenges that need to be addressed were held during this jointly-made interviews and it is suggested for the future that all the primary stakeholders such as the municipality, the WSSS and HEWs, among others, could celebrate a meeting (maybe on a monthly basis) to share their views and interests on the WaSH sector and to address jointly the main problems and challenges of this sector.

4.3 Observation of service providers

Several observations of service providers included the visit to the dumping site, visits to public and institutional toilets, visits to public water points and public latrines. The field visit to the dumping site helped to understand how the faecal sludge is discharged and make a visual assessment on the current situation of the disposal site. The visits to the public and institutional toilets were useful to understand how the sanitation technologies operate and how they contain the faecal sludge. KIIs were conducted during these visits, these allowed for cross-checking of data and also to take photographs to increase credibility of the observations.

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BRE, 2016c. Interview with Yihunile Gosna, health office head of Bure.

BRE, 2016d. Interview with Tilahun Shemeka, water supply and sewerage service of Bure.

BRE, 2016e. Interview with Shimelis Baru, water and energy office head of Bure.

BRE, 2016f. Interview with Zemenu Mossde, health officer of Bure.

BRE, 2016g. Interview with Mitsuh Abebam, health extension worker of Bure.

BRE, 2016h. Interview with Tesfaye Melaku, coordinator of waste cleaning of Bure.

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7 Appendix

7.1 Appendix 1: Stakeholder identification

Name of organisation	Name of contact person	Position	Influence (high/medium/low)	Interest (high/medium/low)
Private company	Haile Asres	Private waste collector	Medium	High
Bure town health office	Haimanot Tafere	Hygiene officer	High	High
Bure town health office	Yihunile Gosna	Head	High	High
WSSS	Tilahun Shemeka,	Technician	Medium	High
Water and energy office	Shimelis Baru	Head	High	High
Bure town health office	Zemenu Mossde	Health officer	High	High
Bure town health office	Mitsuh Abebam	HEW	High	High
WSSS	Tesfaye Melaku	Coordinator of waste cleaning	High	High
WSSS	Menari Waggy	Manager	High	High
Ethiopian Institute of Architecture	Tesfaye Hailu	Chair holder of infrastructure design and construction	Low	High
MoWIE	Tamene Hailu	Coordinator of the national WaSH inventory	Low	High
Addis Ababa Water and Sewerage Authority	Ato Yared	Engineer	Low	High
Horn of Africa Regional Environment Centre and Network	Kassahun Bedene	WaSH Project Coordinator	Low	High
JSI	Birhanu Genet	Senior Environmental Health Advisor	Low	High

7.2 Appendix 2: Tracking of Engagement

Comment: List stakeholder that was directly engaged in the study.	Date of Engagement	Purpose of Engagement	Maximum 100 word summary of outcomes
Haile Asres	03/02/2016	Situation of solid waste disposal	Interview conducted to provide a view on the solid waste situation
Haimanot Tafere	03/02/2016	Situation of HEWs and their work	Information on the work of the HEWs was obtained: training, monitoring, etc.
Yihunile Gosna	03/02/2016	Introductory call to gain permission to do field work	Interview to know how the vacuum trucks operate, tariffs of emptying, etc.
Tilahun Shemeka	03/02/2016	To know about the WaSH situation	Information about the drinking water supply and plans to increase the capacity, lekeage, water coverage, etc.
Shimelis Baru	03/02/2016	To know about the water supply in the city	Information on the groundwater wells: situation, capacity,etc.
Zemenu Mossde	03/02/2016	Situation of HEWs and their work	Information on the work of the HEWs was obtained: training, monitoring, etc.
Mitsuh Abebam	03/02/2016	Situation of HEWs and their work	Information on the work of the HEWs was obtained: training, monitoring, etc.
Tesfaye Melaku	03/02/2016	To know about the WaSH and solid waste situation	Interview conducted to provide a view on the solid waste situation
Menari Waggy	03/02/2016	To know about the WaSH situation	Interview conducted to provide a view on the WaSH situation and to provide unpublished data and reports on WaSH
Tesfaye Hailu	16/12/2015	Introductory email was sent to him to see the willingness to participate in the project	Interview was conducted to gain knowledge about the WaSH situation in Ethiopia on national level.
Tesfaye Hailu	14/01/2016	Introductory email was sent to him to see the willingness to participate in the project	Interview was conducted to gain knowledge about the WaSH situation in Ethiopia on national level.
Tamene Hailu	02/12/2015	Introductory email was sent to him to see the willingness to participate in the project	Interview was conducted to gain knowledge about the WaSH situation in Ethiopia on national level.
Tamene Hailu	15/01/2016	Introductory email was sent to him to see the willingness to participate in the project	Interview was conducted to gain knowledge about the WaSH situation in Ethiopia on national level.
Ato Yared	29/01/2016	Introductory email was sent to him to see the willingness to participate in the project	Interview was conducted to gain knowledge about the WaSH situation in Ethiopia on national level.
Kassahun Bedene	16/12/2015	Introductory email was sent to him to see the willingness to participate in the project	Interview was conducted to gain knowledge about the WaSH situation in Ethiopia on national level.
Kassahun Bedene	14/01/2016	Introductory email was sent to him to see the willingness to participate in the project	Interview was conducted to gain knowledge about the WaSH situation in Ethiopia on national level.
Birhanu Genet	25/11/2016	Introductory email was sent to him to see the willingness to participate in the project	Information about the organizations in charge of WaSH in Ethiopia was acquired

7.3 Appendix 3: SFD matrix