



Partners for Water and Sanitation

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Partners for Water and Sanitation

**Support to Addis Ababa Water and Sewerage Authority,
Ethiopia (Report on Needs Assessment Visit)**

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Contents amendment record

This report has been issued and amended as follows:			
Revision	Description	Date	Signed

Support to Addis Ababa Water and Sewerage Authority, Ethiopia (Report on Needs Assessment Visit)

1. Background

The Addis Ababa Water and Sewerage Authority (AAWSA) is responsible for the collection, treatment and supply of potable water and the collection, treatment and disposal of waste water for the City. AASWA is accountable to a board of directors who in turn are accountable to the Mayor of Addis Ababa.

AASWA and Partners for Water and Sanitation (PAWS) have been working on a partnership aiming at needs based capacity building for the operation, management and further development of the AAWSA waste water infrastructure. To achieve these aims, AAWSA and PAWS set the following objectives for PAWS inputs:

'The aim of the support to AAWSA is to identify capacity gaps and help to build capacity in areas of sewer system management, operation and maintenance, together with a transfer of appropriate skills in waste water treatment and disposal.'

It also aims to provide technical and managerial support that will enable AAWSA to establish a sustainable financing strategy, in order to support a technically, financially and economically viable institution.'

Resulting from the objectives, anticipated key deliverables from PAWS to AAWSA included:

- 1. A report on identified capacity building needs, based on the initial assessment visit, discussions and workshop;*
- 2. Identified and agreed methods to address these needs, through a range of support packages – such as technical assistance and training;*
- 3. Developing & delivering support packages for effective & efficient, sewerage service delivery based on needs-assessment, which also includes providing support to AAWSA in designing a sustainable financing strategy and addressing technical and managerial capacity gaps ;*
- 4. Follow-up support through inputs to delivering capacity building, monitoring and evaluation of learning and the level of implementation of the knowledge gained.*

Based on the objectives and deliverables, a visit of a PAWS team to the AAWSA was arranged. The visit took place from 11 to 15 August 2008 and the PAWS team consisted of Adolf Spitzer, from Mouchel, and Trevor Nott, from South West Water. These two UK experts were drawn from the UK water agencies that are respectively involved in implementation and management of sewer systems. The team was briefed to undertake a needs assessment, including participation in a needs assessment workshop, and develop recommendations for fields of future PAWS support to the AAWSA.

2. Needs Assessment Visit

2.1 Methodology

The needs assessment consisted of visits to sites operated by the AAWSA, discussions with AAWSA staff, discussions with private companies providing waste water services, and a one day needs assessment workshop attended by AAWSA staff. Discussions also took place with a representative of the Addis Ababa Environment Protection Authority (EPA).

Discussions with AAWSA staff, EPA, and private companies took place in offices and during site visits. The discussions were informal and were aimed at providing the PAWS team with a detailed understanding of the services provided by the AAWSA, problems encountered in providing these services, and the needs for external inputs in expertise as perceived by staff of the AAWSA. The discussions were further aimed at providing the PAWS team with an understanding of the services provided to the AAWSA by private companies as well as the view of the EPA on the operations of the AAWSA.

The needs assessment workshop, attended by 22 AAWSA staff, was held on day 4 of the visit in the conference room of the AAWSA main office in Addis Ababa. The workshop started with five presentations (two by AAWSA staff, one by the PAWS country representative, two by the PAWS team from the UK) and was then broken up into two work groups. The work groups were tasked to discuss shortcomings in the current operations of the AAWSA and draw up needs for external inputs of expertise (See appendix 2 for attendees).

Site visits were undertaken for the PAWS team to better understand the operational issues encountered by the AAWSA and to have an opportunity of discussing these with operational staff.

2.2 Operational Sites Visited

The sites visited were Lega Dadi water reservoir and water supply production plant and the waste water treatment works (WwTW) in Kality and Kotebe.

The reservoir and treatment works in Lega Dadi is the main provider of drinking water to the city of Addis Ababa.

Kality WwTW is Addis Ababa's main waste water treatment facility with a capacity of 7500 m³/day. Kality WwTW also provides sludge drying beds for the contents collected by vacuum trucks from pit latrines and septic tanks.

Kotebe WwTW provides only sludge drying beds and is exclusively used for the treatment of material collected by vacuum trucks from pit latrines and septic tanks.

3. Comments and Assessment

The PAWS team, together with their partners from the AAWSA, would like to highlight the following key issues deemed to describe the current situation:

1. The WwTW in Kaliti performs well under its current loading and the WwTP Head stated that the effluent has typically less than 20 mg/l BOD₅ and suspended solids. The works is designed for a treatment capacity of 7,500 m³/day and its current dry weather loading is approximately 5,000 m³/day. With enlargement of the sewer network, load on the works will soon be more than its capacity.
2. The Sewerage services of the AAWSA are a small operation employing approximately 141 staff where 83 are permanent and 58 are contract including technicians and supervisors. The sewerage network has approximately 3,200 connections including private, commercial and a university, serving a population equivalent of approximately 120,000 people, total length of sewers is approximately 150 km with staff having detailed knowledge of all current assets.
3. In several fields of sewerage services, for a large city like Addis Ababa, staff of the AAWSA lacks experience and skills.
4. At present, the AAWSA does not have the financial resources to fund its currently planned network enlargement.
5. The AAWSA is currently held to charge a maximum of ETB 1.75 per m³ of water delivered to customers, in which a negligible portion of inbuilt cost for sewerage service is also included. AAWSA state that the current cost for delivering a m³ of water to a customer is ETB 5.00.
6. The waste water section of the AAWSA has the potential to significantly alleviate water shortages in Addis Ababa by water re-use / recycling.
7. Two transport routes are used for delivering waste water to treatment, sewers and vacuum trucks.
8. Communication and coordination between housing agency, municipality and the AAWSA is not at the level required for securing timely and efficient connection of major housing projects, such as condominiums, to the sewer network.
9. Currently, septic tanks and pit latrines are emptied by vacuum trucks, which then transport the collected material to the WwTWs in Kaliti and Kotebe for drying. Sludge is stored on site and, to date; no concepts for its disposal or utilisation have been developed.
10. Currently, there are no standards for the laying of services (drinking water, sewer, electricity, etc.).
11. Low income households can not afford to pay the fee for connecting to public sewers. This is estimated to be 40% of potential new customers.
12. AAWSA states that cross connections between surface water drainage and foul sewers is an issue.

4. Recommendations

Utilisation of the WwTW final effluent in Kality should be made a high priority, as it would have the added benefit of taking pressure off the water supply side. The potential for re-use is currently in excess of 5,000 m³/day for agricultural and industrial purposes. This should be possible in this area of the city and expertise will be required in how to best implement water re-use system.

To achieve this, the AAWSA will need to identify potential customers for their effluent and undertake preliminary cost / benefit analysis of such undertaking. PAWS can then assist the AAWSA in working out detailed technical solutions and cost / benefit analysis. The volume of treated effluent will increase with sewer network coverage and this should be considered when plans for use of the effluent are being made. There are also new WwTW's planned and the potential use of effluent should be part of the planning process.

Sludge deposition / re-use should be a high priority. Currently, sludge is dried and buried at the sites of the WwTW's. The quantity and quality should be evaluated to enable re-use on a commercial basis.

Like for the potential use of liquid effluent, AAWSA will need to identify potential customers for their material and undertake a preliminary cost / benefit analysis. AAWSA will also need to start separation of the different types of waste arriving at their plants, as sewage sludge from septic tanks has a usage potential that is different to waste from pit latrines. PAWS can then assist the AAWSA in working out detailed technical solutions and cost / benefit analysis.

Currently, small vacuum trucks collect material from septic tanks and pit latrines, bring them to a transfer station where the material is loaded onto bigger tankers and from there being transported to the WwTW. The possibility of unloading contents of vacuum trucks into the sewer should be investigated, as it can result in significant cuts in journeys, associated cost, and would free up trucks to provide services to customers.

This task does not require any input of external expertise, but can be undertaken using AAWSA's 'in house' knowledge of the city and its sewer network. It is best to identify locations that are near to the known areas of vacuum truck operations, provide convenient access for site traffic, and are sufficiently set back from residential areas as to not cause any odour nuisance to residents. To avoid blockages in the sewer pipes the collected waste must be separated and transported in accordance to its quality. Material collected from septic tanks can potentially be offloaded to sewers while this is not possible for material from pit latrines. It is also not advisable to offload sewage from septic tanks mixed with material from pit latrines, as this increases the risk of sedimentation in the sewer and potential blockage. This means that material from pit latrines needs to be transported to the WwTW by road. For offloading material from septic tanks, it is best to choose sewers with base flows capable to prevent settling of sludge.

Operation and maintenance of sewer systems and WwTW's was pointed out as a field where AASWA would welcome outside expertise. Currently there are no detailed maintenance plans in place.

AAWSA will need to make the start on this field, beginning with compiling a catalogue of network assets and problematic sewers. This should be followed by a maintenance schedule where also the financial and human resources required are stated. Maintenance needs for a future, expanded, network need also be predicted. PAWS should then assist with an experienced network operator who will provide input into the maintenance plan. This should be undertaken as an 'on the job exercise' during a visit to AAWSA of not less than two weeks. Ideally, two follow up visits per year should be planned to assess implementation and progress of the maintenance regime, adjust maintenance to network needs and plan for network expansion. In addition, the PAWS expert should provide 'on the job' training in the maintenance of assets where the AAWSA is currently short of expertise.

With expansion of the sewer network technical standards need to be developed. In the UK, much is based upon two documents, 'Sewers for Adoption 6th edition' and 'Sewers for Scotland, 2nd edition'. In addition, South West Water and Scottish Water also develop their own technical standards for consistency of construction, plant and practices. Currently, there are no such standards in place and AAWSA staff state that they are lacking in experience and expertise in developing such standards.

The AAWSA needs to take the lead, starting with identifying facilities that are common in their networks and would benefit from being built to certain standards (e.g. manhole covers, manhole sizes). The AAWSA should then develop first drafts of standards for the facilities identified. The second step, detailed drafting of the standards, can be assisted by PAWS expertise. During the second stage it is most important that the PAWS expert has the in depth knowledge to ask the right questions during discussions with the AAWSA experts (e.g. what load bearing strength does a particular manhole cover need, how to secure a manhole cover against theft, how to lift a manhole cover with the tools available). During the process of developing standards, the AAWSA needs to draw up a list of each potential supplier / manufacturer of a standardised item and, once the standards are drawn up, inform them of the new requirements. In addition, AAWSA will need to devise a mechanism to enforce their standards (e.g. contractors not being paid for sub-standard work, refusal of adopting assets that are not built to standards).

In Addis Ababa, the various Authorities seem to work independently from each other. To help achieve successful development of the water and sewerage infrastructure for new development, it is recommended that the AAWSA explore possible partnership working with the other Authorities and the developers. This could lead to a more cost effective means of developing the water and sewerage networks if done in construction with the road building and installation of any other under ground services.

It is of utmost importance that detailed records of the sewer system and all its assets are being kept in a well organised database (GIS or similar). Staff of AAWSA stated that they would welcome external expertise in setting and maintaining such a database. Subsequently, this data will need to be analysed to develop a cost effective planned maintenance programme.

To take this forward, the AAWSA and PAWS need to work in parallel. The AAWSA needs to identify and formulate their objectives for building a database of their assets. AAWSA also needs to identify the current level of available resources. This means identification of all levels of skills, financial means, as well as current computer hard and software. While AAWSA is working on the task of setting objectives and identifying resources, PAWS can identify and recruit the required expertise in the UK. When these preparations are completed, AAWSA should send their formulated objectives together with the existing database to the UK experts and clearly state their current and anticipated resources. During this initial project phase, details and scope of work for a visit of the PAWS experts to AAWSA should be agreed. During the visit to AAWSA, the PAWS experts should provide on the job training and improvements to the database. The initial visit should be planned to last at least two weeks, ideally longer, and follow up visits should be scheduled on a needs basis. It would be best if PAWS could find a twin partner in the UK water industry that is willing to allocate some of their staff's time to assist the AAWSA with advice for updating and maintaining the database in a meaningful state.

The sewer system of Addis Ababa is expanding and for that outside contractors will be engaged. Staff of the AAWSA state that they do not have the experience and expertise to confidently supervise outside contractors and outside help would be welcome.

PAWS can assist with expertise in reviewing project proposals. PAWS can also assist during the phase of conceptual planning for the expanded sewer system. Most of the assistance do not require UK experts to travel to Ethiopia, but can be undertaken via correspondence.

Quality control and follow up of contractors during construction work is beyond the scope of PAWS, as almost permanent client representation at site is required to ensure work to standards. Only the AAWSA themselves can successfully undertake that task. The AAWSA has two main options to successfully undertake these tasks. Firstly, employ experienced and trustworthy site engineers during the time of construction locally. Secondly, and here PAWS may be able to assist, send one or two members of their current staff for a period of two or three months to the UK to shadow site engineers working on sewer network projects in the UK and gain practical experience. However, this will need to be checked against the required visa and work permit regulations as well as health and safety at site and insurance issues for the companies involved.

As an alternative, AAWSA should evaluate the benefits of partnership working with its contractors where by the contractor is incentivised to provide design and construction expertise with AAWSA to deliver projects that meet the initial scope.

Procedures should be written and engineers trained in the various disciplines required for managing sewerage projects and for overseeing construction to meet AAWSA's design standards and for acceptance by operations

Once the WwTW in Kality is re-built, expertise / skills upgrading in running a plant more complicated than the currently existing one will be required.

Operation of a more complicated plant than current should be subject to continuous skills upgrading (as it also is in Europe). Currently there is no meaningful gap PAWS can fill with UK expertise, as training needs to be on the job and best achieved upon the facility the operators will be working at. Before the WwTW in Kality is being upgraded, the AAWSA should develop a hand over procedure for the contractor that will ensure the delivery of as-built drawings, Operations and Maintenance manuals, test certificates, commissioning of the plant, strategic spares and training for AAWSA staff on the operation of the new facility. In Europe, these hand over procedures are usually a condition of the contract and are a standard for works undertaken for South West water. The AAWSA should make best use of this possibility, as they are the client.

5. Conclusions

The AAWSA invited PAWS to assist the organisation with expertise to improve the operation and maintenance of the sewer network in Addis Ababa. Two PAWS consultants from the UK and the PAWS country Manager visited the AAWSA during 11 – 15 August 2008. The visit entailed discussions with all levels of AAWSA staff, the Addis Ababa EPA, private service providers to the AAWSA, Water and sewerage branch offices and visits to operational sites. In addition, selected staff of the AAWSA and the PAWS visitors convened to a workshop with the aim of identifying current shortcomings in the sewerage operations and possible fields for AAWSA / PAWS cooperation.

During the discussions it was highlighted that the AAWSA is not sufficiently funded and that the price the organisation is currently allowed to charge for water does not cover the cost for its provision. It was also highlighted that only about 120,000 people are currently connected to the sewer network and that it is planned to increase connections to 960,000 by 2020. This will require a rapid expansion of the current sewer network and treatment capacity and the AAWSA feels that they need to increase their knowledge base and expertise for being able to manage an operation on this scale.

Cooperation between the AAWSA and PAWS has the potential to positively contribute in the effectiveness of the AAWSA in running their operations and improve their skills base. PAWS and the AAWSA should start now in developing a programme for PAWS assistance, preferably on the job training. Implementation of an effective maintenance regime and development of a suitable asset database are two possible starting points.

To make best use of available resources and to minimise operational cost, the AAWSA should start now to identify potential customers for their products – treatment plant effluent and sludge. Being successful in these fields has the potential for both, generation of additional income and reducing pressure on the water supply side. The AAWSA should also identify the possibility of transferring contents of septic tanks from vacuum trucks to the sewer at strategic locations in the city, having the potential of huge savings in transportation costs and freeing up resources for serving customers.

To conclude, cooperation between AAWSA and PAWS has the potential of resulting in improved services to the dwellers of Addis Ababa. First steps to implement the recommendations in section 4 need to be made by the AAWSA with PAWS input to follow on requests.

6. Appendices'

Appendix-1: *Summary of Recommendations*

Activity	Importance	PAWS input effective	Ideal start date	Comment
Utilisation of WwTW effluent	High	Yes	Now	AAWSA to identify potential customers; PAWS to assist with technical expertise
Sludge deposition / utilisation	Medium	Yes	Now	AAWSA to identify commercial potential and/or locations for final deposition; PAWS to assist with technical expertise
Sludge transportation	High	No	Now	AAWSA to identify locations for tankers to offload & develop transfer stations. AAWSA to implement system to separate septic tank from pit latrine material
System maintenance	High	Yes	Now	AAWSA to compile asset catalogue and draft maintenance needs; PAWS to assist with implementation and continuous improvement of maintenance plan
Technical standards	Medium	Yes	Now	AAWSA to compile catalogue of facilities common in their system and develop first draft for standards; PAWS to assist in finalising standards
Asset database	High	Yes	Now	AAWSA to identify objectives and available resources; PAWS to assist in development and continuous improvement of database
Contractor supervision	High	No	Now	AAWSA to contract site supervisor locally; PAWS to explore possibilities of providing on the job training for AAWSA staff in the UK
Training on upgraded Kality WwTW	Low	Yes	With start of upgrade	AAWSA to insist on training as part of contract; PAWS to recruit UK expertise on request and where potentially effective

Appendix-2: List of Workshop Participants

No	Name	Responsibility
1	Wondimu Tekle	D/General Manager
2	Zereu Girmay	Head, SSD
3	Solomon Waltenigusse	Head, WPD
4	Gemechese Tilahun	Head, Sewerage Network Division
5	Getachew Demeke	Sewer Line Connection section
6	Getu Mulissa	Sewer Line maintenance section
7	Lemlem Teklu	Non revenue water & System Control
8	Selamawit Teshale	Flow Line Connection
9	Ato Tesfaye Worede	Regulatory unit
10	Berehane Gashu	Sewer Line Connection section
11	Rekik Tsegaye	Regulatory unit
12	Shorit Zewdie	Regulatory unit
13	Ibrahim Adam	Main Line
14	Fikresilasie Afawork	Non revenue water & System Control
15	Zekarias Fanta	Training Institute
16	H/Mariam Gebre	Training Institute
17	Shiferaw Heiy	Waste water Collection Service
18	Tebike Tafese	Waste water Collection Service
19	Assefa Alemayehu	Head, Kaliti WWTP
20	Teressa Workneh	WWT & Disposal Division
21	Mulugeta Tegegne	Water Production & Distribution Dep't
22	Abayneh Alemu	Water Production & Distribution Dep't