"Small-Scale Sanitation in Egypt"

10 POINTS to move forward

Authors

Philippe Reymond, Eawag/Sandec
Dr. Rifaat Abdel Wahaab, HCWW
Dr. Moustafa Moussa

The ultimate goal of the ESRISS Project is the development of a wide-scale replicable model for small-scale sanitation in the Nile Delta. By "small-scale" we refer to "settlements or groups of settlements of up to 5,000 inhabitants". In our approach, the whole sanitation system, including management schemes, is considered. Cost-effectiveness and context-appropriateness are key targets. This document synthesises the main findings detailed in the ESRISS report entitled "Small-scale sanitation in Egypt: challenges and ways forward".

The 10 Points:

1. Development of a clear institutional strategy
2. Standardisation of treatment units
3. Centralised O&M management under the leadership of HCWW
4. Selection of appropriate collection & treatment options
5. Adaptation of laws and regulations
6. Move beyond "business as usual"
7. Development of a data baseline
8. Focus on preliminary assessment
9. Improvement of the project management cycle
10. Transparency and dissemination of lessons learnt

ESRISS Project
www.sandec.ch/esriss

eawag aquatic research

Holding Company for Water and Wastewater

Swiss Confederation
Federal Department of Economic Affairs FDEA
State Secretariat for Economic Affairs SECO

1. Development of a clear institutional strategy

Our assessment revealed that **isolation of existing initiatives** and lack of commitment by the government agencies are significant factors preventing wide-scale replication; none of the approaches tested so far has been institutionalised. So far, the sector is in a vicious circle as isolated initiatives remain prototypes and, as such, are not cost-effective, do not receive the attention required, are considered too expensive and/or prone to failure, and therefore are not replicated.

It is clear that HCWW and its Affiliates must play a pivotal role in the development and management of small-scale sanitation. Experience showed that fully community-based approaches do not work in the Egyptian context.

A clear strategy is needed, including other sector stakeholders (Ministries, communities, NGOs, researchers, private service providers). In particular, the solution implies a closer collaboration with the **Ministry of Water Resources and Irrigation** (MWRI), a significant stakeholder of rural sanitation that manages both important surfaces of land and receiving water bodies.

The strategy should enable the implementation of financial and management schemes which guarantee **full-cost recovery.** Otherwise, small-scale systems risk not to be maintained properly, as the O&M of big centralised schemes is in itself currently a problem. The only way to proceed until water tariffs guarantee cost recovery is to adapt the legal and regulatory framework to allow tailor-made financing schemes, which may include contributions from concerned communities.

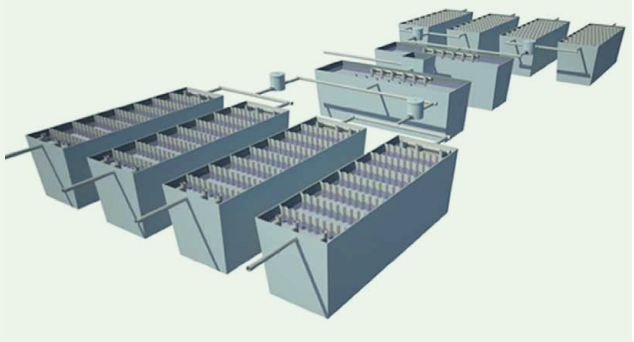
2. Standardisation of treatment units

Wide-scale replication implies standardisation. We recommend to devise & adopt a **mass-production strategy** for small-scale sanitation and explore the concept of locally produced **prefabricated units.** Standardisation of small-scale sanitation systems is needed to **allow economies of scale,** reduction of costs, reduction of time needed for project preparation and implementation and **increase the infrastructure quality.** Quality of the work done by consultants and contractors, as well as delays and cost overruns during implementation, are major issues, which standardisation is best able to tackle.

We strongly advocate for the adoption of a business approach and the opening of a market for prefabricated treatment units (see fig. 1). Such units could easily be manufactured in Egypt. There is a potentially huge market in the country and beyond, and small-scale sanitation could create a lot of job opportunities in production and implementation. Public-private partnerships (PPP) could be developed to stimulate such a process.

A clear governmental strategy and leadership is required to support such a standardisation process.

Figure 1: Modular prefabricated treatment units



Modular prefabricated treatment plant, consisting of 2 prefabricated settlers and 8 prefabricated anaerobic baffled reactors (ABR), treating about 80 m^3/day (source: BORDA, 2012).

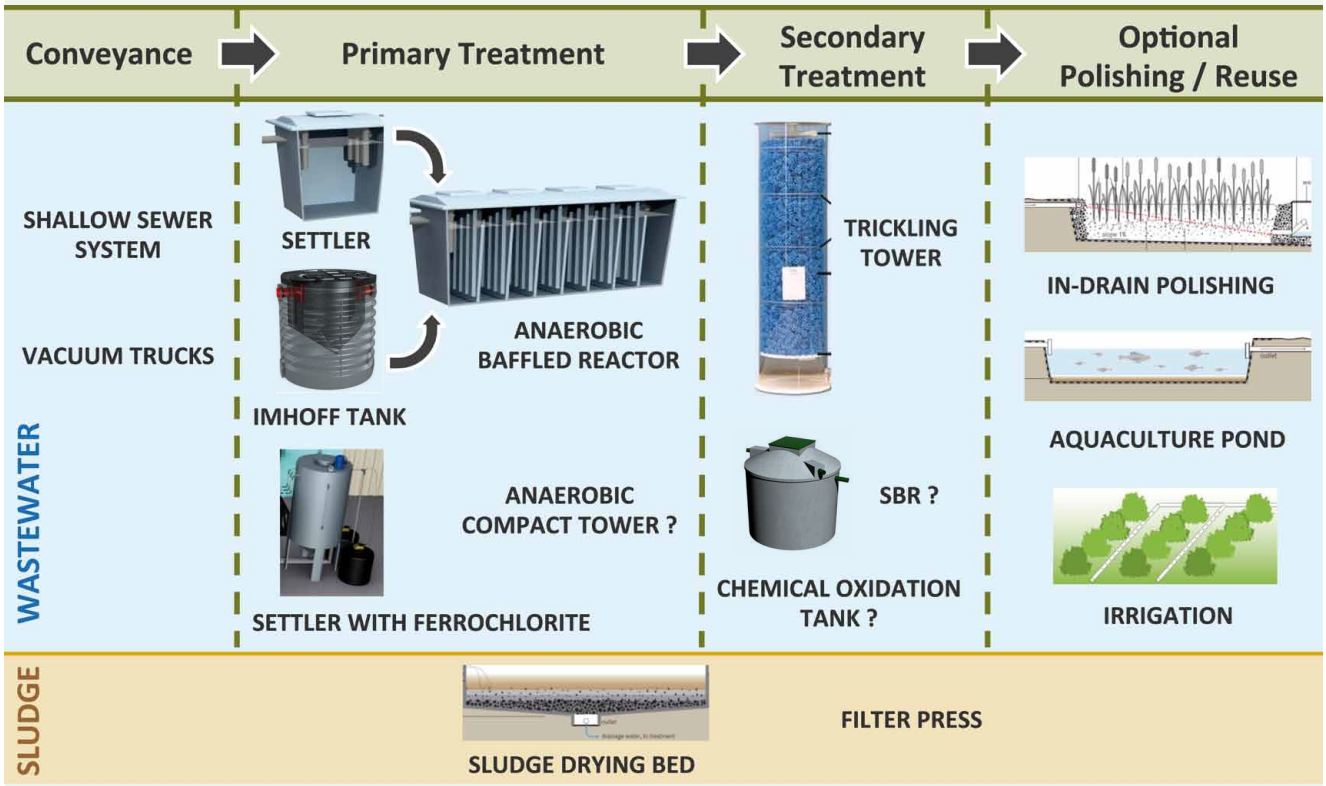
3. Centralised O&M management under the leadership of HCWW

Small-scale systems should be managed centrally. Such an approach goes along with the standardisation of systems. We strongly recommend to **introduce a unified management scheme for all.** HCWW should take the lead, and Affiliates should follow. At the current stage of development of rural sanitation, it is important to have a cross-governorate approach, as the establishment of an effective management scheme requires a minimum number of villages served (**"critical mass"**). The systems can be managed centrally by specialised units in HCWW and/or Affiliates, or by a professional private company subcontracted by HCWW.

Skills and capacities for O&M are a major issue. Four main strategies are recommended (Abdel Wahaab 2011):

(i) Implementing treatment systems which require low levels of maintenance and control,
(ii) Enforcing service contracts for regular maintenance by skilled operators and manufacturers,

Figure 2: Potential options for the Nile Delta



(iii) Forming an appropriate operator organization and,
(iv) Establishing regular training programs for plant operators.

Considering the problems of staff and skills in the Affiliates, the best solution at the moment seems to be the creation of a private company responsible for the operation and maintenance of all the decentralised schemes, in a public-private partnership. This would imply less staff, with higher skill levels and experience. It would also ensure an equal level of service in all governorates.

4. Selection of appropriate collection & treatment options

Several options are available to serve at best the diversity of Egyptian villages (see fig.2). The selection of appropriate options should be tailor-made and based on:

(i) **good planning,** including adapted design criteria;
(ii) feasible **management schemes;**
(iii) search for **economy of scale**
(iv) **comparisons** with **life-cycle cost analysis.**

We strongly recommend the use of a **settler** followed by an **anaerobic baffled reactors** (ABR) as the core technology for wastewater treatment in the Nile Delta. With a slight adaptation of the regulations, ABRs could be used alone, reaching effluent standards that are close to the current Law 48/1982.

ABRs may reduce up to 90% BOD and produce a well-digested sludge, due to the long sludge retention time (1-3 years). An aerobic treatment step may be added to ensure fulfilment of the current Egyptian standards. However, such an addition is in principle not cost-effective, as it is very costly compared to the added load reduction. If required, a trickling tower filled with plastic media is a simple solution to be investigated; airlift

pumps, which can be solar-powered, could be used to lift water between the two units.

If small drains (i.e. width of 1-2 m) are present around the ezbas, they may be adapted to provide further polishing, as natural wetlands ("in-drain" or "in-stream" treatment), in partnership with MWRI. In any case, it is recommended to use them as discharge points. If aquaculture is practiced in the village, as is often the case in Kafr El Sheikh Governorate, the treated wastewater can be further polished in fish ponds. This would provide extra income to the WWTP operator and further treat the effluent, by, among others, removing part of the nutrients still contained in the water. Direct reuse of the effluent in irrigation should also be encouraged, as the nutrients still present could directly benefit the crops.

If the available space is very limited and close to houses, prefabricated settler and oxidation tanks using physico-chemical processes may be of advantage because of their compactness and the absence of smell. For very small settlements, anaerobic compact towers may prove to be cost-effective.

Sludge management is a major shortcoming in the investigated initiatives; it needs to be an integral element of the system. If the amount of sludge is small and desludging not frequent, such as with ABRs, sludge could be pumped and brought to drying beds in centralised treatment plants. The use of a mobile filter press could also be an alternative. Sludge should then be dried further for full hygienisation, mixed with compost or burnt.

As for collection and transport of wastewater, **shallow sewer systems** (= simplified sewer systems = condominial systems) are recommended. Their cost is lower than conventional ones, and with less risks of clogging than with small-bore sewers. They have the following advantages: (i) smaller depth and width of sewers, leading to significant money savings, especially where the groundwater table is high; (ii) lower risk of groundwater infiltration; (iii) reduced risk of structural damage to buildings due to groundwater lowering and deep trenches; (iv) maintenance easier and doable by local people; (v) manholes are not required and are replaced by access chambers, much cheaper and which enable pipes to be cleaned without the need for a person to enter the chamber (Parkinson, Tayler et al. 2008).

Finally, even if often considered as a must in Egypt, chlorination of the effluent is not recommended at all. It is almost never done properly and leads to environmental damage rather than preservation, in an environment where the quality of the receiving water body is often much worse than the non-chlorinated effluent. What is more, a shortage of chlorine makes it difficult for both water and wastewater plants to meet their supply needs (Chemonics Egypt 2009).

5. Adaptation of laws, regulations and Codes of Practice

It is clear that existing laws, regulations and Codes of Practice do not encourage the sound development of rural sanitation. **An incremental approach should replace the current "all or nothing" philosophy,** which has not served Egypt well. It does not make much sense to spend significant amounts of money to reach standards that are far beyond the quality of the drains, and even canals. Besides, more flexibility is also needed to allow the implementation of tailor-made financial schemes ensuring full-cost recovery.

Next to that, there is a need for a better integration of the different stakeholders of small-scale sanitation. Communities, NGOs, private sector providers and individuals who wish to build sanitation systems should be supported and a national platform should be created.

6. Move beyond "business as usual"

The Egyptian Code of Practice authorizes to build huge infrastructure for tiny settlements and, de facto, encourages consultants who do so. Conventional wisdom says that "contractors do not like to go for small-scale systems because there is little money for a big effort". Actually, **small-scale sanitation is a profitable business.** Not because of each unit, but because of the economies of scale that can be achieved by the production of large numbers. This is another reason to standardise small-scale sanitation systems.

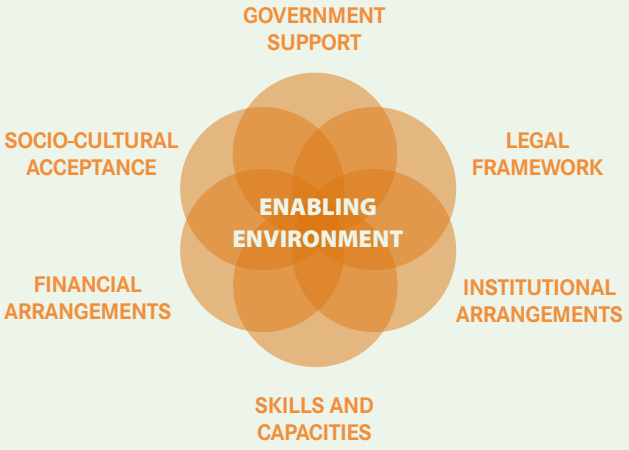
7. Development of a data baseline

Our assessment reveals a lack of baseline data characterising sanitation in rural villages, **leading to under- or over-dimensioned infrastructure.** A data baseline for rural areas should be created, comprising wastewater quantities and characteristics according to settlement features. Research institutions, such as NRC, have a major role to play. The cost of such studies is negligible compared to the total investment in wastewater infrastructure and will be largely compensated by the economies they generate. The close monitoring of the small-

Methodology

We analysed the past experience of small-scale sanitation in Egypt and tried to understand the reasons behind the success and failures. Different methods were used to build our assessment: (i) Interviews with key-stakeholders of the sector to identify the existing initiatives, gather the sparse data, available knowledge and experience; (ii) a thorough literature review; (iii) Selection of the most prominent initiatives, field visits, assessment with evaluation questionnaire and analysis of samples at the National Research Centre (NRC).

The main matrix of analysis is the **enabling environment framework** (cf. Fig. below). It structures the factors that impact projects' success and failures into six components: government support, legal framework, institutional arrangements, skills and capacities, financial arrangements and socio-cultural acceptance. Thus, all the components of sanitation systems are assessed comprehensively. Technical factors are ana-lysed separately.



Main elements of an enabling environment

scale sanitation initiatives would also deliver a good insight into flow and load patterns.

The following points should be taken into account: (i) measure water and wastewater flows; (ii) collect and analyse the measurements at the inlet of the treatment plants in rural areas (inflow, standard parameters); (iii) keep a good record of water bills; (iv) organise all the data in a computerised form (e.g. Excel), in a way that facilitates analysis.

8. Focus on preliminary assessment

Thorough preliminary assessments, leading to realistic design parameters, are a key cost-effectiveness factor, as they allow dimensioning as close as possible to the needs. "Soft components" (e.g. preliminary interview of stakeholders and management schemes) must become an integral part of each design. Animal manure and effluent of dairy factories need to be considered as parts of the sanitation system. In the past, faulty dimensioning of infrastructure due to the lack of consideration of the actual situation on the ground has cost a significant amount of money, in capital and operational costs, and threatened the replication of small-scale systems. Besides, treatment facilities that are over-dimensioned risk reaching the full life expectancy (especially specific components like pumps) far before they reach their design capacity; over-dimensioning may also lead to reduced performance.

In parallel, a good forward planning is necessary, in order to anticipate future developments and design the system accordingly. It is unrealistic to plan for a 2050 horizon for such small settlements. The development of ezbas is highly heterogeneous and depends on a number of factors that are difficult to forecast, leading to large variations in growth. Modular, flexible systems need to be privileged in order to cope with the high uncertainty of future developments. Realistically, in this context, infrastructure development should be limited to a maximal 15 year planning horizon. However, space for future extension should be planned from the beginning; infrastructure can then be extended when and if needed.

9. Improvement of the project management cycle

Terms of reference, tendering and bidding procedures should allow innovation and smaller stakeholders into the process. More flexibility is necessary to enable the emergence of innovation and cost-efficient designs, something that is currently discouraged. Bidding procedures that are too complicated favour big consultancy firms that are specialists in meeting donor requirements, but not in small-scale sanitation.

Donors and governmental agencies have an important role to play to foster and enable integrated approaches. The non-technical components such as awareness-raising, capacity-building and monitoring should be considered as a must. Otherwise, as observed, those components are overlooked by sector consultants, who specialise on

technical aspects. The lack of an integrated approach is, in our view, a major failure factor in the field.

Contract management should be reviewed. Responsibility and accountability of consultants and contractors should be increased, and performance-based contracts should become the norm.

Monitoring and evaluation must be strictly enforced, both by the Egyptian counterparts and donors alike. Donors tend to emphasise the amount of infrastructure built (marketing), but not the amount of functioning infrastructure after five years. It is very hard to find an evaluation of past projects which focus on performance indicators. Presently, there is a lack of monitoring and documentation after project implementation (ex-post evaluation).

10. Transparency and dissemination of lessons learnt

Many projects have been implemented by different organisations and Ministries in the past decades, but lessons learnt are few and far between. It is quite a challenge to access good quality information in HCWW and Affiliates and it seems that, if a large amount of data is collected, it is rarely analysed, and hardly put in a form which allows for a comparative analysis. Performance should be documented and analysed, in order to avoid failures in the future.

It is strongly recommended that HCWW create an **online library** and repository on its website, to collect reports and sector experience in Egypt. It would help any motivated agency, NGO or interested individual to take up rural sanitation challenges. It would also encourage consultants to build upon what exists instead of constantly reinventing the wheel or, even, selling the same report several times.

References and further reading

- Abdel Wahaab, R. and Mohy El-Din, O. (2011). Wastewater Reuse in Egypt: Opportunities and Challenges. HCWW and MWRI. Cairo.
- BORDA (2012). Prefab-DEWATS - The new prefabricated modular solution for decentralized wastewater treatment. Brochure.
- Chemonics Egypt (2009). Affordability Assessment to Support the Development of a Financing Strategy for the Water Supply and Sanitation Sector in Egypt. MED EUWI.
- Gutterer, B., Sasse, L. et al. (2009). Decentralised Wastewater Treatment Systems (DEWATS) and Sanitation in Developing Countries – A Practical Guide, BORDA, WEDC.
- Lüthi, C., Morel, A. et al. (2011). Community-Led Urban Environmental Sanitation, Complete Guidelines for Decision-Makers with 30 Tools. Dübendorf, Switzerland, Swiss Federal Institute of Aquatic Science and Technology (Eawag).
- Parkinson, J., Tayler, K. et al. (2008). A Guide to Decision-making: Technology Options for Urban Sanitation in India.
- Reymond, Ph. (2012). Small-scale sanitation in Egypt: challenges and ways forward. Eawag, Switzerland-Egypt.
- Tilley, E., Lüthi, C. et al. (2008). Compendium of Sanitation Systems and Technologies, Eawag: 157.

This policy brief is an outcome of the *Egyptian-Swiss Research for Innovations in Sustainable Sanitation* (ESRISS), led by the Swiss Federal Institute of Aquatic Science and Technology (Eawag) in partnership with the *Egyptian Holding Company for Water and Wastewater* (HCWW) and financed by the Swiss State Secretariat for Economic Affairs (Seco), as a parallel research component of the World-Bank funded Integrated Sanitation and Sewerage Infrastructure Project (ISSIP). This document synthesises the main findings detailed in the ESRISS report entitled *Small-scale sanitation in Egypt: challenges and ways forward* (Reymond 2012). It is the first in a series of reports and policy briefs that provide research insights on small-scale sanitation in Egypt.

Contact: philippe.reymond@eawag.ch