International Water Management Institute

DRAFT ANONNATED OUTLINE

National Baseline Assessment

Water Reuse Potential in Lebanon

ReWater MENA project

1 Introduction

- Framing of the study within the ReWater MENA project
- Framing of the study within the Lebanese context and explaining the specific challenges that the study will address. This will include an introduction of the wastewater sector in Lebanon, its governance and regulatory framework, current performance and problems, including any existing reuse experiences and their challenges[1];
- Description of the target audience of the report
- Structure of the report (what the reader will find)

2 Objectives

The general objective of this study is to assess the potential of wastewater reuse in Lebanon (mainly in agriculture), understand the different barriers for implementation of reuse projects, specifically related to the Lebanese context (including environmental, technical, financial, socio-cultural and institutional factors) and give recommendation to overcome them. It will guide national institutions and potential donors in selecting wastewater treatment plants (WWTPs) and associated sites where reuse systems are needed and could potentially be implemented.

More specifically, the study will

1) identify, geo-reference and characterize the existing and planned wastewater treatment plants and assess their effluent quantity and quality;

2) identify and geo-reference the main watersheds in Lebanon with agricultural activities, and estimate their water balance –over allocated, equality allocated, not equality allocated- (this assessment could be through expert opinion if such assessment does not exist already);

3) identify, geo-reference and characterize irrigation schemes with reuse potential;

4) recommend a number of sites (10 to 15) with the highest reuse potential and study them in more detail showing the different barriers to overcome to implement safe reuse.

3 Methodology

This section will describe data collection, data sources, validation and processing, as well as the definitions of the main terms (e.g. what do we mean by reuse potential?).

The quality of the study highly depends on 1) the amount and reliability of data collected; 2) having an updated and consolidated GIS data base; 3) presenting the results in clear and self-explanatory maps.

Most of the data used in the data base would be secondary data, available in the literature and/or collected from the Lebanese stakeholders but will have to be complemented as much as possible with recent information based on direct contacts with stakeholders.

For example, the data base related to Wastewater treatment plants will build as a starting point on the FAO's "Assessment of treated wastewater for agriculture" (FAO, 2016) but will have to be updated based on data collected from the different Lebanese stakeholders: Council of Development and Reconstruction, the Ministry of Energy and Water (who is currently updated its National Water Sector Strategy), the Regional Water Establishments and the municipalities[2].

The data related to agriculture and water balance calculation will use available maps and recent studies (CNRS, Atlas Agricole, Litani River Basin Management Support Project reports on the Litani basins, UNDP groundwater assessment, etc.).

For the 10 to 15 sites to be characterized in more detail, the data would be completed with direct interviews with WWTP's operators and farmers.

Draft templates for data collection will be provided by IWMI and discussed with the consultant.

[2] The ReWater MENA Lebanese team has already started data collection with these different stakeholders and will support in data collection.

4 Results and discussions

4.1 (Bulk) wastewater reuse potential

Treated wastewater contains large amounts of nutrients (N, P, C) embedded in it. These can be reused for different productive purposes such as irrigation or biogas production. This section would give an estimation of this bulk potential in Lebanon by estimating the resources embedded in the municipal wastewater produced in the different towns and cities in Lebanon, what portion of these resources is removed by treatment and how much is discharged or directly reused. The methodology can be based on existing work such as the work produced by Mateo-Sagasta et al. 2015[3].

To conduct such assessment, potentially, for every city (Existing or planned by 2030), the following information should ideally be collected (part of which will be collected through the given templates):

Wastewater production	• Volume of produced municipal wastewater (m3/year)
Wastewater collection	▪ Collected municipal wastewater (m3/year) ▪ On-site collection (%) ▪ Off-site collection (%) ▪ Estimated Volumes of uncollected wastewater[4]
Wastewater treatment	• Capacity of the municipal wastewater treatment facility (m3/year) • Municipal wastewater actually treated (m3/year) • Max treatment is Primary (%) • Max treatment is Secondary (%) • Max treatment is Tertiary (%) ▪ Not treated municipal wastewater (m3/year)
Wastewater discharge	▪ Volume and level of treatment of treated wastewater directly disposed to surface water bodies • Volume and level of treatment of treated wastewater disposed to

[3] See methodologies in section 2.4 and 2.5 of this chapter.
https://www.researchgate.net/publication/283744445_Global_Wastewater_and_Sludge_Production_Treatment_and_Use

[4] To be estimated as the difference between wastewater produced and wastewater collected, wastewater produced can be estimated from the water supplied as a percentage, while the collected wastewater can be roughly estimated from different sources, mainly HCWW.

	agricultural drains • Volume and level of treatment of treated wastewater disposed to the sea

With this data and estimates of the quality of the wastewater generated (considering Nutrients and carbon removal removal if there is treatment) one can estimate the resources embedded in wastewater that could be potentially directly reused, and where these resources are generated.

4.2 Irrigated areas in Lebanon and future challenges of irrigation

- Areas of agricultural lands in Lebanon and main types of crops.
- Percentage of irrigated areas/from agricultural lands.
- Challenges posed to irrigation in terms of quantitative access to water (reduction in spring discharges, increased cost of pumping from groundwater; reallocation to potable water uses, etc.) and qualitative access (surface and groundwater pollution).
- Maps of the agricultural areas (including forests) in Lebanon based on available maps and GIS files. (Many national and regional maps exist, such as Schéma D'aménagement du Territoire Libanais (SDATL) produced by the CNRS and others; Forestry maps were produced by a USAID project (LRI)).
- Maps of the irrigation systems (based on availibility). They can be aggregated by categories of 1) water sources (groundwater/surface water); 2) types of water-use management (public/private) 3) identified water scarcity.

4.3 Identification of irrigation schemes with reuse potential

These are irrigation schemes in need of more or alternative water sources, which have a (current or planned) wastewater treatment plant upstream (or downstream within an economic distance/height difference from the irrigation scheme).

- Irrigation schemes in demand for additional water (in irrigation) are those with current water deficits or planned expansion of irrigation.
- Irrigation schemes in demand for alternative water sources are those using (expensive) ground water, or where current water allocations are going to be transferred to cities or industries.

There will be different reuse solutions for different types of watersheds, which need to be classified in:

- Overallocated, where there is already not enough renewable water resources to meet existing demands and therefore there is groundwater depletion, river-flows reduction beyond environmental flows, etc.

- Fully allocated, where all existing renewable water resources are already allocated for existing irrigation schemes.
- Under allocated: where these is enough water resources for future water demands

In in-land irrigation schemes with reuse potential that are located in overallocated or fully allocated watersheds, reuse solutions will need to go hand in hand with water reallocation between sectors. This is the case because the treated wastewater that is now reused in a given irrigation scheme will not flow downstream and therefore these downstream water users will need to be compensated by the release of "fresh water" from users upstream.

4.4 Short list of sites with potential and analysis of barriers that need to be overcome to materialize the potential

Characterize in more details the selected sites through interviews with operators in order to analyse the different barriers that would be preventing the materialization of reuse potential, such as:

(i) cultural barriers and distrust regarding the health and environmental safety of reuse which currently limits public demand for (treated) wastewater;

(ii) institutional fragmentation which jeopardizes the design and implementation of effective reuse policies;

(iii) Inexistent or over stringent regulatory frameworks which constrain viable reuse options; and

(iv) the lack of appropriate tariffs, economic incentives and financial models which undermine cost recovery and the sustainability of reuse projects

Or ???

Summary and conclusions

References

FAO.2016. Assessment of treated wastewater for agriculture in Lebanon.

Machayekhi D., Kalinowski C. and Valfrey B. 2014. Etude de capitalisation sur le secteur de l'assainissement au Liban, Bureau CGLU/BTVL – SIAAP.

Mateo-Sagasta J., Rachid-Sally L., and Thebo Anne. 2015. Global Wastewater and sludge production, treatment and use.