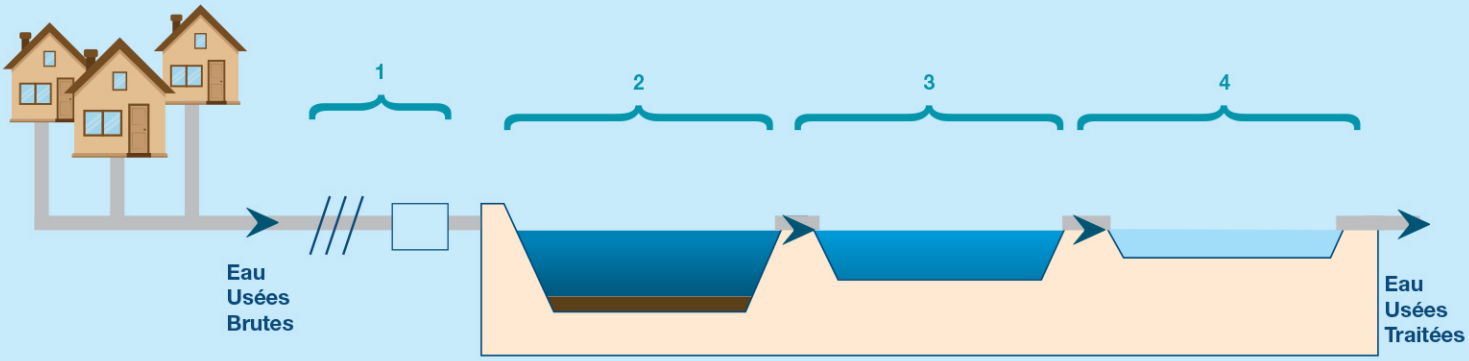
NATURAL LAGOONING

The treatment of wastewater is meant to reduce pollutants in the treated water in order to limit pollution of the natural environment. Wastewater treatment plants are said to be natural once they rely on natural technologies of wastewater treatment. They are responsible for the treatment stage in the overall wastewater collection and treatment process. These imply normally low cost and easy techniques of water treatment that do not require energy input.

WHAT IT IS ?

This water purification process based on natural lagooning treats wastewater by making use of the same self-purification natural pattern of lakes and rivers. Grey water is gradually flowing over several successive basins. Several treatment systems can be designed, yet, this sheet describes the technique implemented in Lebanon, namely in the Bekaa area and South Lebanon.

The basic mechanism on which natural lagooning relies is photosynthesis. The upper water segment in the basins is exposed to the sun. This allows the development of algae which produce the oxygen that is required for the development and maintenance of specific bacteria. These bacteria are responsible for the decomposition of the organic matter. At the bottom of the basin, where light does not penetrate, other bacteria break down the sludge produced from the settling of organic matter.



The treating plant has to adapt to the local context. It is generally composed as follows:

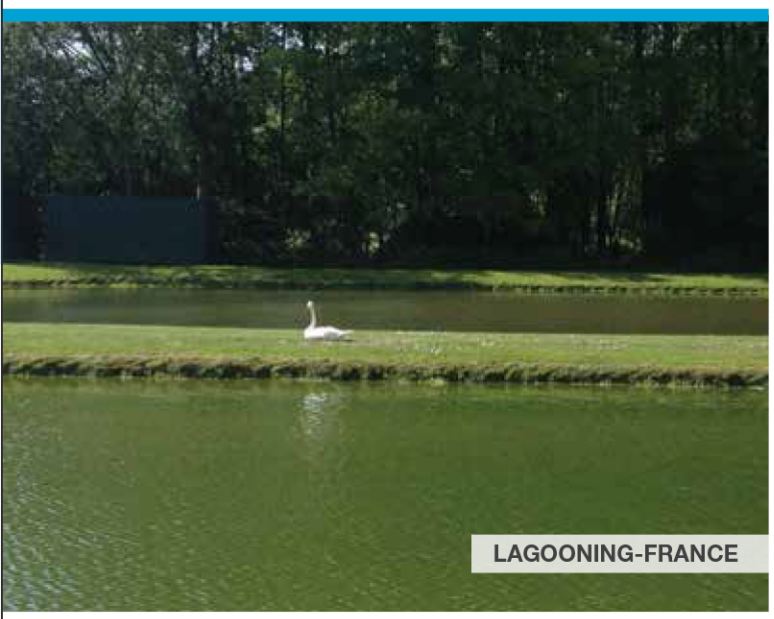
1. A pre-treatment of sewage made of a bar screen, a sand trap, and a suction barrier (fat/oil collector) to avoid the fast filling of lagoons
2. One or several anaerobic ponds to reduce the organic load in wastewater
3. One or several facultative ponds to eliminate organic material
4. One or several maturation ponds for the removal of pathogenic microorganisms

The system is efficient in eliminating pathogenic germs, breaking down dissolved organic material and materials in suspension. Nitrogen and phosphorus are moderately treated in this technique.

IMPLEMENTATION CRITERIA

The number of users served	depending on the available space
Filters land area requirements	large; 10-15m²/ inhabitant according to the context
Type of water treated	domestic and industrial
Maintenance	simple but regular
Special conditions	the slope varies according to the number and depth of basins; avoid a steep slope to prevent the risk of collapsing and sudden increase in the flow of rainwater
Type of soil	natural lagoons must be placed in impervious soils, some waterproofness and lining tasks could be necessary; avoid this type of plants in sand soils or unstable lands, or in karstic or fractured substratum
Climate	works best in tropical and subtropical climates
Point of release	released in surface water or reused for agriculture and aquaculture

Main costs of investment	depending on the size and numbers of lagoons: cost of the land, properties of the soil being excavated, waterproofing tasks to be undertaken, purchase of pre-treatment material
Main costs of treatment	a full-time non-qualified technician for 10 000 users, sludge removal once every few years, operation and maintenance of the pre-treatment unit, maintenance of equipment



LAGOONING-FRANCE

LAGOONING-LEBANON

THE MAINTENANCE

Wastewater lagooning does not require particular technical competences as much as it requires general and regular monitoring of the system. Yet, these competences are essential for the proper and effective functioning of the lagoons.

Several maintenance operations are to be conducted regularly: maintenance of pre-treatment ponds, collecting and removing plants that could grow in the lagoons, monitoring the proper flow of water and the non-obstruction of connecting structures, etc.

Sludge should be removed from basins every two to twenty years, depending on the buildup. The sludge of the primary basin should be removed more often than that of the maturation basin, as sludge accumulates less in the latter.

THE IMPORTANCE OF SLUDGE

Sewage sludge produced in the anaerobic basin requires additional treatment before it can be reused. It either has to be dried; chemical products should be added to it; or it has to be biologically treated, etc. Sludge resulting from other lagoons can be used to fertilize the soil and the plants. Direct sewage sludge spreading is possible depending on the quality of wastewater being treated and the characteristics of the receiving soil. It is also possible to compost the sludge by mixing it with other organic wastes. The compost produced can be used as a soil fertilizer.

+ ADVANTAGES

- Operation remains Simple and low cost
- Integrates well into the landscape, absence of noise pollution
- No unpleasant smells in normal conditions
- Operation in gravity, a supply of energy is not necessary
- Adapts well to rapid variations in population
- Very good elimination of pathogen organisms
- Well suited for tropical and subtropical countries
- Possible reusing of effluents in agriculture and aquaculture

- DRAWBACKS

- Regular maintenance is a must to ensure the proper functioning of the lagoons
- Requires sharp expertise for the project conception and follow up of operations
- The parameters influencing the quality of treated water are not under control, thus it is important to define and control the size of work
- The Cost of investment is strongly related to the cost of the land and its nature
- Some adjustment obstacles may occur when the plant is serving larger populations
- Risk of mosquitoes
- Some unpleasant smells and/or dysfunction may occur when the sizing and/or the maintenance are not well undertaken
- Soil sealing is required in case this one is not impervious
- Treatment process in anaerobic lagoons slows down in prolonged low temperatures
- Much ground space needed

This technical data sheet is a brief presentation of a natural water treatment system that works well for small municipalities in Lebanon. The choice of the treatment technique should result from a local wastewater management strategy.

Steps to define a local wastewater management strategy

1- **Define the needs based on: the national judicial and institutional framework; the characteristics of the land; the requirements of the users; the existing operating system**

2- **Define the strategic orientations of intervention: the land status, zoning, define the infrastructure to be built and the equipment to be installed**

3- **Define an economic framework: the cost to launch and maintain the plant, determine the proportions of local and national funding, the ability of users to cover the expenses of the treatment strategy**

4- **Set an action plan in order to implement the strategy**