

From nuisance to resource

Lebanon is facing numerous environmental problems, one of them being untreated wastewater. Every year, Lebanon produces 248 million m^3 of wastewater. However, only 8% of it is treated. Consequently, around 92% of Lebanon's sewage flows into rivers and the sea untreated. Problem is, releasing untreated wastewater into another body of water has many consequences: decrease in the availability of potable (also used for hand washing) and irrigation water due to its contamination, extinction of marine life, loss and pollution of the sea and beaches, therefore, reducing access for swimmers and economic return from beach tourism and fishing.

To begin with, the COVID-19 pandemic has had drastic consequences on the country, especially that Lebanon was already facing a serious economic crisis before the lockdown imposed by the virus.

Furthermore, the COVID-19 is shed from bodies through stools and consequently goes to wastewater. As a result of the absence of treatment of wastewater and direct discharge into the Mediterranean, our sea might be contaminated with the virus. This has led the government to ban access to beaches.

In addition, the lockdown and the economic crisis, have together encouraged people to return to their gardens and grow their own plants. There is now a higher demand for local food production because imports have been reduced, by the lack of hard currency. As a result, the country will witness a rise in demand for fertilizers and irrigation water, currently rare, due in some cases to pollution.

The above issues can be solved by treating and reusing wastewater thus benefiting from its components. This essay presents solutions to the wastewater problem in Lebanon.

Generally speaking, wastewater is water that has already been used and must be treated before it can be released into other bodies of water or before it can be reused. It comes from domestic activities such as bathing, toilet flushing, laundry, but also from agriculture and industrial processes. Microorganisms and chemicals present in untreated wastewater can also have major consequences on the population's general health, increasing cancers, and infectious diseases. So depending on the wastewater source, it will require a certain treatment before it can be discharged or recycled.

There are multiple levels of wastewater treatment: primary, secondary, and tertiary. The primary level of treatment uses screens to intercept the majority of solids such as branches, garbage, or any large material and remove them from the wastewater so they can be disposed of at a landfill. The water is then kept in settling tanks or clarifiers, where it stays for several hours allowing the sludge, a layer primarily composed of organic matter, to settle and a scum to form on the top. The scum is then skimmed off the top and the sludge removed from the bottom. At this point, the wastewater has lost 50% of its BOD (Biological Oxygen Demand). Primary treatment, however, does not ensure that all harmful pollutants have been removed. Secondary treatment uses aerobic or anaerobic bacteria to digest the remaining pollutants. The effluent water is then again taken to settling tanks where the sludge settles, making the water now 90-95% free of pollutants. Finally, tertiary treatment includes disinfection and removal of nitrates and phosphates. These steps apply to domestic wastewater. Additional more complex processes are needed for some of the industrial waste. Therefore, to address the problem of wastewater we must necessarily work on building numerous treatment plants. Through the process explained above, the influent wastewater would be cleansed

from all its pollutants. The effluent water would then be of no harm to health and the environment in which it is cast or it could be reused in the production process.

Moreover, knowing that wastewater is produced continuously throughout the year, treating it, and reusing it will solve the water shortage problem that usually occurs every year in Lebanon.

Coupled with building wastewater treatment plants, the reuse of this water in agriculture and industrial processes can increase water availability.

On one hand, wastewater reuse in agriculture is a relatively easy process that can have many advantages. For example, irrigation of crops with water rich in nitrogen and phosphate - nutrients contained in wastewater -, will reduce the need for synthetic, currently not easily importable, fertilizers, and improve soil properties (soil fertility; higher yields). Moreover, these alternatives will result in the reduction of treatment costs, and investments in wastewater disposal and irrigation. This water cycle will also allow the conservation of freshwater sources and the reduction of damages to the environment.

On the other hand, industries can recapture and purify wastewater that would otherwise be lost, and recycled water could be used for everything from washing and rinsing to boiler and cooling water tower make-up or fire suppression systems. Refineries, for example, often use as much as half of their water in cooling towers, so in this case, wastewater reuse can have significant positive benefits. Sometimes it's the chemicals found in untreated wastewater that can be the most useful to the production process. Techniques for separating the water from these chemicals are available. This is why a first step for industrial companies desiring to implement the most effective wastewater reuse cycle would be to conduct a professional water usage audit. An appropriate plan, tailored to the manufacturer's specific situation and budget would be proposed by water engineers to save the industry the most money and diminish its impact on the environment.

To summarize, the wastewater problem in Lebanon is a dangerous issue that deserves immediate attention and action. Treatment and reuse options already exist and can be easily implemented in Lebanon. Current solutions to wastewater have shifted the perspective of it being a nuisance to being a resource. Treating wastewater will have not only environmental and health benefits but will also give a much needed boost to the economy.