



Circular Economy Lab & Observatory

2020-1-IT02-KA201-079994

WATER STATUS

Wastewater purification
Lithuania-2.2



Co-funded by the
Erasmus+ Programme
of the European Union

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The purpose of this project is to explore the topic of wastewater purification and explain different problems regarding this topic. The reason why we are interested in this particular subject is that water is essential for human life, and without it, many types of populations would quickly perish. Water resources are becoming scarcer and more contaminated due to population growth and the increased usage of water. These effects in many locations run the risk of getting worse due to changes in rainfall patterns too. Water shortage—caused by physical scarcity or pollution—has emerged as one of the world’s most urgent problems, posing risks to human, economic and environmental security.



The value of wastewater, which was formerly undervalued, is now more widely acknowledged as a possible “new” supply of clean water for both potable and non-potable purposes, with positive social, environmental and economic effects, which is why purification and treatment of wastewater is a relevant and even essential topic to take into consideration. That being the case, in this project, we will review several things starting with describing in which life areas water is important and its many functions, what is the concept of wastewater, where it comes from and how it is currently treated; problems related to wastewater and purification technologies and the negative impact of uncaredful handling of pollution.

In the second part of this work, we’ll discuss possible solutions to fixing problems of nowadays technologies, propose new ones that include systems just being developed at the moment or those that are based on the imitation of natural processes; how everything could and should be handled prior needing to clean polluted liquid – a way to avoid ruining bigger amounts of our most important resource.

All of this information should help deepen the understanding of the problem and not only raise awareness about the current situation and future consequences, but give recognition to the ways of dealing with today's state of water. By acknowledging problems, we will try to contribute our own small part towards stepping into sustainable and resource-efficient water management and most importantly awaken mindfulness regarding water use in various sectors, starting from home and ending with industries and agriculture in hope that this topic's actuality will increase both with the want of creating more accessible and easier implemented practices to stop the situation from going beyond repairing stage.



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As it was emphasized in the introduction, for both our business and society water is crucial. A healthy water system is important not only for drinking, cooking, and cleaning, irrigating crops, but also for other reasons, such as filtering and reducing pollutants, avoiding floods, storing freshwater, preserving the balance of the microclimate and protecting wildlife ¹. The ecosystem and human health could suffer if it's not adequately treated. Among the negative effects include impairment to fish and wildlife populations, oxygen depletion, beach closures and other limits on recreational water usage, limitations on the harvesting of fish and shellfish, and water contamination.

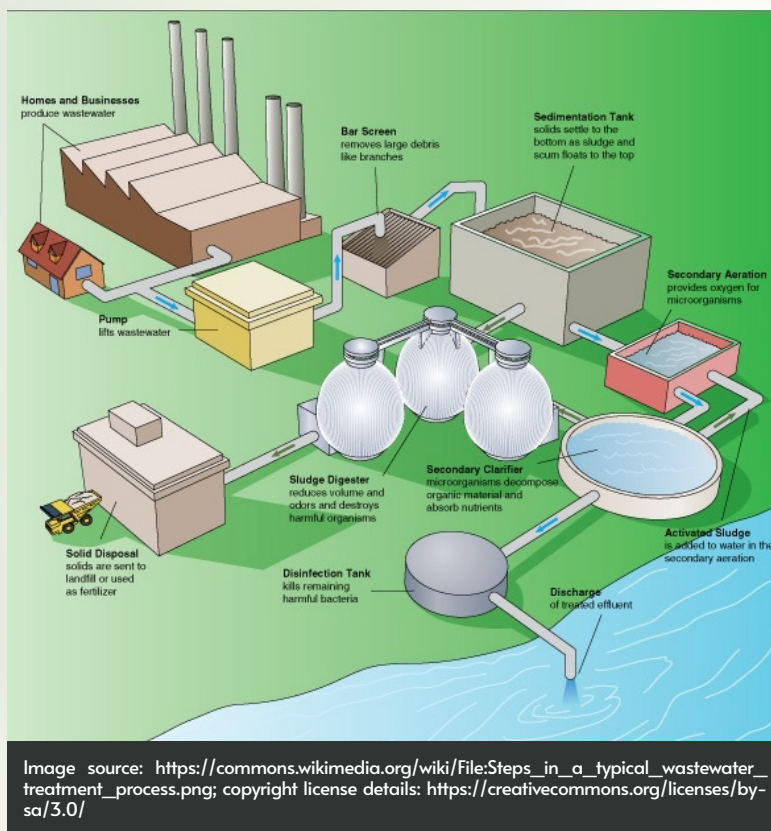
A lot of water pollution that causes mentioned problems comes from wastewater and unfortunately, once water is contaminated, it is challenging, expensive and frequently impossible to clean it up. Even now, 80% of the world's wastewater, which includes everything from human waste to highly toxic industrial discharges, is not treated ².



Wastewater – mostly used water that has things like chemicals, oil, soap, human waste, and food scraps in it – includes water out of various places – not only from washing machines, dishwashers, toilets, showers and bathtubs in houses but also from businesses, farms, and manufacturing companies ³. Storm runoff is also included.

Although small portions of polluted water can be dealt with by nature, if billions of gallons of wastewater and sewage people create every day wouldn't be cleaned before releasing it back into the environment, nature would be unable to handle all the amount of water waste and pollutants. Wastewater is treated at regulated facilities called Wastewater Treatment Plants (WWTP) ⁴.

Depending on the climate, wastewater source, population served, industrial size, plant's size and the degree of treatment required by the discharge permit, treatment techniques may vary – it can include physical, chemical or biological processes.



Small towns may have other ways of handling wastewater like municipal lagoons that are emptied once a year, basic collection systems or individual septic systems. The problem is that State water quality agencies have identified malfunctioning wastewater treatment systems as the second greatest threat to water quality, for example, with the Environmental Protection Agency estimating that between 10 and 20 percent of small community wastewater treatment facilities in the United States alone are not operating properly ⁵.

The leftover liquid waste from home septic systems is usually discharged onto a leach field, where water seeps into the ground from permeable subterranean pipes. This water still has contaminants and dangerous microbes in it.

Some of these are eliminated as water passes through soil and rock, but in many locations, they enter groundwater supplies and worsen the problem of water pollution ⁶.

But not only small communities can be the culprits for various pollutions. Sometimes, chemical waste from manufacturers or sewage from cities is thrown directly into the ground or rivers and lakes, for example, six of Canadian cities alone (Victoria, Dawson City, Montreal, Saint John, Halifax and St. John's) dump 400 million litres of raw sewage each day ⁵. When sprayed on farms, pesticides frequently reach surface water and groundwater in significant amounts.



Groundwater is immediately affected by leaks from liquid subterranean storage tanks, such as gasoline. There are combined sewer systems in many cities, especially older ones, which collect household sewage in the same pipes as stormwater runoff – during periods of severe rains more water than the system can retain accumulates in the street gutters.



Although again some pollutants gradually transform into non-toxic substances – it progressively moves downstream and is replaced by unpolluted water once the pollution input is ceased – the issue is that pollution rarely gets rid of itself in that way quickly. Also, though the pollutant is still there, the concentration frequently drops to the point where the water is already deemed safe for consumption.

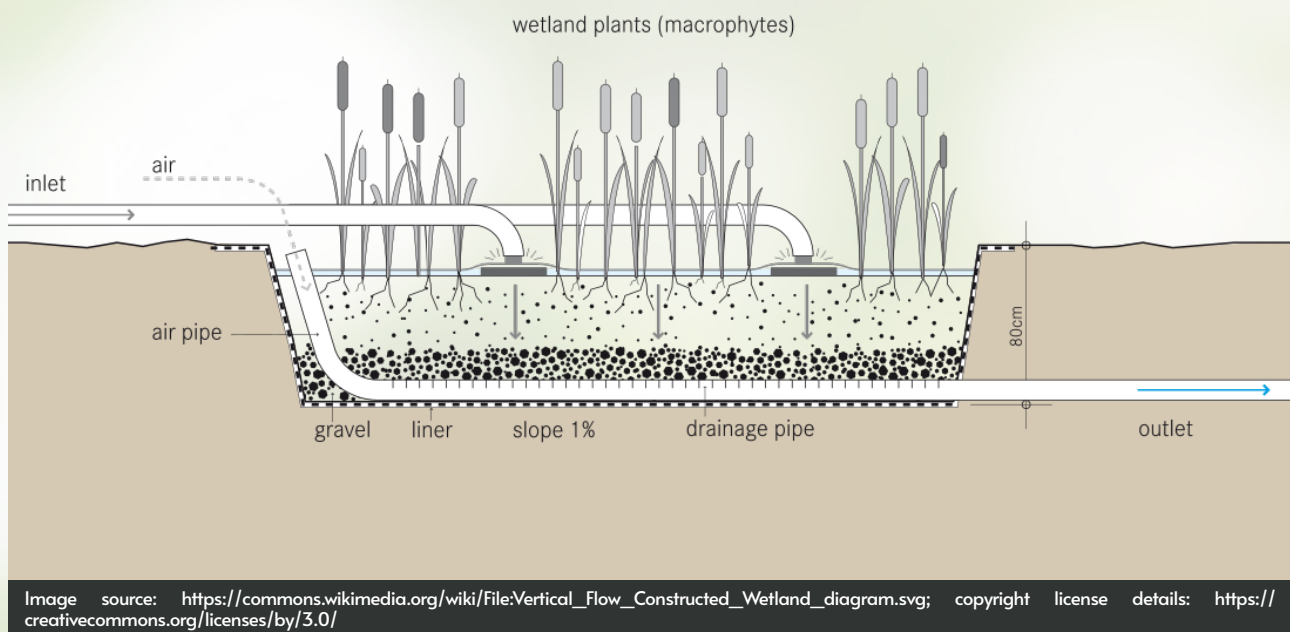
So, although certain measures are taken to improve the status of the waters, many water bodies are still in bad condition and in need of remediation. The first way to work it through is to tackle the causes of wastewater formation. For example, many different types of actions are being implemented by the Member States, such as farm-level nutrient planning, fertilizer regulations, suitable tillage, nitrogen-fixing and catch crops, reserving buffer strips, and crop rotation.



Additional approaches include managing cattle through improved feeding (lower phosphate compounds), reduced grazing, and improved manure management (increased storage, decreased use).

To reduce the risk of excessive leaching into the aquatic environment, manure storage, in particular, can help with the timing of application. To retain chemicals from wastewater, possible steps can include educating consumers, pressuring businesses to change the makeup of their products, and, in the long run, completely reevaluating our usage of chemicals and product design, such as switching to easily repairable or recyclable products.

Viewing this problem from the technology side, as water quality regulations become more stringent, many older wastewater treatment facilities should be upgraded, but this is frequently challenging due to a lack of available room for expansion.





New treatment techniques have been and are still created in order to improve treatment efficacy without needing more land. These include the integrated fixed-film activated sludge (IFAS) method, the ballasted floc reactors, the membrane bioreactor process and thermal hydrolysis ⁷. For communities that experience energy and electrical difficulties, natural remedies, energy saving, and carbon footprint reduction are some of the key considerations.

That is to say, the use of green technology and renewable energy sources, such as solar and wind power, for wastewater treatment is developing and will help reduce the negative effects of human activity on the environment.

Systems for the environmentally friendly and cost-effective natural treatment and disposal of wastewater have already become more and more used, particularly in smaller areas. These consist of systems like artificial wetlands, lagoons, stabilizing ponds, soil filters, drip irrigation, groundwater recharge, and others of a like nature.

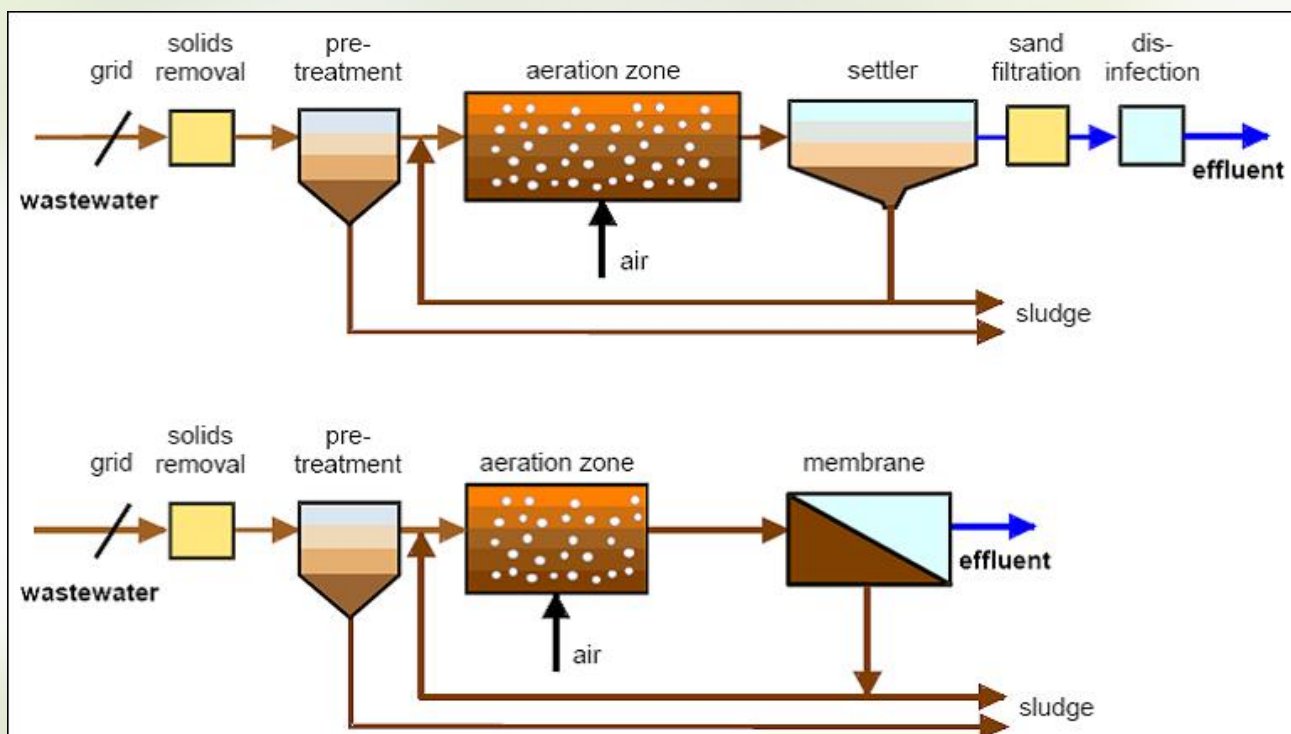


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Potential uses for these ecologically beneficial technologies have been made possible by the simplicity, affordability, efficiency, and dependability of systems. In the end, if nature can purify water on its own, then replicating natural processes may be one of the most efficient and long-lasting methods of treating wastewater too.

One of them, wetlands, naturally regenerate large amounts of water. The water pours into a lined cell that makes up a constructed wetland. The roots of the plants that are placed inside the cell cleanse the water of impurities. Other natural methods include rapid infiltration, overland flow, slow-rate irrigation, and so on ⁵.



Alternative separation techniques are also available that can save water. One such system divides greywater, which can be used to water lawns, from blackwater, which comes from toilets, and greywater, which comes from showers and dishwashers.



Keeping in mind the current situation, even with existing technologies wastewater is not efficiently handled and most of it is released into the environment and water bodies without special treatment and without thinking about future consequences or just because it is cheaper to not deal with it at all.

Every older system that fails to properly take care of polluted water should be renovated not only at the commercial level, but by considering every individual system in homes, because it too might be highly participating in polluting processes.



Even though new technologies that are more cost-efficient, less space using and more natural are essential for achieving a better water state, the initial reasons for pollution should be equally taken into consideration and should be minimized as much as possible by bringing awareness and mindfulness into business manufacturing so that the makeup of products containing dangerous substances to nature would be changed or used less.

All options for water supply, including potable water reuse, must be taken into account in the present and in the future too, when the need for safe water will be greater and water resources will be scarcer than they are now ⁸.

A part of the sanitation circular economy

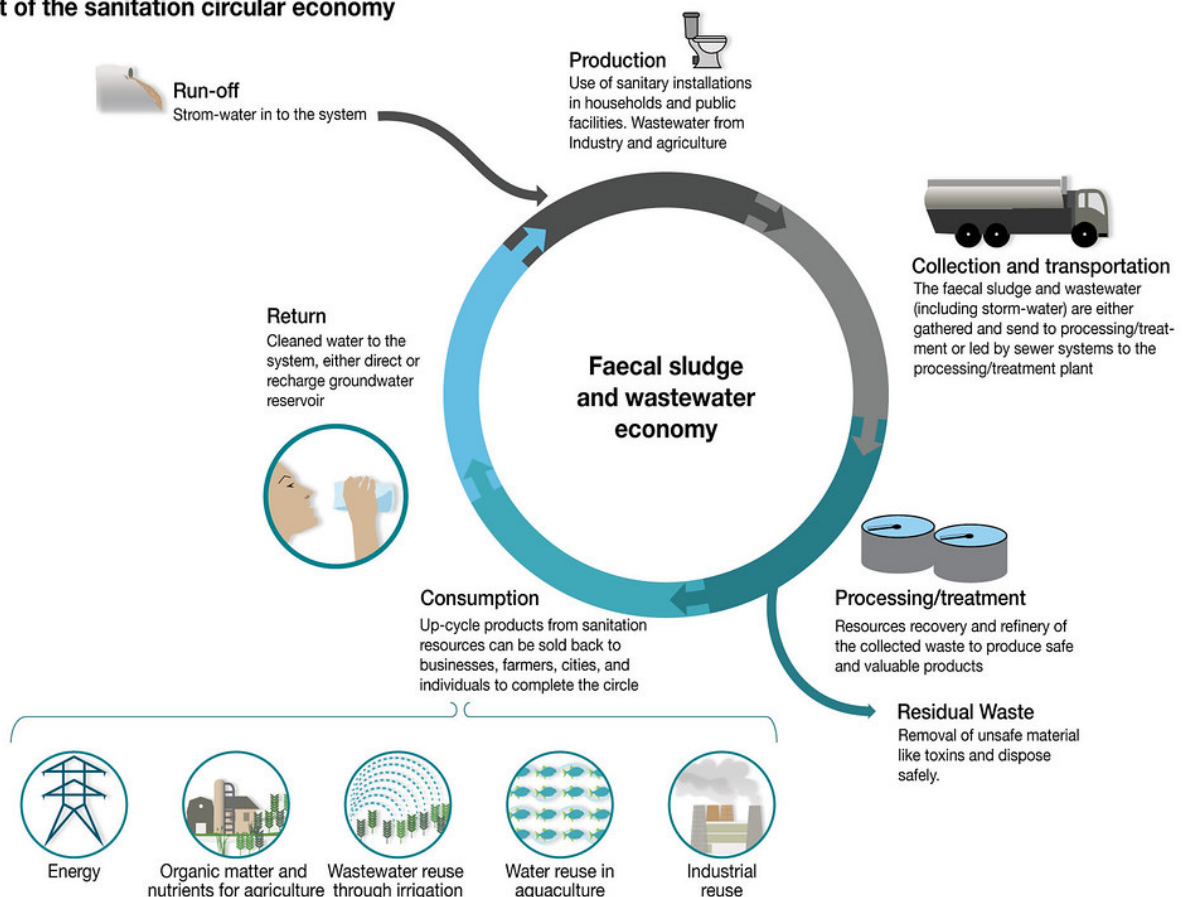


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In cities or towns where the population is expanding and water supplies are constrained, wastewater can be a useful resource.



Reusing wastewater can improve the cleanliness of streams and lakes by lowering the amount of effluent that is discharged into them, which also lessens the demand for scarce freshwater resources. Wastewater can be recovered and utilized again for irrigation of gardens and crops, groundwater recharging or leisure activities and our own personal needs.

Wastewater can be processed to a variety of qualities to meet the needs of business, industry, and agriculture, it can be treated in environmentally friendly ways and even used again as drinking water ⁹.

So, by bringing up these problems and making all the conclusions as to how and why wastewater must be treated and reused, hopefully, there will be actions taken towards this type of sustainability if not for the sake of preserving nature and the world's ecosystems, at least for the ability to live a content life and being able to use resources without constrictions that might occur in the future, of course by still being careful for not taking advantage of the accessibility.

Overall, it was and still is the main goal to achieve more sustainable and better living and there is a chance to step towards it with the new methods and restrictions that are yet to be implemented.



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GROUP

Livija Zamuškaitė, Paulina Kepežinskaitė,
Mantas Nikolaitis, Žygimantas Bakanas.