



Circular Economy Lab & Observatory

2020-1-IT02-KA201-079994

# ECOFUNCTIONS

Water pollution and climate change  
**Italy-5.2**



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

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

# ECOFUNCTIONS

## Water pollution and climate change

Italy-5.2

### Introduction

Water pollution and climate change are matters that affect the entire world as we know it.

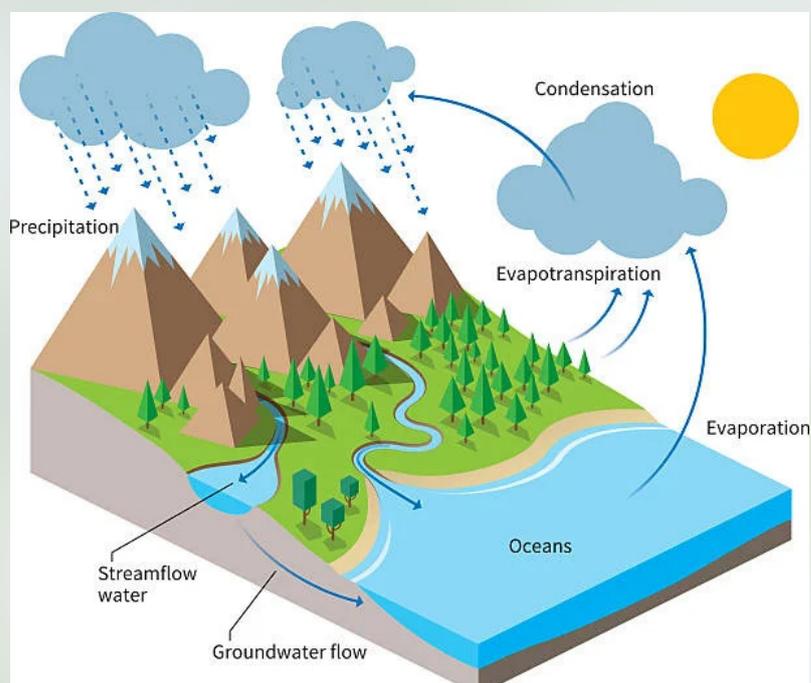
A consequence of climate change is the rise in temperature of (also) water bodies like lakes and rivers, and the reduction in time of the ice/snow cover season. These changes, together with the increase in river flows in winter and the reduction in summer, have important impacts on water quality and freshwater ecosystems.

Pollution is one pressure on aquatic environments that is exacerbated by some of the changes brought on by climate change. For instance, when there is less water to dilution contaminants, a reduced river flow as a result of less rainfall causes a higher concentration of pollutants. Another issue caused by raising of temperature is the quality of water will decrease due to reduction of the quantity dissolved oxygen because it will reduce the water's capacity of self-purification.

There are scientific proofs about climate change. Due to climate change we will have a lesser quantity of water for humans' necessity. The water is a connection element between various sustainable development objectives.

The water is important for management of mitigation and adaption's strategies.

These strategies are important to reduce the risks of climate changes.



<https://www.istockphoto.com/it/immagine/water-cycle-diagram>

The adaptation includes a set of natural, artificial and technological options, as well as social and institutional measures, with the aim of moderating the danger. The mitigation includes human intervention aimed at reducing sources or strengthening the absorption and removal of greenhouse gasses.

Mitigation options are available in all major water-related sectors. The environment and the ecosystem's change will compromise nature's stability. What are the origins of these issues? Who is responsible for the massive damage to our world?

The answers of these questions are easy to find: men pollute nature through multiple types of mechanisms, sometimes people can pollute unconsciously but a lot of them can pollute deliberately because they don't take precautions against these issues. We'll see how people can pollute the environment and how it affects them back.

We'll also talk about water cycle and the climate change that are directly connected and how the weather alters the environment. We begin to talk about pollution caused by man's activities: every waste that we don't recycle or even we drop in nature is a lethal projectile for the environment. Among dangerous wastes we can find plastic components (plastic water bottles, plastic packagings and other consumables).



We may talk about how the industries pollute air and water with their chemicals and radioactive wastes. Obviously nature takes most of the damage but it can't resist forever if we don't change our minds and our habits. In the future we need more cooperation between the scientific community that works on water pollution and the one who works on climate change.

<https://www.istockphoto.com/it/immagine/plastic-pollution-in-river>

### Problem's description

There are three types of water pollution: physical pollution, chemical pollution and biological pollution. Physical pollution refers to garbage visible. Chemical and biological pollution refers to those pollutants that can't be seen without any scientific tool like a microscope, but the presence of those means that the water isn't drinkable. Water pollution always comes from human activities.



In fact, if we talk about pollution produced by an average person, we can think about the garbage that he produces every day, which represents physical pollution, or we can think about cosmetic and hygiene products, which can release polluting chemical agents into the water that consequently can contaminate the water.

Agriculture, industry and transport are the sectors that most pollute water due to their availability of chemical and biological products and their connection with nature resources.

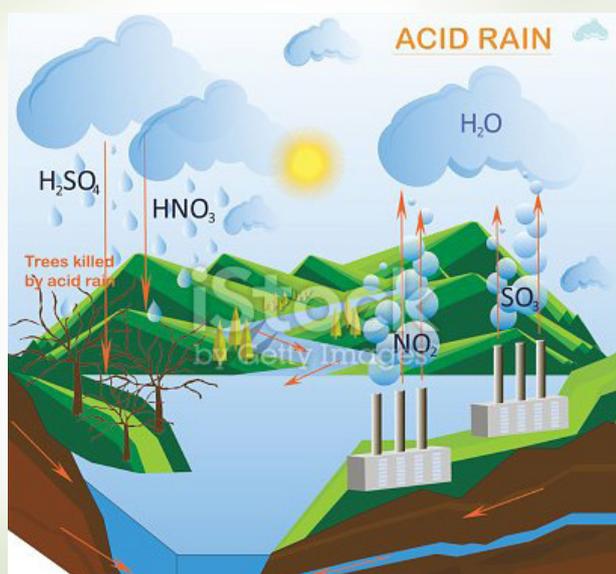
In fact there are other different types of classification of water pollution:

- Civil: it derives from the discharges of the cities when the water is poured into the rivers or into the sea with no or poor treatment;
- Industrial: they are made of various substances, depending on the industrial processes;



<https://www.istockphoto.com/it/immagine/factory-water-pollution>

-Agricultural: depending on the incorrect or excessive use of chemical products that are in general watersoluble, can reach the aquifers. The only way to solve the problem of water pollution comes from three sides: reduce the use of pollutant products, increase the control of industrial wastes and clean contaminated ground and water. In this way, pollution that will end up destroying both groundwater and other water reserves can be avoided and minimized.



<https://www.istockphoto.com/it/immagine/acid-rain>

Some of the most important actions that can be performed in this regard are as follows:

- Reduction of chemical nutrients and pesticides.
- Reduction and treatment of wastewater.
- Reduce deforestation.
- Reduction of water consumption in agriculture and industry.
- Implementation of sustainable transport.
- Reduction of waste.
- Reduction of particularly dangerous agents: oils and batteries.
- Reduce the use of plastics.

To mention a second effect of the industry pollution are the smokes with sulfur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) are emitted into the atmosphere and transported by wind and air currents, all these atmospheric phenomena result in a devastating of crops and groundwater.

Then we can even discuss the transports with their exhaust gas or flue gas emitted as a result of the combustion of fuels such as natural gas, gasoline (petrol), diesel fuel, fuel oil, biodiesel blends, or coal that end up in the atmosphere and in the 1993 we used the asbestos for the brakes or the liquid lead as main component in the gasoline.

#### Problem Solutions:

As said we have three types of pollution and many ways to solve problems, for example in the industry sector we have the "Source Control" to reduce and control the pollution:

Recycling;  
Industry Site Selection;  
Rebuilding Habitats and Afforestation;  
Cleaning of Resources;  
Stricter Laws and Enforcement;  
Proper Treatment of Industrial Waste;  
Regular Environmental Impact Assessments.



<https://www.istockphoto.com/it/immagine/planting>

There is a strong connection between climate and forest composition, and climate change has in general a negative impact, even if in some areas, like Northern Europe, at high latitude, it could also be positive. Afforestation and reforestation can in turn have a role in the mitigation of climate change effects. Of particular interest are afforestation (planting trees in an area where there was not a recent tree cover - at least not in the last 50 years, in order to create a forest) and reforestation (planting or taking care of trees in existing forests that have been depleted). Land cover plays an important role in water filtration too. That's why forest ecosystems with healthy soil assure a good quality of water.

For example an immense wood supply for Europe and even more oxygen or carbon cycles. The forests are known for their power to be the cradle of life at least for us terrans, for the animals and for the climate. <sup>1</sup>

When soil contamination reach high levels that can't be removed by soil filtration, industrial treatments are applied to restore soil and water quality. Industrial wastewater treatment deals with all the processes used to "clean" the water that is being used by industries in their production cycles. It is quite normal to have a liquid waste as a result of an industrial process, but recently the trend is to design the processes in a way to minimize such waste and/or to recycle it during the production process.



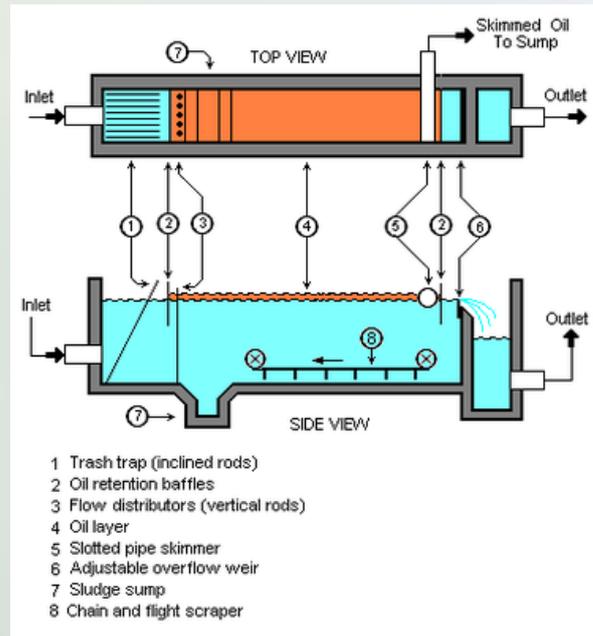
Sometimes the treatment of water is necessary at the first stage of the production, because some processes need a supply of very high quality that meets certain standards.

In both cases, that is treating water before it is used in the factory or after that, sludges containing both organic and minerals are produced during the filtration and sedimentation stages.

There are different water treatments:

-Solids removal.

Most solids can be removed by techniques of sedimentation with the solids recovered as slurry or sludge.



<https://www.iwapublishing.com/news/industrial-wastewater-treatment#:~:text=Methods%20include%20Advanced%20Oxidation%20Processing,wastewater%20treatment%20can%20be%20used>

-Oils and grease removal. Many oils can be recovered by using skimming devices. Considered as a fine solution, oil skimmers are a cheap and clean way to ensure the exact level of purity of the water. On the other hand these devices are the most efficient in ways of cost and oil less consume or waste.

-Removal of biodegradable organics. Biodegradable organic material is taken out of the water with conventional wastewater treatment processes. They are called conventional because they have been used widely and from a long time to treat especially domestic wastewater. They include sedimentation, filtration, but the core of the process is the activity of microorganism that are kept in good "operating condition" in a medium, that can be a sludge in a pond (activated sludge) or a bed of rocks (trickling filter). Since the process depends on living organism, problems can arise when the conditions of the waste to be treated are too extreme. For example when organic matter (that acts as nutrients for the microorganism) is too diluted in water, or if they are too concentrated, like if you are dealing with blood or milk waste. The presence of chemicals, like antibiotics, cleaning agents and so on, can also have a damaging effect on the biological process. <sup>2</sup>



### Conclusions

Modern life in developed countries has left traces in the aquatic environment. Industrial chemicals, drug residues and personal care products can be found in almost all areas of the water cycle, whether it is surface water or groundwater. City and industrial effluents contain pharmaceutical residues and endocrine disrupting chemicals. Groundwater can be polluted by organic compounds produced by industrial activity.

Bio-reclamation refers to the processes that exploit microorganisms and their enzymes or any other living organism (e.g. plants, algae) to restore contaminated water, soil and air to a healthy state. For various target compounds, researchers identified or isolated suitable biocatalysts (enzymes, bacteria or a range of microorganisms) and tested them on a laboratory scale.

This also included the development of appropriate treatment procedures. <sup>3</sup> As said we've talked about all the problems that affect water quality but there's also the civilian pollution caused by our lifestyles and the transports. For these issues we found many solutions like treating the water with tools such as skimmers in industries for the oils and even for solid traces like sludge. Each method is experimented to be as clean and pure as possible to try to not interfere with nature and being the cheapest possible.



<https://www.pexels.com/it-it/foto/climate-street-people-2990650/> Photo by Markus Spiske

With the transports we studied the issue of the CO<sub>2</sub> or other kind of anhydrides with the eu normative for minimizing the amount of these exhaustions. There are little daily actions that everyone can do to reduce the environment pollution, for example, we could use biodegradable material, we may use a lesser quantity of plastic, we could try to produce a lesser quantity of wastes, we should give to our rubbish dump paints, solvents and medicine, we have to preserve as much water as possible; and a lot of more easy actions.

Naturally we have to improve our behavior in all circumstances like if we are attending school or if we're working in our office or if we're simply staying at home. Even if we find ways to approach the environment we must continue to keep the world clean. It will take years, maybe decades.



Who knows how long it will take to restore the purity of nature. So we have to keep improving these clean procedures and update every single information about nature to preserve and prosper. Thanks for reading.

<https://www.istockphoto.com/it/search/2/image?phrase=vehicle+emissions>

# BIBLIOGRAPHY

<sup>1</sup><https://climate-adapt.eea.europa.eu/en/metadata/adaptation-options/afforestation-and-reforestation-as-adaptationopportunity>

<sup>2</sup><https://www.iwapublishing.com/news/industrial-wastewater-treatment#:~:text=Methods%20include%20Advanced%20Oxidation%20Processing,wastewater%20treatment%20can%20be%20used>

<sup>3</sup><https://cordis.europa.eu/article/id/91134-new-ways-to-combat-water-pollution/it>

## GROUP

Lorenzo Sansone, Serena Leto  
and Alessandro Bevilacqua.