

What are you drinking? Tap water versus bottled water

Drinking water infosheet

Every day, in most developed countries, the mere action of turning on a tap for freely flowing water is often taken for granted. And yet, until the first decades of the last century, taps were not actually commonplace, not even, as one might believe, in richer countries, as water was drawn from a well or fountains. And it is still a privilege today, if we think about the fact that one in every four people in the world still doesn't have access to drinking water.

But where does our water come from? And how does it get to our homes?

The supply sources are aquifers (groundwater), streams and rivers, natural lakes, or reservoirs created by dams (through which, thanks to the height differences created, it is also possible to produce electricity). Our water can be disinfected or undergo purification treatments, sometimes simple, other times complex, depending on the origin and quality of water. It is then channelled into a network of underground pipes, where it can be stored in tanks, often suspended to guarantee sufficient pressure. Eventually, it reaches our homes through a dense distribution network.



Lake Brugneto, Torriglia (GE) – Italy
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Purification treatments

What does potable water mean? Water is considered potable (safe to drink) only when it contains no microorganisms, like bacteria, that can be harmful to our health (i.e., it is microbiologically pure); when the content of chemicals does not exceed legal limits; and when it is clear and has a pleasant smell and flavour. However, not all freshwater present in nature can be used directly for human consumption. Water, in fact, can contain substances that make it non-potable: some come from the ground it has filtered through, others are due to pollution. For these reasons, some water has to be purified. Water treatments can be more or less complex. In general, groundwater only requires disinfection, which guarantees the elimination of potentially harmful microorganisms

throughout the distribution network, whereas surface water, which is more vulnerable to pollution, must undergo more complex treatments in large treatment plants.

Therefore, before the water reaches our taps, it must follow a specific pathway that can include one or more of the following steps:

- **Coagulation and flocculation:** water may be turbid due to the presence of suspended solids. A substance called a coagulant is added, which attracts the particles like a magnet, to form flakes called flocs.
- **Sedimentation:** water ‘rests’ at the top of a tank where the floc, due to its weight, sinks to the bottom, thus ‘clarifying’ water.
- **Sand filtration:** water flows into tanks full of sand, which filter it and withhold any particles still present.
- **Activated carbon filtration:** this eliminates certain types of pollutants and substances that can alter the taste and smell of water.
- **Disinfection:** this destroys any microorganisms. There are several disinfection methods: a disinfecting substance can be added (such as chlorine and its derivatives or ozone); water can be subjected to ultraviolet radiation, which destroys microbes; or it can be filtered through membranes with tiny pores that block the microorganisms.

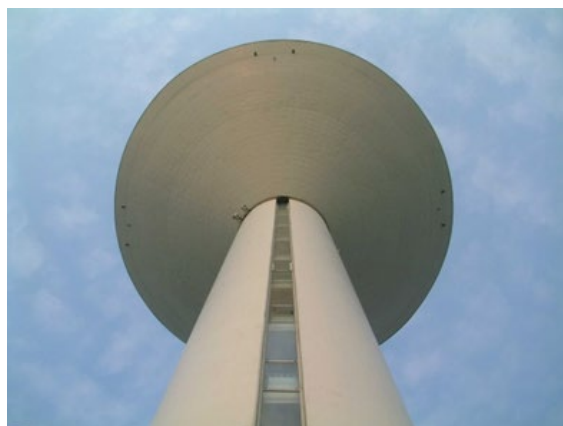


Genoa drinking water treatment
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Water distribution

After treatment, drinking water is distributed to our homes through a network of interconnected pipes. This distribution network is made up of large-diameter transmission mains along which water flows (by gravity or using mechanical pumps) to the distribution network. En route, there may be reservoirs (either underground/semiunderground or elevated, such as water towers) that allow for the storage of a sufficient volume of water to provide for the variable consumption required at different times of day. The last stretch of the network is then divided up into a complex system of pipes of smaller diameter connected to houses and factories. Finally, before arriving in our homes, water passes through a meter that calculates the volume used.

To guarantee the efficiency and continuity of service, the network has to be constantly monitored and needs regular maintenance: broken pipes must be repaired and those that are too old must be replaced.



Water pipes (left) and Reggio Est Water tower (right)
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Water quality

Every day, many quality controls are carried out on tap water. There are strict regulations that establish which substances must not be present and the maximum values of those which, in high quantities, could be dangerous to our health or may change the taste or colour of water.

The laboratory work begins at the source and follows the path of water, with samples being taken at various points along the aqueduct, which are then analyzed to ensure that it is still pure when it reaches our taps.

Its purity is also guaranteed by the supervision of human activities carried out in buffer zones, which are controlled areas established to protect the sources of the water supply from any contamination. In addition to the analyses carried out by the water utility companies, water is also controlled by independent supervisory authorities, which certify that it is potable and in compliance with parameters established by law. Quality is also controlled in real time by means of automatic measuring instruments. In addition, monitoring and control systems allow for the remote surveillance of plants to detect, and correct, possible anomalies.



Image: Sindhu digital/Pixabay

Tap water versus bottled water

With so much effort to bring drinking water to your taps at home, why do many people prefer to drink bottled water? Don't they trust it?

In most places in Europe, tap water is checked daily in analytical laboratories. It is a legal requirement: the laboratory work starts at the source and follows the watercourse, with frequent samples being taken at various points for analysis to ensure that it arrives pure and safe to drink. It also does not have to travel in a lorry on the roads (like most bottled water) or worse, by aeroplane, but reaches your home via the pipe network. And it travels light, with no packaging. Every year, more than 12 billion litres of water are bottled in Italy, 80% of which is in thermoplastic polymer resin (polyethylene terephthalate thermoplastic polymer resin) bottles, which could cover a surface equal to 4300 football pitches! Furthermore, tap water costs much less, up to 1000 times less, not to mention the effort.

Try walking upstairs with two crates of bottled water!

Tip: if tap water has a slight taste of chlorine, just fill up a jug and leave it to stand or put it in the fridge: chlorine evaporates and you won't even taste that it used to be there.



Images: Naja Bertolt Jensen/[Unsplash](#) (left) and Alabama Extension/[Flickr](#), Public domain (right)

Blue gold

Water is indispensable for our survival and its presence is strongly linked to the well-being of our society. A value to keep in mind is 0.065%, which represents the quantity of water on Earth available for us to use for drinking. The rest is found in the sea (which is too salty to drink), in the form of ice, or in inaccessible areas.

The situation is destined to become worse. In fact, pollution, the excessive exploitation of aquifers, and the construction of gigantic dams to produce energy (such as the Three Gorges Dam in China, with a capacity of no less than 22 000 million cubic metres!) negatively affect the natural renewal of water reserves. In addition, climate change, with the consequent phenomena of drought and desertification, and the exponential increase in the consumption of water due to demographic growth, make the situation alarming. To adequately satisfy a person's basic needs (e.g., drinking,

cooking, washing), around 40 litres of water a day is necessary. Today, 40% of the world's population live below this threshold. What will happen in 2050 when our planet is predicted to be inhabited by 10 billion people?

Water resources are distributed unevenly in the world: whilst water is often in abundance but wasted in industrialized countries, in many developing countries, the lack of drinking water is one of the main causes of death and disease.

As freshwater becomes scarcer, it becomes a source of conflict. On all continents, there are lakes and rivers that run through several countries and sharing water has always been a potential cause of international tension (not by chance, the word rival derives from the Latin *rivalis*, a person who uses the same watercourse as another). There are many current examples of shared water sources that are also a source of contention in the countries they flow through, for example, the River Jordan in the Middle East; the Tigris and the Euphrates in Turkey, Syria, and Iraq; the River Nile in East Africa; the Colorado River, which reaches Mexico with a much reduced flow after being 'intercepted' by the Hoover Dam on the US side; the Indus, which flows between India and Pakistan; and the Mekong, which flows through China, Myanmar, Laos, Thailand, Cambodia, and Vietnam.

Water is, therefore, more precious than gold or oil. Let's learn how to safeguard it and to appreciate its value.



Severe drought in Spain with water reservoir at 15% capacity (left) and dry earth during a drought (right)
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Wastewater: collection and treatment

What happens to water after it has been used in our homes or in industrial production processes? The hidden world of wastewater begins in drains and sewers, in a labyrinth of underground pipes and tunnels, which lead to the sewage plant, where, after a series of treatments, step by step, it becomes clean enough to be discharged into rivers, lakes, or the sea without harming the environment.

The treatment that wastewater undergoes can be of three types: physical, that is, water is screened to remove nonbiodegradable and floating solids, then any sand, oils, and grease are eliminated, and

finally it is left to 'rest' to allow for the sedimentation of suspended particles; biological, in which case, good bacteria are used, which feed on pollutants; and/or chemical, to eliminate specific substances. Sometimes water is subjected to ultrafiltration using membranes. And sometimes it is decanted into constructed wetlands, acting as natural biofilters, where plants create the bacterial flora that allow for the removal of pollutants.

Every wastewater treatment plant is a world unto itself, designed in line with the pollution level of the effluent, the place where water is discharged, and the possible industrial or agricultural reuse of purified water.

When these wastewater treatment plants function well, we can see a positive change in the quality of our rivers and seas!



Mancasale Wastewater treatment plant in Reggio (left) and the Loire in Bréhémont (right)

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