Abdelhafid Bousouf University Center - Mila

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Drinking water supply

– Lesson 1 –

Chapter 01 : General information on the AEP

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Institute	**Department Year**		**Speciality**
GC **Science and Technology**	License 3	Hydraulics	Urban hydraulics

Course Objectives 1

The main topics covered are:

1. **Definition and importance of drinking water supply** in the context of health public and sustainable development.

2. **The different water sources** used (surface water, groundwater, treated water).

3. The drinking water **production and distribution cycle :** collection, treatment, storage and delivery.

4. **Drinking water quality standards,** governed by national regulations and international.

5. **Current challenges and issues** related to access to drinking water (pollution, shortages, growth) demographics, climate change).

   The aim of this chapter is to provide readers with the **technical basics and** essential **scientists** for understanding how water supply networks work potable water and its impact on society.

Introduction

Drinking water supply refers to all the processes and infrastructure necessary to It provides clean, safe water in sufficient quantities to the population. It plays an essential role in public health, well-being and socio-economic development.

Drinking water supply (DWS) encompasses all the equipment, services and actions which make it possible, starting from raw water, to produce water that meets the standards of potability, then distributed to consumers.

Four distinct stages are considered in this diet:

- Water intakes (withdrawals - surface water or groundwater)
- Water purification treatment
- Water supply (transport)
- Accumulation (storage).
- Distribution to the consumer.

1. Sources of drinking water

- **Groundwater :** Water tables, aquifers, boreholes. This water is often from better quality because they are protected from surface pollution.

- **Surface waters :** Rivers, lakes, reservoirs. They require more extensive treatment in due to their exposure to pollution.

• **Seawater desalination :** Solution used in arid and coastal regions.

2. Urban hydraulics cycle

Urban hydraulics concerns the urban stormwater cycle.

This field therefore deals with the production, collection, transfer, storage, and processing of

urban runoff and the impacts of stormwater discharges on the environment

natural receiver.

In contrast to the well-known natural water cycle, which leads it from evaporation to

ocean surface, to the precipitation of the clouds thus formed and to direct or indirect runoff

towards the oceans, we consider in everything that follows the elements of an *artificial water cycle:* this

The cycle includes, in parallel with the previous one, the paths due to human intervention, since

the place where it draws natural water for its use, up to the point where it returns it after

use, often also returning the rainwater it has captured against its will.

The diagram below (fig 1 – 1) represents the various functions that a cycle must fulfill.

urban hydraulics.

By logically following the water from the point where it leaves the natural cycle to the point where it

find.
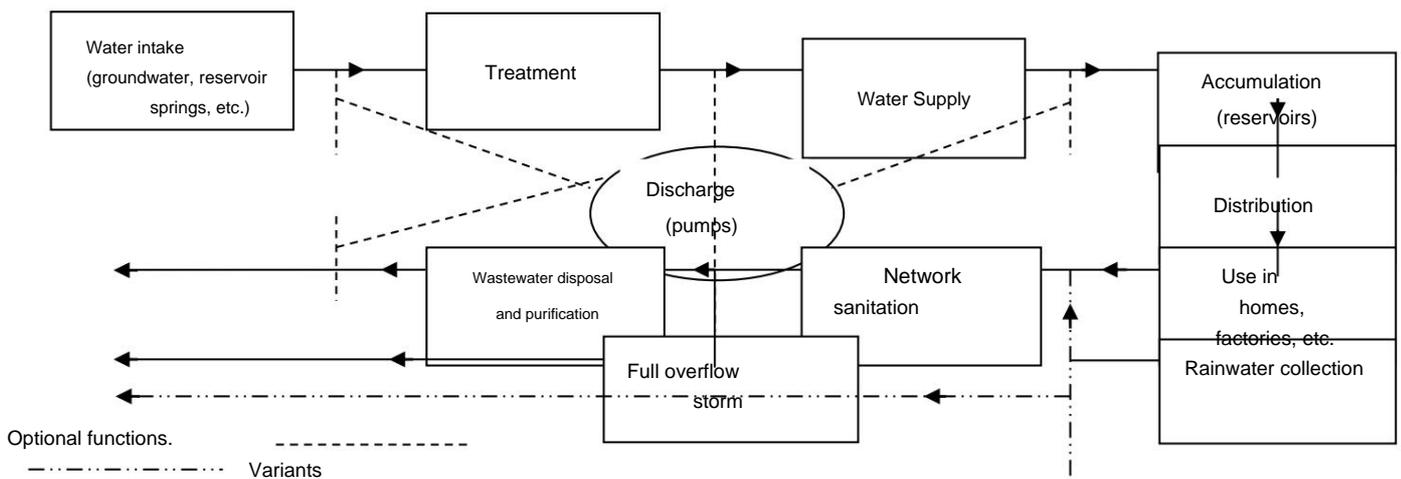
Figure 1: Functions of distribution and sanitation facilities.

2.1 Water intake

The water intake concerns either groundwater (springs, aquifers) or water

surface bodies of water (rivers, lakes or even the sea).

Water intakes are the works carried out to extract natural water for the purpose of

In terms of food, they can relate to either the water present in the subsoil, in the form of aquifers.

aquifer, either that which emerges from the subsoil to the surface through springs, or that which one

found on the surface of the ground, in rivers or in natural or artificial ponds.
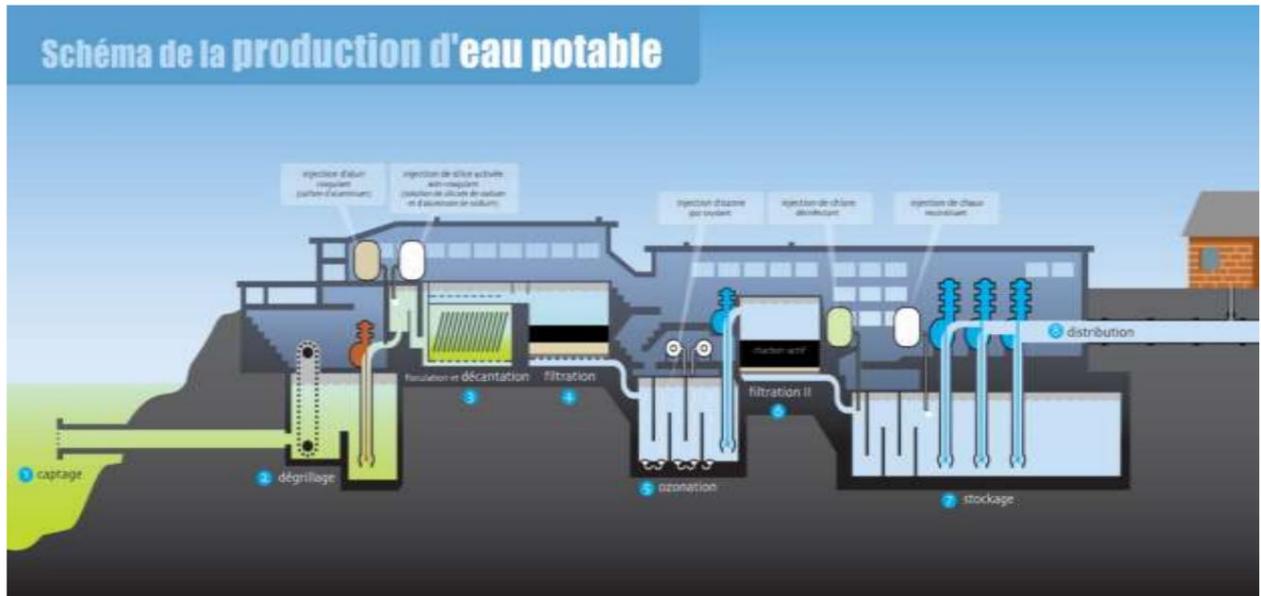

Figure 2: Functions of distribution and sanitation facilities.

2.2 Water Treatment

Treatment is almost always necessary to obtain hygienic water, therefore clean water

any mode of consumption.

Waters collected from nature, specifically surface waters (lakes and rivers), do not present

not the physical, chemical, and biological qualities desirable for consumption. To make

This drinking water needs to be treated. The treatment of raw water depends on its quality, which is

depending on its origin and can vary over time.

The water to be treated must therefore be constantly analyzed because it is essential to adjust the treatment accordingly.

of water to its composition and, if necessary, to modulate it over time according to the variation

observed from its various components.

However, it can happen that a sudden or excessive pollution incident forces the factory to shut down.

momentarily.

The aspects of water treatment are:

- **Clarification:** The removal of solid matter by decantation or filtration.

- **Sterilization:** It is sterilized by oxidants such as chlorine, ozone.

- **Improvement:** This corrects the chemical properties of water, either by adding substances

   appropriate chemicals, either by adsorption of harmful substances to be eliminated.

Figure 3: Functions of a processing station.

2.3 Water Supply

This is the transport of water from the point of extraction to the vicinity of the area.

its use. This function can also be placed before the previous one.

Water supply encompasses the techniques used to bring water from its source through a network of pipes or architectural structures (aqueducts) to places of consumption.
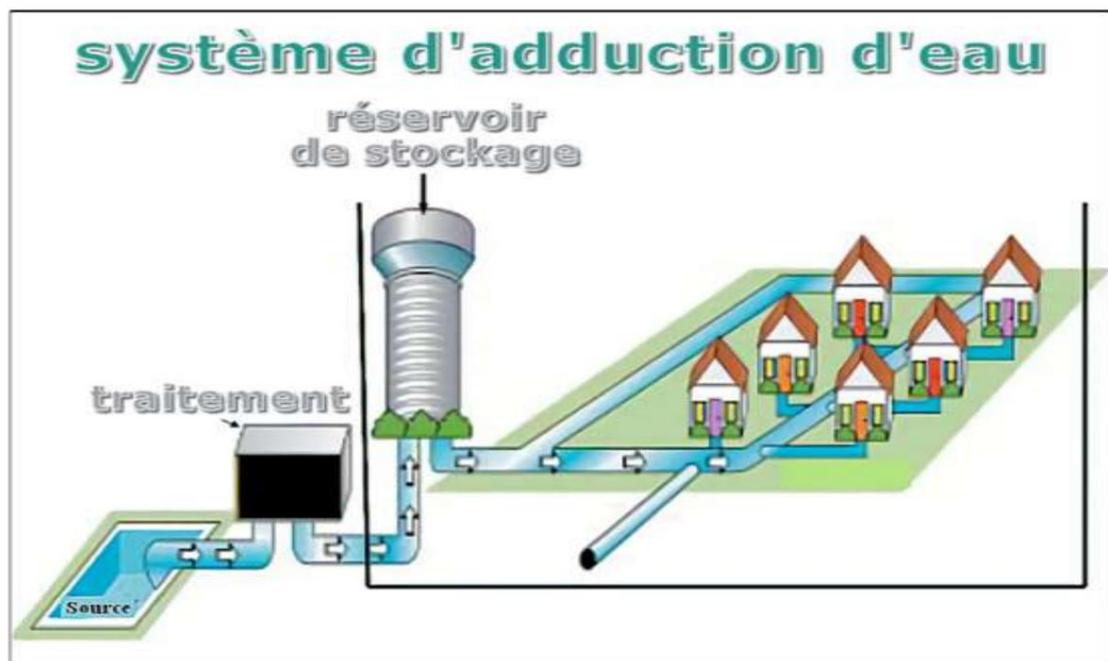

Figure 4: Water supply system.

2.3.1 Types of water supply

There are two types of water supply:

  • **Gravity-fed water supply :** Where the flow of water at high pressures is caused by

     the difference in hydraulic levels: the altitude of the source is higher than the altitude of the

     point of consumption, and therefore moves thanks to the force of gravity, hence its name.

     This is the principle of the water tower.
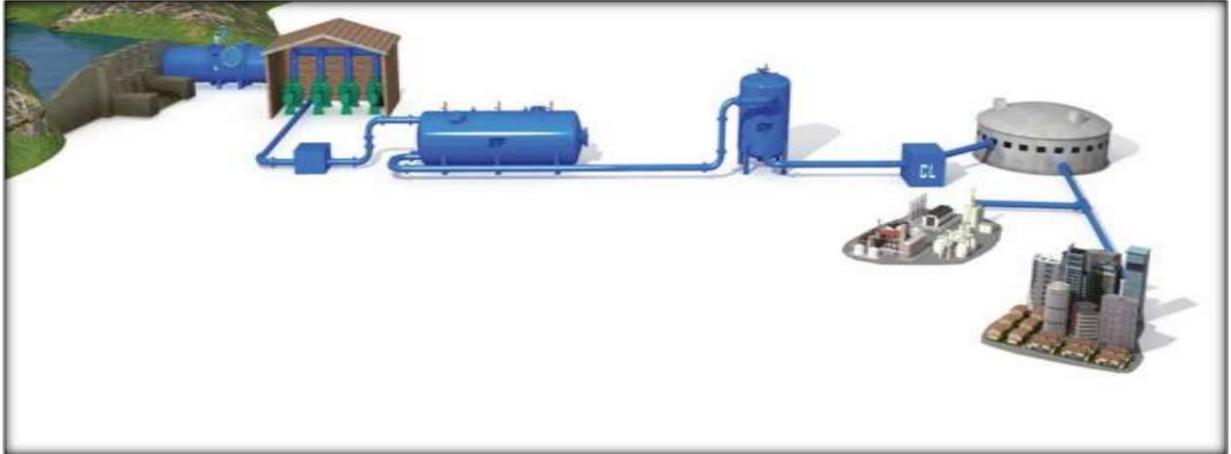
Figure 5: Gravity adduction diagram.

  • **Pumped water supply:** Where the pressure on the network and the path of the water are

     made using pumps inside pumping stations.

2.4 Accumulation

     Accumulation involves filling reservoirs to ensure, on the one hand, a greater

regularity of the flow captured, treated and delivered, and on the other hand, a reliability of supply during a

temporary unavailability of previous works; it is necessary to place the most accumulated

as close as possible to users.

     The reservoirs must keep the water safe from the risk of contamination, and as much as

possible large temperature variations.

     It also serves two purposes:

• To create a reserve of water that is available even if pumping is stopped.

• Separate the pumping from the distribution.

**Figure 6: Diagram of different types of tank.**

2.5 Distribution

Distribution consists of providing users with the bandwidth they need at any given moment.

needs; it requires piping sized for the maximum flow rate likely to pass through

each point.

The pipes must therefore have a sufficient diameter to ensure the

maximum flow rate with a ground pressure compatible with the height of the buildings.

Water distribution is carried out using underground networks consisting of pipes and

pressurized pipelines which include:

• pipes and special parts;

• tap fittings: valves, check valves;

• measuring devices: meters, flow meters;

• Fountain equipment: fire hydrants.
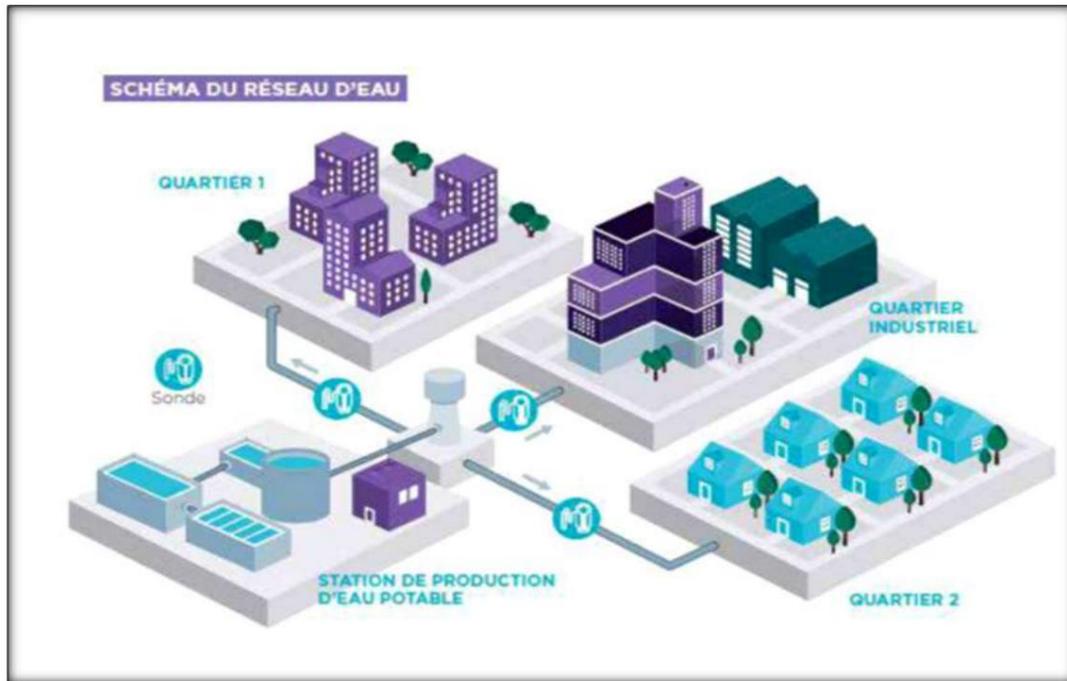
Figure 7: Distribution network diagram.

2.6 Sewerage network

After use, the so-called "wastewater" is discharged into a network that must be able to evacuate it to at each moment a flow rate approximately equal to the flow rate consumed, without any risk of backflow towards either any of the users.
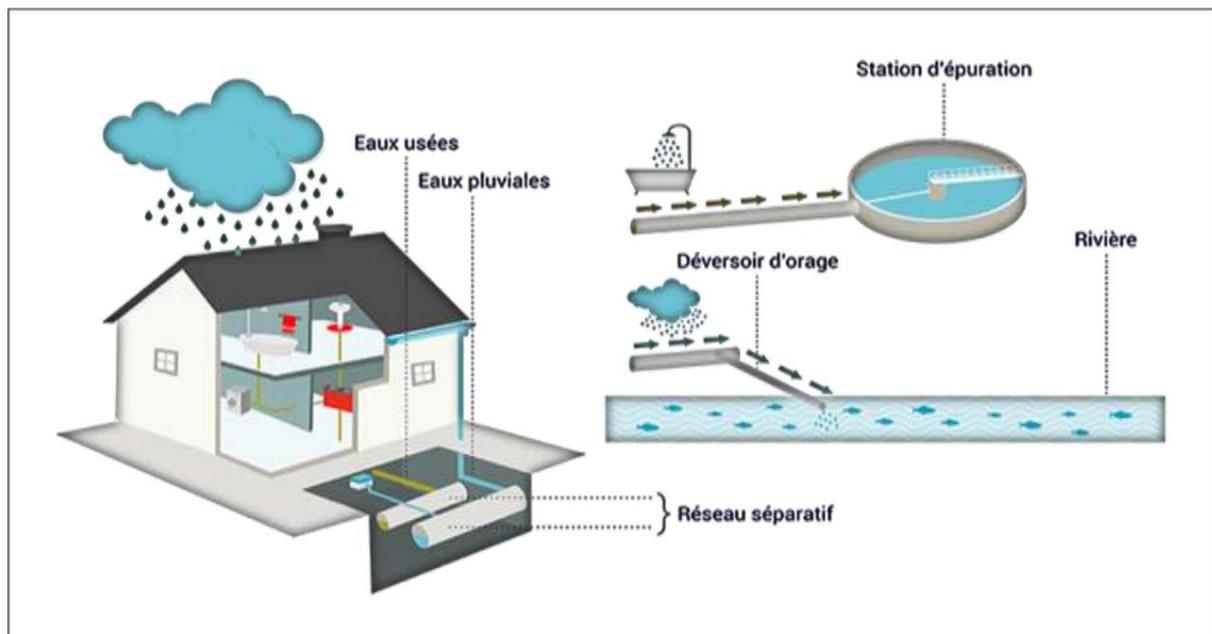
Figure 8: Diagram of the sanitation network.

2.7 Rainwater Collection

In addition to the previous function, rainwater is collected and returned in nature, either directly (and the sanitation network will then be said to *be separate)* or together with wastewater (so-called *combined network).*

Figure 9: Rainwater collection diagram.

2.8 Purification

Wastewater should normally be treated before being released into the environment, in order to prevent
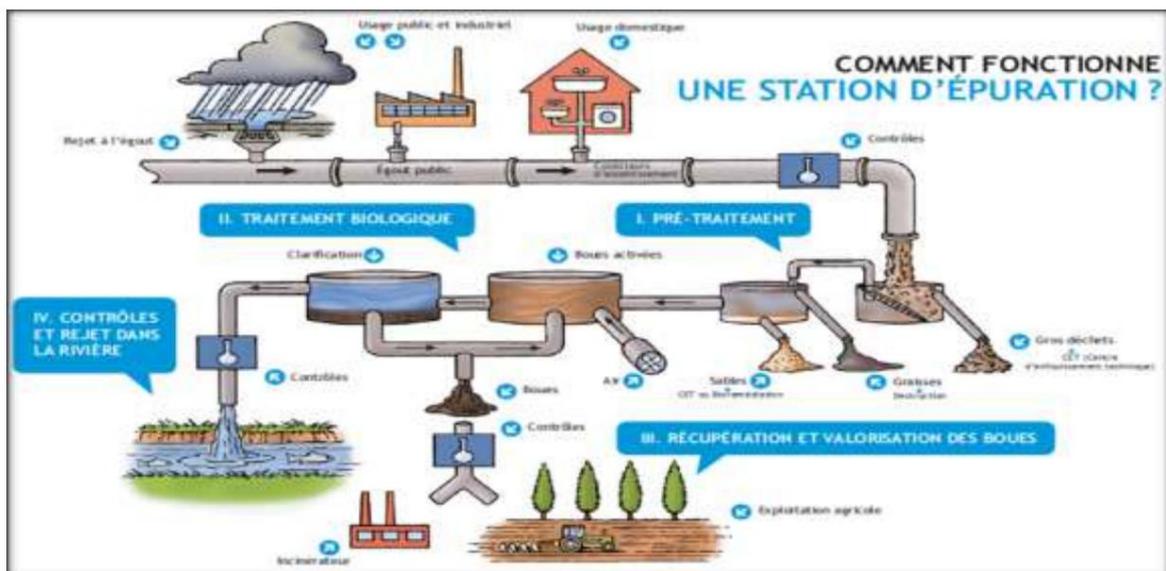
This is a degrading form of pollution.

Figure 10: Diagram of the stages of a wastewater treatment plant.

2.9 rejections

The normally treated water is discharged into nature (most often into rivers).

Optionally, very high flow rates (mainly due to heavy downpours and thunderstorms)

can be eliminated from the treatment process without causing unacceptable pollution (it

Indeed, for short periods, these are abundant, clean inputs that greatly dilute the waters

worn impurities).

Figure 11: Wastewater discharges into the receiving environment.

2.10 Pumping

Most often, the levels encountered in the circuit require energy inputs via Pumping to raise water. Pumps are mainly found in the vicinity of " functions "treatment" and "accumulation", but they can also be necessary for capture, and sometimes in the sanitation network that removes wastewater.

A pump is a device that supplies energy to a liquid. The pump's operation is generally connected to a reservoir. Starting and stopping the Pumps are dependent on the tank level or specific time periods.

A pump can be characterized either by a constant power (energy) supplied to the water over time, independently of the flow rate and discharge head, or by a curve characteristic that describes the relationship between the discharge head and the flow rate supplied using a function *H=f (Q).*

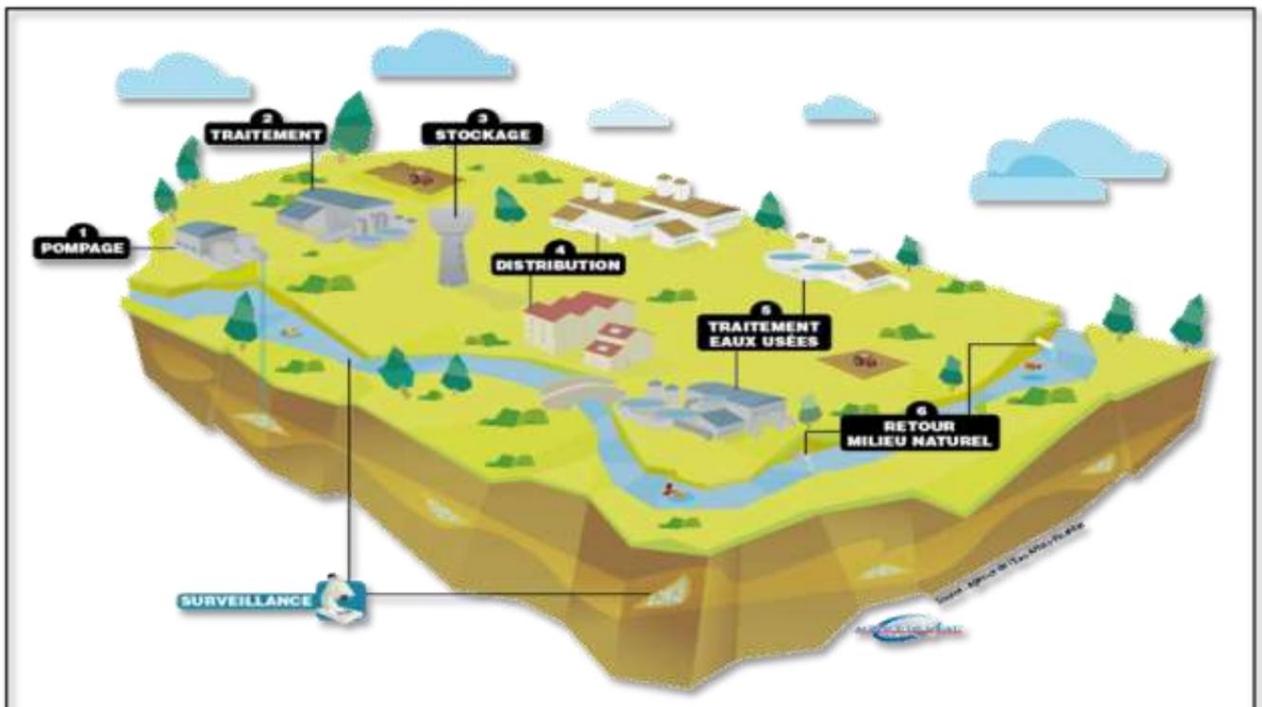**Figure 12: Diagram of a pumping station.**

Figure 13: Diagram of the AEP cycle.

Conclusion

The AEP is a complex system that requires effective coordination between various processes and infrastructure. Understanding the general principles on this subject is essential to ensuring a reliable and high-quality drinking water supply, while meeting contemporary challenges related to water resource management.

Useful links

https://youtu.be/hD-0Tx3avGo

https://youtu.be/46TS8ykjZHQ

https://youtu.be/kZnZEr4KN8U

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