Introduction

Aquifers store nearly one-third of the world's freshwater resources.

Applied hydrogeology for the environment focuses on the sustainable management of groundwater to protect both human health and ecosystems. In the 21st century, this discipline must necessarily prioritize the environment. In Europe, for example:

- Groundwater provides **65% of drinking water** and **25% of irrigation water**.
- **24% of the EU's groundwater bodies are reported to be in poor chemical condition, and 9% in poor quantitative condition.**
- **29% of water bodies can no longer meet the needs of ecosystems and human populations due to quality and quantity deterioration.**
- Population growth and climate change will continuously increase pressure on groundwater.

In Romania, groundwater will soon become the **primary source of drinking water**, as it is less vulnerable to pollution than surface water. In 2022, **56.32%** of drinking water came from surface sources, while **48.68%** came from groundwater.

Water plays a key role in dynamically connecting all components of the environment.

The Environment Is Everything Around Us, Connected by Water

The environment includes everything that surrounds us—both living (biocenosis) and non-living (biotope) components—interconnected through water.
This concise definition highlights the vital role water plays in protecting and conserving the environment and is best framed by two key perspectives:

- **The poetic definition** by Emil Racoviță, a Romanian biologist and explorer:
  "The sum of all events, phenomena, and energies of the world that come into contact with a living being, determining its fate and triggering a corresponding reaction within it."
- **The legal definition** from Romania's environmental protection law (Government Ordinance no. 195/2005):
  "The environment encompasses the natural conditions and elements of Earth: air, water, soil, subsoil, landscape characteristics, atmospheric layers, all organic and inorganic matter, living beings, natural systems in interaction, including the aforementioned elements, as well as certain material and spiritual values, quality of life, and factors influencing human well-being."

Main Components of the Environment

The environment consists of four major categories that interact to sustain life on Earth:

1. Abiotic Environment (Biotope):

- **Atmosphere** – the layer of gases surrounding the planet.
- **Hydrosphere** – all water bodies: oceans, seas, rivers, lakes, groundwater.
- **Lithosphere** – Earth's crust: soil and rocks.
- **Climatosphere** – climate conditions: temperature, humidity, precipitation, wind.

2. Biotic Environment (Biocenosis):

- All living organisms: plants, animals, microorganisms.
- Includes ecosystems and food chains.

3. Anthropogenic Environment (Human-made):

- Urban and rural infrastructure: buildings, roads, dams.
- Economic activities: industry, agriculture, transport, energy.
- Pollution and human interventions affecting nature.

4. Socio-Economic Environment (often considered part of the anthropogenic environment):

- Social, cultural, and economic systems that influence how we use and impact the natural world.

Environmental Pressure Indicators

Water—whether in liquid form, vapor, or within unsaturated aquifer zones—is the primary vehicle for transporting contaminants and plays a role in almost every environmental pressure indicator.

At the European level, **environmental pressure indicators** are designed to synthetically describe the negative impact of human activities on nature. These activities are grouped into nine major categories:

1. Resource depletion
2. Waste generation

3. Toxic substance dispersion
4. Water pollution
5. Marine and coastal environment degradation
6. Climate change
7. Air pollution
8. Ozone layer depletion
9. Urban environmental issues

These indicators are continuously updated by the **European Environment Agency** (https://www.eea.europa.eu).

Key EU Developments

As part of the **EU's 8th Environment Action Programme (EAP)**, the **European Commission** adopted in July 2022 a set of **28 core indicators** to track progress toward environmental and climate goals. Among them:

- **Greenhouse gas emissions** – tracking levels and reduction trends.
- **Resource use** – evaluating efficiency and progress toward a circular economy.
- **Air and water pollution** – measuring pollutants and impacts on health and ecosystems.
- **Biodiversity** – monitoring the condition of habitats and species.

Two Possible Paths for Humanity

Humanity has always had two clear options regarding the environment:

- **Option 1:** Save the planet.
- **Option 2:** Exhaust its resources and abandon it.

We currently stand on a knife's edge. On one hand, we see real progress—renewable energy adoption, reforestation, biodiversity protection, regenerative agriculture, green innovations, EU environmental laws, and rising awareness.

On the other hand, **fossil fuel dependence, deforestation, ocean pollution, species loss**, and profit-driven consumption models persist. More recently, even **space colonization** is being seriously considered as a "Plan B."

What Can Be Done?

We are now caught between salvation and self-destruction. Saving the planet depends on:

- **Policy decisions**
- **Technological innovation**
- **Collective will**

Individually, we can contribute through responsible consumption, waste reduction, education, and pressuring authorities to act. Without rapid and radical changes in how we live, we face:

- Ecological collapse
- Mass migrations
- Resource-based conflicts
- A world increasingly uninhabitable

Water – Our Survival Lifeline

Surface and groundwater are decisive factors in sustaining life on Earth. Their roles include:

- **Climate Regulation**
  Water stabilizes atmospheric temperatures by absorbing and redistributing solar heat via oceans, lakes, and river systems.
- **Supporting Biodiversity**
  Water is essential to ecosystems ranging from tropical rainforests to Arctic tundra.
- **Natural Purification**
  Water undergoes natural self-purification as it filters through permeable formations like gravel, sand, and fractured limestone—supporting healthy biotic communities.
- **Mitigating Global Warming**
  Wetlands and peatlands absorb and store carbon dioxide, helping to curb climate change.

- **Facilitating Key Natural Processes**
  Water is involved in nutrient circulation, photosynthesis, organic matter decomposition, and ecosystem regeneration.

Water Is at Risk

Despite its importance, water is under threat from:

- Pollution
- Wastewater discharge
- Microplastics
- Droughts
- Overuse and waste

Water scarcity directly affects quality of life, agriculture, public health, and social stability.

Most Environmental Pressure Indicators Involve Water

Water is central to nearly all environmental stress factors. In fact, many of the **EU's environmental pressure indicators** directly or indirectly reference water use, pollution, or scarcity.

.....WORKING!!!!