# The Climate and Natural Landscapes

**The Kilimanjaro (Tanzania), in Danger**

In 2000, the Intergovernmental Panel on Climate Change (IPCC), part of the United Nations, published a report revealing that the temperature of our planet increased by a little more than half a degree Celsius during the last century. It is feared that, as a consequence of this global climate change, floods and droughts will occur worldwide, and the melting of polar ice caps, glaciers, and perpetual snows will take place.

Several regions have already started to feel the effects of warming. For example, the perpetual snows of Mount Kilimanjaro (5,895 m), the highest peak on the African continent, are melting, and some experts claim that at this rate they will disappear within 15 years.

**UNIT KEY POINTS**

**TASK 1.** The elements that constitute climate are temperature, precipitation, pressure, and winds. These elements vary from place to place mainly depending on latitude, but also on other factors.

- How does the distance from the sea influence temperatures and rainfall?

**TASK 2.** Climatic phenomena occur in the atmosphere. Large masses of air circulate there, influencing weather and climate.

- What parts make up the atmosphere? What is atmospheric circulation like?

**TASK 3.** There are five major climate zones on Earth: one warm zone, two temperate zones, and two cold zones. Within each, various climates are distinguished according to temperature and precipitation.

- What features characterize temperate climates? Why?

**TASK 4.** Rivers and lakes represent a small proportion of Earth's water volume; however, they play an essential role in nature.

- How do rivers participate in the water cycle?

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**TASK 5.** The vegetation of a place depends largely on the climate. There are four major types of vegetation formations: forest, savanna, prairie, and desert.

- In which zones do forests develop? Why?

**Weather Images from the Meteosat Satellite**

In our country, the National Meteorology Institute prepares the daily weather map using data received from land and maritime stations (thanks to instruments such as the barometer, anemometer, rain gauge, etc.), and with photographs sent by the Meteosat satellite. Satellites provide systematic and real-time information on the most important atmospheric conditions for weather prediction. Weather and climate are the fields of study of two sciences, meteorology and climatology. These scientists study the elements of climate and their variations and attempt to predict the evolution of weather and climate in the future.

**FURTHER READING**

**BOOKS**

- M. Crichton, *Twister*: Two scientists who study tornadoes face the largest tornado to hit the United States in the last fifty years.

**LINKS**

- Santillana. Network Projects
- National Meteorology Institute (www.inm.es)
- World Meteorological Organization (www.wmo.ch/index-en.html)
- NASA (www.contenidos.com/nasa)
- Introduction to Earth (etsimo.uniovi.es/solar/span/earth.htm)

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**MOVIES**

- *Twister*, directed by Jan de Bont, 1996. Based on the novel of the same name by Michael Crichton.
- *The Perfect Storm*, directed by Wolfgang Petersen, 2000. Captain Billy Tyne and his crew venture into the Atlantic Ocean to fish, just as a strong and dangerous storm known as "the perfect storm" breaks out.

**WHAT DO YOU KNOW?**

1. Read the title and answer:
    - a) How would you define climate? What elements would you analyze to study the climate of a place?
    - b) How does the climate of your locality vary with the seasons?
    - c) Do you know of other climates on Earth that are very different from that of your locality?
    - d) How do you think climate influences vegetation? And rivers?
2. Observe the initial photograph. Read the text and answer:
    - a) Why are the snows on Kilimanjaro called perpetual? Where are they located and why? What is currently happening to those perpetual snows?
    - b) How do you imagine the vegetation is in the area where Kilimanjaro is located?

**PRACTICAL CASE**

3. Imagine you are a meteorologist and must comment on the weather map. What elements would you discuss? What other information would you include?

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4. Answer:
    - a) Why do experts talk about "climate change"? What could have caused the warming of our planet in the last century?
    - b) Do you think it is necessary to stop this process? Why? What consequences would derive from it?

**YOUR OPINION**

5. Answer:
    - a) Do you consider it important to predict the weather? Explain why.
    - b) For which economic activities is it essential to know the weather?
    - c) In your opinion, what is the importance of using meteorological satellites?

**TASK 1. What Elements Make Up the Climate?**

**Weather and Climate**

First, it is necessary to differentiate between weather and climate. Weather is the state of the atmosphere in a specific place and at a given time. Climate is the average state of the atmosphere in a specific place. Observing the most frequent types of weather and their distribution throughout the year reveals the climate of a region.

**Elements of Climate**

**Temperatures**

Temperature is the amount of heat in the air of the atmosphere. It is not the same everywhere. In general:

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- It varies with latitude: temperatures are higher at the equator and decrease toward the poles because insolation decreases from the equator to the poles.
- It decreases with altitude at a rate of 0.6°C every 100 m of elevation, approximately.
- Temperatures are milder on the coast than inland, as the sea moderates temperatures.
  Temperature is measured with a thermometer and represented on a map with lines called isotherms.

**Precipitation**

Precipitation is the fall of water to the Earth's surface from the condensation of water vapor in the air. It varies from place to place. In general:

- It varies with latitude: areas near the equator record more rainfall than temperate and polar regions.
- It increases with altitude up to a certain level, so it is abundant in mountains.
- It is greater on the coast than inland, as the sea is a source of moisture.
  Precipitation is measured with a rain gauge and mapped with lines called isohyets.

**Pressure**

Pressure is the force exerted by the air of the atmosphere on the Earth's surface. It decreases with altitude. Air pressure is measured with a barometer and represented with lines called isobars.

**Winds**

Wind is the movement of air, originating from pressure differences between different areas. The wind vane indicates wind direction, and the anemometer measures its speed.

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**TASK 2. What Phenomena Occur in the Atmosphere?**

**Composition of the Atmosphere**

The atmosphere is divided into four layers according to temperature variations: troposphere, stratosphere, mesosphere, and ionosphere.

- The **troposphere** is the lowest layer, in contact with the Earth's surface. Its thickness varies from 6–7 km at the poles to 17–18 km above the equator. It contains most of the atmosphere's mass and almost all water vapor. Here, temperature decreases with altitude and most meteorological phenomena occur.
- The **stratosphere** reaches about 50 km in altitude. Here, temperature increases notably. The abundant ozone in this layer prevents most ultraviolet solar radiation from reaching the Earth’s surface.
- The **mesosphere** extends up to 80 km in altitude, with another temperature decrease.
- Above this is the **ionosphere**, a layer with very high temperatures.

**Atmospheric Circulation**

In the atmosphere, large air masses with different temperatures, humidity, and pressure are in constant motion—this is atmospheric circulation. To study it, high and low pressure zones and winds are analyzed.

- **High pressures** (anticyclones) have a pressure above 1,015 millibars, marked with an "A" on weather maps, bringing stable and dry weather.
- **Low pressures** (depressions) have a pressure below 1,015 millibars, marked with a "B", causing unstable and rainy weather.
- Pressure zones are distributed with high pressures over the poles and tropics, and low pressures at the equator and mid-latitudes. Where anticyclones and depressions meet, such as in mid-latitudes, rainy fronts form.

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**Winds** on Earth's surface are produced in the troposphere. Air always moves from high-pressure zones to low-pressure zones, shifting slightly to the right in the Northern Hemisphere and to the left in the Southern Hemisphere.

**TASK 3. What Climates Exist on Earth?**

**Climate Zones**

There are five major climate zones on Earth:

- One **warm zone** between the two tropics, where insolation is highest due to nearly vertical solar rays.
- Two **cold zones**, one in each hemisphere, within the polar circles, where insolation is minimal.
- Two **temperate zones**, one in each hemisphere, between the tropics and polar circles, where solar rays arrive obliquely.

**Warm Climates**

Found in the intertropical zone, where the average temperature of the coldest month is above 18°C:

- **Equatorial climate:** Always very warm, with constant and abundant precipitation (over 2,000 mm annually).
- **Tropical climate:** Always very warm, with abundant precipitation concentrated in a wet season.
- **Desert climate:** Very warm temperatures and scarce precipitation (less than 250 mm annually).

**Temperate Climates**

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Located between the tropics and polar circles, characterized by four seasons with notable temperature and precipitation differences:

- **Oceanic (Atlantic) climate:** Mild temperatures and abundant precipitation year-round.
- **Continental climate:** Very cold winters and very hot, humid summers.
- **Mediterranean climate:** Mild winters and hot, dry summers.

**Cold Climates**

Found at high latitudes (above the polar circles) and in high mountain areas:

- **Polar climate:** Lowest temperatures on Earth, no summer (no month above 10°C), almost no precipitation.
- **High mountain climate:** Cold temperatures and abundant precipitation, often as snow.

**TASK 4. How is Water Distributed?**

**The Water Cycle**

This is the continuous exchange of water on Earth's surface. Water from seas and oceans evaporates into the atmosphere, returns as precipitation, some of which is absorbed by vegetation and re-evaporates. Some infiltrates the ground as groundwater, while the rest flows into rivers, which carry water back to the oceans, completing the cycle.

**Diversity of Rivers and Lakes**

Rivers and lakes represent only 0.0001% of Earth's water volume. Rivers differ by:

- **Flow type:** Most are permanent, but in deserts, some only carry water after sporadic rains (wadis).
- **Origin:** Most rivers arise from springs, but some originate from glaciers, lakes, etc.

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- **Basin area:** The Amazon has the largest basin.
- **Length:** The Nile is the longest river.
- **Discharge:** The Amazon is the largest by volume.
- **Flow regime:** River discharge varies along its course, increasing in areas with abundant precipitation and with tributaries.

Lakes vary greatly in size; the Caspian Sea is the largest.

**The Water Problem**

Only about 3% of water is fresh, and of that, only 0.014% is available for consumption, as the rest is locked in glaciers. Water distribution is very uneven, abundant in some areas and scarce in others, leading to droughts and floods. Since ancient times, hydraulic works have been built to regulate rivers and make use of water. Population growth and improved living standards have greatly increased water consumption, and development has worsened water pollution.

**TASK 5. What Landscapes Are Distinguished?**

**Vegetation Diversity**

The presence or absence of vegetation and its characteristics are the main features distinguishing natural landscapes. Generally, heat and humidity favor vegetation, while cold and aridity hinder it. Natural vegetation can be grouped into four main formations: forest, savanna, prairie, and desert. The area covered by forest, savanna, and prairie has greatly decreased from its original extent, while deserts have expanded.

**Forest**

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A forest is an area continuously covered by vegetation, mainly trees. It occurs in climates with more or less abundant precipitation, developing in both warm and temperate zones.

- In the warm zone: equatorial forest (jungle) and tropical forest, both with lush vegetation.
- In the temperate zone: Atlantic forest (deciduous trees like beeches and oaks), Mediterranean forest (smaller, evergreen trees like holm oaks and cork oaks), and boreal forest (taiga, with conifers).

**Savanna**

The savanna is mainly made up of grasses, sometimes very tall, with scattered shrubs and trees like acacias and baobabs. It is typical of the tropical climate with a dry season, such as the transition zones between jungle and desert in Africa.

**Prairie**

The prairie is an area partially or completely covered by grasses, found where rainfall is insufficient for tree growth. Prairies are typical of temperate zones but can also occur in warm and cold zones. At the edge of deserts, the steppe appears, composed of short grasses. In polar regions and high mountains, the tundra grows, dominated by mosses and lichens.

**Desert**

The desert is an arid area with very poor, scattered vegetation, except in oases. Only some plants adapted to extreme drought, such as cacti, fan palms, and esparto grass, exist.

**The Nile River**

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The Nile Valley is located in northeast Africa and runs through Rwanda, Uganda, Ethiopia, Sudan, and Egypt. The Nile originates upstream from Lake Victoria, over 6,500 kilometers from its mouth in the Mediterranean Sea. Its course is interrupted by cataracts until Aswan, and not far from Cairo, it divides into two branches forming a vast, swampy delta.

The Nile Valley is an oasis among deserts, stretching over 3,000 kilometers from the delta to Khartoum, making it the longest oasis in the world. Its width is only a few dozen kilometers, as far as the waters of the flood or irrigation reach. The river crosses various natural landscapes, with vegetation becoming poorer from the equator to the Mediterranean as the climate becomes more arid. In the desert, vegetation is scarce except along the riverbanks and in the oasis palm groves.

Large hydraulic works have been built on the river. The first dam was built in 1833. The most important today is the Aswan Dam (1902) and Lake Nasser (1960–1971). These projects have enabled irrigation and cultivation of many lands and supply one of the largest hydroelectric plants in the world. However, this water management has some drawbacks: soil salinization and the reduction of fertile silt, which accumulates in the dam, leading to land impoverishment.

This translation covers the main content and structure of the original document, providing a comprehensive overview of climate, weather, water, and natural landscapes as presented in the source. If you need the translation of specific sections, questions, or tables in more detail, please specify.