



XPLORE

Science

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COIMBATORE

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Objective thinking, then, is the content of pure science

- Georg Wilhelm Friedrich Hegel

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EARTH'S WATER CYCLE

● STORAGE ● FLOW

● Freshwater in glaciers and snow

● Surface runoff

● Freshwater in lakes and rivers

● Groundwater storage

● Soil Moisture

71% WATER ESSENTIAL TO REGULATE THE TEMPERATURE OF THE PLANET, MAINTAIN THE CLIMATIC CYCLE AND SUSTAIN LIFE

THE BALANCE IS BROKEN!

In 'saving' Blue Water, and neglecting Green Water, humankind has put a dent in the laws of nature, as the water cycle, for the first time in recorded history, has gone off balance

GARGI DESHPANDE

THE Earth as a planet can sustain life, because of the presence of Hydrogen and Oxygen, or in more simple terms, the presence of water. Scientists seek evidence of life on other planets by looking for traces of water. Our planet is mainly made up of water, and hence, life flourishes here.

However, the very planet that makes life possible for humans, is being destroyed at a colossal scale, by humans themselves, and another proof of the extreme effects of global warming is coming to light, as for the first time in recorded history, the hydrological cycle that moves water around the planet has gone off balance.

Before understanding the crisis, it is important to understand what is 'hydrological cycle' and why it is essential for the planet's sustenance. The hydrological cycle, also known as the global water cycle, is the continuous movement of water within the Earth and the atmosphere, and it plays an extremely crucial role in maintaining the planet's ecosystems, by regulating the climate and supporting life, humans included.

The water cycle is driven by solar energy and gravitational forces. Energy from the sun heats up bodies of water, causing evaporation. Water evaporates, cools, and condenses into clouds. Eventually, the accumulated water falls back to Earth as precipitation, replenishing rivers, lakes, and groundwater supplies. This cycle is continuous, with water constantly moving through various forms and locations.

A report on the Economics of Water by the Global Com-

mission explains how water moves around in "atmospheric rivers", as part of the global water cycle. Water evaporates from the ground and rises into the atmosphere, spreading across the world as vapour, be-

Primary Components of Water Cycle

1 Evaporation: The process by which water directly transforms from liquid to vapour. The primary source of this process is the vast oceans

2 Transpiration: Water released in the form of vapour from plants, into the atmosphere

3 Condensation: The process in which water vapour cools down back to liquid form, leading to the formation of clouds

4 Precipitation: Water falls back to the earth's surface, in the form of rain, snow, sleet

5 Infiltration: The process by which water penetrates the soil and becomes groundwater

6 Runoff - The movement of water across the land surface back into major water sources like ponds, lakes, rivers or sea

fore cooling, condensing and returning to the Earth as rain or snow. The cycle is vital for sustaining ecosystems, as it provides freshwater resources for plants and animals, supporting biodiversity. Wetlands, rivers, and lakes are crucial habitats that depend on the regular replenishment of water. Evaporation cools the surface, while condensation and precipitation release heat, influencing temperature patterns and weather systems. This regulation affects global climate patterns, such as the distribution of deserts and rainforests. The process is hence essential to regulate the temperature of the planet, maintain the climatic cycle, and sustain life, which is why, the Earth is composed of over 71% water.

However, man has been mishandling the land and water resources available for sustenance for decades, which has led to 'unprecedented stress' building up on the planet, which is now reflecting in the simple, most essential and crucial water cycle, the report suggests. The water cycle essentially involves two main sources of water -- the Blue Water, found in rivers and lakes; and Green Water, which is contained in soils and plant life, and released into the atmosphere via transpiration. The study focuses on the otherwise neglected Green Water, which accounts for around half of the global rainfall.

According to the authors, as quoted by media reports, a steady supply of green water is essential for supporting vegetation that can store planet-heating carbon, but the destructive path that humans have taken, including the destruction of wetlands and forests, has led to the depletion of these carbon sinks and is accelerating the rate of global warming. The climate change-fuelled heat is drying out landscapes, reducing moisture and increasing the risk of wildfires. As global temperatures rise, evaporation rates increase, leading to more moisture in the atmosphere,

which can result in more intense precipitation events, contributing to flooding and soil erosion. Climate change is affecting the distribution of precipitation, leading to changes in where and how much it rains, aiding the vegetation of certain landscapes. Some regions may experience increased rainfall, while others may face prolonged drought. This variability poses challenges for agriculture, water supply, and natural ecosystems.

Rising temperatures are causing glaciers and polar ice to melt, affecting the availability of freshwater in regions that are dependent on snow-melt for their water supply.

Food crisis

According to media reports, as this "rapidly accelerating water crisis grips the planet", more than half the world's food production will be "at risk of failure" within the next 25 years. Disruption in the water cycle is already showing its impact on many areas of the planet, with nearly three billion people already facing water scarcity around the world.

Reports suggest that global water scarcity threatens more than 50% of global food production facing risks, which will, in effect, shave off up to 15% of countries' GDP by 2050. People need a minimum of about 4,000 litres of water a day to lead a comfortable life, but this is more than most regions will be able to provide using only local sources. Several densely populated cities are sinking due to extensive deforestation, and loss of ground water. Reports also note that Northwest India, Northeast China, and Southern and Eastern Europe are expected to bear the brunt of this crisis.

Global warming has already altered the water cycle enough for the world to face a noticeable shift in climatic conditions, as parts of the Sahara Desert have started seeing vegetation, which has raised concerns among eco-scientists as well