Foreword

Riccardo Valentini[*]

According to the IPCC's Sixth Assessment Report (AR6), atmospheric concentrations of green house gases (GHGs) are at their highest in 800,000 years. In the last fifty years alone, GHG emissions have increased 2.5 times, freshwater withdrawal has doubled, and the availability of agricultural land per capita has halved (from 1.4 to 0.7 hectares). This is unprecedented. Each single year between 2015 and 2020 was warmer than any previous year for which records exist. The year 2023 is shaping up to be among the ten warmest years on record.

The rate of the warming-up of our planet has accelerated since the 1980s, compared with the previous eighty years. Overall, temperatures have risen faster than in any previous IPCC assessment cycle. AR6 states that "observed changes in the atmosphere, oceans, cryosphere and biosphere provide unequivocal evidence of a warming world." Since the beginning of the current century, all key indicators of the climate system have been increasing at levels not seen in centuries, or millennia, and are changing at rates unprecedented in at least the last 2,000 years.

In particular, the global mean surface temperature increased by 1.09°C between the pre-industrial reference period of 1850–1900 and the decade 2011–20. This was most likely the warmest period in about 125,000 years. The Earth will be 1.4 to 4.4°C warmer than pre-industrial levels by the end of this century. In addition, the 1.5 and 2°C limits of the Paris Agreement will be violated unless there are rapid and rigorous cuts in emissions of CO_2 and other GHGs. The last time the global surface temperature was at or above 2.5°C higher than in 1850–1900 was more than 3 million years ago.

Climate change is affecting several global critical sectors: agriculture, biodiversity, freshwater, and oceans; and it is augmenting the vulnerability

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[*] Professor of Forest Ecology, University of Tuscia (Italy), 2007 Peace Nobel Prize recipient (together with IPCC)

of less developed countries. For example, the agri-food sector uses about 80% of the world's freshwater, 30% of the world's energy, and it represents more than 37% of manmade GHG emissions, including indirect emissions, such as those from deforestation.

In some regions of the world, such as the tropics and parts of the temperate regions, increased climate extremes will negatively affect the agriculture, forestry, and fisheries sectors, with a 35% yield reduction in African countries and a 2% reduction globally, per each decade, while food demand is increasing.

At the same time, we expect deadly extreme weather events around the world to increase significantly. The middle of 2021 saw, for example, a record-breaking 'heat bubble' in the Pacific Northwest, wildfires in the western parts of the United States and Europe, catastrophic floods in Europe and China, and rain-induced landslides in India. Finally, intensive floods in 2023 hit the Emilia Romagna region of Italy.

The AR6 says it is virtually certain that "the frequency and intensity of warm extremes have increased and those of cold extremes have decreased on a global scale since 1950." As for extreme precipitation' events, the report concludes that their frequency and intensity "are likely to have increased on a global scale in most terrestrial regions with good observational coverage. Human influence is probably the main driver."

Climate change is causing ice and snow to melt across most of the planet. During the decades 1979–88 and 2010–19, the average monthly August–October area of the Arctic sea ice has shrunk by about a quarter, resulting in the loss of about 2 million square kilometers of ice. In addition, rising temperatures led to a shift from thick, multi-year ice to thinner, younger ice. While multi-year ice made up about one-third of the Arctic sea ice coverage in March 1985, multi-year ice was only at 1.2% in March 2019, according to the report. The loss of multi-year sea ice was particularly rapid during the 2000s.

At the same time, climate change and migration are interconnected and complex issues that will have significant implications for individuals, communities, and countries around the world. Climate change can lead to environmental degradation, such as rising sea levels, extreme weather events, droughts, and desertification. These environmental changes can make certain areas uninhabitable or less suitable for human habitation, forcing people to move in search of better living conditions. In some cases, climate change can directly or indirectly contribute to forced displacements of entire communities. People may be displaced by events such as hurricanes, floods, or wildfires. Slow-onset changes, such as prolonged droughts or sea-level rise, can also make living conditions unsustainable, leading to migration as the only means for survival.

So, what do we do now?

Given the critical tipping point on the climate system and its impact on the world, what are the solutions and actions that could save all of us, as well as future generations?

First, we must react quickly to make our society more resilient to climate change. By 2030, most likely, we will reach between +1.5 and 2°C vs. today, which is the maximum limit possible to prevent dramatic changes. The time is now to invest in adaptation measures. 'Adaptation' means to address climate change by building more secure infrastructures; to promote better water management, coastal protection, land use planning, agricultural adaptation, ecosystem restoration; and to develop early warning systems and provide heat mitigation, health adaptation, and community engagement solutions.

Second, we must stabilize the climate through the end of the century by reducing GHG emissions and increasing carbon sequestration. Renewable energies, energy efficiency, and electrical mobility can have a significant impact on reaching the goal of reducing emissions by 90% by 2050 (as supported also by the European Union), but, still, it will not be enough. We need to reach, at the same time, net zero emissions (carbon neutrality), which can only be achieved by the biological sequestration of carbon dioxide, namely planting new trees, and capturing carbon in the agricultural soil. The challenge in front of us is to react as quickly as possible, via the implementation of global, national, and regional policies, while leveraging already available solutions and testing new ones that are still to come. The time is now!