ULST Timisoara

Multidisciplinary Conference on Sustainable Development

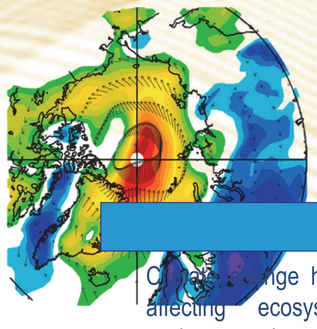
21-22 May 2026

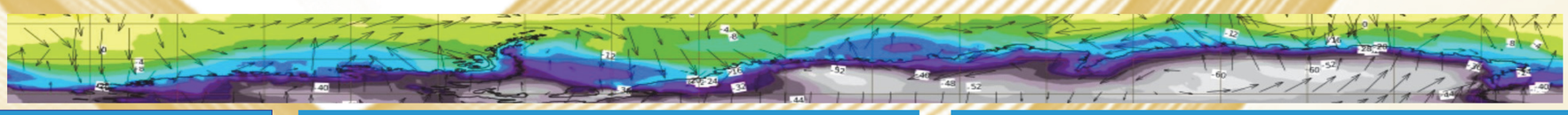
2026 MULTIDISCIPLINARY CONFERENCE ON SUSTAINABLE DEVELOPMENT

CLIMATE CHANGE IMPACTS AND WATER RESOURCE MANAGEMENT STRATEGIES IN AGRICULTURE

Laura ȘMULEAC[1], Adrian ȘMULEAC[1], Raul PAȘCALĂU[1], Răzvan GUI BACHNER[1], BAKLI Mahfoud[2], JURAKHON Rauf[3]

[1]University of Life Sciences „King Mihai I" from Timișoara; [2]Université de Ghardaia, Algeria; [3] Tajik Technical University named after M.S. Osimi





Introduction

Climate change has become one of the major global challenges affecting ecosystems, agriculture, water resources, and socioeconomic systems. Increasing greenhouse gas emissions, deforestation, and unsustainable resource exploitation contribute significantly to environmental instability. Extreme weather events, biodiversity loss, droughts, floods, and rising temperatures emphasize the urgent need for adaptive strategies and sustainable environmental management. Environmental resilience represents the capacity of natural and human systems to adapt, resist, and recover from climate-related disturbances.

1. Climate Impacts

This study was based on an interdisciplinary analysis of scientific literature, climate reports, and environmental sustainability studies published between 2015 and 2026. The research evaluated the main factors contributing to climate change, including greenhouse gas emissions, deforestation, land degradation, and unsustainable resource use. Key climate indicators such as global temperature increase, sea-level rise, biodiversity loss, and the frequency of extreme weather events were analyzed to assess environmental impacts and climate vulnerability.

In addition, several environmental resilience strategies were evaluated, including renewable energy implementation, sustainable land management, ecosystem restoration, climate-smart agriculture, and water conservation practices.

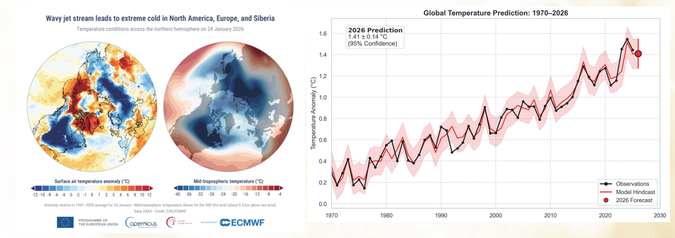
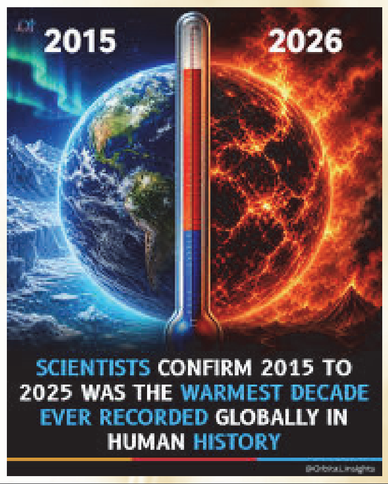


Figure 1 - Increasing Frequency of Extreme Climate Events

2. Greenhouse Gas Emissions

Greenhouse gas emissions generated by industrial activities, transportation, agriculture, and deforestation remain the primary drivers of climate change. The continuous increase in carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) concentrations contributes significantly to global warming, environmental degradation, and ecosystem instability.

Reducing emissions through renewable energy adoption, sustainable resource management, and low-carbon technologies is essential for mitigating climate change and supporting environmental resilience.



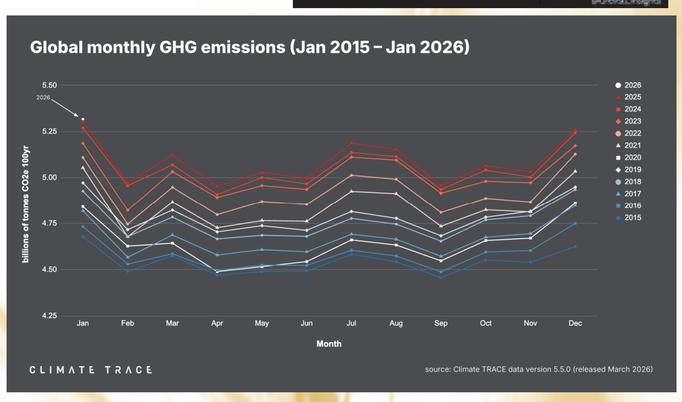


Figure 2– Greenhouse Gas Emissions and Environmental Degradation

3. Environmental Resilience

Environmental resilience represents the capacity of natural and human systems to adapt, resist, and recover from climate-related disturbances. Sustainable land management, ecosystem restoration, reforestation, and water conservation practices contribute significantly to improving biodiversity protection, soil stability, and long-term environmental sustainability. Strengthening resilience through integrated adaptation strategies is essential for reducing climate vulnerability and supporting sustainable development. Environmental resilience represents the capacity of natural and human systems to adapt, resist, and recover from climate-related disturbances.

ENVIRONMENTAL RESILIENCE

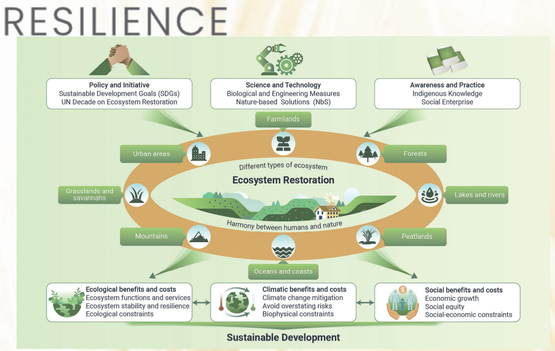


Figure 3 - Adapting ecosystem restoration for sustainable development

Figure 4 - Ecosystem Restoration and Environmental Resilience

4. Vulnerability & Global Inequality

Climate vulnerability varies significantly between developed and developing regions due to differences in economic resources, infrastructure, technology, and adaptive capacity. Developing countries are often more exposed to climate-related risks such as droughts, floods, food insecurity, and water scarcity, while having limited financial and institutional support for adaptation measures. These inequalities highlight the urgent need for international cooperation, climate financing, equitable environmental policies, and sustainable development strategies to strengthen global resilience and reduce climate-related disparities.

Climate vulnerability varies significantly between developed and developing regions due to differences in economic resources, infrastructure, technology, and adaptive capacity.
Developing countries are often more exposed to climate-related risks such as droughts, floods, food insecurity, and water scarcity, while having limited financial and institutional support for adaptation measures. These inequalities highlight the urgent need for international cooperation, climate financing, equitable environmental policies, and sustainable development strategies to strengthen global resilience and reduce climate-related disparities.

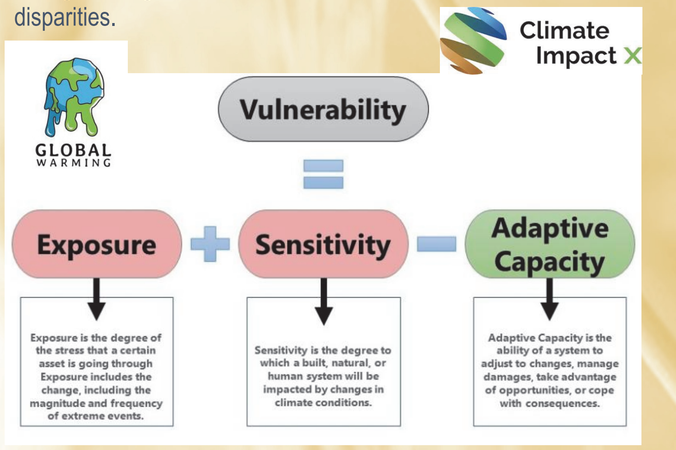


Figure 5 - Understanding Vulnerability

Results and discussion

Main Findings

Climate change intensifies environmental instability and increases the frequency of extreme weather events. Agriculture and water resources are highly vulnerable to climate-related impacts. Greenhouse gas emissions remain the primary drivers of global warming. Renewable energy adoption contributes significantly to emission reduction.

Climate-smart agriculture improves environmental resilience and resource efficiency. Ecosystem restoration supports biodiversity conservation and carbon sequestration. Developing regions remain more vulnerable due to limited adaptive capacity and socioeconomic constraints.

Key Adaptation

Strategies✔ Renewable energy systems✔ Sustainable land management✔ Reforestation and ecosystem restoration✔ Water conservation practices✔ Climate-smart agriculture✔ Digital environmental monitoring systems✔ Community-based adaptation initiatives.

Due to natural cooling patterns that have recently begun in the oceans, it is expected that 2026 will likely be similar to 2025. The most likely outcome is that 2026 ranks as roughly the 4th warmest year since 1850, though warmer or cooler outcomes are also possible. The likelihood of record warmth in 2026 is low, but can not be ruled out.

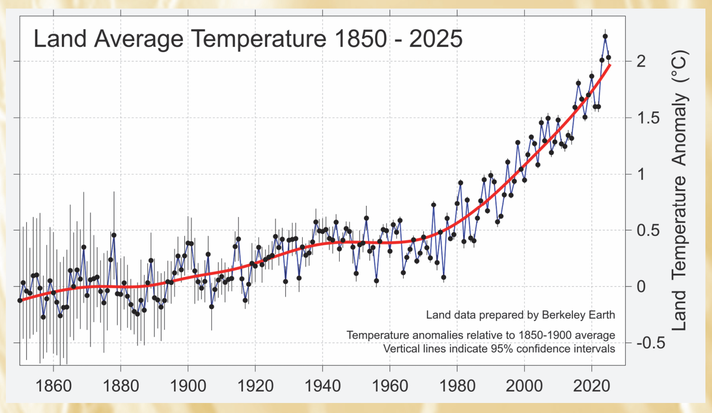


Figure 6 - Global Temperature Report for 2025

Conclusion

The climate crisis represents one of the greatest environmental and socioeconomic challenges of the 21st century. Strengthening environmental resilience through sustainable land management, renewable energy, ecosystem restoration, and climate-smart agriculture is essential for reducing climate vulnerability and supporting long-term sustainability. Integrated adaptation and mitigation strategies, combined with technological innovation, environmental policies, and international cooperation, are necessary to build a more resilient and sustainable future.

The climate crisis represents one of the greatest environmental and socioeconomic challenges of the 21st century. Strengthening environmental resilience through sustainable land management, renewable energy, ecosystem restoration, and climate-smart agriculture is essential for reducing climate vulnerability and supporting long-term sustainability. Integrated adaptation and mitigation strategies, combined with technological innovation, environmental policies, and international cooperation, are necessary to build a more resilient and sustainable future.

Community participation, environmental education, and sustainable resource management are essential for improving climate resilience and supporting sustainable development.

Acknowledgement: This research work was carried out with the support of GEOMATICS RESEARCH LABORATORY infrastructure, https://erris.gov.ro/LABORATOR- CERCETARE GEOMATICA, BIORESOURCES, ENVIRONMENT AND GEOSPATIAL DATA CENTER from BUASMV "King Michael I of Romania" Timisoara - Faculty of Agriculture. BIORESOURCES