International Journal of Science, Strategic Management and Technology
Volume **02** Issue **08** August-2026 | ISSN: **3108-1762 (Online)** | Impact Factor: 3.8
An International, Peer-Reviewed, Open Access Scholarly Journal Indexed in recognized academic databases

Greenhouse Gases and Global Warming: Environmental, Health Impacts and Sustainable Mitigation Strategies

Dr. Devendra Kumar Singh, PhD (Environmental Science), Chief Technical Officer, Department of Cardiology, SGPGIMS Lucknow (U.P.), India.

Email: dksingh.pgi@gmail.com

Dr. Narendra Kumar Ray, Ph.D. (Botany), Registrar, Fusion University, Sikkim, India, D.Sc. (Pursuing), Manipur International University, Imphal, Manipur

Email: drnarendra.ray@gmail.com

https://doi.org/10.55041/ijsmt.v2i8.061

Cite this Article: Singh, D. K. & Ray, N. K. (2026). Greenhouse Gases and Global Warming: Environmental, Health Impacts and Sustainable Mitigation Strategies. International Journal of Science, Strategic Management and Technology, *02*(8), 1-9. https://doi.org/10.55041/ijsmt.v2i8.061

Abstract

Background

Greenhouse gases (GHGs) naturally regulate the Earth's climate; however, increasing human-caused emissions intensify the greenhouse effect, resulting in global warming and climate change. The major anthropogenic GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases.

Objective

This study examined the environmental and health consequences of rising GHG concentrations and evaluated sustainable, technological, and policy-based mitigation strategies to address this issue.

Methods

A structured narrative review and analytical approach were employed using peer-reviewed literature, Intergovernmental Panel on Climate Change reports, international environmental agreements, government publications; and authoritative health and environmental reports. Evidence was thematically analyzed across climate, ecosystems, resources, agriculture, health, mitigation; and adaptation.

Results

Increased GHG levels contribute to rising temperatures, altered precipitation, glacier loss, sea-level rise, biodiversity decline, water scarcity, and agricultural challenges. The associated health risks include heat-related illnesses, respiratory and cardiovascular diseases, infectious diseases, and food insecurity.

Conclusion
Addressing global warming requires integrated mitigation and adaptation supported by renewable energy, sustainable agriculture, conservation, technological innovation, effective governance, public participation, international cooperation; and interdisciplinary research.

Keywords: Greenhouse Gases, Global Warming, Climate Change, Environmental Impacts, Human Health, Renewable Energy, Sustainable Development, Climate Mitigation.

1. Introduction

1.1 Background

Greenhouse gases are atmospheric gases that absorb and re-emit infrared radiation, contributing to the greenhouse effect. This effect is essential for maintaining the Earth's surface temperature at levels suitable for sustaining life. However, human activities have substantially increased the atmospheric concentrations of several greenhouse gases, particularly CO_2, CH_4, N_2O, and fluorinated gases (FGs).(Nadeau et al., 2021)

The principal anthropogenic sources include fossil fuel combustion, industrial production, cement manufacturing, deforestation, agriculture, livestock production, waste management, and land-use change. (Muradov, 2014) The accumulation of these gases alters the Earth's radiative balance and produces long-term warming of the atmosphere, land, and oceans.

The Intergovernmental Panel on Climate Change (IPCC) has concluded that human activities, principally greenhouse gas emissions, have caused global warming. Consequently, climate change is no longer solely an environmental concern; it represents a multidimensional challenge that involves ecosystems, agriculture, water security, human health, economic development; and social resilience.(Deep, 2023)

Environmental and health consequences are interrelated. Increasing temperatures can intensify heatwaves, droughts, and other hazards, whereas changing climatic conditions can affect food production, water availability, air quality, and the distribution of infectious diseases.

The need to understand these relationships has increased the importance of interdisciplinary climate research, which combines environmental science, public health, agriculture, energy technology, and policy studies.

1.2 Objectives

The study aims to:

1. Examine major greenhouse gases and their principal anthropogenic sources
2. Analyzing the relationship between greenhouse gas concentrations and global warming
3. Evaluate the environmental impact of climate change on ecosystems and natural resources
4. Examine the direct and indirect effects of global warming on human health.
5. Assess sustainable technological approaches to reduce greenhouse gas emissions.
6. Examine policy and regulatory approaches to climate mitigation, and
7. Identify major knowledge gaps and priorities for interdisciplinary research in this field.

1.3 Research Questions

This study addresses the following questions:

1. What are the major anthropogenic greenhouse gases and their sources?
2. What environmental changes are associated with increasing greenhouse gas concentrations?
3. How does global warming directly and indirectly affect human health?
4. Which mitigation technologies and policies can contribute most effectively to emission reduction?
5. What research and policy priorities are required to strengthen long-term climate resilience

2. Materials and Methods

2.1 Research Design

This study used a **structured narrative review and an analytical research design**. This methodology was selected because it integrates evidence from atmospheric science, environmental science, ecology, agriculture, public health, energy technology; and climate policy.

This study is primarily based on secondary data and does not involve primary field experiments or human research.

2.2 Sources of Data

Relevant evidence was obtained from the following sources:

1. Peer-reviewed scientific journals
2. IPCC assessment reports.
3. World health organization publications:
4. World meteorological organization reports:
5. United Nations environmental reports
6. Government publications
7. International climate agreements
8. Scientific books; and
9. Relevant academic research has been conducted.

Recent literature was prioritized to ensure that the analysis reflected contemporary scientific understanding of climate change and its environmental and health implications.

2.3 Selection and Analysis of Literature

The literature was organized into the following thematic categories.

1. Greenhouse gases and their sources
2. Global warming and climate patterns
3. Ecosystems and biodiversity
4. Water, soil, and atmospheric resources
5. Agriculture and food security
6. Human-health impacts;
7. Technological mitigation
8. Policy and regulatory approaches; and

9. Future research priorities include the following:

The selected evidence was synthesized through qualitative thematic analysis.

2.4 Analytical Framework

This study applied the following conceptual pathway:

Anthropogenic Activities → Greenhouse-Gas Emissions → Enhanced Greenhouse Effect → Global Warming → Environmental Changes → Health and Socioeconomic Impacts → Mitigation and Adaptation(Kaur, 2018)

This framework provides an integrated basis for evaluating the relationship between greenhouse gas emissions and their consequences.

2.5 Ethical Considerations

This study used publicly available scientific and institutional sources and did not involve human or animal subject. Therefore, ethical approval and informed consent were not required for this study.(Van Helden, 2012)

2.6 Limitations

This study is based on secondary evidence and, therefore, does not generate new atmospheric, environmental, or health data. Differences in the geographical scale, methodology, and data sources among existing studies may also limit direct comparisons.

3. Results

3.1 Major Greenhouse Gases and Their Sources

3.1.1 Carbon Dioxide

CO_2 is the principal greenhouse gas associated with human activities, in terms of its cumulative contribution to global warming. (Eldesouki et al., 2023)The major anthropogenic sources include:

1. Fossil-fuel combustion;
2. Cement production;
3. Deforestation;
4. Land-use change;
5. Industrial processes; and
6. Biomass burning.

Its long atmospheric persistence renders cumulative CO_2 emissions particularly important for long-term climate-change mitigation.

3.1.2 Methane

Methane has a shorter atmospheric lifetime than CO_2 but a considerably greater warming effect per unit mass over shorter time horizons than CO_2.(Ocko et al., 2018)

The major sources include livestock, rice cultivation, landfills, coal mining, oil and gas systems, and wastewater.

Therefore, reducing methane emissions can provide important near-term climate benefits.

3.1.3 Nitrous Oxide

N_2O is a powerful greenhouse gas, particularly associated with agricultural and nitrogen-management practices.(Khatri et al., 2025)

Major sources include:

1. Nitrogen fertilizers;
2. Agricultural soils;
3. Livestock manure;
4. Fossil-fuel combustion;
5. Biomass burning; and
6. Industrial activities.

N_2O also contributes to the depletion of stratospheric ozone.

3.1.4 Fluorinated Gases

Fluorinated gases include hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

Although generally emitted in smaller quantities than CO_2, some fluorinated gases have extremely high global warming potentials and can remain in the atmosphere for long periods.(Schwarz & Leisewitz, 1998)

The major sources of F-gas emissions include refrigeration, air conditioning, semiconductor production, and specialized industrial processes; such as magnesium production.

4. Environmental Impacts

4.1 Temperature and Climate Patterns

Increasing greenhouse gas concentrations alter the Earth's energy balance, causing long-term temperature increases. The resulting climate changes include increases in the average temperature and changes in the frequency and intensity of several climate extremes, such as droughts and floods.

Heatwaves are one of the most direct manifestations of global warming and pose a serious risks to ecosystems, agriculture, and human health.(Brogno et al., 2025)

4.2 Ecosystems and Biodiversity

Climate change affects ecosystems by altering the following:

1. Species distribution;
2. Reproductive cycles;
3. Migration patterns;
4. Habitat suitability;

5. Food webs; and
6. Ecological interactions.

Species with narrow climatic tolerances may be particularly vulnerable to climate change.

Climate change interacts with habitat destruction, pollution, and overexploitation, increasing the cumulative pressure on biodiversity.(Mantyka-Pringle et al., 2011)

4.3 Agriculture and Food Security

Agricultural systems are highly sensitive to temperature, precipitation, and water availability.

Global warming may cause the following:

1. Reduced crop productivity.
2. Shortened crop development periods
3. Increased irrigation requirements
4. Greater pest and disease pressures
5. Livestock heat stress; and
6. Increased food price instability.

Therefore, climate-resilient crops, improved water management, and sustainable agricultural practices are becoming increasingly important in this region to ensure future food security .(Ingram et al., 2025)

4.4 Water Resources

Climate change affects water resources through changes in precipitation, evaporation, snow cover, and glacial dynamics.(Wang & Liu, 2023)

The potential consequences include the following:

1. Water scarcity;
2. Reduced groundwater recharge.
3. Altered river flows;
4. Flooding;
5. Drought; and
6. Declining water quality is a major problem.

Communities that depend on glaciers and seasonal water systems may be particularly vulnerable.

4.5 Glacier and Ice Loss

Increasing temperatures contribute to glacier retreat and the loss of polar ice.

These processes can contribute to sea-level rise and alter freshwater availability in glacier-dependent regions.

4.6 Sea-Level Rise

Sea-level rise is primarily caused by ocean warming and land ice loss.

It increases risks of:

1. Coastal flooding;
2. Coastal erosion;
3. Saltwater intrusion;
4. Infrastructure damage;
5. Ecosystem loss; and
6. Population displacement.(Wright et al., 2018)

4.7 Air Quality

Climate change and air pollution are closely related issues. Temperature changes can influence atmospheric chemical reactions and the formation of pollutants; such as ground-level ozone.(Koenig, 2000)

Therefore, policies that simultaneously reduce greenhouse gas emissions and air pollution can generate significant public health benefits.

5. Health Impacts of Global Warming

5.1 Heat-Related Health Effects

Increasing temperatures can cause the following:

1. Heat exhaustion;
2. Heatstroke;
3. Dehydration;
4. Cardiovascular stress; and
5. Heat-related mortality.

Outdoor workers, older adults, children, and other vulnerable groups are at particularly high risk.

5.2 Respiratory and Cardiovascular Effects

Climate change can interact with air pollution and wildfire smoke to increase respiratory and cardiovascular risk.(Xu et al., 2025)

Exposure to particulate matter and ozone can worsen respiratory conditions and contribute to cardiovascular disease.

5.3 Vector-Borne Diseases

Changes in temperature and precipitation can influence the distribution and seasonal activities of the disease vectors.(Fouque & Reeder, 2019)

Therefore, climate-sensitive infectious diseases may change their geographical and seasonal patterns.

5.4 Food and Water Insecurity

Climate-related agricultural disruptions can reduce food availability and affect nutritional security.

Flooding and water scarcity can compromise access to safe drinking water and increase the risk of waterborne diseases.(Von Braun, 2020)

5.5 Mental Health

Climate-related disasters, displacement, livelihood losses, and environmental uncertainty may contribute to the following issues:

1. Anxiety;
2. Depression;
3. Trauma;
4. Psychological stress; and
5. Other mental health consequences.

Therefore, mental health should be integrated into climate adaptation and disaster-response planning.(Walia et al., 2022)

6. Discussion

The findings demonstrate that greenhouse gas emissions represent a systemic environmental challenge; rather than an isolated atmospheric problem.

This relationship can be represented as follows:

Human Activities → Green House Gases Emissions → Atmospheric Warming → Climate Change → Ecosystem and Resource Changes → Health and Socioeconomic Consequences

These impacts frequently reinforce each other.

For example, an increase in temperature may intensify droughts. Drought can reduce agricultural production, leading to food insecurity and economic distress in affected areas. Similarly, heat and air pollution can combine to increase the risk of respiratory and cardiovascular diseases.

Consequently, effective climate policies must integrate environmental protection with agriculture, water management, public health, energy planning, and socioeconomic development.

7. Sustainable Mitigation Strategies

7.1 Renewable Energy

The transition from fossil fuels to low-carbon energy sources is one of the most important strategies for reducing greenhouse-gas emissions.

Major renewable sources include

1. Solar;
2. Wind;
3. Hydropower;

4. Geothermal; and
5. Other sustainable energy technologies.

Further progress requires improvements in energy storage, transmission networks; and grid management.(Zhang et al., 2024)

7.2 Energy Efficiency

Energy efficiency can reduce emissions and lower energy demand.

Priority areas include:

1. Energy-efficient buildings
2. Industrial efficiency;
3. Efficient appliances;
4. Public transport;
5. Smart energy systems; and
6. Waste-heat recovery.(Kiranmai et al., 2024)

7.3 Sustainable Agriculture

Agricultural emissions can be reduced through the following:

1. Improved fertilizer management
2. Precision agriculture;
3. Efficient irrigation;
4. Improved livestock management
5. Methane reduction practices:
6. Conservation agriculture; and
7. Agroforestry.(Bhattacharyya et al., 2020)

7.4 Forest Conservation and Afforestation

Forests are important carbon sinks that provide critical ecosystem services.

The strategies should include the following:

1. Preventing deforestation.
2. Restoring degraded forests
3. Protecting natural ecosystems.
4. Sustainable forest management; and
5. Community participation in conservation.

Afforestation should be ecologically appropriate and complement, rather than substitute, the direct reductions of fossil-fuel emissions.(Hasegawa et al., 2023)

7.5 Waste Management

Waste management measures include:

1. Reducing waste generation.
2. Reuse;

3. Recycling;
4. Composting;
5. Anaerobic digestion; and
6. Landfill methane recovery:

These approaches can reduce both greenhouse gas emissions and environmental pollution.(Ganesan et al., 2024)

7.6 Sustainable Transportation

Transport emissions can be reduced through the following:

1. Electric vehicles;
2. Public transportation;
3. Railways;
4. Walking and cycling infrastructure
5. Fuel-efficient vehicles; and
6. Low-carbon transportation systems.

8. Carbon Capture and Storage

Carbon capture and storage (CCS) can contribute to emission reduction, particularly in sectors where complete decarbonization is technically challenging.(Gibbins, 2019)

However, CCS should be considered a part of a broader mitigation portfolio rather than a substitute for reducing fossil fuel consumption.

Further research is required to improve the following:

1. Capture efficiency;
2. Storage safety;
3. Cost effectiveness;
4. Monitoring;
5. Long-term permanence; and
6. Public acceptance.

9. Policy and Regulatory Approaches

9.1 International Agreements

International cooperation is essential because greenhouse gas emissions and climate impacts cross national boundaries.

The major international frameworks include:

1. United Nations Framework Convention on Climate Change
2. Kyoto Protocol; and
3. Paris Agreement.

The Paris Agreement establishes a global framework for strengthening climate action and pursuing efforts to limit global warming to 1.5°C above pre-industrial levels.

9.2 National Policies

National climate policies should prioritize the following:

1. Expansion of renewable energy
2. Energy efficiency;
3. Sustainable transport;
4. Forest protection;
5. Climate-smart agriculture
6. Emissions monitoring; and
7. Climate adaptation.

9.3 Public Awareness and Education

Public participation can support climate mitigation through the following:

1. Energy conservation;
2. Sustainable consumption
3. Reduction of food waste
4. Waste segregation;
5. Water conservation;
6. Use of public transportation; and
7. Environmentally responsible lifestyle.

However, individual behavioral changes must be supported by structural policies, infrastructure, and advanced technologies.

10. Future Research Directions

Future research should prioritize the following:

1. regional greenhouse gas monitoring
2. climate-resilient agriculture,
3. methane emission reduction
4. climate-related disease surveillance
5. heat-health early-warning systems;
6. renewable energy storage;
7. carbon capture and removal
8. ecosystem-based adaptation
9. Climate finance and environmental justice
10. climate-resilient urban planning; and
11. integrated climate-health-environment modelling.

Interdisciplinary collaboration among environmental scientists, climatologists, agricultural scientists, public health specialists, engineers, economists, and policymakers is essential.

11. Recommendations

The study recommends:

1. accelerating the transition toward renewable and low-carbon energy sources;
2. strengthening methane and nitrous oxide reduction programs

3. promoting climate-smart and resource-efficient agriculture
4. protecting forests, wetlands, and other carbon-rich ecosystems;
5. Strengthening climate-related health surveillance
6. improving public awareness and environmental education.
7. expanding climate-resilient infrastructure.
8. Strengthening international climate cooperation
9. integrating climate mitigation and adaptation into national development planning; and
10. support interdisciplinary research and evidence-based climate policies.

12. Conclusion

Greenhouse gases are fundamental to the Earth's natural climate system; however, human activities have substantially increased the concentrations of several greenhouse gases, particularly CO_2, CH_4, N_2O, and fluorinated gases (F-gases). This anthropogenic intensification of the greenhouse effect is driving global warming and producing widespread environmental and health-related effects.

The study demonstrated that global warming affects temperature patterns, precipitation, glaciers, sea levels, biodiversity, water resources, agriculture, and food security. It also creates significant health risks, including heat exposure, air pollution, infectious diseases, food and water insecurity; and climate-related psychological stress.

No single intervention can adequately address these problems. Effective climate action requires an integrated strategy that combines renewable energy, energy efficiency, sustainable agriculture, forest conservation, improved waste management, sustainable transportation, appropriate carbon management technologies; and effective climate governance.

Future climate policies must emphasize adaptation because the population is already experiencing certain climate impacts. Climate-resilient agriculture, heat-health action plans, water conservation, early warning systems, and resilient infrastructure will become increasingly important.

The study concluded that sustainable climate action requires **rapid emission reductions, effective adaptation, scientific innovation, strong environmental governance and interdisciplinary cooperation**. Therefore, protecting environmental quality and human health requires climate policies that integrate ecological sustainability with social and economic development efforts.

Declarations

Funding: No external funding was received for this study.

Conflict of Interest: The authors declare no conflicts of interest.

Ethical Approval: Ethical approval was not required for this study because it was based exclusively on secondary scientific literature and publicly available institutional reports.

Informed Consent: Not applicable.

Author Contributions: The author conceptualized the study, reviewed the relevant literature, synthesized the evidence, analyzed the environmental and health implications of the study, and prepared the manuscript.

Data Availability Statement: No primary datasets were generated or analyzed in this study. The evidence used in this study was derived from publicly available scientific literature, institutional reports, and environmental assessments cited in the manuscript.

Study Limitations: The study was based on a structured narrative review rather than primary experimental or field data. Future empirical studies should incorporate region-specific climate, environmental, and health datasets to quantify the relationships identified in this study.

References

Bhattacharyya, P., Pathak, H., & Pal, S. (2020). *Mitigation of Greenhouse Gas Emissions and Low Carbon Technologies* (pp. 129–153). Springer Singapore. https://doi.org/10.1007/978-981-15-9132-7_9

Brogno, L., Barbano, F., Leo, L. S., & Di Sabatino, S. (2025). Review on heatwaves: a risk perspective. *Environmental Research Letters*, *20*(6), 063004. https://doi.org/10.1088/1748-9326/add178

Deep, G. (2023). Climate change: The biggest challenge of this era. *International Journal of Science and Research Archive*, *8*(1), 499–506. https://doi.org/10.30574/ijsra.2023.8.1.0086

Eldesouki, M. H., Rashed, A. E., & El-Moneim, A. A. (2023). A comprehensive overview of carbon dioxide, including emission sources, capture technologies, and conversion into value-added products. *Clean Technologies and Environmental Policy*, *25*(10), 3131–3148. https://doi.org/10.1007/s10098-023-02599-9

Fouque, F., & Reeder, J. C. (2019). Impact of past and ongoing changes in climate and weather on vector-borne disease transmission: a look at the evidence. *Infectious Diseases of Poverty*, *8*(1), 51. https://doi.org/10.1186/s40249-019-0565-1

Ganesan, S., Padmapriya, G., Anupama De Zoysa, A. S., & Omoikhoje, I. D. (2024). *Waste Management Techniques for Sustainable Development: A Review* (pp. 195–203). Bentham Science. https://doi.org/10.2174/9789815165586124020018

Gibbins, J. (2019). *CCS: From an Oil Crisis to a Climate Crisis Response* (pp. 559–562). Royal Society of Chemistry. https://doi.org/10.1039/9781788012744-00559

Hasegawa, T., Fujimori, S., Ito, A., & Takahashi, K. (2023). Forest Types for Afforestation: Benefits for Carbon Sequestration and Food Systems under Stringent Climate Mitigation. In *Research Square*. American Journal of Experts. https://doi.org/10.21203/rs.3.rs-3095494/v1

Ingram, W., Aslam, R., Shrestha, S., Andreae, M., Chaturvedi, V., Edmonds, J., Clarke, L., Guo, X., Wang, Y., Shi, J., Debangshi, U., Singh, J., Grover, M., Ali, S., Venkateswarlu, B., Hagemann, S., Gosling, S., Heinke, J., Voss, F., … Lettenmaier, D. (2025). CLIMATE RESILIENT STRATEGIES FOR SUSTAINABLE WATER RESOURCE MANAGEMENT IN AGRICULTURE: A REVIEW. *Plant Archives*, *25*(1). https://doi.org/10.51470/plantarchives.2025.v25.no.1.130

Kaur, N. (2018). Climate Change: Causes, Health Effects, and Strategies. *Borneo Journal of Medical Sciences (BJMS)*, *12*, 31. https://doi.org/10.51200/bjms.v12i.1376

Khatri, N., Ram, C., Tevatia, M., M, D., & K.R, R. (2025). *CURRENT TRENDS IN AGRICULTURAL NITROUS OXIDE EMISSIONS: DRIVERS, IMPACTS, AND MITIGATION* (pp. 21–29). Iterative Selfypage Developers Pvt. https://doi.org/10.58532/nbennuracepsw2

Kiranmai, N., Kumari, N., & Kadari, S. (2024). Improved Energy Efficiency Technologies and Their Applications. *International Journal of Advanced Research in Science, Communication and Technology*, 32–40. https://doi.org/10.48175/ijarsct-19104

Koenig, J. Q. (2000). *Interactions between Climate Change and Air Pollution* (pp. 213–223). Springer Us. https://doi.org/10.1007/978-1-4615-4569-9_16

Mantyka-Pringle, C. S., Martin, T. G., and Rhodes, J. R. (2011). Interactions between climate and habitat loss effects on biodiversity: a systematic review and meta-analysis. *Global Change Biology*, *18*(4), 1239–1252. https://doi.org/10.1111/j.1365-2486.2011.02593.x

Muradov, N. (2014). *Anthropogenic CO2 Emissions: Sources and Trends* (pp. 79–89). Springer New York. https://doi.org/10.1007/978-1-4939-0545-4_3

Nadeau, K. C., Agache, I., Jutel, M., Annesi Maesano, I., Akdis, M., Sampath, V., D'Amato, G., Cecchi, L., Traidl-Hoffmann, C., & Akdis, C. A. (2021). Climate change: A call to action by the United Nations. *Allergy*, *77*(4), 1087–1090. https://doi.org/10.1111/all.15079

Ocko, I. B., Naik, V., & Paynter, D. (2018). Rapid and reliable assessment of the impact of methane on climate. *Atmospheric Chemistry and Physics*, *18*(21), 15555–15568. https://doi.org/10.5194/acp-18-15555-2018

Schwarz, W., & Leisewitz, A. (1998). Aktuelle und künftige Emissionen treibhauswirksamer fluorierter Verbindungen in Deutschland. *Umweltwissenschaften Und Schadstoff-Forschung*, *10*(4), 230–235. https://doi.org/10.1007/bf03038150

Van Helden, P. (2012). Science and ethics review: The thrill is gone. *EMBO Reports*, *13*(12), 1032. https://doi.org/10.1038/embor.2012.171

Von Braun, J. (2020). *Climate Change Risks for Agriculture, Health, and Nutrition* (pp. 135–148). Springer. https://doi.org/10.1007/978-3-030-31125-4_11

Walia, M., Wheeler, B., & Cleary, A. (2022). Integrative review to develop a holistic ecological framework exploring pathways to climate change impacts on mental health among priority groups. *ISEE Conference Abstracts*, *2022*(1). https://doi.org/10.1289/isee.2022.p-0575

Wang, X., & Liu, L. (2023). Impacts of Climate Change on the Hydrological Cycle and Water Resource Management. *Water*, *15*(13), 2342. https://doi.org/10.3390/w15132342

Wright, L. D., Syvitski, J. P. M., & Nichols, C. R. (2018). *Sea-Level Rise: Recent Trends and Future Projections* (pp. 47–57). Springer. https://doi.org/10.1007/978-3-319-75453-6_3

Xu, J., Su, Z., Liu, C., Nie, Y., & Cui, L. (2025). Climate change, air pollution, and chronic respiratory diseases: understanding risk factors and the need for adaptive strategies. *Environmental Health and Preventive Medicine*, *30*(0), 7. https://doi.org/10.1265/ehpm.24-00243

Zhang, C., Yang, Y., Qiu, J., Ruan, J., Liang, G., & Yang, L. (2024). Comprehensive Approaches to Low-Carbon Transition of the Power Grid. *2024 IEEE 8th Conference on Energy Internet and Energy System Integration, EI2 2024*, 4027–4032. https://doi.org/10.1109/ei264398.2024.10990385