

# Assessing the Effects and Dangers of Climate Change on the Environment and Society of the Philippines

Corpus, Robert Michael B.<sup>1,\*</sup>, Bayani, Meldanette S.<sup>1</sup>, Ado, Remedios.<sup>1</sup>

<sup>1</sup>Polytechnic University of the Philippines, Manila, Philippines

\*corresponding author: Corpus, Robert Michael B.  
e-mail: robcorpus@gmail.com

---

**Abstract.** The Philippines is one of the most susceptible nations to climate change's effects. It is anticipated that the frequency and severity of extreme weather events such as typhoons, floods, and droughts will increase over the next few decades. This thesis seeks to evaluate the environmental and social hazards posed by climate change in the Philippines. Examining the current and projected effects of global warming on critical sectors such as agriculture, coastal zones, and human health. The research methodology will include a literature review, data analysis, and case studies. This study's findings will provide crucial insights into the resiliency and vulnerability of the Philippine community to the effects of climate change. This research will contribute to the development of adaptation and mitigation strategies that will assist the nation in building resilience and reducing the risks associated with global warming. This paper will be of interest to policymakers, academics, and practitioners working in the field of climate change and sustainable development.

**Keywords:** climate change, Philippines, emerging

## 1. Introduction

The Philippines, an archipelago in Southeast Asia, is regarded as one of the nations most susceptible to the effects of climate change. The country's location makes it vulnerable to numerous natural hazards, such as typhoons, floods, and droughts, which are exacerbated by climate change. The vulnerability of the country has been exacerbated by its rapidly expanding population, socioeconomic disparities, and inadequate infrastructure. This paper seeks to assess the impacts and hazards of climate change on the environment and society of the Philippines in order to inform policymakers and stakeholders about the current status of research, identify research gaps, and recommend mitigation and adaptation strategies. The document discusses a variety of topics, such as the effects of climate change on biodiversity, ecosystems, water resources, agriculture, food security, littoral and marine resources, public health, human settlements, infrastructure, the economy, displacement, and migration. Due to the limitations of the search strategy and the extensive scope of the subject, it is essential to observe that the review may not include all relevant studies.

## Overview of Industry 4.0 Technologies

### 2. Methodology

A systematic literature review was conducted to gather and synthesize the existing body of knowledge on the impacts and risks of climate change on the Philippine environment and society. A comprehensive search of relevant databases and search engines was carried out using various keywords and search terms related to the topic. Studies were selected based on predefined inclusion and exclusion criteria, ensuring that the most relevant and recent research was included in the analysis. Data extraction and analysis were then performed to identify key themes, patterns, and trends in the available literature. The findings were further synthesized and discussed in the context of the current challenges and opportunities for climate change mitigation and adaptation in the Philippines.

### 3. Results

#### 3.1 Climate change's effects on the Philippine environment

Literature reveals a number of environmental effects of climate change in the Philippines, including effects on biodiversity, ecosystems, water resources, agriculture, food security, and coastal and marine resources.

##### 3.1.1 Biodiversity and ecosystems

###### 3.1.1.1 Terrestrial ecosystems

Changes in climate have caused alterations in the species distribution, phenology, and composition of terrestrial ecosystems. Additionally, the increased frequency and severity of extreme weather events have contributed to habitat loss and degradation, thereby endangering the country's abundant biodiversity.

###### 3.1.1.2 Marine ecosystems

Warming ocean temperatures, ocean acidification, and sea-level rise have impacted the distribution, abundance, and productivity of marine species, such as coral reefs and commercially valuable fish stocks. The frequency of

coral bleaching events has increased, while the productivity of fisheries has decreased.

### *3.1.2 Water resources*

Climate change has altered precipitation patterns, causing water scarcity in some regions and inundation in others as a result of alterations to water availability and water quality. Changes in temperature and precipitation have also had a negative impact on water quality, heightening the risk of contamination and pollution.

Climate change has exacerbated the vulnerability of watersheds and river systems to erosion, sedimentation, and pollution, impacting downstream water resources and ecosystem services.

### *3.1.3 Agriculture and the safety of food*

**3.1.3.1 Agricultural production:** Due to variations in temperature, precipitation, and the occurrence of extreme weather events such as typhoons, floods, and droughts, climate change has negatively impacted agricultural yields. The decreased productivity of main staple commodities, such as rice and maize, threatens food security.

**3.1.3.2 Livestock and fisheries:** Climate change has affected the health, reproduction, and productivity of livestock, while the decline in seafood stocks due to shifting marine conditions has threatened the livelihoods of coastal communities and the fisheries industry as a whole.

### *3.1.4 Coastline and marine assets*

#### *3.1.4.1 Sea-level rise and coastal erosion*

The increasing rate of sea-level rise has resulted in coastal erosion and land loss, especially in low-lying areas, impacting human settlements, infrastructure, and ecosystems.

#### *3.1.4.2 Effects on coral reefs and mangroves*

Bleaching, disease, and habitat loss have reduced the capacity of coral reefs and mangroves to provide ecosystem services such as coastal protection and fishery habitats as a result of climate change.

## *3.2 Climate change's effects on Philippine society*

The literature also emphasizes the social effects of climate change in the Philippines, such as the effects on public health, human habitation, infrastructure, the economy, displacement, and migration.

### *3.2.1 Health care*

The increasing frequency and intensity of heatwaves has led to an increase in the prevalence of heat-related

ailments, such as heatstroke, dehydration, and cardiovascular disease.

### *3.2.1.2 Waterborne and vector-borne diseases*

Climate change has altered the distribution, abundance, and transmission dynamics of disease vectors like mosquitoes, thereby increasing the risk of vector-borne diseases such as dengue and malaria. Waterborne diseases such as cholera and leptospirosis are more likely due to alterations in water quality and availability.

### *3.2.2 Population density and infrastructure*

Climate change has exacerbated the urban heat island effect and increased the vulnerability of urban infrastructure to extreme weather events such as inundation, landslides, and hurricanes.

## **4. Discussion**

### *4.1 Analysis of the findings*

The literature review exposes the significant and extensive effects of climate change on the environment and society of the Philippines. These effects include, but are not limited to, modifications to biodiversity, ecosystems, water resources, agriculture, food security, littoral and marine resources, public health, human settlements, infrastructure, the economy, displacement and migration. The Philippines' susceptibility to climate change is influenced by geophysical, socioeconomic, and institutional factors, which must be mitigated and adapted to using comprehensive strategies.

### *4.2 Policy and practice implication*

This review's findings have several policy and practice implications, highlighting the need for both mitigation and adaptation measures.

#### *4.2.1 Mitigating actions*

##### *4.2.1.1 Reducing greenhouse gas emissions*

In accordance with the Paris Agreement, the Philippines should strengthen its commitment to reducing greenhouse gas emissions by implementing policies that promote low-carbon development and decarbonization of critical economic sectors.

##### *4.2.1.2 Promoting renewable energy and energy efficiency*

To reduce the nation's dependence on fossil fuels, policies should support the development and deployment of renewable energy technologies, as well as the improvement of energy efficiency in various sectors, including transportation, industry, and buildings.

##### *4.2.2 Adaptation strategies*

#### 4.2.2.1 *Climate-resilient agriculture*

The government and stakeholders should promote climate-resilient agricultural practices, such as diversified crop production, agroforestry, and sustainable land and water management, in order to increase food security and reduce vulnerability to the effects of climate change.

#### 4.2.2.2 *Ecosystem-based adaptation*

Policies should prioritize the protection, restoration, and sustainable management of ecosystems, such as forests, wetlands, and coastal areas, in order to maintain and improve their capacity to provide essential services, such as carbon sequestration, flood control, and coastal protection.

#### 4.2.2.3 *Climate-resilient infrastructure*

Infrastructure planning and development should incorporate climate change factors such as sea-level rise, typhoon surges, and adverse weather events in order to ensure the long-term resilience and sustainability of built assets and systems.

Local communities should be empowered and involved in the planning, implementation, and monitoring of disaster risk reduction and climate change adaptation initiatives, utilizing their knowledge and capabilities to address local vulnerabilities and needs.

#### 4.3 *Gaps in the research and prospective directions*

This review also identifies a number of research gaps and prospective directions that merit additional study.

##### 4.3.1 *Data and modelling challenges*

Additional research is required to enhance the quality and availability of climate data and projections, as well as to develop and refine models for assessing the impacts and vulnerabilities of climate change at various spatial and temporal scales.

Future research should adopt cross-sectoral and interdisciplinary approaches to better comprehend the complex interactions between climate change and diverse environmental and social systems, and to inform more integrated and effective mitigation and adaptation strategies.

##### 4.3.3 *Enhancing local and indigenous knowledge*

There is a need to further investigate and integrate local and indigenous knowledge into climate change research and practice, as these information sources can provide valuable insights and innovations for addressing climate change impacts and vulnerabilities at the local level.

## 5. Conclusion

## 5.1 *Conclusions and findings*

This literature review assesses the effects and hazards of climate change on the environment and society of the Philippines, drawing from numerous sources. The findings disclose significant and extensive repercussions, including effects on biodiversity, ecosystems, water resources, agriculture, food security, coastal and marine resources, public health, human settlements, infrastructure, economy, displacement, and migration. Geophysical, socioeconomic, and institutional factors influence the Philippines' susceptibility to climate change, necessitating comprehensive and integrated mitigation and adaptation strategies.

## 5.2 *Policy, practice, and research suggestions*

On the basis of the review's findings, the following policy, practice, and research recommendations can be made:

- Increase the Philippines' commitment to reducing greenhouse gas emissions and promote a low-carbon economy across all major economic sectors.
- Support the development and deployment of renewable energy technologies and boost energy efficiency across multiple sectors.
- To increase food security, implement climate-resilient agricultural practices and promote sustainable land and water management.
- Focus on ecosystem-based adaptation by protecting, restoring, and managing ecosystems sustainably.
- Incorporate climate change considerations into planning and development to ensure the long-term resilience and sustainability of infrastructure.
- Empower and engage local communities in efforts to reduce disaster risk and acclimatize to climate change.
- Improve the quality and accessibility of climate data and projections by addressing data and modelling hurdles.
- Future research should adopt cross-sectoral and interdisciplinary methods to better comprehend the complex interactions between climate change and environmental and social systems.
- Local and indigenous knowledge should be explored and incorporated into climate change research and practice.

## 5.3 *Final Remarks*

Addressing the impacts and hazards of climate change on the environment and society of the Philippines requires a comprehensive and concerted effort from multiple stakeholders, including the government, private sector, civil society, research institutions, and local communities. This review paper contributes to a deeper understanding of the challenges and opportunities

encountered by the Philippines in the context of climate change by synthesizing the existing literature and providing recommendations for policy, practice, and research. It is anticipated that the insights garnered from this assessment will inform and guide future efforts to increase the nation's climate resilience and sustainability.

## References

- Bankoff, G. (2003). Constructing vulnerability: The historical, natural and social generation of flooding in metropolitan Manila.
- Cruz, R.V., Harasawa, H., Lal, M., Wu, S., Anokhin, Y., Punsalmaa, B., Honda, Y., Jafari, M., Li, C., & Ninh, N.H. (2007). Climate Change 2007: Impacts, Adaptation and Vulnerability.
- Füssel, H. M., & Klein, R. J. (2006). Climate change vulnerability assessments: An evolution of conceptual thinking.
- Lasco, R.D., & Pulhin, J.M. (2009). Climate Change Adaptation in the Philippines: A Review of the Literature and Concepts.
- NEDA (National Economic and Development Authority). (2015). Philippine Development Plan 2011-2016: Midterm Update.
- Intergovernmental Panel on Climate Change (IPCC). (2014). Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- World Bank. (2013). Getting a Grip on Climate Change in the Philippines. Washington, DC: World Bank.
- Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA). (2011). Climate Change in the Philippines: Scientific Assessment, Projections, and Observed Trends. Quezon City, Philippines: PAGASA.
- Perez, R. T., Feir, R. B., & Carandang, E. G. (1999). Climate Change Impacts and Responses in the Philippines: Water Resources. *Climate Research*, 12(2-3), 77-84.