Transactions National Academy of Science & Technology Philippines
ISSN 0115-8848 (print)
ISSN 2815-2042 (online)
Vol. 42 No. 2 (2020)
doi.org/10.57043/transnastphl.2020.2311

Climate Change and Long-Standing Environmental Problems in the Philippines

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ABSTRACT

The Philippines is one of the most vulnerable countries to climate change. A warming planet could exacerbate long-standing environmental problems in the country. The paper explores this link in the management of forest ecosystems, marine ecosystems, and wastes. Natural ecosystems in the Philippines such as forests can play a critical role in both climate change mitigation and adaptation. Similarly, sound waste management could lead to lower greenhouse gas emissions while providing enhanced livelihood opportunities. A holistic approach to addressing these environmental challenges could lead to greater resilience to climate risks, as well as greenhouse gas reduction. Policymakers will do well to support research and development in ecosystems-based adaptation and mitigation.

Keywords:
climate change, environmental problems, vulnerability, adaptation

Keywords:
Lasco RD. 2020. Climate change and long-standing environmental problems in the Philippines. Transactions NAST PHL 42(2): doi.org/10.57043/transnastphl.2020.2311

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Plenary paper presented during the 42nd Annual Scientific Meeting (July 2020) of the National Academy of Science and Technology Philippines.

INTRODUCTION

The Philippines has one of the most unique and diverse natural environments in the world. The past century has witnessed massive destruction of natural ecosystems resulting in system degradation and loss of habitats and biodiversity resources. Rapid urbanization led to further deterioration and rising pollution of land, water, and the atmosphere.

On the global scale, the climate has been slowly warming, which further complicates the environmental management in the country. Climate change will add another layer of complexity to existing challenges to policymakers, development workers, and more significantly, local communities. The most vulnerable will suffer more severely as natural hazards impact their already brittle condition.

This paper aims to explore the interactions between long-term environmental challenges in the Philippines and climate change.

A WARMING PLANET

There is no doubt that the earth's climate is warming. Since the industrial revolution, the planet's air temperature has warmed by about

Transactions NAST PHL 42 No. 2 (2020)
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1oC. As early as the 2030s, the air temperature may be warmer by 1.5°C, breaching the target set in the Paris Agreement. The Intergovernmental Panel on Climate Change (IPCC) recently released three special reports that highlight the increasing risks posed by global warming.

First, the Special Report on Global Warming of 1.5°C (IPCC 2018) concluded that the impacts of a 2°C are significantly higher than a 1.5°C warming. Under a 1.5°C scenario, the regional climate will have a lower mean temperature, number of hot days, and temperature of hottest days, while the temperature of coldest nights (°C) will be lower compared to a 2°C warming. In addition, there will be fewer extreme precipitation events. While 1.5°C warming carries its own risks, the risks associated with 2°C warming are appreciably higher in coastal areas, natural ecosystems, and human health. As expected, the poor and most vulnerable will suffer more than other sectors of the population.

To limit warming to 1.5°C, the IPCC report states that "global net anthropogenic emissions should fall by about 45% (from 2010 levels) by 2030, reaching 'net zero' around 2050". Adaptation options exist but it will be more challenging for ecosystems, food, and health systems at 2°C of global warming than for 1.5°C.

Second, the IPCC Special Report on Climate Change and Land (IPCC 2019a) pointed out that climate change will translate to added stresses on land, exacerbating existing risks to livelihoods, biodiversity, human and ecosystem health, infrastructure, and food systems. For example, it is projected that there will be increased dryland water scarcity, soil erosion, vegetation loss, wildfire damage, coastal degradation, and tropical crop yield decline. The report recognizes the significant role of terrestrial ecosystems in climate change mitigation if they are managed properly. In addition, appropriate land management will lead to significant co-benefits, such as biodiversity conservation and enhanced livelihoods for local communities.

Third, the IPCC Special Report on Oceans and the Cryosphere (IPCC 2019b) validated that the global mean sea level is rising at a higher pace because of increasing rates of loss from ice sheets, as well as continued glacier mass loss and ocean thermal expansion. This increase worsens extreme sea-level events and coastal hazards, which are especially critical for a country like the Philippines.

A warming ocean leads to intensified marine heatwaves, acidification, loss of oxygen, salinity intrusion, and sea-level rise.

The country's temperature has been steadily warming with an increase of 0.68°C in the past 65 years (Figure 1). This is consistent with the global warming trends as described above.

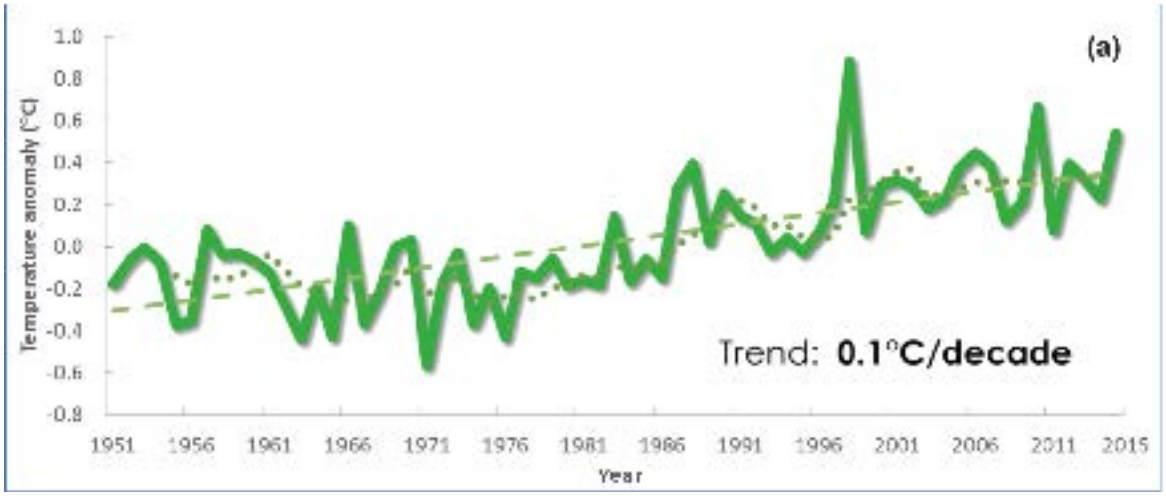

Figure 1. Air temperature in the Philippines from 1951 to the present (PAGASA 2018).

Transactions NAST PHL 42 No. 2 (2020)
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Future climate projections for the Philippines are consistent with global projections. Relative to air temperatures in 1970-2000, the country's air temperature is expected to rise by up to 4oC by the end of the century (Figure 2). By 2050, the air temperature will be between 1–2oC compared to the same baseline. Rainfall amount and seasonality are less homogenous for the country, with some parts becoming wetter and others becoming drier (Figure 3). Future trends on tropical cyclones are more uncertain with models suggesting reduced frequency but higher intensity (PAGASA 2018).

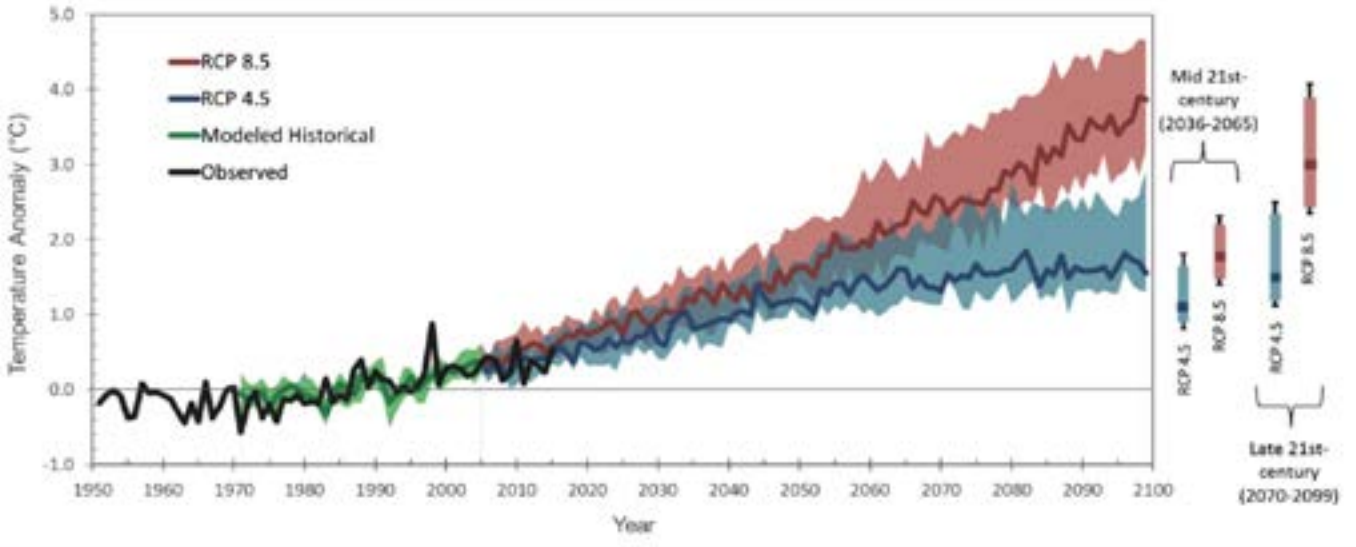

Figure 2. Projected air temperatures for the Philippines with climate change (PAGASA 2018).

The projections from PAGASA (Figure 3) are consistent with the results of other studies in Southeast Asia such as those by Tangang et al. (2020) and Gallo et al. (2019), and Darron et al. (2018). See also Villarin et al. (2016) for a summary of earlier research on future climate in the country.

The impacts of climate change in the country are projected to be manifold and varied in intensity (Figure 4). Adaptation practices and technologies for a warming climate will vary by sector and scale. For example, in agriculture, adaptation practices and technologies include: adjusting the cropping calendar, developing flood-tolerant rice varieties, and diversification of crops and livestock. Sectoral adaptations are summarized in Cruz et al. (2017). For example, for forests and upland communities, adaptation options include conservation and management of vulnerable species, assisting local communities that are highly dependent on forest resources, and adopting biodiversity-based adaptation and mitigation strategies. For the agricultural sector, examples of adaptation measures include the development of climate change-sensitive technologies, the establishment of climate-proof agricultural infrastructure and climate-responsive food production systems, and strengthening the crop insurance system.

LONG-STANDING ENVIRONMENTAL PROBLEMS MEET CLIMATE CHANGE

In this section, the paper explores the relationship of climate change with long-lasting environmental problems in the country. This link is illustrated in the management of forest ecosystems, marine ecosystems, and wastes. The Department of Environment and Natural Resources (DENR) is the lead agency in the management of these environmental concerns. These three areas are among the top ten priority programs of the department.

Transactions NAST PHL 42 No. 2 (2020)
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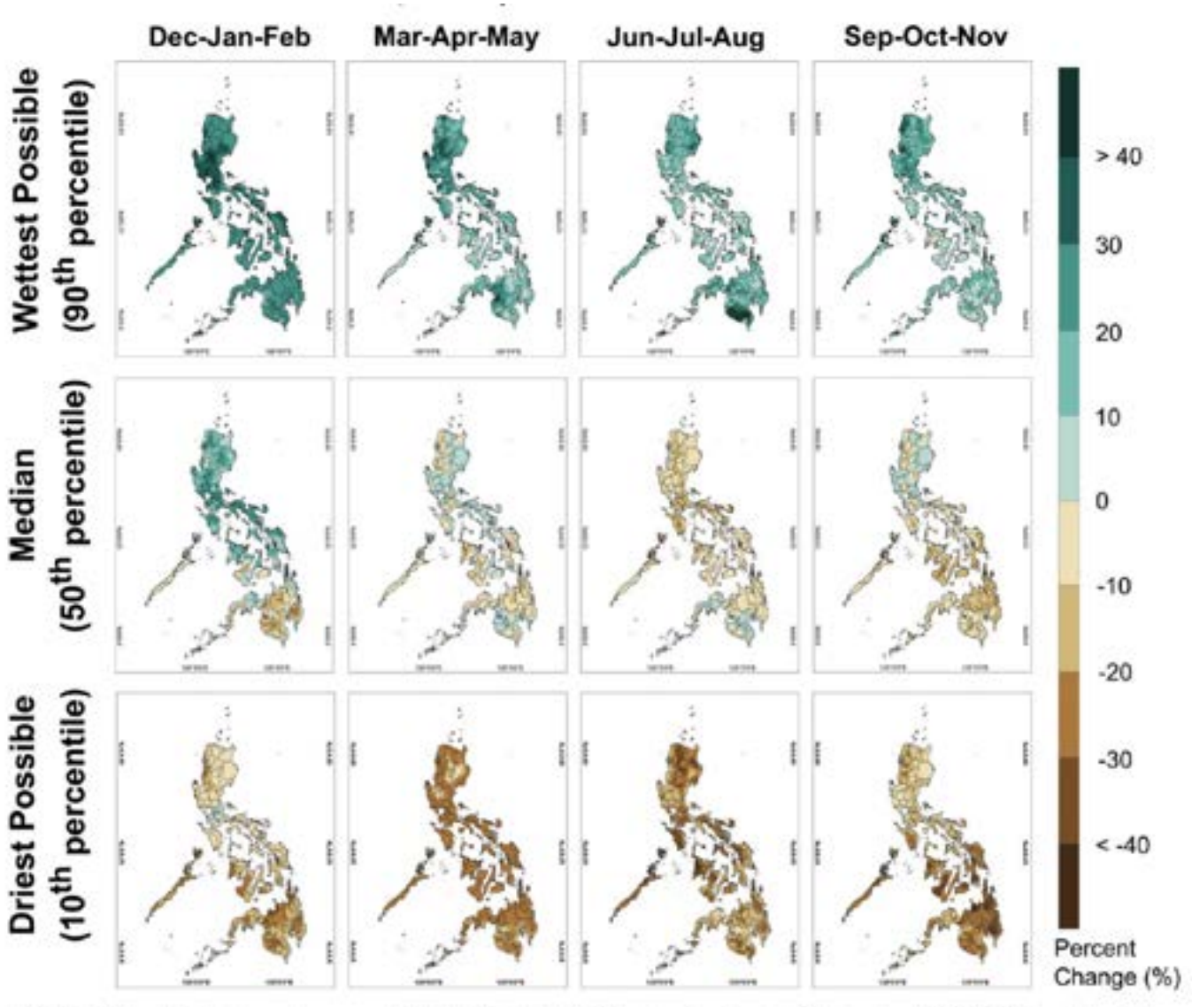

Figure 3. Projected rainfall in the Philippines with climate change (PAGASA 2018).

Transactions NAST PHL 42 No. 2 (2020)
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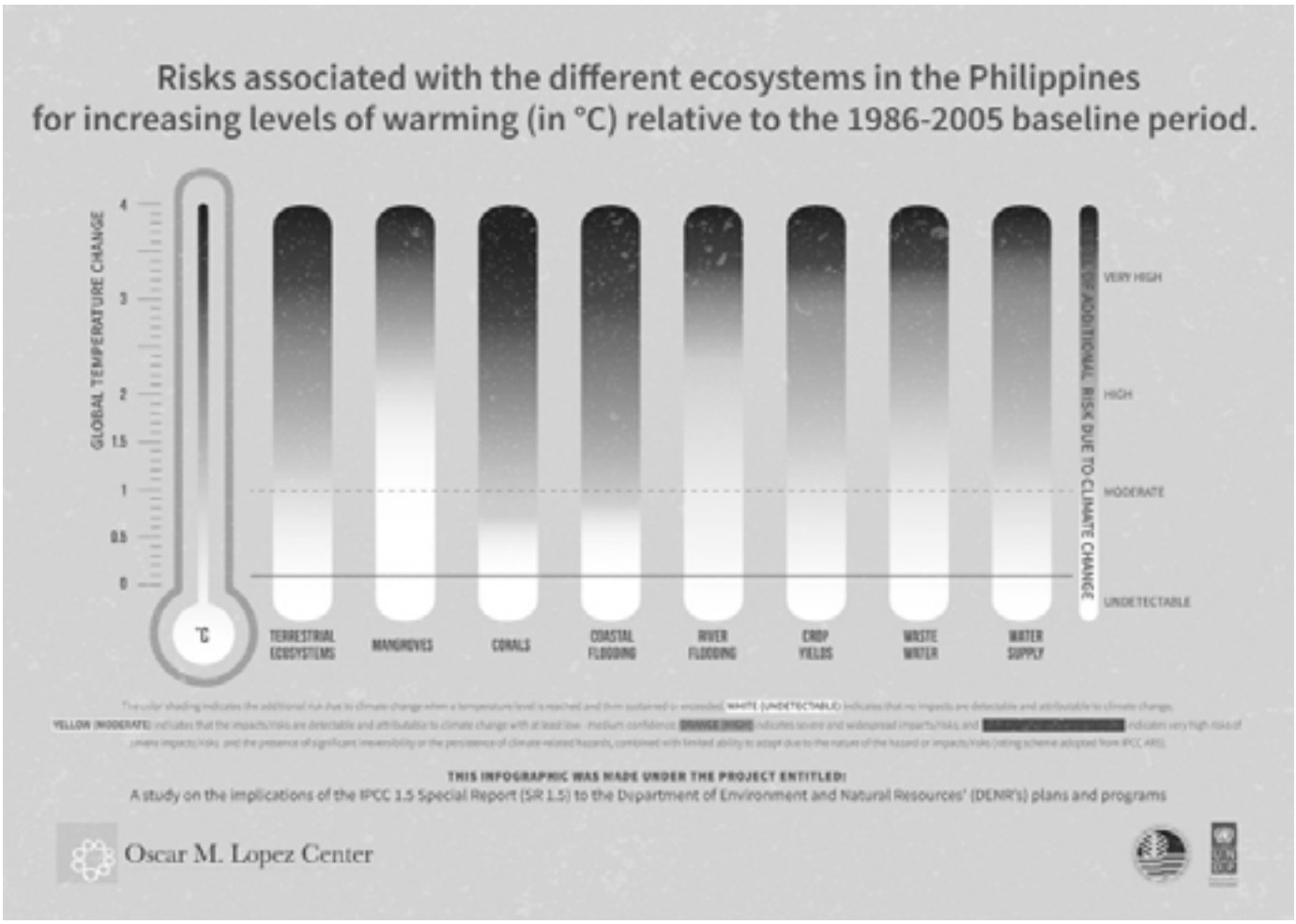

Figure 4. Risks associated with terrestrial and coastal ecosystems in the Philippines (Oscar M. Lopez Center 2019).

Forest cover in the Philippines has declined rapidly in the last century. One of the most critical effects of this decline is that it increases the vulnerability of resource-dependent local communities. In response, rehabilitation and restoration activities are underway primarily through the national greening program of the DENR.

Climate change could impact forest ecosystems in the country, but the specific effects are not yet well defined. There are significant non-climatic factors that affect the health of forest ecosystems, such as illegal cutting of trees and conversion of forests to other land uses. Addressing these drivers of change will lead to the conservation of existing natural forests and greater success of forest rehabilitation activities. A healthier forest ecosystem will mean the protection of the rich biodiversity of plants and animals in these forests. In addition, robust forest cover will foster more stable water flows from watersheds, provision of goods and services for local communities in and around forests, and increased income and livelihoods. Overall, these positive effects will lead to enhanced resilience of natural and human systems.

Forests also play a critical role in climate change mitigation. Healthy forests store and sequester carbon from the atmosphere. However, forest destruction, especially by burning, releases CO_2 into the atmosphere. In conclusion, policies, programs, and activities promoting forest conservation and rehabilitation foster climate resilience and mitigation of greenhouse gas.

Transactions NAST PHL 42 No. 2 (2020)
doi.org/10.57043/transnastphl.2020.2311

The same conclusion is true for coastal and marine ecosystems management, one of the priorities of the DENR. Well-managed coastal and marine areas provide goods and services and increased income and livelihoods to local communities. They help protect diverse plant and animal life. They also promote climate change mitigation through blue carbon stocks conservation and sequestration.

In urban areas, national and local government units are trying to rationalize waste management throughout the country as part of efforts to reduce pollution and its attendant problems. A well-designed and implemented waste management promotes climate resilience and mitigation. Materials recovery facilities help increase the income and livelihoods of local communities. In addition, these facilities lessen disease incidence in waste disposal sites. Sanitary landfills have lower GHG emissions and can even produce cleaner energy from the use of methane (CH_4) from the landfill.

From this brief review, it will be observed that long-term environmental issues in the Philippines could be addressed in such a way as to promote climate change adaptation and mitigation. Natural ecosystems can enhance the climate resilience of human systems that rely on them for goods and services. In contrast, mismanagement of natural ecosystems could lead to greater vulnerability and increase GHG concentration in the atmosphere.

CONCLUSIONS AND RECOMMENDATIONS

Natural resources management can contribute to climate change mitigation and enhancing climate resilience in the Philippines. It must be recognized that natural and human systems are interconnected. Policymakers should consider adopting ecosystem-based adaptation to enhance the resilience of the country, especially in local communities. Such a holistic approach can guide policymakers and development workers in addressing climate change together with long-standing environmental issues in the country.

Research on ecosystems-based adaptation and mitigation in the country should be supported to deepen the understanding of their potential role and to find practical solutions. Finally, a systems approach in environmental management is critical to ensure that multiple threats (hazards) are addressed at the same time and synergies are promoted.

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Transactions NAST PHL 42 No. 2 (2020)
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