

Increasing climate resiliency of Philippine mangroves through
Impact Assessment
Cassiophia M. Madid, PhD
GHD Pty Ltd
11F Alphaland Southgate Tower 2258 Chino Roces Ave. corner EDSA 1232 Makati
City, Philippines, +63 2 479 5600
cmmadid@yahoo.com

Over the years, the impacts of climate change have become prominent. Sea level rise, sea temperature, and increase/decrease in rainfall brought about by climate change exposed the Philippine mangroves to various vulnerabilities further increasing the vulnerability of small coastal communities. The Philippines was hard hit by one of the most intense tropical cyclone that hit Southeast Asia in 2013. After the onslaught of Typhoon Haiyan, villagers reported that they have been spared by the full impact of Typhoon Haiyan by the mere presence of healthy mangrove forests. While damage was also done to mangroves, with some suffering damage to at least 30% of their cover, their ability to soften the blows of extreme weather cannot be undermined. The Philippine Environmental Impact Statement System is a powerful tool to manage ecosystem services that may be provided by mangroves which will subsequently increase the resilience of small coastal communities to climate change.

Introduction

This paper presents an overview of the Philippines vulnerabilities to climate change as well as efforts to increase climate resiliency through mangrove conservation and management. This paper presents the Philippine Environmental Impact Statement System and how it can contribute to increasing climate resiliency, especially of vulnerable ecosystems such as mangroves.

Methods

This paper was developed by reviewing available literature including publicly available information specifically on the context of Philippine experience and legal framework.

Results and Discussion

The Philippine mangroves and their status

The Department of Environment and Natural Resources (DENR) in 1998 reported that mangrove area in the country has decreased greatly from an estimated coverage of 450,000 hectares (ha) in 1918 to less than 120,000ha in the late 1990's. Despite numerous researches and attempts to quantify remaining mangrove forest, a precise figure is still missing.

The greatest loss in mangrove forest occurred during the 1960s and 1970s when the national government motivated local farmers to expand aquaculture in the detriment of the mangrove forest which was unappreciated then. The clearing peaked from 1967 to 1988 with an unprecedented loss of 8,000 ha annually (FAO, 2007).

At present, much of the remaining mangrove stands in the country are found in the southern and western provinces and islands of Mindanao, eastern island provinces of the Visayas and the whole island of Palawan, largely due to their inaccessibility.

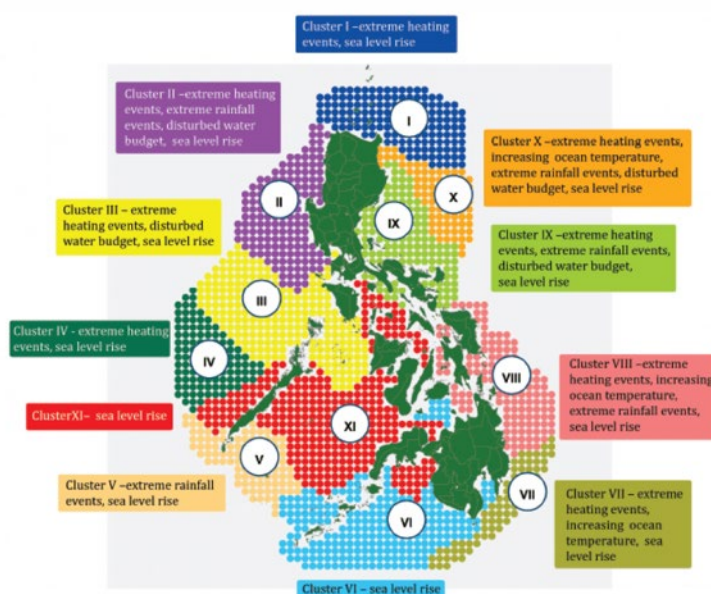
Vulnerability of the Philippines to Climate Change

In 2016, the Philippines ranked fourth in the list of 10 countries exposed to long-term climate risk as the most affected in the period of 1995 to 2014. The ranking is based on an estimated total loss of 2757 million US Dollars, with 337 climate risk events having occurred between 1995 and 2017 (Global Risk Index, 2016). This is largely due to the

Philippines geography – located in the western Pacific Ocean, naturally surrounded by warm waters that will likely get warmer as average sea-surface temperatures continue to rise. The projected additional heat in the ocean and air can lead to stronger and more frequent storms and this has been observed in the Philippines over the past ten years.

A collection of more than 7000 islands, the Philippines lack the natural geographic barriers that would protect these islands from the natural forces coming from the sea. Other natural factors such as regional wind patterns or currents also place the country at the certain of climate change related risks such as stronger tropical storms (Climate Reality Project, 2016). The Philippine Department of Environment and Natural Resources shows how the various regions in the country in terms of risk to climate threats, based on specific geographical location (Figure 1).

PHILIPPINE EXPOSURE MAP ON CLIMATE CHANGE



Source: DENR, Philippines, 2014

Figure 1 Philippine exposure map on climate change (DENR, 2014)

decade, the number of tropical storms making landfall in the country is becoming more frequent and more severe and this trend is attributed to climate change effects.

The country's coral reefs and mangrove ecosystems remain the best natural buffers against various forces such as typhoons. Located in the upper intertidal zones, mangroves are adapted to live in saline environment. Their very location also entails them to the highest amount of disturbance from various anthropogenic impacts and recently from various impacts of climate change. These facts give some indication of their ability to cope with coastal hazards, or at least recover from perturbations.

Response of mangroves to Climate change

Both the island provinces of Samar and Leyte were in the direct path of Typhoon Haiyan. They suffered to serious damages and a large number of casualties. A small town in Eastern Samar known as General McArthur attributed the zero-casualty reported in their town due to the presence of mangrove forests that served as natural barrier between the town and the direct path of the Typhoon. This perception was widely echoed in other coastal municipalities in Eastern Visayas. Specifically, the

Out of the ten deadliest typhoons in the Philippines between 1947 and 2014, five have occurred since 2016, affecting and displacing thousands of people every time. The deadliest storm on record is Typhoon Haiyan, known locally as Typhoon Yolanda, which was responsible for more than 6000 lost lives and over four million displaced citizens, and \$2 billion in damages in 2013 (Climate Reality Project, 2016).

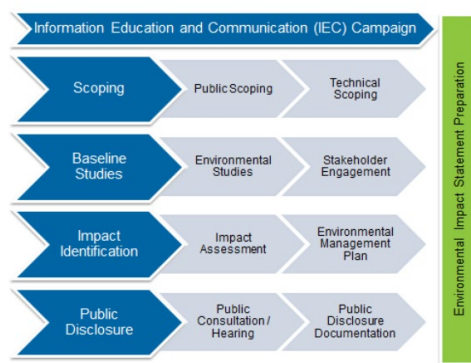
Because of its geographical location, the Philippines experience an average of 20 tropical cyclones per year. Over the past

perception that mangroves play an important role in coastal protection was high among residence with larger, ranging from 430 to 1463 hectares and more diverse mangroves, with a biodiversity index (H') ranging from 1.2 to 1.96 (Delfino et al, 2015).

Damage to existing mangrove forests in Eastern Visayas Region, directly hit by Haiyan accounts to 40 percent. The majority are monospecific tall and rigid mangrove forests (Villamayor et al, 2016). This was further proven by Spalding et.al (2014) in terms of the ability of mangroves to provide coastal defense. Wider mangroves as much as hundred meters in width can significantly reduce wave height by 13 to 66 percent per 100 meters of mangroves. While to significantly withstand against storm surges, hundred meter width of mangrove is needed to significantly reduce wind and waves on top of surge. More significant cover (thousands of meters) is needed to reduce flooding impact (storm surge height is reduced 5-50 cm/km).

Structurally complex mangrove forest can reduce the height and energy of wind and swell waves passing through them. Both from the experience in Typhoon Haiyan and more controlled studies prove that complex mangrove stands with young and small mangroves can already be effective – more effective than single-aged and monospecific stands.

The Philippine Environmental Impact Statement System



The Environmental Impact Assessment (EIA) System in the Philippines, officially referred to as the Philippine EIS System (PEISS), was established under Presidential Decree (PD) 1586 on 11 June 1978 stating that no person, partnership or corporation shall undertake or operate any such declared environmentally critical project or area without first securing an Environmental Compliance Certificate (ECC).

Figure 2 Basic elements of the Philippine EIS System

In 2007, a joint review of the World Bank and the Asian Development Bank revealed that the legal and institutional frameworks of the PEISS were sound and robust. While the ability of the system to be a good planning tool can be further improved, the system nonetheless is recognized as both effective and efficient. The PEISS was reviewed to have all the basic elements of a good Environmental assessment system, such as the presence of screening, scoping, independent review, public participation, disclosure, and monitoring (Figure 2).

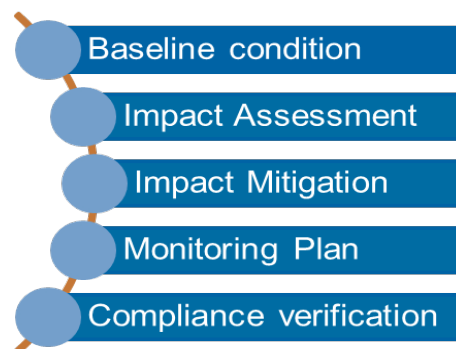


Figure 3 Basic elements of Impact Assessment process as per PEISS

Figure 3 shows the basic elements of the IA process as per the PEISS. Integrating important information in each of these elements can yield a more useful public document that can be utilised for further mangrove conservation and management. This can include the following:

Strengthening baseline assessment of mangroves

Currently, EIA reports typically includes biodiversity (e.g. species richness, importance value, etc). Baseline information can also be extended to site productivity indicators such as soil properties, salinity levels, and elevation. This information will prove to be valuable in future monitoring as well as options for enrichment planting or restoration.

The current PEISS does not include the assessment of ecosystem services in the preparation of the EIS. Ecosystem services, if discussed in the EISs, are insignificantly incorporated in the over-all discussion of baseline information. Incorporating ecosystem services, primarily of important ecosystem such as mangroves, can provide better understanding of the services including protective functions these ecosystems provide. Specifically, this can include information on previous exposure of the ecosystem to events related to climate change.

Inclusion of information on local community's perception of nearby mangrove areas is also important in establishing a higher appreciation of the value of the mangroves. This should also gauge the ability of key members of the community to be part of the impact assessment system in terms of public participation including taking part in monitoring activities post EIA.

In the Philippines, where strategic impact assessment is yet to be strengthened, there is a need for consolidated information on coastal resources including information on existing mangroves – their risk due to events related to climate change, with or without the proposed project. In the country, it is not unusual to find different EISs prepared by different proponents/consultants for different development projects co-located in the same larger ecosystem (i.e., along the same waterbodies such as bays) resulting in highly fragmented information unusable for more important decision making.

Strengthening mitigation measures through the implementation of mitigation hierarchy

The protection of mangroves in the Philippines is set in the legal context of a national law that prohibits the cutting of mangroves by the virtue of Republic Act 7161 (1991). It is therefore imperative that mangrove forests be avoided by project development at all cost. However, when all options have been exhausted and a certain portion of a mangrove forest needs to give way to national interest, options for mitigation should be fully exhausted. This includes transfer of suitable affected individuals. Project proponents need to show proof of closely monitoring survival of transferred individuals and implementation of uniform replacement ratio of 1:100 (1 dead trees to be replaced by 100 seedlings). This is commonly practiced in the Philippines and without proper technical guidance by restoration ecology specialists, this can also prove to be quite daunting for project proponents.

Coastal communities should also be involved in biodiversity offset efforts identified by impact assessment (Plate 1). Learning from the experience of these communities from Typhoon Haiyan and other similar weather perturbations, public participation should be stronger now, more than ever. This realization also initiated renewed efforts on mangrove rehabilitation in the Philippines.



Plate 1 Community members taught to do basic monitoring measurements

Sound mangrove management plan in the Environmental Management Plan

In the midst of climate change impacts to coastal communities, the functionality of mangrove forests was perceived to be high in terms of providing protective and productive functions to vulnerable coastal communities. This realization initiated renewed efforts on mangrove rehabilitation in the Philippines.

Ironically, in a tremendous effort to accomplish physical targets in terms of coverage, previously mangrove rehabilitation efforts have been considered to be of inferior growth and performance. This is attributed to ecological problems that arose from a neglect to pay attention to each of the ecological requirements of mangrove species used (Samson and Rollon, 2008) as well as the lack of understanding of the site where mangrove rehabilitation is undertaken. Even posing a threat to the other ecosystems mangrove support and needed (i.e. mangrove plantation in seagrass meadows).

For this very reason, in an effort to curb the adverse impacts of climate change, many organisations planted without understanding, resulting in the loss of valuable resources i.e., time, money and community's effort, therefore, robbing vulnerable coastal communities of the assurance that these efforts will help in abating the adverse effects of climate change.

A sound Biodiversity Management Plan should be incorporated in the Environmental Management Plan of EIS.

Conclusion

The recent climate change events experienced in the Philippines should provide valuable lessons on how to properly manage mangrove ecosystem in the country. The IA process can serve as guideline in making better management decisions for mangroves.

Through the IA process, information gathered specific for mangroves should include information that should be more useful for rehabilitation planning. Should development pass through important mangrove areas, seriously consider the mitigation hierarchy – avoid first. This should include re-routing or re-siting should be the first option. In case of restoration, consider site and species suitability and remembering specific mangrove species requirements. No mangroves are created equal.

In the Philippines and perhaps in other countries that have suffered the consequences of climate change, this is a great opportunity to strengthen community involvement when they are most willing to participate. This should be further integrated in the IA process especially during post EIA activities such as monitoring and compliance verification.

Other ways should be explore opportunities to align principles of better mangrove management though IA and subsequently provide ways to increase climate change resilience in communities where people and mangroves should co-exist.

References

Food and Agriculture Organization, 2007. The World's Mangroves 1980-2005. A thematic study prepared in the Framework of the Global Forest Resources Assessment.

Kreft S, Eckstein D, Dorsch L and Fischer L. 2016. Global Risk Index 2016. Who suffers most from extreme weather events? Weather related Loss Events in 2014 and 1995 to 2014. www.germanwatch.org/en/crisis Accessed 08 February 2017.

Climate Reality Project. 2016. <https://www.climaterealityproject.org/blog/how-climate-change-affecting-philippines> Accessed 08 February 2017.

Delfino RJ, Carlos C, David L, Lasco R, Juanico DE. 2015. Perceptions of Typhoon Haiyan-affected communities about the resilience and storm protection functions of mangrove ecosystems in Leyte and Eastern Samar, Philippines. *Climate, Disaster and Development Journal*. Vol 1 Issue 1. <https://www.cddjournal.org/article/view/vol01-iss01-004> Accessed 28 January 2017

Villamayor, BM, Rollon R, Samson M, Albano, GM, Primavera J. 2016. Impact of *Haiyan* on Philippine mangroves: Implication to the fate of the widespread monospecific *Rhizophora* plantations against strong typhoon. *Oceana and Coastal Management*. 134.1-14.

Samson M and Rollon R, 2008. Growth Performance of Planted Mangroves in the Philippines: Revisiting Forest Management Strategies", *Ambio* Vol 34 No. 4.

Spalding M, McIvor A, Tonnejick FH, Tol S and van Eijk P. 2014. Mangroves for coastal defence. Guidelines for coastal managers for policy makers. Published by Wetlands International and The Nature Conservancy. 42 p. <http://www.nature.org/media/oceansandcoasts/mangroves-for-coastal-defence.pdf> Accessed 28 January 2017.

World Bank Report. 2009. The Philippines: Country Environmental Analysis.