CREATING PROTECTED AREAS TO TACKLE THE EVER-INCREASING DEFORESTATION OF THE PHILLIPINES MANGROVE FORESTS

Author: Amhar Nayab
25th August 2019

In this policy briefing, I will discuss the growing concerns surrounding mangrove forest deforestation in the Philippines, which is having devastating environmental impacts, such as a reduction in ecosystem productivity and biodiversity. I will then assess current Filipino government's measures to solve this issue, before providing recommendations for creating protected areas, with tighter regulation of activities in mangrove forests.

Target Audience

This policy brief is aimed at the central government of the Philippines as mangrove forests are scattered throughout the country's coastlines. For an effective implementation of recommended policies, the national government will have to work in unison with local authorities and communities to ensure policies are correctly executed and regulated.

University of Warwick
Department of Global Sustainable Development
Published: 2019

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(Krasowski, 2009)

BY AMHAR NAYAB

UNIVERSITY OF WARWICK [COVENTRY, CV4 7AL]

THE UNIVERSITY OF WARWICK

Policy Brief

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Creating protected areas to tackle the ever-increasing deforestation of the Philippines mangrove forests

Executive Summary

Mangrove forests are becoming increasingly threatened, and with their vast stocks of blue carbon and provision of significant ecosystem services, regional impacts on mangroves can have global bearings. The Philippines is dealing with this issue first-hand, with 50% of their mangroves having been deforested, as they are exploited for their economic advantage, through activities such as logging and commercial fishing. This is not only having detrimental impacts on the local ecosystem biodiversity, but there is a growing concern that the 104 tonnes of carbon stored in the Philippines mangroves could be slowly released into the atmosphere, turning the country's mangroves from a vital carbon sink to a carbon source in the years to come, which will have global implications. Government-led attempts to stop deforestation have proved unsuccessful, while initiatives to reduce impacts of deforestation have been limited due to pond contracts. This has contributed to reforested mangroves having survival rates of 10% - 20%, as desired species and sites cannot be effectively selected. The Filipino government has also failed to prevent their mangrove forests from being subject to exploitation, due to the common good nature of mangroves, where land is not bound to contracts. To overcome this issue, the creation of protected areas (PAs) with heightened monitoring and regulation is recommended, following the success of Indonesia, where PAs reduced mangrove loss by 28%. The government is encouraged to consider the long term economic and social benefits of mangroves in all levels of policy making and to introduce taxes on activities affecting mangroves, in an attempt to reduce deforestation.

What is the problem?

Mangrove forests are some of the world's most threatened ecosystems, with 35% of them having already disappeared globally and this figure is closer to 50% in the Philippines (WWF, 2019). This is an alarming matter, as mangrove forests are incredibly useful ecosystems, providing goods and services worth an estimated US$1.6 billion each year globally (IUCN, 2010), through a range of activities, including commercial fishing, tourism and logging (WWF, 2019a). The ecosystem services framework (ESF) emphasises the importance of healthy ecosystems in providing natural capital, which can contribute to sustainable economic development and human wellbeing (Turner and Daily, 2007). Unfortunately, the current Filipino government has prioritised the shear economic value provided by mangroves over the environmental importance of the forests to coastal communities and marine wildlife, which have subsequently been neglected and are now some of the most threatened ecosystems.

This is a growing concern in the Philippines, as their 36,289 km coastline and tropical location creates the ideal climate for mangroves to thrive, as shown by it being home to half of the known mangrove species (Garcia *et al*., 2014: 82). However, aforementioned anthropogenic activities are extremely prevalent in the Philippines, which is severely impacting the country's biodiversity and mangrove populations. Habitat loss in mangroves has resulted in a loss of biodiversity, which has decreased the functioning of the marine ecosystem, with Sesarmid crabs feeding on a limited supply of leaf biomass (Cannicci *et al*., 2008), before being predated on by many fish and birds, such as the collared Kingfisher.

Without effective and urgent management of mangroves, many species of crabs, birds and fish

amongst others, could be pushed towards extinction, which could further harm the extensive aquaculture and fish farming sector, which have largely contributed to this problem. This issue arises due to the fact that the products of the mangrove forests, which are accessible to all, are treated as common goods. However, this unregulated consumption of the ecosystem services provided by the forests results in the long-term depletion of the services. Subsequently, mangrove forests worldwide and especially in the Philippines have been mismanaged, due to the superior private incentives; exploiting them to gain economic benefits whilst disregarding the need for sustainable management (M. Brander *et al*., 2012: 62). These factors have led to the undersupply of mangroves, which has resulted in market failure, thus explaining why half of the Philippines mangroves have been deforested (M. Brander *et al*., 2012: 62).

With mangroves being established as blue carbon ecosystems, which are marine and coastal ecosystems that play a pivotal role in mitigating climate change and providing ecosystem services, more needs to be done to protect their vast stocks of carbon and protect its role as a carbon sink (Lovelock and Duarte, 2019). The sheer accumulation of blue carbon in mangroves, is highlighted by it storing up to four times more carbon than land-based forests, per unit area (McSweeney, 2018). However, with increasing deforestation, mangroves are losing their function as a carbon sink and thus its ability as a long-term carbon storage and reduce the impacts of the enhanced greenhouse effect. This is because the deforestation of trees stops carbon fixation and thus resulting in the accumulation of atmospheric carbon. Much of the carbon in mangrove ecosystems is stored in the thick soils, as shown in figure 1, with more carbon storage (Mg ha^{-1}) than any other major global forest types and around 3.5 times more storage of carbon below 30cm than the next highest global forest type (McSweeney, 2018). Though it is the carbon stored between 0-30 cm of the soil and the roots, that is the most concerning.

Further deforestation could cause mangrove forests to become a net source of carbon and thus contribute further to climate change and global warming, as the removal of mangrove roots binding the soils together, results in carbon being released into the atmosphere through the decomposition of organic matter in the soil. This is a troubling issue for the Philippines, which had approximately 104 million tonnes of carbon stored in mangrove forests in 2012 (Hamilton and Friess, 2018).

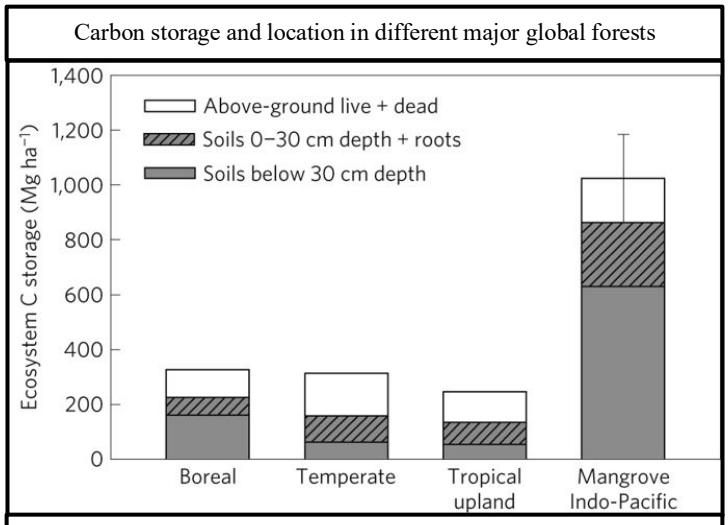

Figure 1: Comparison of mangrove C storage (mean ±95% confidence interval) with that of major global forest domain. (Donato *et al*., 2011)

With more than 1500 towns and 42,000 villages in the country relying on mangroves as a source of food, shelter, as well as other goods and services (Primavera, 2000), urgent action needs to be taken to ensure the protection of mangrove forests in the Philippines.

Figure 2: Rhizophora mangrove species (McSweeney, 2018)

Current Government Responses

The Filipino government has made significant efforts to help recover its mangrove forest population, through a number of reforestation schemes. These policies have seen the initial decline of mangroves in the Philippines from 400,000 - 500,000 ha in 1920 to 120,000 ha in 1994 (Primavera, 2000), recover to 311,000 ha in 2010 (FRA, 2015: 20). However, much of the reforestation of mangrove forests have had low survival rates, between 10%-20%, due to poor selection of species and sites (Primervera and Esteban, 2008: 345). For example, the preferred *Rhizophora* species (as shown in figure 2) have been deforested and used for firewood and several other purposes, however these have now been planted in sandy and exposed coastlines where native species of *Avicennia* and *Sonneratia* would colonise (Primervera and Esteban, 2008) and subsequently have modest survival rates.

Despite community, government and international efforts to reforest the Philippines lost mangroves, the majority of planting sites have been in less favourable conditions between lower intertidal and subtidal zones. This is because, ideal sites which mangroves thrive in have been converted to brackish water fishponds and are subject to pond ownership, whereas open access areas have no such ownership issues (Primervera and Esteban, 2008). This ownership problem has not only resulted in a high mortality rate of young seedlings, but those which do survive tend to have stunted growth (Samson and Rollon, 2008) and are subsequently less effective at sequestering carbon. Therefore, despite the increase in mangrove populations, the ecosystem services provided by reforested mangroves are not equivalent to those which have been lost through deforestation. In addition, the reforestation schemes led by the government have been unsuccessful in returning mangrove populations to 1920s levels thus far (Primervera, 2000). As people and companies continue to exploit mangroves for their economic benefits, on purchased land or areas of open access, where mangroves remain common goods.

The World Bank alongside Wealth Accounting and the Valuation of Ecosystem Services (WAVES) has recently tried to reduce deforestation, by generating an economic value of the social and environmental benefits provided by the country's mangrove forests (Beck, 2017). This aims to provide further information for the government, who currently fail to account the long term economic value of the forests in policy making (Beck, 2017). This is why we are continuing to see mangrove forests being deforested, despite current government reforms. This is a worrying problem, as without mangroves the Philippines would experience a 25% increase in damages to livelihoods and infrastructure from flooding (Beck, 2017).

Recommended Government Policy

Mangrove forests in the Philippines provide a number of important uses, from protecting coastal communities against storm surges, sequestering carbon to reduce the effects of climate change and providing a habitat to some of the worlds most threatened species, amongst several other ecosystem services (Miteva, Murray and Pattanayak, 2015). In order to benefit from mangroves in the future, vital action needs to be taken to ensure mangroves are conserved and managed sustainably.

To overcome the problems arising from mangroves in the Philippines being a common good, it would be recommended to create PAs surrounding 'at risk' mangrove populations. PAs have been a huge success in Indonesia, by reducing the rate of mangrove loss by 28%, thus avoiding 14,000 ha loss between 2000 and 2010 (McKenzie, 2015). Furthermore, an approximate 13 million metric tons of blue carbon emissions have been avoided, which highlights the benefits PAs can have on easing climate change and preventing biodiversity loss (Miteva, Murray and Pattanayak, 2015). It would help solve a growing problem, which the Philippines face with their vast stocks of blue carbon. This is also an extremely sustainable and cost-effective approach as PAs in Indonesia yielded a social welfare benefits of $540 million through the reduction of blue carbon emissions (Miteva, Murray and Pattanayak, 2015).

By creating PAs, the government can have better control over what activities occur in these regions and limit practices, such as aquaculture, which have converted mangroves into culture ponds and contributed to the loss of 237,000 ha between 1968 and 1983 (Fernandez, 1978). However, to ensure these PAs are effectively enforced, the local council needs to continuously regulate activities in these regions and only allow individuals and businesses once they have been authorised to operate there. Permission should only be granted for activities which have minimal effect on the mangrove ecosystem and a fixed tax on all profits generated from activities in mangrove forests should be applied to account for the environmental cost, thus internalising the externalities and reducing market failure. By introducing these taxes, alongside rigorous state monitoring, the ownership problem would be alleviated, as large taxes would disincentivise owners to deforest mangroves on their land. However, the ownership problem should not be a barrier to achieving the sustainability of mangroves in the Philippines, as their economic, social and environmental worth to the country and the world far exceeds the economic benefit gained to the owner of the land. Therefore, I urge the government to purchase vulnerable land off owners, where possible, and monitor any remaining private mangroves to prevent further deforestation to ensure current reforestation responses are effective.

The economic and social benefits of mangroves need to be introduced at all levels of government policy making, especially with the Philippines being particularly prone to flood damages during typhoons and many extreme events. For instance, Typhoon Haiyan claimed over 6,000 lives and cost more than US$2billion in damages (Beck, 2017). This is not an issue the government should take lightly as typhoons, storms and floods damaged 85% of buildings in the country between 2005 to 2010 (Beck, 2017). Mangroves play a vital role in protecting coastlines and providing an environmental buffer and therefore can provide a long-term economic benefit. This economic benefit would far exceed that of exploiting mangroves for their natural capital, which is why the government need to tackle deforestation of the forests, by regaining control through PAs and effective monitoring.

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