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Addressing Climate Change in Manila: Sustainable Solutions for a Resilient Future

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by

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Abstract

Climate change is one of the most pressing issues that the world is facing. As global warming increases, unprecedented weather patterns could bring a catastrophic impact to people. The Philippines, due to its geographic location, is one of the most-at-risk countries from this climate crisis. Whereas, among all the cities in metropolis, Manila is said to be most vulnerable due to the continued increase in the city's population density, inadequate infrastructure particularly in terms of drainage capacity and its close proximity to the coast. Furthermore, the continuous increase in urbanization has resulted in an alarming rise in greenhouse gas emissions and increase in improper waste management practices which ultimately worsened the city's pollution level. All these problems are very alarming. Finding ways to resolve these is now imperative. The group's proposed solutions were categorized into four areas namely (1) building and enhancing physical infrastructure, including implementing an advanced and intelligent flood control system; (2) improving natural ecosystem level; (3) promoting renewable energy adoption and energy-efficient practices; and (4) acquiring properties to relocate informal settlers and decongest the city. There are also some factors to consider in evaluating the feasibility of each solution such as technology, budget, and stakeholders' commitment to participate. Each proposition needs to be evaluated in the area of its environmental impact, social implications, institutional support and long-term planning and adaptive management provisioning to ensure sustainability. Mitigating the far-reaching impacts of climate change demands an urgent response not just from the government but also from everyone on earth.

Keywords: Catastrophic, Climate change, Economic viability, Eco-system, Sustainability

Situation

Located on the eastern shores of Luzon Island, the city of Manila proudly serves as the capital of the Philippines. As the nation's hub of progress and development, Manila faces a pressing environmental crisis - climate change. Over the years, Manila has been facing the extreme impacts of climate change, ultimately leaving its citizens with no choice but to adapt and lessen the effects of this phenomenon. Thus, it is essential to take immediate action in order to tackle the consequences of Manila's alarming changes in climate. The city may increase resilience and lessen the effects of climate change by adopting sustainable solutions such as improving infrastructure, the natural ecosystem level and supporting renewable energy.

As the chief city and economic center of the nation, Manila is home to a significant population of 1,846,513 Filipinos ("2020 Census of Population", 2021). The city accounts for 14 percent of the total population of the National Capital Region (NCR) and is dubbed as one of the most densely populated cities within the nation (Philippine Statistics Authority, 2021). From 2015 to 2020, there was a consistent upward trend of 0.77 percent regarding the city's annual growth rate. This steady increase in population contributed to a notable increase in the city's population density which escalated to 3.7 percent during the same period. Among the various districts within Manila, areas such as Tondo, Sampaloc, and Sta. Ana have emerged as the most populous. These areas collectively account for a significant 67.5 percent of the city's total population.

Being one of the leading cities in the nation, Manila thrives with a diverse range of booming industries, including commerce, services, manufacturing, and tourism. These industries have become crucial drivers of the city's economic growth, generating jobs and offering numerous opportunities for its citizens. However, the rapid pace of development and urbanization has given rise to several pressing challenges. According to Jiang (2019), Manila was ranked as the "most congested city" among the 278 developing cities in Asia. This unfortunate title highlights the primary issues that the city faces, including severe traffic congestion, pollution, frequent flooding, and inadequate infrastructure, particularly in terms of drainage capacity. These challenges not only hinder the daily lives of Manila's citizens, but also contribute significantly to climate change.

Problem

The Philippines faces a range of challenges related to climate change. Due to its geographical location, it is one of the most at-risk nations from the climate crisis ("Philippines country most at risk," 2019). As a result, Manila more frequently experiences extreme weather events such as powerful typhoons and heavy floods. The issue of flooding in particular, heavily affects a number of areas within the city. Locations such as Blumentritt, Espana, FEU, Lagusnilad underpass, Maceda, Pedro Gil, Quirino Avenue, Taft, Recto, and Rizal Avenue, are highly susceptible to flooding (Zoleta,2022).

Furthermore, due to Manila's close proximity to the coast, it is particularly vulnerable to the effects of sea-level rise. This is crucial as it threatens the communities and infrastructure in the coastal area. According to Cabico (2021), Manila faces the possibility of coastal flooding by the year 2030. This is a result of the critically rising sea levels and inundation of the coast.

Numerous causes such as the rapid pace of urbanization in Manila and the lack of effective urban planning are to blame for these climate-related issues. The continuous unchecked expansion and growth of several urban areas has resulted in an alarming rise in greenhouse gas emissions. This has also caused an increase in improper waste management practices, which has ultimately worsened the city's pollution levels. The inadequate consideration and preparation in urban development plans have ultimately affected the city's ability to withstand and fully adapt to the changing climate conditions.

It is without a doubt that climate change has far-reaching impacts on various aspects of Manila's society and environment. The informal settlers are among the most vulnerable groups affected by this phenomenon. These marginalized communities often reside in low-lying areas or unsafe structures, making them highly susceptible to the adverse effects of extreme weather events, such as floods and storms. Moreover, the agricultural sector is another vital component of Manila's economy that is heavily affected by this phenomenon. Crop production and food security are heavily affected by the unstable weather conditions. This includes constant changes in temperature, irregular rainfall patterns, and an increase in the frequency of droughts. Because of these new conditions, agricultural yields may be significantly reduced and scarce. Thus,

climate change can have a significant impact towards the livelihood of farmers and may threaten the availability of food supply (Hobert & Negra, 2020).

Furthermore, climate change puts a strain on infrastructure systems in the city. The city's existing infrastructure, such as drainage systems and transportation networks, is ill-prepared to cope with the changing climate patterns. Increased intensity of rainfall events may overwhelm drainage systems and rising temperatures may contribute to the deterioration of roads and buildings. Overall, climate change is a pertinent issue that heavily affects the city of Manila and its inhabitants.

Solutions

Given the problems identified, the group identified solutions to address the challenges mentioned earlier. The focus is both to address perennial problems and institute resilience and sustainability. We have grouped the proposed solutions into four (4) categories such as (1) Building and enhancing physical infrastructure, including implementing an advanced and intelligent flood control system; (2) Improving natural ecosystem level; (3) Promoting renewable energy adoption and energy-efficient practices; and (4) Acquiring properties to relocate informal settlers and decongest the city.

1. **Building and enhancing infrastructure and flood control measures.** With the adverse effect of climate change, El Nino is anticipated to cause extreme conditions such as excessive rain and storm tides in the country, resulting in extreme flooding. Witnessing how strong typhoons like Ondoy, Yolanda, Lando, and more, have damaged properties and claimed lives, it is a must for the government to start building an effective anti-flooding structure. We need to construct drainage channels and floodways that will help efficiently manage the excess water during heavy rainfall. Priorities should be given to the flood-prone areas in the city. Once these are in place, there is also a need to develop adequate flood warning systems that provide timely alerts to citizens, enabling protocol response measures. Proper land use planning should be implemented, prioritizing flood avoidance. This refers to limiting the development of urban, infrastructure, and economic activities, particularly in hazard-prone areas. Furthermore,

modifying and constructing structures will significantly help reduce the impact of flooding, such as elevating vulnerable structures.

2. **Improving natural ecosystem level.** This is another solution identified, which refers to Incorporating "urban greening," such as wetlands and environmental buffers. The most common form is installing trees, parks, and landscaped green areas in newly-built urban projects. Another way is provisioning roofs and walls to be covered in plants. Street trees and small pocket parks can also be set up between buildings. In addition, cleaning up waterways and further enhancing policies to lessen water pollution can also be revisited. Managing waste products is still very alarming. Despite the law and ordinances implemented on proper waste segregation and disposal, tons of garbage are seen as causing flood problems. Based on the data from the National Solid Waste Commission (NSWMC), the city accumulated an average of 9,500 tons per day of waste in 2020 (Reyes, 2023). This is forecasted to increase to about 10,400 tons daily in about two years. If uncollected remains, it significantly threatens health and causes extreme flooding.

3. **Promoting renewable energy and implementing energy-efficient practices.** This is another solution where we need to promote and encourage people to use more sustainable practices, such as shifting to biking or battery-operated vehicles to eradicate pollution. These can be done by adding this in the TLE / HELE subjects in school to promote good practice and self-discipline in conserving energy.

4. **Acquiring properties and relocating target families to decongest the city.** This refers to acquiring more properties in rural areas, building low-cost houses, and offering them to families living below the poverty line to decongest the city. DSWD can Identify overpopulated areas and persuade or incentivize them to migrate to nearby provinces.

Evaluations

A. Constraints/ Availability of Resources

All the proposed solutions will only work with the help of the local government and the willingness of citizens to participate. There are factors to consider and constraints to address, such as (1) Technology; (2) Budget; and (3) Stakeholders' commitment to participate.

1. **Technology**.

Ensuring our country leverages the advanced technologies available to combat perennial problems of extreme flooding during the rainy season is essential. We must conduct studies to evaluate the availability and suitability of advanced flood control technologies and renewable energy systems in some target areas. Based on research, many existing pumping stations have been built since the 1970s and are already considered inefficient and underperforming (World Bank, 2017). These can be revisited and assessed for possible upgrades and repurposing. One of the features of Bonifacio Global City (BGC) development is its capability to control floods in the area. The government can tap into the BGC's anti-flooding structure model and replicate the technology with the mechanism for excess water to get poured into detention tanks and then pumped out to nearby creeks and rivers (Webb, 2020). According to the Department of Public Works and Highways, if this project has been done in BGC, this can also be done in other areas in Manila.

2. **Budget**.

Aside from the technology's viability, another constraint that needs to be addressed is the funding needed to secure resources and implement the said infrastructure improvements and renewable energy projects. Based on research, BGC's anti-flooding structure project construction only took eight months to implement, with approximately Php 65M (Webb, 2020) total expenses. According to the Department of Budget and Management, the 2022 overall budget allocation for environmental protection is estimated at Php 24.4B (*2022 People's Proposed Budget*, 2022). This is a good indicator of the project's viability.

3. Stakeholders.

Assuming the technology and budget constraints have been addressed, all stakeholders still need total commitment and participation. Government can help, and some NGOs can do some sponsorship, but we still need highly skilled workers to implement and maintain sustainable solutions. Additionally, we need Filipino citizens to support the project and commit to maintaining the sustainability of all these endeavors.

Overall Sustainability of the Project

1. **Environmental Impact**

The project's proposed solutions present considerable promise for alleviating environmental damage instigated by climate change. By adopting advanced flood control measures that prioritize ecological well-being, we may not only combat climate change but also promote sustainable practices. Therefore, the utilization of renewable energy sources markedly reduces greenhouse gas emissions, which is pivotal in our pursuit of carbon-neutral or even zero-carbon output. Ultimately, preserving our natural habitats and enhancing air and water quality remain supreme amidst our endeavors to reduce toxic emissions from carbon-based pollutants. This shift leads us towards low-carbon economies that encourage sustainable growth and protect biodiversity. Critically evaluating how the adoption of renewable energy sources impacts our environment and what infrastructure enhancements are needed is crucial in working towards accomplishing our sustainability objectives.

2. **Social Implications**

The project's proposed solutions could improve the quality of life for residents in Manila. Effective flood control measures, such as building drainage channels and floodways, can protect communities from the devastating consequences of flooding and enhance their safety by implementing flood warning systems. The project's focus on relocating informal settlers and decongesting the city through property acquisition can create more livable spaces, reduce the vulnerability of marginalized communities, and improve social equity. Additionally, promoting renewable energy adoption can create

new job opportunities, enhance energy access for underserved populations, and contribute to community development.

3. **Economic Viability**

The ongoing success of this project relies heavily on its ability to provide feasible and effective solutions at reasonable costs over time. Although there might be early expenses involved initially, initiatives such as job creation can lead to capitalizing gains over an extended period of time, accompanied by reduced infrastructure damage. Revenue streams from renewable energy propositions can also significantly contribute to a better city economy. Carrying out an extensive assessment of its financial feasibility, including calculations related to cost efficiency, plays a vital role in shaping the project's future.

4. **Institutional Support**

The viability of this project depends on receiving firm support from key institutions. Thus, it is imperative to integrate all relevant stakeholders, including government institutions, key representatives from NGOs, civil society entities, etc., who are committed to sustainability components within their respective fields. By doing so, we significantly increase the chances of successfully implementing sustainable practices and closely monitoring them. To achieve this, it is critical to focus on evolving policies and regulations to create a robust framework. Additionally, strengthening governance structures tied to waste management methodologies, land use planning strategies, renewable energy utilization, and conservation initiatives is crucial to keep this project running for a prolonged period. Furthermore, promoting communal participation while sharing data-driven insights about the said initiative, alongside capacity-building initiatives that educate people about the benefits of sustainable living, will foster stakeholder ownership, ultimately leading to stronger collaboration throughout the sustainability continuum.

5. **Long-Term Planning and Adaptive Management**

To keep the project sustainable on a long-term basis, careful attention is required for both planning and management processes. The best way to achieve that is by using adaptive methods throughout. By continuously monitoring the results achieved from implementing infrastructure innovations, along with natural ecosystem enhancements, and adopting renewable energy sources, we can track progress while identifying areas requiring further work. Regular assessments, particularly relating to greenhouse gas emissions reduction or ecological restoration, are necessary as they provide insights into the effectiveness of these changes over time. In order to be successful in achieving goals, it is necessary to prioritize innovation and research efforts that also include collaboration from stakeholders. Remaining up-to-date amidst new developments is paramount in keeping up with evolving social, economic, and environmental changes.

Addressing these sustainability factors comprehensively yields considerable contributions towards building resilience towards an enduring future for Manila, mitigating intensified effects of climate change whilst prioritizing citizen welfare further impacts overall quality of life.

Conclusion

Mitigating the far-reaching impacts of climate change in Manila demands an urgent response. The evidence of various signs of severe weather patterns (including flooding and sea-level rise) makes it evident that immediate action is necessary if we aim to efficiently combat these challenges. By continuously improving our city's infrastructure with innovative technologies like advanced flood control systems coupled with drainage upgrades, we can better manage extreme amounts of rainfall and mitigate risk factors at multiple levels, ensuring the safety of community members during natural disasters. Moreover, focusing on eco-friendly urban greenery initiatives can considerably reduce pollution from vehicle emissions resulting from traffic congestion or other industrial activities commonly associated with large cities like ours.

Manila's economy stands to grow hand-in-hand with the promotion of renewable energy sources and energy-efficient measures, both of which are viable options to mitigate greenhouse gas emissions while simultaneously addressing the urgent need to combat climate change

head-on. The proposed processes may face technical obstacles, financial constraints, and a lack of engagement from stakeholders. Hence, there is a pressing need for government agencies, local communities, and individuals to collaboratively address and overcome these factors, leading to shared success stories amidst sustainable progress.

To make this possible, the first proactive steps include safeguarding funding requests for advanced technological ventures implemented in planet-friendly initiatives under governmental guidance and monitoring instruments. These steps aim to ensure sustained progress through regular feedback loops, enhancing adaptive management strategies effectively at every necessary step. Gaining active stakeholders' contributions is notably crucial, more than ever before. This requires resolute commitment and championing collective ownership, manifested from within community-rooted governance systems using advanced methodologies that have proven successful against adverse climate change affecting our society and beyond.

Collaboratively arriving at collective agreements on sustainable development practices that adhere to the needs of all stakeholders is paramount for achieving a more equitable and just future.

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