Sustaining Esturial Creeks: Water Corridors in Mitigating Flooding in Manila, Philippines

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Abstract. This paper articulates that estuarial creeks as water corridors are essential part of urban flooding mitigation. These water corridors drain excess water from the city to the bay area reducing inland flooding while at the same time flushing pollutants during tidal changes. Using an institutional analysis, it is argued that estuarial creek rehabilitation in the City of Manila, Philippines is based on mandate, policies, legal frame, and programs. Results show that the estuarial creeks have been silent witnesses to the changing human landscape of Manila. These water corridors in congested Manila have been cleared, cleaned and widened by government agencies but were not maintained as natural space breaks in mitigating flood due to short term targets. Their deteriorating conditions have added to Manila’s waterway misery. In conclusion, the rehabilitation of the esteros is a reflection of the institutional arrangements in managing the waterway system in Metro Manila.

1. Introduction
This paper articulates the plight of the estuarial creeks (Pante, 2019) in the City of Manila. Estuaries are bays where rivers empty into the sea, mixing fresh water with salt water (Cunningham, 2008). They are important waterscapes, nutrient rich, biologically diverse, and productive, providing high ecological values to birds, shellfishes and fishes dependent on the bay’s sustenance. The convergence of freshwater and salt water in the estuary supports habitats and regulates flooding at the same time, salt water that enters during high tide flushes pollutants out of the river system thus cleaning the rivers of pollutants from inland area.

Given the role of the estuarial creeks, the objective of the paper is to illustrate how they can sustainably play important functions in urban climate change related flooding mitigation. It is argued that these waterways, as part of the urban environment, mitigate flooding during heavy rainfall, thus have to be managed efficiently. This paper looks into the institutional arrangements in managing these waterways, both top-down and bottom-up approaches.

There are many management strategies implemented to improve water flow of river systems. Two major approaches widely used are the top-down approach and bottom-up approach. The top-down approach stems from government initiatives in managing the river system, and in the Philippines, the Pasig River Rehabilitation Commission (PD 274) included the clearing of the estuarial creeks to improve water quality; the Metropolitan Manila Development Authority (RA 7924) is another government agency that prioritizes estuarial creeks in urban development. Moreover, the Department of Environment and Natural Resources has various programs to clear and clean the esteros together
with the Pasig river and Manila Bay. Definitely, waterways management could not be possible without financial assistance. The Asian Development Bank in 2010 committed to promoting urban regeneration, including estuarial creeks, with a $200 million grant. On the other hand, the Maynilad Water Services Inc. has invested PhP 1.1 billion since 2018 for the following three years in the rehabilitation of five esteros in Manila in support of the government efforts in cleaning the Manila Bay. They will lay out sewer lines to catch waste flow from Maynilad customers along the creeks. Additionally, technology application is essential in improving the river system such as GIS (Cherqui, 2015), aeration (Pasig River Project, 2009), and riverbank rehabilitation (PRRC website). However, there is no single good approach in river management simply because there are many needs to be addressed.

Manila, a low-lying coastal city in the Philippines is located along the estuarine of the Manila Bay. The city is often flooded due to its low elevation, vulnerable to rainfall or tidal changes. Thus, the urban communities in Manila often experience flooding especially those located along coastal areas of Manila Bay who live side by side with flood waters during the rainy season/monsoon and high tide. Manila is geographically divided into two by the Pasig river draining into the Manila bay. The Pasig river connects the Laguna lake on one side and the Manila bay on the other side. And on both sides of the Pasig river are highly congested urban cities interwoven with estuarial creeks locally known as “estero”. The esteros are also known as rivulets, or small streams that sit side by side with Metro Manila.

2. Ecological services of the esteros in Manila
The esteros are part of the freshwater ecosystem linking Pasig River with other rivers and Manila Bay. They are narrow, long winding bodies of water that intersect with communities, commercial areas, institutional areas, wet markets, and churches. In earlier times, they provided food, livelihood, and domestic waters to the estero communities. They were used for transportation from the Pasig river to different parts of the city and neighboring provinces. The esteros were important economic hi-ways then. Moreover, the waters of the esteros were used for washing clothes, swimming, and other domestic water uses.

According to Orbos (2020), the esteros interwoven with the Pasig river were the main thoroughfare carrying passengers and cargo up to the plains of what is now Quezon City and Rizal province. As esteros are connected to the bay,tidal salt water brings in nutrients and freshwater from the Laguna lake and brings out pollutants to the bay area. For most of the Manilenos, the esteros served as a source of fishes, provided transportation, and flood control (Orbos, 2020).

3. Social landscape of the estero
Manila, as a city of esteros, is the economic, social, political, and institutional center of the Philippines. As the central business district, the estero rank among the natural environments most affected by humans. People encroached their vicinity and defined their uses. The easements on both sides of the esteros were occupied by shanties and the waterways receive all the wastes generated by surrounding communities as well as pollutants coming from factories and industries. Informal settlement families (ISF) prefer the free tax easements of the esteros as these waterways are accessible to the markets, schools, and job opportunities. Most of the wet markets in Manila are located near the esteros, coupled with schools and churches.

Through time, the esteros became congested, as waterways were clogged with shanties and garbage. Some esteros were reclaimed for roads and establishments. Others became part of the ISF household as washing area or toilets. As Manila experienced flooding events, both ISF and esteros became vulnerable. As the ISF have been evacuated during flooding seasons, the estero has been left to receive garbage and wastewater. After the floods, the ISF would return to their shanties with murkier esteros and life continues.
Figure 1. Hydrologic map of Map showing the various.

Source: Manilla City Hall

The esteros weave communities so that they are accessible to central business districts. Many have been obliterated and those surviving ones are endangered. In some cases, these esteros have been abused and stripped of their dignity as part of the natural environment of Manila. The water quality has deteriorated, sediments are highly contaminated with heavy metals, and flotsams are everywhere. They are now critical areas whose rehabilitation needs a lot of hard work.

4. Institutional arrangement in managing the esteros

The esteros in Manila as public spaces vulnerable to public abuse are managed by government agencies and the local government units. Both the national government agencies and local government units are enjoined to clean the Pasig river systems including the esteros in accordance with Republic Acts of Ecological Solid Waste Management (RA 9003) and Clean Water Act (RA 9275).

The Metropolitan Manila Development Authority (MMDA, RA 7924), formerly Metropolitan Manila Commission (PD 824) organized in 1975, is an agency directly under the Office of the President. As an agency, MMDA performs planning, monitoring and coordinative functions, and in the process exercises regulatory and supervisory authority over the delivery of metro wide services within Metro Manila without diminution of the autonomy of the local government units concerning purely local matters (mmda.gov.ph). It has a Flood Control and Sewerage Management Office (FCSMO) which controls the formulation and implementation of policies, standards, rules and regulations, programs and projects for an integrated flood control, drainage and sewerage system (mmda.gov.ph). Specifically, MMDA manages the operations of the flood control pumping stations constructed at the mouth of the estero. These pumping stations mitigate flooding in Metro Manila, as they pump out excess water through the Pasig river. Aside from maintaining and upgrading these stations, the MMDA has annual waterway clearing operation like dredging especially during summer season. MMDA initiated the “Esteorro Blitz” activities in 2011 and collected more than 23 million cubic meters of debris in clearing 96 esteros in Metro Manila (emb.gov.ph).

The Pasig River Rehabilitation Commission (PRRC) was a state commission in charge of the rehabilitation of the Pasig River (PD 274). The commission served for 20 years, from 1999 until its dissolution by President Rodrigo Duterte in November 2019 (EO 93). The main goal of PRRC was to improve water quality of the Pasig River, including the esteros, to class C. However, the agency was not able to deliver its goal due to overspending and corruption, thus was abolished in 2019 and management of the Pasig River is now under the Department of Environment and Natural Resources.
The Department of Environment and Natural Resources (DENR) is the policy making and implementing body of the natural environment in the country. The master plan of DENR for the Pasig river is to harness the Pasig River’s potential for transportation, recreation and tourism purposes while undertaking the rehabilitation and restoration of its marine life. The agency initiated an “Adopt an Estero” program allowing the private sector to collaborate on improving its water quality. It was launched in 2010 and a total of 569 companies and groups have partnered with DENR to clear esteros nationwide (denr.gov.ph).

In the Executive Order of President Duterte (EO 93), the Environment Department wishes to remove the dumping of untreated industrial wastewater and sewerage into the river, including violations of Presidential Decrees 948 (referring to the National Pollution Control Commission, 1976) and Presidential Decree 274 (referring to the preservation, beautification, improvement and gainful utilization of the Pasig River, providing for the regulation and control of pollution of the river and its banks in order to enhance development, thereby maximizing its utilization for socio-economic purposes).

Part of the Executive Order (EO 93) is the institutional role of MMDA and DPWH in ensuring the dismantling and removal of all structures, constructions, and other encroachments established or built along Pasig River. The two agencies are also tasked to dredge and clear the Pasig River as well as all the estuaries, and waterways that drain into it. Moreover, it is stipulated that MMDA and DPWH can coordinate with the Department of the Interior and Local Government (DILG), concerned local chief executives, and the Philippine National Police Maritime Group (EO 93).

The Department of Interior and Local Government (DILG) is the government agency directly managing the local government. Memorandum Circular No. 2019-09, 2019 states that local government should implement solid waste management (RA 9003) and improvement of water quality within their jurisdiction. In its circular (2019-09), the DILG directed 178 LGUs and 5,714 villages inside the Manila Bay Watershed Area to “fulfill their roles and responsibilities pursuant to environmental laws that contribute to the rehabilitation of Manila Bay.” The agency cited in the memorandum Section 20 of the Philippine Clean Water Act of 2004, which provides that LGUs “shall share the responsibility in the management and improvement of water quality within their jurisdictions”. In addition, the LGUs must organize clean-up drives to include coastal areas and inland water systems, at the same time encouraging participation and collaboration from different interest groups.

The Barangays and river warriors. The local government are expected to participate in Manila Bay renewal activities by conducting weekly clean-up drives in their communities and leading the eco-waste management in their respective areas (DILG Memorandum 2019-07). The DILG warned that failure to comply with the order may result in administrative charges and suspension or dismissal from government service. On the other hand, community-based river warriors were organized to monitor the esteros, but after some time, only few committed members remained due to lack of funding support.

National laws and local ordinances were implemented to protect the water quality of the esteros. Out of the 47 tributaries of the Pasig River System, ten (10) had been rehabilitated under the Pasig River Rehabilitation Commission programs, three (3) under the Department of Public Works and Highways programs, and one (1) under the non-government organization “KapitBisig Para sa Ilog Pasig” program (Pasig River Rehabilitation, 2014). The ten (10) rehabilitated tributaries includes Estero de Paco, Estero de San Miguel, Estero de Concordia, Estero de San Sebastian, Estero de Aviles, Estero de Balete, Estero de Sampaloc, Estero de Valencia, Estero de Quiapo, and Estero de Uli-Uli. Under the defunct Pasig River Rehabilitation Commission, activities in the Pasig river and the esteros were:

- Social Preparation and Relocation
- Riverbed Deepening
- Easement Recovery
- Solid Waste Management and Point Source Pollution Control
• River Warriors
• Bioremediation
• Academic Institution and Stakeholder Partnership
• Climate Change Mitigation and Adaptation

It is a big challenge for the government to rehabilitate all the esteros at the same time. The model used in estero rehabilitation is the Estero de Paco in 2009. It underwent massive dredging and widening, that a total makeover took place. Relocation of informal settlement families took place in the municipality of Calauan, in the province of Laguna, an agricultural area south of Manila. Aerators were put up in strategic places of the esteros to improve water quality while anti-erosion plants were planted on the banks. Easements were redefined to construct a walkway for the residents. More importantly, river warriors from the communities were organized to monitor and clean the easements of the esteros. The cleaning and clearing of Estero de Paco became a media sensation because of the massive participation from schools, private sector and local government as well as pouring of funds for the rehabilitation. However, the Estero de Paco is just one of the esteros, there were other esteros being cleared and cleaned but the process would take time. Thus, shanties come and go depending on the esteros being rehabilitated.

The esteros as a water corridor and space break, if functioning efficiently, would mitigate climate change related flooding. However, in spite of rehabilitation technology and facilitation of the government, the esteros continue to deteriorate. There were many programs organized to clean the esteros: “Battle for Rivers and Esteros”; “Battle for Manila Bay”, “Manila Bayanihan para sa Kalikasan” but rehabilitating the esteros and rivers are long battles to fight. Aside from the various agencies, the private sector including the industries along the esteros collaborate with the government in cleaning the esteros. The water corridors as part of the natural environment need total commitment to conserve from the community members.

5. Conclusion
Government institutions and private sector working in estero rehabilitation have limited connectivity with the esteros. Their connectivity is based on mandate, funding, regulating functions and technology providing short term solutions. But the local executives and communities as residents and primary stakeholders have a strong bond with the estero as it is part of their natural environment and serve them well. They should be responsible in sustaining the esteros as space break. The esteros connect people with the natural environment. As such, commitment should include more than cleaning but also ecological renewal. The surrounding communities should give value to the esteros to enhance the regulating and supporting services. These esteros, if sustainably managed, would enhance walkability in the city as they connect districts, commercial areas and institutions. The esteros provide shorter routes so sectors at the “bottom of the pyramid” could save transportation cost. In spite of the clearing and cleaning programs, most of the ISF do not give value to rivers and estero. Instead, the waterways were used as a sink for sewage and drainage. This paper argues that sustainability of water corridors should cover more than the physical renewal of the esteros but also ecological renewal of estero communities. The esteros are more than a physical waterway, it is an essential component of the urban social fabric.

6. Recommendation
The paper recommends massive sustainable Information, education, communication campaign and rehabilitation training program on estero management. This is based on the argument that estero communities are the first line of defense during flooding. As such, a murky and polluted estero is hazardous to the well-being of the local communities, thus estero communities should be knowledgeable on their ecological responsibilities in estero management, that is to protect the estero so the latter can protect these surrounding communities in return. The problem is, the residents knew that the government agencies would take care of them thus they left the maintenance of the esteros to
these agencies to dredge and widen. People should be the first to protect the waterways because it means protecting themselves and their daily social lives. And, institutional arrangements with agencies should act as a support system. Not the other way around.

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