



The Resilience of Urban Areas in the Face of Flooding: *A Study on Livability of the Artex compound, Philippines*

Samuel Belderink
Technical University Delft, 2023
History Thesis
Proffesor: Dan Baciú

Content

1.	Abstract	p.3
2.	Introduction	p.4
3.	Literature review	p.5
4.	Method	p.7
5.	Intro Artex Compound	p.8
6.	Historical timeline Artex	p.9
	6.1 Map area	
	6.2 Usable Maps	
7.	Results of Historical Map Study	p.11
	7.1 Chosen typologies	
	7.2 Analyzed Maps	
	7.3 Existing delta landscape	
	7.4 General trends	
	7.5 Green sea buffer	
	7.6 Green local buffer	
	7.7 Recovery of urban structures	
	7.8 Vulnerable area	
8.	Results analyzing documentary and local news papers.	p.16
9.	Conclusion	p.17
10.	Discussion	p.18
11.	References	p.19

Image 1. A.Rivera, flooded street.



1. Abstract

This research investigates whether urban areas can remain liveable when permanently flooded, using the case study of Artex Compound in Malabon, Philippines. The study addresses several sub-questions, including the impact of permanent flooding on the existing urban structure, the relationship between water, greenery, and buildings, and the effect on people's lives. The findings provide insights into how to cope with permanent flooding and maintain the sustainability of urban areas.

Global warming and climate change have led to an increase in the frequency and severity of floods worldwide, with coastal cities and low-lying areas particularly vulnerable. By 2050, the number of people living in cities at risk of coastal flooding and sea-level rise could reach 150 million worldwide. Therefore, learning how to live in permanently flooded cities is essential for maintaining urban areas that would otherwise be uninhabitable.

The study uses a two-way approach combining quantitative and qualitative research to examine the Artex Compound. Quantitative analysis involves examining Google Earth historical maps to identify changes in the physical structure of the area, while qualitative analysis involves gathering information from documentaries and local newspapers to gain insight into the daily lives of residents. The study analyzes changes in typologies such as structures, water, and greenery to explore their correlations and relationships, and uses interviews to understand the residents' experiences and perceptions of living in a permanently flooded area.

The results of the historical map study show that flooded urban areas are highly vulnerable to weather events, with significant impacts on greenery and water levels. The positive impact of greenery on the resilience of urban structures highlights the importance of incorporating green infrastructure into urban planning strategies. However, residents of permanently flooded areas face significant challenges, including limited job opportunities and access to clean water. Despite these challenges, many residents choose to stay because it is the only place they can afford to live.

Overall, the study highlights the complex challenges and opportunities of permanent flood cities, and underscores the importance of incorporating resilience and sustainability considerations into urban planning and policymaking. While further research is needed to develop a more nuanced understanding of the livability of permanent flood cities, this study provides a valuable starting point for future investigations.

2. Introduction

In recent decades, global warming and climate change have led to an increase in the frequency and severity of floods worldwide. Coastal cities and low-lying areas are particularly vulnerable, and it is predicted that a lot of urban areas will be threatened by floods within the next 50 years. According to a report by the World Bank, by 2050, the number of people living in cities at risk of coastal flooding and sea-level rise could reach 150 million worldwide. This poses a significant challenge for urban planners, architects, and policymakers who must consider the long-term sustainability of these cities. Therefore, it is essential to learn how to live in permanently flooded cities, as it may be the only way to maintain urban areas that would otherwise be uninhabitable.

A permanent flood is a situation in which an area remains flooded for an extended period of time, typically more than a few weeks. This can occur due to a variety of factors, including sea-level rise, heavy rainfall, and river overflow. The impact of a permanent flood on people's daily life can be significant, with many of the basic necessities of life, such as housing, food, and water, becoming inaccessible. The impact on infrastructure, including transportation, utilities, and healthcare, can also be severe.

Several cities are at risk of being permanently flooded, including New York, Miami, Tokyo, and Mumbai. These cities have large populations and significant economic and cultural significance. According to a study by Climate Central, by the end of the century, 1,000 U.S. cities and towns could be permanently flooded due to rising sea levels. In Asia, a 2019 report by the United Nations Development Programme (UNDP) identified 19 cities in the region that are at risk of being permanently flooded by 2050, including Bangkok, Ho Chi Minh City, and Jakarta.

The main question of this research is to give answers to the question: Can urban areas still be livable when they are permanently flooded? To fully understand the impact of such an event on urban areas, several sub questions must be addressed.

Firstly, what is a permanent flood city? This question seeks to understand the duration and extent of flooding that can be considered permanent. It also considers the causes of flooding, such as sea-level rise, storm surges, and river overflow. Secondly, how does a permanent flood affects the existing urban structure? Third, is there a relationship seen between the amount of water, greenery and buildings? In addition, how does a permanent flood affect people's lives?

For this research, it will focus on a specific case study, the Artex Compound in Malabon, Philippines. This neighborhood was flooded in 2004, but the water never receded back into the ocean. As a result, the people in this area had to adapt to a new way of living, one that involves permanent flooding. The Artex Compound is an excellent case study to explore the impact of permanent flooding on urban areas and the strategies people use to cope with it.

3. Literature Review

This literature review explores the impact of flooding on the Artex Compound in Malabon, Philippines. In 2004, the area experienced a major flood that has since made it prone to frequent flooding, leading residents to adapt to living in a perpetually submerged environment. To better understand the changes that have occurred in the Artex Compound over time, this review will analyze several sources of information, including historical maps of the area from June 2006 to October 2022, a documentary from Deutsche Welle called “Life in ‘the Venice of Malabon,’” and two secondary sources. The first secondary source is an article called, “Inside the Artex Compound, the ‘Venice of Malabon,’” and is written by Bryle B. Suralta for Esquire Philippines, and offers an insight of the daily lives of residents in the compound, their experiences with flooding, and their strategies for coping with this challenging environment. The second article, “The Floating World of Artex,” is written by George P. Moya for a local Philippine news website and provides an in-depth analysis of the impact of flooding on the Artex Compound and the broader Malabon community. By synthesizing information from these diverse sources, this literature review aims to provide a comprehensive understanding of the effects of flooding on the Artex Compound and to offer insights into the ways in which residents have adapted to their environment.

Historical maps are a valuable source of information for researchers seeking to understand the impact of flooding on urban environments. By examining maps of an area over time, it is possible to identify changes in the landscape, including changes in the course of rivers and the expansion of bodies of water due to flooding. In the case of the Artex Compound in Malabon, Philippines, historical maps can provide valuable insights into the extent and frequency of flooding in the area since the major flood event in 2004. It can provide changes being clearly seen in the urban structure of the neighborhood, and how these structure changed overtime due to the flood.

However, there are also limitations to using historical maps as a research method. For one, maps can only provide a bird’s-eye view of an area and do not offer insights into how flooding has affected people’s lives on the ground. Additionally, historical maps may not always be accurate, particularly in areas where rapid development has occurred. Maps from different time periods may also have different levels of detail, making it difficult to compare changes in the landscape over time. According to the maps from this particular area, there are gaps between maps, whereas in one year there are 10 available maps, and in another year there are none. There is the risk that these maps will not provide a continuous set of data over the time period.

Another potential drawback of using historical maps is the issue of data availability. Maps from certain time periods may be difficult to obtain or may be incomplete, making it challenging to develop a complete picture of how an area has changed over time. This is the case in 2006 and in 2012 where there are no available maps made. Finally, it’s worth noting that historical maps may be from bad quality. A lot of giving maps are incorrect or include lines covering the map. Despite these limitations, historical maps remain a valuable tool for this research seeking to understand the impact of flooding on urban environments.

The use of documentary films as a source for research has gained increasing popularity in recent years. One such documentary that will be used in this study is “Life in the Venice of Malabon” produced by Deutsche Welle. The benefits of using this documentary as a source of data are numerous. First, it provides a unique and personal insight into the lives of the residents of Artex Compound. Through interviews and visual footage, the documentary captures the emotional and psychological impact of living in a permanently flooded city, providing a detailed understanding of how this has affected the daily lives of the residents. This is especially important as it allows for a more nuanced understanding of the experiences of those affected by the flood.

Second, the documentary provides an opportunity to observe the physical impact of the flood on



Image 1. A.Rivera, transportation in the compound.

the urban environment. This includes the conditions of buildings, roads, and other urban elements after the flood. This data can be used to inform future city planning and disaster management strategies.

However, it is important to acknowledge the limitations of using a documentary as a source of data. One of the main disadvantages is that the amount of interviews taken may be limited. This means that the experiences of some residents may not be fully represented. Additionally, a documentary may provide a superficial view of how people live as it focuses on selected individuals and may not capture the full range of experiences. Finally, data extracted from a documentary is not always translatable into numbers or measurable data. It is important to recognize that the observations made through a documentary are subjective and may not be easily quantified.

4. Method

This thesis examines the Artex Compound, a flooded neighborhood, through a two-way method that combines quantitative and qualitative research. For the quantitative part, Google Earth historical maps are used to identify changes in the physical structure of the area over time. For the qualitative part, information is extracted from documentaries and local newspapers to gain insight into the daily lives of the inhabitants of the Artex Compound.

The qualitative method focuses on analyzing maps from 2001 to 2021 and dividing them into typologies such as structures, water, and greenery. By examining these maps, we identify interesting correlations and explore the relationship between different typologies, particularly how changes in one affect the other. This approach provides a better understanding of the neighborhood's development over time and the impact of the permanent flood on its inhabitants. However, the maps provide limited information, such as the specific functions of buildings, which can limit our ability to draw conclusions about the resilience of different structures to flooding.

The quantitative method involves analyzing newspapers, documentaries, and articles where residents of the Artex Compound were interviewed. This approach provides insight into the daily challenges that the inhabitants face and how they cope with living in a permanently flooded area. We also explore their perceptions of the neighborhood, whether it feels like home, and if they have adapted to the unique circumstances of their environment. While documentary and newspaper interviews provide valuable insights into the lived experiences of the residents, they may not be representative of the experiences of the entire community. Therefore, we must exercise caution when drawing conclusions based on the data gathered through interviews.

The combination of quantitative and qualitative research methods provides a comprehensive understanding of the Artex Compound and its inhabitants. While the maps provide valuable information on the physical development of the neighborhood, the absence of information about the functions of buildings limits our understanding of how the neighborhood has changed over time. Similarly, the qualitative data obtained from interviews may not be representative of the experiences of the entire neighborhood. However, the study's findings provide valuable insight into the daily lives of the residents and can inform future policy decisions aimed at improving the resilience and quality of life of the Artex Compound's inhabitants.

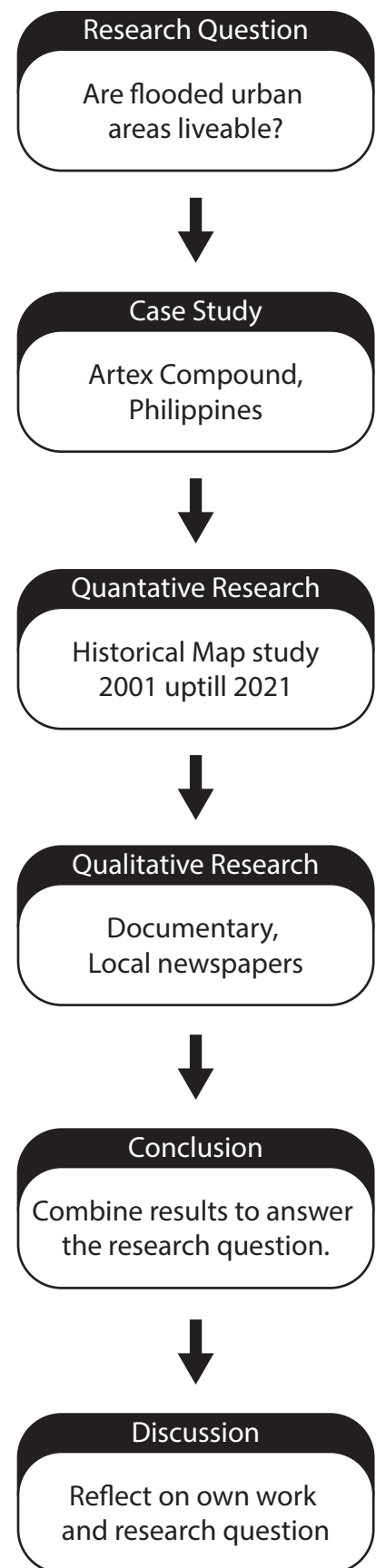


Figure 1. Diagram of research method

5. Artex comound (Case Study)

The Artex Compound, located in Malabon City, Philippines, is a flooded urban area that has been home to approximately 200 families since 2004. These families have not seen the land where their houses stand in the last decade. The compound spans eight hectares and was originally built as housing for workers of Artex Yupangco Textile Mills Corporation, one of the largest textile manufacturers in the Philippines in the 1970s.

In 1984, the workers of Artex Yupangco Textile Mills Corporation went on strike, claiming they were underpaid and complaining of inhumane working conditions. The management allegedly said the workers' low wages were compensated by the rent-free housing they provided. However, the workers refused to vacate the housing compound unless their demands were met, resulting in an impasse.

Artex Yupangco Textile Mills Corporation ceased operations in 1989, partly due to the labor row and partly due to the worsening flood situation in Malabon. The housing compound that was once home to its workers became a permanent catch basin for rainwater due to several factors. Many fishponds were turned into relocation sites for informal settlers and gated villages for the moneyed class, while the rapid urbanization of Malabon saw surrounding roads being elevated, leaving Artex as the lowest lying land in the entire city.

Despite the compound being flooded for years, the families who live in Artex continue to call it home. The challenges they face are immense, from the constant threat of flooding to the lack of basic amenities and services. However, they remain resilient and determined to hold on to the place they call home. The Artex Compound is a testament to the struggles faced by many urban poor communities in the Philippines and around the world.



Image 3, the Artex Compound in 1989 when the textile factory was still open.

6. Historical Maps Timeline

The study of historical maps is a fascinating way to understand the evolution of the Artex Compound neighborhood over time. In this case, we will be using a collection of 22 maps gathered from Google Earth Pro. These maps were carefully selected based on their quality, ensuring that they would be useful for our study. The maps span a period of 15 years, beginning in January 2006 and ending in February 2021. By examining these maps, we hope to gain insight into the changes that have occurred in the Artex Compound over the years, and to better understand the history of this unique neighborhood.

6.1 Map area:

Choosing the right map to represent a certain area is crucial in providing an accurate depiction of the surrounding environment. In the case of the Artex complex, it was important to consider various factors such as water, greenery, and the overall landscape. The complex itself may have been a small neighborhood, but it was essential to incorporate the surrounding elements to provide a comprehensive understanding of the area.

Initially, a larger map that included the entire factory area of the textile business Artex was selected. However, this map proved to be too extensive, and it was difficult to discern important details of the Artex compound itself. Therefore, a second map was chosen to examine the different events occurring within the complex.

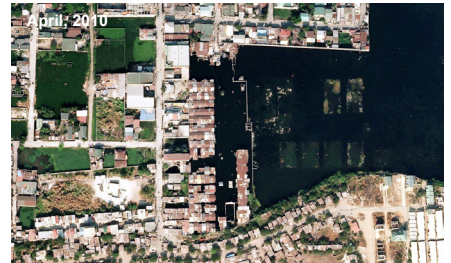
The second map allowed for a closer look at the Artex complex and its immediate surroundings. It displayed various buildings within the compound, including the main factory, warehouses, and administrative offices. Additionally, it highlighted the locations of important landmarks, such as nearby bodies of water, forests, and other greenery.

By selecting a map that accurately represented the Artex complex and its surroundings, it was possible to gain a better understanding of the events that occurred in the area. This allowed for a more thorough analysis of the complex's history and development, providing valuable insights for researchers and historians alike.



Image 1, Three historical Google Earth maps, 2006 and 2018

6.2 Usable Maps (2001 -2021):

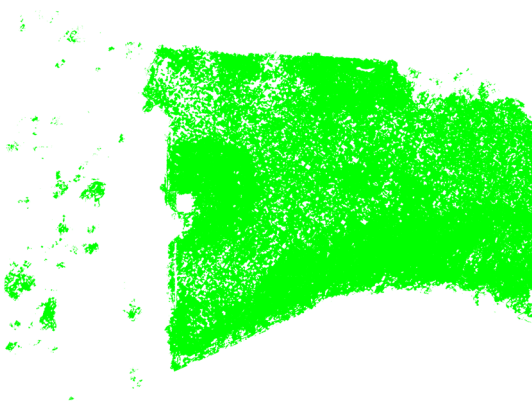


7.Results of Historical Maps study

Building map



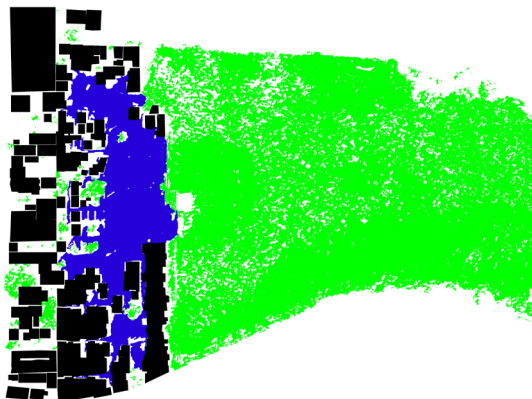
Greenery map



Water surface map



Combined map



7.1 Chosen typologies

The original historical maps have undergone editing to render them functional for analysis. However, the information contained in these maps is often limited, and as a result, the analysis has been focused on three key features: green spaces, water bodies, and structures. By examining these features, valuable insights have been gained into the historical landscape.

One of the significant findings from this analysis has been the identification of general trends and correlations between the three types of features: greenery, water, and buildings. By examining the maps, we can see how the presence or absence of one type of feature often corresponds to the presence or absence of the others. For example, maps with extensive green spaces often have more water bodies, while those with fewer green spaces often have more structures.

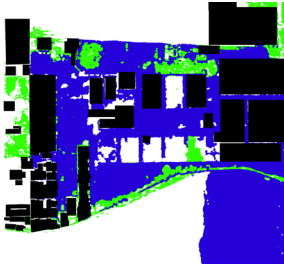
Another important discovery is that weather events have had a profound impact on the landscape over time. In particular, typhoons and rising water levels have caused significant changes, and these changes are visible in the edited maps. For instance, maps that show an increase in the level of water after a typhoon often correspond to a decrease in green spaces or an increase in the number of structures in the same area.

Overall, the analysis of these edited historical maps has shed light on the past landscape and the ways in which it has changed over time. By focusing on key features and identifying correlations and trends, we can gain a deeper understanding of the historical context and the factors that have shaped it.

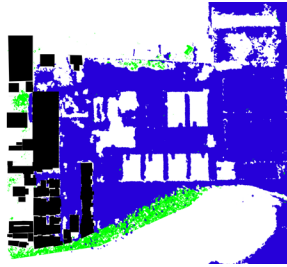
Figure 1 to 4, typologies of edited historical maps

7.2 Analyzed Maps (2001 -2021):

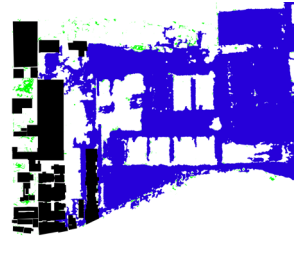
June, 2001



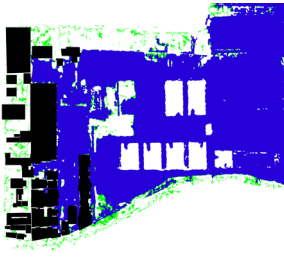
November 2004



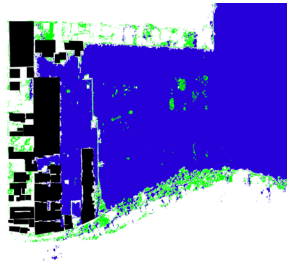
January, 2005



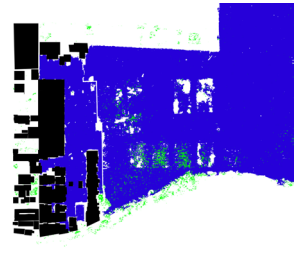
March, 2007



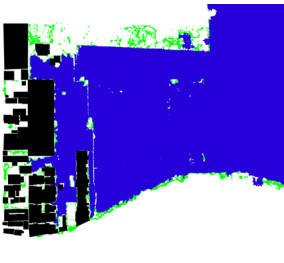
December, 2009



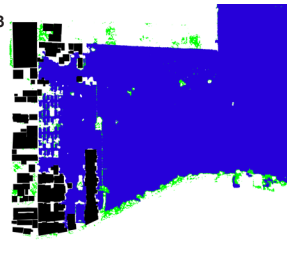
April, 2010



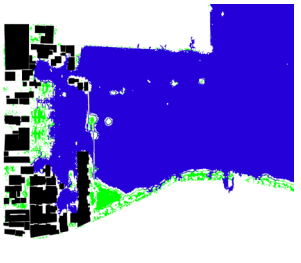
April, 2011



September, 2013



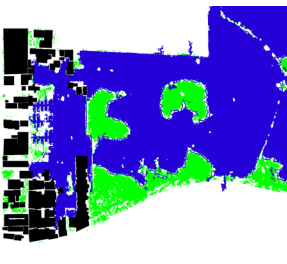
January, 2014



February, 2014



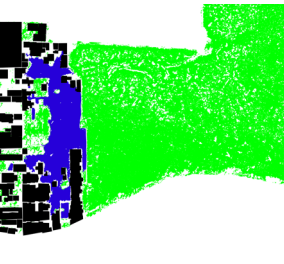
March, 2014



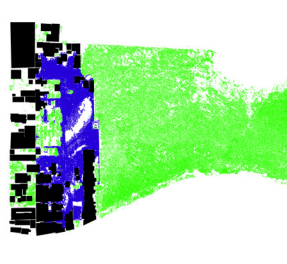
September, 2014



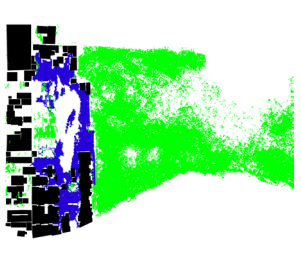
November, 2014



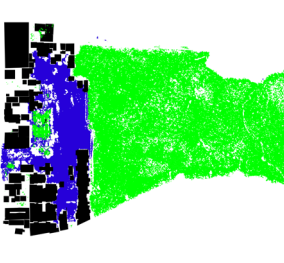
March, 2015



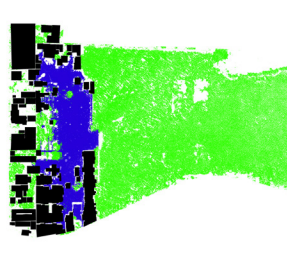
April, 2015



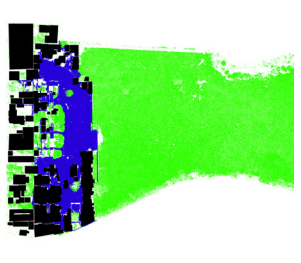
September, 2015



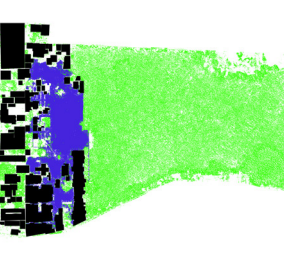
March, 2016



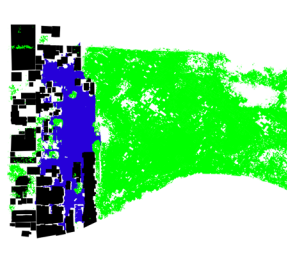
April, 2017



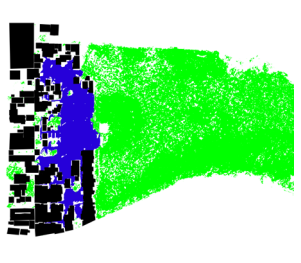
March, 2018



February, 2020



February, 2021



7.3 Existing delta landscape

June, 2001

What is clearly seen in the maps of the Artex Compound is that the neighbourhood already was mixed area of dry and wetland. Before the known flood happened in 2004 which flooded the whole neighbourhood and vanished a great amount of buildings, the people where already familiar with living with and around water.

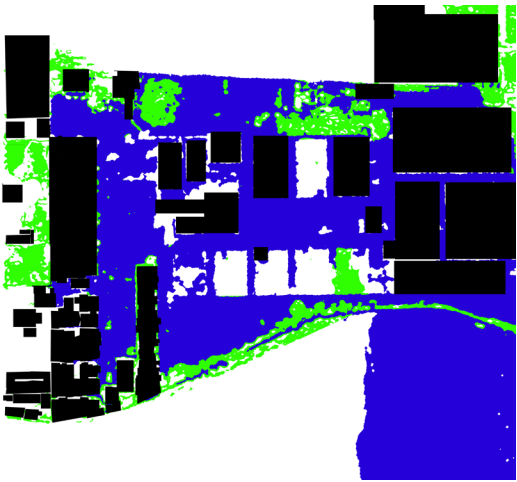


Figure 1, Existing delta landscape

7.4 General trends

There was a significant increase in greenery in the Artex Compound following the devastating Yolanda typhoon. This was followed by a year of unusually high temperatures, which led to a dramatic growth of vegetation throughout the bay area adjacent to the compound. As a result, the water level in the bay decreased significantly, leaving only the low-lying areas of the Artex Compound still covered by water.

Despite the challenges posed by the changing landscape, the residents of the Artex Compound continued to adapt and find ways to make use of the new conditions. The increase in greenery brought new opportunities for agriculture and other activities, while the reduced water levels created new areas for expansion and development. However, it is important to note that these changes also brought new risks and challenges, as the ecosystem of the bay was disrupted and the residents had to find ways to protect themselves from potential flooding and other hazards.

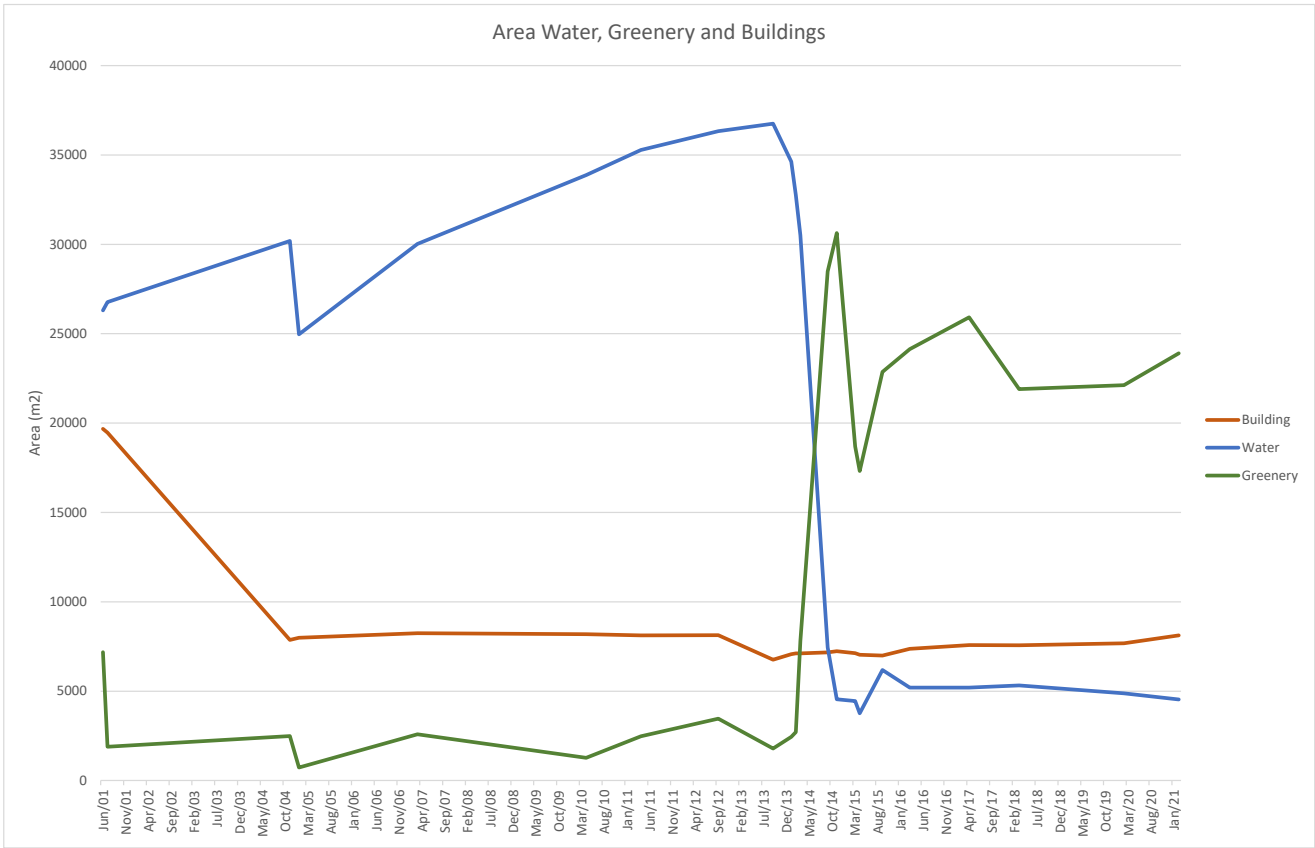
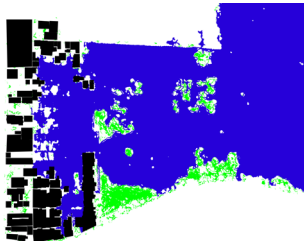


Table 1. Surface areas of greenery, buildings and water in the Artex Compound

7.5 Green sea buffer

In 2014, the water adjacent to the 'Artex Compound' gradually transformed into a thriving marshland, which served as a natural green buffer against high tides and waves during cyclones. This valley, which flows into the ocean, was completely overrun by greenery within a year, effectively creating a protective green sea buffer for the Artex Compound. In the analyzed below it is shown how rapidly this sea buffer grew.

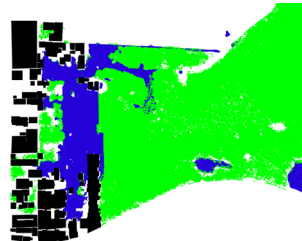
February, 2014



March, 2014



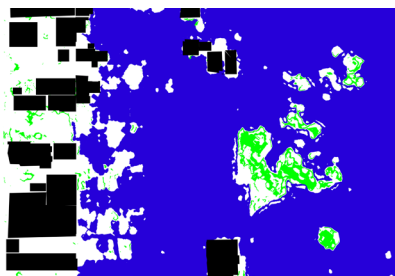
September, 2014



7.6 Green local buffer

Following the second deadliest cyclone, Yolanda, to hit the area in 2013, greenery began to grow on the existing foundations, acting as a local green buffer. From September 2013 to November 2014, the greenery grew rapidly and formed a natural wall that protected against tides. Subsequently, rebuilding efforts began on these foundations in November 2014 and continued until February 2021. This natural growth phenomenon not only provided a protective barrier but also demonstrated the resilience of the local ecosystem in the face of natural disasters. .

February, 2014



March, 2014



September, 2014

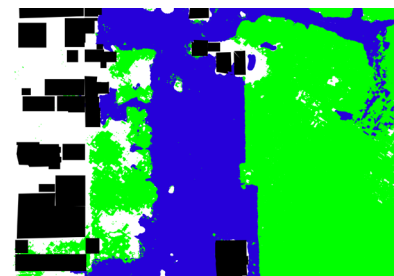
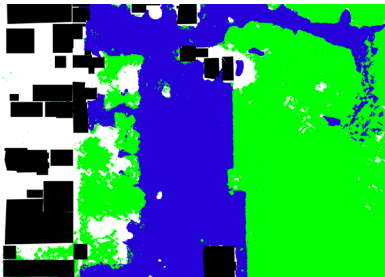


Image 4. Greenery on existing structures

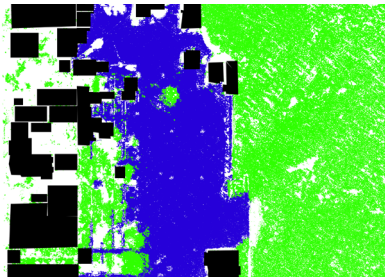
7.7 Recovery of urban structures

Following a devastating flood in 2004, the area of built structures in the region plummeted from approximately 20,000 m² in 2001 to just 8,000 m² in 2004. The aftermath of Typhoon Yolanda in 2013 further reduced the area by another 2,000 m², bringing the total to just 6,758 m². However, the Artex compound gradually recovered from this low point, and by fostering the growth of greenery, the building area slowly increased to a little over 8,100 m². There is a direct relationship between the growth of greenery and the area of built structures, which can be attributed to the two events that occurred: the Green Sea Buffer and the Green Local Buffer. The rebuilding and recovery of the local community is seen clearly in the maps below.

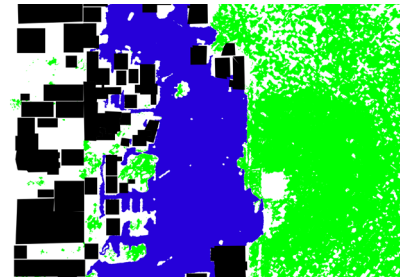
September, 2014



March, 2016



February, 2021



7.8 Vulnerable area

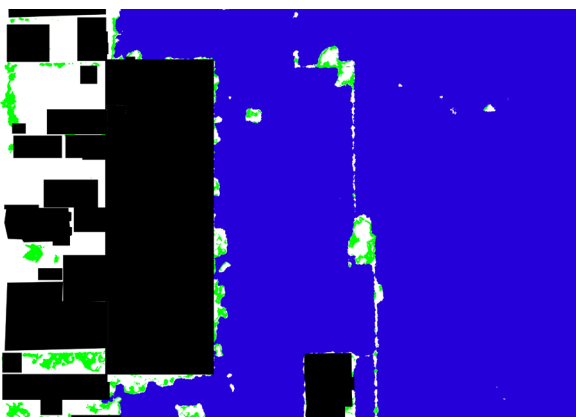
The Artex Compound, a sprawling residential complex located near the coast, has always been at risk for flooding. However, after the devastating flood of 2004, the vulnerability of the houses on the edge of the compound became even more apparent.

The flood of 2004 blurred the line between the city and the ocean as water inundated the area. The houses located on the edge of the compound, which were already at risk, were the most vulnerable during the flood. As a result, many of these houses were destroyed.

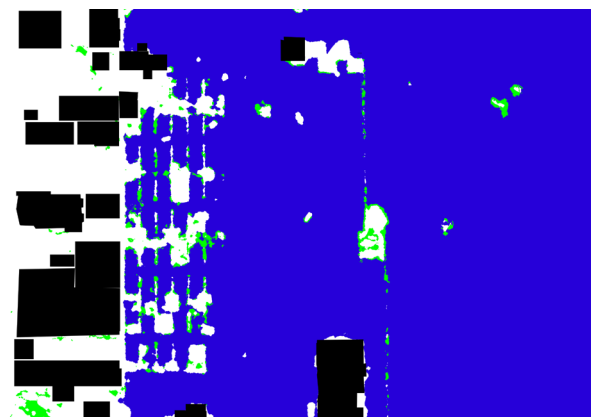
The vulnerability of the Artex Compound to weather events was highlighted once again in 2013, when Typhoon Yolanda hit the region. The maps of the area after the typhoon clearly show that the urban flooded areas were particularly vulnerable, with many of the working houses in the compound completely destroyed.

The destruction caused by the flood and the typhoon serves as a reminder that urban flooded areas are incredibly vulnerable to weather events. As climate change continues to cause more extreme weather events, it is essential that cities take steps to prepare for the impact of these events.

April, 2011



September, 2013



8. Results analyzing documentaries and news sites.

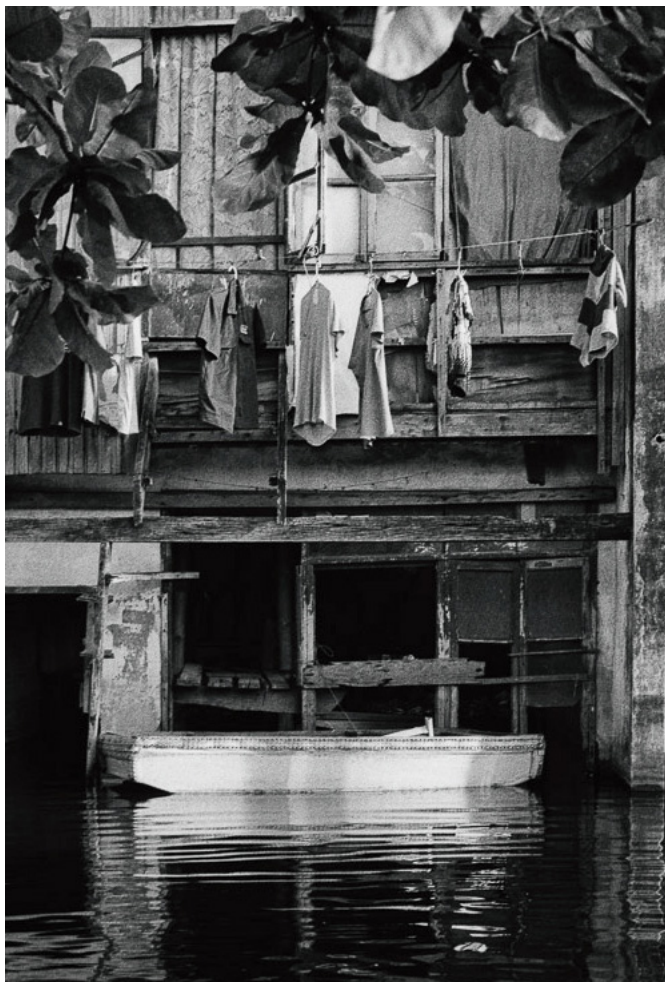
The Artex Compound, located in Manila, Philippines, was once a thriving housing compound for workers of Artex Yupangco Textile Mills Corporation. However, after a strike by the workers and the worsening flood situation in Malabon, the compound turned into a permanent catch basin for rainwater. Today, approximately 200 families live in the Artex Compound and have not seen the land where their houses stand in the last decade. In this article, we will explore the challenges faced by the residents of the Artex Compound through information gathered from two documentaries, "The Big Picture" by CGTN and "Philippines: Life in the Venice of Malabon" by DW, as well as a local newspaper, Rappler.

"The Big Picture" by CGTN:

In the documentary, Lina Karina, a resident of the Artex Compound, shares that her children have no place to play, unlike when she was growing up, where there was a basketball court, a volleyball field, and even palm trees. The Artex Compound is one of the lowest lying areas of the Manila Metropole and has been flooded for almost 20 years. Floodwater used to come and go, but since 2004, it has stayed due to monsoon rains and heavier storms, making it impossible to pump out the water. On average, 20 typhoons batter the country each year, leaving residents with nowhere else to go. They cannot afford to move out, and renting is not an option.

"Philippines: Life in the Venice of Malabon" by DW:

Residents of the Artex Compound collect drinking water, which is the most important thing to get. They row their boats to the water pump by the gate, fill up an average of eight 5-gallon containers, and row back to their homes to use it for washing dishes, clothes, and themselves. The residents do not have direct access to clean and potable water and must order purified drinking water from nearby refilling stations. For the younger generation, the Artex Compound feels like home, and they would not move out if given the opportunity, even though the conditions are challenging.



Information from Rappler:

According to Rappler, many factors contributed to the devolution of the Artex Compound into a permanent catch basin for rainwater. Fishponds were turned into relocation sites for informal settlers and gated villages for the moneyed class. The rapid urbanization of Malabon saw surrounding roads being elevated, leaving Artex as the lowest lying land in the entire city. The residents of the Artex Compound face numerous challenges, including limited job opportunities, which force many of them to earn a meager income ferrying passengers or driving pedicabs.

The residents of the Artex Compound face numerous challenges in their daily lives, including limited job opportunities, limited access to clean and potable water, and the constant threat of flooding. However, despite these challenges, many residents choose to stay because it is the only place they can afford to live. The government must find a way to provide better living conditions for the residents of the Artex Compound and prevent similar situations from happening in the future.

9. Conclusion

In conclusion, this study aimed to investigate the concept of permanent flood cities and whether they are still livable. Three research questions were addressed: firstly, what is a permanent flood city? Secondly, how does a permanent flood affect the existing urban structure? And thirdly, is there a relationship seen between the amount of water, greenery, and buildings?

To answer the first question, it was found that permanent flood cities are urban areas that are situated in low-lying regions and are prone to flooding. They are characterized by a complex network of water channels, buildings on stilts, and the use of boats as the primary mode of transportation.

Regarding the second research question, it was observed that permanent flooding can have both positive and negative impacts on the urban structure. On the one hand, water bodies and greenery can serve as a natural protection against extreme weather events and provide aesthetic value to the city. On the other hand, flooding can cause extensive damage to buildings and infrastructure, resulting in reduced mobility and access to basic amenities such as drinking water.

Finally, to address the third research question, it was found that there is a positive relationship between the amount of greenery in flood cities and the resilience of the urban structure. Greenery serves as a natural buffer against flooding and can help mitigate the damage caused by extreme weather events.

Overall, this study suggests that while permanent flood cities can offer unique cultural and environmental features, they are highly vulnerable to weather events and can present significant challenges to residents. While access to basic amenities such as drinking water can be challenging, the use of boats as the primary mode of transportation offers a potential solution to mobility issues. Furthermore, the positive impact of greenery on the resilience of urban structures highlights the importance of incorporating green infrastructure into urban planning strategies.

It should be noted that this study is limited in its scope, as it relied on the analysis of a local newspaper, two documentaries, and historical maps. A more comprehensive study that incorporates primary data collection and analysis would provide a more nuanced understanding of the livability of permanent flood cities.

In conclusion, this study provides a glimpse into the complex and unique world of permanent flood cities, highlighting the challenges faced by residents and the resilience of the urban structure. Ultimately, the question of whether flooded urban areas are still livable is a nuanced one that depends on a range of factors, including the severity of the flooding, access to basic amenities, and the level of green infrastructure present in the city.

10. Discussion

This discussion will examine the limitations of research on living in permanently flooded urban areas and provide recommendations for future studies. We will also explore the role of architects, urban planners, and governments in making these areas more livable.

The case study used in this research provided unique insight into how one particular community in a flooded area coped with living in such conditions. However, it is important to note that the results are specific to this neighborhood and cannot be generalized to other areas. Variables such as location, landscape, weather conditions, ground level, and building structures are different for every location worldwide. Further research could explore different areas to find similarities and examine how to cope with living in flooded urban areas.

For example, future studies could examine how urban structures, building types, and community resilience play a role in coping with permanent floods. In the case of the Artex Compound, little two-story concrete building blocks were built and later supported by wooden beams. However, building structures in other areas may react differently to permanent flooding. Additionally, the community living in flooded areas plays a crucial role in resilience. Are they willing to work together to overcome challenges such as obtaining clean drinking water and harvesting food, or is evacuation the only option?

Architects, urban planners, and governments can play a significant role in making permanently flooded areas more livable. They must consider this issue as evacuation is not always possible, and thousands of people may be displaced if their neighborhoods or cities become flooded. Current design strategies such as constructing huge seawalls, such as the green ring around Manhattan or “Sponge City” in Shenzhen, China, rely on cities that flood infrequently, not permanently. Alternative strategies are needed to prepare for the phenomenon of permanently flooded cities.

For example, architects and urban planners could consider designing buildings that can withstand floodwaters or building structures that are adaptable to changing water levels. Governments can invest in green infrastructure, such as parks and wetlands, which can act as natural buffers against flooding. Community-based approaches, such as involving residents in decision-making processes and providing them with the resources to adapt to flooding, can also be effective in increasing resilience.

In conclusion, the case study provided useful information on how to cope with living in a flooded area, such as the phenomenon of natural green buffers that can emerge and how communities can support each other. However, it is important to note that this is just one specific case, and the findings cannot be generalized to other situations. Solutions must be found to prepare for permanently flooded cities, and architects, urban planners, and governments must work together to make these areas more livable. Future research and collaboration between different stakeholders will be necessary to develop effective strategies for coping with permanent flooding in urban areas.

References

Literature:

Nicholls, R. J., Hanson, S., & Herweijer, C. (2019). RANKING OF THE WORLD'S CITIES MOST EXPOSED TO COASTAL FLOODING TODAY AND IN THE FUTURE. Tyndall Centre Climate Change Research. <https://climate-adapt.eea.europa.eu/en/metadata/publications/ranking-of-the-worlds-cities-to-coastal-flooding/11240357>

Moya, G. P. (2014, July 6). The floating world of Artex. RAPPLER. <https://www.rappler.com/moveph/62516-floating-world-artex/>

Maps:

Google. (2001). Google Historical Map. Google Earth. <https://earth.google.com/web/>

Google. (2004). Google Historical Map. Google Earth. <https://earth.google.com/web/>

Google. (2005). Google Historical Map. Google Earth. <https://earth.google.com/web/>

Google. (2007). Google Historical Map. Google Earth. <https://earth.google.com/web/>

Google. (2009). Google Historical Map. Google Earth. <https://earth.google.com/web/>

Google. (2010). Google Historical Map. Google Earth. <https://earth.google.com/web/>

Google. (2011). Google Historical Map. Google Earth. <https://earth.google.com/web/>

Google. (2013). Google Historical Map. Google Earth. <https://earth.google.com/web/>

Google. (2014). Google Historical Map. Google Earth. <https://earth.google.com/web/>

Google. (2015). Google Historical Map. Google Earth. <https://earth.google.com/web/>

Google. (2016). Google Historical Map. Google Earth. <https://earth.google.com/web/>

Google. (2017). Google Historical Map. Google Earth. <https://earth.google.com/web/>

Google. (2018). Google Historical Map. Google Earth. <https://earth.google.com/web/>

Google. (2020). Google Historical Map. Google Earth. <https://earth.google.com/web/>

Google. (2021). Google Historical Map. Google Earth. <https://earth.google.com/web/>

Documentaries:

Deutsche Welle, & Marjory Linardy, M. (Directors). (2022). Philippines: Life in “the Venice of Malabon.” DW. <https://www.dw.com/en/philippines-life-in-the-venice-of-malabon/video-62312057>

Why Artex Compound is called ‘Venice of the Philippines’ (2015, July 7). ABS-CBN News. <https://news.abs-cbn.com/video/nation/metro-manila/07/07/15/why-artex-compound-called-venice-philippines>

Images:

Suralta, B. B. (1970). Inside the Artex Compound, the “Venice of Malabon.” Esquiremag.ph. <https://www.esquiremag.ph/long-reads/features/artex-compound-venice-of-malabon-a2765-20220720-lfrm>

Rivera. (2019). Behance. <https://www.behance.net/gallery/76961151/Artex-Compound-Malabon>



Samuel Belderink
Technical University Delft, 2023
History Thesis