A Typo-Morphological Enquiry on Housing Development in Riverine Communities: The Influence of the Dike System of Davao River

Author
Nurvin Zary E. Bustillo, MSc

Course Adviser
Prof. Grace C. Ramos, Ph.D.

Affiliations
DBE 311- ADVANCED S
Ph.D. in the Designed and Built Environment
University of the Philippines Diliman
College of Architecture
Integrated Graduate Program

Urban Setting

S.I.R. Phase II belongs to Barangay Bucana, Davao City. The population as determined by the 2020 Census was 80,538. This represented 4.53% of the total population of Davao City. The population of Bucana grew from 41,210 in 1990 to 80,538 in 2020, an increase of 39,328 people over the course of 30 years. The latest census figures in 2020 denote a negative growth rate of 0.87%, or a decrease of 3,426 people, from the previous population of 83,964 in 2015 (Philippine Statistics Authority).

Introduction

A large population of communities resides near oceans, seas, lakes, and rivers. In many instances, the lives of these individuals, as well as their personal property and possessions, depend on flood defense systems (Baars and Kempen, 2009). The ability of something to recover to its original shape after being bent or squeezed is referred to as resilience in materials science (Kirmayer, Sehdev, Whitley, Dandeneau, & Isaac, 2009). One way government sectors increase the riverside resilience is through the introduction of Dike System. Flooding is a common hazard for people living in the Philippines, and major floods can affect approximately one third of the nation. Flood control projects that consist of earthen dikes are therefore built along the major rivers to protect people living in low-lying areas, stabilize the river banks, and improve agricultural productivity by allowing the year-round cultivation of high-yielding varieties of rice using modern methods of cultivation. These flood control projects are built along the major rivers in the Philippines (Ganiron Jr., 2017).

Aerial View of the Riverside Community(source: SunStar Davao

Objective

1.To determine how flooding impacts the households by understanding their risk perceptions.
2.To document the existing context of the neighborhood at risk to flooding.
3.To map the neighborhood and present the typo-morphological change in infrastructure in terms of floor level and building size.
4.To understand how households react through their shelters to the current risk of being flooded.
5.To identify the willingness of households towards development of residential dwellings given the presence of the dike system.

Methodology

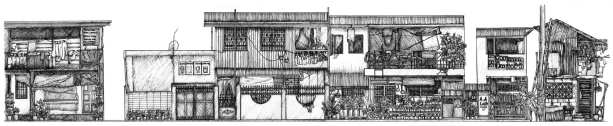
Philosophical Framework: Postpositivism
Perspective: Mixed Method
Research Design: Case Study
Approach: Deductive
Tactics: Survey Questionnaire; Physical Observation; Photo Documentation; Transect Survey
Participants: Heads of Household
Locale: S.I.R. Phase 2, Barangay Bucana, Davao City

Disruptive Variable

Typhoon Tembin, also known as Typhoon Vinta in the Philippines, was the deadliest tropical cyclone to strike Mindanao since Typhoon Bopha in 2012. Following and impacting the Philippines just a few days after the deadly Tropical Storm Kai-tak is the twenty-seventh named storm and eleventh typhoon of the 2017 Pacific typhoon season, Tembin, which means Libra in Japanese. On December 16, it was first classified as a weak tropical depression. On December 20, the system gradually intensified and consolidated into a tropical storm. Tembin arrived on Mindanao late the following day. The 23rd of December, Tembin moved toward the South China Sea and intensified into a typhoon the next day.

Analysis

Before the dike system, in the distant past, riverine villages typically began as nipas, shelters constructed from native materials and discarded objects. Education and Economic Aspect played a vital role in the typo-morphology of the houses in the neighborhood.

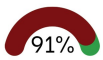


Transect of the Neighborhood Block

Perception on development of shelters

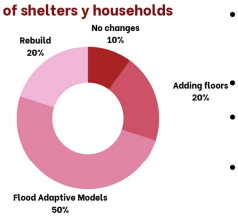
Affordability of housing remodeling

Willingness to resettle



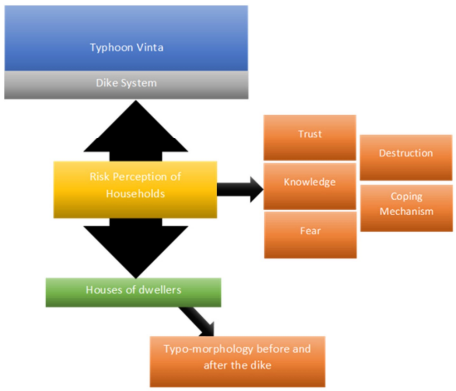
Willingness to Redevelop

Perception on future development of shelters y households



- **Maintaining the existing conditions (no changes)**. The choice of option 1 means minimally maintaining the building to ensure it functions. The contribution of residents is very minimal because they consider flooding to be the responsibility of the government or other parties.
- **Adding floors.** This is the conventional way of anticipating flooding by utilizing existing structures.
- **Flood adaptive models.** This option refers to gradual structural changes without reconstructing the building envelope. It includes adding floors and additional adaptive measures.
- **Flood adaptive models by completely rebuilding the house from scratch including the structures and walls**. Option 4 is the ideal and most comprehensive choice but the construction costs are up to twice that of conventional building improvements.

Conceptual Framework



Conclusion

The S.I.R. Neighborhood Phase 2 before the Dike System
As a starting point, dwellings started as bungalow units using indigenous or recycled materials. Resilience is low.

The S.I.R. Neighborhood Phase 2 with the Dike System
As a neighborhood with experience of flooding, houses began to expand and build additional floors using lightweight materials to safeguard important items in the house when inundation occurs. Some houses added gates as part of the development. Resilience is developing.

The S.I.R. Neighborhood Phase 2: Forward on the Dike System
The participants are looking forward to stronger buildings that will be able to handle floods better, last longer, and make the whole neighborhood more resilient.

Related Literature (Themes)

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2. **Dike Failures**
   a. Zhang, L. M., Xu, Y., Liu, Y., & Peng, M. (2013). Assessment of flood risks in Pearl River Delta due to levee breaching. Georisk: Assessment and Management of Risk for Engineered Systems and Geohazards, 7(2), 122-133.
3. **Classification of Dike**
   a. *Ibrahim, K. M., & Tarawneh, K. (2003). Phases of activity and geochemistry of basaltic dike systems in northeast Jordan parallel to the Red Sea. Journal of Asian Earth Sciences, 21(5), 467-472.*
4. **Risk Perception on Mitigating Systems**
   a. Fişek, G. O., Yenişeri, N., & Muderrisoglu, S. (2002, July). Risk perception and attitudes towards mitigation. In Congress of Informed Ownership, Training, and Organization for Successful Disaster Preparedness. IIASA_DPRI Integrated Disaster Risk Management Meeting, Laxenberg, Austria, July (pp. 29-31).
5. **Influence of Risk to Typo-Morphology**
   a. Stojanovski, T., & Östen, A. (2019). Typo-morphology and environmental perception of urban space.