

Submit : 17/05/2024 | Review Editorial 14/06/2024 | Review 28/06/2024 | Published June,2024

ARCHITECTURE FLOATING ON BUILDINGS FOR ADAPTATION TO GLOBAL WARMING

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Abstraksi: The Earth currently needs to be prepared for sea level rise, both the Earth is threatened by the effects of global warming which has been an issue the world has been facing for a long time. One of them is the melting of ice at the Earth's poles, causing sea levels to continue to rise every year or known as Sea Level Rising. The current architecture needs to pay attention to these conditions. In an architectural effort to provide solutions in dealing with natural phenomena, several methods are carried out. The initial step is to carry out comparative studies related to the phenomena and solutions that are being carried out. Then it is necessary to design the concept of the floating building. Besides design, further efforts need to be made such as the technology used to make it easier for the building to float automatically when sea level rises or floods occur, materials that are able to adapt to sea water where sea water is alkaline.

Kata Kunci: *Global Warming, Architecture, Adaptation, Floating cite*

INTRODUCTION

Global warming is a disaster due to an increase in global temperature from year to year. This results in a greenhouse effect caused by increased emissions of gases such as carbon dioxide (CO₂), methane (CH₄), dinitrooxide (N₂O) and CFCs so that solar energy is trapped in the earth's atmosphere [1]. As a result of this absorption of temperature, the sea temperature increases causing the polar ice to melt. This phenomenon is called Sea Level Rising. Sea Level Rising is a phenomenon of sea level rise that is happening all over the world [2]. So that from the problem of global warming that is being faced, it results in an increase in the volume of sea water and a decrease in the land during high tides. Therefore, efforts are being made to adapt by designing a building that can withstand and adapt to the phenomenon of rising water levels.

METHOD

The research method used is descriptive, qualitative method, namely the method obtained is the result of a literature study by providing a systematic description, picture or painting of the relationship between the phenomena investigated.

RESULT AND DISCUSSION

Floating Building

Floating house, is a concept of a house to live or stop by using a floating structure media. The concept of a floating structure or what is often called a 'Floating Structure' is used as a substitute for land in the construction of a building. Apart from being an alternative to land reclamation besides being an alternative, this is because the structure is able to float on water.

Adaptation

Adaptation means adjusting oneself according to the environment. In this case, an adaptable architecture means an architecture that is capable of being adapted to the site. Initially, sea water enters the area gradually by filling the lower land and the water rises slowly. Every day residents see their yard starting to be inundated by sea water. The event of rising sea water which is seen every day then becomes a natural thing to feel, this event continues to be repeated, then the cumulative dissatisfaction, helplessness, and boredom that begins to appear in him, then he begins to lower his standards, so he can accept that these events are normal. This condition is referred to as the adaptation behavior of residents who live by the beach. Thus, the community will accept the condition of rising sea levels in their residential areas [3].

Global Warming

Global warming is a phenomenon where the average temperature of the earth continues to increase. This causes changes in weather that affect the earth's ecosystem. Climate change is caused by the exacerbation of the greenhouse effect. It has been predicted that if global warming continues, the earth's average temperature will increase by around 1.5 to 5.3oC in 2100. This will be very deadly for humans, as well as living things and the environment on earth.

Floating Structure Specifications

Plastic drums are elastic floating devices that are cheaper and easier to install, namely by connecting them using bolts to wooden blocks. All plastic drums are sandwiched with wooden blocks so that all the plastic drums stick together and Tightly.

HASIL DAN PEMBAHASAN

Konsep dasar

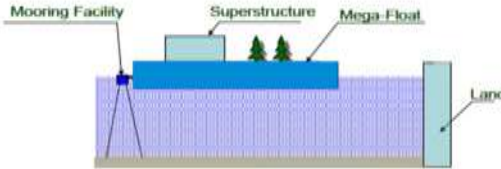

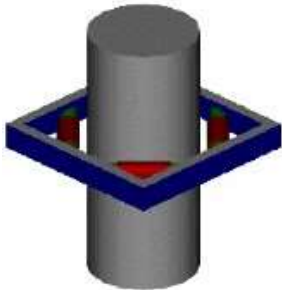
Ruang Publik

Area atau tempat terbuka dengan bangunan yang dapat diakses oleh masyarakat umum semua kalangan yang dapat mewadahi aktivitas-aktivitas masyarakat hingga memiliki fungsi ganda.



Figure 1 Plastic Drum Platform Material [4]

Table 1 Alternative System Structure

Alternative System Structure	Explanation
 <p>Figure 2. Mooring system [5]</p>	<p>The mooring facility system has a function as a mooring system for the entire construction system, so that the entire structure remains afloat in place.</p>
 <p>Figure 3. Amphibious House [6]</p>	<p>In this Amphibious house model it is estimated that it will take a long time to overcome the solution so that it is effective and efficient, with the help of support poles when the water is getting higher.</p>
 <p>Figure 4. Flood-Proof House (FPH) [5]</p>	<p>Flood-Proof House (FPH) Using flexible supports found on the outermost part of the foundation. The function of these columns is so that the entire floating house construction can rise during flood conditions. Each column is equipped with a ring with wheels on each side, so that the column with the casing can be flexibly raised and lowered.</p>

The structure in this study is divided into 3 parts, namely the substructure, middle structure, and upper structure. The following is a discussion of each part of the component:

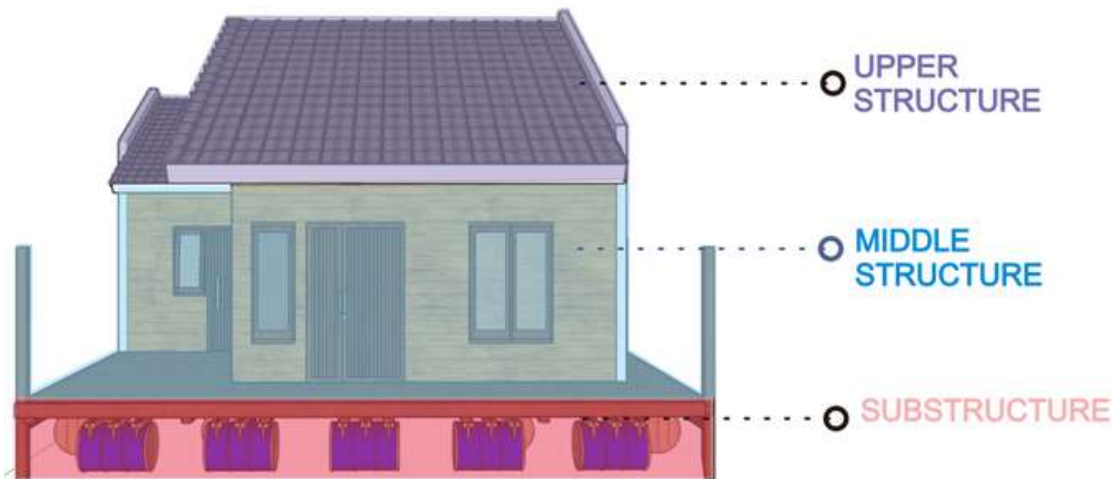


Figure 2 Building Part

Source : Author 2023

Substructure

Using a plastic drum with a capacity of 200 liters as a foundation so that it can float. It is planned that there are 2 structure systems, namely the mooring by using anchor chain resembling a floating ship freely on the water as well, system using 8 stakes that are driven into the base. In the buoy part of the building, there is a hook so that it can connect the building with the moorings that have been plugged in so that it will float. The Amphibious House on the handrail also functions so that the building does not sway or run away with the current so that the building remains strong on its feet when sea level rise occurs.

Middle Structure

In this design, a column made of teak wood with a thickness of 2 cm and a height of 350 cm is used. It functions as a structural column, as well as a mooring for the floating house when the house moves vertically when a flood occurs. The Flood-Proof House (FPH) on this column is also equipped with a ring with wheels on each side, so that the column with the sheath can go up and down flexibly. ring which functions as a binder between the float and the column. This structure is tasked with maintaining the stability of the position of the building when the building is affected by flooding, as well as when the building is exposed to wind.

Upper Structure

The shingle roof was chosen as a roof covering material, due to its light, strong and durable advantages.

Building Design

Table 2 Design Location Data

No	Data Planning	Information
1	Location	-
2	Planning title	Floating House

3	Area	8 m x 10 m (80 m ²)
4	Number of floors	1

Source : Author 2023

The building with the floating house concept uses a mooring system from stakes. house amphibious architecture with a house that will float if there is an increase in water volume.



Figure 3 Front
Source : Author, 2023

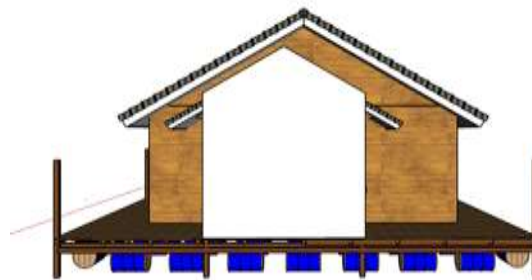


Figure 4 Left
Source : Author, 2023

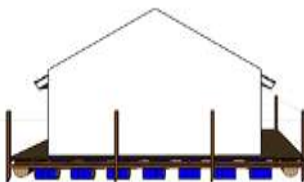


Figure 5 Right
Source : Author, 2023

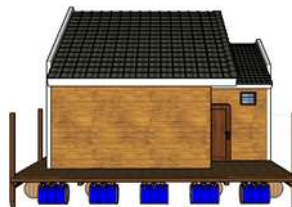


Figure 6 Back
Source : Author, 2023



Figure 7 Perspective
Source : Author, 2023



Figure 8 Perspective, Dry Condition
Source : Author, 2023



Figure 9 Perspective, Rising water levels
Source : Author, 2023

The concept eventually resulted in a design form. This building is a form of adaptation to the conditions of rising sea levels due to the effects of global warming. if there is a flood the house will be lifted by the force of the volume of water that is channeled through used drums as the foundation. Thus the house is flood free for a longer period of time, as well as the use of cheap materials can reduce cost overruns. By allowing water to inundate the streets, water-friendly architecture will be created.

Material Selection Floating Building

Material	Explanation
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Platform	using flexible supports and floats from plastic drum materials in floating construction which is a material that is resistant to water, does not rust, is not easily damaged, and has high buoyancy.
Floor	Using a base cover with wood material because it has a low corrosion rate
Walls	The production process of walls with wood material, namely from working on wooden profiles that will be used as the construction of the walls and floors of wooden house buildings.
Ceiling	Ceiling is the result of processing the main support of the house which has been perforated and formed profiles so that it can be combined with the construction of batten reinforcement and batten rafters
Roof	the use of shingle roofs because they have the advantage of being light and strong makes them suitable for implementing the floating house concept.
Roof Frame	Installation of Roof and Floor Frames Installation of frames using wood materials is a connection of profiles to form a single unit
Coating	Layered painting is done using anti-corrosion paint, under coat is used to increase the thickness of the base paint for this process using epoxy thinner, and finally the top coat is used to protect the outermost paint, the painting is also done 2 times to produce a good color and gloss.

CONCLUTIONS

Global warming causes extreme climate change, these environmental conditions cause sea tides. Floating buildings with plastic drum platforms can be a solution for adaptation to the environment so that the position of the building can follow the elevation of the water level, without going against nature, because the plastic drum material used in floating construction is a material that is resistant to water, does not rust, is not easily damaged, and has a high buoyancy force so that it can withstand loads and activities on it. Based on stability parameters, plastic drums are the most stable floating platform material, followed by styrofoam and bamboo in determining the material for floating building platforms by considering the availability of building materials.

ACKNOWLEDGEMENTS

Thanks to all parties who have helped the author in carrying out this writing.

DAFTAR PUSTAKA

- [1] V. Triana, "Pemanasan global," *J. Kesehat. Masy. Andalas*, vol. 2, no. 2, pp. 159–163, 2008.
- [2] C. Nunez and N. G. Staff, "Sea levels are rising at an extraordinary pace. Here's what to know.," 2023. <https://www.nationalgeographic.com/environment/article/sea-level-rise-1> (accessed May 10, 2023).

- [3] D. Dennis and R. Surya, "PENERAPAN SISTEM BANGUNAN APUNG SEBAGAI CARA UNTUK BERDAMAI DENGAN BANJIR DI JAKARTA UTARA," *J. Sains, Teknol. Urban, Perancangan, Arsit.*, vol. 3, no. 2, pp. 1691–1702, 2021.
- [4] F. A. Mukminin, "Jembatan Apung Terpanjang di Indonesia Dibangun di Cianjur, untuk Warga dan Kendaraan Roda Dua," 2022.
<https://jabar.tribunnews.com/2022/08/02/viral-jembatan-apung-terpanjang-di-indonesia-dibangun-di-cianjur-untuk-warga-dan-kendaraan-roda-dua> (accessed May 08, 2023).
- [5] J. C. Octavia, H. Sufianto, and B. Yatnawijaya, "KONSEP FLOATING PLATFORM PADA RUMAH TINGGAL DI PANTAI MUTIARA, JAKARTA UTARA," *J. Koridor*, vol. 8, no. 1, pp. 21–28, 2017.
- [6] T. S. Adithya and K. K. Manoj, "A s tudy on new amphibious housing solution for vulnerable communities in Kuttanad," in *IOP Conference Series: Materials Science and Engineering*, 2021, vol. 1114, no. 1, p. 12037.