



Preliminary Design of Tirtanadi Water Museum as an Interactive Educational Media

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Abstract. Tower Reservoir or better known as Tirtanadi Water Tower is an iconic building and one of the old buildings in Medan that still has the typical Dutch architecture. This tower is located in the complex of the PDAM Tirtanadi headquarters. The existence of the Tirtanadi Water Tower is not well known by the society and has little attention while it is still actively used to this day. PDAM Tirtanadi is not just an ordinary water company, but it has a history which needs to be preserved in the journey of this company until this day. As an effort to preserve the history of PDAM Tirtanadi, this project aims to design a museum in the Tirtanadi Water Tower area. This study uses the simulation method. The simulation method is accomplished by making the replication or imitation of the existing reality. This aims to get a representation of the preliminary design of Tirtanadi Water Museum. The software program to assist this study is Revit software in order to produce both 3D and 2D drawings that represent the designed spatial area. This study has to explore and analyze the existing phenomena to produce a suitable design concept. The concept of designing the Tirtanadi Water Museum is “Hulu-Hilir” that is taken from the concept of water flowing from upstream (“hulu”) to downstream (“hilir”). The design purpose is intended to make the museum not only act as one of the tourism attractions in Medan, but also as a platform to educate the society in order to increase their awareness to protect the surrounding environment.

Keywords: Water Tower, Water Museum, Preliminary Design, Interactive Museum, Educational Media.

1 Introduction

Tower Reservoir or better known as Tirtanadi Water Tower is an icon of Medan that is owned by PDAM Tirtanadi. This tower is one of the old buildings in Medan that still has the typical Dutch architecture. PDAM Tirtanadi is a company that operates the water management system in Medan.

During the Dutch colonial government, PDAM Tirtanadi was named NV Waterleiding Maatschappij Ajer Beresih. [1] In the past, the clean water was taken from the main source of Rumah Sumbul springs in Sibolangit, North Sumatera and it had a ca

capacity of 3000 m³/day. It was then transmitted to the Tower Reservoir which was located at Jl. Kapitan (now it has changed its name to Jl. Sisingamangaraja and became the head office of PDAM Tirtanadi) with a capacity of 1200 m³ [2]. The main purpose of PDAM Tirtanadi are to manage and operate the drinking water services that meet health requirements and to develop the local economy, increase local incomes, and improve environmental quality by providing sewage treatment collection and distribution services through a pipeline systems to achieve the well-being of the community in general [2]. The head office of PDAM Tirtanadi with its iconic Water Tower is located in the center of Medan.

Medan is the capital city of North Sumatera province. Medan is the third largest city in Indonesia following Jakarta and Surabaya, and the largest city outside Java. Medan is the first city in Indonesia that has integrated the airport with the railroad. The existence of tourist facilities in Medan with the airport facilities above so is considered necessary to be taken a look [3]. Tourists came to Medan not only for the culinary but also the heritage buildings of Dutch colonialization. Several buildings in Medan are still very worthy to be used as tourist attractions because they have a history that should be preserved and maintained. [3] One of colonial government heritage buildings is Tirtanadi Water Tower, which was built during the Dutch colonial government. [3] The location of the head office of PDAM Tirtanadi can be seen in Fig. 1.

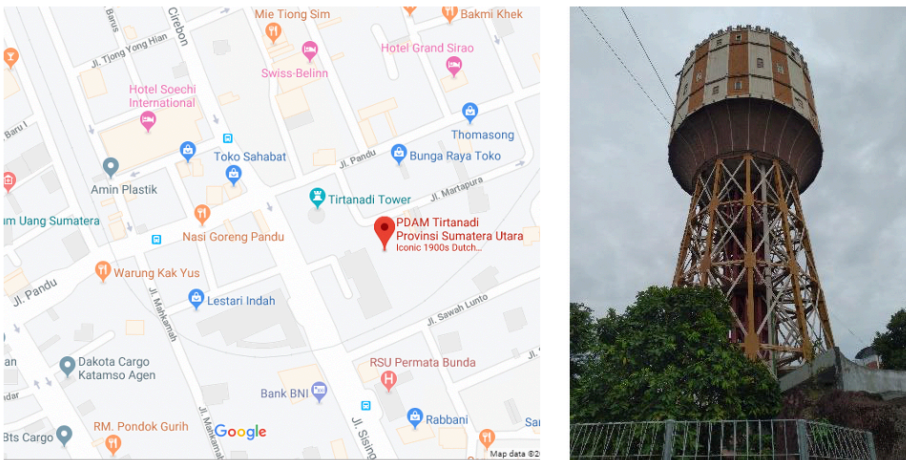


Fig. 1. Location of PDAM Tirtanadi Head Office in Medan.

The location is strategic, as it is located in the middle of the city. The surrounding area, which has a high level of traffic density, has resulted in the head office complex of PDAM Tirtanadi being less exposed to the public. The existence of the Tirtanadi Water Tower is not well known by the society even though the Tirtanadi Water Tower is still actively used to this day and there are still many people who pay less attention to this Water Tower. City residents of Medan only know about the Water Tower as an icon of Medan without having education about the water tower that was built during the Dutch era in 1908 [3].

There is a small building within the PDAM Tirtanadi head office complex that is allocated as a museum (can be seen in Fig. 2) where many artefacts that have historical value as a heritage of the colonial period that has been related to the process of managing and distributing clean water by PDAM Tirtanadi (can be seen in Fig. 3). These objects have high value, so it is unfortunate if they are only stored like that while it can be used as a media for public education as historical evidence.

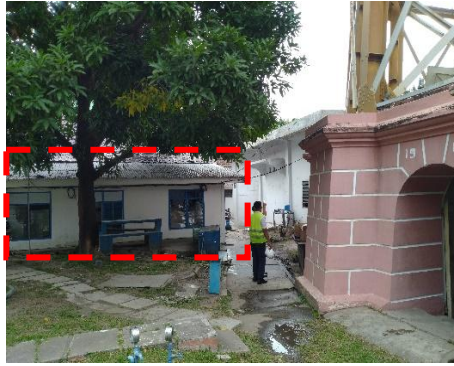


Fig. 2. The existing museum building in the PDAM Tirtanadi Head Office complex.



Fig. 3. The colonial heritage objects inside the PDAM Tirtanadi museum.

By looking at the actual situations in the existing conditions, this study uses simulation research. Simulation research has emerged from a wider human interest in the replication of real-world objects and settings. According to [4], a simulation is a representation of the behavior or characteristics for one system through the use of another system, and in particular a computer program designed for that purpose. The simulation method is accomplished by making the replication or imitation of the existing reality.

This study aims to create a preliminary design of a water museum that is located within the head office complex of PDAM Tirtanadi which not only acts as a place to exhibit colonial heritage objects that are owned by PDAM Tirtanadi but also can function as a tourism and educational media for the society. This study had to explore and analyze the existing phenomena to produce a suitable design concept. The simulation used Revit software to produce both 3D and 2D drawings that represent the designed

spatial area. This method is used to create the preliminary design of this museum where the functions as an educational media about the water management system in Medan and as storage of artefacts that are owned by PDAM Tirtanadi. Preliminary design is made with several design parameters such as accessibility, spatial requirements, and spatial organization.

The author uses a metaphorical approach in conceptualizing the design. The concept of this design is “Hulu-Hilir”. The author takes the metaphor of the water cycle that flows from “Hulu” (upstream) to “Hilir” (downstream). This concept is taken from the concept of water flowing from “hulu” (upstream) to “hilir” (downstream), this museum will explain the water cycle. This museum will explain where the water comes from and how it reaches people’s homes. This concept “Hulu-Hilir” is applied to the spatial program in this museum design.

2 Literature Review

The lack of community enthusiasm in learning habits is caused by external factors, which are the method of communication, the types of facilities, and its monotony in the continuity process. Museum is one of the efforts of the government in providing public spaces as an educational media beyond the school context. Museum is one of the facilities that has the potential to explore the spatial, to get information and knowledge about a certain thing [5].

Most of the museums in Indonesia are considered as uninteresting and boring. This has caused a lack of public interest in visiting museums. This requires an innovation in the approach that is implemented in museums. In classical marketing theory, an innovation requires period of time to be accepted by the market [6]. In order to be accepted and be adopted by the market, usually an innovation must have a greater value than the existing method. One of the innovative forms of the museum concept is an interactive museum where through the needs of interactive spaces, a museum will not only provide various formal needs but also can trigger visitors to be more interactive in exploring the spaces in the museum.

According to [7] as described by [8] that an interactive museum provides the visitor with objects that allow them to interact directly with the collections on display. According to [9] as described by [8] that interactive definition its emphasizes to the:

- Physical activities, which are interactive as a direct component because they convey physical and tactile components.
- Results, which involve engagement ideas that encourage further involvement with the subject of the exhibition.
- Technology, which is an online-based interactive environment for integrating media that allows visitors to explore materials.
- Information, which is interactive, is a tool that allows users to manipulate information to suit the visitors’ interests.

Museum is the form of architectural works. According to [10], the form of architectural works has the following functions, such as:

1. Method. It is interaction between the tools that are used, the processes that are implemented, and the materials that are used.
2. Use. An architectural work must have function.
3. Need. An architectural work exists because of human needs to meet human desires as social beings.
4. Telesis. An architectural work should reflect the times and conditions and should be suitable for the general socio-economic context.
5. Association. An architectural work is recognized by association when it should be understood by everyone with one understanding and should be used for its function.
6. Aesthetics. It is an instrument that is used by a designer by playing with shapes, colours, to make the project more interesting.

According to [11], a museum can be a suitable context for experimenting with a new interaction technique that guides visitors and increases their experience. According to [12] as described by [11] that one way to make exhibitions more attractive to visitors is to increase the interaction between visitors and objects of interest through a guide. It also stated that visitors would be more interested if they could interact with the exhibitions in the museum instead of just looking at and reading information about the artefacts. Based on [11], an interactive design allows interaction with the exhibit between the user and the exhibition. The interactive design has five dimensions which are the word, visual representations, physical objects or space, time, and behaviours.

3 Design Methods

The software program to assist this study is Revit software to create the preliminary design of this museum that represent the designed spatial area. The Revit software is used to produce both 3D and 2D drawings. The main approach of this design is user experience based. According to [11], user experience is more dependent of the application than augmented reality. User experience understands the user's motivation for using a product, whether it relates to the task they want to perform. Inside the space in the museum that is designed, visitors are expected to have user experience that is not only obtained from the technology system used, but also can make the spatial experience with the quality of space that is adjusted to the design theme.

Providing the pieces of information that clarify the role and function of an object is especially important when it comes to a specific cultural heritage object. In this design, not only the traditional tools that will be used for museum display, but also the digital approaches and tools. The traditional tools are panels, labels that can be placed in the various location, but it requires a significant amount of physical space, significant financial resources, and may not be very effective in terms of promoting awareness [13]. Digital approaches and tools, in their various forms, are now a valid support for museum installations, especially when connecting such pieces of information is one of the main interpretive objectives of an exhibition. In [13], digital solutions can guide visitors in an articulated collection through narrative pathways that make clearer the logical connections between various elements, which may not be explicit.

The initial stage is analysing the importance of designing this museum. In the existing condition, there is a museum in the PDAM Tirtanadi head office complex (can be seen in Fig. 2) but the museum is not well maintained. Therefore, a new museum building is needed as a place to display the artefacts of the museum. Then this museum is expected to be able as an educational media for the society where the Water Tower has existed since 1908, and as an educational media about the water management systems in Medan. It makes this colonial heritage site can be used as an educational place.

Not only that, this museum is expected to become a tourist destination and icon of Medan because it is located an area that has high historical value. This museum can support the Water Tower as a source of information about the history of the Water Tower and PDAM Tirtanadi (can be seen in Fig. 4).

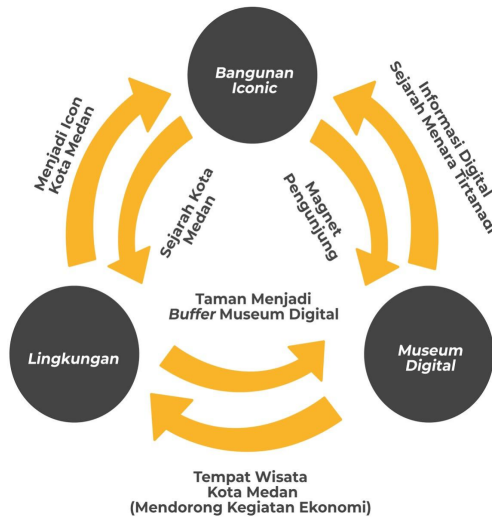


Fig. 4. Concept diagram of Tirtanadi Water Museum.

The development of the museum is planned to be located in the courtyard of the PDAM Tirtanadi head office park and next to the Water Tower. The site selection is designed with the purpose of the museum itself, as an educational media about the role of PDAM Tirtanadi where the Water Tower has an important role in distributing clean water in Medan.

4 Result and Discussion

The concept design of this Tirtanadi Water Museum is “Hulu-Hilir”. This concept is taken from the concept of water flowing from “hulu” (upstream) to “hilir” (downstream), this museum will explain the water cycle. This museum will explain where the water comes from and how it reaches people’s homes. This museum is expected not only as part of preserving history, but also as an icon and education centre. Clean water is a source of daily life for urban communities. Therefore, people rarely appreciate the

importance of clean water. The problem only arises when the existence of clean water is disrupted. The existence of this museum will be part of the process of awareness and education of the importance of clean water for life.

It is hoped that Tirtanadi Water Museum will not only become a museum that exhibits the history of clean water in Medan, but also can be an icon for Medan and become a means of recreation and education for the society. The technology that is implemented in the display museum is useful to provide a new experience in enjoying the museum. The existence of this museum will give Medan with the new pride of having a clean water museum that can be part of the World Water Museum.

The location of the site next to the Water Tower has made the massing form of the museum take a simple concept, so that the presence of this museum will not become something strange in the PDAM Tirtanadi head office complex, especially against the Water Tower. The Water Tower, which is a landmark of Medan, is a focal point that must be highlighted so that the presence of the Water Tower is included in the spatial design program.

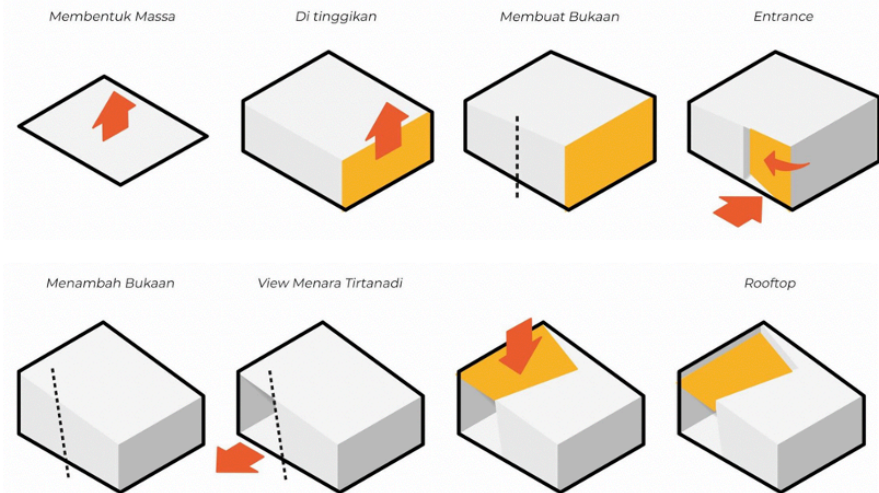


Fig. 5. Massing concept of Tirtanadi Water Museum.

As can be seen in Fig. 5, the building mass is square shaped which is suitable for the surrounding environment. It can maximize the use of space that is adjusted to the function of the museum itself, which is to display the history of PDAM Tirtanadi. The main view (focal point) is located in the heritage building, which is the Water Tower. In order to produce a vista, it is important to create an opening that is directed to the Water Tower so that the presence of the Water Tower can still be felt by visitors even though they are indoors.

The shape of the museum, which is taken from the geometry of square, illustrates the simplicity of the Water Tower. It symbolizes the development of the Water Tower with the city of Medan. The shape of the water wave represents PDAM Tirtanadi. This shape is applied to the building façade using red brick material (can be seen in Fig. 6).

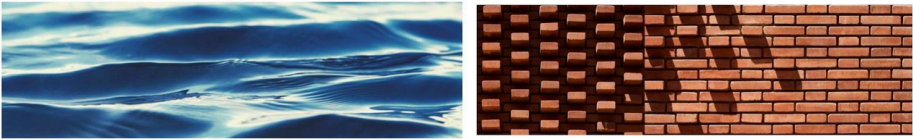


Fig. 6. Application of aquatic wave shape on building façade.

The spatial and circulation program design of the Tirtanadi Water Museum aims to recreate the atmosphere inside the Water Tower (can be seen in Fig. 7). Tirtanadi Water Museum aims to make visitors more familiar with the Water Tower and know how water is processed for various needs. This museum presents digital and real interactive displays.

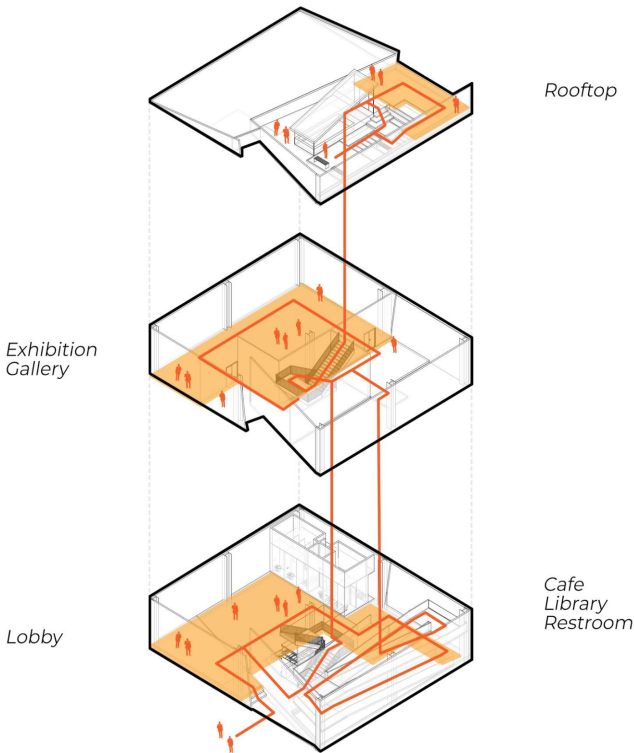


Fig. 7. Circulation of Tirtanadi Water Museum.

This museum consists of two floors and has a rooftop. On the 1st floor there is a reading area, café, and exhibition area (see Fig. 8). The reading area is used as a contemporary reading corner to increase the visitors' interest in reading and increase their knowledge. An attractive design is used to invite visitors to read books more often. The café is designed to be used for visitors to relax, exchange ideas, and share their stories.

In the exhibition area, there is an interactive mock-up that tells the history of world clean water with a combination of graphics and audio-visual presentation.

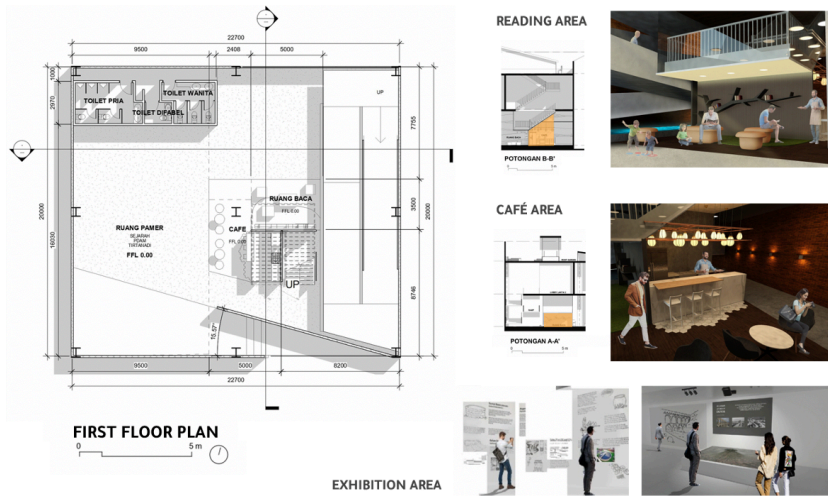


Fig. 8. First floor plan of Tirtanadi Water Museum.

To reach the 2nd floor, visitors can access through the ramp and can enjoy the Water Tower more closely through the glass openings along the ramp. Artefacts that are owned by PDAM Tirtanadi can also be placed on the ramp (can be seen in Fig. 9).

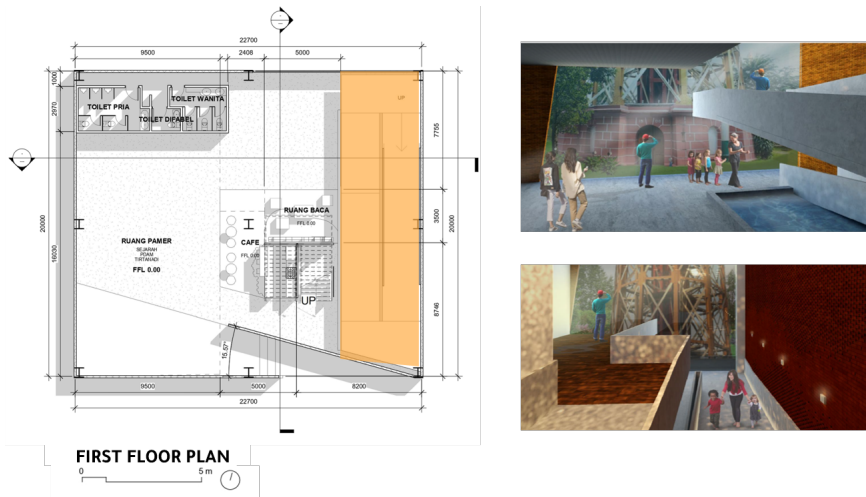


Fig. 9. Ramp area in Tirtanadi Water Museum.

The 2nd floor is designed as an exhibition area that tells the history of Tirtanadi and becomes an educational area about clean water (can be seen in Fig. 10). In this zone there is an interactive mural that tells the history of clean water in Indonesia. There is

also a slider panel to display infographics from PDAM Tirtanadi figures. There is also an interactive simulation game room that gives visitors an overview of water filtration systems such as water treatment plants, or others.

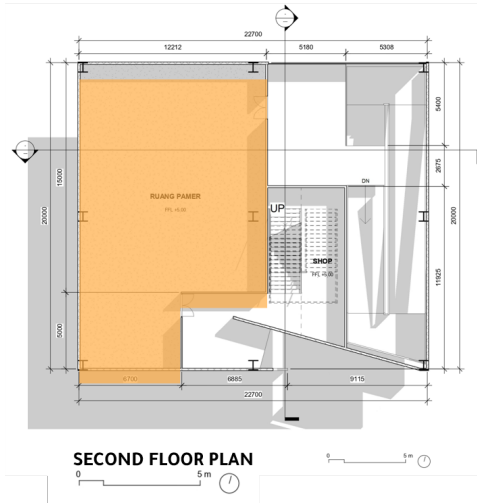


Fig. 10. Second floor plan of Tirtanadi Water Museum.

On the rooftop, there is a roof garden that is designed to be a recreational facility for visitors after enjoying the exhibition in the museum (can be seen in Fig. 11). Rooftop which functions as a public facility that can be used to relax, take pictures, and enjoy the outdoor atmosphere at Tirtanadi Water Museum.

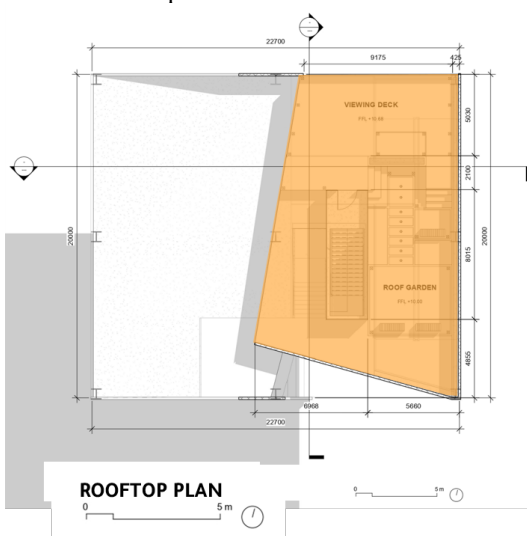


Fig. 11. Rooftop plan of Tirtanadi Water Museum.

5 Conclusion

Tirtanadi Water Tower is an icon of Medan that is owned by PDAM Tirtanadi. Tirtanadi Water Tower has the typical Dutch architecture, but its existence is not well known by the society and it has little attention while it is still actively used to this day. As an effort to preserve the history of PDAM Tirtanadi, this project aims to design a museum in the Tirtanadi Water Tower area. This study aims to create a preliminary design of a water museum that is located within the head office complex of PDAM Tirtanadi. Tirtanadi Water Museum has adopted an interactive museum approach where there is the use of digital services both in the exhibition display and interactive games that can attract visitors' attention so that there is no impression of a boring museum. The visitors can not only have expected to have user experience through the technology system used, but also the spatial experience that can be felt in the museum. With the concept "Hulu-Hilir", this museum will explain where the water comes from and how it reaches people's homes. This concept is also applied to the spatial program in this museum design. It is hoped that this museum design will not only become an interactive museum that exhibits the history of clean water in Medan, but also become a means of recreation and education for the society. The existence of this museum design will give Medan with the new pride of having a clean water museum. This design process resulted in a preliminary design. Further development of the design is needed to make working drawings before the construction process is finally done. At this stage of design development, it is possible to change to adjust the structural system and others.

References

1. A. Prasandi, "Tribun Medan," *Tribun*, 17 May 2021. [Online]. Available: <https://medan.tribunnews.com/2021/05/17/cerita-di-balik-menara-pdam-tirtanadi-dibangun-zaman-kolonial-belanda>. [Accessed 20 May 2023].
2. Tirtanadi, "Tirtanadi," Tirtanadi, [Online]. Available: <https://tirtanadi.co.id/visi-dan-misi-perusahaan/>. [Accessed 20 May 2023].
3. I. F. Pane, "Water Tower of Medan as a Character of the City Tourism," *Procedia - Social and Behavioral Sciences*, vol. 234, pp. 201-209, 2016.
4. L. & W. D. Groat, *Architectural Research Methods*, Canada: John Wiley & Sons, Inc., 2013.
5. R. & H. A. Hadiyanti, "Perancangan Museum Seni dan Musik Interaktif Berbasis Perilaku Belajar," *Jurnal Sains dan Seni ITS*, vol. 7, no. 2, pp. G266-G271, 2018.
6. J. Yudelson, *Marketing Green Buildings: Guide for Engineering, Construction, and Architecture*, London: Taylor & Francis Ltd., 2006.
7. A. V. G. E. S. M. Finna, "Faktor Daya Tarik Display Interaktif terhadap Pengunjung di Museum Ocean World Trans Studio Bandung," vol. 3, no. 2, April 2019.
8. B. S. S. P. N. Wibisono, "Increasing the Interactivity of the Museum Collections Case Study: Museum Nasional Indonesia Building A," *Advances in Social Science, Education and Humanities Research*, vol. 655, pp. 255-259, 2022.
9. S. Institution, *Developing Interactive Exhibitions at the Smithsonian*, Washington DC: Smithsonian Institution, 2002.

10. V. Papanek, *Design for the Real World: Human Ecology and Social Changes*, London: Paladin, 1974.
11. R. M. & R. M. H. Nor, "Interactive Design in Enhancing User Experience in Museum," *Journal of Computing Research and Innovation (JCRINN)*, vol. 6, no. 3, pp. 86-91, 2021.
12. H. F. B. & v. G. L. Bay, "Interactive Museum Guide: Fast and Robust Recognition of Museum Objects," in *Proceedings of the First International Workshop on Mobile Vision*, 2006.
13. L. C. G. G. G. Micoli, "Design of Digital Interaction for Complex Museum Collection," *Multimodal Technologies and Interaction*, vol. 4, no. 31, pp. 1-20, 2020.

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