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EMPOWERING SMALL-SCALE FISHERMEN: SUSTAINABLE DEVELOPMENT STRATEGIES OF FISH CENTER IN BATU MAUNG, PENANG

Aina Shafira Mohd Basir, *Sufian Hamat, Nur Ulfah Awatif Umairah Alias, Zuraini Denan
Department of Architecture, Kulliyyah of Architecture and Environmental Design, IIUM

ABSTRACT

The fishery sector in Batu Maung, Penang, plays a significant role in the local economy and cultural identity, with small-scale fishermen serving as one of the vital contributors. This paper provides an overview of a socio-economic analysis conducted to understand the dynamics and challenges faced by small-scale fishermen in Batu Maung and their impact on the broader fishery sector in the country. The qualitative and quantitative research methods that include interviews, literature review and case study. were used to examine some aspects of the industry namely the socio-economic characteristics of small-scale fishermen, their fishing practices, access to resources, income levels, and livelihood sustainability. In addition to that, the paper has also investigated the role of the fishery sector in supporting local livelihoods, generating income, and preserving cultural heritage in Batu Maung. Furthermore, the paper also identified opportunities for enhancing the resilience and sustainability of small-scale fisheries in Batu Maung, such as promoting community-based management approaches, supporting alternative livelihoods, improving market linkages, and enhancing resource governance. Efforts in addressing these challenges and leveraging local strengths for greater benefits may assist the fishery sector in Batu Maung to achieve greater socio-economic development, environmental sustainability, and cultural preservation, ensuring the long-term well-being of small-scale fishermen and the broader community.

Keyword: Small-scale fisherman, Fishery Industry, Penang, Malaysia, Community development

*Corresponding author: sufian@iium.edu.my

INTRODUCTION

The fishery sector in Pulau Pinang, Malaysia, holds significant importance both culturally and economically. The industry in the country is one of the main contributors to the Malaysian economy as mentioned in the Penang Economic and Development Report (2020). With its extensive coastline and rich marine resources, Pulau Pinang has a long-standing tradition of small-scale fishing activities that play crucial roles in the local economy and community livelihoods. Among the prominent areas within Pulau Pinang known for their fishing activities is Batu Maung, a coastal village renowned for its vibrant fishery community.

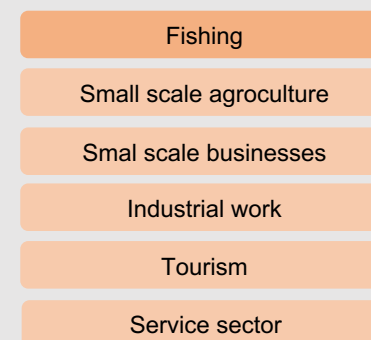


Figure 1: The main occupations and economic activities of Batu Maung, Penang

Batu Maung is one of the districts in Penang where fishery is the main economic activity. Most of the fishermen there are involved in small-scale fishing activities. However, their groups and contributions form the backbone of the fishery sector in Pulau Pinang, with generations of fishing families passing down the legacy and traditional knowledge and skills from one to another. The fishermen in Batu Maung often operate in close-knit communities along the coastline, using traditional boats and gear to catch fish for both subsistence and commercial purposes.

Small-scale fisherman in Batu Maung remains a cornerstone of the fishery sector in Penang. Many generations have relied on the bounties of the ocean, casting nets and lines to sustain their families and contribute to the local economy. The settlement of the vibrant fishermen communities is mostly located along the coastal villages of Batu Maung, engaging in various common fishing methods, including line fishing, net fishing, and trap fishing to harvest a wide range of seafood species. The rhythm of life in Batu Maung has long been dictated by the tides, with each sunrise heralding the departure of fishing boats and the bustle of trade at the waterfront markets.

The traditional fishing methods practiced and passed down through the ages have not only shaped the economic landscape of the community but also fostered a strong sense of communal identity and resilience among the people. Despite the development and changes in fishing industries in the region, the traditional spirit of entrepreneurship and the enduring bond with the sea among the fishermen communities persevered and continued to be observed in Batu Maung. The history of small-scale fishing in Batu Maung is a testament to the resilience and ingenuity of its inhabitants. Despite facing myriad challenges, from fluctuating fish stocks to modernisation pressures, the community has persevered and still maintained the age-old.

fishing techniques to meet the demands of the people in the region. The study on the fishermen community in Batu Maung is sentimental as it delved deeper into the fabric of this vibrant community uncovering stories of perseverance, adaptation, and the enduring symbiosis between humans and the marine environment. Today, as Batu Maung navigates the currents of globalization and urbanization, the spirit of its seafaring heritage remains undimmed. The legacy of small-scale fishing endures as a cornerstone of the community's identity, weaving a narrative of resilience, camaraderie, and reverence for the sea that shape the life along the shores of the ocean.

THESIS ISSUES AND PROBLEMS

Small-scale fishermen in Batu Maung face challenges in effectively marketing their catch, leading to a fragmented marketplace where they often sell at lower prices to local consumers or middlemen. The lack of access to broader markets deprives fishermen of fair prices, undermining their economic returns. Additionally, inadequate infrastructure exacerbates these challenges, as the absence of centralized facilities for storing and handling seafood results in post-harvest losses and reduced product quality.

Without proper storage facilities, fishermen are forced to sell quickly, often at a discount, to avoid spoilage, leading to economic losses and inefficiencies in the supply chain. These issues pose formidable barriers to the economic viability and overall welfare of small-scale fishermen in Batu Maung, with profound implications for their livelihoods and community sustainability.

The lack of processing facilities in Batu Maung deprives small-scale fishermen of opportunities to increase the value of their catch by filleting, packaging, or preserving seafood. Without access to these facilities, fishermen have missed out on potential revenue streams from processed products, limiting their ability to diversify and capitalize on higher-value seafood product in the markets. In addition to that, inadequate infrastructure hinders access to training programs, constraining fishermen's capacity to improve skills, adopt sustainable practices, and enhance competitiveness. Furthermore, the absence has also posed safety risks, as inadequate docking facilities expose vessels to damage from weather or theft and the lack of emergency response infrastructure compromises fishermen's safety and well-being in maritime accidents or emergencies. These issues collectively impede the economic potential, adaptability, and safety of small-scale fishermen in Batu Maung.

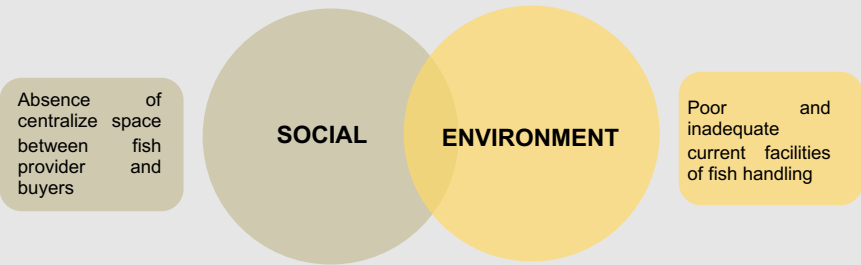


Figure 2: Design thesis issue and problem

RESEARCH AIM

The paper explained the design thesis aimed at rejuvenating the small-scale fisherman in Batu Maung by providing a centralized center for them to market and diversify their fish products towards improving their income.

RESEARCH OBJECTIVES

- 1. To redefine the function of fish center in Batu Maung, Penang.
- 2. To identify the spaces and facilities that are required for small-scale fisherman in Batu Maung.
- 3. To determine the aesthetic architectural experience and features that will be attractive to the people..

RESEARCH SIGNIFICANCE

The significance of the thesis focusing on the fishermen community and their small-scale fishing activities lies in its potential to provide solutions for the underlying issues of the unique challenges, opportunities, and contributions the communities are currently facing in the midst of modernization. Small-scale fishermen often form the backbone of coastal communities and yet their livelihoods are often poorly understood or overlooked. This design thesis delved into the intricate factors and dynamics of the livelihoods of the fishermen community encompassing economic, social, and environmental, providing valuable insights for policymakers, researchers, and practitioners. By examining the challenges faced by small-scale fishermen, such as access to resources, market fluctuations, and environmental degradation, the thesis can pinpoint the critical areas for potential intervention and support. The results may be useful for the inception of targeted policies, programs, and initiatives aimed at addressing the specific needs of these communities. In addition to that, it may also help build trust and foster collaboration through direct engagement with the people and fostering participation in the decision-making processes.

RESEARCH METHODOLOGY

The methodology used to prepare all necessary data and information before the start of the design process for the proposed project are as detailed out in the table 1 below.

Table 1: Detail of thesis objectives, thesis questions, thesis methodology and design solution.

Thesis Objectives	Thesis Questions	Thesis Methodology	Design Solution
1. To define the fish center in Batu Maung, Penang.	1. What are the defining characteristics and functions of the fish center located in Batu Maung, Penang?	1. Literature Review 2. Case Study	Integrate commercial and education spaces for small-scale fishermen to create a conducive environment and sustainable
2. To identify the spaces and facilities that are required for small-scale fisherman in Batu Maung.	2. What specific spaces and facilities are necessary to support small-scale fishermen in Batu Maung, Penang?	1. In-depth interview 2. Literature Review 3. Case Study	Propose a centralized center for the fisherman to sell their product while integrating with restaurants and leisure areas for people to enjoy.
3. To determine the features architecture that is best application to attract more buyers and increase income.	3. What architectural features are most effective in attracting buyers and boosting income for businesses in Batu Maung, Penang?	1. Literature Review 2. Case Study	Design the space that maximizes the efficiency to control the site and the use of material that is conducive for fish center.

Whereas, the design development process has started with the site study and analysis and proceeded with referencing of similar projects for conception of design concept and ideas and project programming.

FISH SECTOR IN PENANG

Penang fishery sector comprises of various types of fisheries, including marine capture fisheries, aquaculture, and inland fisheries. Marine capture fisheries are predominant, with fishermen operating along the coastline and in offshore waters, targeting a diverse range of species. According to Penang Economic and Development Report (2020), the fishery sector contributes significantly to Penang's economy, both in terms of GDP and employment. Fishing activities support a wide range of economic activities, including fishing, processing, marketing, and distribution of seafood products

Penang is equipped with good fishing ports, landing sites, fish markets, and processing facilities to support the fishery sector. These infrastructure elements facilitate the landing, handling, processing, and distribution of seafood products, ensuring efficient supply chain management. In addition to that, Penang's strategic location along the Malacca Strait provides access to domestic and international markets which has greatly benefited the fishery sector where fresh seafood is widely available and sold at local wet markets, supermarkets, restaurants, and export-oriented processing facilities.



Figure 3: The main location of the fishing sector in Penang is located in Batu Maung, Teluk Bahang, Teluk Kumbar and Seberang Perai
(Source : Penang Musuem Board)

The fishery sector in Penang faces various challenges, including overfishing, habitat degradation, pollution, and climate change. Efforts to promote sustainable fishing practices, marine conservation, and resource management are essential to ensure the long-term viability of fisheries and marine ecosystems. By balancing economic development with environmental

sustainability and social equity, Penang can continue to harness the potential of its fishery resources for the benefit of present and future generations.

SMALL-SCALE FISHERMAN

Small-scale fishermen typically operate on a smaller scale fishing activities, often using traditional or artisanal methods and working independently or in small, family-owned boats. They employ a variety of fishing techniques such as handlines, cast nets, traps, or small-scale trawling, often targeting a diverse range of species in coastal or nearshore waters. Small-scale fishermen usually operate smaller vessels, such as wooden boats, sampans, or small motorized boats. These boats are often simpler in design and require less investment compared to larger commercial vessels. The output of their daily fishing activities are most commonly sold directly to local markets, restaurants, or consumers as they often have strong ties to their local communities, or through middlemen who distribute seafood to larger markets. Due to this, the market for their products may be limited, and prices may fluctuate based on local demand and seasonal factors.

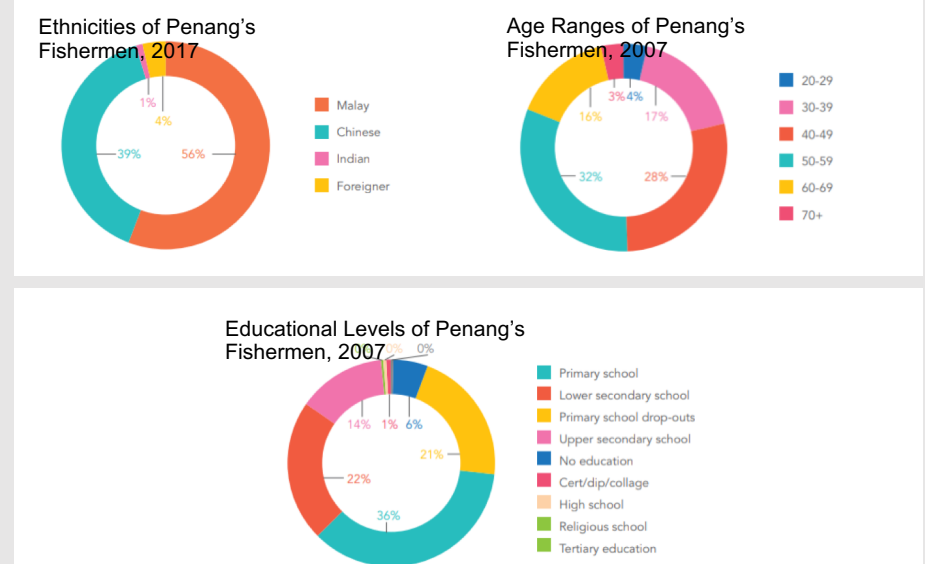
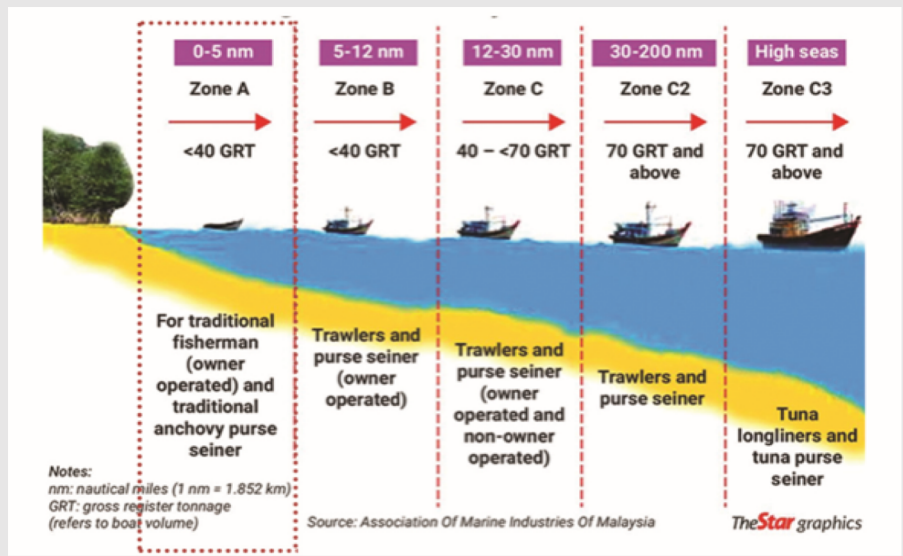


Figure 4: Statistic of ethnicities, age ranges, and education levels of Penang's Fisherman
(Source; Fisheries Development Authority of Malaysia)

Small-scale fishermen often struggle with poverty due to their low and stagnant incomes, impeding their ability to improve their livelihoods and achieve economic security. Addressing the challenges faced by these fishermen is crucial for fostering sustainable development and reducing poverty in coastal communities. Hence, the Malaysia Government has introduced the New Economic Policy (NEP) which aims at balancing the economic status between races from every corner of the state to overcome poverty and recognize society (Nurul Husna et al. 2022: Wan Khairuddin 2020).

TYPE OF FISHING BOAT

In Penang, fishermen use various types of boats depending on their fishing needs, the location of their fishing grounds, and the type of fish they target. Some common types of boats used by fishermen in Penang include traditional wooden boats, fiberglass boats, longboats, trawlers, purse seiners, and speedboats. The choice of fisherman boats in Penang, as in many coastal regions, is heavily influenced by the depth of the water and the specific fishing zone.



On shallow waters and nearshore areas, traditional wooden boats are normally used for fishing activities. These boats are well-suited for navigating shallow waters close to the shore. They're commonly used by fishermen for nearshore fishing activities such as handline fishing, net casting, and small-scale trapping. Whereas for Inshore and coastal waters fiberglass boats are preferred as the boats are more versatile in its function and provide better maneuverability and efficiency compared to traditional wooden boats, making them suitable for various fishing methods such as trolling, gillnetting, and pot fishing.

For offshore and deep-sea fishing zones ,Longboats are used as they are specifically designed long and narrow allowing the boat to navigate rough waters and travel long distances from the coastline. For fishing method using trawlers, a large fishing vessel equipped with heavy-duty fishing gear and processing facilities are used for trawlers to catch a wider range of deep-sea species such as shrimp, squid, and demersal fish.

Pelagic fishing areas on the other hand use purse seiners. Purse seiners are specialized vessels used for pelagic fishing in open waters. They're employed in areas where pelagic fish species like tuna, mackerel, and anchovies are abundant. Purse seiners encircle schools of fish with large nets, making them efficient for catching large quantities of fish at once.

The choice of fisherman boats in Penang is indeed influenced by the depth and zone of the fishing area. Different types of boats are utilized to effectively target specific fish species, navigate different water depths, and adapt to the challenges posed by varying fishing zones.

The use of small boats for fishing activities are common amongst the small scale fishermen in Penang. The boats are typically more manageable, cost-effective, and suitable for navigating the nearshore and shallow waters. The use of small boats such as the traditional wooden boats or fiberglass dinghies, allows the use of traditional fishing techniques such as handline fishing, net casting, and crab trapping. Fishermen deploy these methods, relying on skill and experience to catch a variety of fish species. The use of small boats also allows fishermen to access fishing grounds that may be inaccessible to larger vessels, enabling them to target a variety of fish species closer to the coastline.

Type of Boats/ Properties	Small Boats	Medium Boats	Large Boats
Length (m)	5.5-10.0	7.5-15.0	11.0-25.0
Breadth (m)	1.0-2.0	1.8-3.5	2.8-5.0
Depth (m)	0.3-0.9	0.6-1.4	0.5-2.5
Engine	- no engine - outboard engine - inboard engine	- inboard engine	- inboard engine
Horse Power (Hp)	2 – 10 Hp	50 – 200 Hp	100 Hp & above
GRT	< 10	10 - 25	> 25
Fish Hold	- no fish hold - boxes & baskets	- ordinary hold - boxes & baskets	- ordinary hold - insulated hold - Refrigerated hold
Catch Capacity	120 – 200 kg	200 – 2000 kg	1000 kg & above
Number of Fishermen	1 - 5 people	2 - 7 people	5 - 20 people
Type of Boats/ Properties	Small Boats	Medium Boats	Large Boats
Time at Sea	couple of hours - 0.5 day	1/2 – 1.5 days	1 day – 1.5 weeks
Operating Zone (Nautical Miles From Shore)	< 10	< 30	> 30

Figure 6: The typical size and characteristics of Malaysian Fishing Boats
(Source : Association of Marine Industries of Malaysia)



SITE LOCATION



Figure 8: Location plan at Batu Maung, Penang.
(Source : Google Earth)

Penang is well-known for its fisheries sector, which has long supplied fish and other seafood for domestic use as well as other industrial raw materials throughout Malaysia (Nashaie, R. M., & Firdaus, A. M. 2022). Batu Maung is one of the fishing located in the Southeast part of Penang Island, Malaysia. It is also known for its industrial activities, including the Bayan Lepas Free Industrial Zone. The proposed site for the development of the fish center is as indicated in figure 8 near the natural water bodies to facilitate easy access to fish habitats and promote fishing activities sustainability.



Figure 9 shows the land use and zoning in Batu Maung .(Source : Penang Local Authority)

SITE SELECTION

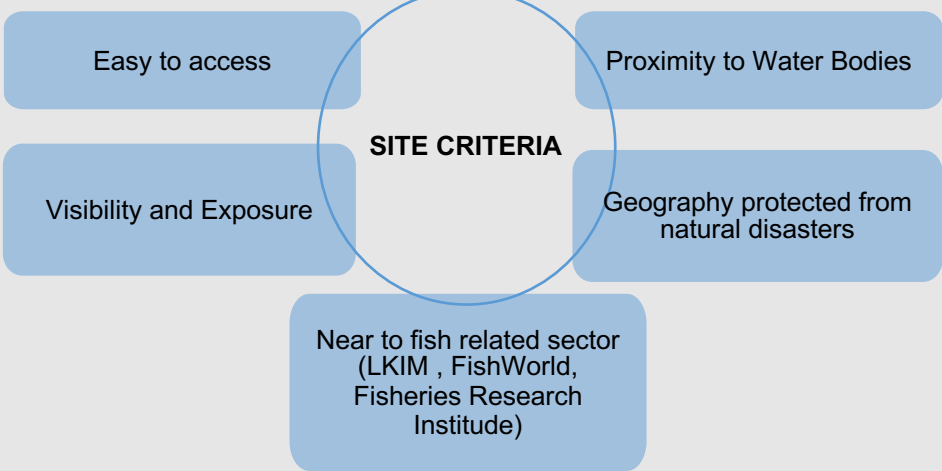


Figure 10: Site selection criteria

The proposed site is viewed as an ideal location for the proposed fish centre due to its strategic positioning near the coastline offering easy accessibility, high visibility, favourable climate conditions, natural ventilation, and proximity to key fish-related sectors. These factors collectively contribute to the site's suitability and potential for a successful establishment and operation of the fish centre.



Figure 11: Fish-related sector near the proposed site

In addition to that, the site's location near the 2nd Penang bridge is another strength as it is closer to the urban center as the significant seafood market. This strategic location offers opportunities to cater to both residents and tourists, maximizing the market potential for the fish center. Furthermore, the proposed site's good visibility and accessibility makes it an attractive destination for tourists who are interested in experiencing local culture and cuisine. Therefore, the presence of the fish center there may contribute to the economic development of the area as the center may generate higher

revenue, create job opportunities, and boost tourism-related activities. The visibility of the site from the bridge serves as free advertising, drawing attention to the facility. The CEO of Invest Penang (2021), Mr Loo had mentioned that Penang has the potential to become a center for fisheries and aquaculture R&D to produce high value-added fish and fish-based products, considering that research facilities and world-renowned research institutes are located here, referring to the presence of fish-related sectors such as Lembaga Kemajuan Ikan Malaysia (LKIM), WorldFish, and Fisheries Institute Researchers near the site offering numerous advantages.

SITE ANALYSIS



Figure 12: Proposed site from the 2nd bridge of Penang



Figure 13 : Entrance to the proposed site from the main road, Jalan Tun Dr. Lim Eu Hwy.

CLIMATE AND SENSORY

Batu Maung has a consistently warm temperatures with very little variation throughout the year. Average highs range from 30°C to 33°C (86°F to 91°F), while average lows hover between 23°C to 25°C (73°F to 77°F). High humidity levels are typical in Batu Maung due to its climate near the sea with reading often exceeds 80%, especially during the rainy season.

Batu Maung experiences a significant amount of rainfall, particularly during the southwest monsoon season from April to September. The northeast monsoon season from November to March brings less rainfall but still contributes to the overall wet climate. Despite the frequent rainfall, Batu

Maung still receives ample sunshine throughout the year, with an average of 6 to 8 hours of sunshine per day. The site location near the coastline allows for easy unloading of fish from the landing area directly to the sorting and market facilities within the fish center. This proximity streamlines the logistical process and reduces transportation time, ensuring the freshness and quality of the fish. Batu Maung has a tropical climate that provides optimal conditions for maintaining the freshness of seafood and ensuring the comfort of visitors.

The warm temperatures and high humidity levels may contribute to the overall pleasant ambience and environment to both visitors and marine life at the proposed fish center. The coastal location of the site allows for natural ventilation, with sea breezes helping to regulate temperatures and improve air circulation within the facilities. Adequate ventilation is essential for maintaining air quality and creating a comfortable atmosphere for visitors and staff.

DESIGN BRIEF

The Batu Maung Fish Center aims to serve as a multifaceted hub that caters to the needs of fishermen, buyers, and the local community. It shall function not only as a commercial marketplace but also as an educational and management center, fostering sustainability in the fishing industry. The project will offer various spaces and facilities designed to enhance the fishing community's capabilities, attract visitors, and contribute and improve the economic development of Batu Maung.

The main client is Majlis Bandaraya Pulau Pinang (MBPP) as landowner supporting by Lembaga Kemajuan Ikan Malaysia (LKIM) and WorldFish. These bodies have the abilities to improve fishing infrastructure, offer financial aid to assist small-scale fisherman in purchasing and acquiring fishing related equipment and technology and providing training to enhance their skills and techniques in fishing.

SPACE DISTRIBUTION

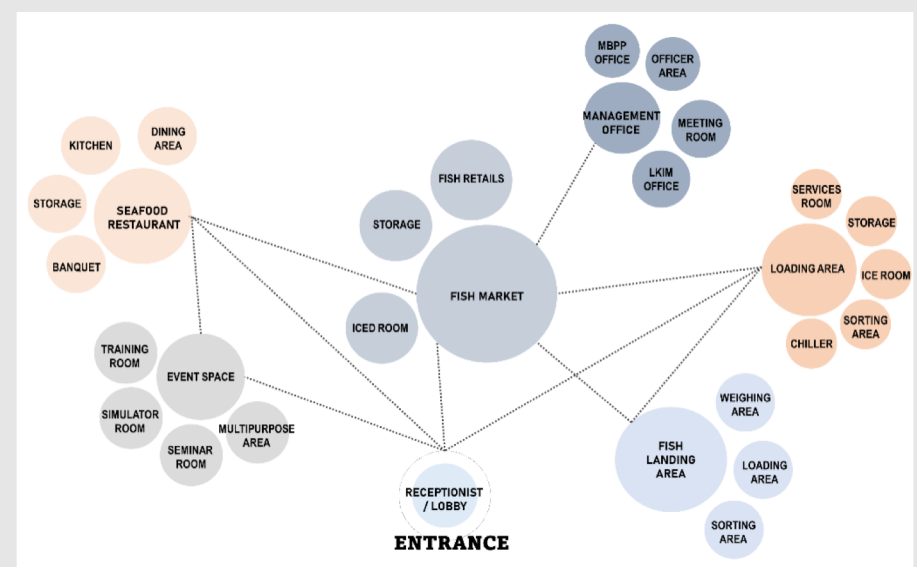


Figure 14: Bubble diagram

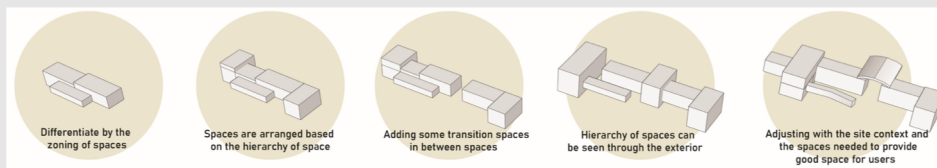


Figure 15: Design development

CONCEPT : OPEN-AIR CONCEPT

The concept of an open-air design for the Batu Maung Fish Center aims at creating an exposed market spaces to the surrounding environment and incorporating natural elements to promote a sense of connection with the sea and the local community.

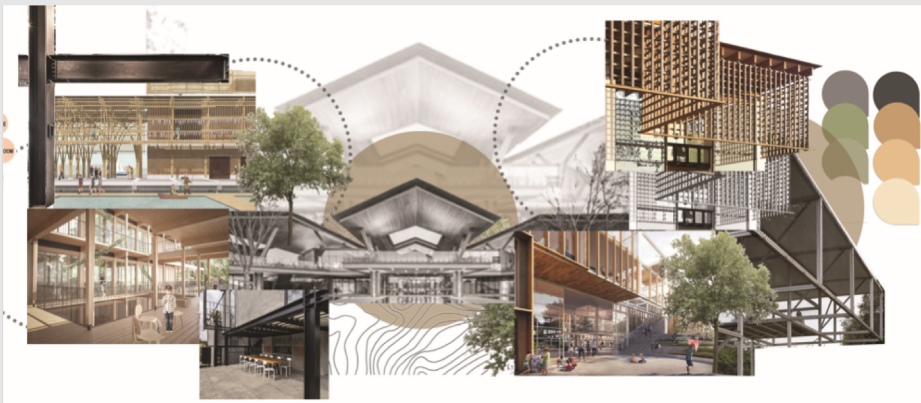


Figure 16: Concept

The design of the center features an open and well-ventilated space supported by the strength and durability of steel as the main structural system. This type of design is appropriate for markets located in coastal areas where the climate is warm and humid. An open-air fish market with steel structures that combines practicality, durability and aesthetics will create a space that is well-suited for the specific needs of a coastal fish market. The design has also maximized natural elements while providing the necessary infrastructure for a functional and thriving marketplace.

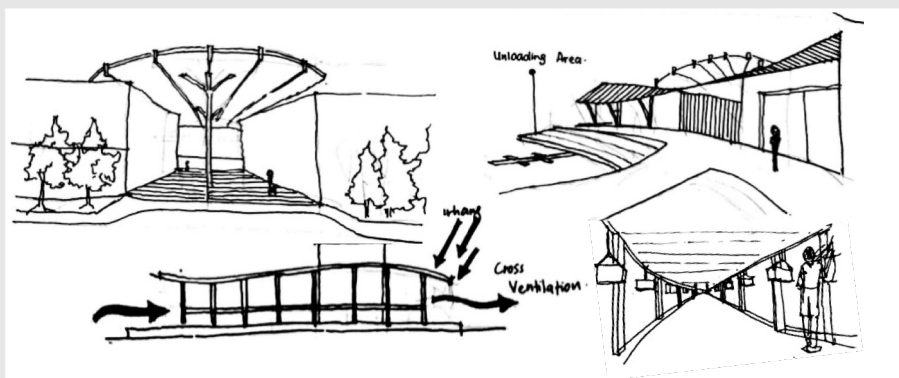


Figure 17: Sketches design ideas

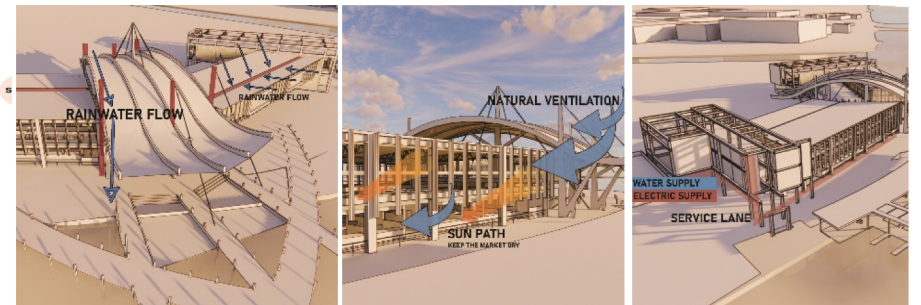


Figure 18: Design strategies

FLOOR PLAN



Figure 19: Ground floor plan

At the ground floor of the center, the fish landing area is positioned near the waterfront or docking facilities. This area is where fisherman unload their catches. The place includes platforms or docks for unloading fish and may have equipment such as cranes to assist in the unloading process. Next, near the fish landing is where the sorting and weighing area is located at is necessary for sorting out fish. It is a crucial space for initial processing before distribution. In a position near the entrance, a flexible multipurpose space is situated. The space can be adapted or used for various activities such as community events, product showcases, or temporary storage needs as it offers versatility and can accommodate different spatial configurations as required.

The dining facilities with cultural ambience is placed near the entrance or in a dedicated space. This area is where visitors can enjoy freshly prepared seafood dishes sourced directly from the fish center. Right besides the multipurpose area is simulator room proposed and designed to replicate a specific environment or scenario related to fishing or fishery operations. It may feature simulation software, control interfaces, and immersive technology to provide training or experiential learning opportunities for users. The space may enhance the overall visitors' experience and supports local seafood consumption. In addition to that, the center also provides an outdoor space or walkway along the waterfront, offering scenic views of the fishing activities and surrounding landscape. The facility provides visitors with an opportunity to stroll, relax, and immerse themselves in the maritime atmosphere at the fish center.

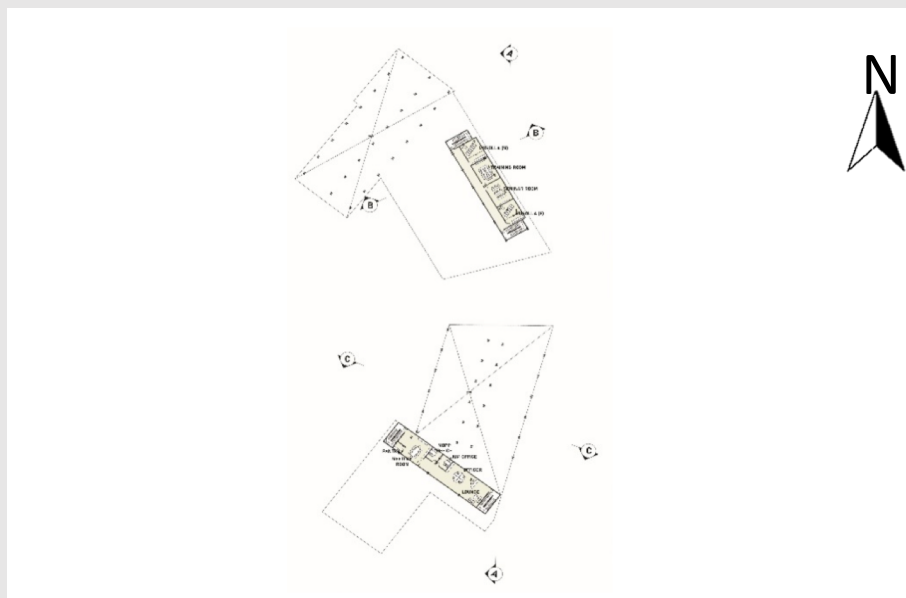


Figure 20: First floor plan

All private and semi-public spaces are located on the first floor. The spaces includes a management office, seminar room, and training room. The management office is dedicated to administrative functions and the management of the fish center. It may include offices for Majlis Bandaraya Pulau Pinang (MBPP), Lembaga Kemajuan Ikan Malaysia (LKIM), managers, and administrative staff, as well as meeting rooms for discussions and decision-making. On the other side of the same level, are where seminar room, training room as well as musolla for public use are located.

The seminar room is for educational events and industry gatherings with efficient technical facilities to conduct presentations, workshops, and discussions. The training room on the other hand is dedicated to fishery-related training programs and skill development workshops. It may include training materials, interactive displays, and demonstration areas to facilitate hands-on learning experiences. Both of these spaces are mainly for fishermen to learn and develop new skills that will enable them to venture into a highly profitable deep sea fishing activities with the use of a bigger boat provided by the client.

PERSPECTIVES



Figure 21: Perspective view from the sea



Figure 22: Perspective view from the sea

FISH LANDING AREA

As mentioned earlier the fish landing area for fishermen at the fish center is an important zone where freshly caught fish are brought ashore and processed for distribution or sale. The area is situated directly adjacent to the water's edge or within close proximity to the docks. The area is designed with sturdy platforms where fishing boats can easily unload their catches. This fish landing area may include berthing spaces for multiple vessels simultaneously. Proper space for fish carrying and sorting must be well designed for monitoring purposes as to ensure environmental sustainability and hygiene standards are maintained. According to Law, Z.Y. Ghazali, A. (2021), the space planning of fish landing area must be emphasized during the preliminary design stage as to enhance the efficiency of fish landing process at the center.

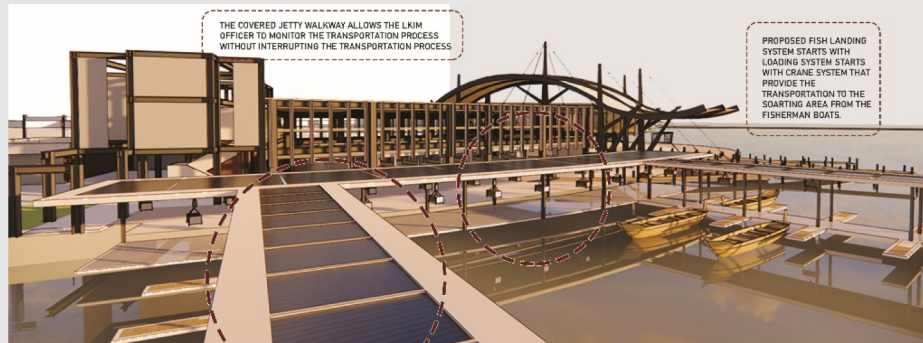


Figure 23: Fish landing area

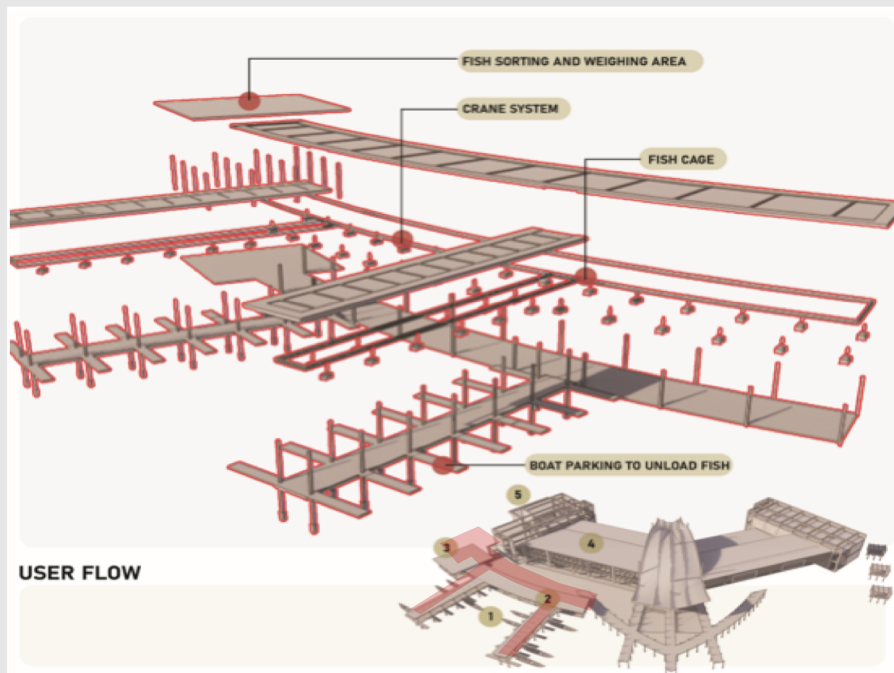


Figure 24: Exploded fish landing area

The design of the center has also considered implementation of safety measures such as non-slip surfaces, handrails, and proper lighting to prevent accidents and ensure the well-being of fishermen and workers when engaged in their respective activities at the center.

Fish landing area

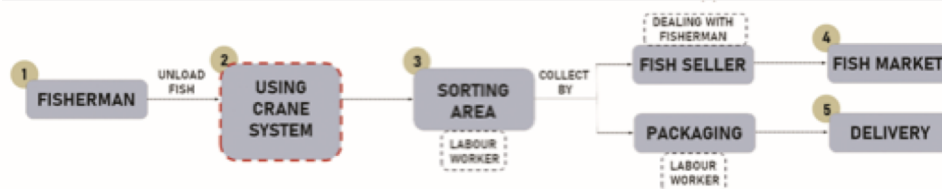


Figure 25: Users flow



Figure 26: Unloading fish from the boat to the crane system on the fish landing area

The width and length of the fish landing are designed to accommodate the size of boats commonly used in the area. This includes consideration on the dimensions of the boat when parked with fully loaded with the catch as well as taking into account the space required for boat maneuvering during docking and unloading. The length of the landing area should also allow for a smooth and efficient movement of fish crates or containers from the vessel to the processing stations and storage areas.

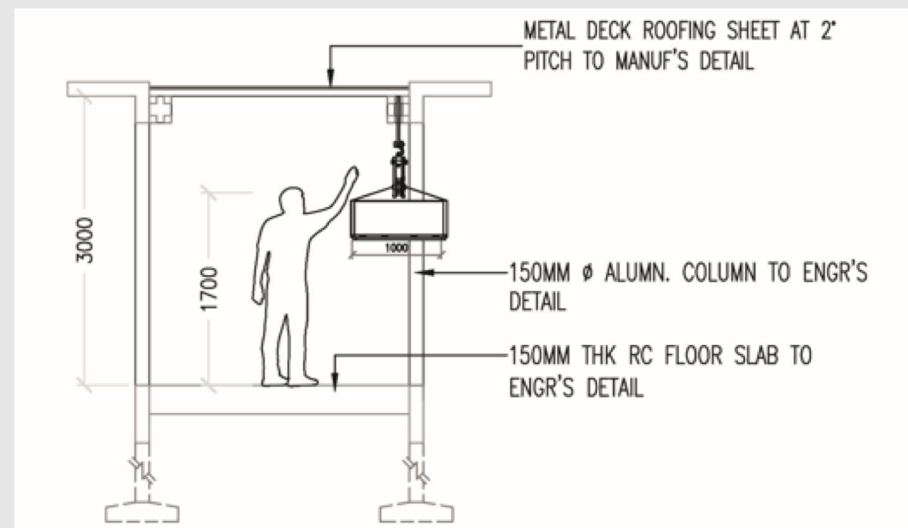


Figure 27: Sectional cut of the crane systems

Sufficient spaces are provided at the center to prevent congestion and facilitate smooth workflow. The layout of the fish landing area has prioritized the comfort and safety of the fishermen. The design measures has included provision of adequate space for them to move and work comfortably around the vessels and processing equipment. Human spaces, such as walkways, workstations, and access routes were also provided and proportionately distributed within the landing area to optimize workflow and minimize congestion. In the design, considerations on the

ergonomic factors, such as the placement of equipment and tools to reduce strain and fatigue on fishermen during repetitive tasks were also emphasized. Safety is paramount at the fish landing area, especially when operating a crane system. Clear markings, signage, and designated safety zones should be implemented to prevent accidents and ensure the well-being of fishermen and workers.

Another important space is the sorting and weighing area where a proper design of the place will avoid delays and ensuring timely delivery of fresh fishes and high quality products are sent to the market. and logistics partners. of a fish center plays a crucial role in the overall operation before fish are sent to the market and logistics. Well-organized operations in this area contribute to efficient supply chain management and customer satisfaction.



Figure 28: Sorting and weighing area

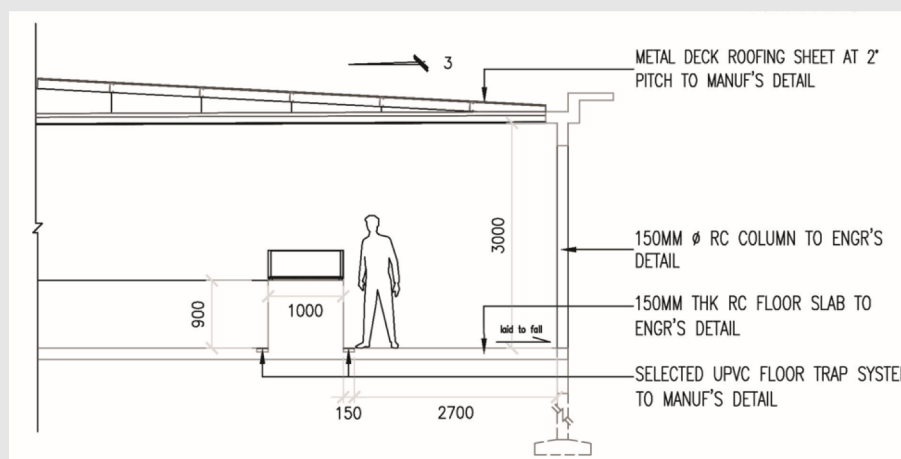


Figure 29: Sectional cut of the sorting area

Hence, the design of the space must facilitate measures that will ensure proper functioning of the space as it is essential for maintaining the center's reputation, profitability, and sustainability in the seafood industry.

CONCLUSION

In conclusion, the development of the Batu Maung Fish Center represents a significant opportunity to support small-scale fishermen, enhance their economic prospects, and contribute to the overall economy of Batu Maung, Penang. By focusing on providing a centralized marketplace for fishermen to market their catch and offering education and training programs to expand their knowledge and skills, the proposed fish center may become the impetus and provide positive impacts towards improvement of the performance of local economy in general and the economy of the small scale fishermen in particular. The center serves as a centralized hub where small-scale fishermen may have access to a wider network of buyers, including wholesalers, retailers, and seafood distributors. This situation may assist the fishermen to secure better prices for their catch, hence, boosting their incomes for better livelihoods.

In addition to that, education and training programs offered at the fish center will provide opportunities for the fishermen to learn new techniques, technologies, and best practices for deep-sea fishing. This knowledge will enable them to diversify their fishing activities and improve the overall quality of their fishing related products, therefore, increasing their earning potential. The development of the fish center will also create employment opportunities not only for fishermen but also for local people for job positions as supporting staff such as administrators, trainers, and market vendors. This, in turn will mitigate unemployment issue and problems among and may contribute towards poverty reduction in Batu Maung.

In conclusion, the Batu Maung Fish Center has the potential to become a cornerstone of economic development and community empowerment in Penang in general and Batu Maung in particular. The center and its activities are empowering small-scale fishermen towards better control of their economic sources through fishing activities, fostering innovation, and promoting sustainable practices. The fish center as the centralized commercial fish hub is the future for the new generation of fishermen in Batu Maung with better livelihood in the age of globalization and modernism..

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